**3GPP TSG-CT WG1 Meeting #141eC1-232265**

**Online 17– 21 April 2023**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **24.554** | **CR** | **0300** | **rev** | **1** | **Current version:** | **18.0.0** |  |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

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| ***Title:*** | Term alignment and editorial correction | | | | | | | | | |
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| ***Source to WG:*** | OPPO, Nokia, Nokia Shanghai Bell | | | | | | | | | |
| ***Source to TSG:*** | C1 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | 5G\_ProSe\_Ph2 | | | | |  | ***Date:*** | | | 2023-04-10 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *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 can be 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:*** | | This CR is to align the term such as 5G ProSe UE-to-UE relay UE.  Also some editorial changes. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | This CR is to align the term such as 5G ProSe UE-to-UE relay UE.  Also some editorial changes. | | | | | | | | |
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| ***Consequences if not approved:*** | | Terms are not aligned and editorial errors. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.2.14.2.2.2, 7.2.4.2, 7.2.4.3, 7.2.4.6, 7.2.13, 7.2.13.1, 7.2.13.2, 7.2.13.3, 7.2.13.4, 7.2.13.5, 7.2.13.6, 7.2.13.6.1, 7.7.1, 7.7.2.3, 7.7.2.4, 7.7.3.5, 8.1, 8.2.13.1, 8.2.13.2, 8.2.13.3, 8.2.13.4, 8.2.13.5, 8a.2.1.1, 8a.2.1.2.2.2, 8a.2.1.2.3.1, 8a.2.1.2.3.2, 8a.2.1.3.2.1, 8a.2.1.3.2.2, 8a.2.1.3.2.3, 8a.2.1.3.3.2, 8a.2.1.3.4.2, 8a.2.3.2, 8a.2.5, 10.2.8, 10.2.9, 10.3.3.4, 10.3.3.7, 10.3.20.4, 10.3.22.2 | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***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 \* \* \* \*

###### 6.2.14.2.2.2 Discoverer UE procedure for 5G ProSe direct discovery initiation

The UE is authorised to perform the discoverer UE procedure for 5G ProSe direct discovery if:

a) the UE is not served by NG-RAN, is authorised to perform 5G ProSe direct discovery discoverer operation when the UE is not served by NG-RAN and is configured with the radio parameters to be used for 5G ProSe direct discovery when not served by NG-RAN;

b) the UE is served by NG-RAN and is authorised to perform 5G ProSe direct discovery discoverer operation in the PLMN indicated by the serving cell; or

c) the UE is:

1) in 5GMM-IDLE mode, in limited service state as specified in 3GPP TS 23.122 [14] and the reason for the UE being in limited service state is one of the following:

i) the UE is unable to find a suitable cell in the selected PLMN as specified in 3GPP TS 38.304 [15];

ii) the UE received a REGISTRATION REJECT message or a SERVICE REJECT message with the 5GMM cause #11 "PLMN not allowed" as specified in 3GPP TS 24.501 [11]; or

iii) the UE received a REGISTRATION REJECT message or a SERVICE REJECT message with the 5GMM cause #7 "5GS services not allowed" as specified in 3GPP TS 24.501 [11]; and

2) authorised to perform 5G ProSe direct discovery discoverer operation when the UE is not served by NG-RAN; and:

i) configured with the radio parameters to be used for 5G ProSe direct discovery use when not served by NG-RAN; or

ii) the lower layers indicate that the UE does not need to request resources for 5G ProSe direct discovery procedure.

NOTE 1: When the lower layers indicate that the UE does not need to request resources for 5G ProSe direct discovery procedure, the serving cell broadcasts a common radio resources pool for ProSe discovery transmission and the UE can use this common radio resources pool while in limited service state.

otherwise, the UE is not authorised to perform the discoverer UE procedure for 5G ProSe direct discovery.

Figure 6.2.14.2.2.2.1 illustrates the interaction of the UEs in the discoverer UE procedure for 5G ProSe direct discovery.



Figure 6.2.14.2.2.2.1: Discoverer UE procedure for 5G ProSe direct discovery

When the UE is triggered by an upper layer application to query the target RPAUID in restricted discovery Model B, associated with both the ProSe query code and the authorised ProSe identifier; and

a) if the UE is authorised to perform the discoverer UE procedure for 5G ProSe direct discovery in the registered PLMN or the local PLMN operating the radio resources that the UE intends to use; and

b) if the validity timer T5070 for the ProSe query code and corresponding ProSe Response Filter(s) has not expired,

then the UE:

a) if the UE is served by NG-RAN and the UE in 5GMM-IDLE mode needs to request resources for sending PROSE PC5 DISCOVERY messages as specified in 3GPP TS 38.331 [13], shall perform a service request procedure as specified in 3GPP TS 24.501 [11];

b) shall obtain a valid UTC time for the discovery transmission from the lower layers and generate the UTC-based counter corresponding to this UTC time and if the resulting UTC-based counter is within max offset of the time shown by the clock used for ProSe by the UE, the UE shall for each ProSe query code in this discovery entry, use the ProSe query code to construct a PROSE PC5 DISCOVERY message as below;

c) shall generate a PROSE PC5 DISCOVERY message for 5G ProSe direct discovery solicitation. In the PROSE PC5 DISCOVERY message for 5G ProSe direct discovery solicitation, the UE:

1) shall set the ProSe direct discovery PC5 message type parameter as specified in table 10.2.1.3;

2) shall include ProSe query code;

3) shall include the MIC field computed as described in 3GPP TS 33.503 [34] by using the UTC-based counter and the DUIK contained in the <restricted-discoverer-response > element of the DISCOVERY\_RESPONSE message;

4) shall set the UTC-based counter LSB parameter to the 4 least significant bits of the UTC-based counter; and

5) shall include the discoveree user info set to the application layer ID of the discoveree UE if provided by the upper layers to identify a specific discoveree UE;

d) shall apply the DUIK, DUSK, or DUCK with the associated encrypted bitmask, along with the UTC-based counter to the PROSE PC5 DISCOVERY message for whichever security mechanism(s) configured to be applied, e.g., integrity protection, message scrambling or confidentiality protection of one or more above parameters, as specified in 3GPP TS 33.503 [34];

e) shall set the destination layer-2 ID to the default destination layer-2 ID as specified in clause 5.2.3 and self-assign a source layer-2 ID for sending the direct discovery announcement; and

NOTE 2: The UE implementation ensures that the value of the self-assigned source layer-2 ID is different from any other self-assigned source layer-2 ID(s) in use for 5G ProSe direct communication as specified in clause 7.2, is different from any other provisioned destination layer-2 ID(s) as specified in clause 5.2 and is different from any other self-assigned source layer-2 ID in use for a simultaneous 5G ProSe direct discovery procedure over PC5 with a different discovery model as specified in clause 6.2.14.2.1.2, clause 6.2.15.2.1.2, clause 8.2.1.2.2.2 and clause 8.2.1.2.4.2.

f) shall pass the resulting PROSE PC5 DISCOVERY message along with the source layer-2 ID and destination layer-2 ID for 5G ProSe direct discovery solicitation and the PLMN ID of the intended announcing PLMN if available in the discovery entry and an indication that the message is for 5G ProSe direct discovery to the lower layers for transmission over the PC5 interface and shall instruct the lower layer to start monitoring.

The UE shall ensure that it keeps on passing the same PROSE PC5 DISCOVERY message to the lower layers for transmission until the validity timer T5070 of the ProSe query code expires, or until the request from upper layers to query the target RPAUID in restricted discovery Model B, associated with both the ProSe query code and the authorised application identity, is not in place. How this is achieved is left up to UE implementation.

NOTE 3: The discoverer UE can stop discoverer UE procedure for 5G ProSe direct discovery for power saving by implementation specific means e.g. an implementation-specific maximum number of 5G ProSe direct links configured in the UE, or an implementation-specific timer expires.

The UE may apply the discovery response filter(s) received from the 5G DDNMF to its monitoring operation. Using the discovery response filter may result in a match event for the target RPAUID the UE is querying for. There is match event when, for any of the masks in a discovery response filter, the output of a bitwise AND operation between the ProSe response code contained in the received PROSE PC5 DISCOVERY message and the mask, matches the output of a bitwise AND operation between the mask and the code contained in the discovery response filter.

Upon reception of a PROSE PC5 DISCOVERY message for direct discovery response, for the target destination layer-2 ID of the direct discovery to be discovered, the UE shall use the associated DUSK, if received from the 5G DDNMF and the UTC-based counter obtained during the monitoring operation to unscramble the PROSE PC5 DISCOVERY message as described in 3GPP TS 33.503 [34]. Then, if a DUCK is received from the 5G DDNMF, the UE shall use the DUCK and the UTC-based counter to decrypt the configured message-specific confidentiality-protected portion, as described in 3GPP TS 33.503 [34]. Finally, if a DUIK is received from the 5G DDNMF, the UE shall use the DUIK and UTC-based counter to verify the MIC field in the unscrambled PROSE PC5 DISCOVERY message for direct discovery response. If a MIC Check Indicator parameter is included instead, the UE shall use the match report procedure described in clause 6.2.10 to trigger checking of the MIC of the PROSE PC5 DISCOVERY message containing the ProSe response code by the 5G DDNMF.

The UE may notify the upper layer application about the match event of restricted 5G ProSe direct discovery model B with the corresponding target RPAUID and metadata, if the RPAUID and metadata are included in the Subquery result element in the DISCOVERY\_RESPONSE message from the 5G DDNMF.

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

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

#### 7.2.4.1 General

The 5G ProSe direct link identifier update procedure is used to update and exchange the new identifiers (e.g., application layer ID, layer-2 ID, security information and IP address/prefix) between two UEs for a 5G ProSe direct link before using the new identifiers. The UE sending the PROSE DIRECT LINK IDENTIFIER UPDATE REQUEST message is called the “initiating UE” and the other UE is called the “target UE”.

