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【誤訳訂正書】

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【誤訳訂正1】

【訂正対象書類名】明細書

【訂正対象項目名】0 0 2 6

【訂正方法】変更

【訂正の内容】

【0 0 2 6】

3 G P P T R 2 3 . 7 8 6 V 1 . 0 . 0 は、e V 2 X 通信に対して以下の解決策を導入した：

[外 2]

6.11 Solution #11: Solution for unicast or multicast for eV2X communication over PC5 reference point

6.11.1 Functional Description

This solution addresses Key Issue #1 on the support of eV2X Group Communication, Key Issue #9 on the support of the unicast/multicast communication over PC5 and Key Issue #4 on the support of PC5 QoS framework enhancement for eV2X, focusing on the following aspects:

- Identifiers for the unicast communication, e.g. L2 ID;
- Signalling protocol to support unicast/multicast communication;
- QoS support and AS layer configurations;
- Security associations;
- Procedures for the link establishment and maintenance.

6.11.2 Solution description

6.11.2.1 Identifiers for the unicast communication

6.11.2.1.1 Separate L2 ID address space for unicast and multicast from those for broadcast

One of the essential identifiers for the unicast/multicast communication is the L2 ID. As of the ProSe design in TS 23.303 [8], the destination L2 ID address space for one-to-one communication and one-to-many communications are separate with AS layer mechanism, i.e. MAC layer version number. This is done to avoid conflicts of the address used that may cause harm to one-to-one communications. In a similar manner, V2X unicast should also use the separate L2 IDs than that for the broadcast and multicast.

This separation applies to both destination L2 ID and source L2 ID. For a UE that has both broadcast and unicast/multicast traffic, different L2 IDs should be used with corresponding formats. The source L2 ID will be used by peer UE as the destination L2 ID in unicast communication. Details of the related L2 ID management for unicast/multicast is described in following clauses.

The UE may use distinct source L2 ID for different unicast one to one communication link e.g.

when different unicast links are associated with different upper layer identifiers.

6.11.2.1.2 Deciding the Destination L2 ID to use for unicast/multicast communication

6.11.2.1.2.1 Option A

In TS 23.285 [5], the Destination L2 ID is decided by the UE based on a configured mapping between PSID/ITS-AID to the L2 ID. This suits for broadcast traffic, but does not work for unicast or multicast traffic. In unicast or multicast, destination L2 ID would not be decided based on PSID/ITS-AID. A V2X UE should be allowed to have multiple unicast connections or multicast groups supported simultaneously for a particular service (PSID/ITS-AID). Therefore, the destination L2 ID information in this case should come from the upper layer. This means that the interface between the V2X layer and upper layer needs to be enhanced to allow such information to be passed down together with the data packet.

It is expected that the actual V2X applications do not understand the notion of L2 ID, as the applications can be built for cross technology or platforms. Therefore, some mid-ware layer within the UE has to translate the identifier used by the application layer, e.g. Station ID, to the V2X L2 ID. It means such mid-ware layer needs to maintain the mapping of application layer destination identifiers and L2 IDs. Since this mid-ware layer is out of scope of SA2, in the specification it can be noted as "upper layer" in general, and the assumption that this "upper layer" maintains the mapping and provides the L2 ID for unicast or multicast communication should be documented.

6.11.2.1.2.2 Option B

An alternative to the above solution is for the V2X layer to manage such unicast link/multicast group to L2 ID mapping. In that case, the unicast link/multicast group can be allocated with a flow identifier at the time of establishment. Corresponding connection profile information, e.g. L2 IDs, transmission settings, QoS parameters, etc., could be associated with it. In such a case, the upper layer only needs to use the flow identifier to indicate the destination and pass it down with the data packet. V2X layer will apply the associated profile information, including the L2 IDs, for the transmission. This would allow the reuse the Uu link handling mechanisms,

e.g. similar to that of the QoS Flows, and be more extensible. Again, the translation of the application layer identifiers, e.g. Station ID, to this flow identifier has to be done by this mid-ware layer, i.e. the "upper layer".

