**3GPP TSG-CT WG1 Meeting #135-eC1-222564**

**E-Meeting, 6th – 12th April 2022**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
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|  | **24.554** | **CR** | **0004** | **rev** | **1** | **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 | **X** |

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|  |
| ***Title:***  | Ciphering algorithm exchange between UE and DDNMF  |
|  |  |
| ***Source to WG:*** | OPPO, Qualcomm?, Nokia?, Nokia Shanghai Bell? |
| ***Source to TSG:*** | C1 |
|  |  |
| ***Work item code:*** | 5G\_ProSe |  | ***Date:*** | 2022-4-8 |
|  |  |  |  |  |
| ***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 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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
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| ***Reason for change:*** | In Clause 6.1.3.2 of TS 33.503, message-specific confidentiality was introduced for restricted direct discovery, both model A and model B.This requires UE provides its ciphering algorithms to DDNMF in discovery request message then DDNMF selects one of the algorithms and sends back to UE to cipher the PC5 discovery messages later. The corresponding stage 3 implementation is needed.For protection of PC5 discovery message, currently TS 33.303 is referred to calculate the keys. However, with introducing the message-specific confidentiality in clause 6.1.3.2.3 of TS 33.503, some new behaviours were introduced. So referring to TS 33.303 is not correct any more. |
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| ***Summary of change:*** | Add ciphering algorithm exchange during restricted direct discovery between UE and DDNMF.Refer to TS 33.503 for protecting the PC5 discovery messages. |
|  |  |
| ***Consequences if not approved:*** | Missing stage 2 requirements. |
|  |  |
| ***Clauses affected:*** | 6.2.3.2, 6.2.3.3, 6.2.3.4, 6.2.3.5, 6.2.5.2, 6.2.5.3, 6.2.5.4, 6.2.5.5, 6.2.6.2, 6.2.6.3, 6.2.6.4, 6.2.6.5, 6.2.7.2, 6.2.7.3, 6.2.7.4, 6.2.7.5, 10.5.3, 10.5.4.2, 10.5.4.3, 11.4.2.8, 11.4.2.y(new) and 11.4.2.z(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 \* \* \* \*

#### 6.2.3.2 Announce request procedure initiation

Before initiating the announce request procedure, the user sets the permissions for the restricted discovery using application layer mechanisms. The application client in the UE retrieves the PDUID provisioned to the UE as part of the service authorization procedure as specified in clause 5 and obtains an RPAUID associated with the UE's PDUID from the ProSe application server. The UE may provide metadata to be associated with the RPAUID, and the ProSe application server stores the metadata. This step is performed using mechanisms that are out of scope of the present specification.

If the UE is authorized to perform restricted 5G ProSe direct discovery model A announcing in the PLMN operating the radio resources signalled from the serving PLMN, it shall initiate an announce request procedure:

a) when the UE is triggered by an upper layer application to announce an RPAUID and the UE has no valid corresponding ProSe restricted code for that RPAUID of the upper layer application;

b) when the validity timer T5062 assigned by the 5G DDNMF to a ProSe restricted code has expired and the request from upper layers to announce the RPAUID corresponding to that ProSe restricted code is still in place;

c) when the UE selects a new PLMN while announcing a ProSe restricted code and intends to announce in the new PLMN, and the UE is authorized for restricted 5G ProSe direct discovery model A announcing in the new PLMN;

d) when, while announcing a RPAUID, the UE intends to switch the announcing PLMN to a different PLMN without performing PLMN selection, and the UE does not have a valid allocated ProSe restricted code for this new PLMN yet; or

e) when the UE needs to update a previously sent restricted 5G ProSe direct discovery model A announcing request.

When the UE selects a new PLMN while announcing a ProSe restricted code and the UE is not yet authorized for restricted 5G ProSe direct discovery model A announcing in the new PLMN, the UE shall initiate an announce request procedure only after the UE is authorized for restricted 5G ProSe direct discovery model A announcing in the new PLMN.

NOTE 1: To ensure service continuity if the UE needs to keep announcing a ProSe restricted code corresponding to the same RPAUID, the UE can initiate the announce request procedure before the validity timer T5062 assigned by the 5G DDNMF for a ProSe restricted code expires.

The UE shall initiate the announce request procedure by sending a DISCOVERY\_REQUEST message with:

a) a new transaction ID not used in any other direct discovery procedures in PC3a interface;

b) the RPAUID set to the RPAUID received from upper layers;

c) the command set to "announce";

d) the UE identity set to the UE's SUPI;

e) the application identity set to the application identity of the upper layer application that requested the announcing;

f) the discovery type set to "Restricted discovery";

g) the ACE enabled indicator set to "application-controlled extension enabled" if application-controlled extension is required by the upper layers or "normal" if application-controlled extension is not used;

h) the announcing type set to "on demand" if on demand announcing is requested by upper layers and "normal" if on demand announcing is not requested by upper layers;

i) optionally the requested timer set to the length of validity timer associated with the ProSe restricted code that the UE expects to receive from the 5G DDNMF;

j) the discovery entry ID set to a 0 if the announcing request is a new request, and set to the discovery entry ID received from the 5G DDNMF if the announcing request is to update a previously sent announcing request;

k) optionally the announcing PLMN ID set to the PLMN ID of the local PLMN operating the radio resources that the UE intends to use for announcing the RPAUID; and

x) the PC5 UE ciphering algorithm capability set to the UE supported ciphering algorithm(s) for ciphering the PROSE PC5 DISCOVERY message.

If restricted 5G ProSe direct discovery model A with application-controlled extension is requested by upper layers, the DISCOVERY\_REQUEST message shall also include the application level container, which contains application-level data transparent to the 3GPP network, to be used by the ProSe application server e.g., to assign ProSe restricted code suffix(es).

When the UE initiates the announce request procedure to inform the 5G DDNMF that the UE wants to stop announcing a ProSe restricted code before the associated valid timer expires, the UE shall set the requested timer to 0.

NOTE 2: A UE can include one or multiple transactions in one DISCOVERY\_REQUEST message for different RPAUIDs, and receive corresponding <restricted-announce-response> element or <response-reject> element in a DISCOVERY\_RESPONSE message for each respective transaction. In the following description of the announce request procedure, only one transaction is included.

Figure 6.2.3.2.1 illustrates the interaction of the UE and the 5G DDNMF in the announce request procedure.



Figure 6.2.3.2.1: Announce request procedure for restricted 5G ProSe direct discovery model A

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

#### 6.2.3.3 Announce request procedure accepted by the 5G DDNMF

Upon receiving a DISCOVERY\_REQUEST message with the command set to "announce" and the discovery type set to "Restricted discovery", if the requested timer is included in the DISCOVERY\_REQUEST message and the requested timer is set to 0, the 5G DDNMF shall check whether there is an existing UE context containing the discovery entry identified by the discovery entry ID included in the DISCOVERY\_REQUEST message. If the discovery entry exists in the UE context, the 5G DDNMF shall inform the 5G DDNMF in the announcing PLMN to remove the corresponding discovery entry as specified in 3GPP TS 29.555 [9] when the announcing PLMN is not the same as that of the PLMN to which the 5G DDNMF belongs and remove the discovery entry identified by the discovery entry ID from the UE's context.

Upon receiving a DISCOVERY\_REQUEST message with the command set to "announce" and the discovery type set to "Restricted discovery", if the requested timer is not included in the DISCOVERY\_REQUEST message or the requested timer included in the DISCOVERY\_REQUEST message is not set to 0, the 5G DDNMF shall perform the following procedure.

The 5G DDNMF shall check that the application corresponding to the application identity contained in the DISCOVERY\_REQUEST message is authorized for restricted 5G ProSe direct discovery model A announcing. If the application is authorized for restricted 5G ProSe direct discovery model A announcing, the 5G DDNMF shall check whether there is an existing context for the UE.

If there is no associated UE context, the 5G DDNMF checks with the UDM whether the UE is authorized for restricted 5G ProSe direct discovery model A announcing as described in 3GPP TS 29.503 [10]. If the check indicates that the UE is authorized, the 5G DDNMF creates a UE context that contains the UE's subscription parameters obtained from the UDM. The UDM also provides to the 5G DDNMF the PLMN ID of the PLMN in which the UE is currently registered. If the UE context exists, the 5G DDNMF shall then check whether the UE is authorized for restricted 5G ProSe direct discovery model A announcing in the currently registered PLMN or in the local PLMN identified by the Announcing PLMN ID included in the DISCOVERY\_REQUEST message.

If the UE is authorized and the discovery entry ID included in the DISCOVERY\_REQUEST message is set to 0 then:

a) the 5G DDNMF shall check whether the UE is authorized to announce the RPAUID contained in the DISCOVERY\_REQUEST message. Optionally this can include checking with the ProSe application server as described in 3GPP TS 29.557 [19] to obtain the binding between the RPAUID and PDUID, and then verifying that the PDUID belongs to the requesting UE;

b) if the UE is authorized to announce the RPAUID, the ACE enabled indicator is set to "application-controlled extension enabled", the application level container is included in the DISCOVERY\_REQUEST message and the requested application uses application-controlled extension, the 5G DDNMF shall check whether the UE is authorized to use ACE. If the UE is authorized for ACE, the 5G DDNMF shall invoke the procedure described in 3GPP TS 29.557 [19] to check whether the UE is authorized to announce the requested RPAUID with application-defined suffix(es), and obtain suffix-related information from the ProSe application server. The 5G DDNMF shall then allocate a ProSe restricted code prefix and a value for validity timer T5062 to be used with the ProSe restricted code suffix(es) obtained from the ProSe application server for the given RPAUID as specified in 3GPP TS 29.557 [19]. The 5G DDNMF may take into account the requested timer if contained in the DISCOVERY\_REQUEST message when allocating validity timer T5062;

c) if the UE is authorized to announce the RPAUID, the ACE enabled indicator is set to "normal" in the DISCOVERY\_REQUEST message and the requested application does not use application-controlled extension, the 5G DDNMF shall allocate the corresponding ProSe restricted code and a value for validity timer T5062. The 5G DDNMF may take into account the requested timer if contained in the DISCOVERY\_REQUEST message when allocating validity timer T5062;

d) if the UE is authorized to announce the RPAUID, the ACE enabled indicator is set to "normal" in the DISCOVERY\_REQUEST message, the application level container is included in the DISCOVERY\_REQUEST and the requested application only uses application-controlled extension, the 5G DDNMF shall check whether the UE is authorized to use ACE. If the UE is authorized for ACE, the 5G DDNMF shall invoke the procedure described in 3GPP TS 29.557 [19] to check whether the UE is authorized to announce the requested RPAUID with application-defined suffix(es), and obtain suffix-related information from the ProSe application server. The 5G DDNMF shall then allocate a ProSe restricted code prefix and a value for validity timer T5062 to be used with the ProSe restricted code suffix(es) obtained from the ProSe application server for the given RPAUID as specified in 3GPP TS 29.557 [19] The 5G DDNMF may consider the requested timer if contained in the DISCOVERY\_REQUEST message when allocating validity timer T5062;

e) if the UE is authorized to announce the RPAUID, the ACE enabled indicator is set to "application-controlled-extension enabled" and the application level container is included in the DISCOVERY\_REQUEST message but the requested application does not use application-controlled extension, the 5G DDNMF shall allocate the corresponding ProSe restricted code and a value for validity timer T5062. The 5G DDNMF may consider the requested timer if contained in the DISCOVERY\_REQUEST message when allocating validity timer T5062; and

f) the 5G DDNMF associates the allocated ProSe restricted code or ProSe restricted code prefix with a new discovery entry in the UE's context, and starts timer T5063. The UDM also provides to the 5G DDNMF the PLMN ID of the PLMN in which the UE is currently registered. For a given ProSe restricted code, timer T5063 shall be longer than timer T5062. By default, the value of timer T5063 is 4 minutes greater than the value of timer T5062.

