

WINDOW PROCESSING SYSTEM, METHOD AND APPARATUS

Technical Field

The embodiments of present disclosure relate to a technical field of computers, and
5 particularly to a window processing system. One or more embodiments of present disclosure also
relate to a window processing method, a window processing apparatus, a computing device, and
a computer-readable storage medium.

Background

10 The window processing technology refers to a technology of simultaneously presenting a
plurality of active windows on a terminal screen, wherein a user can use different application
programs in the plurality of active windows. During window processing, the user is able to not
only simultaneously view the application programs presented in the plurality of active windows
on the terminal screen, but also interact with the application programs respectively by switching
15 between the plurality of active windows.

The traditional multi-windows are a plurality of real active windows. In a cloud desktop
scene, a client needs to establish multiple channels of video streaming links with a cloud server,
so as to realize a multi-channel video streaming transmission from the cloud server to the client
and then realize a multi-window display at the client. However, establishing multiple channels of
20 video streaming links occupies a large amount of resource of the client, and is likely to affect a
business processing efficiency of the client. Therefore, an effective method is urgently needed to
solve such a problem.

Summary of the Disclosure

25 In view of this, the embodiments of present disclosure provide a window processing system.
One or more embodiments of present disclosure also relate to a window processing method, a
window processing apparatus, a computing device, and a computer-readable storage medium, so
as to solve the technical defects existing in the prior art.

According to a first aspect of the embodiments of present disclosure, there is provided a
30 window processing system comprising:

a client and a cloud server communicatively linked to the client;

the client is configured to send, based on a window processing instruction submitted by a
user for a cloud application in a cloud desktop, a window processing request for the cloud
application to the cloud server;

the cloud server is configured to capture a currently active window screen of the cloud application based on the received window processing request, and return the window screen to the client as a virtual window; and

the client is configured to present the received virtual window according to a pre-created window processing style layout, in response to the window processing instruction.

Optionally, the cloud server is further configured to set identification information for the virtual window to establish a mapping between the identification information and the virtual window, and return the mapping to the client.

Optionally, the client is further configured to send a window operation screen rendering request to the cloud server according to a window operation screen rendering instruction submitted by the user for a target virtual window, wherein the window operation screen rendering request carries identification information of the target virtual window; and

the cloud server is further configured to receive the window operation screen rendering request, determine, based on the identification information, a target cloud application that corresponds to the target virtual window, render a to-be-rendered screen content corresponding to the target cloud application, and transmit a rendered window operation screen to the client.

Optionally, the client is further configured to send, based on a window processing instruction submitted by the user for a cloud application in the cloud desktop, a window processing request for the cloud application to the cloud server, wherein the window processing request carries a quantity of foreground application window and/or background application window and identification information of each window;

the cloud server is further configured to receive the window processing request, capture an operational window screen of the foreground application window and/or the background application window based on the window processing request, and return the operational window screen to the client as a virtual window.

Optionally, the client is further configured to receive the virtual window in response to the window processing instruction, adjust a position and/or a size of the virtual window according to the pre-created window processing style layout, and present the virtual window according to the adjustment.

Optionally, the client is further configured to send a window activation request to the cloud server according to an activation instruction submitted by the user for a target virtual window, wherein the window activation request carries identification information of the target virtual window.

Optionally, the cloud server is further configured to receive the window activation request,

determine, based on the identification information, a target cloud application corresponding to the target virtual window, obtain a to-be-output video stream corresponding to the target cloud application, and transmit the to-be-output video stream to the client;

the client is further configured to receive the to-be-output video stream, and display the
5 to-be-output video stream in foreground as a real window screen of the target cloud application.

Optionally, the cloud server is further configured to encode the window operation screen to generate encoded data and transmit the generated encoded data to the client.

Optionally, the cloud server is further configured to encode the to-be-output video stream to generate encoded data and transmit the generated encoded data to the client.

10 Optionally, the client is further configured to receive and decode the encoded data to obtain the window operation screen and present the window operation screen in foreground.

Optionally, the to-be-output video stream comprises screen data and/or audio data corresponding to a currently active window of the target cloud application;

the cloud server is further configured to encode the screen data with a screen encoding
15 function, and/or encode the audio data with an audio encoding function.

Optionally, the client is further configured to send a window switching request to the cloud server based on a window switching instruction submitted by the user;

the cloud server is further configured to receive the window switching request, capture a window operation screen of a foreground application window, obtain a to-be-output video stream
20 corresponding to a to-be-switched target virtual window in a background application window, and transmit the to-be-output video stream to the client;

the client is further configured to receive the to-be-output video stream, and display the to-be-output video stream in foreground as a real window screen of the target cloud application.

