METHODS AND DEVICES FOR UPDATING TIME OFFSET VALUE, ~~UPDATED METHOD AND APPARATUS, AND COMMUNICATION DEVICE~~ AND STORAGE MEDIUM

TECHNICAL FIELD

[0001] The disclosure relates to the field of wireless communication technology, and in particular to methods and apparatuses for updating a time offset value for a non-terrestrial network (NTN), a communication device, and a storage medium.

BACKGROUND

[0002] The continuous emergence of new Internet applications, such as a new generation of Augmented Reality (AR)/Virtual Reality (VR) and vehicle-to-vehicle communication, has put forward higher requirements for wireless communication technology, driving the continuous evolution of wireless communication technology to meet the needs of the application. At present, the cellular mobile communication technology is in the evolution stage of a new generation technology. An important feature of the new generation technology is to support flexible configuration of multiple business types. Different service types have different requirements for the wireless communication technology. For example, the enhanced mobile bandwidth (eMBB) service type mainly focuses on large bandwidth and high speed, the Ultra-reliable and Low Latency Communications, (URLLC) business type mainly requires high reliability and low delay, and the massive Machine Type of Communication (mMTC) business type mainly requires a large number of connections. Therefore, the new generation of wireless communication system needs a flexible and configurable design to support the transmission of various service types.

[0003] In the research of wireless communication technology, a non-terrestrial network (NTN) communication is an important scheme of wireless communication. A typical NTN communication includes a satellite communication. The satellite communication refers to the communication carried out by radio communication devices on the ground using a satellite as the relay. The satellite communication system consists of a satellite part and a ground part. Characteristics of the satellite communication includes that a communication range is range; within a range covered by radio waves emitted by the satellite, the communication can be carried out between any two points; the communication is not easily affected by land disasters (i.e., has a high reliability). As a complement to a current terrestrial cellular communication system, the satellite communication can have the

WHAT IS CLAIMED IS:

1. A method for updating a time offset value for a non-terrestrial network (NTN), performed by a base station, comprising:

determining an update condition being satisfied;

updating ~~a~~the time offset value for the NTN~~in response to an update condition being satisfied~~.

2. The method of claim 1, wherein the update condition ~~for updating the time offset value~~being satisfied comprises at least one of:

receiving an update request for requesting to update the time offset value reported by a user equipment (UE);

a number of UEs that report an update request for requesting to update the time offset value reaching a predetermined number;

a ratio of a number of UEs that report an update request for requesting to update the time offset value to a total number of UEs within an NTN cell reaching a predetermined ratio value;

a current time reaching a predefined update time;

a current orbit of a satellite of the NTN being an orbit for which the time offset value needs to be updated; or

a current orbital position of a satellite of the NTN being a predefined update position.

3. The method of claim 1 or 2, further comprising at least one of:

sending a trigger signaling for triggering an update request for requesting to update the time offset value; ~~and/or~~or

sending a trigger condition for triggering an update request for requesting to update the time offset value.

4. The method of claim 1, wherein a trigger condition for updating the time offset value is predefined.

~~5. The method of claim 4 or 5, wherein the trigger condition comprises at least one of:~~

~~a reference signal measurement value of an NTN cell being less than a first threshold;~~

~~a demodulation performance of the UE on a downlink transmission of an NTN cell being less than a second threshold;~~

~~a duration during which the UE does not receive scheduling information of an NTN cell being greater than or equal to a third threshold; or~~

~~a duration during which the UE does not receive a downlink transmission of an NTN cell being greater than or equal to a fourth threshold.~~

~~6~~5. The method of any one of claims 2 to ~~5~~4, wherein the update request comprises at least one of:

request information, for requesting to update the time offset value;

an update parameter, for determining an updated time offset value; or

a suggested value of the time offset value.

~~7~~6. The method of any one of claims 1 to ~~6~~5, further comprising:

sending an update notification of the time offset value~~.~~;

~~8. The method of claim 7,~~ wherein sending the update notification of the time offset value comprises at least one of:

sending a physical layer signaling carrying an updated time offset value;

sending a higher-layer signaling carrying an updated time offset value; or

sending a physical layer signal having a correspondence with an updated time offset value.

~~9~~7. The method of claim ~~8~~6, wherein sending the physical layer signaling carrying the updated time offset value comprises one of:

sending group common downlink control information carrying the updated time offset value; or

sending a UE-specific downlink control information carrying the updated time offset value.

