

In embodiments of the present disclosure, for a direct communication scenario in the above V2X business scenario, a data transmission method for direct communication is provided to solve resource conflict issues.

In embodiments of the present disclosure, a first terminal and a second terminal are devices at two ends for direct communication in the V2X business scenario, which may establish a sidelink through the direct communication interface (for example, the PC5 interface) and perform user data and control signaling interaction through the sidelink. For example, the first terminal may be the vehicle-mounted device of the vehicle 14 in the network architecture as illustrated in Fig. 1, and the second terminal may be the vehicle-mounted device of other vehicles, or may also be the terminal 13 or the RSU. For another example, the first terminal may be the terminal 13 in the network architecture as illustrated in Fig. 1, and the second terminal may be other terminals, or may also be the vehicle-mounted device of the vehicle 14 or the RSU. In some embodiments, for the same device (for example, the same vehicle-mounted device or the same terminal) it may be the first terminal in some scenarios, and may also be the second terminal in other scenarios.

In embodiments of the present disclosure, the first terminal is referred to as a UE at a direct communication transmitting end, and the second terminal is referred to as a UE at a direct communication receiving end.

The technical solution in the present disclosure is described in several exemplary embodiments.

Fig. 2 is a flowchart illustrating a data transmission method for direct communication according to an exemplary embodiment. The method may be applied to the network structure as illustrated in Fig. 1. The method may include following steps.

At step 201, the access network device transmits information to the first terminal.

Optionally, the access network device transmits DCI to the first terminal, the DCI carrying data transmission parameters.

At step 202, the first terminal transmits sidelink data to the second terminal through a sidelink according to the information.

For example, the first terminal transmits sidelink data to the second terminal through the sidelink according to the DCI transmitted by the access network device.

Optionally, the first terminal receives the DCI transmitted by the access network device through a downlink channel, and transmits the sidelink data to the second terminal through the sidelink according to the data transmission parameters in the DCI.

Optionally, the DCI is configured to schedule sidelink data transmission.

feedback information by the second terminal.

Optionally, the access network device transmits the second configuration signaling to the first terminal and/or the second terminal.

In a possible implementation, the access network device transmits the second configuration signaling to the first terminal and the second terminal respectively. Correspondingly, both the first terminal and the second terminal receive the second configuration signaling transmitted by the access network device.

Optionally, the second configuration signaling is a second RRC signaling, the second RRC signaling including a third newly added field and a fourth newly added field, the third newly added field being configured to indicate the PSFCH resource set, and the fourth newly added field being configured to indicate the second time interval set.

For example, the third newly-added field resourceSetSL in the second RRC signaling PSFCH-config is dedicated to configuring a PSFCH resource used by sidelink HARQ feedback information, and the fourth newly-added field SI-DataToUL-ACK is dedicated to configuring the second time interval set.

In a possible implementation, the access network device transmits the second configuration signaling to the first terminal, and then the first terminal transfers the second configuration signaling to the second terminal.

In another possible implementation, the access network device transmits the second configuration signaling to the second terminal, and then the second terminal transmits the second configuration signaling to the first terminal. The implementation of transmitting the second configuration signaling by the access network device to the second terminal is not limited.

At step 303, the access network device transmits information to the first terminal.

The information may be DCI. The DCI is configured to indicate the first terminal to transmit sidelink data to the second terminal through a sidelink. Optionally, the DCI is configured to indicate the first terminal to transmit the fourth time-frequency resource of the sidelink data to the second terminal.

Optionally, the access network device indicates data transmission parameters to the first terminal in an explicit manner or an implicit manner, the data transmission parameter being configured to indicate the first time-frequency resource and/or the second time-frequency resource.

