be considered that the ONT and the OLT are upgraded and reset concurrently or synchronously.

[0054] When the ONT detects an upgrade triggering event that meets a condition, the ONT triggers upgrading and resetting of the ONT. When the ONT detects the upgrade triggering event, it indicates that the OLT is also to start or starts to perform upgrading and resetting of the OLT. In this case, upgrading and resetting of the ONT and upgrading and resetting of the OLT constitute the concurrent upgrade. After completing upgrading, the OLT may restore the service with the ONT that also completes upgrading, so that a user can perform normal communication.

[0055] Optionally, in an embodiment, the upgrade triggering event includes at least one of the following: no downstream optical signal from the OLT is detected within a predetermined time period; a concurrent upgrade message that instructs the ONT to perform resetting and is sent by the OLT before the OLT is upgraded and reset is received; or the preloaded ONT upgrade program is detected.

[0056] That is, when the ONT detects any one or more of the foregoing cases, the ONT may trigger upgrading and resetting. Specifically, the OLT at normal work continuously sends a downstream optical signal, that is, light is continuously emitted in a downstream, and when the OLT performs upgrading and resetting, an interruption of downstream light emission may be caused due to device restart. In this case, the ONT may detect a loss of the downstream optical signal (~~Lost~~Loss of Signal, LOS), and upgrading and resetting subsequently performed by the ONT are basically concurrent or synchronous with upgrading and resetting of the ~~ONT~~OLT.

[0057] Preferably, a downstream LOS time period may be preset, that is, the ONT triggers upgrading and resetting of the ONT only when the ONT detects that a downstream LOS time exceeds the time period. In this way, mis-determining of the ONT caused by a short-time transient interruption of the downstream optical signal from the OLT may be avoided.

[0058] Optionally, the upgrade triggering event may be: the ONT detects the concurrent upgrade message delivered by the OLT, where the concurrent upgrade message is used to instruct the ONT to immediately perform upgrading and resetting. The concurrent upgrade message may be sent to the ONT when the OLT is to perform upgrading and resetting of the OLT or starts to perform upgrading and resetting, so as to ensure that the ONT and the OLT basically concurrently or synchronously start to perform upgrading and resetting.

[0093] Before step 404: Reset the OLT, an upgrade program also needs to be loaded to the OLT, which is similar to step 401, where the OLT upgrade program may be loaded under the control of the central office or manually loaded by the network maintenance personnel, which is not limited in the present invention. In addition, step 402 may be performed at any moment before step 404.

[0094] 403. Implementing ~~An~~ an indication message.

[0095] Before being upgraded and reset, the OLT sends, to the ONT, the indication message that is used to indicate an upgrade triggering event. Specifically, the OLT may use some specific messages, which manage the ONT, to carry attribute information that can indicate the upgrade triggering event, so as to instruct the ONT to perform upgrading and resetting of the ONT when the ONT detects that the upgrade triggering event is met. Generally, the upgrade triggering event may indicate that the OLT starts or is to start to perform upgrading and resetting. In this way, upgrading and resetting of the ONT implemented by the ONT may be basically synchronously with upgrading and resetting of the OLT.

[0096] Specifically, the indication message may be one of the specific messages, such as an OAM, an OMCI, and a PLOAM, that carry the attribute information that can indicate the upgrade triggering event. An OMCI-type message is used as an example, and attribute information that identifies the upgrade triggering event may be added by extending an ONT2-G entity. In a specific example, a concurrent upgrade CoUpdate attribute may be added into the ONT2-G entity, and a default value of the attribute is agreed as 0, where when a value of the attribute is set to 1, it indicates that if the ONT detects a loss of a downstream optical signal (there is no light in a downstream) from the OLT, the ONT starts to perform upgrading and resetting to activate a preloaded ONT upgrade program. Generally, the OLT and the ONT may further agree on the upgrade triggering event by adding, into an entity of another specific message, the attribute information that identifies the upgrade triggering event, which is not limited in the present invention.

[0097] In addition, in a preferable embodiment, the attribute may further be set to that the ONT triggers upgrading and resetting of the ONT only if the ONT detects that a time during which there is no light in the downstream exceeds a predetermined time period. Herein, the predetermined time period may be preset to 100 ms, so as to avoid mis-determining caused by a transient interruption of downstream light. The predetermined time period may be determined by the network maintenance personnel

[0111] It should be understood that step 501 is an optional step. Specifically, in addition to that the ONT upgrade program is remotely loaded, in some special cases, the ONT upgrade program may be directly loaded to the ONT. In this process, network maintenance personnel may manually load the ONT upgrade program at the user's premises, or the ONT device locally prestores the ONT upgrade program, which is not limited in the present invention.