#### 7.2.4.2 5G ProSe direct link identifier update procedure initiation by initiating UE

The initiating UE shall initiate the procedure if:

a) the initiating UE receives a request from upper layers to change the application layer ID and there is an existing 5G ProSe direct link associated with this application layer ID; or

b) the privacy timer (see clause 5.2.4) of the initiating UE's layer-2 ID expires for an existing 5G ProSe direct link.

If the 5G ProSe direct link identifier update procedure is triggered by a change of the initiating UE's application layer ID, the initiating UE shall create a PROSE DIRECT LINK IDENTIFIER UPDATE REQUEST message. In this message, the initiating UE:

a) shall include the initiating UE's new application layer ID received from upper layer;

b) shall include the initiating UE's new layer-2 ID assigned by itself;

c) shall include the new MSB of KNRP-sess ID;

d) shall include the new IP address/prefix if IP communication is used and the 5G ProSe direct link is not for 5G ProSe direct communication between 5G ProSe layer-2 remote UE and 5G ProSe layer-2 UE-to-network relay UE and the target UE is not a 5G ProSe layer-3 UE-to-UE relay UE;

e) shall include the new IP address/prefix, if IP communication is used, IP address/prefix needs to be changed, the target UE is a 5G ProSe layer-3 UE-to-UE relay UE and IP address/prefix of the initiating UE is allocated by the initiating UE;

f) shall include the IP address/prefix needed indication if IP communication is used, the target UE is a 5G ProSe layer-3 UE-to-UE relay UE, and IP address/prefix of the initiating UE needs to be changed and is allocated by the 5G ProSe UE-to-UE relay UE;

g) shall include the list of target end UE IP address/prefix (i.e. application layer ID(s) and IP address(es)/prefix(es)), if IP communication is used, the initiating UE's IP address/prefix needs to be changed, and the target UE is a 5G ProSe layer-3 UE-to-UE relay UE; and

h) shall include peer update indication if IP communication is used, the initiating UE's IP address/prefix needs to be changed, and the target UE is a 5G ProSe layer-3 UE-to-UE relay UE..

If the 5G ProSe direct link identifier update procedure is triggered by the expiry of the initiating UE's privacy timer T5090 as specified in clause 5.2.4 and clause 5.2.5, the initiating UE shall create a PROSE DIRECT LINK IDENTIFIER UPDATE REQUEST message. In this message, the initiating UE:

a) shall include the initiating UE's new layer-2 ID assigned by itself;

b) shall include the new MSB of KNRP-sess ID;

c) may include the initiating UE's new application layer ID if received from upper layer;

d) shall include the new IP address/prefix if IP communication is used and changed and the 5G ProSe direct link is not for 5G ProSe direct communication between 5G ProSe layer-2 remote UE and 5G ProSe layer-2 UE-to-network relay UE and the the target UE is not a 5G ProSe layer-3 UE-to-UE relay UE;

e) shall include the new IP address/prefix if IP communication is used, IP address/prefix needs to be changed, the target UE is a 5G ProSe layer-3 UE-to-UE relay UE and IP address/prefix of the initiating UE is allocated by the initiating UE;

f) shall include the IP address/prefix needed indication if IP communication is used, IP address/prefix shall be changed and the target UE is a 5G ProSe layer-3 UE-to-UE relay UE and IP address/prefix of the initiating UE is allocated by the 5G ProSe layer-3 UE-to-UE relay UE;

g) shall include the list of target end UE IP address/prefix (i.e. application layer ID and IP address/prefix) if IP communication is used, IP address/prefix shall be changed and the target UE is a 5G ProSe layer-3 UE-to-UE relay UE; and

h) shall include peer update indication if IP communication is used, IP address/prefix changed and the target UE is a 5G ProSe layer-3 UE-to-UE relay UE..

After the PROSE DIRECT LINK IDENTIFIER UPDATE REQUEST message is generated, the initiating UE shall pass this message to the lower layers for transmission along with the initiating UE's old layer-2 ID for 5G ProSe direct communication and the target UE's layer-2 ID for 5G ProSe direct communication and start timer T5082. The UE shall not send a new PROSE DIRECT LINK IDENTIFIER UPDATE REQUEST message to the same target UE while timer T5082 is running.



Figure 7.2.4.2.1: 5G ProSe direct link identifier update procedure

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

#### 7.2.4.3 5G ProSe direct link identifier update procedure accepted by the target UE

Upon receipt of a PROSE DIRECT LINK IDENTIFIER UPDATE REQUEST message, if the target UE determines:

a) the 5G ProSe direct link associated with this request message is still valid; and

b) the timer T5083 for the 5G ProSe direct link identified by this request message is not running,

then the target UE accepts this request and responds with a PROSE DIRECT LINK IDENTIFIER UPDATE ACCEPT message.

If the target UE is a 5G ProSe layer-3 UE-to-UE relay UE and IP address/prefix needed indication is received from the initiating UE, the 5G ProSe layer-3 UE-to-UE relay UE assigns a new IP address/prefix to the initiating UE.

If the target UE is a 5G ProSe layer-3 UE-to-UE relay UE, the 5G ProSe layer-3 UE-to-UE relay UE may initiate the 5G ProSe UE to UE relay update procedure as specified in clause 7.2.13.

The target UE shall create the PROSE DIRECT LINK IDENTIFIER UPDATE ACCEPT message. In this message, the target UE:

a) shall include the target UE's new layer-2 ID assigned by itself;

b) shall include the new LSB of KNRP-sess ID;

c) shall include the initiating UE's new MSB of KNRP-sess ID;

d) shall include the initiating UE's new layer-2 ID;

e) shall include the target UE's new application layer ID if received from upper layer;

f) shall include the initiating UE's new IP address/prefix if received from the initiating UE and IP communication is used or if IP address/prefix needed indication is received from the initiating UE and IP communication is used;

g) shall include the initiating UE's new application layer ID if received from the initiating UE; and

h) shall include the target UE's new IP address/prefix if IP communication is used and changed and the 5G ProSe direct link is not for 5G ProSe direct communication between 5G ProSe layer-2 remote UE and 5G ProSe layer-2 UE-to-network relay UE.

After the PROSE DIRECT LINK IDENTIFIER UPDATE ACCEPT message is generated, the target UE shall pass this message to the lower layers for transmission along with the initiating UE's old layer-2 ID for 5G ProSe direct communication and the target UE's old layer-2 ID for 5G ProSe direct communication and start timer T5083. The UE shall not send a new PROSE DIRECT LINK IDENTIFIER UPDATE ACCEPT message to the same initiating UE while timer T5083 is running.

Before target UE receives the traffic using the new layer-2 IDs, the target UE shall continue to receive the traffic with the old layer-2 IDs (i.e., initiating UE's old layer-2 ID and target UE's old layer-2 ID) from initiating UE.

Before target UE receives the PROSE DIRECT LINK IDENTIFIER UPDATE ACK message from initiating UE, the target UE shall keep sending traffic to the initiating UE using the old layer-2 IDs (i.e., initiating UE's old layer-2 ID for 5G ProSe direct communication and target UE's old layer-2 ID for 5G ProSe direct communication).

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

#### 7.2.4.6 5G ProSe direct link identifier update procedure not accepted by the target UE

If the PROSE DIRECT LINK IDENTIFIER UPDATE REQUEST message cannot be accepted, the target UE shall send a PROSE DIRECT LINK IDENTIFIER UPDATE REJECT message. The PROSE DIRECT LINK IDENTIFIER UPDATE REJECT message contains a PC5 signalling protocol cause IE set to one of the following cause values:

#3 conflict of layer-2 ID for 5G ProSe direct communication is detected;

#y unknown target UE's IP address/prefix or target UE's Application layer ID; or

#111 protocol error, unspecified.

For a received PROSE DIRECT LINK IDENTIFIER UPDATE REQUEST message from a layer-2 ID (for 5G ProSe direct communication), if the target UE already has an existing link using this layer-2 ID or is currently processing a PROSE DIRECT LINK IDENTIFIER UPDATE REQUEST message from the same layer-2 ID, but with user info different from the user info IE included in this new incoming message, the target UE shall send a PROSE DIRECT LINK IDENTIFIER UPDATE REJECT message with PC5 signalling protocol cause value #3 "conflict of layer-2 ID for 5G ProSe direct communication is detected".

NOTE: After receiving the PROSE DIRECT LINK IDENTIFIER UPDATE REJECT message, whether the initiating UE initiates the 5G ProSe direct link release procedure or initiates another 5G ProSe direct link identifier update procedure with a new layer-2 ID depends on UE implementation.

For a received PROSE DIRECT LINK IDENTIFIER UPDATE REQUEST message from a source 5G ProSe end UE, if the target UE is a 5G ProSe layer-3 UE-to-UE relay UE and receives the PC5 signalling protocol cause value #x "unknown initiating end UE's IP address/prefix or initiating UE's Application layer ID" from the target 5G ProSe end UE in the PROSE DIRECT RELAY UPDATE REJECT message as specified in clause 7.2.13.5, the target UE sends a PROSE DIRECT LINK IDENTIFIER UPDATE REJECT message with PC5 signalling protocol cause value #y "unknown target UE's IP address/prefix or target UE's Application layer ID".

For other reasons causing the failure of link identifier update, the target UE shall send a PROSE DIRECT LINK IDENTIFIER UPDATE REJECT message with PC5 signalling protocol cause value #111 "protocol error, unspecified".

Upon receipt of the PROSE DIRECT LINK IDENTIFIER UPDATE REJECT message, the initiating UE shall stop timer T5082 and abort this 5G ProSe direct link identifier update procedure.

