**3GPP TSG-CT WG1 Meeting #141eC1-23xxxx**

**Online 17– 21 April 2023**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  | **24.554** | **CR** | **0330** | **rev** | **1** | **Current version:** | **18.0.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

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|  |
| ***Title:***  | Update UE-to-UE Relay discovery procedure considering privacy issue |
|  |  |
| ***Source to WG:*** | Xiaomi |
| ***Source to TSG:*** | C1 |
|  |  |
| ***Work item code:*** | 5G\_ProSe\_Ph2 |  | ***Date:*** | 2023-04-08 |
|  |  |  |  |  |
| ***Category:*** | C |  | ***Release:*** |  |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***Reason for change:*** | To avoid privacy problmem for broadcasting the 5G ProSe end UE list during the UE-to-UE relay discovery procedure with mode A, SA2 agreed on CR #202 for TS 23.304 to have the relay indication in the discovering procedure and only annouce 5G ProSe end UE list with User Info IDs of UEs with relay indication. |
|  |  |
| ***Summary of change:*** | The main change include:* Update description of direct discovery over PC5 to 6.2.1 for better readibility.
* Update the procedure and message 5G ProSe direct discovery with addition of relay indication
* Update UE-to-UE relay discovery procedure to have 5G ProSe end UE list with User Info IDs of UEs with relay indication
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| ***Consequences if not approved:*** | Not aligned with stage 2 and there will be privacy problem. |
|  |  |
| ***Clauses affected:*** | 6.2.1, 6.2.14.2.1.2, 6.2.14.2.2.2, 6.2.14.2.2.4, 8a.2.1.2.2.2, 10.2.1, 11.2.y(new) |
|  |  |
|  | **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 \* \* \* \*

### 6.2.1 Types of 5G ProSe direct discovery procedures

The following PC3a control protocol procedures are defined:

a) announce request;

b) monitor request;

c) discoveree request;

d) discoverer request;

e) match report;

f) network initiated direct discovery update;

g) announcing alert request; and

h) 5G PKMF address request procedure.

The following PC5 protocol procedures are defined:

 a) 5G ProSe direct discovery procedure over PC5 interface;

b) Group member discovery over PC5 interface.

In the following descriptions of PC3a control protocol procedures, the terms "request" and "response" refer to the corresponding PC3a control protocol messages, not to the HTTP request or response. The following procedure descriptions use a single PC3a control protocol message for illustration purposes.

The PC3a control protocol procedures for 5G ProSe direct discovery shall be integrity protected and confidentiality protected using the security procedures defined in clause 5.2.3 in 3GPP TS 33.503 [34].

NOTE 1: A single HTTP request message can contain multiple PC3a control protocol requests and a single HTTP response message can contain multiple PC3a control protocol responses.

When the TLS tunnel between the UE and the 5G DDNMF for transport of PC3a messages is established by the UE according to 3GPP TS 33.503 [34], the 5G DDNMF shall obtain identity of the served UE using the procedures specified in 3GPP TS 33.220 [46] or 3GPP TS 33.535 [47].

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

###### 6.2.14.2.1.2 Announcing UE procedure for 5G ProSe direct discovery initiation

The UE is authorised to perform the announcing 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 using announcing procedure 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 using announcing 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 using announcing when the UE is not served by NG-RAN; and:

i) configured with the radio parameters to be used for 5G ProSe direct discovery 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 announcing UE procedure for 5G ProSe direct discovery.

Figure 6.2.14.2.1.2.1 illustrates the interaction of the UEs in the announcing UE procedure for 5G ProSe direct discovery.



Figure 6.2.14.2.1.2.1: Announcing UE procedure for 5G ProSe direct discovery

When the UE is triggered by an upper layer application to perform announcing UE procedure for 5G ProSe direct discovery announcing procedure, if the UE is authorised to perform the announcing UE procedure for 5G ProSe direct 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];

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 5G ProSe direct discovery announcement if the resulting UTC-based counter is within the max offset of the time shown by the clock used for ProSe by the UE and if the timer T5060 or T5062 does not expire. In the PROSE PC5 DISCOVERY message for direct discovery announcement, the UE:

1) shall set the ProSe direct discovery PC5 message type parameter as specified in table 10.2.1.1 or table 10.2.1.2;

2) shall include either ProSe application code or ProSe restricted code;

