METHOD FOR PC5 LINK ESTABLISHMENT, DEVICE, AND SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to Chinese Patent Application No. 201910365449.0, filed in China on April 30, 2019, which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] Embodiments of this disclosure relate to the field of communications technologies, and in particular, to a method for PC5 link establishment, a device, and a system.

BACKGROUND

[0003] With the continuous development of communications technologies, vehicle to X (V2X) technologies such as communication interactions of vehicle to vehicle (V2V), vehicle to pedestrian (V2P), and vehicle to infrastructure (V2I) have emerged. V2X services such as V2V and V2P may be transmitted through a PC5 interface between user equipments (UE).

[0004] For example, currently for transmitting a 5G NR–based V2X service between UE 1 and UE 2 through a PC5 interface, a PC5 link needs to be established between UE 1 and UE 2 in advance. Specifically, UE 1 broadcasts a direct communication request message (hereinafter referred to as direct communication request message 1) that carries at least a layer 2 address of UE 1. In this case, UE 2 near UE 1 can reply to UE 1 with a direct communication accept message after UE 2 receives direct communication request message 1. Thus, UE 1 can establish the PC5 link with UE 2.

[0005] However, in the foregoing process, in one aspect, when UE 1 needs to establish another PC5 link for the same service with another UE, UE 1 again broadcasts a direct communication request message in which the layer 2 address of UE 1 may have been changed. Therefore, UE 2 may establish another PC5 link with UE 1 after receiving the direct communication request message broadcast again. In other words, a plurality of PC5 links for the same service may be established between UE 1 and UE 2, resulting in waste of air interface resources. In another aspect, when the foregoing direct communication request message 1 also carries identifiers of a plurality of UEs, only some of the UEs may reply to UE 1 with direct communication accept messages. As a result, UE 1 may fail to identify which UEs accept the direct communication request, further leading to a PC5 link establishment failure. Therefore, in the foregoing two aspects, PC5 links between UEs cannot be well established.

SUMMARY

[0006] Embodiments of this disclosure provide a method for PC5 link establishment, a device, and a system, to resolve a problem that PC5 links between UEs cannot be well established in the related art.

[0007] To resolve the foregoing technical problem, this disclosure is implemented as follows:

[0008] According to a first aspect, an embodiment of this disclosure provides a method for PC5 link establishment, applied to first UE and including: sending a direct communication request message, where the direct communication request message carries an identifier of the first UE, and is used to request establishment of a PC5 link; and receiving a direct communication accept message sent by second UE, where the direct communication accept message carries an identifier of the second UE, and is used to accept the establishment of the PC5 link with the first UE.

[0009] According to a second aspect, an embodiment of this disclosure provides a method for PC5 link establishment, applied to second UE and including: receiving a direct communication request message sent by first UE, where the direct

communication request message carries an identifier of the first UE, and is used to request establishment of a PC5 link; and sending a direct communication accept message to the first UE, where the direct communication accept message carries an identifier of the second UE, and is used to accept the establishment of the PC5 link with the first UE.

[0010] According to a third aspect, an embodiment of this disclosure provides UE. The UE is first UE, and includes a sending module and a receiving module, where the sending module is configured to send a direct communication request message, where the direct communication request message carries an identifier of the first UE, and is used to request establishment of a PC5 link; and the receiving module is configured to receive a direct communication accept message sent by second UE, where the direct communication accept message carries an identifier of the second UE, and is used to accept the establishment of the PC5 link with the first UE.

[0011] According to a fourth aspect, an embodiment of this disclosure provides UE. The UE is second UE, and includes a receiving module and a sending module, where the receiving module is configured to receive a direct communication request message sent by first UE, where the direct communication request message carries an identifier of the first UE, and is used to request establishment of a PC5 link; and the sending module is configured to send a direct communication accept message to the first UE, where the direct communication accept message carries an identifier of the second UE, and is used to accept the establishment of the PC5 link with the first UE.

[0012] According to a fifth aspect, an embodiment of this disclosure provides UE, including a processor, a memory, and a computer program stored in the memory and capable of running on the processor, where when the computer program is executed by the processor, the steps of the method for PC5 link establishment according to the first aspect are implemented.

[0013] According to a sixth aspect, an embodiment of this disclosure provides UE, including a processor, a memory, and a computer program stored in the memory and capable of running on the processor, where when the computer program is executed by

the processor, the steps of the method for PC5 link establishment according to the second aspect are implemented.

[0014] According to a seventh aspect, an embodiment of this disclosure provides a communications system, where the communications system includes the UE in the third aspect and the UE in the fourth aspect.

[0015] Alternatively, the communications system includes the UE in the fifth aspect and the UE in the sixth aspect.

[0016] According to an eighth aspect, an embodiment of this disclosure provides a computer-readable storage medium, where the computer-readable storage medium stores a computer program, and when the computer program is executed by a processor, the steps of the method for PC5 link establishment according to the first aspect and the second aspect are implemented.

[0017] In the embodiments of this disclosure, the first UE may send the direct communication request message, and receive the direct communication accept message sent by the second UE, where the direct communication request message carries the identifier of the first UE, and is used to request the establishment of the PC5 link, and the direct communication accept message carries the identifier of the second UE, and is used to accept the establishment of the PC5 link with the first UE. In this solution, because the direct communication request message carries the identifier that uniquely identifies the first UE, and the direct communication accept message carries the identifier that uniquely identifies the second UE, the first UE and the second UE can recognize each other. This not only ensures that the PC5 link can be successfully established between the first UE and the second UE, but also ensures that only one PC5 link for a same service is established between the first UE and the second UE. In this way, a PC5 link between UEs can be well established.

BRIEF DESCRIPTION OF DRAWINGS

[0018] FIG. 1 is a schematic architectural diagram of a communications system according to an embodiment of this disclosure;

[0019] FIG. 2 is a first flowchart of a method for PC5 link establishment according to an embodiment of this disclosure;

[0020] FIG. 3 is a second flowchart of a method for PC5 link establishment according to an embodiment of this disclosure;

[0021] FIG. 4 is a schematic structural diagram of UE according to an embodiment of this disclosure;

[0022] FIG. 5 is a schematic structural diagram of another UE according to an embodiment of this disclosure; and

[0023] FIG. 6 is a schematic diagram of hardware of UE according to an embodiment of this disclosure.

DESCRIPTION OF EMBODIMENTS

[0024] The following clearly and completely describes the technical solutions in the embodiments of this disclosure with reference to the accompanying drawings in the embodiments of this disclosure. Apparently, the described embodiments are merely some rather than all of the embodiments of this disclosure. All other embodiments obtained by persons of ordinary skill in the art without creative efforts based on the embodiments of this disclosure shall fall within the protection scope of this disclosure.

[0025] In the embodiments of this disclosure, terms such as "an example" or "for example" are used to represent examples, illustrations, or explanations. Any embodiment or design solution described as "an example" or "for example" in the embodiments of this disclosure shall not be interpreted as being more preferred or advantageous than other embodiments or design solutions. Specifically, the terms such as "an example" or "for example" are used to present related concepts in a specific manner.