[0112] It should further be understood that step 501 is not necessarily performed before step 502. Step 501 may be performed at any moment before the following step 505: The ONT receives a concurrent upgrade message and performs upgrading and resetting, which is not limited in the present invention.

[0113] 502. Load an OLT upgrade program.

[0114] Before step 504: Reset the OLT, an upgrade program also needs to be loaded to the OLT, which is similar to step 501, where the OLT upgrade program may be loaded under the control of the central office or manually loaded by the network maintenance personnel, which is not limited in the present invention. In addition, step 502 may be performed at any moment before step 504.

[0115] 503. Sending ~~A~~ a concurrent upgrade message.

[0116] Before being upgraded and reset, the OLT sends, to the ONT, the concurrent upgrade message that is used to instruct the ONT to perform resetting. Specifically, the OLT may use some specific messages, which manage the ONT, to carry attribute information that can instruct the ONT to perform resetting, so as to instruct the ONT to immediately perform upgrading and resetting when receiving the concurrent upgrade message. Because the concurrent upgrade message is sent to the ONT by the OLT when the OLT is to perform upgrading and resetting or starts to perform upgrading and resetting, upgrading and resetting of the ONT implemented by the ONT may be basically synchronously with upgrading and resetting of the OLT.

[0117] Specifically, an indication message may be one of the specific messages, such as an OAM, an OMCI, and a PLOAM, that carry the attribute information that can instruct the ONT to perform resetting. A broadcast PLOAM message is used as an example. The attribute information that is used to instruct the ONT to perform resetting may be set in the broadcast PLOAM, where the attribute information may include an information name, an information type, and information content that are each described by using at least one byte. The information name may include an identifier ID of an ONT and indicates that the attribute information is exclusive to the

unit, where the receiving unit is configured to receive an indication message that is used to indicate the upgrade triggering event to the ONT 70 and sent by the OLT. That is, the OLT and the ONT may agree on the upgrade triggering event in advance, so that when the ONT detects the upgrade triggering event that is agreed on in advance, the ONT performs upgrading and resetting.

[0159] Optionally, the indication message includes at least one of the following: an OAM, an OMCI, and a PLOAM. Specifically, an attribute or information that is used to indicate the upgrade triggering event may be added into a specific message that is used to manage the ONT, so as to form the foregoing indication message.

[0160] Optionally, in an embodiment, the ONT 70 further includes a receiving unit, where the receiving unit is configured to receive and load the ONT upgrade program sent by the OLT.

[0161] Generally, the ONT upgrade program is delivered by the OLT and loaded to a corresponding ONT device for use in subsequent upgrading of the ONT device. In addition, alternatively, network maintenance personnel may manually load the ONT upgrade program to the ONT, or the ONT device locally prestores the ONT upgrade program.

[0162] Optionally, in an embodiment, the ONT upgrade program includes: a command line that is used to indicate the upgrade triggering event to the ONT. That is, a new program used for upgrading is carried in the ONT upgrade program, and a concurrent upgrade command may further be added, so that when the ONT detects the upgrade triggering event, the ONT performs upgrading and resetting.

[0163] Optionally, in an embodiment, the service restoration unit ~~70~~ 73 is specifically configured to restore the service in a case in which after upgrading and resetting end, the ONT detects the downstream optical signal from the OLT by using the detection unit 71, and if the downstream optical signal is detected, notifies the OLT that upgrading of ONT succeeds; and the OLT responds to the ONT, and then normal service communication is performed.

[0164] According to this embodiment of the present invention, an ONT 70 and an OLT basically concurrently or synchronously perform upgrading and resetting, that is, a concurrent upgrade, so that a quantity and a time of service interruptions caused when the ONT 70 and the OLT are upgraded are reduced, thereby improving user experience. In addition, detecting a loss of a downstream optical signal within a predetermined time period may further be agreed on and preset in an upgrade

[0181] FIG. 9 is a schematic block diagram of an optical network terminal according to another embodiment of the present invention. The optical network terminal ONT 90 shown in FIG. 9 includes a processor 91 and a memory 92. The processor 91 and the memory 92 are connected by using a bus system 93.

[0182] The memory 92 is configured to store an instruction that enables the processor ~~51~~ 91 to perform the following operations: detecting an upgrade triggering event, where the upgrade triggering event is used to instruct the optical network terminal ONT 90 and an optical line terminal OLT to perform a concurrent upgrade; resetting the ONT 90 to activate a preloaded ONT upgrade program; and restoring a service with the OLT.

[0183] According to this embodiment of the present invention, an ONT 90 and an OLT perform a concurrent upgrade, so that a quantity and a time of service interruptions caused when the ONT 90 and the OLT are upgraded are reduced, thereby improving user experience.

