**3GPP TSG-CT WG1 Meeting #135-eC1-222753**

**E-Meeting, 6th – 12th April 2022**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **4** | **CR** |  | **rev** |  | **Current version:** | **17.0.0** |  |
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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:*** | Clarification on the initiating UE stopping passing the same PROSE PC5 DISCOVERY message to lower layers | | | | | | | | | |
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| ***Source to WG:*** | vivo | | | | | | | | | |
| ***Source to TSG:*** | C1 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | 5G\_ProSe | | | | |  | ***Date:*** | | | 2022.03.28 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | F |  | | | | | ***Release:*** | | | Rel-17 |
|  | *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)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Stage-3 TS 24.554 states that the UE shall ensure that it keeps on passing the PROSE PC5 DISCOVERY message until the UE is triggered by an upper layer application or until the UE stops being authorised to perform the announcing UE procedure for UE-to-network relay discovery, and the above is left up to UE implementation, see below:  *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 an upper layer application to stop announcing availability of a connectivity service provided by a UE-to-network relay, or until the UE stops being authorised to perform the announcing UE procedure for UE-to-network relay discovery. How this is achieved is left up to UE implementation.*  However, the trigger from an upper layer application is depend on the application or application server. The triggering of not be authorised to perform the announcing UE procedure depends on the valid timer of configured policy from PCF. So actually, the above two triggers leave no room for the UE vender to implement when to stop sending PROSE PC5 DISCOVERY message.  Similar to the mechanism for the implementation-specific maximum number when UE determines whether to establish a PC5 connection, this CR proposes to clarify what can be left to UE implementation for the initiating UE with model A and model B, i.e. an implementation-specific maximum number or an implementation-specific timer expires.  Another issue can be identified is that, when UE selects a RSD containing a 5G ProSe layer-3 UE-to-network relay offload indication and the 5G ProSe layer-3 UE-to-network relay is currently not available, the UE shall select a route selection descriptor with the next smallest precedence value which has not yet been evaluated, see below:  *ia) the selected route selection descriptor contains a 5G ProSe layer-3 UE-to-network relay offload indication:*  *A) if the information on the 5G ProSe layer-3 UE-to-network relay is available and the UE supports acting as ProSe layer-3 UE-to-network remote UE as specified in 3GPP TS 24.501 [11], it shall be provided to the upper layers and the UE shall stop selecting a route selection descriptor matching the application information.*  *B) if the information about the 5G ProSe layer-3 UE-to-network relay is not available or the UE does not support acting as ProSe layer-3 UE-to-network remote UE as specified in 3GPP TS 24.501 [11], the UE shall proceed to step 4);*  and  *4) if there is any route selection descriptor which has not yet been evaluated, the UE shall proceed to step 1). If all route selection descriptors for the matching non-default URSP rule have been evaluated and there is one or more non-default matching URSP rule which has not yet been evaluated, the UE shall proceed to step a). If all non-default matching URSP rules have been evaluated, the UE shall inform the upper layers of the failure.*  However, it lacks flexibility for the remote UE if the triggers can only from application or provisioning parameters. The UE can base on the proposed implementation-specific maximum number or an implementation-specific timer to choose to match the next RSD, not stuck in finding L3 relay which is not available currently for saving powers. | | | | | | | | |
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| ***Summary of change:*** | | 1. Add a NOTE to clarify that 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 the UE at a time, or an implementation-specific timer expires.  2. Condition alignment for direct discovery with model B. | | | | | | | | |
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| ***Consequences if not approved:*** | | Unclear description on UE implementation | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.2.14.2.1.2, 6.2.14.2.1.3, 6.2.14.2.2.2, 6.2.14.2.2.3, 6.2.15.2.1.2, 6.2.15.2.1.3, 6.2.15.2.2.2, 6.2.15.2.2.3, 8.2.1.2.2.2, 8.2.1.2.2.3, 8.2.1.2.4.2, 8.2.1.3.1.2, 8.2.1.3.1.3 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | | -In Rev 1: Cover the proposal to a NOTE | | | | | | | | |

**\*\*\*\*\*\*\***

\* \* \* First 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 filed 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;

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

5) shall set the UTC-based counter LSB parameter to include the 8 least significant bits of the UTC-based counter;

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 33.303[36]; and

e) 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 the UE at a time, or an implementation-specific timer expires.

