

METHOD, DEVICE, TERMINAL, AND SERVER FOR A SECURITY CHECK

TECHNICAL FIELD

[001] The disclosure relates to a field of communication technologies, and in particular, to a method, a device, a terminal, and a server for a security check.

BACKGROUND

[002] With the development of smart terminals and network applications, a user may access various network applications via various client applications installed on a terminal. During the access, the user generally needs to perform identity authentication, membership registration, network transaction, or the like. In the meanwhile, an application server may verify the user identity. The traditional mode for verification is an application server check. That is, a user sends a pre-set check password to an application server via a terminal, and when the application server verifies that the check password is consistent with a password at the time of user registration, the check is passed. However, the check password in the above check mode may be easily stolen by a malicious third party through a Trojan program. Therefore, generally, during check, a terminal local check may be an alternative of the application server check. For example, based on check prompting information sent by the application server, the terminal locally performs user-biometric-based fingerprint check, dynamic-identifying-based gesture check, or the like, so as to complete user identity check and send a check result to the server.

[003] However, when the terminal local check is used to replace the application server check, if the malicious third party simulates the terminal to interact with the server and sends a forged terminal local check result to the server, the server cannot determine the trustworthiness of the terminal local check mode which serves as a substitute check mode, thereby making the reliability of the existing security check mode poor and the access security of network applications low.

SUMMARY

[004] Embodiments of the disclosure provide a method, a device, a terminal and a server for a security check, so as to address the problem of poor reliability of a security check mode in conventional technologies.

[005] A first aspect of the disclosure provides a security check method, comprising: performing a local check via an updated check mode to acquire a local check result, when a terminal user performs the security check; encrypting the local check result according to stored substitutive credential information to acquire an encrypted check result, wherein the substitutive credential information is generated when the updated check mode is used to replace an original check mode; and sending the encrypted check result, the local check result and user information of the terminal user to a server, so that the server determines that the local check result is trustable when verification of the encrypted check result according to substitutive credential information corresponding to the user information is passed.

[006] A second aspect of the disclosure further provides a security check method, comprising: receiving an encrypted check result, a local check result, and user information of a terminal user that are sent by a terminal, wherein the encrypted check result is generated when the terminal encrypts the local check result according to stored substitutive credential information, the substitutive credential information is generated when the terminal uses an updated check mode to replace an original check mode, and the local check result is acquired by the terminal performing a local check via the updated check mode when the terminal user performs a security check; acquiring substitutive credential information corresponding to the user information; and verifying the encrypted check result according to the substitutive credential information corresponding to the user information, and determining the local check result to be trustable when the verification is passed.

[007] A third aspect of the disclosure further provides a security check device, comprising: a checking unit used for performing a local check via an updated check mode to acquire a local check result when a terminal user performs a security check; an encrypting unit used for encrypting the local check result according to stored substitutive credential information to acquire an encrypted check result, wherein the substitutive credential information is generated when the updated check mode is used to replace an original check mode; and a first sending unit used for sending the encrypted check result, the local check result, and user information of the terminal user to a server, so that the server determines the local check result to be trustable when the verification of the encrypted check result according to second substitutive credential information corresponding to the user information is passed.

[008] A fourth aspect of the disclosure further provides a security check device, comprising: a first receiving unit used for receiving an encrypted check result, a local check result, and user information of a terminal user that are sent by a terminal, wherein the encrypted check result is generated when the terminal encrypts the local check result according to stored substitutive credential information, the substitutive credential information is generated when the terminal uses an updated check mode to replace an original check mode, and the local check result is acquired by the terminal performing a local check via the updated check mode when the terminal user performs a security check; an acquiring unit used for acquiring substitutive credential information corresponding to the user information; and a checking unit used for verifying the encrypted check result according to the substitutive credential information corresponding to the user information, and determining the local check result to be trustable when the verification is passed.

[009] A fifth aspect of the disclosure further provides a terminal, comprising: a processor; a memory, storing instruction executable by the processor; wherein, the processor

is configured to: perform a local check via an updated check mode to acquire a local check result, when a terminal user performs the security check; encrypt the local check result according to stored substitutive credential information to acquire an encrypted check result, wherein the substitutive credential information is generated when the updated check mode is used to replace an original check mode; and send the encrypted check result, the local check result and user information of the terminal user to a server, so that the server determines that the local check result is trustable when the verification of the encrypted check result according to substitutive credential information corresponding to the user information is passed.

[010] A sixth aspect of the disclosure provides a server, comprising: a processor; and a memory for storing instructions executable by the processor; wherein the processor is configured to: receive an encrypted check result, a local check result, and user information of a terminal user that are sent by a terminal, wherein the encrypted check result is generated when the terminal encrypts the local check result according to stored substitutive credential information, the substitutive credential information is generated when the terminal uses an updated check mode to replace an original check mode, and the local check result is acquired by the terminal performing a local check via the updated check mode when the terminal user performs a security check; acquire substitutive credential information corresponding to the user information; and verify the encrypted check result according to the substitutive credential information corresponding to the user information, and determine the local check result to be trustable when the verification is passed.

