**3GPP TSG-CT WG1 Meeting #127-eC1-207249**

**Electronic meeting, 13-20 November 2020**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  | **24.587** | **CR** | **0159** | **rev** | **1** | **Current version:** | **16.2.1** |  |
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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:***  | Update on the PC5 unicast link privacy timer |
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| ***Source to WG:*** | CATT |
| ***Source to TSG:*** | C1 |
|  |  |
| ***Work item code:*** | eV2XARC |  | ***Date:*** | 2020-10-26 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-16 |
|  | *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-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)* |
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| ***Reason for change:*** | In V2X configuration parameters, the privacy timer for privacy is used to trigger the PC5 unicast link update procedure for the specific V2X service identifier with in specified geograpical area.On expiry of the privacy timer for a V2X service identifier, the initial UE should initiate the PC5 unicast link update procedure.For the activation of privacy timer, the current PC5 unicast link of the UE should ensure that at least one of V2X service identifiers satisfies privacy requirement in the configuration parameters for privacy support. For a PC5 unicast link configured with privacy, the initating UE should stop old privacy timer and start new privacy timer after accepting the DIRECT LINK IDENTIFIER UPDATE ACCEPT message if one of V2X service identifiers for the PC5 unicast link satisfies the privacy requirement. Because at this time, it marks the success of PC5 unicast link update procedure. And the target UE should stop old privacy timer and start new privacy timer after receiving the DIRECT LINK IDENTIFIER UPDATE ACK message if one of V2X service identifiers for the PC5 unicast link satisfies the privacy requirement. Because at this time, it marks that the target UE receives the acknowledgement of the PC5 unicast link update procedure. |
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| ***Summary of change:*** | Under the condition that at least one of V2X service identifiers for the PC5 unicast link satisfies the privacy requirements: 1. The initiating UE should start new privacy timer after receving DIRECT LINK ESTABLISHMENT ACCEPT message.
2. The target UE should start new privacy timer after accepting DIRECT LINK ESTABLISHMENT REQUEST message.
3. The initiating UE should stop old privacy timer(if available) and (re)start new privacy timer after accepting the DIRECT LINK IDENTIFIER UPDATE ACCEPT message.
4. The target UE should stop privacy timer(if available) and (re)start new privacy timer after accepting the DIRECT LINK IDENTIFIER UPDATE ACK message.
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| ***Consequences if not approved:*** | Some preconditions of triggering the privacy timer of PC5 unicast link are missing or incorrect. |
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| ***Clauses affected:*** | 6.1.2.2.3, 6.1.2.2.4, 6.1.2.5.2, 6.1.2.5.3, 6.1.2.5.4, 6.1.2.5.5, 10.3 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

\*\*\*\*\* First change \*\*\*\*\*

##### 6.1.2.2.3 PC5 unicast link establishment procedure accepted by the target UE

Upon receipt of a DIRECT LINK ESTABLISHMENT REQUEST message, if the target UE accepts this request, the target UE shall uniquely assign a PC5 link identifier, create a PC5 unicast link context and assign a layer-2 ID for this PC5 unicast link. Then the target UE shall store this assigned layer-2 ID and the source layer-2 ID used in the transport of this message provided by the lower layers in the PC5 unicast link context.

If:

a) the target user info IE is included in the DIRECT LINK ESTABLISHMENT REQUEST message and this IE includes the target UE’s application layer ID; or

b) the target user info IE is not included in the DIRECT LINK ESTABLISHMENT REQUEST message and the target UE is interested in the V2X service(s) identified by the V2X service identifier IE in the DIRECT LINK ESTABLISHMENT REQUEST message;

then the target UE shall either:

a) identify an existing KNRP based on the KNRP ID included in the DIRECT LINK ESTABLISHMENT REQUEST message; or

b) if KNRP ID is not included in the DIRECT LINK ESTABLISHMENT REQUEST message, the target UE does not have an existing KNRP for the KNRP ID included in DIRECT LINK ESTABLISHMENT REQUEST message or the target UE wishes to derive a new KNRP, derive a new KNRP. This may require performing one or more PC5 unicast link authentication procedures as specified in clause 6.1.2.6.

NOTE: How many times the PC5 unicast link authentication procedure needs to be performed to derive a new KNRP depends on the authentication method used.

After an existing KNRP was identified or a new KNRP was derived, the target UE shall initiate a PC5 unicast link security mode control procedure as specified in subclause 6.1.2.7.

Upon successful completion of the PC5 unicast link security mode control procedure, in order to determine whether the DIRECT LINK ESTABLISHMENT REQUEST message can be accepted or not, in case of IP communication, the target UE checks whether there is at least one common IP address configuration option supported by both the initiating UE and the target UE.