The access network device indicates the data transmission parameters to the first terminal in an explicit manner as follows. The access network device transmits DCI to the first terminal, the DCI carrying the data transmission parameters configured to indicate the first time-frequency

WHAT IS CLAIMED IS:

1. A data transmission method for direct communication, comprising:
 - transmitting, by a first terminal, sidelink data to a second terminal through a sidelink according to information transmitted by an access network device;
 - receiving, by the first terminal, sidelink hybrid auto repeat request (HARQ) feedback information fed back by the second terminal, the sidelink HARQ feedback information being configured to indicate a receiving state corresponding to the sidelink data; and
 - reporting, by the first terminal, the sidelink HARQ feedback information to the access network device.
2. The method of claim 1, wherein, reporting the sidelink HARQ feedback information to the access network device, comprises:
 - reporting the sidelink HARQ feedback information to the access network device in a first time-frequency resource through a physical uplink control channel (PUCCH).
3. The method of claim 2, wherein, the first time-frequency resource comprises one of following parameters:
 - a PUCCH resource preconfigured for transmitting uplink HARQ feedback information of downlink data;
 - a PUCCH resource preconfigured to be used by the first terminal for reporting the sidelink HARQ feedback; or
 - a PUCCH resource mapped according to a third time-frequency resource used for transmitting the information transmitted by the access network device.
4. The method of claim 1, wherein, receiving sidelink HARQ feedback information fed back by the second terminal, comprises:
 - receiving the sidelink HARQ feedback information fed back by the second terminal in a second time-frequency resource through a physical sidelink feedback channel PSFCH.
5. The method of claim 4, wherein, the second time-frequency resource comprises one of the following parameters:
 - a PSFCH resource preconfigured to be used by the second terminal for transmitting the sidelink HARQ feedback to the first terminal;
 - a PSFCH resource mapped by the second terminal according to a fourth time-frequency resource used for transmitting the sidelink data;
 - a PSFCH resource mapped by the second terminal according to the first time-frequency resource used by the first terminal for reporting the sidelink HARQ feedback information; or

a PSFCH resource configured by the first terminal or the second terminal according to the first time-frequency resource and a preset timing relationship.

6. The method of claim 2 or 4, further comprising:

determining data transmission parameters indicated by the access network device in an explicit manner or an implicit manner, the data transmission parameters being configured to indicate the first time-frequency resource, the second time-frequency resource, or the first time-frequency resource and second time-frequency resource.

7. The method of claim 6, wherein, the data transmission parameters configured to indicate the first time-frequency resource and the second time-frequency resource are carried by the information transmitted by the access network device, and the method further comprises:

transmitting the data transmission parameter configured to indicate the second time-frequency resource to the second terminal.

8. The method of claim 6, wherein, the data transmission parameters comprise at least one of following parameters:

a first physical resource indicator, configured to represent a time domain resource, a frequency domain resource, or the time domain resource and the frequency domain resource used by the first terminal for reporting the sidelink HARQ feedback information;

a first feedback timing indicator, configured to represent a time interval between the sidelink data transmission and reporting the corresponding sidelink HARQ feedback information by the first terminal;

a second physical resource indicator, configured to represent a time domain resource, a frequency domain resource, or the time domain resource and the frequency domain resource, wherein the time domain resource and the frequency domain resource are used by the second terminal for transmitting the sidelink HARQ feedback information; or

a second feedback timing indicator, configured to represent a time interval between the sidelink data transmission and feeding back the corresponding sidelink HARQ feedback information by the second terminal.

9. The method of claim 2, further comprising:

receiving a first configuration signaling transmitted by the access network device, the first configuration signaling being configured to indicate a first time interval set, a PUCCH resource set, or the first time interval set and the PUCCH resource set, wherein the PUCCH resource set and the first time interval set are corresponding to the sidelink HARQ feedback information;

wherein, the PUCCH resource set comprises a plurality of PUCCH resources configured to report the sidelink HARQ feedback information, and the first time interval set comprises

configured time intervals between the sidelink data transmission and reporting the corresponding sidelink HARQ feedback information by the first terminal.

10. The method of claim 9, wherein, the first configuration signaling is a first radio resource control (RRC) signaling, the first RRC signaling comprising a first newly added field and a second newly added field, the first newly added field being configured to indicate the PUCCH resource set, and the second newly added field being configured to indicate the first time interval set.

