

NETWORK PERFORMANCE TESTING METHOD AND APPARATUS, STORAGE MEDIUM, AND COMPUTER SYSTEM

TECHNICAL FIELD

[0001] One or more embodiments of this specification relate to the computer field, and in particular, to a network performance testing method and apparatus, a storage medium, and a computer system.

BACKGROUND

[0002] In a service system using a browser/server architecture or a client/server architecture, a terminal deployed with a browser or a corresponding client is allowed to access a resource provided by a server. Because there may be a relatively large difference between network infrastructures in different geographical areas, there is a relatively large difference between time that needs to be consumed when terminals located in different geographical areas access the same resource. In some technical scenarios, network performance of the server in the service system in a plurality of geographical areas needs to be tested. To be specific, time in which the terminal deployed with the browser or the corresponding client accesses the related resource provided by the server in the plurality of geographical areas needs to be tested.

[0003] In view of this, how to test the network performance of the server more accurately, comprehensively, and efficiently becomes an urgent problem to be resolved.

SUMMARY

[0004] Embodiments of this specification provide a network performance testing method and apparatus, a storage medium, and a computer system, to at least partially resolve the above-mentioned problems in the conventional technology.

[0005] This specification provides a network performance testing method. The method relates to a testing terminal and a plurality of proxy terminals that act as proxies to perform network performance testing, the method is performed by the testing terminal, and the method includes:

determining a target proxy terminal from the plurality of proxy terminals, where the target proxy terminal is located in a to-be-tested geographical area; sending a testing request to the target proxy terminal based on connection information of the target proxy terminal, where the testing request includes a service request expected to be sent to a target server, so that the target proxy terminal
5 sends the service request to the target server; receiving a testing response from the target proxy terminal, where the testing response indicates a time interval between a sending moment at which the target proxy terminal sends the service request and a receiving moment at which the target proxy terminal receives a service response from the target server; and generating a testing result corresponding to the to-be-tested geographical area based on the time interval.

10 **[0006]** This specification provides a network performance testing method. The method relates to a testing terminal and a plurality of proxy terminals that act as proxies to perform network performance testing, the method is performed by any proxy terminal in the plurality of proxy terminals, and the method includes: when the proxy terminal is located in a to-be-tested geographical area pre-determined by a testing terminal, and is determined by the testing terminal
15 as a target proxy terminal, receiving a testing request sent by the testing terminal to the proxy terminal based on connection information of the proxy terminal, where the testing request includes a service request expected to be sent to a target server; sending the service request to the target server, and recording a sending moment of the service request; receiving a service response to the service request from the target server, and recording a receiving moment of the service response;
20 and sending a testing response to the testing terminal, where the testing response indicates a time interval between the sending moment and the receiving moment, so that the testing terminal generates a testing result corresponding to the to-be-tested area based on the time interval.

[0007] This specification provides a computer system, including a storage, a processor, and a computer program that is stored in the storage and that is capable of running on the processor. The
25 computer system is implemented as a testing terminal, and when the processor executes the computer program, the following steps are implemented: determining a target proxy terminal from a plurality of proxy terminals that act as proxies to perform network performance testing, where the target proxy terminal is located in a to-be-tested geographical area; sending a testing request to the target proxy terminal based on connection information of the target proxy terminal, where
30 the testing request includes a service request expected to be sent to a target server, so that the target proxy terminal sends the service request to the target server; receiving a testing response from the

target proxy terminal, where the testing response indicates a time interval between a sending moment at which the target proxy terminal sends the service request and a receiving moment at which the target proxy terminal receives a service response from the target server; and generating a testing result corresponding to the to-be-tested geographical area based on the time interval.

5 **[0008]** This specification provides a computer system, including a storage, a processor, and a computer program that is stored in the storage and that is capable of running on the processor. The computer system is implemented as a proxy terminal that acts as a proxy to perform network performance testing, and when the processor executes the computer program, the following steps are implemented: when the proxy terminal is located in a to-be-tested geographical area pre-
10 determined by a testing terminal, and is determined by the testing terminal as a target proxy terminal, receiving a testing request sent by the testing terminal to the proxy terminal based on connection information of the proxy terminal, where the testing request includes a service request expected to be sent to a target server; sending the service request to the target server, and recording a sending moment of the service request; receiving a service response to the service request from
15 the target server, and recording a receiving moment of the service response; and sending a testing response to the testing terminal, where the testing response indicates a time interval between the sending moment and the receiving moment, so that the testing terminal generates a testing result corresponding to the to-be-tested area based on the time interval.

[0009] This specification provides a network performance testing apparatus. The apparatus
20 relates to a testing terminal and a plurality of proxy terminals that act as proxies to perform network performance testing, the apparatus is deployed in the testing terminal, and the apparatus includes: a proxy determining unit, configured to determine a target proxy terminal from the plurality of proxy terminals, where the target proxy terminal is located in a to-be-tested geographical area; a request sending unit, configured to send a testing request to the target proxy terminal based on
25 connection information of the target proxy terminal, where the testing request includes a service request expected to be sent to a target server, so that the target proxy terminal sends the service request to the target server; a response receiving unit, configured to receive a testing response from the target proxy terminal, where the testing response indicates a time interval between a sending moment at which the target proxy terminal sends the service request and a receiving moment at
30 which the target proxy terminal receives a service response from the target server; and a record processing unit, configured to generate a testing result corresponding to the to-be-tested

geographical area based on the time interval.

[0010] This specification provides a network performance testing apparatus. The apparatus relates to a testing terminal and a plurality of proxy terminals that act as proxies to perform network performance testing, the apparatus is deployed in any of the plurality of proxy terminals, and the
5 apparatus includes: a request receiving unit, configured to: when the proxy terminal is located in a to-be-tested geographical area pre-determined by the testing terminal, and is determined by the testing terminal as a target proxy terminal, receive a testing request sent by the testing terminal to the proxy terminal based on connection information of the proxy terminal, where the testing request includes a service request expected to be sent to a target server; a sending processing unit,
10 configured to: send the service request to the target server, and record a sending moment of the service request; a receiving processing unit, configured to: receive a service response to the service request from the target server, and record a receiving moment of the service response; and a response sending unit, configured to send a testing response to the testing terminal, where the testing response indicates a time interval between the sending moment and the receiving moment,
15 so that the testing terminal generates a testing result corresponding to the to-be-tested area based on the time interval.