If the discovery entry ID included in the DISCOVERY\_REQUEST message is not set to 0 and if there is an existing discovery entry for this discovery entry ID value in the UE's context, the 5G DDNMF shall either update the discovery entry with a new validity timer T5062, or allocate a new ProSe restricted code or ProSe restricted code prefix for the requested RPAUID with a new validity timer T5062, restart timer T5063, and clear any existing on demand announcing enabled indicator. The 5G DDNMF may consider the requested timer if contained in the DISCOVERY\_REQUEST message when allocating validity timer T5062.

If the discovery entry ID contained in the DISCOVERY\_REQUEST message is not found in the UE context or there is no UE context in the 5G DDNMF, the 5G DDNMF shall behave as if the discovery entry ID included in the DISCOVERY\_REQUEST message was set to 0, and the 5G DDNMF shall allocate a new non-zero discovery entry ID for this entry.

If the announcing type is set to "on demand" in the DISCOVERY\_REQUEST message, the 5G DDNMF shall check if "on demand" announcing is authorized and enabled based on the application identity and the operator's policy. If "on demand" announcing is authorized and enabled, and there is no ongoing monitoring request for this RPAUID, then the 5G DDNMF shall set the on demand announcing enabled indicator to 1 for the corresponding discovery entry in the UE's context.

If a new UE context was created or an existing UE context was updated, and the UE is currently roaming or the announcing PLMN ID is included in the DISCOVERY\_REQUEST message, and the on demand announcing enabled indicator is not set to 1 for this discovery entry in the UE's context, the 5G DDNMF checks with the 5G DDNMF of the VPLMN or the local PLMN represented by the Announcing PLMN ID whether the UE is authorized for restricted 5G ProSe direct discovery model A announcing as described in 3GPP TS 29.555 [9].

The 5G DDNMF shall then send a DISCOVERY\_RESPONSE message containing a <restricted-announce-response> element with:

a) the transaction ID set to the value of the transaction ID received in the DISCOVERY\_REQUEST message from the UE;

b) if the on demand announcing enabled indicator is not set to 1 in the UE's context for this discovery entry, either the ProSe restricted code set to the ProSe restricted code or the ProSe restricted code prefix allocated by the 5G DDNMF, and optionally one or more ProSe restricted code suffix Ranges which contain the suffix(es) for the RPAUID received in the DISCOVERY\_REQUEST message;

c) a validity timer T5062 set to the T5062 timer value assigned by the 5G DDNMF to the ProSe restricted code;

d) the ACE enabled indicator set to "application-controlled extension enabled" if application-controlled extension is used, or "normal" if application-controlled extension is not used;

e) the code-sending security parameter containing the security-related information for the UE to protect the transmission of the ProSe restricted code;

f) the on demand announcing enabled indicator indicating whether the on demand announcing is enabled or not for this discovery entry if the announcing type is set to "on demand" in the DISCOVERY\_REQUEST message;

g) the discovery entry ID set to the ID of the discovery entry associated with this announce request in the UE's context;

h) the current time set to the current UTC-based time at the 5G DDNMF and the max offset;

i) optionally, the PC5 security policies used for 5G ProSe direct link establishment procedure; and

x) the selected PC5 ciphering algorithm set to the PC5 ciphering algorithm selected by the 5G DDNMF based on the received PC5 UE ciphering algorithm capability and the ProSe restricted code.

If timer T5063 expires, the 5G DDNMF shall remove the discovery entry associated with the corresponding RPAUID from the UE's context.

The 5G DDNMF may associate the ProSe restricted code with the PC5 security policies.

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

#### 6.2.3.4 Announce request procedure completion by the UE

Upon receipt of the DISCOVERY\_RESPONSE message, if only the transaction ID and the discovery entry ID are contained in the <restricted-announce-response> element and the transaction ID and the discovery entry ID match the corresponding values sent by the UE in a DISCOVERY\_REQUEST message, the UE shall:

a) stop the validity timer T5062 for the discovery entry corresponding to the discovery entry ID received in the DISCOVERY\_RESPONSE message;

b) remove the discovery entry identified by the discovery entry ID included; and

c) instruct the lower layers to stop announcing.

Upon receipt of the DISCOVERY\_RESPONSE message, if the transaction ID contained in the <restricted-announce-response> element matches the value sent by the UE in a DISCOVERY\_REQUEST message with the command set to "announce", the UE shall create a new discovery entry or update an existing discovery entry with the received ProSe restricted code or ProSe restricted code prefix and the PLMN ID of the intended announcing PLMN. For this discovery entry, the UE shall stop the validity timer T5062, if running, for the discovery entry corresponding to the discovery entry ID received in the DISCOVERY\_RESPONSE message, and start the validity timer T5062 for this discovery entry with the received value in the DISCOVERY\_RESPONSE message. Otherwise, the UE shall discard the DISCOVERY\_RESPONSE message and shall not perform the procedures below. The UE shall set a ProSe clock (see 3GPP TS 33.503 [34]) to the value of the received current time parameter and store the received max offset parameter.

If the DISCOVERY\_RESPONSE message includes new ProSe restricted code or ProSe restricted code prefix to replace the existing ProSe restricted code being announced, the UE shall notify lower layer to stop announcing the old ProSe restricted code in PC5 interface.

The UE shall store the selected PC5 ciphering algorithm received in the DISCOVERY\_RESPONSE message for the received ProSe restricted code and use it for protection of the restricted 5G ProSe direct discovery messages over the PC5 interface as specified in clause 6.1.3.2.3 of 3GPP TS 33.503 [34].

If the DISCOVERY\_RESPONSE message contains an on demand announcing enabled indicator set to 1, the UE shall wait for an announcing alert Request message from the 5G DDNMF of the HPLMN before starting to perform restricted 5G ProSe direct discovery model A announcing. Otherwise, the UE may perform restricted 5G ProSe direct discovery model A announcing as described in clause 6.2.14.2.1.

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

#### 6.2.3.5 Announce request procedure not accepted by the 5G DDNMF

If the DISCOVERY\_REQUEST message cannot be accepted by the 5G DDNMF, the 5G DDNMF sends a DISCOVERY\_RESPONSE message containing a <response-reject> element to the UE including an appropriate PC3a control protocol cause value.

If the application corresponding to the application identity contained in the DISCOVERY\_REQUEST message is not authorized for ProSe direct discovery announcing, the 5G DDNMF shall send the DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #1 "Invalid application".

If the RPAUID contained in the DISCOVERY\_REQUEST message is unknown to the 5G DDNMF or ProSe application server, the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #9 "Unknown RPAUID".

If the RPAUID contained in the DISCOVERY\_REQUEST message does not match the stored RPAUID for the requested discovery entry ID, the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #10 "Unknown or invalid discovery entry ID".

If the UE is not authorized for restricted 5G ProSe direct discovery model A announcing, the 5G DDNMF shall send the DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #3 "UE authorization failure".

If the UE is not authorized for restricted "on demand" restricted 5G ProSe direct discovery model A announcing, the 5G DDNMF shall send the DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #13 "UE unauthorized for on-demand announcing".

If the RPAUID contained in the DISCOVERY\_REQUEST message is not associated with the PDUID belonging to the requesting UE, the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #3 "UE authorization Failure".

If the UE is not authorized to use ACE, but the DISCOVERY\_REQUEST message contains the ACE enabled indicator set to "application-controlled extension enabled", the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #12 "UE unauthorized for discovery with application-controlled extension".

If the DISCOVERY\_REQUEST message contains the ACE enabled indicator set to "application-controlled extension enabled", but does not contain the application level container parameter, the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #14 "Missing application level container".

If the ProSe application server indicates to the 5G DDNMF that the application level container in the DISCOVERY\_REQUEST message contains invalid information, the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #15 "Invalid data in application level container".

If the discovery entry ID contained in the DISCOVERY\_REQUEST message is unknown to the 5G DDNMF and the requested timer is set to zero, the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value # 10 "Unknown or invalid discovery entry ID".

If the PC5 UE ciphering algorithm capability contained in DISCOVERY\_REQUEST message is not compatible with the selected PC5 ciphering algorithm for the target ProSe restricted code, the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #19 "Not compatible PC5 UE ciphering algorithm capability".

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

#### 6.2.5.2 Monitor request procedure Initiation

Before initiating the monitor request procedure, the user sets the permissions for the restricted discovery using application layer mechanisms. The application client in the UE retrieves the PDUID provisioned to the UE as part of the service authorization procedure as specified in clause 5, and obtains an RPAUID associated with the UE's PDUID and the target RPAUID(s) to be monitored from the ProSe application server. This step is performed using mechanisms that are out of scope of the present specification.

If the UE is authorized to perform ProSe direct discovery model A monitoring in at least one PLMN, it shall initiate a monitor request procedure:

a) when the UE is triggered by an upper layer application to perform restricted 5G ProSe direct discovery model A monitoring corresponding to at least one RPAUID, and the UE has no valid restricted discovery filters corresponding to the requested RPAUID for that upper layer application; or

b) when the TTL timer T5066 assigned by the 5G DDNMF to a Restricted discovery filter has expired and the request from upper layers to monitor that RPAUID is still in place; or

NOTE 1: To ensure service continuity if the UE needs to keep monitoring the same restricted discovery filter, the UE can initiate the monitor request procedure before the TTL timer T5066 assigned by the 5G DDNMF for a Restricted discovery filter expires.

c) when the UE needs to update a previously sent restricted 5G ProSe direct discovery model A monitoring request.

The UE shall initiate the monitor request procedure by sending a DISCOVERY\_REQUEST message with:

a) a new transaction ID;

b) the RPAUID set to the RPAUID received from upper layers;

c) the command set to "monitor";

d) the discovery type set to "Restricted discovery"

e) the UE identity set to the UE's SUPI;

f) the application identity set to the application identity of the upper layer application that requested the monitoring;

g) the ACE enabled indicator set to "application-controlled extension enabled" if application-controlled extension is required by the upper layers, or "normal" if application-controlled extension is not used;

h) the application level container set to the target RPAUIDs to monitor;

i) the discovery entry ID set to 0 if the monitoring request is a new request, and set to the discovery entry ID received from the 5G DDNMF if the monitoring request is to update a previously sent monitoring request;

j) optionally, the requested timer set to 0 only when the UE wants to stop using restricted discovery filter(s) for direct discovery monitoring; and

x) the PC5 UE ciphering algorithm capability set to the UE supported ciphering algorithm(s) for ciphering the PROSE PC5 DISCOVERY message.

If restricted direct discovery model A with application-controlled extension is requested by upper layers, the application level container included in the DISCOVERY\_REQUEST also contains information corresponding to the ProSe restricted code suffix, e.g., group or user-specific information.

NOTE 2: A UE can include one or multiple transactions in one DISCOVERY\_REQUEST message for one or more different monitoring targets, and receive corresponding <response-monitor> element or <response-reject> element in the DISCOVERY\_RESPONSE message for each respective transaction. In the following description of the monitor request procedure, only one transaction is included.

Figure 6.2.5.2.1 illustrates the interaction between the UE and the 5G DDNMF in the monitor request procedure.



Figure 6.2.5.2.1: Monitor request procedure for restricted 5G ProSe direct discovery model A

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

#### 6.2.5.3 Monitor request procedure accepted by the 5G DDNMF

Upon receiving a DISCOVERY\_REQUEST message with the command set to "monitor" and the discovery type set to "Restricted discovery", if the requested timer is included in the DISCOVERY\_REQUEST message and the requested timer is set to 0, the 5G DDNMF shall check whether there is an existing UE context containing the discovery entry identified by the discovery entry ID included in the DISCOVERY\_REQUEST message. If the discovery entry exists in the UE context, the 5G DDNMF shall remove the discovery entry identified by the discovery entry ID from the UE's context. For each of the PDUIDs corresponding to the target RPAUIDs contained the restricted discovery filters in the discovery entry, if the PDUID is PLMN-specific and that PLMN ID indicated by the PDUID is not the same as that of the PLMN to which the 5G DDNMF belongs, the 5G DDNMF shall inform the 5G DDNMF in the PLMN indicated by the PDUID to remove the corresponding discovery entry as specified in 3GPP TS 29.555 [9].