[0026] The following first explains some nouns/terms in the claims and the specification of this application as an example.

[0027] In the descriptions of the embodiments of this disclosure, "a plurality of" means two or more than two, for example, a plurality of processing units mean two or

more processing units; a plurality of elements mean two or more elements; or the like, unless otherwise specified.

[0028] The term "and/or" in the specification describes an association relationship for describing associated objects and represents that three relationships may exist. For example, A and/or B may represent the following three cases: Only A exists, both A and B exist, and only B exists. The symbol "/" herein indicates an "or" relationship of associated objects. For example, A/B means A or B.

[0029] The terms are described as follows:

[0030] Provider service identifier (PSID): indicates a service that UE needs to transmit.

[0031] Source layer 2 identifier (source layer2 Identifier, source L2 ID): indicates a layer 2 address of UE that sends a message. For example, if UE 1 sends a message carrying a source layer2 identifier, the source layer2 identifier is a layer 2 address of UE 1.

[0032] PC5 link: indicates a unicast link that transmits a service between two UEs through a PC5 interface.

[0033] According to a method for PC5 link establishment in this embodiment of this disclosure, first UE may send a direct communication request message, and receive a direct communication accept message sent by second UE, where the direct communication request message carries an identifier of the first UE, and is used to request establishment of a PC5 link, and the direct communication accept message carries an identifier of the second UE, and is used to accept the establishment of the PC5 link with the first UE. In this solution, because the direct communication request message carries the identifier that uniquely identifies the first UE, and the direct communication accept message carries the identifier that uniquely identifies the second UE, the first UE and the second UE can recognize each other. This not only ensures that the PC5 link can be successfully established between the first UE and the second UE, but also ensures that only one PC5 link for a same service is established between the first UE and the second UE. In this way, a PC5 link between UEs can be well established.

[0034] The method for PC5 link establishment, the device, and the system in the embodiments of this disclosure may be applied to communications systems, for example, a long term evolution (LTE) system, a new radio (NR) system, or a plurality of communications fusion systems, and may be specifically applied to transmission of a V2X service, such as V2V or V2P, through a PC5 interface between UEs based on the communications system.

[0035] For example, FIG. 1 is a schematic architectural diagram of a communications system according to an embodiment of this disclosure. As shown in FIG. 1, the communications system may include at least one UE (UE 101 and UE 102 in FIG. 1 are used as an example of the at least one UE). As shown in FIG. 1, a PC5 link may be established between two UEs of the at least one UE through a PC5 interface, and a service may be transmitted through the established PC5 link.

[0036] For example, the UE is a device that provides a user with voice and/or data connectivity, a handheld device with a wireless or wired connection function, or another processing device connected to a wireless modem. The UE may communicate with one or more core network devices through a radio access network (RAN). The UE may be a mobile terminal, such as a mobile phone (or referred to as a "cellular" phone) and a computer with a mobile terminal, or may be a portable, pocket-sized, handheld, computer built-in or vehicle-mounted mobile apparatus, which exchanges a voice and/or data with the RAN. For example, the UE is a device such as a personal communication service (PCS) phone, a cordless telephone set, a session initiation protocol (SIP) phone, a wireless local loop (WLL) station, or a personal digital assistant (PDA). The UE may also be referred to as a user agent, a terminal device, or the like.

[0037] The method for PC5 link establishment provided in this embodiment of this disclosure may be applied to but is not limited to the following two scenarios. The following provides an exemplary description by using an example in which UE 1 is UE that sends a direct communication request message (a UE that initiates PC5 link establishment), and UE 2 and/or UE 3 is UE(s) that send(s) a direct communication accept message (direct communication accept).

[0038] First scenario: In a case that a V2X application layer of UE 1 provides an identifier of UE 2 and an identifier of UE 3 (that is, UE 1 knows an identifier of at least one target UE (user info)), UE 1 broadcasts the direct communication request message carrying a source layer2 identifier, an application layer ID (application layer ID) of UE 2, and an application layer ID of UE 3. After receiving the direct communication request message, UE 2 and UE 3 determine, based on the application layer IDs (for example, based on whether the direct communication request message includes the application layer IDs), whether to send a direct communication accept message to UE 1, and then determine whether to establish a PC5 link with UE 1. A direct communication accept message sent by UE as a reply does not carry an identifier of the UE.

[0039] It should be noted that, in the first scenario, if UE 1 receives only one direct communication accept message, because the direct communication accept message does not carry an identifier of a corresponding UE (a UE that sends the direct communication accept message), UE 1 cannot identify whether UE 2 or UE 3 accepts the direct communication request message sent by UE 1. In this case, UE 1 may fail to establish the PC5 links (that is, UE 1 cannot establish the PC5 link with UE 2 or the PC5 link with UE 3).

[0040] To resolve the problem in the first scenario, in the method for PC5 link establishment provided in this embodiment of this disclosure, the direct communication request message carries the identifier of UE 1, and the direct communication accept message carries the identifier of the corresponding UE (if UE 2 replies with the direct communication accept message, the direct communication accept message carries the identifier of UE 2 (for example, the application layer ID of UE 2); or if UE 3 replies with the direct communication accept message, the direct communication accept message carries the identifier of UE 3 (for example, the application layer ID of UE 3)). Therefore, when receiving only one direct communication accept message, UE 1 can identify, based on the identifier of the corresponding UE carried in the direct communication accept message, whether UE 2 or UE 3 replies with the direct communication accept message. In this way, UE 1 can successfully establish a PC5 link with the UE (UE 2 or UE 3) that replies with the direct communication accept message.

[0041] Second scenario: In a case that UE 1 does not know any UE identifier, UE 1 broadcasts a direct communication request message carrying a source layer2 identifier. After receiving the direct communication request message, UE 2 and/or UE 3 may determine, based on service interests (that is, whether a service needs to be transmitted), whether to send the direct communication accept message to UE 1, and further determine whether to establish the PC5 link with UE 1. A direct communication accept message sent by UE as a reply does not carry an identifier of the UE.

[0042] It should be noted that, it can be learned from the description of the second scenario that UE 1 does not need to know whether UE 2 or UE 3 replies to the direct communication request of UE 1. However, if UE 1 has established one PC5 link for service 1 with UE 2, and needs to establish PC5 links for service 1 with more UEs, UE 1 broadcasts a direct communication request message again. However, from the perspective of security, a source layer2 identifier carried in the direct communication request message broadcast again by UE 1 may be different from the source layer2 identifier carried in the previously broadcast direct communication request message (that is, the layer 2 address of UE 1 is changed). In this case, when UE 2 also needs to establish PC5 links for service 1 with more UEs, UE 2 may establish another PC5 link with UE 1 after receiving the direct communication request message broadcast again by UE 1. As a result, UE 1 and UE 2 may establish two or more PC5 links for service 1. However, establishing a plurality of PC5 links for a same service between two UEs is unnecessary, and only leads to waste of air interface resources.