[0011] This specification provides a computer-readable nonvolatile storage medium. The storage medium stores a computer program, and when the computer program is executed by a processor, the network performance testing method is implemented.

[0012] The above-mentioned at least one technical solution used in the embodiments of this
20 specification can achieve at least one of the following beneficial effects: When network performance of a target server in a specific to-be-tested geographical area needs to be tested, a testing terminal can cooperate with a specific target proxy terminal located in the to-be-tested geographical area, to complete testing of the network performance of the target server in the to-
25 be-tested geographical area. There is no need to deploy a dedicated equipment room in each of a large quantity of geographical areas in which network performance testing may need to be performed, to help test network performance of the target server in a plurality of geographical areas more accurately, comprehensively, and efficiently.

BRIEF DESCRIPTION OF DRAWINGS

[0013] To describe the technical solutions in the embodiments of this specification more clearly, the following briefly describes the accompanying drawings needed for describing the embodiments. Clearly, the accompanying drawings in the following descriptions show merely
5 some embodiments of the present invention, and a person of ordinary skill in the art can still derive other drawings from these accompanying drawings without creative efforts.

[0014] FIG. 1 is a diagram of a system architecture of a technical solution according to an embodiment of this specification;

[0015] FIG. 2 is a schematic diagram of an example process in which a terminal accesses a
10 VPN according to an embodiment of this specification;

[0016] FIG. 3 is a schematic diagram of an example process in which a terminal is registered with a management server according to an embodiment of this specification;

[0017] FIG. 4 is a flowchart of a network performance testing method according to an embodiment of this specification;

15 [0018] FIG. 5 is a schematic diagram of a process of determining a target proxy terminal according to an embodiment of this specification;

[0019] FIG. 6 is a first schematic structural diagram of a network performance testing apparatus according to an embodiment of this specification;

[0020] FIG. 7 is a second schematic structural diagram of a network performance testing
20 apparatus according to an embodiment of this specification; and

[0021] FIG. 8 is a schematic structural diagram of a computer system according to an embodiment of this specification.

DESCRIPTION OF EMBODIMENTS

[0022] To make the objectives, technical solutions, and advantages of this specification clearer,
25 the following clearly and comprehensively describes the technical solutions of this specification with reference to specific embodiments and corresponding accompanying drawings of this specification. Clearly, the described embodiments are merely some but not all of embodiments of this specification. All other embodiments obtained by a person of ordinary skill in the art based on the embodiment of this specification without creative efforts shall fall within the protection scope

of this specification.

[0023] In a related technology, a dedicated equipment room can be deployed in a plurality of geographical areas. A large quantity of terminals that can be configured to perform network performance testing on a server is configured in the dedicated equipment room. When network performance of a specific target server in a specific to-be-tested geographical area needs to be tested, a terminal deployed in a dedicated equipment room in the to-be-tested geographical area can serve as a testing terminal, and the network performance of the target server in the to-be-tested geographical area is tested by executing a corresponding test case. The above-mentioned solution has many disadvantages in the following examples: A dedicated equipment room is usually deployed at a location with a relatively good network infrastructure. When network performance of a target server is tested by a terminal configured in the dedicated equipment room, a testing result is not representative. To be specific, the testing result can hardly accurately express network performance of the target server in a geographical area of the dedicated equipment room. Deployment and management of the dedicated equipment room need to occupy a relatively large quantity of manpower costs and material costs. In fact, it is difficult to deploy the dedicated equipment room in a large quantity of geographical areas in which network performance testing needs to be performed. Due to device availability, network connectivity, and another device configuration problem, it may be difficult for the dedicated equipment room to meet an actual requirement of a user to complete network performance testing of the target server efficiently.

[0024] In view of this, embodiments of this specification provide at least a network performance testing method and apparatus, a storage medium, and a computer system. When corresponding network performance of a target server in a specific to-be-tested geographical area needs to be tested, a testing terminal can determine a target proxy terminal from a plurality of proxy terminals that act as proxies to perform network performance testing. The target proxy terminal needs to be located in the to-be-tested geographical area. Then, the testing terminal can send a testing request to the target proxy terminal based on connection information of the target proxy terminal. The testing request includes a service request expected to be sent to a target server, so that the target proxy terminal sends the service request to the target server. Further, the testing terminal can receive a testing response from the target proxy terminal, where the testing response indicates a time interval between a sending moment at which the target proxy terminal sends the service request and a receiving moment at which the target proxy terminal receives a service

response from the target server; and generate a testing result corresponding to the to-be-tested geographical area based on the time interval.

[0025] In this way, when network performance of the target server in a specific to-be-tested geographical area needs to be tested, the testing terminal can cooperate with a specific target proxy terminal located in the to-be-tested geographical area, to complete testing of the network performance of the target server in the to-be-tested geographical area. There is no need to deploy a dedicated equipment room in each of a large quantity of geographical areas in which network performance testing may need to be performed, to help test network performance of the target server in a plurality of geographical areas more accurately, comprehensively, and efficiently.

[0026] FIG. 1 is a diagram of a system architecture of a technical solution according to an embodiment of this specification. As shown in FIG. 1, before a target service system officially goes online or in a process in which a target service system runs, network performance corresponding to a target server in the target service system in a plurality of geographical areas may need to be tested. For example, a specific target server in a product transaction system can provide a page used for product purchase. In consideration of fairness achieved when users located in the plurality of geographical areas separately participate in product purchase on the page, access times of accessing the page by using a terminal in the plurality of geographical areas may be expected to be estimated, so that a product purchase activity is better implemented on the product purchase page based on the estimated access time. For example, a process in which the target server responds to a service request that is from a corresponding geographical area and that is used to access the page is adjusted based on the access time.

[0027] The terminal can include but is not limited to a mobile terminal such as a mobile phone, a notebook computer, or a tablet computer.

[0028] A tester can compile a plurality of test cases for the target service system, to test the network performance of the target server in the target service system in the plurality of geographical areas, for example, to test network performance of the target server in geographical areas A, B, C, and D. For a single test case, a geographical area (namely, a to-be-tested geographical area) expected to be tested, a target resource (for example, the page used to support the product purchase activity in the product transaction system in the above-mentioned example) expected to be accessed, a service request used to access the target resource, a manner of triggering a testing terminal to generate a service request, etc. can be indicated.