Upon receiving a DISCOVERY\_REQUEST message with the command set to "monitor" and the discovery type set to "Restricted discovery", if the requested timer is not included in the DISCOVERY\_REQUEST message, the 5G DDNMF shall perform the following procedure.

The 5G DDNMF shall check that the application corresponding to the application identity contained in the DISCOVERY\_REQUEST message is authorized for ProSe direct discovery model A monitoring. If the application is authorized for restricted 5G ProSe direct discovery model A monitoring, the 5G DDNMF shall check whether there is an existing UE context.

If there is no associated UE context, the 5G DDNMF checks with the UDM whether the UE is authorized for restricted 5G ProSe direct discovery model A monitoring as described in 3GPP TS 29.503 [10]. The UDM provides to the 5G DDNMF the PLMN ID of the PLMN in which the UE is currently registered. If the subscription check indicates that the UE is authorized, the 5G DDNMF creates a new UE context containing the UE's subscription parameters obtained from the UDM.

If the discovery entry ID included in the DISCOVERY\_REQUEST is set to 0 then:

a) the 5G DDNMF shall use the procedure described in 3GPP TS 29.557 [19] to pass the application level container included in the DISCOVERY\_REQUEST message to the ProSe application server and obtain a list of PDUID(s) , an application level container and optionally Metadata Indicator(s) corresponding to the authorized target RPAUID(s) from the ProSe application server;

b) if the ACE enabled indicator in the DISCOVERY\_REQUEST message is set to "application-controlled extension enabled" and the requested application uses application-controlled extension, the 5G DDNMF shall check whether the UE is authorized to use ACE. If the UE is authorized for ACE, the 5G DDNMF shall also use the procedure described in 3GPP TS 29.557 [19] to obtain the mask(s) for monitoring a ProSe restricted suffix pool corresponding to each of the Target RPAUIDs.

NOTE 1: The ProSe application server can reject the request for some of the target RPAUIDs included in the application level container in the DISCOVERY\_REQUEST message because they are ineligible to be monitored by the requesting UE. Depending on the operator policy and application layer permissions, it is possible that only a subset of valid RPAUIDs is authorized by the ProSe application server.

c) for each of the PDUIDs corresponding to an authorized target RPAUID, if the PLMN ID of the PDUID is not the same as that of the PLMN to which the 5G DDNMF belongs, then the 5G DDNMF executes the procedures defined in 3GPP TS 29.555 [9] to obtain the ProSe restricted code or ProSe restricted code prefix for the target RPAUID and creates restricted discovery filter(s). Otherwise, for each target RPAUID, the 5G DDNMF shall allocate one or more restricted discovery filter(s). If the ACE enabled indicator in the DISCOVERY\_REQUEST message does not match the ACE configuration in the 5G DDNMF or ProSe application server for this application, the ACE configuration in the 5G DDNMF or ProSe application server shall be used to create Restricted discovery filter(s). Each Restricted discovery filter consists of a ProSe restricted code, one or more masks, a TTL timer T5066, optionally the target RPAUID, optionally a metadata indicator and optionally metadata associated with this RPAUID;

d) the 5G DDNMF associates the restricted discovery filters with a new discovery entry in the UE's context; and

e) the 5G DDNMF starts timer T5067 assigned for each Restricted discovery filter. For a given restricted discovery filter, timer T5067 shall be longer than timer T5066. By default, the value of timer T5067 is 4 minutes greater than the value of timer T5066.

NOTE 2: For each target RPAUID, the 5G DDNMF either allocates one restricted discovery filter for full-matching the ProSe restricted code assigned to this RPAUID, or allocates one or more restricted discovery filter(s) for matching the ProSe restricted code prefix and suffix pool assigned to this RPAUID.

If the discovery entry ID included in the DISCOVERY\_REQUEST message is not set to 0 and if there is an existing discovery entry for this discovery entry ID in the UE's context, the 5G DDNMF shall check whether the UE is authorized for restricted 5G ProSe direct discovery model A monitoring. If the UE is authorized, the 5G DDNMF shall process the request as above-mentioned and update this discovery entry with the contents of the restricted discovery filter(s) associated with this discovery entry and restart timer T5067(s) for each filter. The update of a restricted discovery filter content includes setting new TTL timer(s) and if necessary, obtaining new ProSe restricted code and ProSe restricted mask(s) via the procedure defined in 3GPP TS 29.555 [9].

If the discovery entry ID contained in the DISCOVERY\_REQUEST message is not found in the UE context or there is no UE context in the 5G DDNMF, the 5G DDNMF shall behave as if the discovery entry ID included in the DISCOVERY\_REQUEST message was set to 0, and the 5G DDNMF shall allocate a new non-zero discovery entry ID for this entry.

Then the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <restricted-monitor-response> element with:

a) the transaction ID set to the value of the transaction ID received in the DISCOVERY\_REQUEST message from the UE;

b) one or more restricted discovery filter(s) allocated by the 5G DDNMF(s) for the authorized target RPAUID(s);

c) the ACE enabled indicator set to "application-controlled extension enabled" if application-controlled extension is used, or "normal" if application-controlled extension is not used;

d) the discovery entry ID set to the ID of the discovery entry associated with this monitor request;

e) the application level container set to the application-level data received from the ProSe application server;

f) the coding-receiving security parameter containing the security-related information needed by the UE to undo the protection applied by the announcing UE;

g) the current time set to the current UTC-based time at the 5G DDNMF and the max offset;

h) optionally, the PC5 security policies used for 5G ProSe direct link establishment procedure; and

x) the selected PC5 ciphering algorithm set to the PC5 ciphering algorithm selected by the 5G DDNMF if the received PC5 UE ciphering algorithm capability include the selected PC5 ciphering algorithm associated with the ProSe restricted code corresponding to the restricted discovery filter(s).

If T5067 expires, the 5G DDNMF shall remove the corresponding restricted discovery filter from the discovery entry in the UE's context. Furthermore, if there are no valid restricted discovery filters associated with the discovery entry (e.g., all restricted discovery filters have expired), the 5G DDNMF shall delete the discovery entry from the UE's context.

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

#### 6.2.5.4 Monitor request procedure completion by the UE

Upon receipt of the DISCOVERY\_RESPONSE message, if only the transaction ID and the discovery entry ID are contained in <restricted-monitor-response> element and the transaction ID and the discovery entry ID match the corresponding values sent by the UE in a DISCOVERY\_REQUEST message with the command set to "monitor", the UE shall:

a) stop TTL timer T5066 for each Restricted discovery filter in the discovery entry identified by the discovery entry ID;

b) remove the discovery entry identified by the discovery entry ID; and

c) instruct the lower layers to stop monitoring.

Upon receipt of the DISCOVERY\_RESPONSE message, if the transaction ID contained in the <restricted-monitor-response> element matches the value sent by the UE in a DISCOVERY\_REQUEST message with the command set to "monitor" and, the UE shall process as follow:

a) if the DISCOVERY\_RESPONSE creates a new discovery entry, start the TTL timer T5066 with the received value for each restricted discovery filter information element received in the DISCOVERY\_RESPONSE message; or

b) if the DISCOVERY\_RESPONSE updates an existing discovery entry, the UE shall

1) stop the T5066 timer(s) of any restricted discovery filter in this discovery entry which are no longer authorized by the 5G DDNMF, ask lower layers to stop using those filters in monitoring operation, and remove the corresponding restricted discovery filter from the discovery entry;

2) restart the T5066 timer(s) for those remain eligible; and

3) start the T5066 timer(s) for any new restricted discovery filter(s) included in the DISCOVERY\_RESPONSE message.

Otherwise, the UE shall discard the DISCOVERY\_RESPONSE message and shall not perform the procedures below. The UE shall set a ProSe clock (see 3GPP TS 33.503 [34]) to the value of the received current time parameter and store the received max offset parameter.

The UE shall store the selected PC5 ciphering algorithm received in the DISCOVERY\_RESPONSE message for the received ProSe restricted code and use it for decryption of the restricted 5G ProSe direct discovery messages over the PC5 interface as specified in clause 6.1.3.2.3 of 3GPP TS 33.503 [34].

The UE may perform monitoring for discovery messages received over the PC5 interface as described in clause 6.2.14.2.1.3.

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

#### 6.2.5.5 Monitor request procedure not accepted by the 5G DDNMF

If the DISCOVERY\_REQUEST message is not accepted by the 5G DDNMF, the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element to the UE including an appropriate PC3a control protocol cause value.

If the application corresponding to the application identity contained in the DISCOVERY\_REQUEST message is not authorized for ProSe direct discovery monitoring, the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #1 "Invalid application".

If the RPAUID contained in the DISCOVERY\_REQUEST message is unknown to the ProSe application server, the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #9 "Unknown RPAUID".

If none of the RPAUID(s) contained in the application level container in the DISCOVERY\_REQUEST message is eligible to be discovered by the requesting RPAUID, the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #11 "Invalid discovery target".

If the RPAUID contained in the DISCOVERY\_REQUEST message does not match the stored RPAUID for the requested discovery entry ID, the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #10 "Unknown or invalid discovery entry ID".

If the UE is not authorized for restricted 5G ProSe direct discovery monitoring, the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #3 "UE authorization failure".

If the RPAUID contained in the DISCOVERY\_REQUEST message is not associated with a PDUID belonging to the requesting UE, the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #3 "UE authorization failure".

If the UE is not authorized to use ACE, but the DISCOVERY\_REQUEST message contains the ACE enabled indicator set to "application-controlled extension enabled", the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #12 "UE unauthorized for discovery with application-controlled extension".

If the discovery entry ID contained in the DISCOVERY\_REQUEST message is unknown to the 5G DDNMF and the requested timer is set to 0, the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #10 "Unknown or invalid discovery entry ID".

If the PC5 UE ciphering algorithmcapability contained in DISCOVERY\_REQUEST message is not compatible with the selected PC5 ciphering algorithm for the target ProSe restricted code, the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #19 "Not compatible PC5 UE ciphering algorithm capability".

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

#### 6.2.6.2 Discoveree request procedure initiation

Before initiating the discoveree request procedure, the user sets the permissions for the restricted discovery using application layer mechanisms. The application client in the UE retrieves the PDUID provisioned to the UE as part of the service authorisation procedure as specified in clause 5 and obtains an RPAUID associated with the UE's PDUID from the ProSe application server. The UE can provide metadata to be associated with the RPAUID, and the ProSe application server stores the metadata. This step is performed using mechanisms that are out of scope of the present specification.

If the UE is authorised to perform restricted 5G ProSe direct discovery model B discoveree operation in the PLMN operating the radio resources signalled from the serving PLMN, it shall initiate a discoveree request procedure:

a) when the UE is triggered by an upper layer application to announce an RPAUID in Model B and the UE has no valid corresponding ProSe response code and discovery query filter(s) for that RPAUID of the upper layer application;

b) when the validity timer T5068 assigned by the 5G DDNMF to a ProSe response code and the corresponding discovery query filter(s) has expired and the request from upper layers to announce the RPAUID corresponding to that ProSe response code is still in place;

c) when the UE selects a new PLMN while announcing or waiting for announcing a ProSe response code and intends to announce in the new PLMN, and the UE is authorised for restricted 5G ProSe direct discovery model B discoveree operation in the new PLMN;

d) when, while announcing or waiting for announcing a ProSe response code, the UE intends to switch the announcing PLMN to a different PLMN without performing PLMN selection, and the UE does not have a valid allocated ProSe response code for this new PLMN yet; or

e) when the UE needs to update a previously sent restricted 5G ProSe direct discovery model B discoveree request.