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

### 7.2.13 5G ProSe UE-to-UE relay update procedure

#### 7.2.13.1 General

The 5G ProSe UE-to-UE relay update procedure is used to update the target 5G ProSe end UE(s) with the source 5G ProSe end UE's new IP address/prefix and new Application layer ID during a 5G ProSe direct link identifier update procedure between the source 5G ProSe end UE and the 5G ProSe layer-3 UE-to-UE relay UE. The 5G ProSe layer-3 UE-to-UE relay UE initiates the 5G ProSe UE-to-UE relay update procedure with each target end UE as indicated by the source 5G ProSe end UE during the 5G ProSe direct link identifier update procedure.

The 5G ProSe layer-3 UE-to-UE relay UE is called the initiating UE in this procedure and the target 5G ProSe end UE is called target UE.

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

#### 7.2.13.2 5G ProSe UE-to-UE relay update procedure initiation by initiating UE

The initiating UE shall initiate the 5G ProSe UE-to-UE relay update procedure with the target UE, if:

a) the initiating UE receives a PROSE DIRECT LINK IDENTIFIER UPDATE REQUEST message from the source 5G ProSe end UE as part of 5G ProSe direct link identifier update procedure; and

b) the peer update indication is included in the PROSE DIRECT LINK IDENTIFIER UPDATE REQUEST message.

The initiating UE retrieves the target UEs' entry from its local table based on the target 5G ProSe end UE(s) user info received in the PROSE DIRECT LINK IDENTIFIER UPDATE REQUEST message. The initiating UE initiates the 5G ProSe relay update procedure with each 5G ProSe target end UE.

In order to initiate the 5G ProSe UE-to-UE relay update procedure, the initiating UE shall create a PROSE UE TO UE RELAY UPDATE REQUEST message. In this message, the initiating UE:

1. shall include the source 5G ProSe end UE's old IP address/prefix;
2. may include the source 5G ProSe end UE's old application layer ID;
3. may include the source 5G ProSe end UE's new application layer ID; and
4. shall include the source 5G ProSe end UE's new IP address/prefix.

The initiating UE shall pass this message to the lower layers for transmission along with the target UE's layer-2 ID for 5G ProSe direct communication and start timer Txxxx. The initiating UE shall not send a new PROSE UE TO UE RELAY UPDATE REQUEST message to the same target UE while timer Txxxx is running.



Figure 7.2.13.2.1: 5G ProSe UE-to-UE relay update procedure

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

#### 7.2.13.3 5G ProSe UE-to-UE relay update procedure accepted by the target UE

Upon receipt of a PROSE UE TO UE RELAY UPDATE REQUEST message, the target UE shall replace the original source 5G ProSe end UE's IP address/prefix with the new source 5G ProSe end UE's IP address/prefix or unicast communication as received in the message. The target UE shall also replace the original source 5G ProSe end UE's Application ID with the new source 5G ProSe end UE's Application ID for unicast communication if received in the PROSE UE TO UE RELAY UPDATE REQUEST message. If the target UE determines that the PROSE UE TO UE RELAY UPDATE REQUEST message can be accepted, the target UE shall create a PROSE UE TO UE RELAY UPDATE ACCEPT message. In this message, the target UE:

1. shall include the source 5G ProSe end UE's old IP address/prefix, as received from the initiating UE;
2. shall include the source 5G ProSe end UE's old application layer ID, if received from the initiating UE;
3. shall include the source 5G ProSe end UE's new application layer ID, if received from the initiating UE; and
4. shall include the source 5G ProSe end UE's new IP address/prefix, as received from the initiating UE.

After the PROSE UE TO UE RELAY UPDATE ACCEPT message is generated, the target UE shall pass this message to the lower layers for transmission along with the target UE's layer-2 ID for 5G ProSe direct communication and the initiating UE's layer-2 ID for 5G ProSe direct communication.

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

#### 7.2.13.4 5G ProSe UE-to-UE relay update procedure completion by the initiating UE

Upon receiving a PROSE UE TO UE RELAY UPDATE ACCEPT message, if the initiating UE determines that the PROSE UE TO UE RELAY UPDATE ACCEPT message can be accepted, the initiating UE shall stop timer Txxxx.

If more than one target 5G ProSe end UE is included on the received PROSE UE TO UE RELAY UPDATE REQUEST message, the initiating UE may wait for the responses from all target UEs before stopping timer Txxxx.

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

#### 7.2.13.5 5G ProSe UE-to-UE relay update procedure not accepted by the target UE

If the PROSE UE TO UE RELAY UPDATE REQUEST message cannot be accepted, the target UE shall create a PROSE UE TO UE RELAY UPDATE REJECT message. In this message, the target UE shall include a PC5 signalling protocol cause IE indicating one of the following cause values:

#x: unknown initiating end UE's IP address/prefix or initiating UE's Application layer ID;

After the PROSE UE TO UE RELAY UPDATE REJECT message is generated, the target UE shall pass this message to the lower layers for transmission along with initiating UE’s layer-2 ID for unicast communication and the target UE's layer-2 ID for unicast communication.

Upon receipt of the PROSE UE TO UE RELAY UPDATE REJECT message, the initiating UE shall stop timer Txxxx and shall continue the ongoing procedure that triggered the initiation of the 5G ProSe UE-to-UE relay update procedure indicating the failing target UE(s) to the source 5G ProSe end UE as specified in clause 7.2.4.6.

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

#### 7.2.13.6 Abnormal cases

##### 7.2.13.6.1 Abnormal cases at the initiating UE

a) Timer Txxxx expires.

The initiating UE shall retransmit the PROSE UE TO UE RELAY UPDATE REQUEST message and restart timer Txxxx. After reaching the maximum number of allowed retransmissions, the initiating UE shall abort the 5G ProSe UE-to-UE relay update procedure and shall continue the ongoing procedure that triggered the initiation of the 5G ProSe UE-to-UE relay update procedure indicating the failing target end UE(s) to the source 5G ProSe end UE as specified in clause 7.2.4.6.

NOTE 1: The maximum number of allowed retransmissions is UE implementation specific.

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

### 7.7.1 General

This clause describes the procedures for path switching procedure between the direct communication path over Uu and the direct communication path over PC5.

The communication path of direct communication path over Uu refers to the communication path between two ProSe-enabled UEs that is performed via the network over Uu reference point. The communication path of direct communication path over PC5 refers to the communication path between two ProSe-enabled UEs that is performed via the unicast mode 5G ProSe direct communication over PC5 as specified in clause 7.2.

The ProSe application to path switching mapping rules as specified in clause 5.2.4 is provisioned to UE to indicate whether the ProSe application identified by a ProSe identifier is authorized to perform the commnucation path switching between the direct communication path over Uu and the direct communication path over PC5, whether all the ProSe applications are authorized to perform the path switching procedure between the direct communication path over Uu and the direct communication path over PC5, or both. Only the ProSe application(s) that are authorized to perform the commnucation path switching are allowed to perform the path switching procedure between the direct communication path over Uu and the direct communication path over PC5 as specified in clause 7.7.

Editor's note: The path switching mapping rules related content in clause 7.7 will be revisited once SA2 determines the final requirement of path switching mapping rules.

The following procedures are defined for path switching procedure between the direct communication path over Uu and the direct communication path over PC5:

a) path switching procedure from the direct communication path over Uu to the direct communication path over PC5; and

b) path switching procedure from the direct communication path over PC5 to the direct communication path over Uu.

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

#### 7.7.2.3 Path switching procedure from the direct communication path over Uu to the direct communication path over PC5 accepted by the target UE

Upon receipt of the PROSE DIRECT LINK MODIFICATION REQUEST message as specified in clause 7.7.2.2, if the received PROSE DIRECT LINK MODIFICATION REQUEST message is accepted by the target UE, the target UE shall respond with the PROSE DIRECT LINK MODIFICATION ACCEPT message as specified in clause 7.2.3.3.

Upon receipt of the PROSE DIRECT LINK ESTABLISHMENT REQUEST message as specified in clause 7.7.2.2, if the received PROSE DIRECT LINK ESTABLISHMENT REQUEST message is accepted by the target UE, the target UE shall respond with the PROSE DIRECT LINK ESTABLISHMENT ACCEPT message as specified in clause 7.2.2.3.

The PROSE DIRECT LINK MODIFICATION ACCEPT message or the PROSE DIRECT LINK ESTABLISHMENT ACCEPT message is considered as the path switching procedure from the direct communication path over Uu to the direct communication path over PC5 is accepted by the target UE.

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

#### 7.7.2.4 Path switching procedure from the direct communication path over Uu to the direct communication path over PC5 completion by the initiating UE

Upon receipt of the PROSE DIRECT LINK MODIFICATION ACCEPT message or the PROSE DIRECT LINK ESTABLISHMENT ACCEPT message, the initiating UE:

1) shall perform the procedures as specified in clause 7.2.3.4 to complete the 5G ProSe direct link modification procedure, if the PROSE DIRECT LINK MODIFICATION ACCEPT message is received;

2) shall perform the procedures as specified in clause 7.2.2.4 to complete the 5G ProSe direct link establishment procedure, if the PROSE DIRECT LINK ESTABLISHMENT ACCEPT message is received; and

3) shall perform the PC5 QoS flow establishment over 5G ProSe direct link as specified in clause 7.2.7 if bullet 2) is performed;

The path switching procedure from the direct communication path over Uu to the direct communication path over PC5 is considered as completed when the initiating UE has at least one PC5 QoS flow(s) over the 5G ProSe direct link for the authorized ProSe application(s) for which the communication path switching procedure is to be performed.

The initiating UE shall then transmit the data traffic of the authorized ProSe application(s) for which the communication path switching procedure is to be performed with the target UE as specified in clause 7.2.8 and clause 7.2.9 using the direct communication path over PC5.