[0029] For any terminal located in any geographical area in which network performance testing may be performed, for example, a terminal M1 located in the geographical area A, when a holder of the terminal M1 allows the terminal M1 to serve as a proxy terminal to participate in network performance testing, the terminal M1 can download and install a first application (or referred to as a target application) used to act as a proxy to perform network performance testing. Similarly, when a related tester expects to use a specific terminal in a geographical area, for example, a terminal M2 in the geographical area D as a testing terminal, the terminal M2 can be deployed with a corresponding second application, to support the testing terminal to implement testing of the network performance corresponding to the target server in the plurality of geographical areas.

[0030] The terminal usually needs to access the Internet by using a customer edge device, for example, access the Internet by using a router or another gateway device, so that some terminals may not have a fixed internet protocol (IP) address. Correspondingly, to ensure that the testing terminal can find a proxy terminal and communicate with the proxy terminal, the testing terminal and each proxy terminal can access the same virtual private network (VPN), so that the testing terminal and each proxy terminal can communicate with each other by using internal IP addresses corresponding to the testing terminal and each proxy terminal in the same VPN.

[0031] FIG. 2 is a schematic diagram of an example process in which a terminal accesses a VPN according to an embodiment of this specification. As shown in FIG. 2, for a terminal M1 located in any geographical area, for example, a geographical area A, when a holder of the terminal M1 allows the terminal M1 to serve as a proxy terminal, the terminal M1 can access a target VPN by using step S201 to step S205.

[0032] First, in step S201, the terminal M1 sends an access information query request to a management server.

[0033] For example, the terminal M1 can send the access information query request to the management server by using the above-mentioned target application downloaded and installed by the terminal M1. The access information query request can include related authentication information. For example, the holder of the terminal M1 registers a login account, a login password corresponding to the login account, etc. in the management server by using the target application.

[0034] When the management server stores access information of a plurality of VPNs, the target application deployed in the terminal M1 may obtain identification information of the

plurality of VPNs from the management server, and present the identification information to the holder of the terminal M1. The holder of the terminal M1 can select, by using the target application, identification information of a target VPN that is expected to be accessed. Further, the access query request can further include the identification information of the target VPN that is expected by the terminal M1 to be accessed, so that the management server adds access information of the target VPN to a corresponding query response based on the identification information of the target VPN, and returns the query response to the terminal M1.

[0035] Correspondingly, in step S203, the terminal M1 receives the query response corresponding to the access information query request from the management server. The query response includes the access information of the target VPN.

[0036] The above-mentioned example is still used. The access information query request can include the related authentication information. For example, the holder of the terminal M1 registers the login account, the login password corresponding to the login account, etc. in the management server by using the target application. The management server can verify the authentication information in the access information query request. After verification succeeds, the query response can be sent to M1.

[0037] The access information of the target VPN includes at least connection information of a VPN server corresponding to the target VPN, for example, an IP address of the corresponding VPN server in the Internet. In addition, the access information can further include cryptographic data used to support the terminal M1 and the corresponding VPN server to establish a communication tunnel, for example, a public key certificate of the corresponding VPN server.

[0038] Finally, in step S205, the terminal M1 exchanges information with the corresponding VPN server based on the access information of the target VPN, to complete access to the target VPN and obtaining of an internal IP address of the terminal M1 in the target VPN.

[0039] Step S201 to step S205 describe an example process in which the terminal A1 located in the geographical area A accesses the target VPN. However, it can be understood that all terminals located in a large quantity of geographical areas can access the same target VPN by using a similar process. For example, for a terminal M2 located in a geographical area D, a related tester may use the terminal M2 as a testing terminal. To be specific, the terminal M2 can access a target VPN the same as that of the terminal M1 by using a process similar to step S201 to step S205, to obtain an internal IP address of the terminal M2 in the target VPN.

[0040] To enable the testing terminal to find and select a proxy terminal that meets a filtering condition to act as a proxy to perform network performance testing, a terminal that is allowed to serve as the proxy terminal can be further registered with a centralized management server, so that the testing terminal cooperates with the management server to find and select the proxy terminal
5 that meets the filtering condition to cooperate to implement network performance testing of a target server.

[0041] FIG. 3 is a schematic diagram of an example process in which a terminal is registered with a management server according to an embodiment of this specification.

[0042] As shown in FIG. 3, for a terminal A1 located in any geographical area, for example, a
10 geographical area A, when a holder of the terminal A1 allows the terminal A1 to serve as a proxy terminal, the terminal M1 can be registered with the management server by using some or all of step S301 to step S305, so that the terminal M1 becomes a proxy terminal configured to act as a proxy to perform network performance testing.

[0043] First, in step S301, the terminal M1 sends configuration information of the terminal
15 M1 to the management server. The configuration information includes at least location information and connection information of the terminal M1.

[0044] When the terminal M1 has accessed a target VPN, the connection information of the terminal M1 can be an internal IP address of the terminal M1 in the target VPN. In some technical scenarios, the terminal M1 may have a fixed IP address. For example, a customer edge device
20 connected to the terminal M1 is prohibited from being connected to a terminal other than the terminal M1. An IP address of the customer edge device can be used as the fixed IP address of the terminal M1, and the connection information of the terminal M1 can include an IP address of the customer edge device.

[0045] The configuration information of the terminal M1 can further include an access
25 network type and/or a device attribute of the terminal M1. For example, the access network type can include but is not limited to wireless fidelity (Wi-Fi), 2G, 3G, 4G, 5G, etc. For example, the device attribute can include but is not limited to a device name, a device type, a manufacturer, a device model, etc.

[0046] Next, in step S303, the management server stores the configuration information of the
30 terminal M1.

[0047] In some technical scenarios, a plurality of testing terminals may simultaneously test

network performance of a target server in the same geographical area. For example, as shown in FIG. 1, both terminals M2 and M6 in a geographical area D can serve as testing terminals to execute the same or different test cases in a subsequent process, to implement testing of network performance of the target server in a geographical area A. In this case, to avoid a case in which the plurality of testing terminals simultaneously use the same proxy terminal to implement testing of network performance of the target server in a same geographical area, and consequently, a network bandwidth of the proxy terminal withstands pressure and network performance of the target server in a related geographical area cannot be accurately tested, the management server can further perform step S305 on the basis that step S303 is performed, to set the terminal M1 to be not in a locked state.