When the UE selects a new PLMN while announcing or waiting for announcing a ProSe response code and the UE is not yet authorised for restricted 5G ProSe direct discovery model B discoveree operation in the new PLMN, the UE shall initiate a discoveree request procedure only after the UE is authorised for restricted 5G ProSe direct discovery model B discoveree operation in the new PLMN.

NOTE 1: To ensure service continuity if the UE needs to keep announcing in Model B a ProSe response code corresponding to the same RPAUID, the UE can initiate the discoveree request procedure before the validity timer T5068 assigned by the 5G DDNMF for a ProSe response code expires.

The UE shall initiate the discoveree request procedure by sending a DISCOVERY\_REQUEST message with:

a) a new transaction ID not used in any other direct discovery procedures in PC3a interface;

b) the RPAUID set to the RPAUID received from upper layers;

c) the command set to "response";

d) the UE identity set to the UE's SUPI;

e) the application identity set to the application identity of the upper layer application that requested the announcing;

f) the discovery type set to "Restricted discovery";

g) the discovery model set to "Model B";

h) the discovery entry ID set to a 0 if the discoveree request is a new request, and set to the discovery entry ID received from the 5G DDNMF if the discoveree request is to update a previously sent discoveree request;

i) optionally the announcing PLMN ID set to the PLMN ID of the local PLMN operating the radio resources that the UE intends to use for announcing the RPAUID; and

x) the PC5 UE ciphering algorithm capability set to the UE supported ciphering algorithm(s) for ciphering the PROSE PC5 DISCOVERY message.

NOTE 2: A UE can include one or multiple transactions in one DISCOVERY\_REQUEST message for different RPAUIDs (e.g., for different applications), and receive corresponding <restricted-discoveree-response> element or <response-reject> element in a DISCOVERY\_RESPONSE message for each respective transaction. In the following description of the discoveree request procedure, only one transaction is included.

Figure 6.2.6.2.1 illustrates the interaction of the UE and the 5G DDNMF in the discoveree request procedure.



Figure 6.2.6.2.1: Discoveree request procedure for restricted 5G ProSe direct discovery model B

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

#### 6.2.6.3 Discoveree request procedure accepted by the 5G DDNMF

Upon receiving a DISCOVERY\_REQUEST message, the 5G DDNMF shall check that the application corresponding to the application identity contained in the DISCOVERY\_REQUEST message is authorised for restricted 5G ProSe direct discovery model B discoveree operation. If the application is authorised for restricted 5G ProSe direct discovery model B discoveree operation, the 5G DDNMF shall check whether there is an existing context for the UE.

If there is no associated UE context, the 5G DDNMF checks with the UDM whether the UE is authorised for restricted 5G ProSe direct discovery model B discoveree operation as described in 3GPP TS 29.503 [10]. If the check indicates that the UE is authorised, the 5G DDNMF creates a UE context that contains the UE's subscription parameters obtained from the UDM. The UDM also provides to the 5G DDNMF the PLMN ID of the PLMN in which the UE is currently registered.

If the UE context exists, the 5G DDNMF shall check whether the UE is authorized for restricted 5G ProSe direct discovery model B discoveree operation in the currently registered PLMN or the local PLMN identified by the Announcing PLMN ID included in the DISCOVERY\_REQUEST message.

If the UE is authorized and the discovery entry ID included in the DISCOVERY\_REQUEST message is set to 0 then:

a) the 5G DDNMF shall check whether the UE is authorised to announce the RPAUID contained in the DISCOVERY\_REQUEST message. Optionally this can include checking with the ProSe application server as described in 3GPP TS 29.557 [19] to obtain the binding between the RPAUID and PDUID, and then verifying that the PDUID belongs to the requesting UE;

b) if the UE is authorised to announce the RPAUID, the 5G DDNMF shall allocate the corresponding ProSe response code and ProSe query code for the RPAUID. It shall also allocate discovery query filter(s) based on the allocated ProSe query code. Then it shall assign a value for validity timer T5068, which is associated with the ProSe response code, ProSe query code and discovery query filter(s); and

c) the 5G DDNMF associates the allocated ProSe response code, ProSe query code, and discovery query filter with a new discovery entry ID in the UE context, and starts timer T5069. For a given ProSe response code, timer T5069 shall be longer than timer T5068. By default, the value of timer T5069 is 4 minutes greater than the value of timer T5068.

If the discovery entry ID included in the DISCOVERY\_REQUEST message is not set to 0 and if there is an existing discovery entry for this discovery entry ID value in the UE context, the 5G DDNMF shall either update the discovery entry with a new validity timer T5068, or allocate a new ProSe response code, ProSe query code and the discovery query filter(s) for the requested RPAUID with a new validity timer T5068, restart timer T5069.

If the discovery entry ID contained in the DISCOVERY\_REQUEST message is not found in the UE context or there is no UE context in the 5G DDNMF, the 5G DDNMF shall behave as if the discovery entry ID included in the DISCOVERY\_REQUEST message was set to 0, and the 5G DDNMF shall allocate a new non-zero discovery entry ID for this entry.

If a new UE context was created or an existing UE context was updated, and the UE is currently roaming or the Announcing PLMN ID is included in the DISCOVERY\_REQUEST message, the 5G DDNMF checks with the 5G DDNMF of the VPLMN or the local PLMN identified by the Announcing PLMN ID whether the UE is authorised for restricted 5G ProSe direct discovery model B discoveree operation as described in 3GPP TS 29.555 [9].

The 5G DDNMF shall then send a DISCOVERY\_RESPONSE message containing a <restricted-discoveree-response> element with:

a) the transaction ID set to the value of the transaction ID received in the DISCOVERY\_REQUEST message from the UE;

b) the ProSe response code set to the ProSe response code allocated for the RPAUID received in the DISCOVERY\_REQUEST message;

c) one or more discovery query filters set to the ProSe query filter(s) used to match a query for the RPAUID received in the DISCOVERY\_REQUEST message;

d) a validity timer T5068 set to the T5068 timer value assigned by the 5G DDNMF to the ProSe response code and the discovery query filter(s);

e) the code-sending security parameter containing the security-related information for the discoveree UE to protect the transmission of the ProSe response code;

f) the code-receiving security parameter containing the security-related information needed by the discoveree UE to undo the protection applied by the discoverer UE;

g) the discovery entry ID set to the ID of the discovery entry associated with this discoveree request in the UE context;

h) the current time set to the current UTC-based time at the 5G DDNMF and the max offset;

i) optionally, the PC5 security policies used for 5G ProSe direct link establishment procedure; and

x) the selected PC5 ciphering algorithm set to the PC5 ciphering algorithm selected by the 5G DDNMF if the received PC5 UE ciphering algorithm capability include the selected PC5 ciphering algorithm associated with the ProSe response code corresponding to the discovery query filters.

If timer T5069 expires, the 5G DDNMF shall remove the discovery entry associated with the corresponding RPAUID from the UE's context.

The 5G DDNMF may associate the ProSe response code with the PC5 security policies.

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

#### 6.2.6.4 Discoveree request procedure completion by the UE

Upon receipt of the DISCOVERY\_RESPONSE message, if the transaction ID contained in the <restricted-discoveree-response> element matches the value sent by the UE in a DISCOVERY\_REQUEST message with the command set to "response", the UE shall create a new discovery entry or update an existing discovery entry with the ProSe response code and discovery query filter(s) received in the DISCOVERY\_RESPONSE message and the PLMN ID of the intended announcing PLMN. For this discovery entry, the UE shall stop the validity timer T5068 if running and start the validity timer T5068 with the received value. The UE shall also use the received ProSe response code and discovery query filter(s) to replace the old counterparts if they are currently used. This may involve notifying the lower layers to stop announcing the old ProSe response code or to stop monitoring with the old discovery query filter(s). Otherwise, the UE shall discard the DISCOVERY\_RESPONSE message and shall not perform the procedures described in clause 6.2.14.2.2.3. The UE shall set a ProSe clock (see 3GPP TS 33.503 [34]) to the value of the received current time parameter and store the received max offset parameter.

The UE shall store the selected PC5 ciphering algorithm received in the DISCOVERY\_RESPONSE message for the ProSe response code and the ProSe query code, and the UE shall use it for protection of the restricted 5G ProSe direct discovery messages over the PC5 interface as specified in clause 6.1.3.2.3 of 3GPP TS 33.503 [34].

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

#### 6.2.6.5 Discoveree request procedure not accepted by the 5G DDNMF

If the DISCOVERY\_REQUEST message cannot be accepted by the 5G DDNMF, the 5G DDNMF sends a DISCOVERY\_RESPONSE message containing a <response-reject> element to the UE including an appropriate PC3a control protocol cause value.

If the application corresponding to the application identity contained in the DISCOVERY\_REQUEST message is not authorised for ProSe direct discovery Model B discoveree operation, the 5G DDNMF shall send the DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #1 "Invalid application".

If the RPAUID contained in the DISCOVERY\_REQUEST message is unknown to the 5G DDNMF or ProSe application server, the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #9 "Unknown RPAUID".

If the RPAUID contained in the DISCOVERY\_REQUEST message does not match the stored RPAUID for the requested discovery entry ID, the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #10 "Unknown or invalid discovery entry ID".

If the UE is not authorised for restricted 5G ProSe direct discovery model B discoveree operation, the 5G DDNMF shall send the DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #3 "UE authorisation failure".

If the RPAUID contained in the DISCOVERY\_REQUEST message is not associated with a PDUID belonging to the requesting UE, the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #3 "UE authorisation failure".

If the PC5 UE ciphering algorithm capability contained in DISCOVERY\_REQUEST message is not compatible with the selected PC5 ciphering algorithm for the ProSe response code and the ProSe query code, the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #19 "Not compatible PC5 UE security capability".

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

#### 6.2.7.2 Discoverer request procedure initiation

Before initiating the discoverer request procedure, the user sets the permissions for the restricted discovery using application layer mechanisms. The application client in the UE retrieves the PDUID provisioned to the UE as part of the service authorisation procedure as specified in clause 5 and obtains an RPAUID associated with the UE's PDUID from the ProSe application server. The UE can also obtain the target RPAUID(s) from the ProSe application server. This step is performed using mechanisms that are out of scope of the present specification.

If the UE is authorised to perform restricted 5G ProSe direct discovery model B discoverer operation in the PLMN operating the radio resources signalled from the serving PLMN, it shall initiate a discoverer request procedure:

a) when the UE is triggered by an upper layer application to perform the query for one or more target RPAUIDs in Model B and the UE has no valid corresponding ProSe query code and Discovery Response Filter for those target RPAUIDs of the upper layer application;

b) when the validity timer T5070 assigned by the 5G DDNMF to a ProSe query codes and the corresponding Discovery Response Filter has expired and the request from upper layers to announce the RPAUID corresponding to that ProSe response code is still in place;

c) when the UE selects a new PLMN while announcing a ProSe query code or waiting for a ProSe response code and intends to announce the ProSe query code in the new PLMN, and the UE is authorised for restricted 5G ProSe direct discovery model B discoverer operation in the new PLMN;

d) when, while querying for target RPAUID(s), the UE intends to switch the announcing PLMN to a different PLMN without performing PLMN selection, and the UE does not have a valid allocated ProSe query code for this new PLMN yet; or

e) when the UE needs to update a previously sent restricted 5G ProSe direct discovery model B discoverer request.

When the UE selects a new PLMN while announcing a ProSe query code or waiting for a ProSe response code and the UE is not yet authorised for restricted 5G ProSe direct discovery model B discoverer operation in the new PLMN, the UE shall initiate a discoverer request procedure only after the UE is authorised for restricted 5G ProSe direct discovery model B discoverer operation in the new PLMN.

NOTE 1: To ensure service continuity if the UE needs to keep announcing in Model B a ProSe query code corresponding to the same RPAUID, the UE can initiate the discoverer request procedure before the validity timer T5070 assigned by the 5G DDNMF for a ProSe query code expires.