[011] In the embodiments of the disclosure, when the original check mode is replaced by the updated check mode, both the terminal and the server store the substitutive credential information generated for the updated check mode. Therefore, when the updated check mode is used for a check, the local check result may be encrypted according to the

substitutive credential information. And the corresponding server may verify, according to the substitutive credential information, the encrypted check result that has been encrypted and is transmitted by the terminal, and then determine the local check result to be trustable when the verification is passed. By applying embodiments of the disclosure, a malicious third party cannot acquire the substitutive credential information, and the security check cannot be completed even if the malicious third party acquires the local check result. Therefore the embodiments of the disclosure may improve the reliability of the security check and secure the access of network applications.

BRIEF DESCRIPTION OF THE DRAWINGS

[012] **FIG. 1** is a schematic diagram of a security check scenario according to embodiments of the disclosure.

[013] **FIG. 2A** is a flow chart of a security check method according to embodiments of the disclosure.

[014] **FIG. 2B** is a flow chart of a security check method according to embodiments of the disclosure.

[015] **FIG. 3** is a flow chart of another security check method according to embodiments of the disclosure.

[016] **FIG. 4** is a flow chart of another security check method according to embodiments of the disclosure.

[017] **FIG. 5** is a hardware structural diagram of a device where a device for a security check is disposed according to embodiments of the disclosure.

[018] **FIG. 6** is a block diagram of a device for a security check according to embodiments of the disclosure.

[019] **FIG. 7** is a block diagram of another device for a security check according to embodiments of the disclosure.

[020] **FIG. 8** is a block diagram of another device for a security check according to embodiments of the disclosure.

[021] **FIG. 9** is a block diagram of another device for a security check according to embodiments of the disclosure.

DETAILED DESCRIPTION

[022] Exemplary embodiments are described in detail herein, and examples of the embodiments are shown in the accompanying drawings. When the accompanying drawings are described below, unless specified otherwise, same numerals in different drawings indicate same or similar elements. Implementations described in the following exemplary embodiments do not represent all implementations consistent with the present disclosure. On the contrary, they are only examples of devices and methods consistent with some aspects described in detail in claims, of the present disclosure.

[023] The terms used in the present disclosure are merely for the purpose of describing specific embodiments, rather than limiting the present disclosure. Singular forms, such as “a”, “said”, and “the”, used in the present disclosure and the claims are also intended to include plural forms, unless clearly specified otherwise in the context. It should also be understood that the term “and/or” used herein indicates and includes any or all possible combinations of one or more associated listed items.

[024] It should be understood that, although terms “first”, “second”, “third”, and the like may be used in the present disclosure to describe various elements, the elements are not limited by the terms. These terms are used merely to differentiate elements of a same type. For example, without departing from the scope of the present disclosure, a first element may also be referred to as a second element. Similarly, the second element may also be referred to as the first element. According to the context, as used herein, the word “if” may be construed as “at the time of” or “when” or “in response to determining”.

[025] In a scenario for communication based on Internet, a user may access various network applications via various client applications installed on a terminal held by the user. During the access, the user generally needs to perform identity authentication, membership registration, network transaction, or the like. In order to secure the above access, a server has to perform a security check on the user identity. A terminal local check mode is gradually replacing a server-end check mode. However, because a malicious third party may easily forge a terminal local check result and interact with the server during the replacing, the reliability of the security check is deteriorated. With reference to **FIG. 1**, which is a schematic diagram of an application scenario for implementing security check according to the embodiments of the disclosure, all of the check between a terminal and a server are performed based on the Internet. During replacing an original check mode with an updated check mode, because both the terminal and the server store the substitutive credential information generated for the updated check mode, when the updated check mode is used for checking, a local check result may be encrypted according to substitutive credential information and the corresponding server may verify, according to the substitutive credential information, an encrypted check result that has been encrypted and is transmitted by the terminal. And the local check result may be further determined to be reliable when the verification is passed, so as to improve the reliability of the security check and secure the access of network applications. Embodiments of the present disclosure are described in detail as below.

[026] **FIG. 2A** is a flow chart of a security check method according to embodiments of the disclosure. The embodiments of the method describe from a terminal side where the security check is performed. The method includes steps 201-203.

[027] In step 201, when a terminal user performs a security check, a local check is performed via an updated check mode to acquire a local check result.

[028] For example, a mode for a security check being performed at a server side may be referred to as an original check mode, and the original check mode usually includes a server performing a check by a check password stored at the time of terminal user registration. A mode for a security check being locally performed at a terminal may be referred to as an updated check mode. The updated check mode may include a fingerprint check mode, a gesture check mode, a face pose check mode, or the like.

[029] For example, when the updated check mode is used to replace the original check mode, the terminal may acquire first original check credential information regarding the original check mode, wherein the first original check credential information may be a check password set at the time of terminal user registration. The terminal generates substitutive credential information for the updated check mode, and sends the first original check credential information, the substitutive credential information, and user information of the terminal user to the server, wherein the substitutive credential information may be a key or a random string, the user information may be a user name of the terminal user and may further include a terminal identifier of the terminal. The terminal user may be uniquely identified by the user information. In the meanwhile, the terminal may locally store the generated substitutive credential information. For example, the substitutive credential information may be stored in a Trusted Execution Environment (TEE) module or a Security Environment (SE) module. After receiving the first original check credential information, the substitutive credential information, and the user information of the terminal user, the server may search for second original check credential information corresponding to the user information. The second original check credential information may be a check password that is set by the terminal user at the time of terminal user registration and is sent by the terminal to the server. The server may store the correlation between the substitutive credential information and the user information when the second original check credential

information is consistent with the first original check credential information after being compared.

