CLAIMS

What is claimed is:

1. A method for guaranteeing data transmission, applied to a terminal and comprising:

obtaining information of an IPsec tunnel; and

performing a related operation for a tunnel of a first network based on the information of the IPsec tunnel;

wherein the obtaining information of the IPsec tunnel comprises: obtaining information of a data IPsec tunnel, or obtaining information of a first IPsec tunnel;

wherein the data IPsec tunnel is an IPsec tunnel used for transmitting user plane data between the terminal and a second network, or data of the tunnel between the terminal and the second network;

wherein the first IPsec tunnel is an IPsec tunnel used for transmitting control signaling between the terminal and the second network;

in a case that the obtaining information of the IPsec tunnel comprises obtaining information of the data IPsec tunnel, performing the related operation for the tunnel of the first network based on the information of the IPsec tunnel comprises: performing a second related operation for the tunnel of the first network based on the information of the data IPsec tunnel;

wherein the performing a second related operation for a tunnel of a first network comprises at least one of the following:

making a request to the first network for establishing a second tunnel;

requesting the first network to provide a standalone second tunnel for each data IPsec tunnel;

wherein uplink and/or downlink packet filter information in QoS information of the second tunnel is set to the information of the data IPsec tunnel; or,

wherein a traffic descriptor component type identifier in QoS information of the second tunnel is set to a security parameter index type; or,

wherein QoS parameter information in QoS information of the second tunnel is set to QoS parameter information corresponding to a tunnel, associated with the data IPsec tunnel, between the terminal and the second network;

wherein

the second tunnel is used for transmitting data of the data IPsec tunnel;

in a case that the obtaining information of the IPsec tunnel comprises obtaining information of the first IPsec tunnel, performing the related operation for the tunnel of the first network based on the information of the IPsec tunnel comprises: performing a first related operation for the tunnel of the first network based on the information of the first IPsec tunnel;

wherein the performing the first related operation for a tunnel of a first network comprises:

making a request to the first network for establishing a first tunnel;

wherein uplink and/or downlink packet filter information in QoS information of the first tunnel is set to the information of the first IPsec tunnel; or,

wherein a traffic descriptor component type identifier in QoS information of the first tunnel is set to a security parameter index type;

wherein the first tunnel is used for transmitting data of the first IPsec tunnel, or used for transmitting control signaling between the terminal and the second network.

2. The method according to claim 1, wherein

the second tunnel is second QoS flow;

wherein making the request to the first network for establishing the second tunnel comprises: sending a second PDU session modification request to the first network, wherein the second PDU session modification request comprises: a QoS rule requesting to establish the second QoS flow, and/or QoS flow description information requesting to establish the second QoS flow.

3. The method according to claim 2, the QoS flow description information comprises QoS parameter information.

4. The method according to claim 1, wherein

the QoS information comprises at least one of following: a QoS rule, QoS flow description information, wherein the QoS flow description information comprises QoS parameter information;

wherein the QoS rule comprises at least one of following: the uplink and/or downlink packet filter information, the traffic descriptor component type identifier.

5. The method according to any one of claims 1-4, wherein

the QoS parameter information comprises a QoS class indication.

6. The method according to claim 5, wherein

the QoS class indication comprises 5QI or QCI.

7. The method according to any one of claims 1-6, wherein

after establishment of the second tunnel is completed, the performing a second related operation for a tunnel of a first network further comprises at least one of the following:

transmitting, via the second tunnel, data of the data IPsec tunnel;

establishing and/or saving an association between the second tunnel and the data IPsec tunnel.

8. The method according to any one of claims 1-6, wherein

when a first condition is met, the first network is requested to provide a standalone second tunnel for the data IPsec tunnel, wherein

the first condition comprises at least one of the following:

the tunnel, associated with the data IPsec tunnel, between the terminal and the second network is a GBR tunnel or contains GBR related QoS parameter information;

a QoS class indication of the tunnel, associated with the data IPsec tunnel, between the terminal and the second network takes a value of N, wherein N is one of the following: 1, 5, 69, and 70;

the tunnel, associated with the data IPsec tunnel, between the terminal and the second network is a tunnel carrying voice traffic;

the tunnel, associated with the data IPsec tunnel, between the terminal and the second network is a tunnel carrying emergency traffic;

the tunnel, associated with the data IPsec tunnel, between the terminal and the second network is a tunnel carrying high priority traffic;

the obtained information of the tunnel between the terminal and the second network contains indication information of a separate bearer resource;

QoS information of a fourth tunnel is different from QoS information of the tunnel, associated with the data IPsec tunnel, between the terminal and the second network;

a QoS class indication of the fourth tunnel is different from a QoS class indication of the tunnel, associated with the data IPsec tunnel, between the terminal and the second network;

GBR related QoS parameter information of the fourth tunnel is different from GBR related QoS parameter information of the tunnel, associated with the data IPsec tunnel, between the terminal and the second network;

a priority of the fourth tunnel is different from a priority of the tunnel, associated with the data IPsec tunnel, between the terminal and the second network;

no fourth tunnel is a non-GBR tunnel, and the tunnel, associated with the data IPsec tunnel, between the terminal and the second network is a non-GBR tunnel; and

uplink and/or downlink packet filter information of the fourth tunnel contains no information of the data IPsec tunnel.