[0048] The management server can set status indication information for the terminal M1, to indicate whether the terminal M1 is in the locked state. For example, when the status indication information corresponding to the terminal M1 is a first preset value, for example, 0, it indicates that the terminal M1 is not in the locked state, that is, it indicates that a testing terminal that uses the terminal M1 to perform network performance testing does not exist at a current moment. Correspondingly, when the status indication information of the terminal M1 is a second preset value, for example, 1, it indicates that the terminal M1 is in the locked state, that is, it indicates that a testing terminal that uses the terminal M1 to perform network performance testing exists at a current moment.

[0049] Step S301 to step S305 describe an example process in which the terminal A1 located in the geographical area A is registered with the management server. However, it can be understood that a plurality of terminals located in a large quantity of geographical areas can be registered with the management server by using a similar process. For example, for a terminal M3 in the geographical area A, a terminal M4 in a geographical area B, and a terminal M5 in a geographical area C, all of the terminal M3, the terminal M4, and the terminal M5 can be registered with the management server by using a process similar to step S301 to step S305, and become proxy terminals that act as proxies to perform network performance testing.

[0050] When the holder of the terminal A1 no longer allows to use the terminal A1 as a proxy terminal, the terminal M1 can be correspondingly triggered to send a related device release request to the management server, so that the management server deletes, based on the device release request, the configuration information that is of the terminal A1 and that is stored in the

management server. In a subsequent process, a related testing device and the management server do not continue to use the terminal A1 as a proxy terminal that acts as a proxy to perform network performance testing. In addition, the management server can further correspondingly calculate, based on duration in which the terminal A1 serves as a proxy terminal, for example, storage time
5 of the configuration information of the terminal A1 in the management server, a resource share that needs to be allocated to the holder of the terminal A1, and allocate a specific resource (for example, a digital resource or a determined currency) to the holder of the terminal A1 based on the resource sharer. In this way, a large quantity of users located in a large quantity of geographical areas can be encouraged to register, terminals held by the users, as proxy terminals that act as
10 proxies to perform network performance testing, thereby facilitating use of a large quantity of terminals located in the large quantity of geographical areas and comprehensively testing network performance corresponding to the target server in the large quantity of geographical areas.

[0051] The following describes, with reference to the system framework shown in FIG. 1, an example of a network performance testing method provided in an embodiment of this specification.

[0052] FIG. 4 is a flowchart of a network performance testing method according to an embodiment of this specification. The method describes a process in which a testing terminal cooperates with a target proxy terminal to implement testing of network performance of a target server in a to-be-tested geographical area.

[0053] First, in step S301, the testing terminal determines the target proxy terminal from a plurality of proxy terminals. The target proxy terminal is located in a to-be-tested geographical area;

[0054] With reference to the above-mentioned descriptions, configuration information of the plurality of proxy terminals can be stored in a management server. For example, the configuration information of the plurality of proxy terminals such as terminals M1, M3, M4, and M5 may be
25 stored in the management server. Correspondingly, in a possible implementation, some or all of step S4011 to step S4017 can be used to determine the target proxy terminal from the plurality of proxy terminals, so that the testing terminal obtains connection information of the target proxy terminal.

[0055] Step S4011: The testing terminal sends a filtering condition to the management server, where the filtering condition indicates at least the to-be-tested geographical area.

[0056] For example, the testing terminal is a terminal M2 located in a geographical area D.

The terminal M2 is configured to execute a test case related to the target server. The test case can indicate a corresponding filtering condition, and the filtering condition indicates at least the to-be-tested geographical area, for example, indicates that the to-be-tested geographical area is a geographical area A. In addition, for example, the filtering condition can further indicate access
5 network constraint information and/or device attribute constraint information. The access network constraint information is used to limit a condition that needs to be satisfied by an access network type of the target proxy terminal, and the device attribute constraint information is used to limit a condition that needs to be satisfied by a device attribute of the target proxy terminal.

[0057] Step S4013: The management server determines, from the plurality of proxy terminals,
10 several candidate proxy terminals that are not in a locked state.

[0058] Step S4015: The management server determines, from the several candidate proxy terminals based on respective configuration information of the several candidate proxy terminals, a target proxy terminal that matches the filtering condition.

[0059] The above-mentioned example is still used. Several candidate proxy terminals that are
15 not in the locked state in the plurality of proxy terminals including the terminals M1, M3, M4, and M5 include, for example, the terminals M1, M3, M4, and M5. When the to-be-tested geographical area indicated by the filtering condition is the geographical area A, the target proxy terminal can be selected from the terminal M1 and the terminal M3 in the geographical area A based on location information of the terminals M1, M3, M4, and M5. Further, it is still assumed here that an access
20 network type of the terminal M1 is Wi-Fi, an access network type of the terminal M3 is 5G, and an access network type that is of the target proxy terminal and that is limited by the access network constraint information indicated in the filtering condition needs to be 5G. In this case, the terminal M3 is determined as a target proxy terminal that acts as a proxy to perform network performance testing.

[0060] Step S4017: The management server sends the connection information of the target
25 proxy terminal to the testing terminal.

[0061] The above-mentioned example is still used. The connection information of the target proxy terminal can be an internal IP address in a corresponding VPN, or may be an IP address of a customer edge device connected to the target proxy terminal in the Internet.

[0062] To avoid a case in which a plurality of testing terminals simultaneously use the same
30 proxy terminal to implement testing of network performance of the target server in the same

geographical area, the management server can further set the target proxy terminal to the locked state after completing step S4015, for example, set the status indication information of the target proxy terminal to a second preset value 1.

5 **[0063]** The testing terminal can alternatively determine, from the plurality of proxy terminals in another manner other than step S4011 to step S4017, the target proxy terminal located in the to-be-tested geographical area. For example, the testing terminal may obtain respective configuration information of the plurality of proxy terminals, so that the testing terminal determines, from the plurality of proxy terminals based on the respective configuration information of the plurality of proxy terminals, the target proxy terminal located in the to-be-tested geographical area, and obtains
10 the connection information of the target proxy terminal.