[030] The terminal may perform a local check according to the updated check mode to acquire a local check result when the terminal user performs the security check. When the updated check mode is used to perform the local check, the server may usually send check prompting information to the terminal, and the terminal acquires the local check result, for example, in real time according to the check prompting information.

[031] In step 202, the local check result is encrypted according to stored substitutive credential information to acquire an encrypted check result, wherein the substitutive credential information is the information generated when the updated check mode is used to replace an original check mode.

[032] For example, the terminal may acquire, after acquiring the local check result, the substitutive credential information that has been stored and is generated for the updated check mode, and encrypt the local check result according to the substitutive credential information to acquire an encrypted check result. According to different types of substitutive credential information, different encryption modes may be applied. Embodiments shown in **FIG. 3** and **FIG. 4** will provide detailed description taking a key and a random string as examples respectively, and details are omitted herein.

[033] In step 203, the encrypted check result, the local check result, and user information of the terminal user are sent to a server, so that the server determines the local check result to be trustable when the encrypted check result is verified by the substitutive credential information corresponding to the user information.

[034] It may be seen from the above embodiments that, during replacing the original check mode by the updated check mode, because both the terminal and the server store the substitutive credential information generated for the updated check mode, when the

updated check mode is used for a check, the local check result may be encrypted according to the substitutive credential information, and the corresponding server may verify, according to the substitutive credential information, the encrypted check result that has been encrypted and is transmitted by the terminal, and determine the local check result to be trustable when the verification is passed. By applying embodiments of the disclosure, a malicious third party cannot acquire the substitutive credential information, and the security check cannot be completed even if the malicious third party acquires the local check result. Therefore the embodiments of the method may improve the reliability of the security check and secure the access of network applications.

[035] **FIG. 2B** is a flow chart of another security check method according to embodiments of the disclosure, and this method describes how to implement a security check from a server side. The method includes steps 211-213.

[036] In step 211, an encrypted check result, a local check result, and user information of a terminal user that are sent by a terminal may be received.

[037] Referring to the description in earlier step 201, when an updated check mode is used to replace an original check mode, the terminal may acquire first original check credential information of the original check mode, generate substitutive credential information for the updated check mode, and send to a server the first original check credential information, the substitutive credential information, and the user information of the terminal user. After receiving the first original check credential information, the substitutive credential information, and the user information of the terminal user, the server may search for second original check credential information corresponding to the user information, and the server may store the correlation between the substitutive credential information and the user information when the second original check credential information is consistent with the first original check credential information after being compared.

[038] When the terminal user performs a security check, the terminal sends to the server, the local check result that is acquired according to the updated check mode, the encrypted check result that is generated by encrypting the local check result according to stored substitutive credential information, and the user information of the terminal user.

[039] In step 212, substitutive credential information corresponding to the user information is acquired.

[040] For example, after receiving the encrypted check result, the local check result, and the user information of the terminal user, the server may search for the correlation between the stored substitutive credential information and the user information, and acquire the substitutive credential information corresponding to the user information.

[041] In step 213, the encrypted check result is verified according to the substitutive credential information corresponding to the user information, and the local check result is determined to be trustable when the verification is passed.

[042] For example, when the server verifies the encrypted check result according to the substitutive credential information, according to different types of substitutive credential information, different verification modes may be used, and the embodiments shown in subsequent **FIG. 3** and **FIG. 4** will provide detailed description taking a key and a random string as examples respectively, and details are omitted herein. When the verification of the encrypted check result is passed, the server may determine the local check result sent by the terminal to be a trusted check result.

[043] It may be seen from the above embodiments that, during replacing the original check mode with the updated check mode, because both the terminal and the server store the substitutive credential information generated for the updated check mode, when the updated check mode is used for a check, the local check result may be encrypted according to the substitutive credential information, and the corresponding server may verify,

according to the substitutive credential information, the encrypted check result that has been encrypted and is transmitted by the terminal, and determine the local check result to be trustable when the verification is passed. In the application of the embodiments of the disclosure, a malicious third party cannot acquire the substitutive credential information, and the security check cannot be completed even if the malicious third party acquires the local check result, and therefore this embodiment may improve the reliability of the security check and secure the access of network applications.

[044] **FIG. 3** is a flow chart of another security check method according to some embodiments of the disclosure. The embodiments take the substitutive credential information being a public key and a private key as an example, to describe in detail the process of a security check from the perspective of interaction between a terminal and a server. The method may include steps 301-312.

[045] In step 301, the terminal acquires first original check credential information of the original check mode when the updated check mode is used to replace the original check mode.

[046] For example, a mode of security check being performed at a server side may be referred to as an original check mode, and the original check mode is usually a server performing a check using a check password stored at the time of terminal user registration. A mode of security check being locally performed at a terminal may be referred to as an updated check mode, and the updated check mode may include a fingerprint check mode, a gesture check mode, a face pose check mode, or the like.