When the data traffic is successfully transmitted, the initiating UE or the target UE may perform either of the followings:

a) initiate a UE-requested PDU session release procedure as specified in clause 6.4.3 of 3GPP TS 24.501 [11] if there are no more traffic transmitted over the PDU Session; or

b) initiate a UE-requested PDU session modification procedure as specified in clause 6.4.2 of 3GPP TS 24.501 [11] to request the deletion of the existing QoS flow description(s) corresponding to ProSe application(s) for which the path switching procedure from the direct communication path over Uu to the direct communication path over PC5 is performed.

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

#### 7.7.3.5 Path switching procedure from the direct communication path over PC5 to the direct communication path over Uu not accepted by the target UE

Upon receipt of the PROSE PATH SWITCHING REQUEST message, if there is no ProSe application identified by the ProSe identifier in the PROSE PATH SWITCHING REQUEST message to perform the path switching procedure from the direct communication path over PC5 to the direct communication path over Uu, the target UE shall consider the PROSE PATH SWITCHING REQUEST is not acceptable, and shall generate a PROSE PATH SWITCHING REJECT message. The PROSE PATH SWITCHING REJECT message contains a PC5 signalling protocol cause IE set to one of the following cause values:

#18 path switching is not allowed for the ProSe applications;

#20 communication path over Uu is not available for path switching;

#111 protocol error, unspecified.

If all the ProSe application(s) identified by the ProSe identifier(s):

a) are not authorized to perform the communication path switching from the direct communication path over PC5 to the direct communication path over Uu procedure according to the ProSe application to path switching mapping rules as specified in clause 5.2.4 in the PROSE PATH SWITCHING REQUEST message; or

b) are not able to be supported because of e.g the QoS requirements for the direct communication path over Uu;

the target UE shall send a PROSE PATH SWITCHING REJECT message with the PC5 signalling protocol cause value #18 "path switching is not allowed for the ProSe applications". In this case, the initiating UE may initiate another PROSE PATH SWITCHING REQUEST message for the ProSe application(s) that are not in the previous PROSE PATH SWITCHING REQUEST message with the same target UE.

If the communication path over Uu is not available to the target UE (because of e.g. week signal strength over Uu) for the path switching procedure from the direct communication path over PC5 to the direct communication path over Uu, the target UE shall send a PROSE PATH SWITCHING REJECT message with the PC5 signalling protocol cause value #20 "communication path over Uu is not available for path switching".

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

## 8.1 Overview

This clause describes the procedures for 5G ProSe UE-to-network relay. The UE is configured with the related information as described in clause 5.2.5.

For the UE acting as a 5G ProSe layer-2 remote UE, the communication path switching between direct network communication path and indirect network communication path via the 5G ProSe layer-2 UE-to-network relay UE is supported as specified in clause 6.5.2.3 of 3GPP TS 23.304 [2].

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

#### 8.2.13.1 General

For a 5G ProSe remote UE accessing the network via a 5G ProSe UE-to-network relay UE, if the related conditions specified in clause 8.2.3.2 are met, the 5G ProSe remote UE:

a) may perform the procedure of target UE-to-network relay discovery and selection for communication path swithching as specified in clause 8.2.13.2; and

b) if a target 5G ProSe UE-to-network relay UE which can provide the connectivity service same as the source 5G ProSe UE-to-network relay UE provides to the 5G ProSe remote UE is selected, shall perform procedures of communication path switching from the source 5G ProSe UE-to-network relay UE to the target 5G ProSe UE-to-network relay UE as specified in clause 8.2.13.3, clause 8.2.13.4 or clause 8.2.13.5,

otherwise, may (re-)evaluate the URSP, if any, as specified clause 6.5.4 of 3GPP TS 23.304 [2].

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

#### 8.2.13.2 Target UE-to-network relay discovery and selection for communication path switching

In order to discover a target UE-to-network relay UE, the 5G ProSe remote UE shall initiate monitoring procedure for UE-to-network relay discovery as specified in clause 8.2.1.2.3, discoverer procedure for UE-to-network relay discovery as specified in clause 8.2.1.3.1 or both, depending on UE's configuration parameters for 5G ProSe UE-to-network relay as specified in clause 5.2.5, with following additions:

a) for monitoring procedure for UE-to-network relay discovery, in the PROSE PC5 DISCOVERY message for UE-to-network relay discovery announcement received from the announcing UE, the 5G ProSe remote UE shall monitor the same service relay code as provided by the source UE-to-network relay UE; and

b) for discoverer procedure for UE-to-network relay discovery, in the PROSE PC5 DISCOVERY message for UE-to-network relay discovery solicitation, the 5G ProSe remote UE shall set the relay service code parameter to the same relay service code as provided by the source UE-to-network relay UE.

NOTE: The connectivity service in a) and b) above refers to 5G ProSe layer-2 UE-to-network relay service, 5G ProSe layer-3 UE-to-network relay service with the set of PDU session parameters, or 5G ProSe layer-3 UE-to-network relay service using N3IWF access for the relayed traffic.

If the target 5G ProSe UE-to-network relay UE with the same service relay code as provided by the source UE-to-network relay UE is available after the execution of the above discovery procedure(s), the 5G ProSe remote UE performs the UE-to-network relay selection procedure as specified in clause 8.2.2 and perform the procedure of path switching as specified in clause 8.2.13.3, clause 8.2.13.4 or clause 8.2.13.5. Otherwise, the 5G ProSe remote UE may:

a) (re-)evaluate the URSP, if any, as specified in in clause 6.5.4 of 3GPP TS 23.304 [2];

b) perform UE-to-network relay discovery over PC5 interface and UE-to-network relay selection procedures as specified in clause 8.2; and

c) perform the procedure of path switching as specified in clause 8.2.13.3, clause 8.2.13.4 or clause 8.2.13.5.

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

#### 8.2.13.3 Path switching to 5G ProSe layer-3 UE-to-network relay without N3IWF

If a 5G ProSe layer-3 UE-to-network relay without N3IWF is selected as the target 5G ProSe UE-to-network relay UE, the 5G ProSe remote UE shall perform the procedure of 5G ProSe communication via 5G ProSe layer-3 UE-to-network relay without N3IWF as specified in clause 6.5.1.1 of 3GPP TS 23.304 [2]. In this case, the service continuity support is used by the application layer procedures which is out of scope of the present specification.

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

#### 8.2.13.4 Path switching to 5G ProSe layer-3 UE-to-network relay with N3IWF

If a 5G ProSe layer-3 UE-to-network relay with N3IWF is selected as the target 5G ProSe UE-to-network relay UE, the 5G ProSe remote UE shall perform the procedure as specified in clause 8.2.7 with following additions:

a) if the source 5G ProSe UE-to-network relay UE is a 5G ProSe layer-3 UE-to-network relay with N3IWF, the 5G ProSe remote UE shall select the same N3IWF which is connected with the source 5G ProSe layer-3 UE-to-network relay UE and use MOBIKE as specified in IETF RFC 4555 [52] if the 5G ProSe remote UE supports IETF RFC 4555 [52];

b) if the source 5G ProSe UE-to-network relay UE is a 5G ProSe layer-3 UE-to-network relay without N3IWF, the service continuity support is used by the application layer procedures which is out of scope of the present specification; and

c) if the source 5G ProSe UE-to-network relay UE is a 5G ProSe layer-2 UE-to-network relay, the 5G ProSe remote UE shall perform handover of a PDU session procedure from 3GPP to untrusted non-3GPP access as specified in clause 4.9.2.2 of 3GPP TS 23.502 [51].

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

#### 8.2.13.5 Path switching to 5G ProSe layer-2 UE-to-network relay

If a 5G ProSe layer-2 UE-to-network relay is selected as the target 5G ProSe UE-to-network relay UE, the 5G ProSe remote UE shall perform the procedure of 5G ProSe communication via 5G ProSe layer-2 UE-to-network relay as specified in clause 6.5.2 of 3GPP TS 23.304 [2] with following additions:

a) if the source 5G ProSe UE-to-network relay UE is a 5G ProSe layer-3 UE-to-network relay with N3IWF, the 5G ProSe remote UE shall perform handover of a PDU session procedure from untrusted non-3GPP to 3GPP access as specified in clause 4.9.2.1 of 3GPP TS 23.502 [51];

b) if the source 5G ProSe UE-to-network relay UE is a 5G ProSe layer-3 UE-to-network relay without N3IWF, the service continuity support is used by the application layer procedures which is out of scope of the present specification.

Editor's note: If the source 5G ProSe UE-to-network relay is a 5G ProSe layer-2 UE-to-network relay, the procedure is FFS and will be aligned with RAN2 specification.

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

#### 8a.2.1.1 General

This clause describes the procedures for both 5G ProSe layer-3 and layer-2 UE-to-UE relay discovery for public safety use and commercial services at a ProSe-enabled UE over the PC5 interface. The purpose of the 5G ProSe UE-to-UE relay discovery procedure over PC5 interface is to enable a ProSe-enabled UE to detect and identify another ProSe-enabled UE over PC5 interface for 5G ProSe UE-to-UE relay communication between two UEs.

A 5G ProSe UE-to-UE relay supporting multiple relay service codes can advertise the relay service codes using multiple discovery messages, with one relay service code per discovery message.

To perform 5G ProSe UE-to-UE relay discovery over PC5 interface, the UE is configured with the related information as described in clause 5.2.7. The following models for 5G ProSe UE-to-UE relay discovery procedure over PC5 interface as specified in 3GPP TS 23.304 [2] are supported:

a) Model A uses a single discovery protocol message (Announcement); and

b) Model B uses two discovery protocol messages (Solicitation and Response).

NOTE: If the UE is authorized to perform both 5G ProSe UE-to-UE relay discovery Model A and 5G ProSe UE-to-UE relay discovery Model B, it is up to UE implementation to select which model to perform or perform both models simultaneously.