[0064] Back to FIG. 4. In step S403, the testing terminal sends a testing request to the target proxy terminal based on the connection information of the target proxy terminal. The testing request includes a service request expected to be sent to the target server.

[0065] The test case executed by the testing terminal can include a target resource expected to
15 be obtained from the target server, and a service request used to access the target resource or a manner of triggering the related testing terminal to initiate the service request. In a process in which the testing terminal executes the test case, the testing terminal can obtain, based on the test case, the service request expected to be sent to the target server.

[0066] When both the target proxy terminal and the testing terminal access the same target
20 VPN, the testing request sent by the testing terminal to the target proxy terminal can be transmitted through the target VPN based on internal IP addresses corresponding to the target proxy terminal and the testing terminal in the target VPN.

[0067] Step S405: The target proxy terminal sends the service request to the target server, and records a sending moment of the service request.

25 **[0068]** The service request is used to access the target resource provided by the target server. If the target server can normally process the service request, the target server returns a service response that includes the target resource to the target proxy terminal. If the target server cannot normally process the service request, the target server returns, to the target proxy terminal, a service response indicating a response failure.

30 **[0069]** Correspondingly, in step S407, the target proxy terminal receives the service response corresponding to the service request from the target server, and records a receiving moment of the

service response.

[0070] Further, in step S409, the target proxy terminal sends a testing response to the testing terminal. The testing response indicates a time interval between the sending moment and the receiving moment.

5 **[0071]** Finally, in step S411, a testing result corresponding to the to-be-tested geographical area is generated based on the time interval.

[0072] The target proxy terminal can calculate the time interval between the receiving moment and the sending moment, and send, to the testing terminal, the testing response that includes the time interval. Alternatively, the target proxy terminal can directly send, to the testing terminal, a
10 testing response that includes the receiving moment and the sending moment, and the testing terminal calculates the time interval between the receiving moment and the sending moment.

[0073] The testing result can include the time interval and indication information used to indicate a proxy geographical area. In addition, other information provided in a related test case can be further included, for example, a complete filtering condition included in the related test
15 case, a service request included in the testing request, and a service response included in the testing response.

[0074] Based on the same concept as the above-mentioned method embodiments, an embodiment of this specification further provides a network performance testing apparatus 600. The apparatus 600 relates to a testing terminal and a plurality of proxy terminals that act as proxies
20 to perform network performance testing, and the apparatus 600 is deployed in the testing terminal. As shown in FIG. 6, the apparatus 600 includes: a proxy determining unit 601, configured to determine a target proxy terminal from the plurality of proxy terminals, where the target proxy terminal is located in a to-be-tested geographical area; a request sending unit 603, configured to send a testing request to the target proxy terminal based on connection information of the target
25 proxy terminal, where the testing request includes a service request expected to be sent to a target server, so that the target proxy terminal sends the service request to the target server; a response receiving unit 605, configured to receive a testing response from the target proxy terminal, where the testing response indicates a time interval between a sending moment at which the target proxy terminal sends the service request and a receiving moment at which the target proxy terminal
30 receives a service response from the target server; and a record processing unit 607, configured to generate a testing result corresponding to the to-be-tested geographical area based on the time

interval.

[0075] Based on the same concept as the above-mentioned method embodiments, an embodiment of this specification further provides a network performance testing apparatus 700. The apparatus 700 relates to a testing terminal and a plurality of proxy terminals that act as proxies to perform network performance testing, and the apparatus 700 is deployed in any of the plurality of proxy terminals. As shown in FIG. 7, the apparatus 700 includes: a request receiving unit 701, configured to: when the proxy terminal is located in a to-be-tested geographical area pre-determined by the testing terminal, and is determined by the testing terminal as a target proxy terminal, receive a testing request sent by the testing terminal to the proxy terminal based on connection information of the proxy terminal, where the testing request includes a service request expected to be sent to a target server; a sending processing unit 703, configured to: send the service request to the target server, and record a sending moment of the service request; a receiving processing unit 705, configured to: receive a service response to the service request from the target server, and record a receiving moment of the service response; and a response sending unit 707, configured to send a testing response to the testing terminal, where the testing response indicates a time interval between the sending moment and the receiving moment, so that the testing terminal generates a testing result corresponding to the to-be-tested area based on the time interval.

[0076] For ease of description, the above-mentioned apparatus is described by dividing the apparatus into various units/modules based on functions. Certainly, during implementation of this specification, functions of all modules/units can be implemented in one or more pieces of software and/or hardware.

[0077] The specification also provides a computer-readable non-transitory storage medium, where the storage medium stores a computer program, which, when executed by a processor, can be used to perform one or more steps of one or more methods described or illustrated herein or provides functionality described or illustrated herein. Herein, the computer-readable non-transitory storage medium or media may include one or more semiconductor-based or other integrated circuits (ICs) (such, as for example, field-programmable gate arrays (FPGAs) or application-specific ICs (ASICs)), hard disk drives (HDDs), hybrid hard drives (HHDs), optical discs, optical disc drives (ODDs), magneto-optical discs, magneto-optical drives, floppy diskettes, floppy disk drives (FDDs), magnetic tapes, solid-state drives (SSDs), RAM-drives, SECURE DIGITAL cards or drives, any other suitable computer-readable non-transitory storage media, or

any suitable combination of two or more of these, where appropriate. A computer-readable non-transitory storage medium may be volatile, non-volatile, or a combination of volatile and non-volatile, where appropriate.

[0078] The specification also provides a computer system. FIG. 8 illustrates an example
5 computer system 1000. In particular embodiments, one or more computer systems 1000 perform one or more steps of one or more methods described or illustrated herein. In particular embodiments, one or more computer systems 1000 provide functionality described or illustrated herein. In particular embodiments, software running on one or more computer systems 1000 performs one or more steps of one or more methods described or illustrated herein or provides
10 functionality described or illustrated herein. Particular embodiments include one or more portions of one or more computer systems 1000. Herein, reference to a computer system may encompass a computing device, and vice versa, where appropriate. Moreover, reference to a computer system may encompass one or more computer systems, where appropriate.