3) shall include the MIC field computed as described in 3GPP TS 33.503 [34], by using the UTC-based counter and the discovery key contained in the <response-announce> element of the DISCOVERY\_RESPONSE message for open 5G ProSe direct discovery, or using the UTC-based counter and the DUIK contained in the <restricted-announce-response> element of the DISCOVERY\_RESPONSE message for restricted 5G ProSe direct discovery model A;

4) may include the Metadata IE to provide the application layer metadata information;

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

x) may include the relay indication to indicate whether the 5G ProSe UE-to-UE relay(s) can broadcast user info ID of the announcing UE during the procedure of 5G ProSe UE-to-UE relay discovery over PC5 interface with model A if the announcing UE can act as a 5G ProSe end 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], for restricted 5G ProSe direct discovery;

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 6.2.14.2.2.2, clause 6.2.15.2.2.2 and clause 8.2.1.3.1.2.

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

In case of open 5G ProSe direct discovery, the UE shall either use the ProSe application code received in the DISCOVERY\_RESPONSE message from the 5G DDNMF, or select one ProSe application code based on the ProSe application code prefix and ProSe application code suffix range(s) received in the DISCOVERY\_RESPONSE message from the 5G DDNMF as announced ProSe application code, along with the MIC and the four least significant bits of the UTC-based counter.

NOTE 2: The UE can use different codes formed based on different ProSe application code suffixes to announce, without having to send a new request to the 5G DDNMF, as long as the validity timer T5060 of the ProSe application code prefix has not expired.

In case of restricted 5G ProSe direct discovery model A, the UE shall either use the ProSe restricted code received in the DISCOVERY\_RESPONSE message, or select one ProSe restricted code based on the ProSe restricted code prefix and ProSe restricted code suffix range(s) received in the DISCOVERY\_RESPONSE message from the 5G DDNMF as announced ProSe restricted code, along with the 4 least significant bits of the UTC-based counter.

NOTE 3: The UE can use different codes formed based on different ProSe restricted code suffixes to announce, without having to send a new DISCOVERY\_REQUEST message to the 5G DDNMF, as long as the validity timer T5062 of the ProSe restricted code prefix has not expired.

The announcing UE shall ensure that it keeps on passing the same PROSE PC5 DISCOVERY message to the lower layers for transmission until the request from upper layers to perform announcing UE procedure for 5G ProSe direct discovery is still in place, or the validity timer of the ProSe application code or ProSe application code prefix in case of open 5G ProSe direct discovery or the validity timer of the ProSe restricted code or ProSe restricted code prefix in case of restricted 5G ProSe direct discovery expires. How this is achieved is left up to UE implementation.

NOTE 4: The announcing UE can stop announcing 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.

\* \* \* Next 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; and

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

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

y) may include the relay indication to indicate whether the 5G ProSe UE-to-UE relay(s) can broadcast user info ID of the discoverer UE during the procedure of 5G ProSe UE-to-UE relay discovery over PC5 interface with model A if the discoverer UE can act as a 5G ProSe end 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 \* \* \* \*

###### 6.2.14.2.2.4 Discoveree UE procedure for 5G ProSe direct discovery initiation

The UE is authorised to perform the discoveree 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 discoveree 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 discoveree UE procedure for 5G ProSe direct discovery.

Figure 6.2.14.2.2.4.1 illustrates the interaction of the UEs in the discoveree UE procedure for 5G ProSe direct discovery.



Figure 6.2.14.2.2.4.1: Discoveree UE procedure for 5G ProSe direct discovery

When the UE is triggered by an upper layer application to perform discoveree operation for the RPAUID associated with an authorized ProSe identifier; and if:

a) the UE is authorised to perform the discoveree UE procedure for 5G ProSe direct discovery;

b) the UE has obtained the ProSe response code and discovery query filter(s) and the respective validity timer T5068 for the corresponding discovery entry has not expired; and

c) the difference between UTC-based counter associated with that discovery slot and UE's ProSe clock is not greater than the max offset of the monitoring UE's ProSe clock,

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 or registration procedure as specified in 3GPP TS 24.501 [11]; and

b) shall instruct the lower layers to start monitoring for PROSE PC5 DISCOVERY messages as specified in 3GPP TS 38.331 [13].

The UE may apply the discovery query filter(s) received from the 5G DDNMF to its monitoring operation. Using the discovery query filter(s) may result in a match event. There is match event when, for any of the masks in a discovery query filter, the output of a bitwise AND operation between the ProSe query 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 query filter.