[0184] The concurrent upgrade means that when a device or functional entity is upgraded, another associated device or functional entity is also upgraded accordingly. For example, that the ONT and the OLT perform the concurrent upgrade means that when the OLT is upgraded, the ONT is upgraded concurrently or synchronously with the OLT. A case in which the ONT and the OLT are upgraded and reset concurrently or synchronously is relative to a case in which the ONT and the OLT are upgraded and reset separately and independently. In other words, when there is an intersection between time periods in which the ONT and the OLT are upgraded and reset, it may be considered that the ONT and the OLT are upgraded and reset concurrently or synchronously.

[0185] When the ONT 90 detects an upgrade triggering event that meets a condition, the ONT 90 triggers upgrading and resetting of the ONT 90. When the ONT 90 detects the upgrade triggering event, it indicates that the OLT is also to start or starts to perform upgrading and resetting of the OLT. In this case, upgrading and resetting of the ONT 90 and upgrading and resetting of the OLT constitute the concurrent upgrade. After completing upgrading, the OLT may restore the service with the ONT 90 that also completes upgrading, so that a user can perform normal communication.

[0186] In addition, the ONT 90 may further include a transmitter circuit 94, a receiver circuit 95, and the like. The processor 91 controls an operation of the ONT 90,

OLT 100 perform a concurrent upgrade, so that a quantity and a time of service interruptions caused when the ONT and the OLT ~~80~~ 100 are upgraded are reduced, thereby improving user experience.

[0199] The concurrent upgrade means that when a device or functional entity is upgraded, another associated device or functional entity is also upgraded accordingly. For example, that the ONT and the OLT perform the concurrent upgrade means that when the OLT is upgraded, the ONT is upgraded concurrently or synchronously with the OLT. A case in which the ONT and the OLT are upgraded and reset concurrently or synchronously is relative to a case in which the ONT and the OLT are upgraded and reset separately and independently. In other words, when there is an intersection between time periods in which the ONT and the OLT are upgraded and reset, it may be considered that the ONT and the OLT are upgraded and reset concurrently or synchronously.

[0200] The OLT 100 sends the indication information to the ONT and instructs the ONT to perform upgrading and resetting when a particular condition is met or to immediately perform upgrading and resetting. When the ONT meets the particular condition, it indicates that the OLT 100 is to start or starts to perform upgrading and resetting. If the OLT 100 instructs the ONT to immediately perform upgrading and resetting, it also indicates that the OLT 100 is to start or starts to perform upgrading and resetting. Therefore, upgrading and resetting of the ONT and upgrading and resetting of the OLT 100 constitute the concurrent upgrade. After completing upgrading, the OLT 100 may restore the service with the ONT that also completes upgrading, so that a user can perform normal communication.

[0201] In addition, the OLT 100 may further include a receiver circuit 105 and the like. The processor 101 controls an operation of the OLT 100, and the processor 101 may also be referred to as a CPU (Central Processing Unit, central processing unit). The memory 102 may include a read-only memory and a random access memory and provides an instruction and data for the processor 101. A part of the memory 102 may further include a nonvolatile random access memory (NVRAM). Components of the OLT 100 are coupled together by using the bus system 104. In addition to a data bus, the bus system 104 may further include a power supply bus, a control bus, a status signal bus, and the like. However, for clarity of description, buses are marked as the bus system 104 in the figure.

[0202] The method disclosed in the foregoing embodiment of the present

CLAIMS

What is claimed is:

1. A system upgrade method, comprising:

detecting an upgrade triggering event, wherein the upgrade triggering event is used to instruct an optical network terminal ONT and an optical line terminal OLT to perform a concurrent upgrade;

resetting the ONT to activate a preloaded ONT upgrade program; and

restoring a service with the OLT.

2. The method according to claim 1, wherein the upgrade triggering event comprises at least one of the following:

no downstream optical signal from the OLT is detected within a predetermined time period;

a concurrent upgrade message that instructs the ONT to perform resetting and is sent by the OLT before the OLT is upgraded and reset is received; or

the preloaded ONT upgrade program is detected.

3. The method according to claim 2, before the detecting an upgrade triggering event, further comprising: receiving an indication message that is used to indicate the upgrade triggering event to the ONT and sent by the OLT.

~~4. The method according to claim 3, wherein the indication message comprises at least one of the following: an OAM, an OMCI, and a PLOAM.~~

~~5~~4. The method according to claim 1, before the resetting the ONT to activate a preloaded ONT upgrade program, further comprising: receiving and loading the ONT upgrade program sent by the OLT.

~~6~~5. The method according to claim 2 or ~~5~~4, wherein the ONT upgrade program comprises: a command line that is used to indicate the upgrade triggering event to the ONT.