[0079] This disclosure contemplates any suitable number of computer systems 1000. This
15 disclosure contemplates computer system 1000 taking any suitable physical form. As example and not by way of limitation, computer system 1000 may be an embedded computer system, a system-on-chip (SOC), a single-board computer system (SBC) (such as, for example, a computer-on-module (COM) or system-on-module (SOM)), a desktop computer system, a laptop or notebook computer system, an interactive kiosk, a mainframe, a mesh of computer systems, a mobile
20 telephone, a personal digital assistant (PDA), a server, a tablet computer system, or a combination of two or more of these. Where appropriate, computer system 1000 may include one or more computer systems 1000; be unitary or distributed; span multiple locations; span multiple machines; span multiple data centers; or reside in a cloud, which may include one or more cloud components in one or more networks. Where appropriate, one or more computer systems 1000 may perform
25 without substantial spatial or temporal limitation one or more steps of one or more methods described or illustrated herein. As an example and not by way of limitation, one or more computer systems 1000 may perform in real time or in batch mode one or more steps of one or more methods described or illustrated herein. One or more computer systems 1000 may perform at different times or at different locations one or more steps of one or more methods described or illustrated herein,
30 where appropriate.

[0080] In particular embodiments, computer system 1000 includes a processor 1002, memory

1004, storage 1006, an input/output (I/O) interface 1008, a communication interface 1010, and a bus 1012. Although this disclosure describes and illustrates a particular computer system having a particular number of particular components in a particular arrangement, this disclosure contemplates any suitable computer system having any suitable number of any suitable components in any suitable arrangement.

[0081] In particular embodiments, processor 1002 includes hardware for executing instructions, such as those making up a computer program. As an example and not by way of limitation, to execute instructions, processor 1002 may retrieve (or fetch) the instructions from an internal register, an internal cache, memory 1004, or storage 1006; decode and execute them; and then write one or more results to an internal register, an internal cache, memory 1004, or storage 1006. In particular embodiments, processor 1002 may include one or more internal caches for data, instructions, or addresses. This disclosure contemplates processor 1002 including any suitable number of any suitable internal caches, where appropriate. As an example and not by way of limitation, processor 1002 may include one or more instruction caches, one or more data caches, and one or more translation lookaside buffers (TLBs). Instructions in the instruction caches may be copies of instructions in memory 1004 or storage 1006, and the instruction caches may speed up retrieval of those instructions by processor 1002. Data in the data caches may be copies of data of 80 in memory 1004 or storage 1006 for instructions executing at processor 1002 to operate on; the results of previous instructions executed at processor 1002 for access by subsequent instructions executing at processor 1002 or for writing to memory 1004 or storage 1006; or other suitable data. The data caches may speed up read or write operations by processor 1002. The TLBs may speed up virtual-address translation for processor 1002. In particular embodiments, processor 1002 may include one or more internal registers for data, instructions, or addresses. This disclosure contemplates processor 1002 including any suitable number of any suitable internal registers, where appropriate. Where appropriate, processor 1002 may include one or more arithmetic logic units (ALUs); be a multi-core processor; or include one or more processors 1002. Although this disclosure describes and illustrates a particular processor, this disclosure contemplates any suitable processor.

[0082] In particular embodiments, memory 1004 includes main memory for storing instructions for processor 1002 to execute or data for processor 1002 to operate on. As an example and not by way of limitation, computer system 1000 may load instructions from storage 1006 or

another source (such as, for example, another computer system 1000) to memory 1004. Processor 1002 may then load the instructions from memory 1004 to an internal register or internal cache. To execute the instructions, processor 1002 may retrieve the instructions from the internal register or internal cache and decode them. During or after execution of the instructions, processor 1002
5 may write one or more results (which may be intermediate or final results) to the internal register or internal cache. Processor 1002 may then write one or more of those results to memory 1004. In particular embodiments, processor 1002 executes only instructions in one or more internal registers or internal caches or in memory 1004 (as opposed to storage 1006 or elsewhere) and operates only on data in one or more internal registers or internal caches or in memory 1004 (as
10 opposed to storage 1006 or elsewhere). One or more memory buses (which may each include an address bus and a data bus) may couple processor 1002 to memory 1004. Bus 1012 may include one or more memory buses, as described below. In particular embodiments, one or more memory management units (MMUs) reside between processor 1002 and memory 1004 and facilitate accesses to memory 1004 requested by processor 1002. In particular embodiments, memory 1004
15 includes random access memory (RAM). This RAM may be volatile memory, where appropriate. Where appropriate, this RAM may be dynamic RAM (DRAM) or static RAM (SRAM). Moreover, where appropriate, this RAM may be single-ported or multi-ported RAM. This disclosure contemplates any suitable RAM. Memory 1004 may include one or more memories 1004, where appropriate. Although this disclosure describes and illustrates particular memory, this disclosure
20 contemplates any suitable memory.

[0083] In particular embodiments, storage 1006 includes mass storage for data or instructions. As an example and not by way of limitation, storage 1006 may include a hard disk drive (HDD), a floppy disk drive, flash memory, an optical disc, a magneto-optical disc, magnetic tape, or a Universal Serial Bus (USB) drive or a combination of two or more of these. Storage 1006 may
25 include removable or non-removable (or fixed) media, where appropriate. Storage 1006 may be internal or external to computer system 1000, where appropriate. In particular embodiments, storage 1006 is non-volatile, solid-state memory. In particular embodiments, storage 1006 includes read-only memory (ROM). Where appropriate, this ROM may be mask-programmed ROM, programmable ROM (PROM), erasable PROM (EPROM), electrically erasable PROM
30 (EEPROM), electrically alterable ROM (EAROM), or flash memory or a combination of two or more of these. This disclosure contemplates mass storage 1006 taking any suitable physical form.

Storage 1006 may include one or more storage control units facilitating communication between processor 1002 and storage 1006, where appropriate. Where appropriate, storage 1006 may include one or more storages 1006. Although this disclosure describes and illustrates particular storage, this disclosure contemplates any suitable storage.