The UE shall initiate the discoverer request procedure by sending a DISCOVERY\_REQUEST message with:

a) a new transaction ID not used in any other direct discovery procedures in PC3a interface;

b) the RPAUID set to the RPAUID received from upper layers;

c) the application level container set to contain the application-layer information, e.g., target RPAUID(s) to discover;

d) the command set to "query";

e) the UE identity set to the UE's SUPI;

f) the application identity set to the application identity of the upper layer application that requested the announcing;

g) the discovery type set to "Restricted discovery";

h) the discovery model set to "Model B";

i) the discovery entry ID set to a 0 if the discoverer request is a new request, and set to the discovery entry ID received from the 5G DDNMF if the discoverer request is to update a previously sent discoverer request;

j) optionally the Announcing PLMN ID set to the PLMN ID of the local PLMN operating the radio resources that the UE intends to use for transmitting the query for the target RPAUID(s); and

x) the PC5 UE ciphering algorithm capability set to the UE supported ciphering algorithm(s) for ciphering the PROSE PC5 DISCOVERY message.

NOTE 2: A UE can include one or multiple transactions in one DISCOVERY\_REQUEST message for different discovering requests (e.g., for different applications), and receive corresponding <restricted-discoverer-response> element or <response-reject> element in a DISCOVERY\_RESPONSE message for each respective transaction. In the following description of the discoverer request procedure, only one transaction is included.

Figure 6.2.7.2.1 illustrates the interaction of the UE and the 5G DDNMF in the discoverer request procedure.



Figure 6.2.7.2.1: Discoverer request procedure for restricted 5G ProSe direct discovery model B

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

#### 6.2.7.3 Discoverer request procedure accepted by the 5G DDNMF

Upon receiving a DISCOVERY\_REQUEST message, the 5G DDNMF shall check that the application corresponding to the application identity contained in the DISCOVERY\_REQUEST message is authorised for restricted 5G ProSe direct discovery model B discoverer operation. If the application is authorised for restricted 5G ProSe direct discovery model B discoverer operation, the 5G DDNMF shall check whether there is an existing context for the UE.

If there is no associated UE context, the 5G DDNMF checks with the UDM whether the UE is authorised for restricted 5G ProSe direct discovery model B discoverer operation as described in 3GPP TS 29.503 [10]. If the check indicates that the UE is authorised, the 5G DDNMF creates a UE context that contains the UE's subscription parameters obtained from the UDM. The UDM also provides to the 5G DDNMF the PLMN ID of the PLMN in which the UE is currently registered.

If the UE context exists, the 5G DDNMF shall check whether the UE is authorized for restricted 5G ProSe direct discovery model B discoveree operation in the currently registered PLMN or the local PLMN identified by the Announcing PLMN ID included in the DISCOVERY\_REQUEST message.

If the UE is authorized and the discovery entry ID included in the DISCOVERY\_REQUEST message is set to 0 then:

a) the 5G DDNMF uses the procedure described in 3GPP TS 29.557 [19] to pass the application level container included in the DISCOVERY\_REQUEST message to the ProSe application server and obtain a list of PDUID(s) corresponding to the authorised target RPAUID(s) from the ProSe application server;

b) for each of the PDUIDs corresponding to an authorised target RPAUID:

1) if the PLMN ID of the PDUID is not the same as that of the PLMN to which the 5G DDNMF belongs, then the 5G DDNMF executes the procedures defined in 3GPP TS 29.555 [9] to obtain the ProSe query code, the ProSe response code, the associated validity timer T5070, and optionally metadata associated with this target RPAUID. Otherwise, the 5G DDNMF shall locate the discoveree UE context and retrieve the corresponding ProSe query code and ProSe response code and the validity timer T5070, and optionally metadata associated with this RPAUID. Then, the 5G DDNMF in the HPLMN builds one or more discovery response filter(s) based on the respective ProSe response code, and associate the discovery response filter(s) and ProSe query code with a new validity timer T5071 based on the remaining value of T5071.

NOTE 1: If the 5G DDNMF cannot retrieve the corresponding discoveree UE context for a target RPAUID, e.g., the target RPAUID has not yet been requested to be discovered by Model B in a discoveree request procedure, or the discoveree UE context expires, the 5G DDNMF can skip the processing of this target RPAUID.

NOTE 2: The 5G DDNMF can choose the value of T5070 to be longer than the remaining value of T5069, so that the discoverer UE sends a new discoverer request for renewing the query-related information no earlier than the discoveree UE renewing its own ProSe response code with the 5G DDNMF.

2) the 5G DDNMF associates the ProSe query code and corresponding discovery response filter(s), target RPAUID, and optionally metadata associated with the target RPAUID with a new discovery entry in the discoverer UE's context; and

c) the 5G DDNMF starts timer T5071 assigned for each ProSe query code and discovery response filter(s) (of each target RPAUID) under this discovery entry of the discoverer UE context. For a given ProSe query code and the corresponding discovery response filter(s), timer T5071 shall be longer than timer T5070. By default, the value of timer T5071 is 4 minutes greater than the value of timer T5070.

If the discovery entry ID included in the DISCOVERY\_REQUEST message is not set to 0 and if there is an existing discovery entry for this discovery entry ID value in the UE's context, the 5G DDNMF shall still process the above steps, but update the discovery entry instead of creating a new discovery entry.

If the discovery entry ID contained in the DISCOVERY\_REQUEST message is not found in the UE context or there is no UE context in the 5G DDNMF, the 5G DDNMF shall behave as if the discovery entry ID included in the DISCOVERY\_REQUEST message was set to 0, and the 5G DDNMF shall allocate a new non-zero discovery entry ID for this entry.

If a new UE context was created or an existing UE context was updated, the UE is currently roaming or the announcing PLMN ID is included in the DISCOVERY\_REQUEST message, the 5G DDNMF checks with the 5G DDNMF of the VPLMN or the local PLMN indicated by the announcing PLMN ID whether the UE is authorised for restricted 5G ProSe direct discovery model B discoverer operation as described in 3GPP TS 29.555 [9].

The 5G DDNMF shall then send a DISCOVERY\_RESPONSE message containing a <restricted-discoverer-response> element with:

a) the transaction ID set to the value of the transaction ID received in the DISCOVERY\_REQUEST message from the UE;

b) one or more Subquery Result information elements, each of which includes:

1) a target RPAUID;

2) the ProSe query code set to the ProSe query code for the target RPAUID;

3) one or more discovery response filters which are set to the discovery response filter(s) used to match a potential ProSe response code responding to the ProSe query code;

4) a validity timer T5070 set to the T5070 timer value assigned by the 5G DDNMF to the ProSe query code and the discovery response filter(s);

5) optionally, the metadata associated with the target RPAUID;

6) the code-sending security parameter containing the security-related information needed by the discoverer UE to protect the transmission of ProSe query code; and

7) the code-receiving security parameter containing the security-related information needed by the discoverer UE to undo the protection applied by the discoveree UE;

c) the discovery entry ID set to the ID of the discovery entry associated with this announce request in the UE context;

d) the current time set to the current UTC-based time at the 5G DDNMF and the max offset;

e) optionally, the PC5 security policies used for 5G ProSe direct link establishment procedure; and

x) the selected PC5 ciphering algorithm set to the PC5 ciphering algorithm selected by the 5G DDNMF if the received PC5 UE ciphering algorithm capability include the selected PC5 ciphering algorithm associated with the ProSe response code corresponding to the discovery response filters.

If T5071 expires, the 5G DDNMF shall remove the corresponding ProSe query code and ProSe response filter(s) from the discovery entry associated with the discoverer UE's context.

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

#### 6.2.7.4 Discoverer request procedure completion by the UE

Upon receipt of the DISCOVERY\_RESPONSE message, if the transaction ID contained in the <restricted-discoverer-response> element matches the value sent by the UE in a DISCOVERY\_REQUEST message with the command set to "query" and the discovery model set to "Model B", the UE shall, process as follow:

a) If the DISCOVERY\_RESPONSE creates a new discovery entry, start the validity timer T5070 with the received value for the ProSe query code and the corresponding Discovery Response Filter(s) included for each SubQuery-Result information element received in the DISCOVERY\_RESPONSE message and the PLMN ID of the intended announcing PLMN if included in the DISCOVERY\_REQUEST message;

b) If the DISCOVERY\_RESPONSE updates an existing discovery entry, the UE shall:

1) stop the timer T5070 of any ProSe query code(s) and discovery response filter(s) in this discovery entry which are no longer authorized by the 5G DDNMF, ask lower layers to stop announcing the ProSe query code(s) and monitoring ProSe response filter(s), and remove the ProSe query code(s) and discovery response filter(s) from the existing discovery entry;

2) restart the T5070 timer(s) for those remain eligible;

3) start the T5070 timer(s) for any new ProSe query codes and their corresponding discovery response filter(s); and

4) update the PLMN ID of the intended announcing PLMN for this discovery entry if included in the DISCOVERY\_REQUEST message.

Otherwise, the UE shall discard the DISCOVERY\_RESPONSE message and shall not perform the discoverer UE procedure for 5G ProSe direct discovery as described in clause 6.2.14.2.2.2. The UE shall set a ProSe clock (see 3GPP TS 33.503 [34]) to the value of the received current time parameter and store the received max offset parameter.

The UE shall store the selected PC5 ciphering algorithm received in the DISCOVERY\_RESPONSE message and use it for protection of the restricted 5G ProSe direct discovery messages over the PC5 interface as specified in clause 6.1.3.2.3 of 3GPP TS 33.503 [34].

For each ProSe query code in this discovery entry, the UE performs the discoverer UE procedure for 5G ProSe direct discovery to announce the ProSe query code in the PC5 interface, as described in clause 6.2.14.2.2.2.

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

#### 6.2.7.5 Discoverer request procedure not accepted by the 5G DDNMF

If the DISCOVERY\_REQUEST message cannot be accepted by the 5G DDNMF, the 5G DDNMF sends a DISCOVERY\_RESPONSE message containing a <response-reject> element to the UE including an appropriate PC3a control protocol cause value.

If the application corresponding to the application identity contained in the DISCOVERY\_REQUEST message is not authorised for restricted 5G ProSe direct discovery Model B discoverer operation, the 5G DDNMF shall send the DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #1 "Invalid application".

If the RPAUID contained in the DISCOVERY\_REQUEST message is unknown to the 5G DDNMF or ProSe application server, the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #9 "Unknown RPAUID".

If the RPAUID contained in the DISCOVERY\_REQUEST message does not match the stored RPAUID for the requested discovery entry ID, the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #10 "Unknown or invalid discovery entry ID".

If the UE is not authorised for restricted 5G ProSe direct discovery model B discoverer operation, the 5G DDNMF shall send the DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #3 "UE authorisation failure".

If the RPAUID contained in the DISCOVERY\_REQUEST message is not associated with a PDUID belonging to the requesting UE, the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #3 "UE authorisation failure".

If the 5G DDNMF fails to retrieve any valid target PDUIDs from ProSe application server based on the application level container contained in the DISCOVERY\_REQUEST message, the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #11 "Invalid discovery target".

If the 5G DDNMF fails to retrieve any valid discoveree UE contexts for the valid target RPAUIDs contained in the application level container contained in the DISCOVERY\_REQUEST message, the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #11 "Invalid discovery target".

If the PC5 UE ciphering algorithm capability contained in DISCOVERY\_REQUEST message is not compatible with the selected PC5 ciphering algorithm for the ProSe response code and the ProSe query code, the 5G DDNMF shall send a DISCOVERY\_RESPONSE message containing a <response-reject> element with PC3a control protocol cause value #19 "Not compatible PC5 UE security capability".

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

### 10.5.3 XML schema

Implementations in compliance with the present document shall implement the XML schema defined below for messages used in 5G ProSe direct discovery procedures over PC3a interface.