6.11.2.2 Signalling protocol to support unicast/multicast communication

For unicast or multicast communication, there is a need for some control message exchanged between the UEs involved in order to establish the link or group. Therefore, some signalling protocol is required.

In ProSe one-to-one communication defined in TS 23.303 [8], a PC5 Signalling Protocol (clause 5.1.1.5.2) was introduced, which runs over PDCP layer. Although it is defined for ProSe use, the messages could be extended in order to be used for V2X communication. The detailed protocol design needs to be reviewed based on the actual unicast operation procedures.

Another alternative approach is to run RRC over PC5. As PC5 Signalling Protocol is used over PDCP anyway, RRC protocol can be used to replace it. Although not all RRC features are required for PC5 operation, those selected V2X relevant RRC messages can be extended and used, e.g. SidelinkUEInformation, etc. The advantage of that is the potential unification of control signalling protocols for Uu and PC5.

Therefore, in this solution a signalling protocol over PC5 for the unicast/multicast communication management is introduced.

6.11.2.3 QoS support and AS layer configurations

It is desirable that QoS can be support over the unicast and multicast communication as well. In TS 23.285 [5], the QoS model for V2X communication is based on the per packet model, e.g. PPPP and PPPR. With unicast or multicast communication, it should be discussed whether a connection-oriented QoS model similar to that of Uu connection should be supported as well. As also discussed in Key Issue #4 "Support of PC5 QoS framework enhancement for eV2X", something more than existing PPPP and PPPR is expected be required.

Specifically for unicast or multicast, due to the link or group involved, most packets sent over the same unicast link between a pair of peers should have the same QoS characteristics. This is closer to the Uu connection model, rather than the normal broadcast based traffic. Therefore,

Uu type of QoS management concept can be reused here. This allow a unified model for Uu and PC5.

In addition, there could be different AS layer features that may be optional or not backward compatible. Therefore, when setting up the unicast link, such configuration could be also negotiated and configured together with/or as part of the QoS profile.

NOTE: The QoS Model for unicast described in Solution #19 (clause 6.19) is used.

6.11.2.4 Security associations

The unicast or multicast communication may need protection at link layer as well. The ProSe one-to-one communication supports secure L2 link establishment, as defined in TS 33.303 [11]. However, within V2X communication context, each UE has the corresponding certificates for the security protection. Therefore, there may be a need to enhancement or adjust the existing L2 secure link establishment protocol in order to support the use of such security associations. The exact security handling should be analysed and decided by SA3. SA2 design needs to be aligned with those decisions when available.

6.11.2.5 Procedures for the link establishment and maintenance

TS 23.303 [8] has defined the procedures for the establishment and maintenance of secure L2 link over PC5, as in clause 5.4.5. These procedures can be enhanced and adapted for the V2X use, subject to the decisions above regarding signalling protocol choice, security handling, etc. Some addition considerations for the V2X for the link/group handling is required though. For V2X communication, not all UEs will be supporting or use unicast communication. In addition, not all services may be run over the same channel or RAT (e.g. LTE V2X vs. NR V2X). With V2X, there is no discovery channel like that of ProSe (i.e. PC5-D), and there is no assumption on the configuration from network as that of Public Safety use. Therefore, in order to support the link establishment, there is a need for service announcement in order to inform the peer of the existence of the UE and the capability of the UE for the unicast communication, e.g. channel to operate, or the services supported, etc.

Such a service announcement should be made accessible to all the UEs that are interested in using the service. For example, such announcement could be either configured to send over a

dedicate channel, similar to how WAVE Service Advertisement (WSA) is handled, or to be piggybacked on the periodical messages from the supporting UEs.

NOTE 1: Service announcement is handled by upper layer and out of scope of SA2.

For layer 2 link maintenance, keep-alive functionality is needed to detect that when the UEs are not in direct communication range, so that they can proceed with implicit layer 2 link release.

NOTE 2: It is left to Stage 3 to determine how keep-alive functionality is supported.