[047] In some embodiments, when the updated check mode is used to replace the original check mode, the terminal may acquire first original check credential information of the original check mode, wherein the first original check credential information may be a check password set at the time of terminal user registration. When the original check mode

is used for a security check, the terminal user inputs, on a security check interface of the terminal, a user name and a check password set at the time of registration. The terminal may carry the user name and the check password in a security check request, and send the security check request to the server. And the server searches for a check password corresponding to the user name stored in user registration information, and may determine that the terminal user has passed the security check if the retrieved check password is the same as the check password sent by the terminal, so that service operations executed by the terminal user may be released.

[048] In step 302, the terminal generates a public key and a private key for the updated check mode.

[049] For example, when it is determined to use the updated check mode to replace the original check mode, the terminal may generate, for the updated check mode, a key that serves as the substitutive credential information, including a public key and a private key. Any key generating algorithm may be used for generating the key, and description of the algorithm is omitted herein.

[050] In step 303, the terminal stores the private key in a trusted storage area associated with the terminal user.

[051] For example, the trusted storage area may include a TEE module or an SE module. After the public key and the private key are generated, the terminal may store the private key in the trusted storage area.

[052] In step 304, the terminal transmits the first original check credential information, the public key, and the user information of the terminal user to the server.

[053] In some embodiments, the user information may be a user name of the terminal user (e.g., a user name set at the time of terminal user registration). The user information may further include a terminal identifier of the terminal (e.g., a Media Access

Control (MAC) address of the terminal). The terminal user may be uniquely identified according to the user information. The terminal further transmits the acquired first original check credential information, the generated public key, and the user information of the terminal user to the server, so that the server may verify the first original check credential information.

[054] In step 305, the server searches for second original check credential information corresponding to the user information.

[055] With regard to all the terminal users that have registered on the server, the server stores the correlations between user information of these terminal users and check passwords, wherein the check password is check credential information. In some embodiments, upon receiving the first original check credential information, the public key, and the user information of the terminal user transmitted by the terminal, the server may search for the correlation between the user information and the check password and acquire a check password corresponding to the received user information. The check password is referred to as the second original check credential information in embodiments.

[056] In step 306, the server compares whether the first original check credential information is consistent with the second original check credential information.

[057] For example, the server compares whether the received first original check credential information is consistent with the found second original check credential information. That is, comparing whether the check password of the terminal user stored by the server is the same as the check password transmitted by the terminal may be determined, so that whether an object that is currently replacing a security check mode is the terminal user himself/herself may be further determined.

[058] In step 307, the server stores the correlation between the public key and the user information, when the first original check credential information is consistent with the second original check credential information.

[059] When the first original check credential information is determined to be consistent with the second original check credential information according to a comparison result, the server may determine that the object that is currently replacing a security check mode is the terminal user himself/herself. Then the server may store the correlation between the received public key and the user information.

[060] In step 308, the terminal performs a local check via the updated check mode to acquire a local check result when the terminal user performs a security check.

[061] The terminal may perform a local check via the updated check mode to acquire a local check result when the terminal user performs a security check. When the updated check mode is used for a local check, check prompting information is generally sent to the terminal by the server, and the terminal acquires a local check result in real time according to the check prompting information. For example, when the updated check mode is a gesture check mode, assuming that gesture check prompting information returned by the server to the terminal is “2”, then the terminal user may show two fingers according to the gesture check prompting information. After the two fingers is recognized by an image recognition processing technology, the terminal takes a recognition result of “2” as a local check result.

[062] In step 309, the terminal digitally signs the local check result according to the private key stored in the trusted storage area to acquire signature information.

[063] For example, after acquiring the local check result, the terminal may acquire the stored private key from the trusted storage area, and use the private key to digitally sign the local check result. The digital signature technique is an encryption technique, by which

abstract information may be encrypted by a private key of a sender and sent, together with an original text, to a receiver. The receiver may decrypt the encrypted abstract information by a public key of the sender, and then generate abstract information of the received original text by a HASH function, and compare the generated abstract information with the decrypted abstract information. If the generated abstract information and the decrypted abstract information are the same, it is indicated that the received information is not modified, and therefore the information integrity may be verified by a digital signature. For the specific process of digitally signing the local check result in the embodiments, reference may be made to the implementation process of the existing digital signature technique, and details are omitted herein.

[064] In step 310, the terminal sends the signature information, the local check result, and the user information of the terminal user to the server.

[065] In step 311, the server acquires a public key corresponding to the received user information by searching for the stored correlation.

[066] With reference back to step 307, when the updated check mode is used to replace the local check mode, the server stores the correlation between the public key and the user information. In this step, the server may search for the above-mentioned correlation after receiving the signature information, the local check result, and the user information of the terminal user, so as to acquire a public key corresponding to the received user information.

[067] In step 312, the server verifies the received signature information by the retrieved public key, and determines the received local check result to be trustable when the verification is passed.

[068] Corresponding to the digital signature process locally performed at the terminal in step 309, the verification of the signature information is a decryption process.

During the verification of the signature information, the server may verify the signature information by the retrieved public key, and the specific verification process is consistent with the existing digital signature technique, and details are omitted herein. When the verification is passed, the server may determine that the received local check result is a trusted check result.

[069] Furthermore, the server may determine the accuracy of the check result. If the check result is accurate, current operations of the terminal user may be released; if the check result is inaccurate, the terminal user is prohibited from executing the operations.