Upon reception of a PROSE PC5 DISCOVERY message for direct discovery solicitation for the destination layer-2 ID which the UE is configured to respond for, with applying a discovery query filter to a received PROSE PC5 DISCOVERY message for the above-mentioned bitwise AND operation, 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 solicitation.

NOTE 2: The UE can look for a match on the unencrypted bits first before applying DUCK, to minimise the amount of processing performed before finding a match.

NOTE 3: The UE needs to verify the MIC field because the match report procedure is not used for checking the MIC of a PROSE PC5 DISCOVERY message containing a ProSe query code by the 5G DDNMF.

NOTE 4: The UE can determine the received PROSE PC5 DISCOVERY message for direct discovery solicitation is for 5G ProSe direct discovery based on an indication from the lower layer.

If the discoveree user info is included in the PROSE PC5 DISCOVERY message, the discoveree user info shall match the user info ID of the UE. Once the match of the discovery query filter(s) occurs, the UE process this match event and requests the lower layers to announce the corresponding ProSe response code in the PC5 interface as a response, as specified in 3GPP TS 38.331 [13]. If the UE in 5GMM-IDLE mode has to request resources for 5G ProSe direct discovery announcing as specified in 3GPP TS 38.331 [13], the UE shall perform a service request procedure or registration procedure as specified in 3GPP TS 24.501 [11]. The UE 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. 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 use the ProSe response code received in the DISCOVERY\_RESPONSE message from the 5G DDNMF. The UE shall generate a PROSE PC5 DISCOVERY message for 5G ProSe direct discovery response. In the PROSE PC5 DISCOVERY message for 5G ProSe direct discovery response, the UE:

a) shall set the ProSe direct discovery PC5 message type parameter as specified in table 10.2.1.4;

b) shall include ProSe response code;

c) 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-discoveree-response> element of the DISCOVERY\_RESPONSE message;

d) may include the Metadata IE to provide the application layer metadata information;

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

x) may include the relay indication to indicate whether the 5G ProSe UE-to-UE relay(s) can broadcast user Info ID of the discoveree UE during the procedure of 5G ProSe UE-to-UE relay discovery over PC5 interface with model A if the discoveree UE can act as a 5G ProSe end UE.

After generating the PROSE PC5 DISCOVERY message for 5G ProSe direct discovery response, the UE:

a) shall set the destination layer-2 ID to the source layer-2 ID of the received message and self-assign a source layer-2 ID for sending the direct discovery response message;

NOTE 5: 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.

b) 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]; and

c) 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 response, the PLMN ID of the intended announcing PLMN and an indication that the message is for 5G ProSe direct discovery to the lower layers for transmission over the PC5 interface.

NOTE 6: 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 direct 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 direct discovery solicitation).

For each match event with the discovery query filter(s), the UE shall at least pass PROSE PC5 DISCOVERY message once to the lower layers for transmission. The UE shall ensure that it keeps on passing PROSE PC5 DISCOVERY messages to the lower layers for transmission as response(s) to the match event(s) of the corresponding discovery query filter(s) until the validity timer T5068 expires. How this is achieved is left up to UE implementation.

\* \* \* 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 UE-to-UE relay in the PLMN indicated by the serving cell as specified in clause 5.2.x, and

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

2) the UE is authorised to perform 5G ProSe direct discovery when not served by NG-RAN as specified in clause 5 and intends to use the provisioned radio resources for 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.x; and2) the User info ID for the UE-to-UE relay discovery parameter as specified in clause 5.2.x;

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 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 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 UE-to-UE relay discovery, as specified in clause 5.2.x;

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.x;

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); The 5G ProSe end UE list shall only include user info IDs of UEs in the 5G ProSe end UE list if the UEs are in proximity of the announcing UE and the UEs have indicated the relay indication during the discovery procedure as specified in clause 6.2.14.

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 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 UE-to-UE relay, 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 \* \* \* \*

## 10.2 5G ProSe direct discovery messages

### 10.2.1 Message definition

This message is sent by the UE over the PC5 interface for open 5G ProSe direct discovery and restricted 5G ProSe direct discovery. See table 10.2.1.1, table 10.2.1.2, table 10.2.1.3, table 10.2.1.4, table 10.2.1.5, table 10.2.1.6, table 10.2.1.7, table 10.2.1.8, table 10.2.1.9, table 10.2.1.10 and table 10.2.1.11.