6.11.3 Procedures

6.11.3.1 Establishment of layer 2 link over PC5

Layer-2 link establishment procedure as defined in TS 23.303 [8] clause 5.4.5.2 can be reused for the eV2X unicast link establishment, with the following adaptations:

- The messages may be converted to RRC signaling message instead of PC5 signaling message, depends on RAN WG's decision.
- "UE oriented layer 2 link establishment" operates as below and Figure 6.11.3.1-1 shows the procedure:
 - The Direct Communication Request message can be sent by UE-1 with broadcast mechanism, i.e. to a broadcast address associated with the application instead of the L2 ID of UE-2. The upper identifier of UE-2 is included in the Direct Communication Request message to allow UE-2 to decide on if to respond to the request. The Source L2 ID of this message should be the unicast L2 ID of the UE-1.
 - The Direct Communication Request message should be transmitted using default AS layer setting e.g. broadcast setting, that can be understood by UE-2.
 - UE-2 uses the source L2 ID of the received Direct Communication Request message as destination L2 ID in the subsequent signalling to UE-1, and uses its own unicast L2 ID as the source L2 ID. UE-1 obtains UE-2's L2 ID for future communication, for signalling and data traffic.

[“UE oriented layer 2 link establishment procedure” と題する、3 G P P T R 2 3 . 7 8 6 V 1 . 0 . 0 の図 6 . 1 1 . 3 . 1 - 1 は、図 5 として複製される]

[外 3]

- "V2X Service oriented layer 2 link establishment" operates same to the "UE oriented layer 2 link establishment" with the following differences and Figure 6.11.3.1-2 shows the procedure:
 - The information about V2X Service requesting L2 link establishment, i.e. information about the announced V2X Service is included in the Direct Communication Request message to allow other UEs to decide on if to respond to the request.
 - The UEs that are interested in using the V2X Service announced by the Direct Communication Request message can respond to the request (UE-2 and UE-4 in Figure 6.11.3.1-2).
 - After establishing layer 2 link with other UE(s) as described above, new UE(s) can enter proximity with UE-1, i.e. UE-1's direct communication range. In this case, UE-1 may initiate V2X Service oriented layer 2 link establishment procedure as it is aware of new UE(s) from Application Layer messages sent by the UE(s). Or the new UE may initiate V2X Service oriented layer 2 link establishment procedure. Therefore, UE-1 does not have to keep sending a Direct Communication Request message periodically to announce the V2X Service it wants to establish L2 link with other UE for unicast.

["V2X Service oriented layer 2 link establishment procedure" と題する、3GPP TR 23.786 V1.0.0の図6.11.3.1-2は、図6として複製される]

レイヤ2リンクは、非IPトラフィックをサポートする。IPアドレスネゴシエーション及び割り当て手順は実施されない。

6.11.3.2 リンク確立のためのシグナリングメッセージの内容

TS 24.334 [13]で定義されている直接通信要求メッセージで搬送される情報は、少なくとも以下の更新を必要とする：

- 「UE指向レイヤ2リンク確立」の場合

- ユーザ情報は、開始側UEのID (UE-1の上位レイヤID)の他に、ターゲットUEのID (UE-2の上位レイヤID)を含める必要がある。

注：ステージ3は、これらのIDを同じIEまたは別々のIEで搬送することができるかどうかを決定することができる。例えば、ステーションID/車両一時IDは4オクテットだけでよい。

- 「V2Xサービス指向レイヤ2リンク確立」の場合

- アナウンスされたV2Xサービス情報は、L2リンク確立を要求するV2Xサービスに関する情報、例えば、V2XアプリケーションのPSIDまたはITS-AIDを含める必要がある。V2Xサービスでは、センサ共有などが可能である。

- ProSeのために必須として指定されたIPアドレス設定は、受信側UE (例えば、UE-2)がこの特定のリンクのためのいかなるIP設定手順も開始しないように、IPが使用されない指示を許容すべきである。