[070] It may be seen from the above embodiments that, when the updated check mode is used to replace the original check mode, because the terminal stores the private key generated for the updated check mode, and the server stores the public key generated for the updated check mode, when the updated check mode is used for a check, the terminal may digitally sign the local check result by the private key, and the corresponding server may verify, via the public key, the signature information transmitted by the terminal, and determine the local check result to be trustable when the verification is passed. In the application of the embodiments of the present disclosure, a malicious third party cannot acquire the private key and the public key, and the security check cannot be completed even if the malicious third party acquires the local check result, and therefore this embodiment may improve the reliability of the security check and secure the access of network applications.

[071] **FIG. 4** is a flow chart of another security check method according to embodiments of the disclosure. The embodiments of the method take the substitutive credential information being a random string as an example, so as to describe in detail the process of a security check from the perspective of interaction between a terminal and a server. The method includes 401-413.

[072] In step 401, the terminal acquires first original check credential information of the original check mode when the updated check mode is used to replace the original check mode.

[073] The description of step 401 is consistent with that of step 301, and details are omitted herein.

[074] In step 402, the terminal generates a random string for the updated check mode.

[075] Different from generating a key as the substitutive credential information in **FIG. 3**, the terminal may generate for the updated check mode a random string that serves as the substitutive credential information after it has been determined to use the updated check mode to replace the original check mode in the embodiment. The specific algorithm for generating a random string is not limited by embodiments of the disclosure.

[076] In step 403, the terminal stores the random string in a trusted storage area associated with the terminal user.

[077] For example, the trusted storage area may include a TEE module or an SE module, and after the random string is generated, the terminal may store the random string in the trusted storage area.

[078] In step 404, the terminal transmits the first original check credential information, the random string, and the user information of the terminal user to the server.

[079] Consistent with the description in step 304, for example, the user information is the only information by which the terminal user may be uniquely identified. The user information may be a user name of the terminal user.

[080] In step 405, the server searches for second original check credential information corresponding to the user information.

[081] In step 406, the server determines whether the first original check credential information is consistent with the second original check credential information.

[082] Description of steps 405 and 406 is consistent with that of steps 305 and 306, and details will be omitted herein.

[083] In step 407, the server stores the correlation between the random string and the user information when the first original check credential information is consistent with the second original check credential information.

[084] When the first original check credential information is determined to be consistent with the second original check credential information according to a determining result, the server may determine that the object who is currently replacing a security check mode is the terminal user himself/herself, and at this time the server may store the correlation between the received random string and the user information.

[085] In step 408, the terminal performs a local check according to the updated check mode to acquire a local check result when the terminal user performs a security check.

[086] Description of step 408 is consistent with that of step 308, and details are omitted herein.

[087] In step 409, the terminal encrypts, by a message abstract algorithm pre-negotiated with the server, the random string and the local check result stored in the trusted storage area, to acquire a first encrypted data result.

[088] For example, the terminal and the server may pre-negotiate a message abstract algorithm, wherein the message abstract algorithm may be, for example, a Hash-based Message Authentication Code (HMAC). The HMAC may use a Hash algorithm, take a key and a message as inputs, and generate a message abstract as an output.

[089] For example, after the local check result is acquired, the terminal may acquire the stored random string from the trusted storage area, take the random string as a

key and the local check result as a message, and encrypt the random string and the local check result by an HMAC algorithm, so as to generate a first encrypted data result.

[090] In step 410, the terminal sends the first encrypted data result, the local check result, and the user information of the terminal user to the server.

[091] In step 411, the server acquires a random string corresponding to the received user information by searching for the stored correlation.

[092] Referring to the above step 407, when the updated check mode is used to replace the local check mode, the server stores correlation between the random string and the user information. In this step, the server may search for the correlation after receiving the first encrypted data result, the local check result, and the user information of the terminal user, so as to acquire a random string corresponding to the received user information.

[093] In step 412, the server encrypts the found random string and the local check result by an encryption abstract algorithm that is pre-negotiated with the terminal, so as to acquire a second encrypted data result.

[094] Corresponding to the process of locally encrypting the local check result and the random string by a message abstract algorithm at the terminal in step 409, in this step, the server may acquire a message abstract algorithm that is pre-negotiated with the terminal, and then encrypt the received local check result and the found random string by the message abstract algorithm, so as to acquire a second encrypted data result.

[095] In step 413, the server determines whether the second encrypted data result is consistent with the first encrypted data result, and if yes, the local check result may be determined to be trustable.

[096] For example, when the second encrypted data result is determined to be consistent with the first encrypted data result, the server may determine that the local check result is trustable. Furthermore, the server may determine the accuracy of the check result,

and if the check result is accurate, current service operations of the terminal user may be released, and if the check result is inaccurate, the terminal user is prohibited from executing the current service operations.

[097] It may be seen from the above embodiments that, when the updated check mode is used to replace the original check mode, because the terminal and the server store the random string generated for the updated check mode, when the updated check mode is used for a check, the terminal may encrypt the random string and the local check result by a message abstract algorithm that is pre-negotiated. The corresponding server may encrypt, by the same message abstract algorithm, the random string and the local check result transmitted by the terminal, and determine that the local check result is trustable when the two encrypted data results are consistent with each other. By applying embodiments of the disclosure, a malicious third party cannot acquire the random string and the message abstract algorithm that is pre-negotiated by the terminal with the server, and the security check cannot be completed even if the malicious third party acquires the local check result. Thus, it may improve the reliability of the security check and secure the access of network applications.