The following procedures are defined for 5G ProSe UE-to-UE relay discovery procedure over PC5 interface:

a) 5G ProSe UE-to-UE relay discovery over PC5 interface with Model A:

1) Announcing UE procedure for 5G ProSe UE-to-UE relay discovery initiation;

2) Announcing UE procedure for 5G ProSe UE-to-UE relay discovery completion;

3) Monitoring UE procedure for 5G ProSe UE-to-UE relay discovery initiation; and

4) Monitoring UE procedure for 5G ProSe UE-to-UE relay discovery completion; and

b) 5G ProSe UE-to-UE relay discovery over PC5 interface with Model B:

1) Discoverer end UE procedure for 5G ProSe UE-to-UE relay discovery initiation;

2) Discoverer end UE procedure for 5G ProSe UE-to-UE relay discovery completion;

3) Relay UE procedure for UE-to-UE relay discovery initiation;

4) Relay UE procedure for UE-to-UE relay discovery completion;

5) Discoveree end UE procedure for 5G ProSe UE-to-UE relay discovery initiation; and

6) Discoveree end UE procedure for 5G ProSe UE-to-UE relay discovery completion.

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

###### 8a.2.1.2.2.2 Announcing UE procedure for UE-to-UE relay discovery initiation

The UE is authorised to perform the announcing UE procedure for UE-to-UE relay discovery if:

a) the UE is authorised to act as a 5G ProSe UE-to-UE relay UE in the PLMN indicated by the serving cell as specified in clause 5.2.7, and

1) the UE is served by NG-RAN and the UE is authorised to perform 5G ProSe UE-to-UE relay discovery in the PLMN as specified in clause 5; or

2) the UE is authorised to perform 5G ProSe UE-to-UE relay discovery when not served by NG-RAN as specified in clause 5 and intends to use the provisioned radio resources for 5G ProSe UE-to-UE relay discovery; and

b) the UE is configured with:

1) the relay service code parameter identifying the connectivity service to be announced as specified in clause 5.2.7; and

2) the User info ID for the 5G ProSe UE-to-UE relay discovery parameter as specified in clause 5.2.7;

otherwise, the UE is not authorised to perform the announcing UE procedure for UE-to-UE relay discovery.

Figure 8a.2.1.2.2.2.1 illustrates the interaction of the UEs in the announcing UE procedure for UE-to-UE relay discovery.



Figure 8a.2.1.2.2.2.1: Announcing UE procedure for UE-to-UE relay discovery

When the UE is triggered by the upper layers to announce availability of a connectivity service provided by a 5G ProSe UE-to-UE relay, if the UE is authorised to perform the announcing UE procedure for UE-to-UE relay discovery, then the UE:

a) if the UE is served by NG-RAN and the UE in 5GMM-IDLE mode needs to request resources for sending PROSE PC5 DISCOVERY messages for 5G ProSe UE-to-UE relay discovery as specified in 3GPP TS 38.331 [13], shall perform a service request procedure or mobility registration procedure as specified in 3GPP TS 24.501 [11];

b) shall obtain a valid UTC time for the discovery transmission from the lower layers and generate the UTC-based counter corresponding to this UTC time as specified in clause 11.2.5;

c) shall generate a PROSE PC5 DISCOVERY message for UE-to-UE relay discovery announcement according to clause 10.2.1. In the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery announcement, the UE:

1) shall set the announcer info parameter to the User info ID configured for the 5G ProSe UE-to-UE relay discovery, as specified in clause 5.2.7;

2) shall set the relay service code parameter to the relay service code configured for the connectivity service to be announced, as specified in clause 5.2.7;

3) may set the 5G ProSe end UE list to a list of user info ID(s) of the 5G ProSe end UE(s), if known e.g. during previous 5G ProSe UE-to-UE relay discovery or 5G ProSe UE-to-UE relay communication procedure(s);

Editor's note: It is FFS on the case when the announcing UE updates the list of user info ID(s) of the 5G ProSe end UE(s).

4) shall include the MIC field computed as described in 3GPP TS 33.503 [34];5) shall set the UTC-based counter LSB parameter to the 4 least significant bits of the UTC-based counter;

6) shall set the Resource Status Indicator bit of the status indicator parameter to indicate whether or not the UE has resources available to provide a connectivity service for additional ProSe-enabled UEs; and

7) shall set the ProSe direct discovery PC5 message type parameter as specified in table 10.2.1.12;

Editor's note: The security related contents are FFS and depend on SA3 requirements.

d) shall set the destination layer-2 ID to the default destination layer-2 ID as specified in clause 5.2.x and self-assign a source layer-2 ID for sending the 5G ProSe UE-to-UE relay discovery announcement; and

NOTE 1: The UE implementation ensures that the value of the self-assigned source layer-2 ID is different from any other self-assigned source layer-2 ID(s) in use for 5G ProSe direct communication as specified in clause 7.2, is different from any other provisioned destination layer-2 ID(s) as specified in clause 5.2 and is different from any other self-assigned source layer-2 ID in use for a simultaneous 5G ProSe direct discovery procedure over PC5 with a different discovery model as specified in clause 6.2.14.2.2.2, clause 6.2.15.2.2.2, clause 8.2.1.3.1.2 and clause 8a.2.1.3.1.2.

e) shall pass the resulting PROSE PC5 DISCOVERY message for UE-to-UE relay discovery announcement to the lower layers for transmission over the PC5 interface with the source layer-2 ID, destination layer-2 ID and an indication that the message is for 5G ProSe direct discovery.

The UE shall ensure that it keeps on passing the same PROSE PC5 DISCOVERY message along with the same source layer-2 ID, destination layer-2 ID and an indication that the message is for 5G ProSe direct discovery to the lower layers for transmission until the UE is triggered by the upper layers to stop announcing availability of a connectivity service provided by a 5G ProSe UE-to-UE relay UE, or until the UE stops being authorised to perform the announcing UE procedure for UE-to-UE relay discovery. How this is achieved is left up to UE implementation.

NOTE 2: The announcing UE can stop announcing UE procedure for UE-to-UE relay discovery for power saving by implementation specific means e.g. an implementation-specific maximum number of 5G ProSe direct links configured in the UE, or an implementation-specific timer expires.

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

###### 8a.2.1.2.3.1 General

The purpose of the monitoring UE procedure for UE-to-UE relay discovery is:

a) to enable a ProSe-enabled UE to become aware of proximity of a connectivity service provided by a 5G ProSe UE-to-UE relay UE, upon a request from upper layers as defined in 3GPP TS 23.304 [2]; or

b) to enable a ProSe-enabled UE to perform measurements of signal strength of PROSE PC5 DISCOVERY messages from 5G ProSe UE-to-UE relay UE(s) for relay selection/reselection.

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

###### 8a.2.1.2.3.2 Monitoring UE procedure for UE-to-UE relay discovery initiation

The UE is authorised to perform the monitoring UE procedure for UE-to-UE relay discovery if:

a) the following is true:

1) the UE is not served by NG-RAN, is authorised to perform 5G ProSe UE-to-UE relay discovery using monitoring when the UE is not served by NG-RAN and is configured with the radio parameters to be used for 5G ProSe UE-to-UE relay discovery when not served by NG-RAN;

2) the UE is served by NG-RAN and is authorised to perform 5G ProSe UE-to-UE relay discovery monitoring in at least one PLMN; or

3) the UE is:

i) in 5GMM-IDLE mode, in limited service state as specified in 3GPP TS 23.122 [14] and the reason for the UE being in limited service state is one of the following:

A) the UE is unable to find a suitable cell in the selected PLMN as specified in 3GPP TS 38.304 [15];

B) the UE received a REGISTRATION REJECT message or a SERVICE REJECT message with the 5GMM cause #11 "PLMN not allowed" as specified in 3GPP TS 24.501 [11] ; or

C) the UE received a REGISTRATION REJECT message or a SERVICE REJECT message with the 5GMM cause #7 "5GS services not allowed" as specified in 3GPP TS 24.501 [11]; and

Editor's note: The UE behavior in limited service state needs to be revisited, which will be determined by SA2.

ii) authorised to perform 5G ProSe UE-to-UE relay discovery using monitoring when the UE is not served by NG-RAN, and:

A) configured with the radio parameters to be used for 5G ProSe UE-to-UE relay discovery when not served by NG-RAN; and

b) the UE is configured with the relay service code parameter identifying the connectivity service to be monitored, as specified in clause 5.2.7;

otherwise, the UE is not authorised to perform the monitoring UE procedure for UE-to-UE relay discovery.

Figure 8a.2.1.2.3.2.1 illustrates the interaction of the UEs in the monitoring UE procedure for UE-to-UE relay discovery.



Figure 8a.2.1.2.3.2.1: Monitoring UE procedure for UE-to-UE relay discovery

When the UE is triggered by the upper layers to monitor proximity of a connectivity service provided by a 5G ProSe UE-to-UE relay UE or when the UE decides to perform 5G ProSe UE-to-UE relay reselection as specified in clause 8a.2.3, and if the UE is authorised to perform the monitoring UE procedure for UE-to-UE relay discovery, then the UE shall instruct the lower layers to start monitoring for PROSE PC5 DISCOVERY messages with the default destination layer-2 ID as specified in clause 5.2.7.

Editor's note: The security related contents are FFS and depend on SA3 requirements.

NOTE: The UE can determine the received PROSE PC5 DISCOVERY message for UE-to-UE relay discovery announcement is for 5G ProSe direct discovery based on an indication from the lower layer.