- eV2Xのためのセキュリティメカニズムは異なることがあり、異なるIEを必要とするため、セキュリティ専用のIEは、SA3によってレビューされる必要がある。

- 例えば、RRCメッセージが使用されるときに、リンクに関する追加の設定情報は、ASレイヤ設定にあってもよい。

6.11.3.3 ユニキャスト通信のプライバシー保護のためのリンク識別子更新手順
 [“Layer-2 link identifier update procedure” と題する、3GPP TR 23.786 V1.0.0 の図 6.11.3.3 - 1 は、図 7 として複製される]
 [外 5]

This procedure is used to update the peer in the unicast communication of the impending change of the identifiers used for this link. Due to the privacy requirements, in eV2X use, UE should frequently change its identifiers in order to avoiding being trackable by 3rd party. When the identifier change happens, all identifiers across all the layers, i.e. from application layer ID to L2 ID, need to be changed. This signaling is required before the identifier changes happen, to prevent service interruptions.

1. UE-1 decides the change of identifiers, e.g. due to the upper layer identifier change or a timer, and includes the new identifiers to use (including the new upper layer identifiers, new IP address/prefix if application, new L2 IDs) in the Link Identifier Update Request message, and send to UE-2 before it changes the identifiers. The new identifiers to use should be cyphered to protect privacy.

NOTE 1: The timer is running on a per Source L2 ID.

2. UE-2 respond with a Link Identifier Update Response message. Upon reception of the message, UE-1 and UE-2 can start to use the new identifiers for the data traffic. UE-1 shall receive traffic on its old L2 ID until it receives the Link Id Update Response from UE-2.

NOTE 2: If there are multiple links from UE-1 using the same upper layer identifiers or L2 IDs, UE-1 needs to perform the update procedure over each of the link and for each link needs to keep receiving traffic on its old L2 ID for that specific link until it receives the Link Id Update Response.

6.11.3.4 Security aspects for layer 2 link

As the eV2X applications have associated security certificates, the unicast link can reuse those to derive the security association for protecting the signalling or data of the unicast link.

6.11.4 Impact on existing entities and interfaces

Editor's note: Impacts on existing nodes or functionality will be added.

6.11.5 Topics for further study

None.

6.11.6 Conclusions

Solution documented in clauses 6.11.1 to 6.11.4 addressed all the aspects of Key Issue #9

Support of unicast/multicast for sensor sharing over PC5, and should move to normative phase.

Following aspects will be further updated based on feedbacks from other Working Groups:

- the signalling message definition for unicast link establishment and management, e.g. if and how RRC signalling is used for unicast link;
- the choice of per packet QoS model or bearer based QoS model for broadcast, groupcast, and unicast based on RAN decisions;
- signal to the base station regarding the service used when network scheduled mode is used;
- the potential security related procedure updates for unicast communication over PC5.

NOTE: The application layer may use unicast or groupcast communication mechanism for different applications, e.g. platooning applications.

[...]

6.19 Solution #19: QoS Support for eV2X communication over PC5 interface

6.19.1 Functional Description

6.19.1.1 General description

This solution addresses Key Issue#4 (clause 5.4) Support of PC5 QoS framework enhancement for eV2X. The QoS requirements for eV2X are different from that of the EPS V2X, and the previous defined PPPP/ PPR in TS 23.285 [5] are considered not to satisfy the needs.

Specifically, there are much more QoS parameters to consider for the eV2X services. This solution proposes to use 5QI for eV2X communication over PC5 interface. This allows a unified QoS model for eV2X services over different links.

6.19.1.2 Solution description

The new service requirements were captured in TS 22.186 [4]. The new performances KPIs were specified with the following parameters:

- Payload (Bytes);
- Transmission rate (Message/Sec);
- Maximum end-to-end latency (ms);

- Reliability (%);
- Data rate (Mbps);
- Minimum required communication range (meters).

Note that the same set of service requirements apply to both PC5 based V2X communication and Uu based V2X communication. As analysed in Solution #2 (clause 6.2), these QoS characteristics could be well represented with 5QI defined in TS 23.501 [7].