[098] Corresponding to the embodiments of the security check method of the disclosure, the disclosure further provides embodiments of a device, a terminal, and a server for a security check.

[099] The embodiments of the device for a security check of the disclosure may be applied to the terminal and the server, respectively. The embodiments of the device may be implemented via software, hardware or a combination thereof. For example, software implementation, as an device in a logical sense, is formed by a processor of an apparatus, where the device is located, reading a corresponding computer program instruction in a non-volatile memory to a memory for running. From the perspective of hardware, **FIG. 5** is a

hardware structural diagram of an apparatus where the security check device is located according to embodiments of the disclosure. Besides a processor, a memory, a network interface and a non-volatile memory as shown in **FIG. 5**, the apparatus where the device is located may generally further include other hardware according to the actual functions of the device. For example, the terminal may include a camera, a touch screen, a communications component, or the like. And the server may include a transceiver chip, which is responsible for processing packets.

[0100] **FIG. 6** is a block diagram of a security check device according to some embodiments of the disclosure. The security check device may be applied to a terminal. The device may include: a checking unit 610, an encrypting unit 620, and a first sending unit 630.

[0101] Checking unit 610 is used for performing a local check by an updated check mode to acquire a local check result when a terminal user performs a security check.

[0102] Encrypting unit 620 is used for encrypting the local check result according to stored substitutive credential information to acquire an encrypted check result, wherein the substitutive credential information is information that is generated when the updated check mode is used to replace an original check mode.

[0103] First sending unit 630 is used for sending the encrypted check result, the local check result, and user information of the terminal user to a server, so that the server determines the local check result to be trustable when the verification of the encrypted check result according to substitutive credential information corresponding to the user information is passed.

[0104] **FIG. 7** is a block diagram of a security check device according to some embodiments of the disclosure. The security check device may be applied to a terminal, and

the device includes: an acquiring unit 710, a generating unit 720, a second sending unit 730, a storing unit 740, a checking unit 750, an encrypting unit 760, and a first sending unit 770.

[0105] Acquiring unit 710 is used for acquiring first original check credential information of an original check mode when the updated check mode is used to replace the original check mode.

[0106] Generating unit 720 is used for generating the substitutive credential information for the updated check mode.

[0107] Second sending unit 730 is used for transmitting the first original check credential information, the substitutive credential information, and the user information to the server, so that the server retrieves second original check credential information corresponding to the user information, and when the second original check credential information is consistent with the first original check credential information, storing the correlation between the substitutive credential information and the user information.

[0108] Storing unit 740 is used for storing the substitutive credential information in a trusted storage area associated with the terminal user, wherein the trusted storage area comprises a TEE module or an SE module;

[0109] Checking unit 750 is used for performing a local check via an updated check mode to acquire a local check result when a terminal user performs a security check.

[0110] Encrypting unit 760 is used for encrypting the local check result according to stored substitutive credential information, so as to acquire an encrypted check result, wherein the substitutive credential information is information that is generated when the updated check mode is used to replace an original check mode.

[0111] First sending unit 770 is used for sending the encrypted check result, the local check result, and user information of the terminal user to a server, so that the server determines the local check result to be trustable when the verification of the encrypted

check result according to substitutive credential information corresponding to the user information is passed.

[0112] In an alternative implementation, the substitutive credential information may comprise: a public key and a private key; second sending unit 730 may be specifically used for transmitting the public key to the server; encrypting unit 760 may be specifically used for digitally signing the local check result according to the stored private key to acquire signature information; first sending unit 770 may be specifically used for sending the signature information to the server, so that the server determines the local check result to be trustable when the verification of the signature information according to the public key corresponding to the user information is passed.

[0113] In another alternative implementation, the substitutive credential information may comprise a random string; second sending unit 730 may be specifically used for transmitting the random string to the server; encrypting unit 760 may be specifically used for encrypting the random string and the local check result by a message abstract algorithm pre-negotiated with the server, to acquire a first encrypted data result; first sending unit 770 may be specifically used for sending the first encrypted data result to the server, so that the server acquires a random string corresponding to the user information, and encrypts the random string corresponding to the user information and the local check result by the message abstract algorithm, so as to acquire a second encrypted data result, and, when the second encrypted data result is consistent with the first encrypted data result, determines that the local check result is trustable.

[0114] **FIG. 8** is a block diagram of another embodiment of the security check device according to embodiments of the disclosure. The security check device may be applied to a server, and the device may include: a first receiving unit 810, an acquiring unit 820, and a checking unit 830.

[0115] First receiving unit 810 is used for receiving an encrypted check result, a local check result, and user information of a terminal user that are sent by a terminal, wherein the encrypted check result is an encrypted check result that is generated when the terminal encrypts the local check result according to stored substitutive credential information, the substitutive credential information is information that is generated when the terminal uses an updated check mode to replace an original check mode, and the local check result is a check result that is acquired by the terminal performing a local check via the updated check mode when the terminal user performs a security check.