If the target UE accepts the PC5 unicast link establishment procedure, the target UE shall create a DIRECT LINK ESTABLISHMENT ACCEPT message. The target UE:

a) shall include the source user info set to the target UE’s application layer ID received from upper layers;

b) shall include PQFI(s), the corresponding PC5 QoS parameters and the V2X service identifier(s) that the target UE accepts;

c) shall include an IP address configuration IE set to one of the following values if IP communication is used:

1) "IPv6 router" if IPv6 address allocation mechanism is supported by the target UE, i.e. acting as an IPv6 router; or

2) "IPv6 address allocation not supported" if IPv6 address allocation mechanism is not supported by the target UE;

d) shall include a link local IPv6 address IE formed locally based on IETF RFC 4862 [16] if IP address configuration IE is set to "IPv6 address allocation not supported" and the received DIRECT LINK ESTABLISHMENT REQUEST message included a link local IPv6 address IE; and

e) shall include the configuration of UE PC5 unicast user plane security protection based on the agreed user plane security policy, as specified in 3GPP TS 33.536 [20].

After the DIRECT LINK ESTABLISHMENT ACCEPT message is generated, the initiating UE shall pass this message to the lower layers for transmission along with the initiating UE's layer-2 ID for unicast communication and the target UE's layer-2 ID for unicast communication, NRPIK, NRPEK if applicable, KNRP-sess ID, and the selected security algorithm as specified in TS 33.536 [20], and shall start timer T5011 if at least one of V2X service identifiers for the PC5 unicast links satisfies the privacy requirements as specified in clause 5.2.3.

After sending the DIRECT LINK ESTABLISHMENT ACCEPT message, the target UE shall provide the following information along with the layer-2 IDs to the lower layer, which enables the lower layer to handle the coming PC5 signalling or traffic data:

a) the PC5 link identifier self-assigned for this PC5 unicast link;

b) PQFI(s) and its corresponding PC5 QoS parameters;

c) an indication of activation of the PC5 unicast signalling security protection for the PC5 unicast link, if applicable; and

e) an indication of activation of the PC5 unicast user plane security protection for the PC5 unicast link, if applicable.

If the target UE accepts the PC5 unicast link establishment request, then the target UE may perform the PC5 QoS flow establishment over PC5 unicast link as specified in clause 6.1.2.12.

\*\*\*\*\* Second change \*\*\*\*\*

##### 6.1.2.2.4 PC5 unicast link establishment procedure completion by the initiating UE

Upon receipt of the DIRECT LINK ESTABLISHMENT ACCEPT message, the initiating UE shall stop timer T5000, uniquely assign a PC5 link identifier and create a PC5 unicast link context for this PC5 unicast link. Then the target UE shall store the source layer-2 ID and the destination layer-2 ID used in the transport of this message provided by the lower layers in the PC5 unicast link context. From this time onward the initiating UE shall use the established link for V2X communication over PC5 and additional PC5 signalling messages to the target UE.

After receiving the DIRECT LINK ESTABLISHMENT ACCEPT message, the initiating UE shall provide the following information along with the layer-2 IDs to the lower layer, which enables the lower layer to handle the coming PC5 signalling or traffic data:

a) the PC5 link identifier self-assigned for this PC5 unicast link;

b) PQFI(s) and its corresponding PC5 QoS parameters;

c) Indication of activation of the PC5 unicast signalling security protection for the PC5 unicast link, if applicable; and

d) Indication of activation of the PC5 unicast user plane security protection for the PC5 unicast link, if applicable.

The initiating UE shall start timer T5011 if at least one of V2X service identifiers for the PC5 unicast links satisfies the privacy requirementsas specified in clause 5.2.3.

In addition, the initiating UE may perform the PC5 QoS flow establishment over PC5 unicast link as specified in clause 6.1.2.12.

\*\*\*\*\* Third change \*\*\*\*\*

##### 6.1.2.5.2 PC5 unicast link identifier update procedure initiation by initiating UE

The initiating UE shall initiate the procedure if:

a) the initiating UE receives a request from upper layers to change the application layer ID and there is an existing PC5 unicast link associated with this application layer ID; or

b) the privacy timer (see clause 5.2.3) of the initiating UE's layer-2 ID expires for an existing PC5 unicast link.

If the PC5 unicast link identifier update procedure is triggered by a change of the initiating UE’s application layer ID, and create a DIRECT LINK IDENTIFIER UPDATE REQUEST message. In this message, the initiating UE

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

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

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

d) may include the new IP address/prefix if IP communication is used.