5 **[0084]** In particular embodiments, I/O interface 1008 includes hardware, software, or both, providing one or more interfaces for communication between computer system 1000 and one or more I/O devices. Computer system 1000 may include one or more of these I/O devices, where appropriate. One or more of these I/O devices may enable communication between a person and computer system 1000. As an example and not by way of limitation, an I/O device may include a
10 keyboard, keypad, microphone, monitor, mouse, printer, scanner, speaker, still camera, stylus, tablet, touch screen, trackball, video camera, another suitable I/O device or a combination of two or more of these. An I/O device may include one or more sensors. This disclosure contemplates any suitable I/O devices and any suitable I/O interfaces 1008 for them. Where appropriate, I/O interface 1008 may include one or more device or software drivers enabling processor 1002 to
15 drive one or more of these I/O devices. I/O interface 1008 may include one or more I/O interfaces 1008, where appropriate. Although this disclosure describes and illustrates a particular I/O interface, this disclosure contemplates any suitable I/O interface.

[0085] In particular embodiments, communication interface 1010 includes hardware, software, or both providing one or more interfaces for communication (such as, for example, packet-based
20 communication) between computer system 1000 and one or more other computer systems 1000 or one or more networks. As an example and not by way of limitation, communication interface 1010 may include a network interface controller (NIC) or network adapter for communicating with an Ethernet or other wire-based network or a wireless NIC (WNIC) or wireless adapter for communicating with a wireless network, such as a WI-FI network. This disclosure contemplates
25 any suitable network and any suitable communication interface 1010 for it. As an example and not by way of limitation, computer system 1000 may communicate with an ad hoc network, a personal area network (PAN), a local area network (LAN), a wide area network (WAN), a metropolitan area network (MAN), or one or more portions of the Internet or a combination of two or more of these. One or more portions of one or more of these networks may be wired or wireless. As an example,
30 computer system 1000 may communicate with a wireless PAN (WPAN) (such as, for example, a BLUETOOTH WPAN), a WI-FI network, a WI-MAX network, a cellular telephone network (such

as, for example, a Global System for Mobile Communications (GSM) network), or other suitable wireless network or a combination of two or more of these. Computer system 1000 may include any suitable communication interface 1010 for any of these networks, where appropriate. Communication interface 1010 may include one or more communication interfaces 1010, where
5 appropriate. Although this disclosure describes and illustrates a particular communication interface, this disclosure contemplates any suitable communication interface.

[0086] In particular embodiments, bus 1012 includes hardware, software, or both coupling components of computer system 1000 to each other. As an example and not by way of limitation, bus 1012 may include an Accelerated Graphics Port (AGP) or other graphics bus, an Enhanced
10 Industry Standard Architecture (EISA) bus, a front-side bus (FSB), a HYPERTRANSPORT (HT) interconnect, an Industry Standard Architecture (ISA) bus, an INFINIBAND interconnect, a low-pin-count (LPC) bus, a memory bus, a Micro Channel Architecture (MCA) bus, a Peripheral Component Interconnect (PCI) bus, a PCI-Express (PCIe) bus, a serial advanced technology attachment (SATA) bus, a Video Electronics Standards Association local (VLB) bus, or another
15 suitable bus or a combination of two or more of these. Bus 1012 may include one or more buses 1012, where appropriate. Although this disclosure describes and illustrates a particular bus, this disclosure contemplates any suitable bus or interconnect.

[0087] It should be further noted that, the terms "include", "comprise", or any other variant thereof are intended to cover a non-exclusive inclusion, so that a process, a method, a product or
20 a device that includes a list of elements not only includes those elements but also includes other elements which are not expressly listed, or further includes elements inherent to such process, method, product, or device. Without more constraints, an element preceded by "includes a ..." does not preclude the existence of additional identical elements in the process, method, product or device that includes the element.

[0088] The embodiments of this specification are described in a progressive way. For same or
25 similar parts in the embodiments, references can be made to each other. Each embodiment focuses on a difference from another embodiment. Particularly, some system embodiments are briefly described because they are basically similar to some method embodiments. For related parts, references can be made to related descriptions in some method embodiments.

[0089] The above-mentioned descriptions are merely embodiments of this specification, and
30 are not intended to limit this specification. A person skilled in the art can make various changes

and changes to this specification. Any modification, equivalent replacement, improvement, etc. made without departing from the spirit and principle of this specification shall fall within the scope of the claims in this application.

CLAIMS

What is claimed is:

1. A network performance testing method, wherein the method relates to a testing terminal and a plurality of proxy terminals that act as proxies to perform network performance testing, the method is performed by the testing terminal, and the method comprises:

determining a target proxy terminal from the plurality of proxy terminals, wherein the target proxy terminal is located in a to-be-tested geographical area;

sending a testing request to the target proxy terminal based on connection information of the target proxy terminal, wherein the testing request comprises a service request expected to be sent to a target server, so that the target proxy terminal sends the service request to the target server;

receiving a testing response from the target proxy terminal, wherein the testing response indicates a time interval between a sending moment at which the target proxy terminal sends the service request and a receiving moment at which the target proxy terminal receives a service response from the target server; and

generating a testing result corresponding to the to-be-tested geographical area based on the time interval.

2. The method according to claim 1, wherein the method further relates to a management server, the management server stores respective configuration information of the plurality of proxy terminals, and the configuration information comprises at least location information and connection information; and

the determining a target proxy terminal from the plurality of proxy terminals comprises:

sending a filtering condition to the management server, wherein the filtering condition indicates at least the to-be-tested geographical area, so that the management server determines, from the plurality of proxy terminals based on the respective configuration information of the plurality of proxy terminals, a target proxy terminal that matches the filtering condition, and returns connection information of the target proxy terminal to the testing terminal.

3. The method according to claim 2, wherein the management server further stores respective status indication information of the plurality of proxy terminals, the status indication information is used to indicate whether a corresponding proxy terminal is in a locked state, and the target proxy terminal that matches the filtering condition is determined from several candidate proxy terminals

that are never in the locked state.

4. The method according to claim 2, wherein the configuration information further comprises an access network type and/or device attribute information, and the testing result further comprises an access network type and/or a device attribute of the target proxy terminal.

5 5. The method according to claim 1, wherein all of the testing terminal and the plurality of proxy terminals have accessed a target virtual private network (VPN), and the connection information comprises an internal internet protocol (IP) address corresponding to the target VPN.