[0116] Acquiring unit 820 is used for acquiring substitutive credential information corresponding to the user information.

[0117] Checking unit 830 is used for verifying the encrypted check result according to the substitutive credential information corresponding to the user information, and determining the local check result is trustable when the verification is passed.

[0118] **FIG. 9** is a block diagram of another security check device according to embodiments of the disclosure. The security check device may be applied to a server, and the device comprises: a second receiving unit 910, a searching unit 920, a comparing unit 930, a storing unit 940, a first receiving unit 950, an acquiring unit 960, and a checking unit 970.

[0119] Second receiving unit 910 is used for receiving first original check credential information, substitutive credential information, and the user information sent by the terminal when the terminal uses the updated check mode to replace an original check mode. The first original check credential information is check credential information of the original check mode. The substitutive credential information is substitutive credential information that is generated by the terminal for the updated check mode.

[0120] Searching unit 920 is used for searching for second original check credential information corresponding to the user information.

[0121] Comparing unit 930 is used for determining whether the first original check credential information is consistent with the second original check credential information.

[0122] Storing unit 940 is used for storing the correlation between the substitutive credential information and the user information when the first original check credential information is consistent with the second original check credential information.

[0123] First receiving unit 950 is used for receiving an encrypted check result, a local check result, and user information of a terminal user that are sent by a terminal, wherein the encrypted check result is an encrypted check result that is generated when the terminal encrypts the local check result according to stored substitutive credential information, the substitutive credential information is information that is generated when the terminal uses an updated check mode to replace an original check mode, and the local check result is a check result that is acquired by the terminal performing a local check via the updated check mode when the terminal user performs a security check.

[0124] Acquiring unit 960 is used for acquiring substitutive credential information corresponding to the user information.

[0125] Checking unit 970 is used for verifying the encrypted check result according to the substitutive credential information corresponding to the user information, and determining that the local check result is trustable when the verification is passed.

[0126] In an alternative implementation, the substitutive credential information may comprise a public key and a private key. Second receiving unit 910 may be specifically used for receiving the public key sent by the terminal. First receiving unit 950 may be specifically used for receiving signature information sent by the terminal, wherein the signature information is signature information that is acquired by the terminal digitally

signing the local check result according to the stored private key. Acquiring unit 960 may be specifically used for acquiring a public key corresponding to the user information by searching for the correlation. And checking unit 970 may be specifically used for verifying the signature information via the public key corresponding to the user information.

[0127] In another alternative implementation, the substitutive credential information comprises a random string; second receiving unit 910 may be specifically used for receiving the random string sent by the terminal; first receiving unit 950 may be specifically used for receiving a first encrypted data result sent by the terminal, wherein the first encrypted data result is an encrypted data result that is acquired by the terminal encrypting the random string and the local check result by a message abstract algorithm pre-negotiated with the server; acquiring unit 960 may be specifically used for acquiring a random string corresponding to the user information by searching for the correlation.

[0128] Checking unit 970 may comprise (not shown in **FIG. 9**): a result encrypting sub-unit, used for encrypting a random string corresponding to the user information and the local check result by the encryption abstract algorithm, so as to acquire a second encrypted data result; and a result determining sub-unit, used for determining whether the second encrypted data result is consistent with the first encrypted data result, and if yes, then the verification being passed.

[0129] For an implementation process of functions and effects of the units of the above device, please refer to a corresponding step implementation process in the foregoing method, and details are omitted herein.

[0130] As to the device embodiments, because they substantially correspond to the method embodiments, reference may be made to related parts of the method embodiments. The device embodiments described above are merely illustrative, in which units that are described as separated parts may or may not be physically separated from each other, and

those parts shown as units may or may not be physical units, which may be positioned at one location or may also be distributed over multiple network units. Some or all of the modules may be selected according to practical requirements to achieve the objectives of the solutions of the disclosure. Those of ordinary skill in the art may understand and implement the solutions without involving inventive efforts.

[0131] It may be seen from the above embodiment that when the updated check mode is used to replace the original check mode, since both the terminal and the server store the substitutive credential information generated for the updated check mode, when the updated check mode is used for a check, the local check result may be encrypted via the substitutive credential information, and the corresponding server may verify, via the substitutive credential information, the encrypted check result that has been encrypted and is transmitted by the terminal, and determine that the local check result is trustable when the verification is passed. In the application of the embodiments of the disclosure, a malicious third party cannot acquire the substitutive credential information, and the security check cannot be completed even if the malicious third party acquires the local check result, and therefore the embodiments of the disclosure may improve the reliability of the security check and ensure the access security of network applications.

[0132] Those skilled in the art would readily conceive of other implementations of the present invention after taking the specification into consideration and making practice of the invention. The disclosure is intended to cover any variants, usages or adaptive variations of the present invention, and these variants, usages or adaptive variations follow the general principles of the present invention and comprise common knowledge or customary technical means in the art which are not disclosed in the disclosure. The specification and embodiments are merely deemed as illustrative, and the true scope and spirit of the disclosure are pointed out by the claims below.

[0133] It should be understood that the disclosure is not limited to the precise structures which have been described and shown in the drawings above, and various modifications and changes may be made without departing from the scope thereof. The scope of the disclosure is only limited by the appended claims.