<?xml version="1.0" encoding="UTF-8"?>

<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"

 xmlns="urn:3GPP:ns:5GProSe:Discovery:2021"

 elementFormDefault="qualified"

 targetNamespace="urn:3GPP:ns:5GProSe:Discovery:2021">

 <xs:annotation>

 <xs:documentation>

 Info for 5G ProSe Discovery Control Messages Syntax

 </xs:documentation>

 </xs:annotation>

 <!-- Complex types defined for parameters with complicated structure -->

 <xs:complexType name="AppID-info">

 <xs:sequence>

 <xs:element name="OS-ID">

 <xs:simpleType>

 <xs:restriction base="xs:hexBinary">

 <xs:length value="16"/>

 </xs:restriction>

 </xs:simpleType>

 </xs:element>

 <xs:element name="OS-App-ID" type="xs:string"/>

 <xs:any namespace="##any" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="PLMN-info">

 <xs:sequence>

 <xs:element name="mcc" type="xs:integer"/>

 <xs:element name="mnc" type="xs:integer"/>

 <xs:any namespace="##any" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="SUPI-info">

 <xs:sequence>

 <xs:element name="MCC" type="xs:integer"/>

 <xs:element name="MNC" type="xs:integer"/>

 <xs:element name="MSIN" type="xs:integer"/>

 <xs:any namespace="##any" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="DiscFilter-info">

 <xs:sequence>

 <xs:element name="ProSe-Application-Code" type="xs:hexBinary"/>

 <xs:element name="ProSe-Application-Mask" type="xs:hexBinary" maxOccurs="unbounded"/>

 <xs:element name="TTL-timer-T5064" type="xs:integer"/>

 <xs:any namespace="##any" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

<xs:complexType name="MatchingFilter-info">

 <xs:sequence>

 <xs:element name="Code" type="xs:hexBinary"/>

 <xs:element name="Mask" type="xs:hexBinary" maxOccurs="unbounded"/>

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

<xs:complexType name="DUCK-info">

 <xs:sequence>

 <xs:element name="discovery-user-confidentiality-key" type="xs:hexBinary"/>

 <xs:element name="encrypted-bitmask" type="xs:hexBinary"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

</xs:complexType>

 <xs:complexType name="RestrictedDiscFilter-info">

 <xs:sequence>

 <xs:element name="filter" type="MatchingFilter-info" maxOccurs="unbounded"/>

 <xs:element name="TTL-timer-T5066" type="xs:integer"/>

 <xs:element name="RPAUID" type="xs:string" minOccurs="0" />

 <xs:element name="metadata-indicator" type="xs:integer" minOccurs="0"/>

 <xs:element name="metadata" type="xs:string" minOccurs="0"/>

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

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 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="RestrictedCodeSuffixRange-info">

 <xs:sequence>

 <xs:element name="beginning-suffix-code" type="xs:hexBinary" />

 <xs:element name="ending-suffix-code" type="xs:hexBinary" minOccurs="0"/>

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

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 <xs:anyAttribute namespace="##any" processContents="lax"/>

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 <xs:complexType name="RestrictedMonitoringUpdate-info">

 <xs:sequence>

 <xs:element name="updated-filter" type="RestrictedDiscFilter-info" maxOccurs="unbounded"/>

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="RestrictedAnnouncingUpdate-info">

 <xs:sequence>

 <xs:element name="ProSe-Restricted-Code" type="xs:hexBinary" />

 <xs:element name="validity-timer-T5062" type="xs:integer" />

 <xs:any namespace="##any" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="MonitoringUpdate-info">

 <xs:sequence>

 <xs:element name="updated-filter" type="DiscFilter-info" maxOccurs="unbounded"/>

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

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 <xs:complexType name="AnnouncingUpdate-info">

 <xs:sequence>

 <xs:element name="ProSe-Application-Code" type="xs:hexBinary" />

 <xs:element name="validity-timer-T5060" type="xs:integer" />

 <xs:any namespace="##any" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="Update-Option-info">

 <xs:choice>

 <xs:element name="update-info-restricted-announce" type="RestrictedAnnouncingUpdate-info" />

 <xs:element name="update-info-restricted-monitor" type="RestrictedMonitoringUpdate-info" />

 <xs:element name="update-info-open-annnounce" type="AnnouncingUpdate-info" />

 <xs:element name="update-info-open-monitor" type="MonitoringUpdate-info"/>

 <xs:element name="anyExt" type="anyExtType" />

 <xs:any namespace="##other" processContents="lax"/>

 </xs:choice>

 </xs:complexType>

 <xs:complexType name="Restricted-Code-Option-info">

 <xs:choice>

 <xs:element name="ProSe-Restricted-Code" type="xs:hexBinary" />

 <xs:element name="ProSe-Response-Code" type="xs:hexBinary" />

 <xs:element name="anyExt" type="anyExtType" />

 <xs:any namespace="##other" processContents="lax"/>

 </xs:choice>

 </xs:complexType>

 <xs:complexType name="Subquery-info">

 <xs:sequence>

 <xs:element name="ProSe-Rquery-Code" type="xs:hexBinary" />

 <xs:element name="response-filter" type="MatchingFilter-info" maxOccurs="unbounded"/>

 <xs:element name="validity-timer-T5070" type="xs:integer"/>

 <xs:element name="code-sending-security-parameter" type="Restricted-Security-info" />

 <xs:element name="code-receiving-security-parameter" type="Restricted-Security-info" minOccurs="0" />

 <xs:element name="RPAUID" type="xs:string" minOccurs="0" />

 <xs:element name="metadata" type="xs:string" minOccurs="0"/>

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="Restricted-Security-info">

 <xs:sequence>

 <xs:element name="DUSK" type="xs:hexBinary" minOccurs="0" />

 <xs:element name="DUIK" type="xs:hexBinary" minOccurs="0" />

 <xs:element name="DUCK" type="DUCK-info" minOccurs="0" />

 <xs:element name="MIC-check-indicator" type="xs:boolean" minOccurs="0" />

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

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 <xs:complexType name="ApplicationCodeSuffixRange-info">

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 <xs:element name="ending-suffix-code" type="xs:hexBinary" minOccurs="0"/>

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

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 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

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 <xs:complexType name="ProSeApplicationCodeACE-info">

 <xs:sequence>

 <xs:element name=" ProSe-Application-Code-Prefix" type="xs:hexBinary" />

 <xs:element name=" ProSe-Application-Code-Suffix-Range" type="ApplicationCodeSuffixRange-info" maxOccurs="unbounded" />

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

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 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="PC5-Security-Policies-info">

 <xs:sequence>

 <xs:element name="signalling-integrity-protection-policy" type="xs:integer"/>

 <xs:element name="signalling-ciphering-policy" type="xs:integer"/>

 <xs:element name="user-plane-integrity-protection-policy" type="xs:integer"/>

 <xs:element name="user-plane-ciphering-policy" type="xs:integer"/>

 <xs:any namespace="##any" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

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 </xs:complexType>

 <!-- Complex types defined for transaction-level -->

 <xs:complexType name="AnnounceRsp-info">

 <xs:sequence>

 <xs:element name="transaction-ID" type="xs:integer"/>

 <xs:element name="ProSe-Application-Code" type="xs:hexBinary" minOccurs="0" maxOccurs="unbounded"/>

 <xs:element name="ProSe-Application-Code-ACE" type="ProSeApplicationCodeACE-info" minOccurs="0"/>

 <xs:element name="validity-timer-T5060" type="xs:integer" minOccurs="0" />

 <xs:element name="discovery-key" type="xs:hexBinary" minOccurs="0" />

 <xs:element name="discovery-entry-ID" type="xs:integer" minOccurs="0" />

 <xs:element name="ACE-enabled-indicator" type="xs:integer" minOccurs="0"/>

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="MonitorRsp-info">

 <xs:sequence>

 <xs:element name="transaction-ID" type="xs:integer"/>

 <xs:element name="discovery-filter" type="DiscFilter-info" minOccurs="0" maxOccurs="unbounded"/>

 <xs:element name="discovery-entry-ID" type="xs:integer" minOccurs="0" />

 <xs:element name="ACE-enabled-indicator" type="xs:integer" minOccurs="0"/>

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="DiscReq-info">

 <xs:sequence>

 <xs:element name="transaction-ID" type="xs:integer"/>

 <xs:element name="command" type="xs:integer"/>

 <xs:element name="UE-identity" type="SUPI-info"/>

 <xs:element name="ProSe-Application-ID" type="xs:string"/>

 <xs:element name="application-identity" type="AppID-info"/>

 <xs:element name="discovery-entry-ID" type="xs:integer" minOccurs="0" />

 <xs:element name="Requested-Timer" type="xs:integer" minOccurs="0" />

 <xs:element name="metadata" type="xs:string" minOccurs="0"/>

 <xs:element name="Announcing-PLMN-ID" type="PLMN-info" minOccurs="0" />

 <xs:element name="ACE-enabled-indicator" type="xs:integer" minOccurs="0"/>

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="RestrictedDiscReq-info">

 <xs:sequence>

 <xs:element name="transaction-ID" type="xs:integer"/>

 <xs:element name="command" type="xs:integer"/>

 <xs:element name="UE-identity" type="SUPI-info"/>

 <xs:element name="RPAUID" type="xs:string"/>

 <xs:element name="application-identity" type="AppID-info"/>

 <xs:element name="discovery-type" type="xs:integer"/>

 <xs:element name="UE-PC5-ciphering-algorithms" type="xs:integer"/>

 <xs:element name="ACE-enabled-indicator" type="xs:integer" minOccurs="0"/>

 <xs:element name="announcing-type" type="xs:integer" minOccurs="0"/>

 <xs:element name="application-level-container" type="xs:hexBinary" minOccurs="0"/>

 <xs:element name="discovery-model" type="xs:integer" minOccurs="0"/>

 <xs:element name="Announcing-PLMN-ID" type="PLMN-info" minOccurs="0" />

 <xs:element name="discovery-entry-ID" type="xs:integer"/>

 <xs:element name="Requested-Timer" type="xs:integer" minOccurs="0" />

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="RestrictedAnnounceRsp-info">

 <xs:sequence>

 <xs:element name="transaction-ID" type="xs:integer"/>

 <xs:element name="ProSe-Restricted-Code" type="xs:hexBinary" minOccurs="0"/>

 <xs:element name="ProSe-Restricted-Code-Suffix-Range" type="RestrictedCodeSuffixRange-info" minOccurs="0"/>

 <xs:element name="validity-timer-T5062" type="xs:integer" minOccurs="0"/>

 <xs:element name="ACE-enabled-indicator" type="xs:integer" minOccurs="0" />

 <xs:element name="code-sending-security-parameter" type="Restricted-Security-info" />

 <xs:element name="selected-PC5-ciphering-algorithm" type="xs:integer"/>

 <xs:element name="on-demand-announcing-enabled-indicator" type="xs:boolean" minOccurs="0" />

 <xs:element name="discovery-entry-ID" type="xs:integer"/>

 <xs:element name="PC5-security-policies" type="xs:PC5-Security-Policies-info" minOccurs="0" />

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

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 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="RestrictedMonitorRsp-info">

 <xs:sequence>

 <xs:element name="transaction-ID" type="xs:integer"/>

 <xs:element name="restricted-discovery-filter" type="RestrictedDiscFilter-info" minOccurs="0" maxOccurs="unbounded"/>

 <xs:element name="ACE-enabled-indicator" type="xs:integer" minOccurs="0" />

 <xs:element name="application-level-container" type="xs:hexBinary"/>

 <xs:element name="code-receiving-security-parameter" type="Restricted-Security-info" minOccurs="0" />

 <xs:element name="selected-PC5-ciphering-algorithm" type="xs:integer"/>

 <xs:element name="discovery-entry-ID" type="xs:integer"/>

 <xs:element name="PC5-security-policies" type="xs:PC5-Security-Policies-info" minOccurs="0" />

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="RestrictedDiscovereeRsp-info">