Then if:

a) the relay service code parameter of the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery announcement is the same as the relay service code parameter configured as specified in clause 5 for the connectivity service being monitored; and

b) the target end UE info is not provided by upper layers for the connectivity service being monitored, or the 5G ProSe end UE list parameter of the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery announcement contains the user info of the target end UE if the user info of the target end UE is provided by upper layers for the connectivity service being monitored,

then the UE shall consider that the connectivity service the UE seeks to monitor has been discovered. In addition, the UE can measure the signal strength of the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery announcement for 5G ProSe UE-to-UE relay selection or reselection.

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

###### 8a.2.1.3.2.1 General

The purpose of the discoverer end UE procedure for UE-to-UE Relay discovery is:

a) to enable a ProSe-enabled UE to solicit proximity of a connectivity service provided by a 5G ProSe UE-to-UE relay UE, upon a request from upper layers; or

b) to enable a ProSe-enabled UE to measure the PROSE PC5 DISCOVERY message signal strength between the ProSe-enabled UE and the 5G ProSe UE-to-UE Relay UE(s) for relay selection/reselection.

Editor's note: How to handle the case that the discoveree UE may be found by the discoverer UE directly (i.e. not via the 5G ProSe UE-to-UE relay UE) is FFS.

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

###### 8a.2.1.3.2.2 Discoverer end UE procedure for UE-to-UE relay discovery initiation

The UE is authorised to perform the discoverer end UE procedure for UE-to-UE relay discovery if:

a) one of the following is true:

1) the UE is not served by NG-RAN, is authorised to act as a 5G ProSe end UE towards a 5G ProSe UE-to-UE relay UE and is configured with the radio parameters to be used for ProSe UE-to-UE relay discovery when not served by NG-RAN;

2) the UE is served by NG-RAN, is authorised to act as a 5G ProSe end UE towards a 5G ProSe UE-to-UE relay UE; or

3) the UE is:

i) in 5GMM-IDLE mode, in limited service state as specified in 3GPP TS 23.122 [14] and the reason for the UE being in limited service state is one of the following:

A) the UE is unable to find a suitable cell in the selected PLMN as specified in 3GPP TS 38.304 [15];

B) the UE received a REGISTRATION REJECT message or a SERVICE REJECT message with the 5GMM cause #11 "PLMN not allowed" as specified in 3GPP TS 24.501 [11]; or

C) the UE received a REGISTRATION REJECT message or a SERVICE REJECT message with the 5GMM cause #7 "5GS services not allowed" as specified in 3GPP TS 24.501 [11]; and

Editor's note: The UE behavior in limited service state needs to be revisited, which will be determined by SA2.

ii) authorised to act as a 5G ProSe end UE towards a 5G ProSe UE-to-UE relay UE when the UE is not served by NG-RAN and configured with the radio parameters to be used for ProSe UE-to-UE relay discovery use when not served by NG-RAN;

b) the UE is configured with:

1) the relay service code parameter identifying the connectivity service provided by a 5G ProSe UE-to-UE relay to be solicited; and

Editor's note: The security related contents are FFS and depend on SA3 requirements.

2) the User info ID for the 5G ProSe UE-to-UE relay discovery parameter, as specified in clause 5.2.7.

otherwise, the UE is not authorised to perform the discoverer end UE procedure for UE-to-UE relay discovery.

Figure 8a.2.1.3.2.2.1 illustrates the interaction of the UEs in the discoverer end UE procedure for UE-to-UE relay discovery.



Figure 8a.2.1.3.2.2.1: Discoverer end UE procedure for UE-to-UE Relay discovery

For PROSE PC5 DISCOVERY message signal strength measurement, the UE manages a periodic measurement timer T51yy, which is used to trigger the periodic PROSE PC5 DISCOVERY message signal strength measurement between the UE and the 5G ProSe UE-to-UE relay UE with which the UE has a link established. It is started whenever the UE has established a direct link with a 5G ProSe UE-to-UE relay UE and restarted whenever the UE receives the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery response from the 5G ProSe UE-to-UE relay UE with which the UE has a link established.

When the UE is triggered by the upper layers to solicit proximity of a connectivity service provided by a 5G ProSe UE-to-UE relay UE, or when the periodic measurement timer T51yy expires and if the UE is authorised to perform the discoverer end UE procedure for UE-to-UE relay discovery, then the UE:

a) if the UE is served by NG-RAN and the UE in 5GMM-IDLE mode needs to request resources for sending PROSE PC5 DISCOVERY messages for relay discovery as specified in 3GPP TS 38.331 [13], shall perform a service request procedure as specified in 3GPP TS 24.501 [11];

b) shall obtain a valid UTC time for the discovery transmission from the lower layers and generate the UTC-based counter corresponding to this UTC time;

c) shall generate a PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation. In the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation, the UE:

1) shall set the source discoverer end UE info parameter to the configured User info ID for the 5G ProSe UE-to-UE relay discovery parameter, as specified in clause 5.2.7;

2) shall set the relay service code parameter to the relay service code parameter identifying the connectivity service to be solicited, configured in clause 5.2.7.

3) shall include the MIC filed computed as described in 3GPP TS 33.503 [34];

4) shall set the UTC-based counter LSB parameter to the 4 least significant bits of the UTC-based counter;

5) shall set the ProSe direct discovery PC5 message type parameter as specified in table 10.2.1.13;

6) may include the target discoveree end UE info parameter set to the user info ID of the targeted discoveree end UE if the user info ID of the targeted discoveree end UE is provided by the upper layers; and

7) may set the UE-to-UE relay UE info parameter to user info ID for the 5G ProSe UE-to-UE relay UE, if known e.g. during previous 5G ProSe UE-to-UE relay discovery or 5G ProSe UE-to-UE relay communication procedure(s);

d) shall set the destination layer-2 ID to the default destination layer-2 ID as specified in clause 5.2.7 and self-assign a source layer-2 ID for sending the UE-to-UE relay discovery solicitation message; and

NOTE 2: The UE implementation ensures that the value of the self-assigned source layer-2 ID is different from any other self-assigned source layer-2 ID(s) in use for 5G ProSe direct communication as specified in clause 7.2, is different from any other provisioned destination layer-2 ID(s) as specified in clause 5.2 and is different from any other self-assigned source layer-2 ID in use for a simultaneous 5G ProSe direct discovery procedure over PC5 with a different discovery model as specified in clause 6.2.14.2.1.2, clause 6.2.15.2.1.2, clause 8.2.1.2.2.2, clause 8.2.1.2.4.2 and clause 8a.2.1.2.2.2.

e) shall pass the resulting PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation along with the source layer-2 ID, destination layer-2 ID and an indication that the message is for 5G ProSe direct discovery to the lower layers for transmission over the PC5 interface.

Editor's note: The security related contents are FFS and depend on SA3 requirements.

If the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation is used to solicit proximity of a connectivity service provided by a 5G ProSe UE-to-UE relay UE, the UE shall ensure that it keeps on passing the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation for transmission until the UE is triggered by the upper layers to stop soliciting proximity of a connectivity service provided by a 5G ProSe UE-to-UE relay UE, or until the UE stops being authorised to perform the discoverer end UE procedure for UE-to-UE relay discovery. How this is achieved is left up to UE implementation.

NOTE 3: The discoverer end UE can stop discoverer end UE procedure for UE-to-UE relay discovery for power saving by implementation specific means e.g. an implementation-specific maximum number of 5G ProSe direct links configured in the UE, or an implementation-specific timer expires.

If the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation is used to trigger the PROSE PC5 DISCOVERY message signal strength measurement between the UE and the 5G ProSe UE-to-UE Relay UE with which the UE has a link established, the UE shall start the retransmission timer T51xx. If retransmission timer T51xx expires, the UE shall retransmit the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation and restart timer T51xx. If no response is received from the 5G ProSe UE-to-UE relay UE with which the UE has a link established after reaching the maximum number of allowed retransmissions, the UE shall trigger relay reselection procedure.

NOTE 4: The maximum number of allowed retransmissions is UE implementation specific.

NOTE 5: The UE can determine the received PROSE PC5 DISCOVERY message for UE-to-UE relay discovery response is for 5G ProSe direct discovery based on an indication from the lower layer.

Then if:

a) the relay service code parameter of the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery response is the same as the relay service code parameter of the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation; and

b) the user info ID of target discoveree end UE is not provided by upper layers for the connectivity service being solicited, or the target discoveree end UE info parameter of the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery response is the same as the user info ID of targeted discoveree end UE if the user info ID of targeted discoveree end UE is provided by upper layers for the connectivity service being solicited,

then the UE shall consider that the connectivity service the UE seeks to discover has been discovered. In addition, the UE can measure the signal strength of the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery response for relay selection or reselection. If the UE has received the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery response from the 5G ProSe UE-to-UE Relay UE with which the UE has a link established, the UE shall stop the retransmission timer T51xx and start the periodic measurement timer T51yy.

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

###### 8a.2.1.3.2.3 Discoverer end UE procedure for UE-to-UE relay discovery completion

When the UE is triggered by the upper layers to stop soliciting for proximity of a connectivity service provided by a 5G ProSe UE-to-UE relay UE, or when the UE stops being authorised to perform the discoverer end UE procedure for UE-to-UE relay discovery, the UE shall instruct the lower layers to stop the discoverer operation.

NOTE: The discoverer end UE can stop discoverer end UE procedure for UE-to-UE relay discovery for power saving by implementation specific means e.g. an implementation-specific maximum number of 5G ProSe direct links configured in the UE, or an implementation-specific timer expires.

When the UE stops discoverer operation, if the UE is in 5GMM-CONNECTED mode, the UE shall trigger the corresponding procedure in lower layers as specified in 3GPP TS 38.331 [13].