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

###### 6.2.14.2.1.3 Announcing UE procedure for 5G ProSe direct discovery completion

When the request from upper layers to perform announcing UE procedure for 5G ProSe direct discovery is not 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, the UE may instruct the lower layers to stop announcing.

NOTE 1: 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 the UE at a time, or an implementation-specific timer expires.

When the UE stops announcing, 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 \* \* \* \*

###### 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 application identity, 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 filed 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; and

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

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]; and

e) 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 2: 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 the UE at a time, 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 configured as a part of the discovery response filter, and the UTC-based counter obtained during the monitoring operation to unscramble the PROSE PC5 DISCOVERY message as described in 3GPP TS 33.303 [36]. Then, if a DUCK is configured, 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 33.303 [36]. Finally, if a DUIK is configured, 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.

Editor's note: Details of Discoverer UE procedure upon reception of a PROSE PC5 DISCOVERY message for direct discovery response are FFS and will be determinated by cooperation with SA WG3.

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

###### 6.2.14.2.2.3 Discoverer UE procedure for 5G ProSe direct discovery completion

During the discoverer operation, if

a) the validity timer T5070 for the ProSe query code and corresponding ProSe Response Filter(s) has expired; and

b) 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,

NOTE: 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 the UE at a time, or an implementation-specific timer expires.

then the UE may instruct the lower layers to stop the discoverer operation. 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 \* \* \* \*

###### 6.2.15.2.1.2 Announcing UE procedure for group member discovery initiation

The UE is authorised to perform the announcing UE procedure for group member discovery if:

a) the following is true:

1) 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;

2) 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

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

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

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

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

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 5G ProSe discovery transmission and the UE can use this common radio resources pool while in limited service state.

b) the UE is configured with the application layer group ID identifying the application layer group to be announced and with the User info ID for the group member discovery parameter;

otherwise, the UE is not authorised to perform the announcing UE procedure for group member discovery procedure.

Figure 6.2.15.2.1.2.1 illustrates the interaction of the UEs in the announcing UE procedure for group member discovery.



Figure 6.2.15.2.1.2.1: Announcing UE procedure for group member discovery

When the UE is triggered by an upper layer application to announce availability in a discovery group, if the UE is authorised to perform the announcing UE procedure for group member 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 group member discovery announcement. In the PROSE PC5 DISCOVERY message for group member discovery announcement, the UE:

1) shall set the announcer info parameter to the User info ID for the group member discovery parameter; and

2) shall set the application layer group ID parameter to the application layer group ID parameter identifying the discovery group to be announced;

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

4) shall set the 4 least significant bits of 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 10.2.1.5; and

6) may include the Metadata IE to provide the application layer discovery message;

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 33.303[36];

e) shall apply one of the following to determine the destination layer-2 ID:

1) if the application layer group ID has a configured layer-2 group ID as specified in clause 5.2.3, set the destination layer-2 ID to the layer-2 group ID; or

2) otherwise, convert the application layer group ID into a destination layer-2 ID as following:

i) to use the group identifier as the input to the SHA-256 hashing algorithm as specified in ISO/IEC 10118-3:2018 [28]; and

ii) to use the 24 least significant bits of the 256 bits of the output as destination layer-2 ID;

NOTE 2: SHA-256 hashing algorithm is implemented in the ME.

f) shall self-assign a source layer-2 ID for sending the group member discovery announcement message; and

g) shall pass the resulting PROSE PC5 DISCOVERY message for group member discovery announcement along with the source layer-2 ID and the destination layer-2 ID to the lower layers for transmission over the PC5 interface.

The announcing UE shall ensure that it keeps on passing the same PROSE PC5 DISCOVERY message to the lower layers for transmission until the announcing UE is triggered by an upper layer application to stop announcing availability in a discovery group, or until the UE stops being authorised to perform the announcing UE procedure for group member discovery. How this is achieved is left up to UE implementation.