Optionally, the client is further configured to send, based on a multi-window processing
25 instruction submitted by the user for at least two cloud applications in the cloud desktop, a multi-window processing request for the at least two cloud applications to the cloud server;

the cloud server is configured to capture at least two currently active window screens of the at least two cloud applications based on the received multi-window processing request, and return the at least two window screens to the client as virtual windows;

30 the client is configured to present the received virtual windows according to a pre-created multi-window processing style layout in response to the window processing instruction.

Optionally, the client is further configured to send, based on a window processing instruction submitted by the user for a single cloud application in the cloud desktop, a window processing request for the single cloud application to the cloud server;

the cloud server is configured to capture a currently active window screen of the single cloud application based on the received window processing request, and return the window screen to the client as a virtual window;

the client is configured to present the received virtual window according to a preset single
5 window processing style layout in response to the window processing instruction.

According to a second aspect of the embodiments of present disclosure, there is provided a window processing method applied to a cloud server, comprising:

receiving a window processing request submitted by a client for a cloud application in a cloud desktop;

10 capturing a currently active window screen of the cloud application based on the window processing request; and

returning the respective window screen to the client as a virtual window.

Optionally, the method further comprising:

setting identification information for the virtual window to establish a mapping between the
15 identification information and the virtual window, and returning the mapping to the client.

Optionally, capturing the currently active window screen of the cloud application based on the window processing request comprises:

capturing a window screen of a foreground application window and/or a background application window based on the window processing request, and returning the respective
20 window screen to the client as a virtual window.

Optionally, the method further comprising:

receiving a window activation request submitted by the client for a target virtual window;

determining a target cloud application corresponding to the target virtual window, based on identification information of the target virtual window carried in the window activation request;

25 and

obtaining a to-be-output video stream corresponding to the target cloud application, and transmitting the to-be-output video stream to the client.

Optionally, transmitting the to-be-output video stream to the client comprises:

encoding the to-be-output video stream, and transmitting the generated encoded data to the
30 client.

Optionally, the to-be-output video stream comprises screen data and/or audio data corresponding to a currently active window of the target cloud application;

accordingly, transmitting the to-be-output video stream to the client comprises:

encoding the screen data with a screen encoding function, and/or encoding the audio data

with an audio encoding function.

Optionally, receiving the window processing request submitted by the client for the cloud application in the cloud desktop comprises:

5 receiving a multi-window processing request submitted by the client for at least two cloud applications in the cloud desktop;

accordingly, capturing the currently active window screen of the cloud application based on the window processing request comprises:

capturing at least two currently active window screens of the at least two cloud applications based on the multi-window processing request.

10 Optionally, receiving the window processing request submitted by the client for the cloud application in the cloud desktop comprises:

receiving a window processing request submitted by the client for a single cloud application in the cloud desktop;

15 accordingly, capturing the currently active window screen of the cloud application based on the window processing request comprises:

capturing a currently active window screen of the single cloud application based on the window processing request.

According to a third aspect of the embodiments of present disclosure, there is provided a window processing apparatus applied to a cloud server, comprising:

20 a receiving module configured to receive a window processing request submitted by a client for a cloud application in a cloud desktop;

a capturing module configured to capture a currently active window screen of the cloud application based on the window processing request; and

25 a returning module configured to return the respective window screen to the client as a virtual window.

According to a fourth aspect of the embodiments of present disclosure, there is provided a window processing method applied to a client, comprising:

30 sending, based on a window processing instruction submitted by a user for a cloud application in a cloud desktop, a window processing request for the cloud application to a cloud server;

receiving a currently active window screen of the cloud application captured by the cloud server based on the window processing request; and

taking the respective window screen as a virtual window, and presenting the virtual window according to a pre-created window processing style layout, in response to the window processing

instruction.

Optionally, the method further comprising:

5 sending a window activation request to the cloud server according to an activation instruction submitted by the user for a target virtual window, wherein the window activation request carries identification information of the target virtual window.

Optionally, the method further comprising:

receiving a to-be-output video stream returned by the cloud server, wherein the to-be-output video stream corresponds to a target cloud application that corresponds to the target virtual window, which is determined based on the identification information; and
10 displaying the to-be-output video stream in foreground as a real window screen of the target cloud application.

Optionally, the method further comprising:

receiving encoded data returned by the cloud server, wherein the encoded data is generated by encoding the to-be-output video stream by the cloud server; and
15 decoding the encoded data to obtain the window operation screen and present the window operation screen in foreground.

Optionally, sending, based on the window processing instruction submitted by the user for the cloud application in the cloud desktop, the window processing request for the cloud application to the cloud server comprises:

20 sending, based on a multi-window processing instruction submitted by the user for at least two cloud applications in the cloud desktop, a multi-window processing request for the at least two cloud applications to the cloud server;

accordingly, receiving the currently active window screen of the cloud application captured by the cloud server based on the window processing request comprises:

25 receiving at least two currently active window screens of the at least two cloud applications captured by the cloud server based on the multi-window processing request.