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

###### 8a.2.1.3.3.2 Relay UE procedure for UE-to-UE relay discovery initiation

The UE is authorised to perform the relay UE procedure for UE-to-UE relay discovery if:

a) the UE is authorised to act as a 5G ProSe UE-to-UE relay UE in the PLMN indicated by the serving cell, and

1) the UE is served by NG-RAN; or

2) the UE is not served by NG-RAN and intends to use the provisioned radio resources for 5G ProSe UE-to-UE relay discovery;

b) the UE is configured with:

1) the relay service code parameter identifying the connectivity service to be responded to as specified in clause 5.2.7; and

2) the User info ID for the 5G ProSe UE-to-UE relay discovery parameter, as specified in clause 5.2.7.

otherwise, the UE is not authorised to perform the relay UE procedure for UE-to-UE relay discovery.

When the UE is triggered by the upper layers to start responding to solicitation on proximity of a connectivity service provided by the 5G ProSe UE-to-UE relay UE and if the UE is authorised to perform the relay UE procedure for UE-to-UE relay discovery, then the UE:

a) if the UE is served by NG-RAN and the UE in 5GMM-IDLE mode needs to request resources for sending PROSE PC5 DISCOVERY messages as specified in 3GPP TS 38.331 [13], shall perform a service request procedure as specified in 3GPP TS 24.501 [11]; and

b) shall instruct the lower layers to start monitoring for PROSE PC5 DISCOVERY messages.

Editor's note: The security related contents are FFS and depend on SA3 requirements.

NOTE 1: The UE can determine the received PROSE PC5 DISCOVERY message for 5G ProSe direct discovery solicitation is for 5G ProSe direct discovery based on an indication from the lower layer.

Then, if:

a) the relay service code parameter of the received PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation is the same as the relay service code parameter configured as specified in clause 5.2.7 for the connectivity service;

then the UE:

a) shall obtain a valid UTC time for the discovery transmission from the lower layers and generate the UTC-based counter corresponding to this UTC time;

b) shall generate a PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation to the discoveree end UE. In the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation, the UE:

1) shall set the source discoverer end UE info parameter to the source discoverer end UE info parameter in the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation received from the discoverer end UE;

2) shall set the UE-to-UE relay UE info parameter to the configured User info ID for the 5G ProSe UE-to-UE relay discovery parameter, as specified in clause 5.2.7;

3) shall set the relay service code parameter to the relay service code parameter of the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation received from the discoverer end UE;

4) shall set the Resource status indicator bit of the status indicator parameter to indicate whether or not the UE has resources available to provide a connectivity service for additional ProSe-enabled UEs;

5) may include the target discoveree end UE info parameter, if the target discoveree end UE info parameter is included in the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation received from the discoverer end UE;

6) shall include the MIC filed computed as described in 3GPP TS 33.503 [34];

7) shall set the UTC-based counter LSB parameter to the 4 least significant bits of the UTC-based counter;

8) shall set the ProSe direct discovery PC5 message type parameter as specified in table 10.2.1.14;

c) shall set the destination layer-2 ID to the default destination layer-2 ID as specified in clause 5.2.7 and self-assign a source layer-2 ID for sending the UE-to-UE relay discovery response message; and

NOTE 2: The UE implementation ensures that the value of the self-assigned source layer-2 ID is different from any other self-assigned source layer-2 ID(s) in use for 5G ProSe direct communication as specified in clause 7.2 and is different from any other provisioned destination layer-2 ID(s) as specified in clause 5.2.

d) shall pass the resulting PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation along with the source layer-2 ID, destination layer-2 ID and an indication that the message is for 5G ProSe direct discovery to the lower layers for transmission over the PC5 interface.

Editor's note: The security related contents are FFS and depend on SA3 requirements.

Figure 8a.2.1.3.3.2.1 illustrates the interactions between the 5G ProSe UE-to-UE relay UE and discoveree end UE in the relay UE procedure for UE-to-UE relay discovery.



Figure 8a.2.1.3.3.2.1: Relay UE procedure with the discoveree end UE for UE-to-UE Relay discovery

The UE shall instruct the lower layers to start monitoring for PROSE PC5 DISCOVERY messages for UE-to-UE relay discovery response from the discoveree end UE.

If:

a) the relay service code parameter of the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery response is the same as the relay service code parameter of the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation; and

b) the target discoveree end UE info is not provided by the discoverer end UE for the connectivity service being solicited, or the discoveree end UE info parameter of the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery response is the same as the target discoveree end UE info if the target discoveree end UE info parameter is included in the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation,

then the UE:

a) shall obtain a valid UTC time for the discovery transmission from the lower layers and generate the UTC-based counter corresponding to this UTC time;

b) shall generate a PROSE PC5 DISCOVERY message for UE-to-UE relay discovery response. In the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery response, the UE:

1) shall set the target discoveree end UE info parameter to the target discoveree end UE info parameter of the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery response received from the discoveree end UE;

2) shall set the UE-to-UE relay UE info parameter to the configured User info ID for the 5G ProSe UE-to-UE relay discovery parameter, as specified in clause 5.2.7;

3) shall set the source discoverer end UE info parameter to the source discoverer end UE info parameter of the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation received from the 5G ProSe UE-to-UE relay UE;

4) shall set the relay service code parameter to the relay service code parameter of the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery response received from the discoveree end UE;

5) shall set the Resource status indicator bit of the status indicator parameter to indicate whether or not the UE has resources available to provide a connectivity service for additional ProSe-enabled UEs;

6) shall include the MIC filed computed as described in 3GPP TS 33.503 [34];

7) shall set the UTC-based counter LSB parameter to the 4 least significant bits of the UTC-based counter; and

8) shall set the ProSe direct discovery PC5 message type parameter as specified in table 10.2.1.14;

c) shall set the destination layer-2 ID to the source layer-2 ID from the discoverer end UE used in the transportation of the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation and self-assign a source layer-2 ID for sending the UE-to-UE relay discovery response message; and

NOTE 2: The UE implementation ensures that the value of the self-assigned source layer-2 ID is different from any other self-assigned source layer-2 ID(s) in use for 5G ProSe direct communication as specified in clause 7.2 and is different from any other provisioned destination layer-2 ID(s) as specified in clause 5.2.

d) shall pass the resulting PROSE PC5 DISCOVERY message for UE-to-UE relay discovery response along with the source layer-2 ID, destination layer-2 ID and an indication that the message is for 5G ProSe direct discovery to the lower layers for transmission over the PC5 interface.

NOTE 3: If the UE is processing a PROSE DIRECT LINK ESTABLISHMENT REQUEST message from the same source layer-2 ID of the received PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation, it depends on UE implementation to avoid the conflict of destination layer-2 ID (e.g. send a PROSE DIRECT LINK ESTABLISHMENT REJECT message containing PC5 signalling protocol cause value #3 "conflict of layer-2 ID for unicast communication is detected", or ignore the PROSE DIRECT DISCOVERY message for UE-to-UE relay discovery solicitation).

Editor's note: The security related contents are FFS and depend on SA3 requirements.

Figure 8a.2.1.3.3.2.2 illustrates the interactions between the 5G ProSe UE-to-UE relay UE and discoverer end UE in the relay UE procedure for UE-to-UE relay discovery.



Figure 8a.2.1.3.3.2.2: Relay UE procedure for UE-to-UE relay discovery with the discoverer end UE

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

###### 8a.2.1.3.4.2 Discoveree end UE procedure for UE-to-UE relay discovery initiation

The UE is authorised to perform the discoveree end UE procedure for UE-to-UE relay discovery if:

a) the UE is authorised to act as a 5G ProSe end UE in the PLMN indicated by the serving cell, and

1) the UE is served by NG-RAN; or

2) the UE is not served by NG-RAN and intends to use the provisioned radio resources for 5G ProSe UE-to-UE relay discovery;

b) the UE is configured with:

1) the relay service code parameter identifying the connectivity service to be responded to as specified in clause 5.2.7; and

2) the User info ID for the UE-to-UE relay discovery parameter, as specified in clause 5.2.7.

otherwise, the UE is not authorised to perform the discoveree end UE procedure for UE-to-UE relay discovery.

Figure 8a.2.1.3.4.2.1 illustrates the interaction of the UEs in the discoveree end UE procedure for UE-to-UE relay discovery.



Figure 8a.2.1.3.4.2.1: Discoveree end UE procedure for UE-to-UE relay discovery

When the UE is triggered by the upper layers to start responding to solicitation on proximity of a connectivity service provided by a 5G ProSe UE-to-UE relay UE and if the UE is authorised to perform the discoveree end UE procedure for UE-to-UE relay discovery, then the UE:

a) if the UE is served by NG-RAN and the UE in 5GMM-IDLE mode needs to request resources for sending PROSE PC5 DISCOVERY messages as specified in 3GPP TS 38.331 [13], shall perform a service request procedure as specified in 3GPP TS 24.501 [11]; and

b) shall instruct the lower layers to start monitoring for PROSE PC5 DISCOVERY messages.

Editor's note: The security related contents are FFS and depend on SA3 requirements.

NOTE 1: The UE can determine the received PROSE PC5 DISCOVERY message for 5G ProSe direct discovery solicitation is for 5G ProSe direct discovery based on an indication from the lower layer.