 <xs:sequence>

 <xs:element name="transaction-ID" type="xs:integer"/>

 <xs:element name="ProSe-Response-Code" type="xs:hexBinary" />

 <xs:element name="query-filter" type="MatchingFilter-info" maxOccurs="unbounded"/>

 <xs:element name="validity-timer-T5068" type="xs:integer"/>

 <xs:element name="code-sending-security-parameter" type="Restricted-Security-info" />

 <xs:element name="code-receiving-security-parameter" type="Restricted-Security-info" minOccurs="0" />

 <xs:element name="selected-PC5-ciphering-algorithm" type="xs:integer"/>

 <xs:element name="discovery-entry-ID" type="xs:integer"/>

 <xs:element name="PC5-security-policies" type="xs:PC5-Security-Policies-info" minOccurs="0" />

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="RestrictedDiscovererRsp-info">

 <xs:sequence>

 <xs:element name="transaction-ID" type="xs:integer"/>

 <xs:element name="subquery-result" type="Subquery-info" minOccurs="1" maxOccurs="unbounded"/>

 <xs:element name="selected-PC5-ciphering-algorithm" type="xs:integer"/>

 <xs:element name="discovery-entry-ID" type="xs:integer"/>

 <xs:element name="PC5-security-policies" type="xs:PC5-Security-Policies-info" minOccurs="0" />

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

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 </xs:complexType>

 <xs:complexType name="RejectRsp-info">

 <xs:sequence>

 <xs:element name="transaction-ID" type="xs:integer"/>

 <xs:element name="PC3a-control-protocol-cause-value" type="xs:integer"/>

 <xs:any namespace="##any" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="UE-RejectRsp-info">

 <xs:sequence>

 <xs:element name="DDNMF-transaction-ID" type="xs:integer"/>

 <xs:element name="PC3a-control-protocol-cause-value" type="xs:integer"/>

 <xs:any namespace="##any" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="MatchRep-info">

 <xs:sequence>

 <xs:element name="transaction-ID" type="xs:integer"/>

 <xs:element name="ProSe-Application-Code" type="xs:hexBinary"/>

 <xs:element name="UE-identity" type="SUPI-info"/>

 <xs:element name="Monitored-PLMN-ID" type="PLMN-info"/>

 <xs:element name="VPLMN-ID" type="PLMN-info" minOccurs="0"/>

 <xs:element name="MIC" type="xs:hexBinary"/>

 <xs:element name="UTC-based-counter" type="xs:hexBinary"/>

 <xs:element name="Metadata-flag" type="xs:boolean"/>

 <xs:element name="MessageType" type="xs:hexBinary" minOccurs="0"/>

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="RestrictedMatch-info">

 <xs:sequence>

 <xs:element name="transaction-ID" type="xs:integer"/>

 <xs:element name="UE-identity" type="SUPI-info"/>

 <xs:element name="discovery-type" type="xs:integer"/>

 <xs:element name="application-identity" type="AppID-info"/>

 <xs:element name="RPAUID" type="xs:string"/>

 <xs:element name="Restricted-Code-Discovered" type="Restricted-Code-Option-info" />

 <xs:element name="MIC" type="xs:hexBinary" minOccurs="0"/>

 <xs:element name="MessageType" type="xs:hexBinary" minOccurs="0"/>

 <xs:element name="UTC-based-counter" type="xs:hexBinary" minOccurs="0"/>

 <xs:element name="Metadata-flag" type="xs:boolean" />

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="MatchAck-info">

 <xs:sequence>

 <xs:element name="transaction-ID" type="xs:integer"/>

 <xs:element name="ProSe-Application-ID" type="xs:string"/>

 <xs:element name="validity-timer-T5072" type="xs:integer"/>

 <xs:element name="metadata" type="xs:string" minOccurs="0"/>

 <xs:element name="metadata-index-mask" type="xs:hexBinary" minOccurs="0"/>

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:attribute name="match-report-refresh-timer-T5074" type="xs:integer"/>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="RestrictedMatchAck-info">

 <xs:sequence>

 <xs:element name="transaction-ID" type="xs:integer"/>

 <xs:element name="application-identity" type="AppID-info"/>

 <xs:element name="RPAUID" type="xs:string"/>

 <xs:element name="validity-timer-T5076" type="xs:integer"/>

 <xs:element name="metadata" type="xs:string" minOccurs="0"/>

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:attribute name="match-report-refresh-timer-T5077" type="xs:integer"/>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="MatchReject-info">

 <xs:sequence>

 <xs:element name="transaction-ID" type="xs:integer"/>

 <xs:element name="PC3a-control-protocol-cause-value" type="xs:integer"/>

 <xs:any namespace="##any" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="DiscUpdateReq-info">

 <xs:sequence>

 <xs:element name="DDNMF-transaction-ID" type="xs:integer"/>

 <xs:element name="UE-identity" type="SUPI-info"/>

 <xs:element name="discovery-entry-ID" type="xs:integer"/>

 <xs:element name="update-info" type="Update-Option-info" minOccurs="0"/>

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="DiscUpdateRsp-info">

 <xs:sequence>

 <xs:element name="DDNMF-transaction-ID" type="xs:integer"/>

 <xs:element name="discovery-entry-ID" type="xs:integer"/>

 <xs:any namespace="##any" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="AnnouncingAlertReq-info">

 <xs:sequence>

 <xs:element name="DDNMF-transaction-ID" type="xs:integer"/>

 <xs:element name="RPAUID" type="xs:string"/>

 <xs:element name="UE-identity" type="SUPI-info"/>

 <xs:element name="discovery-entry-ID" type="xs:integer"/>

 <xs:element name="ProSe-Restricted-Code" type="xs:hexBinary"/>

 <xs:element name="ProSe-Restricted-Code-Suffix-Range" type="RestrictedCodeSuffixRange-info" minOccurs="0" maxOccurs="unbounded"/>

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="AnnouncingAlertRsp-info">

 <xs:sequence>

 <xs:element name="DDNMF-transaction-ID" type="xs:integer"/>

 <xs:any namespace="##any" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <!-- Complex types defined for Message-level -->

 <xs:complexType name="prose-direct-discovery-request">

 <xs:sequence>

 <xs:element name="discovery-request" type="DiscReq-info" minOccurs="0" maxOccurs="unbounded"/>

 <xs:element name="restricted-discovery-request" type="RestrictedDiscReq-info" minOccurs="0" maxOccurs="unbounded"/>

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:attribute name="network-initiated-transaction-method" type="xs:integer"/>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="prose-direct-discovery-response">

 <xs:sequence>

 <xs:element name="Current-Time" type="xs:dateTime"/>

 <xs:element name="Max-Offset" type="xs:integer"/>

 <xs:element name="response-announce" type="AnnounceRsp-info" minOccurs="0" maxOccurs="unbounded"/>

 <xs:element name="response-monitor" type="MonitorRsp-info" minOccurs="0" maxOccurs="unbounded"/>

 <xs:element name="restricted-announce-response" type="RestrictedAnnounceRsp-info" minOccurs="0" maxOccurs="unbounded"/>

 <xs:element name="restricted-monitor-response" type="RestrictedMonitorRsp-info" minOccurs="0" maxOccurs="unbounded"/>

 <xs:element name="restricted-discoveree-response" type="RestrictedDiscovereeRsp-info" minOccurs="0" maxOccurs="unbounded"/>

 <xs:element name="restricted-discoverer-response" type="RestrictedDiscovererRsp-info" minOccurs="0" maxOccurs="unbounded"/>

 <xs:element name="response-reject" type="RejectRsp-info" minOccurs="0" maxOccurs="unbounded"/>

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:attribute name="network-initiated-transaction-method" type="xs:integer"/>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="prose-direct-discovery-update-request">

 <xs:sequence>

 <xs:element name="discovery-update-request" type="DiscUpdateReq-info" maxOccurs="unbounded"/>

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="prose-direct-discovery-update-response">

 <xs:sequence>

 <xs:element name="response-update" type="DiscUpdateRsp-info" minOccurs="0" maxOccurs="unbounded"/>

 <xs:element name="response-reject" type="UE-RejectRsp-info" minOccurs="0" maxOccurs="unbounded"/>

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="prose-direct-discovery-match-report">

 <xs:sequence>

 <xs:element name="match-report" type="MatchRep-info" minOccurs="0" maxOccurs="unbounded"/>

 <xs:element name="restricted-match" type="RestrictedMatch-info" minOccurs="0" maxOccurs="unbounded"/>

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="prose-direct-discovery-match-report-ack">

 <xs:sequence>

 <xs:element name="Current-Time" type="xs:dateTime"/>

 <xs:element name="match-ack" type="MatchAck-info" minOccurs="0" maxOccurs="unbounded"/>

 <xs:element name="match-reject" type="MatchReject-info" minOccurs="0" maxOccurs="unbounded"/>

 <xs:element name="restricted-match-ack" type="RestrictedMatchAck-info" minOccurs="0" maxOccurs="unbounded"/>

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="prose-direct-discovery-announcing-alert-request">

 <xs:sequence>

 <xs:element name="announcing-alert-request" type="AnnouncingAlertReq-info" maxOccurs="unbounded"/>

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <xs:complexType name="prose-direct-discovery-announcing-alert-response">

 <xs:sequence>

 <xs:element name="announcing-alert-response" type="AnnouncingAlertRsp-info" maxOccurs="unbounded"/>

 <xs:element name="response-reject" type="UE-RejectRsp-info" minOccurs="0" maxOccurs="unbounded"/>

 <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>

 <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <!-- extension allowed -->

 <xs:complexType name="DiscMsgExtType">

 <xs:sequence>

 <xs:any namespace="##any" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 <xs:anyAttribute namespace="##any" processContents="lax"/>

 </xs:complexType>

 <!-- XML attribute for any future extensions -->

 <xs:complexType name="anyExtType">

 <xs:sequence>

 <xs:any namespace="##any" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

 </xs:sequence>

 </xs:complexType>

<!-- Top levelDiscovery Message definition -->

 <xs:element name="prose-discovery-message">

 <xs:complexType>

 <xs:choice>

 <xs:element name="DISCOVERY\_REQUEST" type="prose-direct-discovery-request"/>

 <xs:element name="DISCOVERY\_RESPONSE" type="prose-direct-discovery-response"/>

 <xs:element name="MATCH\_REPORT" type="prose-direct-discovery-match-report"/>

 <xs:element name="MATCH\_REPORT\_ACK" type="prose-direct-discovery-match-report-ack"/>

 <xs:element name="DISCOVERY\_UPDATE\_REQUEST" type="prose-direct-discovery-update-request"/>

 <xs:element name="DISCOVERY\_UPDATE\_RESPONSE" type="prose-direct-discovery-update-response"/>

 <xs:element name="ANNOUNCING\_ALERT\_REQUEST" type="prose-direct-discovery-announcing-alert-request"/>

 <xs:element name="ANNOUNCING\_ALERT\_RESPONSE" type="prose-direct-discovery-announcing-alert-response"/>

 <xs:element name="message-ext" type="DiscMsgExtType"/>

 <xs:any namespace="##other" processContents="lax"/>

 </xs:choice>

 </xs:complexType>

 </xs:element>

</xs:schema>

An entity receiving the XML body ignores any unknown XML element and any unknown XML attribute.