6. The method according to any one of claims 1 to 5, wherein the testing terminal and the target proxy terminal are located in different geographical areas.

10 7. A network performance testing method, wherein the method relates to a testing terminal and a plurality of proxy terminals that act as proxies to perform network performance testing, the method is performed by any proxy terminal in the plurality of proxy terminals, and the method comprises:

when the proxy terminal is located in a to-be-tested geographical area pre-determined by the
15 testing terminal, and is determined by the testing terminal as a target proxy terminal, receiving a testing request sent by the testing terminal to the proxy terminal based on connection information of the proxy terminal, wherein the testing request comprises a service request expected to be sent to a target server;

20 sending the service request to the target server, and recording a sending moment of the service request;

receiving a service response to the service request from the target server, and recording a receiving moment of the service response; and

25 sending a testing response to the testing terminal, wherein the testing response indicates a time interval between the sending moment and the receiving moment, so that the testing terminal generates a testing result corresponding to the to-be-tested area based on the time interval.

8. The method according to claim 7, wherein the method further comprises: sending configuration information of the proxy terminal to a management server, so that the management server stores the configuration information of the proxy terminal, wherein the configuration information comprises at least location information and the connection information, the connection
30 information is provided by the management server to the testing terminal when the testing terminal determines, based on the configuration information, that the proxy terminal is a target proxy

terminal that matches a filtering condition provided by the testing terminal, and the filtering condition indicates at least the to-be-tested geographical area.

9. The method according to claim 8, wherein the management server further stores status indication information of the proxy terminal, the status indication information is used to indicate whether the proxy terminal is in a locked state, and the proxy terminal is in an unlocked state before being determined as the target proxy terminal, and is in a locked state after being determined as the target proxy terminal.

10. The method according to claim 8, wherein the configuration information further comprises an access network type and/or device attribute information, and the testing result further comprises an access network type and/or a device attribute of the proxy terminal.

11. The method according to claim 7, wherein all of the testing terminal and the plurality of proxy terminals have accessed a target virtual private network (VPN), and the connection information comprises an internal internet protocol (IP) address corresponding to the target VPN.

12. The method according to claim 11, wherein the method further comprises: accessing the target VPN based on access information of the target VPN, and obtaining an internal IP address corresponding to the proxy terminal in the target VPN.

13. The method according to any one of claims 7 to 12, wherein a target application is deployed in the proxy terminal, and the method is implemented by the proxy terminal by using the target application.

14. A computer system, comprising a storage, a processor, and a computer program that is stored in the storage and that is capable of running on the processor, wherein the computer system is implemented as a testing terminal, and when the processor executes the computer program, the following steps are implemented:

determining a target proxy terminal from a plurality of proxy terminals that act as proxies to perform network performance testing, wherein the target proxy terminal is located in a to-be-tested geographical area;

sending a testing request to the target proxy terminal based on connection information of the target proxy terminal, wherein the testing request comprises a service request expected to be sent to a target server, so that the target proxy terminal sends the service request to the target server;

receiving a testing response from the target proxy terminal, wherein the testing response indicates a time interval between a sending moment at which the target proxy terminal sends the

service request and a receiving moment at which the target proxy terminal receives a service response from the target server; and

generating a testing result corresponding to the to-be-tested geographical area based on the time interval.

5 15. A computer system, comprising a storage, a processor, and a computer program that is stored in the storage and that is capable of running on the processor, wherein the computer system is implemented as a proxy terminal that acts as a proxy to perform network performance testing, and when the processor executes the computer program, the following steps are implemented:

when the proxy terminal is located in a to-be-tested geographical area pre-determined by a
10 testing terminal, and is determined by the testing terminal as a target proxy terminal, receiving a testing request sent by the testing terminal to the proxy terminal based on connection information of the proxy terminal, wherein the testing request comprises a service request expected to be sent to a target server;

 sending the service request to the target server, and recording a sending moment of the service
15 request;

 receiving a service response to the service request from the target server, and recording a receiving moment of the service response; and

 sending a testing response to the testing terminal, wherein the testing response indicates a time interval between the sending moment and the receiving moment, so that the testing terminal
20 generates a testing result corresponding to the to-be-tested area based on the time interval.

 16. A network performance testing apparatus, wherein the apparatus relates to a testing terminal and a plurality of proxy terminals that act as proxies to perform network performance testing, the apparatus is deployed in the testing terminal, and the apparatus comprises:

 a proxy determining unit, configured to determine a target proxy terminal from the plurality
25 of proxy terminals, wherein the target proxy terminal is located in a to-be-tested geographical area;

 a request sending unit, configured to send a testing request to the target proxy terminal based on connection information of the target proxy terminal, wherein the testing request comprises a service request expected to be sent to a target server, so that the target proxy terminal sends the service request to the target server;

30 a response receiving unit, configured to receive a testing response from the target proxy terminal, wherein the testing response indicates a time interval between a sending moment at which

the target proxy terminal sends the service request and a receiving moment at which the target proxy terminal receives a service response from the target server; and

a record processing unit, configured to generate a testing result corresponding to the to-be-tested geographical area based on the time interval.

5 17. A network performance testing apparatus, wherein the apparatus relates to a testing terminal and a plurality of proxy terminals that act as proxies to perform network performance testing, the apparatus is deployed in any of the plurality of proxy terminals, and the apparatus comprises:

10 a request receiving unit, configured to: when the proxy terminal is located in a to-be-tested geographical area pre-determined by the testing terminal, and is determined by the testing terminal as a target proxy terminal, receive a testing request sent by the testing terminal to the proxy terminal based on connection information of the proxy terminal, wherein the testing request comprises a service request expected to be sent to a target server;

15 a sending processing unit, configured to: send the service request to the target server, and record a sending moment of the service request;

a receiving processing unit, configured to: receive a service response to the service request from the target server, and record a receiving moment of the service response; and

20 a response sending unit, configured to send a testing response to the testing terminal, wherein the testing response indicates a time interval between the sending moment and the receiving moment, so that the testing terminal generates a testing result corresponding to the to-be-tested area based on the time interval.

25 18. A computer-readable nonvolatile storage medium, wherein the storage medium stores a computer program, and when the computer program is executed by a processor, the method according to any one of claims 1 to 13 is implemented.