[0043] To resolve the problem in the second scenario, in the method for PC5 link establishment in this embodiment of this disclosure, the direct communication request message carries the identifier of UE 1, and the direct communication accept message carries the identifier of the corresponding UE (if UE 2 replies with the direct communication accept message, the direct communication accept message carries the identifier of UE 2; or if UE 3 replies with the direct communication accept message, the direct communication accept message carries the identifier of UE 3). Therefore, after receiving the direct communication accept message, UE 1 can identify, based on the identifier of the corresponding UE carried in the direct communication accept

message, whether UE 2 or UE 3 replies with the direct communication accept message. In this way, UE 1 can successfully establish the PC5 link with UE 2 that replies with the direct communication accept message, and/or successfully establish the PC5 link with UE 3 that replies with the direct communication accept message.

[0044] It should be noted that the following problem may also exist in the second scenario: Because each UE generates its own layer 2 address, when UE 1 receives direct communication accept messages (carrying layer 2 addresses of UEs) sent by a plurality of UEs, source layer2 identifiers carried in direct communication accept messages sent by different UEs may be the same (this case has a relatively low probability). As a result, UE 1 may fail to determine whether the direct communication accept messages are direct communication accept messages sent by different UEs, or one direct communication accept message sent twice by same UE (for example, the UE does not receive a confirmation message from UE 1 in time).

[0045] To resolve the foregoing problem, in the method for PC5 link establishment in this embodiment of this disclosure, the direct communication request message carries the identifier of UE 1, and the direct communication accept message carries the identifier of the corresponding UE (if UE 2 replies with the direct communication accept message, the direct communication accept message carries the identifier of UE 2; or if UE 3 replies with the direct communication accept message, the direct communication accept message carries the identifier of UE 3). Therefore, when receiving a plurality of direct communication accept messages carrying a same source layer2 identifier, UE 1 can identify whether the direct communication accept messages are direct communication accept messages sent by different UEs, or one direct communication accept message sent repeatedly by a same UE (for example, the UE does not receive a confirmation message from UE 1 in time).

[0046] In conclusion, the method for PC5 link establishment provided in this embodiment of this disclosure can resolve a problem that a PC5 link between UEs cannot be well established in the related art.

[0047] With reference to the accompanying drawings, the following describes in detail a method for PC5 link establishment, a device, and a system provided in the

embodiments of this disclosure based on specific embodiments and application scenarios of the embodiments.

[0048] Based on the communications system shown in FIG. 1, an embodiment of this disclosure provides a method for PC5 link establishment. As shown in FIG. 2, the method may include the following step 201 to step 204.

[0049] Step 201. First UE sends a direct communication request message.

[0050] It may be understood that the first UE broadcasts the direct communication request message. All UEs near the first UE can receive the direct communication request message.

[0051] Any UE that receives the direct communication request message may or may not reply with a direct communication accept message. This may be specifically determined based on an actual usage status, and is not limited in this embodiment of this disclosure.

[0052] For example, if both second UE and third UE are near the first UE, the second UE may receive the direct communication request message, and the third UE may also receive the direct communication request message. The following provides an exemplary description by using an example in which the second UE replies with the direct communication accept message, but the third UE does not reply with the direct communication accept message.

[0053] Step 202a. Second UE receives the direct communication request message sent by the first UE.

[0054] The second UE receives the direct communication request message broadcast by the first UE. The direct communication request message carries an identifier of the first UE, and is used to request establishment of a PC5 link.

[0055] In this embodiment of this disclosure, the identifier of the first UE is used to uniquely identify the first UE. A layer 2 address of the first UE is not the identifier of the first UE.

[0056] It should be noted that, in this embodiment of this disclosure, an identifier of UE is an identifier that uniquely identifies the UE. Because a layer 2 address of UE is not an identifier that uniquely identifies the UE, and the UE may have a plurality of

different layer 2 addresses at the same time, the layer 2 address of the UE is not the identifier of the UE.

[0057] Optionally, the identifier of the first UE is an application layer ID of the first UE, an international mobile subscriber identification number (IMSI) of the first UE, a permanent equipment identifier (PEI) of the first UE, or another identifier of the first UE that is used to uniquely identify the first UE. This is not limited in this embodiment of this disclosure.

[0058] The application layer ID of the first UE may be provided by a V2X service, or self-designed by the first UE. This may be specifically determined based on an actual usage status, and is not limited in this embodiment of this disclosure.

[0059] It should be noted that, after receiving the direct communication request message sent by the first UE, the second UE may determine, based on a preset rule, whether to reply with the direct communication accept message.

[0060] Optionally, the direct communication request message further carries the layer 2 address of the first UE, and may further carry other information. This may be specifically determined according to an actual usage requirement, and is not limited in this embodiment of this disclosure.

[0061] Step 202b. A third UE receives the direct communication request message sent by the first UE.

[0062] The third UE does not send the direct communication accept message to the first UE.

[0063] Step 203. The second UE sends a direct communication accept message to the first UE.

[0064] Step 204. The first UE receives the direct communication accept message sent by the second UE.

[0065] The direct communication accept message carries an identifier of the second UE, and is used to accept the establishment of the PC5 link with the first UE.

[0066] In this embodiment of this disclosure, the identifier of the second UE is used to uniquely identify the second UE. A layer 2 address of the second UE is not the identifier of the second UE.

[0067] Optionally, the identifier of the second UE is an application layer ID of the second UE, an IMSI of the second UE, a PEI of the second UE, or another identifier that is used to uniquely identify the second UE. This is not limited in this embodiment of this disclosure.

[0068] The application layer ID of the second UE may be provided by a V2X service, or self-designed by the second UE. This may be specifically determined based on an actual usage status, and is not limited in this embodiment of this disclosure.

[0069] Optionally, the direct communication accept message further carries the layer 2 address of the second UE, and may also carry other information. This may be specifically determined according to an actual usage requirement, and is not limited in this embodiment of this disclosure.

[0070] According to the method for PC5 link establishment in this embodiment of this disclosure, the first UE may send the direct communication request message, and receive the direct communication accept message sent by the second UE, where the direct communication request message carries the identifier of the first UE, and is used to request the establishment of the PC5 link, and the direct communication accept message carries the identifier of the second UE, and is used to accept the establishment of the PC5 link with the first UE. In this solution, because the direct communication request message carries the identifier that uniquely identifies the first UE, and the direct communication accept message carries the identifier that uniquely identifies the second UE, the first UE and the second UE can recognize each other. This not only ensures that the PC5 link can be successfully established between the first UE and the second UE, but also ensures that only one PC5 link for a same service is established between the first UE and the second UE. In this way, a PC5 link between UEs can be well established.

[0071] In the foregoing first scenario, optionally, the direct communication request message further carries an identifier of at least one target UE. An identifier of each target UE in the identifier of the at least one target UE may uniquely identify the target UE. The identifier of each target UE may be an application layer ID of the target UE, an IMSI of the target UE, a PEI of the target UE, or another identifier that is used to uniquely identify the target UE. This is not limited in this embodiment of this disclosure.