It is therefore possible to have a unified QoS model for PC5 and Uu, i.e. also use 5QIs for V2X communication over PC5, such that the application layer can have a consistent way of indicating QoS requirements regardless of the link used. This does not prevent the AS layer from implementing different mechanisms over PC5 and Uu to achieve the QoS requirements. Considering the 5GS V2X capable UEs, there are three different types of traffic: broadcast, multicast, and unicast.

The UE-PC5-AMBR is applied to all types of traffic and is used for the RAN for capping the UE PC5 transmission in the resources management.

For unicast type of traffic, it is clear that the same QoS Model as that of Uu can be utilized, i.e. each of the unicast link could be treated as a bearer, and QoS flows could be associated with it. All the QoS characteristics defined in 5QI and the additional parameter of data rate could apply. In addition, the Minimum required communication range could be treated as an additional parameter specifically for PC5 use.

For broadcast traffic, there is no bearer concept. Therefore, each of the message may have different characteristics according to the application requirements. The 5QI should then be used in the similar manner as that of the PPPP/PPPR, i.e. to be tagged with each of the packet. 5QI is able to represent all the characteristics needed for the PC5 broadcast operation, e.g. latency, priority, reliability, etc. A group of V2X broadcast specific 5QIs (i.e. VQIs) could be defined for PC5 use.

NOTE 1: The 5QI used for PC5 may be different from that used for Uu even for the same V2X service, e.g. the PDB for the PC5 can be longer than that for the Uu as it is a direct link. The 5QIs used for PC5 is named VQI for differentiation.

NOTE 2: A mapping between the EPS V2X QoS parameters, e.g. PPPP and PPPR, with the new

VQIs, e.g. similar to the non-GBR 5QIs defined in TS 23.501 [7], will be defined in normative phase for broadcast operation.

NOTE 3: The working assumption is that NR PC5 design support the use of V2X 5QIs.

NOTE 4: AS layer may handle unicast, groupcast and broadcast traffic by taking all their priorities, e.g. indicated by VQI, into account.

6.19.1.3 V2X 5QI (VQI) values for PC5 broadcast use

A set of new VQIs for V2X use will be defined in normative phase reflecting the service requirements documented in TS 22.186 [4].

NOTE 1: The working assumption is that non-standardized VQI is not supported in this release.

NOTE 2: Whether per packet or per QoS flow QoS Model is used depends on RAN decision.

6.19.2 Procedures

Editor's note: This clause describes procedures to use the new QoS model for PC5 communication. It depends on RAN development as well.

6.19.2.1 QoS support for unicast communication over PC5 interface

6.19.2.1.0 General

To enable QoS support for eV2X one-to-one communication over PC5 interface, the followings procedures need to be supported.

Editor's note: The following procedures may be further updated depending on the progress on PC5 QoS Model.

6.19.2.1.1 QoS parameters provision to UE and NG-RAN

The PC5 QoS parameters and PC5 QoS rule are provisioned to the UE as part of service authorization parameters using the solution defined for Key Issue #5. The PC5 QoS rule is used to map the V2X services (e.g. PSID or ITS-AIDs of the V2X application) to the PC5 QoS flow. The PC5 QoS parameters retrieved by the PCF from the UDR are provided to the NG-RAN via AMF. The AMF stores such information as part of the UE context. For subsequent procedures (e.g., Service request, Handover), the provision of the PC5 QoS parameters via N2 will follow

the description as per clause 6.6.2.

NOTE 1: The UE-PC5-AMBR is provided by the UDM and the details will follow the description as per Solution #6.

The PC5 QoS parameters provisioning to the UE and NG-RAN could be triggered by the UE Policy container included in the NAS message provided by the UE. The PCF sends to the AMF the updated PC5 QoS parameters for NG-RAN when needed.

NOTE 2: The detailed PC5 QoS parameters used by NG-RAN will be identified during the normative work phase.

NOTE 3: NG-RAN is configured with static parameters for network scheduled resources allocation mode to support PC5 QoS.

