1. A remote terminal device comprising:

at least one processor; and

at least one memory storing instructions that, when executed by the at least one processor, cause the remote terminal device at least to:

obtain a selection policy for selecting a relay selection code (RSC) from a plurality of RSCs, an RSC of the plurality of RSCs being associated with an indicator for indicating whether the RSC supports a control plane (CP) security procedure or a user plane (UP) security procedure;

based on determining that path switching from a source relay terminal device with a source RSC is triggered, select a target RSC based on the selection policy, a source indicator associated with the source RSC, and a plurality of indicators associated with the plurality of RSCs; and

select, for the path switching, a target relay terminal device based on the target RSC.

2. The remote terminal device of claim 1, wherein the remote terminal device is caused to select a target relay terminal device based on the target RSC by:

selecting the target relay terminal device with the target RSC that is the same as the source RSC.

3. The remote terminal device of claim 1, wherein the remote terminal device is further caused to:

determine the plurality of RSCs;

obtain the plurality of indicators; and

determine, based on the source RSC and the plurality of indicators, whether the source RSC and the plurality of RSCs support the CP security procedure or the UP security procedure.

4. The remote terminal device of claim 1, wherein the remote terminal device is caused to select the target RSC based on the selection policy by:

selecting one of the plurality of RSCs for which the remote terminal device has a valid root key as the target RSC.

5. The remote terminal device of claim 4, wherein the remote terminal device is further

caused to select the target RSC based on the selection policy by:

based on determining that the source RSC supports the CP security procedure, select, as the target RSC, one of the plurality of RSCs for which the remote terminal device has the valid root key and supporting the CP security procedure.

6. The remote terminal device of claim 4, wherein the remote terminal device is further caused to select the target RSC based on the selection policy by:

based on determining that the source RSC supports the UP security procedure, select, as the target RSC, one of the plurality of RSCs for which the remote terminal device has the valid root key and supporting the UP security procedure.

7. The remote terminal device of claim 1, wherein the remote terminal device is further caused to:

generate a direct communication request (DCR) including an identity (ID) of the valid root key, the valid root key being used to generate at least one security key for establishing a security link for a direct communication between the remote terminal device and the target relay terminal device.

8. The remote terminal device of claim 3, wherein the remote terminal device is further caused to at least one of:

based on determining that the source RSC supports the CP security procedure, select, as the target RSC, one of the at least one candidate RSC supporting the CP security procedure;

based on determining that the source RSC supports the UP security procedure, select, as the target RSC, one of the plurality of RSCs supporting the UP security procedure; or

randomly select one of the plurality of RSCs as the target RSC.

9. The remote terminal device of claim 8, wherein the remote terminal device is further caused to:

generate a DCR including a subscription concealed identifier (SUCI) used for triggering a proximity based services (ProSe) authentication procedure of the remote terminal device.

10. The remote terminal device of claim 1, wherein the selection policy comprises at least one of:

a selection order based on the CP security procedure or the UP security procedure that the source RSC and the target RSC supported; or

an authentication policy to be used by the remote terminal device to determine whether to trigger a ProSe authentication procedure.

11. A remote terminal device comprising:

at least one processor; and

at least one memory storing instructions that, when executed by the at least one processor, cause the remote terminal device at least to:

obtain an authentication policy to be used by the remote terminal device to determine whether to trigger a proximity based services (ProSe) authentication procedure; and

determine to trigger the ProSe authentication procedure at least based on the authentication policy.

12. The remote terminal device of claim 11, wherein the authentication policy is based on mobility of the remote terminal device.

13. The remote terminal device of claim 11, wherein the remote terminal device is caused to determine to trigger the ProSe authentication procedure by:

determining to trigger the ProSe authentication procedure based on the remote terminal device moving to a new serving public land mobile network (PLMN).

14. The remote terminal device of claim 11, wherein the remote terminal device is caused to determine to trigger the ProSe authentication procedure by:

determining to trigger the ProSe authentication procedure based on the remote terminal device selecting a relay terminal device in the new serving PLMN.

15. The remote terminal device of claim 11, wherein the remote terminal device is further caused to determine to trigger the ProSe authentication procedure by:

determining to trigger the ProSe authentication procedure based on a root key is invalid, wherein the root key is used to generate at least one security key for establishing a security link for the direct communication between the remote terminal device and the relay terminal device.

16. The remote terminal device of claim 11, wherein the ProSe authentication procedure comprises a control plane (CP) security procedure, and the remote terminal device is caused to determine to trigger the ProSe authentication procedure at least based on the authentication policy by:

determining to trigger the ProSe authentication procedure based on the authentication policy regardless changing of a RSC, generation of the root key being independent of the RSC.

17. An authentication server function (AUSF) device comprising:

at least one processor; and

at least one memory storing instructions that, when executed by the at least one processor, cause the AUSF device at least to:

generate a root key independent of a relay selection code (RSC), the root key being used to generate at least one proximity based services (ProSe) key for establishing a security link for a direct communication between a remote terminal device and a relay terminal device; and

transmit, to a ProSe anchor function (PAnF) device, a ProSe key registration request without the RSC.

18. The AUSF device of claim 17, wherein AUSF device is further caused to:

transmit, to the PAnF device, a ProSe key get request to trigger a relay service authorization procedure of the remote terminal device based on the RSC.

19. The AUSF device of claim 17, wherein AUSF device is further caused to:

generate the at least ProSe security key based at least on the RSC, the at least ProSe security key being RSC specific.

20. The AUSF device of claim 17, wherein the root key comprises a control plane ProSe remote user key (CP-PRUK).