NOTE 3: The announcing UE can stop announcing UE procedure for group member discovery for power saving by implementation specific means e.g., an implementation-specific maximum number of the UE at a time, or an implementation-specific timer expires.

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

###### 6.2.15.2.1.3 Announcing UE procedure for group member discovery completion

When the announcing UE is triggered by an upper layer application to stop announcing availability in a discovery group, or when the announcing UE stops being authorised to perform the announcing UE procedure for group member discovery, the UE shall instruct the lower layers to stop announcing.

NOTE: The announcing UE can stop announcing UE procedure for group member discovery for power saving by implementation specific means e.g., an implementation-specific maximum number of the UE at a time, or an implementation-specific timer expires.

When the UE stops announcing, 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 \* \* \* \*

###### 6.2.15.2.2.2 Discoverer UE procedure for group member discovery initiation

The UE is authorised to perform the discoverer UE procedure for group member discovery if:

a) the following is true:

1) 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;

2) 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

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

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

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

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

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 5G ProSe discovery transmission and the UE can use this common radio resources pool while in limited service state.

b) the UE is configured with the application layer group ID parameter identifying the discovery group to be solicited and with the User info ID for the group member discovery parameter;

otherwise, the UE is not authorised to perform the discoverer UE procedure for group member discovery.

Figure 6.2.15.2.2.2.1 illustrates the interaction of the UEs in the discoverer UE procedure for group member discovery.



Figure 6.2.15.2.2.2.1: Discoverer UE procedure for group member discovery

When the UE is triggered by an upper layer application to solicit proximity of other UEs in a discovery group, and if the UE is authorised to perform the discoverer UE procedure for group member 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 group member discovery solicitation. In the PROSE PC5 DISCOVERY message for group member discovery solicitation, the UE:

1) shall set the discoverer info parameter to the user info ID for the group member discovery parameter;

2) shall set the application layer group ID parameter to the application layer group ID parameter identifying the discovery group to be solicited;

3) shall set the target user info parameter to the target info, if the target information is provided by the upper layers to identify a specific group member of the application layer group identified by the configured application layer group ID;

NOTE 2: If the PROSE PC5 DISCOVERY message for group member discovery solicitation does not indicate any specific target UE (i.e., target user info is not included in the PROSE PC5 DISCOVERY message), the PROSE PC5 DISCOVERY message for group member discovery solicitation is only used to discover the targeted group members that are identified by the configured application layer group ID.

4) shall include the MIC filed 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;

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

6) shall set the ProSe direct discovery PC5 message type parameter as specified in table 10.2.1.6;

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 33.303 [36];

e) shall apply one of the following to determine the destination layer-2 ID:

1) if the application layer group ID has a configured layer-2 group ID as specified in clause 5.2.3, set the destination layer-2 ID to the layer-2 group ID; or

2) otherwise, convert the application layer group ID into a destination layer-2 ID as following:

i) to use the group identifier as the input to the SHA-256 hashing algorithm as specified in ISO/IEC 10118-3:2018 [28]; and

ii) to use the 24 least significant bits of the 256 bits of the output as destination layer-2 ID;

NOTE 3: SHA-256 hashing algorithm is implemented in the ME.

f) shall self-assign a source layer-2 ID for sending the group member discovery solicitation message; and

g) shall pass the resulting PROSE PC5 DISCOVERY message for group member discovery solicitation along with the source layer-2 ID and destination layer-2 ID to the lower layers for transmission over the PC5 interface.

The UE shall ensure that it keeps on passing the same PROSE PC5 DISCOVERY message to the lower layers for transmission with an indication that the message until the UE is triggered by an upper layer application to stop soliciting proximity of other UEs in a discovery group, or until the UE stops being authorised to perform the discoverer UE procedure for group member discovery. How this is achieved is left up to UE implementation.