6.19.2.1.2 QoS parameters negotiation between UEs

The PC5 QoS parameters are negotiated at the establishment of one-to-one communication procedure, so the one-to-one communication establishment procedure defined in TS 23.303 [8] is enhanced to support PC5 QoS parameters negotiation between two UEs. After the PC5 QoS parameters negotiation procedure, the same QoS is used in both directions.

[“ Establishment of secure layer-2 link over PC5 ” と題する、3 G P P T R 23 . 7 8 6 V 1 . 0 . 0 の図 6 . 1 9 . 2 . 1 . 2 - 1 は、図 8 として複製される]

[外 6]

UEs engaged in one to one communication negotiate PC5 QoS parameters during the link establishment procedure.

1. UE-1 sends a Direct Communication Request message to UE-2 in order to trigger mutual authentication. This message includes the requested PC5 QoS parameters.
2. UE-2 initiates the procedure for mutual authentication. The UE-2 includes the accepted PC5 QoS parameters in the Response message.

NOTE: This procedure is aligned with Solution #11 (clause 6.11).

6.19.2.1.3 QoS handling for eV2X communication

When PC5 unicast is used for the transmission of eV2X messages, the following principles are applied for both network scheduled operation mode and UE autonomous resources selection mode:

- PC5 QoS parameters defined in clause 6.19.1.2 applies to the eV2X communication over PC5.
- The eV2X message is sent on the PC5 QoS flow established using the procedure described in clause 6.19.2.1.2.
- The mapping of application layer eV2X message to PC5 QoS parameters is based on the PC5 QoS rule.

When the network scheduled operation mode is used, following additional principles apply:

- UE provides PC5 QoS parameter information to the gNB for resources request.
- When the gNB receives a request for PC5 resource from a UE, the gNB can authorize the requested PC5 QoS parameter based on the PC5 QoS parameters received from AMF.
- gNB can use the PC5 QoS parameter information for PC5 QoS handling.

When the autonomous resources selection mode is used, following additional principle applies:

- The UE can use the PC5 QoS parameter for PC5 QoS handling based on the provisioned information described in clause 6.19.2.1.1.

6.19.2.2 QoS support for broadcast communication over PC5 interface

When PC5 broadcast is used for the transmission of eV2X messages, the following principles are followed for both network scheduled operation mode and UE autonomous resources selection mode:

- PC5 QoS parameters (e.g. VQI) defined in clause 6.19.1.2 applies to the eV2X

communication over PC5.

- The application layer sets the PC5 QoS parameters for each eV2X message when passing it to V2X layer for transmission.

When the network scheduled operation mode is used, following additional principles apply:

- UE provides PC5 QoS information reflecting PC5 QoS parameters to the gNB for resources request.
- gNB can use the PC5 QoS information reflecting PC5 QoS parameters for QoS handling.

When the autonomous resources selection mode is used, following additional principle applies:

- The UE can use the PC5 QoS parameters for PC5 QoS handling.

NOTE: The choice of per packet QoS model or bearer based QoS model for broadcast is based on RAN decisions.

6.19.2.3 QoS support for group communication over PC5 interface

The procedure on QoS support for group communication over PC5 interface is described in clause 6.21.2 (Solution #21).

6.19.3 Impact on existing entities and interfaces

Following are the impacts to the UE and other NFs:

- UE needs to support new QoS model for PC5 communication.
- AMF provides NG-RAN with the QoS parameters for PC5 communication fetched from PCF in associating N2 messages for different procedures.
- NG-RAN receives QoS parameters for PC5 communication from AMF and enforces QoS parameter for the network schedule mode.
- UDR stores QoS parameters for PC5 communication.

Editor's note: It is FFS if mapping of PPPP, PPPR to the new VQI would be necessary for broadcast traffic.

6.19.4 Topics for further study

Editor's note: This clause describes topics for further study.

6.19.5 Conclusions

The solution captured in clauses 6.19.1 to 6.19.3 should move to normative phase.