[0072] The direct communication request message is specifically used to request establishment of a PC5 link with the at least one target UE. Specifically, the direct communication request message is used to request establishment of a PC5 link with each of the at least one target UE. The identifier of the at least one target UE may include the identifier of the second UE (in this case, the second UE is a target UE), or may not include the identifier of the second UE (in this case, the second UE is not the target UE). This may be specifically determined according to an actual usage requirement, and is not limited in this embodiment of this disclosure.

[0073] For example, step 203 may be specifically implemented by using the following step 203a.

[0074] Step 203a. In a case that the identifier of the at least one target UE includes the identifier of the second UE, the second UE sends the direct communication accept message to the first UE.

[0075] It may be understood that, in a case that the second UE detects that the identifier of the at least one target UE that is carried in the direct communication request message includes the identifier of the second UE, the second UE sends the direct communication accept message to the first UE.

[0076] It should be noted that, in a case that the third UE detects that the identifier of the at least one target UE that is carried in the direct communication request message does not include the identifier of the third UE, the third UE dost not reply to the direct communication request message (that is, the third UE does not send the direct communication accept message to the first UE).

[0077] In this embodiment of this disclosure, the identifier of the at least one target UE carried in the direct communication request message can identify target UE with which the first UE needs to establish a PC5 link. Therefore, the first UE can establish a better PC5 link.

[0078] It should be noted that, in the foregoing first scenario, in this embodiment of this disclosure, the second UE may further determine, with reference to information that is in the identifier of the at least one target UE and that is different from the identifier of the second UE, whether to send the direct communication accept message

to the first UE. This may be specifically determined according to an actual usage requirement, and is not limited in this embodiment of this disclosure.

[0079] Further optionally, the direct communication request message further carries an identifier of a first service. The identifier of the first service is used to indicate the first service. The target UE is specifically UE that is in the at least one target UE and that needs to transmit the first service.

[0080] For example, step 203a may be specifically implemented by using the following step 203a1.

[0081] Step 203a1. In a case that the identifier of the at least one target UE includes the identifier of the second UE, and the second UE needs to transmit the first service, the second UE sends the direct communication accept message to the first UE.

[0082] It may be understood that, in a case that the second UE detects that the direct communication accept message carries the identifier of the at least one target UE and the identifier of the first service, detects that the identifier of the at least one target UE includes the identifier of the second UE, and determines that the second UE needs to transmit the first service (that is, the second UE is a target UE), the second UE sends the direct communication accept message to the first UE.

[0083] It should be noted that, in a case that the third UE detects that the identifier of the at least one target UE does not include the identifier of the third UE, and/or, determines that the third UE does not need to transmit the first service, the third UE does not reply to the direct communication request message.

[0084] In this embodiment of this disclosure, the identifier of the at least one target UE and the identifier of the first service that are carried in the direct communication request message can further identify the target UE with which the first UE needs to establish the PC5 link. Therefore, the first UE can establish a better PC5 link.

[0085] In the foregoing second scenario, optionally, the direct communication request message further carries an identifier of a first service. The identifier of the first service is used to indicate the first service. The direct communication request message is specifically used to request the establishment of the PC5 link with the target UE. The target UE is UE that needs to transmit the first service.

[0086] For example, step 203 may be specifically implemented by using the following step 203b.

[0087] Step 203b. In a case that the second UE needs to transmit the first service, the second UE sends the direct communication accept message to the first UE.

[0088] It may be understood that, in a case that the second UE detects that the direct communication request message carries the identifier of the first service, and the second UE needs to transmit the first service, the second UE sends the direct communication accept message to the first UE.

[0089] It should be noted that, in a case that the third UE detects that the direct communication request message carries the identifier of the first service, but the third UE does not need to transmit the first service, the third UE does not reply to the direct communication request message.

[0090] In this embodiment of this disclosure, the identifier of the first service carried in the direct communication request message can further identify the target UE with which the first UE needs to establish the PC5 link, and help UE (for example, the second UE) that receives the direct communication request message to determine, based on the identifier of the first service, whether to reply to the direct communication request message. Therefore, the first UE can establish a better PC5 link.

[0091] Optionally, the direct communication accept message further carries the identifier of the first service, where the direct communication accept message is specifically used to accept establishment of a PC5 link with the first UE for transmitting the first service.

[0092] It may be understood that, the direct communication accept message further carries the identifier of the first service, which can clearly indicate that the second UE accepts the establishment of the PC5 link with the first UE for transmitting the first service, helping the first UE establish the PC5 link.

[0093] It should be noted that, in the foregoing second scenario, in this embodiment of this disclosure, the second UE may further determine, with reference to information that is different from the identifier of the first service, whether to send the direct communication accept message to the first UE. This may be specifically determined

according to an actual usage requirement, and is not limited in this embodiment of this disclosure.

[0094] Optionally, with reference to FIG. 2, as shown in FIG. 3, after step 204, the method for PC5 link establishment provided in this embodiment of this disclosure may further include the following step 205 and step 206.

[0095] Step 205. The first UE saves an association relationship among a first link identifier, an identifier of the first UE, an identifier of the second UE, and an identifier of a first service.

[0096] The first link identifier is used to indicate the PC5 link (hereinafter referred to as first link) established between the first UE and the second UE.

[0097] The first link identifier is an identifier generated by the first UE according to its own requirements to indicate the PC5 link established between the first UE and the second UE. For a specific generation method, refer to any related art. This is not limited in this embodiment of this disclosure.

[0098] In this embodiment of this disclosure, the first UE may save the association relationship (hereinafter referred to as first association relationship) among the first link identifier, the identifier of the first UE, the identifier of the second UE, and the identifier of the first service in text of the first link in the first UE. For a format of the link text, refer to any related art. Details are not described herein. Optionally, the first association relationship may be specifically an association relationship among the first link identifier, the identifier of the first UE, the identifier of the second UE, the identifier of the first service, the layer 2 address of the first UE, and the layer 2 address of the second UE.

[0099] In this embodiment of this disclosure, the first UE saves the first association relationship, to identify the second UE more conveniently, thereby helping the first UE establish the PC5 link with the second UE.

[00100] Step 206. The second UE saves an association relationship among a target link identifier, the identifier of the first UE, the identifier of the second UE, and the identifier of the first service.

[00101] The target link identifier is used to indicate the PC5 link (the same as the first link in step 205) established between the first UE and the second UE.

[00102] The target link identifier is an identifier generated by the second UE according to its own requirements to indicate the PC5 link established between the first UE and the second UE. For a specific generation method, refer to any related art. This is not limited in this embodiment of this disclosure.

[00103] In this embodiment of this disclosure, the second UE may save the association relationship (hereinafter referred to as second association relationship) among the target link identifier, the identifier of the first UE, the identifier of the second UE, and the identifier of the first service in text of the first link in the second UE. For a format of the link text, refer to any related art. Details are not described herein. Optionally, the second association relationship may be specifically an association relationship among the target link identifier, the identifier of the first UE, the identifier of the second UE, the identifier of the first service, the layer 2 address of the first UE, and the layer 2 address of the second UE.

[00104] It should be noted that, the first link identifier may be the same as or different from the target link identifier. This may be specifically determined according to an actual usage requirement, and is not limited in this embodiment of this disclosure.