NOTE 4: The discoverer UE can stop discoverer UE procedure for group member discovery for power saving by implementation specific means e.g., an implementation-specific maximum number of the UE at a time, or an implementation-specific timer expires.

Upon reception of a PROSE PC5 DISCOVERY message for group member discovery response, for the target application layer group ID of the discovery group to be discovered, the UE shall use the associated DUSK, if configured or calculated using the PSDK, and the UTC-based counter obtained during the monitoring operation to unscramble the PROSE PC5 DISCOVERY message as described in 3GPP TS 33.303 [36]. Then, if a DUCK is configured or calculated using the PSDK, 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 33.303 [36]. Finally, if a DUIK is configured or calculated using the PSDK, the UE shall use the DUIK and UTC-based counter to verify the MIC field in the unscrambled PROSE PC5 DISCOVERY message for group member discovery response.

Then if the application layer group ID parameter of the PROSE PC5 DISCOVERY message for group member discovery response is the same as the application layer group ID parameter of the PROSE PC5 DISCOVERY message for group member discovery solicitation, the UE shall consider that other UE in the discovery group the UE seeks to discover has been discovered.

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

###### 6.2.15.2.2.3 Discoverer UE procedure for group member discovery completion

When the UE is triggered by an upper layer application to stop soliciting proximity of other UEs in a discovery group, or when the UE stops being authorised to perform the discoverer UE procedure for group member discovery, the UE shall instruct the lower layers to stop discoverer operation.

NOTE: The discoverer UE can stop discoverer UE procedure for group member discovery for power saving by implementation specific means e.g., an implementation-specific maximum number of the UE at a time, 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 \* \* \* \*

###### 8.2.1.2.2.2 Announcing UE procedure for UE-to-network relay discovery initiation

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

a) the UE is authorised to act as a UE-to-network relay in the PLMN indicated by the serving cell as specified in clause 5.2.5, 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-network relay discovery;

b) the UE is configured with:

1) the relay service code parameter identifying the connectivity service to be announced as specified in clause 5.2.5, and for 5G ProSe layer-3 UE-to-network relay UE,

i) the S-NSSAI associated with that relay service code shall belong to the allowed NSSAI of the UE; and

ii) if the UE is camped on a cell whose TAI is in the list of "non-allowed tracking areas" or is camped on a cell whose TAI is not in the list of "allowed tracking areas", then the relay service code shall be associated with an emergency service or high priority access as defined in clause 5.3.5 of 3GPP TS 24.501 [11]; and

2) the User info ID for the UE-to-network relay discovery parameter as specified in clause 5.2.5;

c) for 5G ProSe layer-3 UE-to-network relay UE, the UE is configured with PDU Session parameters which is used for relayed traffic for the associated relay service code, as specified in clause 5.2.5; and

d) the back-off timer T3346 used for NAS mobility management congestion control as specified in clause 5.3.9 of 3GPP TS 24.501 [11] is not running at the UE;

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

Figure 8.2.1.2.2.2.1 illustrates the interaction of the UEs in the announcing UE procedure for UE-to-network relay discovery.



Figure 8.2.1.2.2.2.1: Announcing UE procedure for UE-to-network relay discovery

When the UE is triggered by an upper layer application to announce availability of a connectivity service provided by a UE-to-network relay, if the UE is authorised to perform the announcing UE procedure for UE-to-network 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-network relay discovery announcement according to clause 10.2.1. In the PROSE PC5 DISCOVERY message for UE-to-network relay discovery announcement, the UE:

1) shall set the announcer info parameter to the User info ID for the UE-to-network relay discovery parameter, as specified in clause 5.2.5;

2) shall set the relay service code parameter to the relay service code parameter identifying the connectivity service to be announced, as specified in clause 5.2.5;

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

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) shall set the ProSe direct discovery PC5 message type parameter as specified in table 10.2.1.8; and

6) if acting as 5G ProSe layer-2 UE-to-network relay UE, shall set the NCGI parameter to the NCGI of its serving cell;

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 5.2.5, and self-assign a source layer-2 ID for sending the UE-to-network relay discovery announcement; and

f) shall pass the resulting PROSE PC5 DISCOVERY message for UE-to-network 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 an upper layer application to stop announcing availability of a connectivity service provided by a UE-to-network relay, or until the UE stops being authorised to perform the announcing UE procedure for UE-to-network relay discovery. How this is achieved is left up to UE implementation.