Message type: PROSE PC5 DISCOVERY

Significance: dual

Direction: UE to peer UE

Table 10.2.1.1: PROSE PC5 DISCOVERY message content for open 5G ProSe direct discovery announcement

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| IEI | Information Element | Type/Reference | Presence | Format | Length |
|  | ProSe direct discovery PC5 message type (NOTE) | ProSe direct discovery PC5 message type11.2.1 | M | V | 1 |
|  | UTC-based counter LSB | UTC-based counter LSB11.2.14 | M | V | 1 |
|  | MIC | MIC11.2.4 | M | V | 4 |
|  | ProSe application code | ProSe application code11.2.2 | M | V | 23 |
| 7A | Metadata | Metadata11.2.13 | O | TLV-E | 4-8195 |
| X1 | Relay indication | Relay indication11.2.y | O | TV | 1 |
| NOTE: The discovery type is set to "Open discovery" and the content type is set to "Announcement". |

Table 10.2.1.2: PROSE PC5 DISCOVERY message content for restricted 5G ProSe direct discovery announcement

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| IEI | Information Element | Type/Reference | Presence | Format | Length |
|  | ProSe direct discovery PC5 message type (NOTE) | ProSe direct discovery PC5 message type11.2.1 | M | V | 1 |
|  | UTC-based counter LSB | UTC-based counter LSB11.2.14 | M | V | 1 |
|  | MIC | MIC11.2.4 | M | V | 4 |
|  | ProSe restricted code | ProSe restricted code11.2.3 | M | V | 23 |
| 7A | Metadata | Metadata11.2.13 | O | TLV-E | 4-8195 |
| X1 | Relay indication | Relay indication11.2.y | O | TV | 1 |
| NOTE: The discovery type is set to "Restricted discovery" and the content type is set to "Announcement". |

Table 10.2.1.3: PROSE PC5 DISCOVERY message content for restricted 5G ProSe direct discovery solicitation

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| IEI | Information Element | Type/Reference | Presence | Format | Length |
|  | ProSe direct discovery PC5 message type (NOTE) | ProSe direct discovery PC5 message type11.2.1 | M | V | 1 |
|  | UTC-based counter LSB | UTC-based counter LSB11.2.14 | M | V | 1 |
|  | MIC | MIC11.2.4 | M | V | 4 |
|  | ProSe query code | ProSe restricted code11.2.3 | M | V | 23 |
| XX | Discoveree user info | Application layer ID11.2.15 | O | TLV | 3-257 |
| X1 | Relay indication | Relay indication11.2.y | O | TV | 1 |
| NOTE: The discovery type is set to "Restricted discovery" and the content type is set to "Solicitation". |

Table 10.2.1.4: PROSE PC5 DISCOVERY message content for restricted 5G ProSe direct discovery response

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| IEI | Information Element | Type/Reference | Presence | Format | Length |
|  | ProSe direct discovery PC5 message type (NOTE) | ProSe direct discovery PC5 message type11.2.1 | M | V | 1 |
|  | UTC-based counter LSB | UTC-based counter LSB11.2.14 | M | V | 1 |
|  | MIC | MIC11.2.4 | M | V | 4 |
|  | ProSe response code | ProSe restricted code11.2.3 | M | V | 23 |
| 7A | Metadata | Metadata11.2.13 | O | TLV-E | 4-8195 |
| X1 | Relay indication | Relay indication11.2.y | O | TV | 1 |
| NOTE: The discovery type is set to "Restricted discovery" and the content type is set to "response". |

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

### 11.2.y Relay indication

The relay indication parameter is used to indicate if 5G ProSe UE-to-UE relay UE(s) can broadcast its User Info ID during the procedure of 5G ProSe UE-to-UE relay discovery over PC5 interface.

The relay indication is a type 1 information element with a length of 1 octet.

The relay indication IE is coded as shown in figure 11.2.y.1 and table 11.2.y.1.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |
|  |  |
|  |  |  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |  |
| 　Relay Indication IEI | Spare | RI | Octect 1 |

Figure 11.2.y.1: Relay indication information element

Table 11.2.y.1: Relay indication information element

|  |
| --- |
| Relay Indication (RI) (octet 1, bit 1)The bit is used to indicate whether or not the UE’s User Info ID can be broadcasted during the procedure of 5G ProSe UE-to-UE relay discovery over PC5 interface. |
| Bit |
| 1 |  |  |  |  |
| 0 |  |  |  | It is not allowed to broadcast the user info ID. |
| 1 |  |  |  | It is allowed to broadcast the user info ID. |
| Bits 2 to 4 of octet 1 are spare and shall be coded as zero. |

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