[00105] It should be noted that step 205 is executed after step 204. However, neither an execution sequence of step 206 and step 203 nor an execution sequence of step 206 and step 204 is limited in this embodiment of this disclosure. For example, the execution sequence of step 206 and step 203 is not limited. Step 203 may be executed before or after step 206, or step 203 and step 206 may be executed simultaneously.

[00106] In this embodiment of this disclosure, the second UE saves the second association relationship, to identify the first UE more conveniently. Therefore, the second UE can better establish the PC5 link with the first UE.

[00107] The following describes in detail specific establishment processes of the two PC5 links provided in this embodiment of this disclosure by using an example in which UE 1 (the first UE) establishes the PC5 links with UE 2 (the second UE) and UE 3 (the third UE) respectively and the identifier of the UE is the application layer ID of the UE.

[00108] The specific establishment process of the first PC5 link is as follows: 1. In a case that a V2X application layer of UE 1 provides an application layer ID of UE 2 and an application layer ID of UE 3, UE 1 sends the direct communication request message through broadcasting, where the direct communication request message carries the identifier of the first service, the layer 2 address of UE 1, the application layer ID of UE 1, the application layer ID of UE 2, and the application layer ID of UE 3. 2. After receiving the direct communication request message sent by UE 1, UE 2 detects that the direct communication request message carries the application layer ID of UE 2, and sends to UE 1 the direct communication accept message carrying the identifier of the first service, the layer 2 address of UE 2, and the application layer ID of UE 2. After receiving the direct communication request message sent by UE 1, UE 3 does not send the direct communication accept message to UE 1, although it detects that the direct communication request message carries the application layer ID of UE 3. After receiving the direct communication request message sent by UE 1, UE 4 does not send a direct communication accept message to UE 1 because it detects that the direct communication request message does not carry an application layer ID of UE 4. 3. UE 2 creates and saves text (hereinafter referred to as text 1) of a PC5 link (hereinafter referred to as PC5 link 1) used to transmit the first service with UE 1 (the first association relationship among identifier 1 of PC5 link 1, the layer 2 address of UE 1, the layer 2 address of UE 2, the identifier of the first service, the application layer ID of UE 1, and the application layer ID of UE 2 is stored in text 1, where identifier 1 of PC5 link 1 is generated by UE 2). UE 1 creates and saves text (hereinafter referred to as text 2) of PC5 link 1 (the second association relationship among identifier 2 of PC5 link 1, the layer 2 address of UE 1, the layer 2 address of UE 2, the identifier of the first service, the application layer ID of UE 1, and the application layer ID of UE 2 is stored in text 2, where identifier 2 of PC5 link 1 is generated by UE 1, and may be different from identifier 1 of PC5 link 1). After UE 2 creates text 1 and UE 1 creates text 2, PC5 link 1 between UE 1 and UE 2 is successfully established, and UE 1 and UE 2 can transmit the first service through PC5 link 1.

[00109] The specific establishment process of the second PC5 link is as follows: 1. In a case that UE 1 does not obtain any UE identifier information through a V2X application layer, UE 1 sends the direct communication request message through broadcasting, where the direct communication request message carries the identifier of the first service, the layer 2 address of UE 1, and the application layer ID of UE 1. 2. If UE 2 needs to transmit the first service after receiving the direct communication request message, UE 2 sends to UE 1 the direct communication accept message carrying the identifier of the first service, the layer 2 address of UE 2, and the application layer ID of UE 2. If UE 3 does not need to transmit the first service after receiving the direct communication request message sent by UE 1, UE 3 does not send a direct communication accept message to UE 1. 3. UE 2 creates and saves text (hereinafter referred to as text 1) of a PC5 link (hereinafter referred to as PC5 link 1) used to transmit the first service with UE 1 (the first association relationship among identifier 1 of PC5 link 1, the layer 2 address of UE 1, the layer 2 address of UE 2, the identifier of the first service, the application layer ID of UE 1, and the application layer ID of UE 2 is stored in text 1, where identifier 1 of PC5 link 1 is generated by UE 2). UE 1 creates and saves text (hereinafter referred to as text 2) of PC5 link 1 (the second association relationship among identifier 2 of PC5 link 1, the layer 2 address of UE 1, the layer 2 address of UE 2, the identifier of the first service, the application layer ID of UE 1, and the application layer ID of UE 2 is stored in text 2, where identifier 2 of PC5 link 1 is generated by UE 1, and may be different from identifier 1 of PC5 link 1). After UE 2 creates text 1 and UE 1 creates text 2, PC5 link 1 between UE 1 and UE 2 is successfully established, and UE 1 and UE 2 can transmit the first service through PC5 link 1.

[00110] As shown in FIG. 4, an embodiment of this disclosure provides UE 300. The UE 300 is first UE, and includes a sending module 301 and a receiving module 302. The sending module 301 is configured to send a direct communication request message, where the direct communication request message carries an identifier of the first UE, and is used to request establishment of a PC5 link. The receiving module 302 is configured to receive a direct communication accept message sent by second UE, where

the direct communication accept message carries an identifier of the second UE, and is used to accept the establishment of the PC5 link with the first UE.

[00111] Optionally, the direct communication request message further carries an identifier of at least one target UE, where the direct communication request message is specifically used to request establishment of a PC5 link with the at least one target UE.

[00112] Optionally, the direct communication request message further carries an identifier of a first service, where the direct communication request message is specifically used to request establishment of a PC5 link with UE that needs to transmit the first service.

[00113] Optionally, the UE 300 further includes a saving module 303. The saving module 303 is configured to: after the receiving module 302 receives the direct communication accept message sent by the second UE, save an association relationship among a first link identifier, the identifier of the first UE, the identifier of the second UE, and the identifier of the first service, where the first link identifier is used to indicate the PC5 link established between the first UE and the second UE.

[00114] It should be noted that, the UE 300 shown in FIG. 4 may include only the sending module 301 and the receiving module 302, or may include the sending module 301, the receiving module 302, and the saving module 303. To clearly illustrate a structure of the UE 300, the saving module 303 is illustrated with a dashed frame in FIG. 4.

[00115] Optionally, the direct communication accept message further carries the identifier of the first service, where the direct communication accept message is specifically used to accept establishment of a PC5 link with the first UE for transmitting the first service.

[00116] Optionally, the identifier of the first UE is an application layer ID of the first UE, an IMSI of the first UE, or a PEI of the first UE; and the identifier of the second UE is an application layer ID of the second UE, an IMSI of the second UE, or a PEI of the second UE.

[00117] The terminal device provided in this embodiment of this disclosure can implement the process in the foregoing embodiment. To avoid repetition, details are not described herein again.

[00118] An embodiment of this disclosure provides UE. The UE may be first UE. The first UE may send a direct communication request message, and receive a direct communication accept message sent by second UE, where the direct communication request message carries an identifier of the first UE, and is used to request establishment of a PC5 link, and the direct communication accept message carries an identifier of second UE, and is used to accept the establishment of the PC5 link with the first UE. In this solution, because the direct communication request message carries the identifier that uniquely identifies the first UE, and the direct communication accept message carries the identifier that uniquely identifies the second UE, the first UE and the second UE can recognize each other. This not only ensures that the PC5 link can be successfully established between the first UE and the second UE, but also ensures that only one PC5 link for a same service is established between the first UE and the second UE. In this way, a PC5 link between UEs can be well established.