NOTE: The announcing UE can stop announcing UE procedure for UE-to-network relay discovery for power saving by implementation specific means e.g., an implementation-specific maximum number of the UE at a time, or an implementation-specific timer expires.

Editor's note: Details of security aspects of a PROSE PC5 DISCOVERY message for UE-to-network relay discovery announcement are FFS and will be determinated by cooperation with SA WG2 and SA WG3.

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

###### 8.2.1.2.2.3 Announcing UE procedure for UE-to-network relay discovery completion

When the announcing UE is triggered by an upper layer application to stop announcing availability in a discovery group, or when the announcing UE stops being authorised to perform the announcing UE procedure for UE-to-network relay discovery, the UE shall instruct the lower layers to stop announcing.

NOTE: The announcing UE can stop announcing UE procedure for UE-to-network relay discovery for power saving by implementation specific means e.g., an implementation-specific maximum number of the UE at a time, or an implementation-specific timer expires.

When the UE stops announcing, 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 \* \* \* \*

###### 8.2.1.2.4.2 Announcing procedure for relay discovery additional information

The 5G ProSe UE-to-network relay UE announces the relay discovery additional information:

a) if the 5G ProSe remote UE requests the 5G ProSe UE-to-network relay UE to announce the NG-RAN Cell Global ID (NCGI) or TAI of the cell serving the 5G ProSe UE-to-network relay UE, and as a response the 5G ProSe UE-to-network relay UE acknowledges with the ProSe additional parameters announcement response message, then the 5G ProSe UE-to-network relay UE includes the NCGI or TAI of the serving cell in the PROSE PC5 DISCOVERY message for relay discovery additional information until the timer T5107 expires (see the clause 8.2.8).

NOTE 1: 5G ProSe UE-to-network relay UE announces the relay discovery additional information only when it is in NG-RAN coverage.

Figure 8.2.1.2.4.2.1 illustrates the interaction of the 5G ProSe UE-to-network relay UE and the 5G ProSe remote UE in the announcing UE procedure for relay discovery additional information.



Figure 8.2.1.2.4.2.1: Announcing procedure for relay discovery additional information

The 5G ProSe UE-to-network relay UE may start announcing relay discovery additional information if:

a) the 5G ProSe UE-to-network relay UE is currently authorised to perform 5G ProSe direct discovery Model A announcing in the serving PLMN if the UE is served by NG-RAN; and

1) additional parameters announcement for the serving cell of the 5G ProSe UE-to-network relay UE has been requested and responded to 5G ProSe remote UEs, the timer T5107 has not expired (periodic reporting); or

2) additional parameters announcement for the serving cell of the 5G ProSe UE-to-network relay UE has been requested and responded to 5G ProSe remote UEs, the timer T5107 has not expired, and the 5G ProSe UE-to-network relay UE detects camping on a new serving cell; or

3) additional parameters announcement for the serving cell of the 5G ProSe UE-to-network relay UE has been requested and responded to 5G ProSe remote UEs, the timer T5107 has not expired, and the 5G ProSe UE-to-network relay UE detects entering a new tracking area.

When the 5G ProSe UE-to-network relay UE has some additional information to broadcast (i.e., NCGI, due to the periodic reporting or due to camping on a new serving cell), then the 5G ProSe UE-to-network relay UE:

a) shall request the parameters from the lower layers for ProSe direct discovery announcing (see 3GPP TS 38.331 [13]). If the 5G ProSe UE-to-network relay UE in 5GMM-IDLE mode needs to request resources for sending PROSE PC5 DISCOVERY messages as specified in 3GPP TS 38.331 [13], the 5G ProSe UE-to-network relay UE 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 PROSE PC5 DISCOVERY message(s) for relay discovery additional information according to clause 10.2.1. In the PROSE PC5 DISCOVERY message for relay discovery additional information, the 5G ProSe UE-to-network relay UE shall:

1) include the relay service code used for 5G ProSe direct communication which the 5G ProSe remote UE used to request for the relay discovery additional information;

2) set the announcer info parameter to the User info ID parameter, configured in clause 5.2.5;

3) set the relay discovery additional information contents by the additional information to broadcast;

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

5) shall set the ProSe direct discovery PC5 message type parameter as specified in table 10.2.1.11;

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];

Editor's note: Details of security related content in d) are FFS and will be determinated by SA WG3.

e) shall set the default destination layer-2 ID as specified in clause 5.2.5 to the destination layer-2 ID, and self-assign a source layer-2 ID for sending the UE-to-network relay discovery announcement; and

f) shall pass the resulting PROSE PC5 DISCOVERY message for relay discovery additional information 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.

The 5G ProSe UE-to-network relay UE shall ensure that it keeps on passing the PROSE PC5 DISCOVERY messages periodically to the lower layers for transmission until the corresponding timer (i.e., timer T5107 when the additional information is NCGI or TAI) expires. How this is achieved is left up to UE implementation.

NOTE 2: The announcing UE can stop announcing UE procedure for relay discovery additional information for power saving by implementation specific means e.g., an implementation-specific maximum number of the UE at a time, or an implementation-specific timer expires.

NOTE 3: The periodicity of sending the PROSE PC5 DISCOVERY messages for relay discovery additional information by the 5G ProSe UE-to-network relay UE is implementation specific and is normally lower than the one related to the additional parameters announcement request refresh timer T5016.

During the announcing operation, if one of the above conditions is no longer met, the 5G ProSe UE-to-network relay UE may instruct the lower layers to stop announcing.

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

###### 8.2.1.3.1.2 Discoverer UE procedure for UE-to-network relay discovery initiation

The UE is authorised to perform the discoverer UE procedure for UE-to-network 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 remote UE towards a UE-to-network relay UE, and is configured with the radio parameters to be used for ProSe UE-to-network relay discovery when not served by NG-RAN;

2) the UE is served by NG-RAN, is authorised to act as a remote UE towards a UE-to-network 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

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

b) the UE is configured with the relay service code parameter identifying the connectivity service to be solicited and with the User info ID for the UE-to-network relay discovery parameter, as specified in clause 5.2.5; and

c) for 5G ProSe layer-2 remote UE, the UE is camped on a cell whose TAI is not in the list of "non-allowed tracking areas" or is camped on a cell whose TAI is in the list of "allowed tracking areas",

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

Figure 8.2.1.3.1.2.1 illustrates the interaction of the UEs in the discoverer UE procedure for UE-to-network relay discovery.



Figure 8.2.1.3.1.2.1: Discoverer UE procedure for UE-to-network Relay discovery

For PROSE PC5 DISCOVERY message signal strength measurement, the UE manages a periodic measurement timer T5091, which is used to trigger the periodic PROSE PC5 DISCOVERY message signal strength measurement between the UE and the ProSe UE-to-network 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-network relay UE and restarted whenever the UE receives the PROSE PC5 DISCOVERY message for UE-to-network relay discovery response from the 5G ProSe UE-to-network relay UE with which the UE has a link established.

When the UE is triggered by an upper layer application to solicit proximity of a connectivity service provided by a UE-to-network relay UE, or when the periodic measurement timer T5091 expires, and if the UE is authorised to perform the discoverer UE procedure for UE-to-network 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-network relay discovery solicitation. In the PROSE PC5 DISCOVERY message for UE-to-network relay discovery solicitation, the UE:

1) shall set the discoverer info parameter to the User info ID for the UE-to-network relay discovery parameter, configured in clause 5.2.5;

2) shall set the relay service code parameter to the relay service code parameter identifying the connectivity service to be solicited, configured in clause 5.2.5;

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

4) shall set the ProSe direct discovery PC5 message type parameter as specified in table 10.2.1.9;

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];

Editor's note: Details of security related content in d) are FFS and will be determinated by SA3.

e) shall set the default destination layer-2 ID as specified in clause 5.2.5 to the destination layer-2 ID, and self-assign a source layer-2 ID for sending the UE-to-network relay discovery solicitation message; and

f) shall pass the resulting PROSE PC5 DISCOVERY message for UE-to-network 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.