Then, if:

a) the relay service code parameter of the received PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation is the same as the relay service code parameter configured as specified in clause 5.2.7 for the connectivity service; and

b) the target discoveree end UE info parameter of the received PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation is the same as the configured user info ID for the 5G ProSe UE-to-UE relay discovery as specified in clause 5.2.7;

then the UE:

a) shall obtain a valid UTC time for the discovery transmission from the lower layers and generate the UTC-based counter corresponding to this UTC time;

b) shall generate a PROSE PC5 DISCOVERY message for UE-to-UE relay discovery response. In the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery response, the UE:

1) shall set the target discoveree end UE info parameter to the configured User info ID for the 5G ProSe UE-to-UE relay discovery parameter, as specified in clause 5.2.7;

2) shall set the source discoverer end UE info parameter to the source discoverer end UE info parameter of the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation received from the 5G ProSe UE-to-UE relay UE;

3) shall set the relay service code parameter to the relay service code parameter of the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation;

4) shall set the ProSe direct discovery PC5 message type parameter as specified in table 10.2.1.14;

c) shall set the destination layer-2 ID to the source layer-2 ID from the 5G ProSe UE-to-UE relay UE used in the transportation of the PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation and self-assign a source layer-2 ID for sending the UE-to-UE relay discovery response message; and

NOTE 2: The UE implementation ensures that the value of the self-assigned source layer-2 ID is different from any other self-assigned source layer-2 ID(s) in use for 5G ProSe direct communication as specified in clause 7.2 and is different from any other provisioned destination layer-2 ID(s) as specified in clause 5.2.

d) shall pass the resulting PROSE PC5 DISCOVERY message for UE-to-UE relay discovery response along with the source layer-2 ID, destination layer-2 ID and an indication that the message is for 5G ProSe direct discovery to the lower layers for transmission over the PC5 interface.

NOTE 3: If the UE is processing a PROSE DIRECT LINK ESTABLISHMENT REQUEST message from the same source layer-2 ID of the received PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation, it depends on UE implementation to avoid the conflict of destination layer-2 ID (e.g. send a PROSE DIRECT LINK ESTABLISHMENT REJECT message containing PC5 signalling protocol cause value #3 "conflict of layer-2 ID for unicast communication is detected", or ignore the PROSE DIRECT DISCOVERY message for UE-to-UE relay discovery solicitation).

Editor's note: The security related contents are FFS and depend on SA3 requirements.

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

#### 8a.2.3.2 UE-to-UE relay reselection procedure initiation

The 5G ProSe end UE shall trigger the UE-to-UE relay reselection procedure if one of the following conditions is met:

a) the UE has received a lower layers indication that the serving 5G ProSe UE-to-UE relay UE no longer fulfills the lower layers criteria as specified in 3GPP TS 38.331 [13];

Editor's note: The mentioned reference 3GPP TS 38.331 [13] is subject to be updated based on RAN work.

b) the parameters related to 5G ProSe UE-to-UE relay in the configuration parameters for 5G ProSe UE-to-UE relay as specified in clause 5.2.7 (e.g., relay service code, User info ID, etc.) have been updated and the serving 5G ProSe UE-to-UE relay UE no longer fulfills the conditions specified in clause 8a.2.2.2;

c) the UE has received a PROSE DIRECT LINK ESTABLISHMENT REJECT message from the 5G ProSe UE-to-UE relay UE with the PC5 signalling protocol cause value #1 "direct communication to the target UE not allowed";

d) the UE has received a PROSE DIRECT LINK RELEASE REQUEST message from the 5G ProSe UE-to-UE relay UE with the PC5 signalling protocol cause value #1 "direct communication to the target UE not allowed";

e) the UE has received a PROSE DIRECT LINK RELEASE REQUEST message from the 5G ProSe UE-to-UE relay UE with the PC5 signalling protocol cause value #4 "direct connection is not available anymore";

f) the UE has not received any response from the 5G ProSe UE-to-UE relay UE after M consecutive retransmissions of PROSE DIRECT LINK ESTABLISHMENT REQUEST or PROSE DIRECT LINK KEEPALIVE REQUEST messages;

g) the UE has not received any response from the 5G ProSe UE-to-UE relay UE after M consecutive retransmissions of PROSE PC5 DISCOVERY message for UE-to-UE relay discovery solicitation used to trigger the PROSE PC5 DISCOVERY message signal strength measurement between the UE and the 5G ProSe UE-to-UE relay UE with which the UE has a link established;

NOTE: The value of M is implementation specific and is less than or equal to the maximum number of retransmissions allowed for PC5 signalling protocol.

h) the UE has received a PROSE DIRECT LINK ESTABLISHMENT REJECT message from the 5G ProSe UE-to-UE relay UE with the PC5 signalling protocol cause value #13 "congestion situation";

i) the UE has received a PROSE DIRECT LINK RELEASE REQUEST message from the 5G ProSe UE-to-UE relay UE with the PC5 signalling protocol cause value #13 "congestion situation"; or

j) the UE has received a PROSE DIRECT LINK ESTABLISHMENT REJECT message from the 5G ProSe UE-to-UE relay UE with the PC5 signalling protocol cause value #15 "security procedure failure of 5G ProSe UE-to-UE relay".

In cases c), d), h), i) and j), the 5G ProSe end UE shall exclude the 5G ProSe UE-to-UE relay UE which sent the message specified in cases c), d), h), i) or j) from the UE-to-UE relay reselection process described below (at least for the indicated back-off time period if provided from the ProSe UE-to-UE relay UE in cases h) and i)).

To conduct UE-to-UE relay reselection process, the UE shall first initiate one of the following procedures or both depending on UE's configuration parameters for 5G ProSe UE-to-UE relay as specified in clause 5.2.7:

a) monitoring procedure for UE-to-UE relay discovery as specified in clause 8a.2.1.2.2; or

b) discoverer procedure for UE-to-UE relay discovery as specified in clause 8a.2.1.3.1.

After the execution of the above discovery procedure(s), the 5G ProSe end UE performs the 5G ProSe direct link modification procedure.

Editor's note: The details of how the 5G ProSe direct link modification procedure is used in UE-to-UE relay reselection are FFS.

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

### 8a.2.5 IP address allocation for 5G ProSe end UE in 5G ProSe layer-3 UE-to-UE relay procedure

If the 5G ProSe direct link establishment procedure is accepted by the target 5G ProSe end UE, the target 5G ProSe end UE may indicate the IP address configuration to the 5G ProSe UE-to-UE relay UE and the 5G ProSe UE-to-UE relay UE may indicate the IP address configuration to the source 5G ProSe end UE.

IP address allocation mechanisms of unicast mode of 5G ProSe direct communication over PC5 as described in clause 7.2.2.3 can be reused between each 5G ProSe end UE and the 5G ProSe layer-3 UE-to-UE relay UE.

The 5G ProSe end UE may obtain the IP address of other 5G ProSe end UEs via the 5G ProSe layer-3 UE-to-UE relay UE using DNS query.

Editor's note: It is FFS how to use DNS query for the 5G ProSe end UE to obtain the IP address of other 5G ProSe end UEs via the 5G ProSe Layer-3 UE-to-UE relay.

NOTE: 5G ProSe layer-3 UE-to-UE relay UE may convert the IP versions between the first hop PC5 interface(between the source 5G ProSe layer-3 end UE and 5G ProSe layer-3 UE-to-UE relay UE) and second hop PC5 interface (between the 5G ProSe layer-3 UE-to-UE relay UE and the target 5G ProSe layer-3 end UE).

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

10.2.8 Target discoveree end UE info

The target discoveree end UE info IE may be included in PROSE PC5 DISCOVERY message for UE-to-UE relay discovery discovery solicitation as in table 10.2.1.13, if available, if the message is sent by the source 5G ProSe end UE.

The target discoveree end UE info IE shall be included in PROSE PC5 DISCOVERY message for UE-to-UE relay discovery discovery solicitation as in table 10.2.1.13 if it is received from the source 5G ProSe end UE and the message is sent by the 5G ProSe UE-to-UE relay UE.

The target discoveree end UE info IE shall be included in PROSE PC5 DISCOVERY message for UE-to-UE relay discovery discovery response as in table 10.2.1.14 if the message is sent by the 5G ProSe UE-to-UE relay UE or if the message is sent by the target 5G ProSe end UE.

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

10.2.9 UE-to-UE relay UE info

The UE-to-UE relay UE info IE shall be included in PROSE PC5 DISCOVERY message for UE-to-UE relay discovery discovery solicitation as in table 10.2.1.13 or PROSE PC5 DISCOVERY message for UE-to-UE relay discovery discovery response as in table 10.2.1.14 if the message is sent by the 5G ProSe UE-to-UE relay UE.

The UE-to-UE relay UE info IE may be included in PROSE PC5 DISCOVERY message for UE-to-UE relay discovery discovery solicitation as in table 10.2.1.13, if available, if the message is sent by the source 5G ProSe end UE.

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

#### 10.3.3.4 PC5 end UE failure cause

The UE may include this IE if:

a) the UE acts as a 5G ProSe UE-to-UE relay UE and the 5G ProSe direct link is between the source 5G ProSe end UE and the 5G ProSe UE-to-UE relay UE to indicate the PC5 signalling protocol cause received from the target 5G ProSe end UE.

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

#### 10.3.3.7 UE-to-UE relay UE user info

The UE may include this IE if:

a) the UE acts as a target 5G ProSe end UE and the 5G ProSe direct link is between the 5G ProSe UE-to-UE relay UE and the target 5G ProSe end UE; or

b) the UE acts as a 5G ProSe UE-to-UE relay UE and the 5G ProSe direct link is between the source 5G ProSe end UE and the 5G ProSe UE-to-UE relay UE;

to indicate the user info ID of the 5G ProSe UE-to-UE relay UE.

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

#### 10.3.20.4 Source link local IPv6 address

This IE is included when the initiating UE's IP address/prefix is allocated by the 5G ProSe layer-3 UE-to-UE relay UE and the initiating UE receives the Link local IPv6 address IE in the PROSE DIRECT LINK IDENTIFIER UPDATE ACCEPT message.

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

#### 10.3.22.2 PC5 end UE failure cause

The UE may include this IE if:

a) the UE acts as a 5G ProSe UE-to-UE relay UE and the 5G ProSe direct link is between the source 5G ProSe end UE and the 5G ProSe UE-to-UE relay UE to indicate the PC5 signalling protocol cause received from the target 5G ProSe end UE.

\* \* \* End of Changes \* \* \* \*