[00119] As shown in FIG. 5, an embodiment of this disclosure provides UE 400. The UE 400 is second UE, and includes a receiving module 401 and a sending module 402. The receiving module 401 is configured to receive a direct communication request message sent by first UE, where the direct communication request message carries an identifier of the first UE, and is used to request establishment of a PC5 link. The sending module 402 is configured to send a direct communication accept message to the first UE, where the direct communication accept message carries an identifier of the second UE, and is used to accept the establishment of the PC5 link with the first UE.

[00120] Optionally, the direct communication request message further carries an identifier of at least one target UE, and the sending module 402 is specifically configured to: in a case that the identifier of the at least one target UE includes the identifier of the second UE, send the direct communication accept message to the first UE.

[00121] Optionally, the direct communication request message further carries an identifier of a first service, and the sending module 402 is specifically configured to: in a case that the second UE needs to transmit the first service, send the direct communication accept message to the first UE.

[00122] Optionally, the UE 400 further includes a saving module 403. The saving module 403 is configured to: after the receiving module 401 receives the direct communication request message sent by the first UE, save an association relationship among a target link identifier, the identifier of the first UE, the identifier of the second UE, and the identifier of the first service, where the target link identifier is used to indicate the PC5 link established between the first UE and the second UE.

[00123] It should be noted that, the UE 400 shown in FIG. 5 may include only the receiving module 401 and the sending module 402, or may include the receiving module 401, the sending module 402, and the saving module 403. To clearly illustrate a structure of the UE 400, the saving module 403 is illustrated with a dashed frame in FIG. 5.

[00124] Optionally, the direct communication accept message further carries the identifier of the first service, where the direct communication accept message is specifically used to accept establishment of a PC5 link with the first UE for transmitting the first service.

[00125] Optionally, the identifier of the first UE is an application layer ID of the first UE, an IMSI of the first UE, or a PEI of the first UE; and the identifier of the second UE is an application layer ID of the second UE, an IMSI of the second UE, or a PEI of the second UE.

[00126] The terminal device provided in this embodiment of this disclosure can implement the process in the foregoing embodiment. To avoid repetition, details are not described herein again.

[00127] An embodiment of this disclosure provides UE. The UE may be second UE. The second UE may receive a direct communication request message sent by first UE, and send a direct communication accept message to the first UE, where the direct communication request message carries an identifier of the first UE, and is used to

request establishment of a PC5 link, and the direct communication accept message carries an identifier of the second UE, and is used to accept the establishment of the PC5 link with the first UE. In this solution, because the direct communication request message carries the identifier that uniquely identifies the first UE, and the direct communication accept message carries the identifier that uniquely identifies the second UE, the first UE and the second UE can recognize each other. This not only ensures that the PC5 link can be successfully established between the first UE and the second UE, but also ensures that only one PC5 link for a same service is established between the first UE and the second UE. In this way, a PC5 link between UEs can be well established.

[00128] FIG. 6 is a schematic structural diagram of hardware of UE according to an embodiment of this disclosure. The UE 500 includes but is not limited to: a radio frequency unit 501, a network module 502, an audio output unit 503, an input unit 504, a sensor 505, a display unit 506, a user input unit 507, an interface unit 508, a memory 509, a processor 510, a power supply 511, and the like. A person skilled in the art may understand that a structure of the UE 500 shown in FIG. 6 does not constitute a limitation on the UE, and the UE 500 may include more or fewer components than those shown in the figure, or some components may be combined, or there may be a different component arrangement. In this embodiment of this disclosure, the UE 500 includes but is not limited to: a mobile phone, a tablet computer, a notebook computer, a palmtop computer, a vehicle-mounted UE, a wearable device, a pedometer, or the like.

[00129] The radio frequency unit 501 is configured to: send a direct communication request message, where the direct communication request message carries an identifier of first UE, and is used to request establishment of a PC5 link; and receive a direct communication accept message sent by second UE, where the direct communication accept message carries an identifier of the second UE, and is used to accept the establishment of the PC5 link with the first UE.

[00130] An embodiment of this disclosure provides UE. The UE may be first UE. The first UE may send a direct communication request message, and receive a direct communication accept message sent by second UE, where the direct communication request message carries an identifier of the first UE, and is used to request establishment

of a PC5 link, and the direct communication accept message carries an identifier of second UE, and is used to accept the establishment of the PC5 link with the first UE. In this solution, because the direct communication request message carries the identifier that uniquely identifies the first UE, and the direct communication accept message carries the identifier that uniquely identifies the second UE, the first UE and the second UE can recognize each other. This not only ensures that the PC5 link can be successfully established between the first UE and the second UE, but also ensures that only one PC5 link for a same service is established between the first UE and the second UE. In this way, a PC5 link between UEs can be well established.

[00131] Alternatively, the radio frequency unit 501 is configured to: receive a direct communication request message sent by first UE, where the direct communication request message carries an identifier of the first UE, and is used to request establishment of a PC5 link; and send a direct communication accept message to the first UE, where the direct communication accept message carries an identifier of the second UE, and is used to accept the establishment of the PC5 link with the first UE.

[00132] An embodiment of this disclosure provides UE. The UE may be second UE. The second UE may receive a direct communication request message sent by first UE, and send a direct communication accept message to the first UE, where the direct communication request message carries an identifier of the first UE, and is used to request establishment of a PC5 link, and the direct communication accept message carries an identifier of the second UE, and is used to accept the establishment of the PC5 link with the first UE. In this solution, because the direct communication request message carries the identifier that uniquely identifies the first UE, and the direct communication accept message carries the identifier that uniquely identifies the second UE, the first UE and the second UE can recognize each other. This not only ensures that the PC5 link can be successfully established between the first UE and the second UE, but also ensures that only one PC5 link for a same service is established between the first UE and the second UE. In this way, a PC5 link between UEs can be well established.

[00133] It should be understood that, in this embodiment of this disclosure, the radio frequency unit 501 may be configured to transmit and receive a signal in an information

transmitting/receiving or call process. Specifically, the radio frequency unit 501 receives downlink data from a base station and transmits the downlink data to the processor 510 for processing; and transmits uplink data to the base station. Generally, the radio frequency unit 501 includes but is not limited to an antenna, at least one amplifier, a transceiver, a coupler, a low noise amplifier, a duplexer, and the like. In addition, the radio frequency unit 501 may also communicate with a network and another device via a wireless communications system.

[00134] The UE 500 provides the user with wireless broadband Internet access by using the network module 502, for example, helps the user send or receive an email, browse a web page, access streaming media, and the like.

[00135] The audio output unit 503 may convert audio data received by the radio frequency unit 501 or the network module 502 or stored in the memory 509 into an audio signal and output the audio signal as a sound. In addition, the audio output unit 503 may further provide an audio output (for example, a call signal reception sound or a message reception sound) related to a specific function performed by the UE 500. The audio output unit 503 includes a speaker, a buzzer, a receiver, and the like.