If the PROSE PC5 DISCOVERY message for UE-to-network relay discovery solicitation is used to solicit proximity of a connectivity service provided by a UE-to-network relay UE, the UE shall ensure that it keeps on passing the PROSE PC5 DISCOVERY message for UE-to-network relay discovery solicitation for transmission until the UE is triggered by an upper layer application to stop soliciting proximity of a connectivity service provided by a UE-to-network relay UE, until the number of annoucing is more than an implementation-specific maximum number of the UE at a time or an implementation-specific timer has expired, or until the UE stops being authorised to perform the discoverer UE procedure for UE-to-network relay discovery. How this is achieved is left up to UE implementation.

NOTE 1: The discoverer UE can stop discoverer UE procedure for UE-to-network relay discovery for power saving by implementation specific means e.g., an implementation-specific maximum number of the UE at a time, or an implementation-specific timer expires.

If the PROSE PC5 DISCOVERY message for UE-to-network relay discovery solicitation is used to trigger the PROSE PC5 DISCOVERY message signal strength measurement between the UE and the 5G ProSe UE-to-network Relay UE with which the UE has a link established, the UE shall start the retransmission timer T5090. If retransmission timer T5090 expires, the UE shall retransmit the PROSE PC5 DISCOVERY message for UE-to-network relay discovery solicitation and restart timer T5090. If no response is received from the ProSe UE-to-network 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 2: The maximum number of allowed retransmissions is UE implementation specific.

Upon reception of a PROSE PC5 DISCOVERY message for UE-to-network relay discovery response along with the destination layer-2 ID which the UE is configure to respond for, for the target relay service code of the connectivity service which the UE is authorized to discover, the UE shall use the associated DUSK, if configured, and the UTC-based counter obtained during the reception operation to unscramble the PROSE PC5 DISCOVERY message as described in 3GPP TS 33.503 [34]. Then, if a DUCK is configured, 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 configured, the UE shall use the DUIK and the UTC-based counter to verify the MIC field in the unscrambled PROSE PC5 DISCOVERY message for UE-to-network relay discovery response.

Editor's note: Details of Discoverer UE procedure upon reception of a PROSE PC5 DISCOVERY message for direct discovery response are FFS and will be determinated by cooperation with SA WG3.

NOTE 3: The UE can determine the received PROSE PC5 DISCOVERY message for UE-to-network 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-network relay discovery response is the same as the relay service code parameter of the PROSE PC5 DISCOVERY message for UE-to-network relay discovery solicitation; and

b) the User info ID of the UE-to-network Relay is not configured as specified in clause 5.2.5 for the connectivity service being solicited, or the Discoverer info parameter of the PROSE PC5 DISCOVERY message for UE-to-network relay discovery response is the same as the User info ID of the UE-to-network Relay configured as specified in clause 5.2.5 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-network relay discovery response for relay selection or reselection. If the UE has received the PROSE PC5 DISCOVERY message for UE-to-network relay discovery response from the ProSe UE-to-network Relay UE with which the UE has a link established, the UE shall stop the retransmission timer T5090, and start the periodic measurement timer T5091.

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

###### 8.2.1.3.1.3 Discoverer UE procedure for UE-to-network Relay discovery completion

When the UE is triggered by an upper layer application to stop soliciting for proximity of a connectivity service provided by a UE-to-network Relay, or when the UE stops being authorised to perform the Discoverer UE procedure for UE-to-network Relay discovery, the UE shall instruct the lower layers to stop the discoverer operation.

NOTE: The discoverer UE can stop discoverer UE procedure for UE-to-network relay discovery for power saving by implementation specific means e.g., an implementation-specific maximum number of the UE at a time, 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].

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