~~10. The method of claim 9, wherein a scrambling sequence of the group common downlink control information carrying the updated time offset value is different from a scrambling sequence of group common downlink control information not carrying the updated time offset value; and/or~~

~~a scrambling sequence of a check code in the group common downlink control information carrying the updated time offset value is different from a scrambling sequence of a check code in group common downlink control information not carrying the updated time offset value.~~

~~11. The method of claim 10, wherein the scrambling sequence of the group common downlink control information carrying the updated time offset value is a radio network temporary identity of received group common downlink control information.~~

~~12~~8. The method of ~~any one of claims 7 to 11~~claim 6 or 7, wherein the update notification comprises at least one of:

an update instruction, for indicating to update the time offset value;

an update parameter, for determining an updated time offset time; or

an update value, for indicating an updated time offset time.

~~13~~9. A method ~~for updating a time offset value of a non-terrestrial network (NTN),~~ performed by a user equipment (UE), comprising:

updating a time offset value for a non-terrestrial network (NTN).

~~14~~10. The method of claim ~~13~~9, further comprising:

receiving an update notification for updating the time offset value.

~~15~~11. The method of claim ~~14~~10, further comprising:

sending an update request for requesting to update the time offset value.

~~16. The method of claim 14, wherein sending the update request for requesting to update the time offset value comprises at least one of:~~

~~sending the update request for requesting to update the time offset value in response to receiving a trigger signaling for triggering the update request for requesting to update the time offset value;~~

~~sending the update request for requesting to update the time offset value in response to a signal reference measurement value of an NTN cell being less than a first threshold;~~

~~sending the update request for requesting to update the time offset value in response to a demodulation performance on a downlink transmission of an NTN cell being less than a second threshold;~~

~~sending the update request for requesting to update the time offset value in response to a duration during which the UE does not receive scheduling information of the an cell being greater than or equal to a third threshold; or~~

~~sending the update request for requesting to update the time offset value in response to a duration during which the UE does not receive a downlink transmission of an NTN cell being greater than or equal to a fourth threshold.~~

~~17~~12. The method of claim ~~15 or 16~~11, wherein the update request comprises at least one of:

request information, for requesting to update the time offset value;

an update parameter, for determining an updated time offset value; or

a suggested value of the time offset value.

~~18~~13. The method of any one of claims ~~14~~ 10 to ~~17~~12, wherein the update notification comprises at least one of:

an update instruction, for indicating to update the time offset value;

an update parameter, for determining an updated time offset time; or

an update value, for indicating an updated time offset time.

~~19~~14. The method of any one of claims ~~14~~ 10 to ~~18~~13, wherein receiving the update notification for updating the time offset value comprises:

determining an updated time offset value in response to the update notification carrying an update instruction.

~~20~~15. The method of claim ~~13~~9, wherein updating the time offset value comprises at least one of:

updating the time offset value in response to a current time reaching a predefined update time;

updating the time offset value in response to an orbit of a satellite of the NTN being an orbit for which the time offset value needs to be updated; or

updating the time offset value in response to an orbital position of a satellite of the NTN being a predefined update position.

~~21~~16. The method of claim ~~19 or 20~~14 or 15, wherein updating the time offset value comprises at least one of:

determining ~~an~~ the updated time offset value based on predefined adjustment information; or

determining ~~an~~ the updated time offset value based on a predefined correspondence between status information and time offset values, wherein the status information comprises at least one of current time information ~~and/or~~or orbital information of a satellite of the NTN.

~~22. An apparatus for updating a time offset value for a non-terrestrial network (NTN), comprising:~~

~~an updating module, configured to update a time offset value in response to an update condition being satisfied.~~

~~23. The apparatus of claim 22, wherein the update condition for updating the time offset value comprises at least one of:~~

~~receiving an update request for requesting to update the time offset value reported by a user equipment (UE);~~

~~a number of UEs that report the update request for requesting to update the time offset value reaching a predetermined number;~~

~~a ratio of a number of UEs that report the update request for requesting to update the time offset value to a total number of UEs within an NTN cell reaching a predetermined ratio value;~~

~~a current time reaching a predefined update time;~~

~~a current orbit of a satellite of the NTN being an orbit for which the time offset value needs to be updated; or~~

~~a current orbital position of a satellite of the NTN being a predefined update position.~~

~~24. The apparatus of claim 22 or 23, further comprising:~~

~~a sending module, configured to send a trigger signaling for triggering an update request for requesting to update the time offset value; and/or send a trigger condition for triggering an update request for requesting to update the time offset value.~~

~~25. The apparatus of claim 22, wherein the trigger condition for updating the time offset value is predefined.~~

~~26. The apparatus of claim 24 or 25, wherein the trigger condition comprises at least one of:~~

~~a reference signal measurement value of an NTN cell being less than a first threshold;~~

~~a demodulation performance of the UE on a downlink transmission of the NTN cell being less than a second threshold;~~

~~a duration when the UE does not receive scheduling information of the NTN cell being greater than or equal to a third threshold; or~~

~~a duration when the UE does not receive a downlink transmission of the NTN cell being greater than or equal to a fourth threshold.~~