[00136] The input unit 504 is configured to receive an audio or video signal. The input unit 504 may include a graphics processing unit (GPU) 5041 and a microphone 5042. The graphics processing unit 5041 processes image data of a static picture or a video obtained by an image capture apparatus (for example, a camera) in an image capture mode or a video capture mode. A processed image frame may be displayed on the display unit 506. An image frame processed by the graphics processing unit 5041 may be stored in the memory 509 (or another storage medium) or transmitted by the radio frequency unit 501 or the network module 502. The microphone 5042 can receive sounds and process such sounds into audio data. The processed audio data may be converted in a call mode into a format that can be sent by the radio frequency unit 501 to a mobile communication base station for outputting.

[00137] The UE 500 further includes at least one sensor 505, for example, an optical sensor, a motion sensor, and another sensor. Specifically, the optical sensor includes an ambient light sensor and a proximity sensor, where the ambient light sensor can adjust

luminance of the display panel 5061 based on brightness of ambient light, and the proximity sensor can turn off the display panel 5061 and/or backlight when the UE 500 is moved to an ear. As a type of motion sensor, an accelerometer sensor can detect magnitudes of accelerations in all directions (usually three axes), can detect a magnitude and a direction of gravity when the mobile phone is in a static state, and can be applied to UE posture recognition (such as screen switching between portrait and landscape, related games, and magnetometer posture calibration), functions related to vibration recognition (such as pedometer and tapping), and the like. The sensor 505 may also include a fingerprint sensor, a pressure sensor, an iris sensor, a molecular sensor, a gyroscope, a barometer, a hygrometer, a thermometer, an infrared sensor, and the like. Details are not described herein.

[00138] The display unit 506 is configured to display information input by the user or information provided to the user. The display unit 506 may include the display panel 5061. The display panel 5061 may be configured in a form of a liquid crystal display (LCD), an organic light-emitting diode (OLED), or the like.

[00139] The user input unit 507 may be configured to receive input digit or character information and generate key signal input related to user setting and function control of the UE 500. Specifically, the user input unit 507 includes a touch panel 5071 and other input devices 5072. The touch panel 5071 is also referred to as a touchscreen, and may collect a touch operation of the user on or near the touch panel (for example, an operation performed on or near the touch panel 5071 by the user by using any appropriate object or accessory such as a finger or a stylus). The touch panel 5071 may include two parts: a touch detection apparatus and a touch controller. The touch detection apparatus detects a touch orientation of the user, detects a signal brought by the touch operation, and transmits the signal to the touch controller. The touch controller receives touch information from the touch detection apparatus, converts the touch information into touch point coordinates, transmits the touch point coordinates to the processor 510, and receives and executes a command transmitted by the processor 510. In addition, the touch panel 5071 may be implemented in a plurality of forms, for example, as a resistive, capacitive, infrared, or surface acoustic wave touch panel. In

addition to the touch panel 5071, the user input unit 507 may further include other input devices 5072. Specifically, the other input devices 5072 may include but are not limited to a physical keyboard, a function key (for example, a volume control key or a power on/off key), a trackball, a mouse, and a joystick. Details are not described herein.

[00140] Further, the touch panel 5071 may cover the display panel 5061. When detecting a touch operation on or near the touch panel 5071, the touch panel 5071 transmits the touch operation to the processor 510 for determining a type of the touch event. Then, the processor 510 provides a corresponding visual output on the display panel 5061 based on the type of the touch event. Although in FIG. 6, the touch panel 5071 and the display panel 5061 act as two separate parts to implement input and output functions of the UE 500, in some embodiments, the touch panel 5071 and the display panel 5061 may be integrated to implement the input and output functions of the UE 500. This is not specifically limited herein.

[00141] The interface unit 508 is an interface connecting an external apparatus to the UE 500. For example, the external apparatus may include a wired or wireless headphone port, an external power supply (or battery charger) port, a wired or wireless data port, a memory card port, a port for connecting an apparatus with an identification module, an audio input/output (I/O) port, a video I/O port, a headset port, or the like. The interface unit 508 may be configured to receive input (for example, data information and power) from the external apparatus, and transmit the received input to one or more elements of the UE 500, or may be configured to transmit data between the UE 500 and the external apparatus.

[00142] The memory 509 may be configured to store software programs and various data. The memory 509 may mainly include a program storage area and a data storage area. The program storage area may store an operating system, an application program required for at least one function (for example, a sound play function and an image play function), and the like. The data storage area may store data created based on use of the mobile phone (for example, audio data and a phone book), and the like. In addition, the memory 509 may include a high-speed random access memory, and may further include

a non-volatile memory such as a disk storage device, a flash memory device, or another volatile solid-state storage device.

[00143] The processor 510 is a control center of the UE 500, and is connected to all components of the UE 500 by using various interfaces and lines. By running or executing a software program and/or module that is stored in the memory 509 and calling data stored in the memory 509, the processor 510 executes various functions of the UE 500 and processes data, so as to perform overall monitoring on the UE 500. The processor 510 may include one or more processing units. Optionally, the processor 510 may integrate an application processor and a modem processor. The application processor mainly processes an operating system, a user interface, an application program, and the like. The modem processor mainly processes wireless communication. It can be understood that the modem processor may alternatively be not integrated in the processor 510.

[00144] The UE 500 may further include the power supply 511 (for example, a battery) supplying power to each component. Optionally, the power supply 511 may be logically connected to the processor 510 by using a power management system, so that functions such as charge and discharge management and power consumption management are implemented by using the power management system.

[00145] In addition, the UE 500 includes some function modules that are not shown, details of which are not described herein.

[00146] Optionally, an embodiment of this disclosure further provides UE, where the UE is first UE, and the UE includes the processor 510 and the memory 509 that are shown in FIG. 6, and a computer program that is stored in the memory 509 and capable of running on the processor 510. When the computer program is executed by the processor 510, the processes of the foregoing method embodiments are implemented, with the same technical effects achieved. To avoid repetition, details are not described again herein.

[00147] Optionally, an embodiment of this disclosure further provides UE, where the UE is second UE, and the UE includes the processor 510 and the memory 509 that are shown in FIG. 6, and a computer program that is stored in the memory 509 and capable

of running on the processor 510. When the computer program is executed by the processor 510, the processes of the foregoing method embodiments are implemented, with the same technical effects achieved. To avoid repetition, details are not described again herein.

[00148] Optionally, an embodiment of this disclosure further provides a communications system. The communications system includes the first UE and the second UE that are provided in the foregoing embodiments.

[00149] An embodiment of this disclosure further provides a computer-readable storage medium, where the computer-readable storage medium stores a computer program. When the computer program is executed by the processor 510 shown in FIG. 6, the processes of the foregoing method embodiments are implemented, with the same technical effects achieved. To avoid repetition, details are not described herein again. The computer-readable storage medium may be a read-only memory (ROM for short), a random access memory (RAM for short), a magnetic disk, an optical disc, or the like.