If the PC5 unicast link identifier update procedure is triggered by the expiry of the initiating UE's privacy timer T5011 as specified in clause 5.2.3, the initiating UE shall create a DIRECT LINK IDENTIFIER UPDATE REQUEST message. In this message, the initiating UE

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

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

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

d) may include the new IP address/prefix if IP communication is used.

After the DIRECT LINK IDENTIFIER UPDATE REQUEST message is generated, the initiating UE shall pass this message to the lower layers for transmission along with the initiating UE's old layer-2 ID and the target UE's layer-2 ID, and start timer T5009. The UE shall not send a new DIRECT LINK IDENTIFIER UPDATE REQUEST message to the same target UE while timer T5009 is running.



Figure 6.1.2.5.2.1: PC5 unicast link identifier update procedure

\*\*\*\*\* Fourth change \*\*\*\*\*

##### 6.1.2.5.3 PC5 unicast link identifier update procedure accepted by the target UE

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

a) the PC5 unicast link associated with this request message is still valid; and

b) the timer T5010 for the PC5 unicast link identified by this request message is not running,

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

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

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

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

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

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

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

f) may include the initiating UE's new IP address/prefix if IP communication is used;

g) may include the initiating UE's new application layer ID; and

h) may include the target UE's new IP address/prefix if IP communication is used.

After the DIRECT LINK IDENTIFIER UPDATE ACCEPT message is generated, the target UE shall pass this message to the lower layers for transmission along with the initiating UE's old layer-2 ID and the target UE's old layer-2 ID, and start timer T5010. The UE shall not send a new DIRECT LINK IDENTIFIER UPDATE ACCEPT message to the same initiating UE while timer T5010 is running.

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

Before target UE receives the DIRECT LINK IDENTIFIER UPDATE ACK message from initiating UE, the target UE shall keep sending traffic to the initiating UE using the old layer-2 IDs (i.e. initiating UE’s old layer-2 ID and target UE’s old layer-2 ID).

\*\*\*\*\* Fifth change \*\*\*\*\*

##### 6.1.2.5.4 PC5 unicast link identifier update procedure acknowledged by the initiating UE

Upon receipt of the DIRECT LINK IDENTIFIER UPDATE ACCEPT message, the initiating UE shall stop timer T5009 and respond with a DIRECT LINK IDENTIFIER UPDATE ACK message. In this message, the initiating UE:

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

b) shall include the target UE's new LSB of KNRP-sess ID;

c) may include the target UE's new application layer ID, if received; and

d) may include the target UE's new IP address/prefix, if received.

After the DIRECT LINK IDENTIFIER UPDATE ACK message is generated, the initiating UE shall pass this message to the lower layers for transmission along with the initiating UE's old layer-2 ID and the target UE's old layer-2 ID and shall stop timer T5011 if running and (re)start a timer T5011 as configured if at least one of V2X service identifiers for the PC5 unicast link satisfying the privacy requirements as specified in clause 5.2.3.

Upon sending the DIRECT LINK IDENTIFIER UPDATE ACK message, the initiating UE shall update the associated PC5 unicast link context with the new identifiers and pass the new layer-2 IDs (i.e. initiating UE's new layer-2 ID and target UE's new layer-2 ID if changed) along with the PC5 link identifier down to the lower layer. Then the initiating UE shall use the new layer-2 IDs (i.e. initiating UE's new layer-2 ID and target UE’s new layer-2 ID if changed) to transmit the PC5 signalling message and PC5 user plane data.

The initiating UE shall continue to receive traffic with the old layer-2 IDs (i.e. initiating UE's old layer-2 ID and target UE's old layer-2 ID) from the target UE until it receives traffic with the new layer-2 IDs (i.e. initiating UE's new layer-2 ID and target UE's new layer-2 ID if changed) from the target UE.

\*\*\*\*\* Sixth change \*\*\*\*\*

##### 6.1.2.5.5 PC5 unicast link identifier update procedure completion by the target UE

Upon receipt of the DIRECT LINK IDENTIFIER UPDATE ACK message, the target UE shall update the associated PC5 unicast link context with the new identifiers, pass the new layer-2 IDs (i.e. initiating UE's new layer-2 ID and target UE's new layer-2 ID if changed) down to the lower layer, stop timer T5010 and timer T5011 if running and (re)start a timer T5011 as configured if at least one of V2X service identifiers for the PC5 unicast link satisfying the privacy requirements as specified in clause 5.2.3. Then the target UE shall use the new layer-2 IDs (i.e. initiating UE's new layer-2 ID and target UE's new layer-2 ID if changed) to transmit the PC5 signalling message and PC5 user plane data.