~~7. The method according to claim 2, wherein the concurrent upgrade message comprises at least one of the following: an OMCI and a broadcast PLOAM.~~

~~8~~6. The method according to any one of claims 1 to ~~7~~5, wherein the predetermined time period is greater than 100 ms.

~~9~~7. A system upgrade method, comprising:

sending an indication message to an optical network terminal ONT, wherein the

indication message is used to instruct the ONT and an optical line terminal OLT to perform a concurrent upgrade;

resetting the OLT to activate a preloaded OLT upgrade program; and

restoring a service with the ONT.

~~10~~8. The method according to claim ~~9~~7, wherein the indication message is used to indicate attribute information that the ONT performs ONT resetting when the ONT detects no downstream optical signal from the OLT within a predetermined time period, or to instruct the ONT to perform resetting.

~~11~~9. The method according to claim ~~9~~7, before the resetting the OLT to activate a preloaded OLT upgrade program, further comprising: sending an ONT upgrade program to the ONT, so that the ONT loads the ONT upgrade program.

~~12~~10. The method according to claim ~~11~~9, wherein the ONT upgrade program comprises: a command line that is used to indicate that the ONT performs ONT resetting when the ONT detects no downstream optical signal from the OLT within a predetermined time period.

~~13. The method according to claim 10, wherein the indication message comprises at least one of the following: an OAM, an OMCI, and a PLOAM.~~

~~14. The method according to any one of claims 9 to 13, wherein the predetermined time period is greater than 100 ms.~~

~~15~~11. An optical network terminal, comprising:

a detection unit, configured to detect an upgrade triggering event, wherein the upgrade triggering event is used to instruct the optical network terminal ONT and an optical line terminal OLT to perform a concurrent upgrade;

a resetting unit, configured to reset the ONT to activate a preloaded ONT upgrade program; and

a service restoration unit, configured to restore a service with the OLT.

~~16~~12. The optical network terminal according to claim ~~15~~11, wherein the upgrade triggering event detected by the detection unit comprises at least one of the following:

no downstream optical signal from the OLT is detected within a predetermined time period;

a concurrent upgrade message that instructs the ONT to perform resetting and is sent by the OLT before the OLT is upgraded and reset is received; or

the preloaded ONT upgrade program is detected.

~~17~~13. The optical network terminal according to claim ~~16~~12, wherein the ONT further

comprises a receiving unit, wherein the receiving unit is configured to receive an indication message that is used to indicate the upgrade triggering event to the ONT and sent by the OLT.

~~18. The optical network terminal according to claim 17, wherein the indication message comprises at least one of the following: an OAM, an OMCI, and a PLOAM.~~

~~19~~14. The optical network terminal according to claim ~~15~~11, wherein the ONT further comprises a receiving unit, wherein the receiving unit is configured to receive and load the ONT upgrade program sent by the OLT.

~~20~~15. The optical network terminal according to claim ~~16~~12 or ~~19~~14, wherein the ONT upgrade program comprises: a command line that is used to indicate the upgrade triggering event to the ONT.

~~21. The optical network terminal according to claim 16, wherein the concurrent upgrade message comprises at least one of the following: an OMCI and a broadcast PLOAM.~~

~~22. The optical network terminal according to any one of claims 15 to 21, wherein the predetermined time period is greater than 100 ms.~~

~~23~~16. An optical line terminal, comprising:

a sending unit, configured to send an indication message to an optical network terminal ONT, wherein the indication message is used to instruct the ONT and the optical line terminal OLT to perform a concurrent upgrade;

a resetting unit, configured to reset the OLT to activate a preloaded OLT upgrade program; and

a service restoration unit, configured to restore a service with the ONT.

~~24~~17. The optical line terminal according to claim ~~23~~16, wherein the indication message sent by the sending unit is used to indicate attribute information that the ONT performs ONT resetting when the ONT detects no downstream optical signal from the OLT within a predetermined time period, or to instruct the ONT to perform resetting.

~~25~~18. The optical line terminal according to claim ~~23~~16, wherein the sending unit is further configured to send an ONT upgrade program to the ONT, so that the ONT loads the ONT upgrade program.

~~26~~19. The optical line terminal according to claim ~~25~~18, wherein the ONT upgrade program comprises: a command line that is used to indicate that the ONT performs ONT resetting when the ONT detects no downstream optical signal from the OLT

within a predetermined time period.

~~27. The optical line terminal according to claim 24, wherein the indication message comprises at least one of the following: an OAM, an OMCI, and a PLOAM.~~

~~28. The optical line terminal according to any one of claims 23 to 27, wherein the predetermined time period is greater than 100 ms.~~