11. The method of claim 4, further comprising:

receiving a second configuration signaling transmitted by the access network device, the second configuration signaling being configured to indicate a second time interval set, a PSFCH resource set, or the second time interval set and the PSFCH resource set, wherein the second time interval set and the PSFCH resource set are corresponding to the sidelink HARQ feedback information;

wherein, the PSFCH resource set comprises a plurality of PSFCH resources configured to report the sidelink HARQ feedback information, and the second time interval set comprises configured time intervals between the sidelink data transmission and feeding back the corresponding sidelink HARQ feedback information by the second terminal.

12. The method of claim 11, wherein, the second configuration signaling is a second radio resource control (RRC) signaling, the second RRC signaling comprising a third newly added field and a fourth newly added field, the third newly added field being configured to indicate the PSFCH resource set, and the fourth newly added field being configured to indicate the second time interval set.

13. A data transmission method for direct communication, comprising:

transmitting, by an access network device, information to a first terminal, the information being configured to instruct the first terminal to transmit sidelink data to a second terminal through a sidelink, receive sidelink hybrid auto repeat request (HARQ) feedback information fed back by the second terminal, the sidelink HARQ feedback information being configured to indicate a receiving state corresponding to the sidelink data, and report the sidelink HARQ feedback information to the access network device;

receiving, by the access network device, the sidelink HARQ feedback information reported by the first terminal.

14. The method of claim 13, wherein, receiving the sidelink HARQ feedback information reported by the first terminal, comprises:

receiving the sidelink HARQ feedback information transmitted by the first terminal in a first time-frequency resource through a physical uplink control channel (PUCCH).

15. The method of claim 13, further comprising:

indicating data transmission parameters to the first terminal in an explicit manner or an implicit manner, the data transmission parameters being configured to indicate the first time-frequency resource, the second time-frequency resource, or the first time-frequency resource and the second time-frequency resource.

16. The method of claim 15, wherein, data transmission parameters configured to indicate the first time-frequency resource and the second time-frequency resource are carried by the information transmitted by the access network device, and the information transmitted by the access network device is configured to instruct the first terminal to transmit the data transmission parameter configured to indicate the second time-sequence resource to the second terminal.

17. The method of claim 13, further comprising:

transmitting a first configuration signaling to the first terminal, the first configuration signaling being configured to indicate a first time interval set, a PUCCH resource set, or the first time interval set and the PUCCH resource set, wherein the first time interval set and the PUCCH resource set are corresponding to the sidelink HARQ feedback information;

wherein, the PUCCH resource set comprises a plurality of PUCCH resources configured to report the sidelink HARQ feedback information, and the first time interval set comprises configured time intervals between the sidelink data transmission and reporting the corresponding sidelink HARQ feedback information by the first terminal.

18. The method of claim 13, further comprising:

transmitting a second configuration signaling to the first terminal, the second terminal, or the first terminal and the second terminal, the second configuration signaling being configured to indicate a second time interval set, a PSFCH resource set, or the second time interval set and the PSFCH resource set, wherein the second time interval set and the PSFCH resource set are corresponding to the sidelink HARQ feedback information;

wherein, the PSFCH resource set comprises a plurality of PSFCH resources configured to report the sidelink HARQ feedback information, and the second time interval set comprises configured time intervals between the sidelink data transmission and feeding back the corresponding sidelink HARQ feedback information by the second terminal.

19. A terminal, comprising:

a processor;

a transceiver connected to the processor;

a memory configured to store instructions executable by the processor;

wherein, the processor is configured to load and execute the executable instructions to

implement the method of any one of claims 1 to 12.

20. An access network device, comprising:

a processor;

a transceiver connected to the processor;

a memory configured to store instructions executable by the processor;

wherein, the processor is configured to load and execute executable the instructions to implement the method of any one of claims 13 to 18.