9. The method according to any one of claims 1-6, wherein

when a second condition is met, the first network is requested to provide one second tunnel for a plurality of data IPsec tunnels,

wherein the second condition comprises at least one of the following:

the tunnel, associated with the data IPsec tunnel, between the terminal and the second network is a non-GBR tunnel or contains no GBR related QoS parameter; and

the obtained information of the tunnel between the terminal and the second network contains no indication information of a separate bearer resource, or contains indication information that no separate bearer resource is needed.

10. The method according to any one of claims 1-6, wherein

when the data IPsec tunnel is associated with one tunnel between the terminal and the second network, the setting QoS parameter information of a second tunnel to QoS

parameter information corresponding to a tunnel, associated with the data IPsec tunnel, between the terminal and the second network comprises:

setting or modifying a QoS class indication of the second tunnel to a QoS class indication corresponding to the tunnel, associated with the data IPsec tunnel, between the terminal and the second network.

11. The method according to any one of claims 1-6, wherein

when a multi-tunnel condition is met, the setting QoS parameter information of a second tunnel to QoS parameter information corresponding to a tunnel, associated with the data IPsec tunnel, between the terminal and the second network comprises at least one of the following:

setting or modifying QoS parameter information of the second tunnel to QoS parameter information having a highest QoS requirement in QoS parameter information corresponding to the tunnels, associated with the data IPsec tunnel, between the terminal and the second network;

setting or modifying a QoS class indication of the second tunnel to a QoS class indication having a highest priority in QoS class indications corresponding to the tunnels, associated with the data IPsec tunnel, between the terminal and the second network;

when there is no standardized QoS class indication corresponding to a combination of the following QoS parameter information of the second tunnel: a priority, a packet delay budget, a packet error rate, a maximum data burst volume, whether it is GBR, and/or whether a default averaging window requirement is set, setting or modifying a QoS class indication of the second tunnel to be a non-standardized QoS class indication or contain no QoS class indication;

wherein the multi-tunnel condition comprises at least one of the following:

the data IPsec tunnel is associated with a plurality of tunnels of the second network;

the data IPsec tunnel is newly associated with a tunnel between the terminal and the second network, and the newly associated tunnel between the terminal and the second network has a highest QoS requirement in the tunnels, associated with the data IPsec tunnel, between the terminal and the second network; and

the data IPsec tunnel removes association with a tunnel between the terminal and the second network, and the association-removed tunnel between the terminal and the second network has a higher QoS requirement than the tunnels, associated with the data IPsec tunnel, between the terminal and the second network.

12. The method according to any one of claims 1-11, wherein

the information of the data IPsec tunnel comprises at least one of the following: an identifier of the data IPsec tunnel, a protocol field indicating encapsulating security payload (ESP), a security parameter index of the data IPsec tunnel, and identifier information of a tunnel, associated with the data IPsec tunnel, between the terminal and the second network;

and/or

the information of the first IPsec tunnel comprises: at least one of the following: an identifier of the first IPsec tunnel, a protocol field indicating ESP, a security parameter index (SPI) of the first IPsec tunnel, and information of the second network associated with the first IPsec tunnel.

13. The method according to any one of claims 1-11, wherein the obtaining information of the IPsec tunnel comprises:

obtaining the information of the IPsec tunnel from a proxy network element.

14. The method according to claim 1, wherein

the first tunnel is first QoS flow;

wherein the performing a first related operation for a tunnel of a first network comprises: sending a first PDU session modification request to the first network, wherein the first PDU session modification request comprises: a QoS rule requesting to establish a QoS rule of the first QoS flow, and/or QoS flow description information requesting to establish the first QoS flow.

15. A terminal, comprising a processor, a memory, and a program that is stored in the memory and capable of running on the processor, wherein when the program is executed by the processor, the processor is configured to implement the method for guaranteeing data transmission according to any one of claims 1-14.

16. A computer readable storage medium, wherein the computer readable storage medium stores a program, wherein when the program is executed by a processor, the processor is configured to implement the method for guaranteeing data transmission according to any one of claims 1-14.