\*\*\*\*\*Seventh change \*\*\*\*\*

## 10.3 Timers of PC5 unicast link management procedures

Table 10.3.1: PC5 unicast link management timers

| TIMER NUM. | TIMER VALUE | CAUSE OF START | NORMAL STOP | ON EXPIRY |
| --- | --- | --- | --- | --- |
| T5000 | 8s | Upon sending a DIRECT LINK ESTABLISHMENT REQUEST message | Upon receiving a DIRECT LINK ESTABLISHMENT ACCEPT or DIRECT LINK ESTABLISHMENT REJECT message from the target UE | Retransmission of DIRECT LINK ESTABLISHMENT REQUEST message |
| T5001 | 5s | Upon sending a DIRECT LINK MODIFICATION REQUEST message | Upon receiving a DIRECT LINK MODIFICATION ACCEPT or DIRECT LINK MODIFICATION REJECT or DIRECT LINK RELEASE REQUEST message from the target UE | Retransmission of DIRECT LINK MODIFICATION REQUEST message |
| T5002 | 5s | Upon sending a DIRECT LINK RELEASE REQUEST message | Upon receiving a DIRECT LINK RELEASE ACCEPT message from the target UE | Retransmission of DIRECT LINK RELEASE REQUEST message |
| T5003 | 5s | Upon receiving a PC5 signalling message or PC5 user plane data | Upon PC5 unicast link release or upon initiating the PC5 unicast link keep-alive procedure | Initiate the PC5 unicast link keep-alive procedure |
| T5004 | 5s | Upon sending a DIRECT LINK KEEPALIVE REQUEST message | Upon receiving a PC5 signalling message or PC5 user plane data | Retransmission of the DIRECT LINK KEEPALIVE REQUEST message |
| T5005 | Default 10mNOTE 1 | Upon receiving a Maximum inactivity period in a DIRECT LINK KEEPALIVE REQUEST message, receiving a PC5 signalling message or receiving PC5 user plane data | Upon receiving a PC5 signalling message or PC5 user plane data | Either initiate the PC5 unicast link keep-alive procedure or the PC5 unicast link release procedure |
| T5006 | 2s | Upon sending a DIRECT LINK AUTHENTICATION REQUEST message | Upon receiving a DIRECT LINK AUTHENTICATION RESPONSE or DIRECT LINK AUTHENTICATION REJECT message from the target UE | Retransmission of DIRECT LINK AUTHENTICATION REQUEST message |
| T5007 | 2s | Upon sending a DIRECT LINK SECURITY MODE COMMAND message | Upon receiving a DIRECT LINK SECURITY MODE COMPLETE or DIRECT LINK SECURITY MODE REJECT message from the target UE | Retransmission of DIRECT LINK SECURITY MODE COMMAND message |
| T5008 | 8s | Upon sending a DIRECT LINK REKEYING REQUEST message | Upon receiving a DIRECT LINK REKEYING RESPONSE message or DIRECT LINK RELEASE REQUEST message from the target UE | Retransmission of DIRECT LINK REKEYING REQUEST message |
| T5009 | 2s | Upon sending a DIRECT LINK IDENTIFIER UPDATE REQUEST message | Upon receiving a DIRECT LINK IDENTIFIER UPDATE ACCEPT or DIRECT LINK IDENTIFIER UPDATE REJECT or DIRECT LINK RELEASE REQUEST message from the target UE | Retransmission of the DIRECT LINK IDENTIFIER UPDATE REQUEST message |
| T5010 | 2s | Upon sending a DIRECT LINK IDENTIFIER UPDATE ACCEPT message | Upon receiving a DIRECT LINK IDENTIFIER UPDATE ACK message or DIRECT LINK RELEASE REQUEST message from the initiating UE | Retransmission of the DIRECT LINK IDENTIFIER UPDATE ACCEPT message  |
| T5011 | NOTE X | Upon establishing a PC5 unicast link and at least one of V2X service identifier for the PC5 unicast link satisfying the privacy requirements or upon completing a PC5 unicast link update and at least one of V2X service identifiers for the PC5 unicast link satisfying the privacy requirements | Upon completing a PC5 unicast link identifier update and if available orupon a PC5 unicast link release and if available | Transmission of LINK IDENTIFIER UPDATE REQUEST message |
| NOTE 1 The default value of this timer is used if the DIRECT LINK KEEPALIVE REQUEST message does not provide a timer value in the Maximum inactivity period IE,NOTE x The value of this timer is the privacy timer value which is one of the configuration parameters for V2X communication over PC5 (see clause 5.2.3), |

\*\*\*\*\* End of change \*\*\*\*\*