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

#### 10.5.4.2 Semantics of <DISCOVERY\_REQUEST>

The <DISCOVERY\_REQUEST> element contains one or more of the following elements:

a) zero, one or more <discovery-request> element which contains transactions sent from the UE to the 5G DDNMF as announcing or monitoring requests for open 5G ProSe direct discovery. Each <discovery-request> consists of:

1) a <transaction-ID> element containing the parameter defined in clause 11.4.2.1;

2) a <command> element containing the parameter defined in clause 11.4.2.2;

3) a <UE-identity> element containing the parameter defined in clause 11.4.2.3;

4) a <Prose-Application-ID> element containing the parameter defined in clause 11.4.2.4;

5) an <application-identity> element containing the parameter defined in clause 11.4.2.5;

6) a <Discovery-Entry-ID> element containing the parameter defined in clause 11.4.2.26;

7) an optional <Requested-Timer> element containing the parameter defined in clause 11.4.2.20;

8) an optional <metadata> element containing the parameter defined in clause 11.4.2.15;

9) an optional <Announcing-PLMN-ID> element containing the parameter defined in clause 11.4.2.43;

10) zero or one <ACE-enabled-indicator> element containing the parameter defined in clause 11.4.2.31;

11) zero or one <anyExt> element containing elements defined in future releases;

12) zero, one or more elements from other namespaces defined in future releases; and

13) zero, one or more attributes defined in future releases;

b) zero, one, or more <restricted-discovery-request> element which contains transactions sent from the UE to the 5G DDNMF as announcing or monitoring requests for restricted 5G ProSe directed discovery model A or transactions sent from the UE to the 5G DDNMF as discoveree or discoverer requests for restricted 5G ProSe directed discovery model B. Each <restricted-discovery-request> consists of:

1) a <transaction-ID> element containing the parameter defined in clause 11.4.2.1;

2) a <command> element containing the parameter defined in clause 11.4.2.2;

3) a <UE-identity> element containing the parameter defined in clause 11.4.2.3;

4) a <RPAUID> element containing the parameter defined in clause 11.4.2.23;

5) an <application-identity> element containing the parameter defined in clause 11.4.2.5;

6) a <discovery-type> element containing the parameter defined in clause 11.4.2.18;

7) zero or one <ACE-enabled-indicator> element containing the parameter defined in clause 11.4.2.31;

8) an <announcing-type> element containing the parameter defined in clause 11.4.2.24;

9) an <application-level-container> element containing the parameter defined in clause 11.4.2.25;

10) zero or one <discovery-model> element containing the parameter defined in clause 11.4.2.34;

11) zero or one <Announcing-PLMN-ID> element containing the parameter defined in clause 11.4.2.43;

12) a <discovery-entry-id> element containing the parameter defined in clause 11.4.2.26;

13) an optional <Requested-Timer> element containing the parameter defined in clause 11.4.2.20;

14) a <UE-PC5-ciphering-algorithms> element containing the parameter defined in clause 11.4.2.y;

15) zero or one <anyExt> element containing elements defined in future releases;

16) zero, one or more elements from other namespaces defined in future releases; and

17) zero, one or more attributes defined in future releases;

c) zero or one <anyExt> element containing elements defined in future releases;

d) zero, one or more elements from other namespaces defined in future releases;

e) an optional "network-initiated transaction method" attribute containing the parameter defined in clause 11.4.2.42; and

f) zero, one or more attributes defined in future releases.

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

#### 10.5.4.3 Semantics of <DISCOVERY\_RESPONSE>

The <DISCOVERY\_RESPONSE> element contains one or more of the following elements:

a) a <Current-Time> element containing the parameter defined in clause 11.4.2.16;

b) a <Max-Offset> element containing the parameter defined in clause 11.4.2.17;

c) zero, one or more <response-announce> element which contains transactions sent from the 5G DDNMF to the UE as a response to an announcing request if the 5G DDNMF accepts the request. Each <response-announce> consists of:

1) a <transaction-ID> element containing the parameter defined in clause 11.4.2.1;

2) zero, one or more <ProSe-Application-Code> elements containing the parameter defined in clause 11.4.2.6;

3) zero or one <ProSe application code-ACE> element containing the parameter defined in clause 11.4.2.45;

4) zero, or one <validity-timer-T5060> element containing the parameter defined in 11.4.2.7;

5) zero, or, one <discovery-key> element containing the parameter defined in clause 11.4.2.48;

6) a <discovery-entry-ID> element containing the parameter defined in clause 11.4.2.26;

7) zero or one <ACE-enabled-indicator> element containing the parameter defined in clause 11.4.2.31;

8) zero or one <anyExt> element containing elements defined in future releases;

9) zero, one or more elements from other namespaces defined in future releases; and

10) zero, one or more attributes defined in future releases;

d) zero, one or more <response-monitor> element which contains transactions sent from the 5G DDNMF to the UE as a response to a monitoring request if the 5G DDNMF accepts the request. Each <response-monitor> consists of:

1) a <transaction-ID> element containing the parameter defined in clause 11.4.2.1;

2) zero, one or more <discovery-filter> elements containing the parameter defined in clause 11.4.2.9;

3) a <discovery-entry-ID> element containing the parameter defined in clause 11.4.2.26;

4) zero or one <ACE-enabled-indicator> element containing the parameter defined in clause 11.4.2.31;

5) zero or one <anyExt> element containing elements defined in future releases;

6) zero, one or more elements from other namespaces defined in future releases; and

7) zero, one or more attributes defined in future releases;

e) zero, one or more <restricted-announce-response> element which contains transactions sent from the 5G DDNMF to the UE as a response to an announcing request for restricted 5G ProSe direct discovery model A if the 5G DDNMF accepts the request. Each <restricted-announce-response> consists of:

1) a <transaction-ID> element containing the parameter defined in clause 11.4.2.1;

2) zero or one <ProSe-Restricted-Code> element containing the parameter defined in clause 11.4.2.27;

3) zero, one or more <ProSe-Restricted-Code-Suffix-Range> element containing the parameter defined in clause 11.4.2.28;

4) zero or one <validity-timer-T5062> element containing the parameter defined in 11.4.2.32;

5) zero or one <ACE-enabled-indicator> element containing the parameter defined in clause 11.4.2.31;

6) a <code-sending-security-parameter> element containing the parameter defined in clause 11.4.2.33;

7) zero or one <on-demand-announcing-enabled-indicator> element containing the parameter defined in clause 11.4.2.29;

8) a <discovery-entry-id> element containing the parameter defined in clause 11.4.2.26;

9) a <selected-PC5-ciphering-algorithm> element containing the parameter defined in clause 11.4.2.z;

10) zero or one <PC5-security-policies> element containing the parameter defined in clause 11.4.2.49;

11) zero or one <anyExt> element containing elements defined in future releases;

12) zero, one or more elements from other namespaces defined in future releases; and

13) zero, one or more attributes defined in future releases;

f) zero, one or more <restricted-monitor-response> element which contains transactions sent from the 5G DDNMF to the UE as a response to a monitoring request for restricted 5G ProSe direct discovery model A if the 5G DDNMF accepts the request. Each <restricted-monitor-response> consists of:

1) a <transaction-ID> element containing the parameter defined in clause 11.4.2.1;

2) one or more <restricted-discovery-filter> elements containing the parameter defined in clause 11.4.2.30;

3) zero or one <ACE-enabled-indicator> element containing the parameter defined in clause 11.4.2.31

4) a <discovery-entry-id> element containing the parameter defined in clause 11.4.2.26;

5) an <application-level-container> element containing the parameter defined in clause 11.4.2.25;

6) one or more <code-receiving-security-parameter> element containing the parameter defined in clause 11.4.2.33;

7) a <selected-PC5-ciphering-algorithm> element containing the parameter defined in clause 11.4.2.z;

8) zero or one <PC5-security-policies> element containing the parameter defined in clause 11.4.2.49;

9) zero or one <anyExt> element containing elements defined in future releases;

10) zero, one or more elements from other namespaces defined in future releases; and

11) zero, one or more attributes defined in future releases;

g) zero, one or more <restricted-discoveree-response> element which contains transactions sent from the 5G DDNMF to the UE as a response to a discoveree UE's request for restricted 5G ProSe direct discovery model B if the 5G DDNMF accepts the request. Each <restricted-discoveree-response> consists of:

1) a <transaction-ID> element containing the parameter defined in clause 11.4.2.1;

2) a <ProSe-Response-Code> element containing the element defined in clause11.4.2.35;

3) one or more <query-filter> elements containing the parameter defined in clause 11.4.2.36;

4) a <validity-timer-T5068> element containing the parameter defined in clause 11.4.2.37;

5) a <code-sending-security-material > element containing the parameter defined in clause 11.4.2.33;

6) one or more <code-receiving-security-parameter> element containing the parameter defined in clause 11.4.2.33;

7) a <discovery-entry-id> element containing the parameter defined in clause 11.4.2.26;

8) zero or one <PC5-security-policies> element containing the parameter defined in clause 11.4.2.49;

9) a <selected-PC5-ciphering-algorithm> element containing the parameter defined in clause 11.4.2.z;

10) zero or one <anyExt> element containing elements defined in future releases;

11) zero, one or more elements from other namespaces defined in future releases; and

12) zero, one or more attributes defined in future releases;

h) zero, one or more <restricted-discoverer-response> element which contains transactions sent from the 5G DDNMF to the UE as a response to a discoverer UE's request for restricted 5G ProSe direct discovery model B if the 5G DDNMF accepts the request. Each <restricted-discoverer-response> consists of:

1) a <transaction-ID> element containing the parameter defined in clause 11.4.2.1;

2) one or more <subquery-result> elements containing the parameter defined in clause 11.4.2.38;

3) a <discovery-entry-id> element containing the parameter defined in clause 11.4.2.26;

4) zero or one <PC5-security-policies> element containing the parameter defined in clause 11.4.2.49;

5) a <selected-PC5-ciphering-algorithm> element containing the parameter defined in clause 11.4.2.z;

6) zero or one <anyExt> element containing elements defined in future releases;

7) zero, one or more elements from other namespaces defined in future releases; and

8) zero, one or more attributes defined in future releases;

i) zero, one or more <response-reject> element which contains transactions sent from the 5G DDNMF to the UE as a response to an announcing or monitoring requests if the 5G DDNMF cannot accept the request. Each <response-reject> consists of:

1) a <transaction-ID> element containing the parameter defined in clause 11.4.2.1;

2) a <PC3a-control-protocol-cause-value> element containing the parameter defined in clause 11.4.2.8.

3) zero, one or more elements defined in future releases; and

4) zero, one or more attributes defined in future releases;

j) zero or one <anyExt> element containing elements defined in future releases;

k) zero, one or more elements from other namespaces defined in future releases;

l) an optional "network-initiated transaction method" attribute containing the parameter defined in clause 11.4.2.42; and

m) zero, one or more attributes defined in future releases.

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

#### 11.4.2.8 PC3a control protocol cause value

This parameter is used to indicate the particular reason why a DISCOVERY\_REQUEST or MATCH\_REPORT message from the UE has been rejected by the 5G DDNMF. It is an integer in the 0-255 range encoded in table 11.4.2.8.1.

Table 11.4.2.8.1: PC3a control protocol cause value

|  |
| --- |
| 0 Reserved |
| 1 Invalid Application |
| 2 Unknown ProSe application ID |
| 3 UE authorisation failure |
| 4 Unknown ProSe application code |
| 5 Invalid MIC |
| 6 Invalid UTC-based counter |
| 7 Invalid message format |
| 8 Scope violation in ProSe application ID |
| 9 Unknown RPAUID |
| 10 Unknown or invalid discovery entry ID |
| 11 Invalid discovery target |
| 12 UE unauthorised for discovery with application-controlled extension |
| 13 UE unauthorised for on-demand announcing |
| 14 Missing application level container |
| 15 Invalid data in application level container |
| 16 Invalid match event |
| 17 No valid ProSe application code |
| 18 Invalid UE Identity |
| 19 Not compatible PC5 UE ciphering algorithm capability |
| 20-255 Unused |

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

#### 11.4.2.y PC5 UE ciphering algorithm capability

This parameter is used to indicate the UE supported ciphering algorithms as integer values, where the UE supported ciphering algorithms field is defined as octet 3 of figure 11.3.11.1 and table 11.3.11.1.

#### 11.4.2.z Selected PC5 ciphering algorithm

This parameter is used to indicate the selected PC5 ciphering algorithm as integer values, where the selected PC5 ciphering algorithm filed is defined as bit 5 to 7 of octet 2 in figure 11.3.22.1 and table 11.3.22.1.

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