[00150] It should be noted that the terms "comprise", "include", or any of their variants in this specification are intended to cover a non-exclusive inclusion, such that a process, method, article, or apparatus that includes a list of elements includes not only those elements but also other elements that are not expressly listed, or further includes elements inherent to such process, method, article, or apparatus. In absence of more constraints, an element preceded by "includes a..." does not preclude the existence of other identical elements in the process, method, article, or apparatus that includes the element.

[00151] According to the description of the foregoing implementations, persons skilled in the art can clearly understand that the method in the foregoing embodiments may be implemented by software on a necessary universal hardware platform or by hardware only. In most cases, the former is a more preferred implementation though. Based on such an understanding, the technical solutions of this disclosure essentially, or the part contributing to the related art may be implemented in a form of a software product. The computer software product is stored in a storage medium (for example, a ROM/RAM, a magnetic disk, or an optical disc), and includes several instructions for

instructing a terminal device (which may be a mobile phone, a computer, a server, an air conditioner, a network device, or the like) to perform the method described in the embodiments of this disclosure.

[00152] The foregoing describes the embodiments of this disclosure with reference to the accompanying drawings. However, this disclosure is not limited to the foregoing specific implementations. The foregoing specific implementations are merely illustrative rather than restrictive. As instructed by this disclosure, persons of ordinary skill in the art may develop many other manners without departing from principles of this disclosure and the protection scope of the claims, and all such manners fall within the protection scope of this disclosure.

CLAIMS

What is claimed is:

1. A method for PC5 link establishment, applied to first user equipment (UE) and comprising:

sending a direct communication request message, wherein the direct communication request message carries an identifier of the first UE, and is used to request establishment of a PC5 link; and

receiving a direct communication accept message sent by second UE, wherein the direct communication accept message carries an identifier of the second UE, and is used to accept the establishment of the PC5 link with the first UE.

2. The method according to claim 1, wherein the direct communication request message further carries an identifier of at least one target UE, wherein

the direct communication request message is specifically used to request establishment of a PC5 link with the at least one target UE.

3. The method according to claim 1 or 2, wherein the direct communication request message further carries an identifier of a first service, wherein

the direct communication request message is specifically used to request establishment of a PC5 link with UE that needs to transmit the first service.

4. The method according to claim 3, wherein after the receiving a direct communication accept message sent by second UE, the method further comprises:

saving an association relationship among a first link identifier, the identifier of the first UE, the identifier of the second UE, and the identifier of the first service, wherein the first link identifier is used to indicate the PC5 link established between the first UE and the second UE.

5. The method according to claim 3, wherein the direct communication accept message further carries the identifier of the first service, wherein

the direct communication accept message is specifically used to accept establishment of a PC5 link with the first UE for transmitting the first service.

6. The method according to claim 1 or 2, wherein the identifier of the first UE is an application layer ID of the first UE, an international mobile subscriber identity (IMSI) of the first UE, or a permanent equipment identifier (PEI) of the first UE; and

the identifier of the second UE is an application layer ID of the second UE, an IMSI of the second UE, or a PEI of the second UE.

7. A method for PC5 link establishment, applied to second user equipment UE and comprising:

receiving a direct communication request message sent by first UE, wherein the direct communication request message carries an identifier of the first UE, and is used to request establishment of a PC5 link; and

sending a direct communication accept message to the first UE, wherein the direct communication accept message carries an identifier of the second UE, and is used to accept the establishment of the PC5 link with the first UE.

8. The method according to claim 7, wherein the direct communication request message further carries an identifier of at least one target UE, wherein

the sending a direct communication accept message to the first UE comprises:

in a case that the identifier of the at least one target UE comprises the identifier of the second UE, sending the direct communication accept message to the first UE.

9. The method according to claim 7 or 8, wherein the direct communication request message further carries an identifier of a first service, wherein

the sending the direct communication accept message to the first UE comprises:

in a case that the second UE needs to transmit the first service, sending the direct communication accept message to the first UE.

10. The method according to claim 9, wherein after the receiving a direct communication request message sent by first UE, the method further comprises:

saving an association relationship among a target link identifier, the identifier of the first UE, the identifier of the second UE, and the identifier of the first service, wherein the target link identifier is used to indicate the PC5 link established between the first UE and the second UE.

11. The method according to claim 9, wherein the direct communication accept message further carries the identifier of the first service, wherein

the direct communication accept message is specifically used to accept establishment of a PC5 link with the first UE for transmitting the first service.

12. The method according to claim 7 or 8, wherein the identifier of the first UE is an application layer ID of the first UE, an international mobile subscriber identity (IMSI) of the first UE, or a permanent equipment identifier (PEI) of the first UE; and

the identifier of the second UE is an application layer ID of the second UE, an IMSI of the second UE, or a PEI of the second UE.

13. First user equipment (UE), comprising a processor, a memory, and a computer program stored in the memory and capable of running on the processor, wherein the computer program is executed by the processor to implement:

sending a direct communication request message, wherein the direct communication request message carries an identifier of the first UE, and is used to request establishment of a PC5 link; and

receiving a direct communication accept message sent by second UE, wherein the direct communication accept message carries an identifier of the second UE, and is used to accept the establishment of the PC5 link with the first UE.

14. The first UE according to claim 13, wherein the direct communication request message further carries an identifier of at least one target UE, wherein

the direct communication request message is specifically used to request establishment of a PC5 link with the at least one target UE.

15. The first UE according to claim 13 or 14, wherein the direct communication request message further carries an identifier of a first service, wherein

the direct communication request message is specifically used to request establishment of a PC5 link with UE that needs to transmit the first service.

16. The first UE according to claim 13 or 14, wherein the identifier of the first UE is an application layer ID of the first UE, an international mobile subscriber identity (IMSI) of the first UE, or a permanent equipment identifier (PEI) of the first UE; and

the identifier of the second UE is an application layer ID of the second UE, an IMSI of the second UE, or a PEI of the second UE.

17. Second user equipment (UE), comprising a processor, a memory, and a computer program stored in the memory and capable of running on the processor, wherein the computer program is executed by the processor to implement:

receiving a direct communication request message sent by first UE, wherein the direct communication request message carries an identifier of the first UE, and is used to request establishment of a PC5 link; and

sending a direct communication accept message to the first UE, wherein the direct communication accept message carries an identifier of the second UE, and is used to accept the establishment of the PC5 link with the first UE.

18. The second UE according to claim 17, wherein the identifier of the first UE is an application layer ID of the first UE, an international mobile subscriber identity (IMSI) of the first UE, or a permanent equipment identifier (PEI) of the first UE; and

the identifier of the second UE is an application layer ID of the second UE, an IMSI of the second UE, or a PEI of the second UE.

19. A communications system, wherein

the communications system comprises the first UE according to any one of claims 13 to 16 and the second UE according to claim 17 or 18.

20. A computer-readable storage medium, wherein the computer-readable storage medium stores a computer program, and when the computer program is executed by a processor, the steps of the method for PC5 link establishment according to any one of claims 1 to 12 are implemented.