~~27. The apparatus of any one of claims 23 to 26, wherein the update request comprises at least one of:~~

~~request information, for requesting to update the time offset value;~~

~~an update parameter, for determining an updated time offset value; or~~

~~a suggested value of the time offset value.~~

~~28. The apparatus of any one of claims 22 to 27, further comprising:~~

~~a sending module, configured to send an update notification of the time offset value.~~

~~29. The apparatus of claim 28, wherein the sending module is further configured to perform at least one of:~~

~~sending a physical layer signaling carrying an updated time offset value;~~

~~sending a higher-layer signaling carrying the updated time offset value; or~~

~~sending a physical layer signal having a correspondence with the updated time offset value.~~

~~30. The apparatus of claim 29, wherein the sending module is configured to send group common downlink control information carrying the updated time offset value; or send a UE-specific downlink control information carrying the updated time offset value.~~

~~31. The apparatus of claim 30, wherein a scrambling sequence of the group common downlink control information carrying the updated time offset value is different from a scrambling sequence of group common downlink control information not carrying the updated time offset value; and/or~~

~~a scrambling sequence of a check code in the group common downlink control information carrying the updated time offset value is different from a scrambling sequence of a check code in group common downlink control information not carrying the updated time offset value.~~

~~32. The apparatus of claim 31, wherein the scrambling sequence of the group common downlink control information carrying the updated time offset value is a radio network temporary identity of received group common downlink control information.~~

~~33. The apparatus of any one of claims 28 to 32, wherein the update notification comprises at least one of:~~

~~an update instruction, for indicate to update the time offset value;~~

~~an update parameter, for determining an updated time offset time; or~~

~~an update value, for indicating the updated time offset time.~~

~~34. An apparatus for updating a time offset value of a non-terrestrial network (NTN), comprising:~~

~~an updating module, configured to update a time offset value.~~

~~35. The apparatus of claim 34, further comprising:~~

~~a receiving module, configured to receive an update notification for updating the time offset value.~~

~~36. The apparats of claim 35, further comprising:~~

~~a sending module, configured to send an update request for requesting to update the time offset value.~~

~~37. The apparatus of claim 35, wherein the sending module is further configured to perform at least one of:~~

~~send the update request for requesting to update the time offset value in response to receiving a trigger signaling for triggering the update request for requesting to update the time offset value;~~

~~sending the update request for requesting to update the time offset value in response to a signal reference measurement value of an NTN cell being less than a first threshold;~~

~~sending the update request for requesting to update the time offset value in response to a~~

demodulation performance on a downlink transmission of the NTN cell being less than a second threshold;

sending the update request for requesting to update the time offset value in response to a duration when the UE does not receive scheduling information of the NTN cell being greater than or equal to a third threshold; or

sending the update request for requesting to update the time offset value in response to a duration when the UE does not receive a downlink transmission of the NTN cell being greater than or equal to a fourth threshold.

38. The apparatus of claim 36 or 37, wherein the update request comprises at least one of:

request information, for requesting to update the time offset value;

an update parameter, for determining an updated time offset value; or

a suggested value of the time offset value.

39. The apparatus of any one of claims 35 to 38, wherein the update notification comprises at least one of:

an update instruction, for indicating to update the time offset value;

an update parameter, for determining an updated time offset time; or

an update value, for indicating the updated time offset time.

40. The apparatus of any one of claims 35 to 39, wherein the updating module is configured to determine an updated time offset value in response to the update notification carrying the update instruction.

41. The apparatus of claim 34, wherein the updating module is configured to perform at least one of:

updating the time offset value in response to a current time reaching a predefined update time;

updating the time offset value in response to an orbit of a satellite of the NTN being an orbit for which the time offset value needs to be updated; or

updating the time offset value in response to an orbital position of a satellite of the NTN being a predefined update position..

42. The apparatus of claim 40 or 41, wherein the updating module is configured to perform at least one of:

determining an updated time offset value based on predefined adjustment information; or

determining an updated time offset value based on a predefined correspondence between status information and time offset values, wherein the status information comprises current

~~time information and/or orbital information of a satellite of the NTN.~~

~~43~~17. A communication device, comprising: a processor; a transceiver; and a memory~~;~~ ~~and~~ storing an executable program ~~stored on the memory and executable by the processor~~, wherein ~~when the executable program is executed by the processor,~~ the processor is configured to perform the method of any one of claims 1 to ~~12~~ 8 or claims ~~13 to 21~~9 to 16 ~~is performed~~.

~~44~~18. A non-transitory computer-readable~~computer~~ storage medium~~,~~ having stored thereon an executable program ~~stored thereon; wherein after the executable program is~~that when executed by a processor, causes the processor to perform the method of any one of claims 1 to ~~12~~ 8 or claims 9 to 16~~13 to 31 is performed~~.