CLAIMS

1. A security check method for performing a security check between a terminal and a server, the method performed by the terminal, the method comprising:
 - replacing an original check mode with an updated check mode for performing
 - 5 security checks between the terminal and the server, when performing a security check of a terminal user, by:
 - acquiring (301; 401) first original check credential information of the original check mode,
 - generating (302; 402) substitutive credential information for the updated
 - 10 check mode and storing the substantive credential information at the terminal, and
 - transmitting (304; 404) the first original check credential information, the substitutive credential information, and user information of the terminal user from the terminal to the server for correlation of the substitutive credential information with the user information; and
 - 15 subsequently performing a security check between the terminal and the server using the updated check mode by:
 - performing (201) a local check of the terminal user at the terminal via the updated check mode to acquire a local check result,
 - encrypting (202) the local check result according to the substitutive
 - 20 credential information stored at the terminal to acquire an encrypted check result, and
 - sending (203) the encrypted check result, the local check result, and user information of the terminal user from the terminal to the server for verification, wherein the local check result is trustable when the encrypted check result is
 - 25 verifiable according to substitutive credential information corresponding to the user information.
2. The security check method according to claim 1, further comprising:

storing (303; 403) the substitutive credential information in a trusted storage area associated with the terminal user, wherein the trusted storage area comprises a trusted execution environment module or a security environment module.

5 3. The security check method according to claim 1 or claim 2, wherein:
the substitutive credential information comprises a public key and a private key;
transmitting the substitutive credential information comprises transmitting (304)
the public key from the terminal to the server;
encrypting the local check result comprises digitally signing (309) the local check
10 result according to the stored private key to acquire signature information; and
sending the encrypted check result comprises sending (310) the signature
information from the terminal to the server, wherein the local check result is deemed
trustable the signature information is verifiable according to the public key corresponding
to the user information.

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4. The security check method according to claim 1 or claim 2, further comprising:
pre-negotiating, by the terminal with the server, a message abstract algorithm, wherein:
the substitutive credential information comprises a random string;
transmitting the substitutive credential information comprises transmitting (404)
20 the random string from the terminal to the server for correlation with the user information;
encrypting the local check result comprises encrypting (409) the random string and
the local check result using the message abstract algorithm to acquire a first encrypted
data result; and
sending the encrypted check result comprises sending (410) the first encrypted
25 data result from the terminal to the server for verification, wherein the local check result is
trustable if second encrypted data generated by encrypting the local check result and a
random string corresponding to the user information using the message abstract algorithm
is consistent with the first encrypted data result.

5. A security check method for performing a security check between a terminal and a server, the method executed by the server, the method comprising:

replacing an original check mode with an updated check mode for performing security checks between the terminal and the server, when performing a security check of a terminal user, by:

receiving, from the terminal, first original check credential information, substitutive credential information, and user information of a terminal user, wherein the first original check credential information is check credential information of the original check mode, and the substitutive credential information are for the updated check mode;

searching (305; 405) for second original check credential information corresponding to the user information;

determining (306; 406) whether the first original check credential information is consistent with the second original check credential information; and

storing (307; 407) correlation between the substitutive credential information and the user information in response to determining that the first original check credential information is consistent with the second original check credential information; and

subsequently performing a security check between the terminal and the server in accordance with the updated check mode by:

receiving (211), from the terminal, an encrypted check result, a local check result, and the user information of the terminal user,

acquiring (212) the substitutive credential information corresponding to the user information by searching for the correlation; and

determining (213) that the local check result is trustable by verifying the encrypted check result according to the substitutive credential information corresponding to the user information.

6. The security check method according to claim 5, wherein:
the substitutive credential information comprises a public key and a private key;
receiving the substitutive credential information comprises receiving the public
key from the terminal;
- 5 receiving the encrypted check result comprises receiving signature information
from the terminal;
acquiring the substitutive credential information comprises acquiring (311) a
public key corresponding to the user information by searching for the correlation; and
verifying the encrypted check result comprises verifying (313) the signature
10 information using the public key corresponding to the user information.
7. The security check method according to claim 5, wherein:
the substitutive credential information comprises a random string;
receiving the substitutive credential information comprises receiving the random
15 string from the terminal;
receiving the encrypted check result comprises receiving a first encrypted data
result from the terminal;
acquiring the substitutive credential information comprises acquiring (411) a
random string corresponding to the user information by searching for the correlation; and
20 verifying the encrypted check result comprises:
encrypting (412) using the message abstract algorithm the random string
corresponding to the user information and the local check result to acquire a
second encrypted data result, and
verifying (413) that the second encrypted data result is consistent with the
25 first encrypted data result.
8. A terminal, comprising:
a processor; and
a memory for storing instructions executable by the processor,

wherein the processor is configured to execute the method according to any one of claims 1 to 4.

9. A server, comprising:
5 a processor; and
a memory for storing instructions executable by the processor,
wherein the processor is configured to execute the method according to any one of claims 5 to 7.

10 10. A computer-readable medium storing instructions which, when executed by a processor of a terminal, cause the terminal to execute the method according to any one of claims 1 to 4.

11. A computer-readable medium storing instructions which, when executed by a
15 processor of a server, cause the server to execute the method according to any one of claims 5 to 7.