Optionally, sending, based on a window processing instruction submitted by the user for the cloud application in the cloud desktop, the window processing request for the cloud application to the cloud server comprises:

30 sending, based on a window processing instruction submitted by the user for a single cloud application in the cloud desktop, a window processing request for the single cloud application to the cloud server;

accordingly, receiving the currently active window screen of the cloud application captured by the cloud server based on the window processing request comprises:

receiving a currently active window screen of the single cloud application captured by the cloud server based on the window processing request.

According to a fifth aspect of the embodiments of present disclosure, there is provided a window processing apparatus applied to a client, comprising:

5 a sending module configured to send, based on a window processing instruction submitted by a user for a cloud application in a cloud desktop, a window processing request for the cloud application to a cloud server;

a receiving module configured to receive a currently active window screen of the cloud application captured by the cloud server based on the window processing request; and

10 a presenting module configured to take the respective window screen as a virtual window, and present the virtual window according to a pre-created window processing style layout, in response to the window processing instruction.

According to a sixth aspect of the embodiments of present disclosure, there is provided a computing device comprising:

15 a memory and a processor, wherein

the memory is configured to store computer-executable instructions, and the processor is configured to execute the computer-executable instructions to implement the steps of the method according to any one of claims 15 to 22 or 24 to 29.

According to a seventh aspect of the embodiments of present disclosure, there is provided a
20 computer readable storage medium storing computer instructions which, when executed by a processor, implement the steps of the window processing method.

In one embodiment of present disclosure, after receiving the window processing request submitted by the client, the cloud server captures an operational window screen of a cloud application currently running in the cloud desktop, and returns the operational window screen to
25 the client as a virtual window, and the client performs window processing by presenting the operational window screens, i.e., the client takes the window screenshot of the cloud application returned by the cloud server as a virtual window so as to statically present multiple windows, thus avoids establishing multiple channels of video streams between the client and the cloud server, reducing the resource occupancy of the client, and realizing window processing through a
30 single-channel video stream to meet the user's need of window processing.

Brief Description of the Drawings

Fig. 1 is a schematic diagram of a window processing system provided by an embodiment of present disclosure;

Fig. 2 is a processing flowchart of a window processing method provided by an embodiment of present disclosure;

Fig. 3 is a schematic diagram of a window processing apparatus provided by an embodiment of present disclosure;

5 Fig. 4 is a processing flowchart of another window processing method provided by an embodiment of present disclosure;

Fig. 5 is a schematic diagram of another window processing apparatus provided by an embodiment of present disclosure;

10 Fig. 6 is a schematic diagram of an interaction of a window processing method provided by an embodiment of present disclosure; and

Fig. 7 is a structural block diagram of a computing device provided by an embodiment of present disclosure.

Detailed Description of the Preferred Embodiments

15 In the following description, numerous specific details are set forth in order to provide a thorough understanding of present disclosure. However, present disclosure can be implemented in many other ways different from those described here, and those skilled in the art can make similar derivations without violating the connotation of present disclosure, so present disclosure is not limited by the specific implementation disclosed below.

20 The terms used in one or more embodiments of present disclosure are for the purpose of describing specific embodiments only, and are not intended to limit one or more embodiments of present disclosure. As used in one or more embodiments of present disclosure and in the appended claims, the singular forms ‘a’, ‘said’ and ‘the’ are also intended to include the plural forms, unless otherwise specified in the context clearly. It should also be understood that the
25 term ‘and/or’ used in one or more embodiments of present disclosure refers to and includes any or all possible combinations of one or more associated listed items.

It should be understood that although the terms ‘first’, ‘second’, etc. may be used in one or more embodiments of present disclosure to describe various information, the information should not be limited to the terms. These terms are only used to distinguish the same type of information
30 from each other. For example, without departing from the scope of one or more embodiments of present disclosure, ‘first’ may also be referred to as ‘second’, and similarly, ‘second’ may also be referred to as ‘first’. Depending on the context, the term ‘if’ as used here may be interpreted as ‘when ...’ or ‘in a case where ...’ or ‘in response to a determination of ...’.

First of all, the terminologies involved in one or more embodiments of present disclosure

will be explained.

Cloud desktop: a desktop system actually running on a server (cloud), while a terminal only displays screen and sound of a cloud desktop.

Zero terminal: a terminal product having no CPU, memory or hard disk operating system,
5 and it is a hardware product for presenting the cloud desktop and a carrier of the service (cloud).

Multi-window: application windows that are tiled and displayed by a certain rule.

Cloud application: an application program running on the server (cloud).

Cloud server (Elastic Compute Service, ECS), also known as a cloud host, is a host product
in a cloud computing service system, and it is a simple, efficient, safe and reliable computing
10 service with a flexible processing capacity.

In present disclosure, there is provided a window processing system. Present disclosure also
relates to a window processing method, a window processing apparatus, a computing device, and
a computer-readable storage medium, which are described one by one in detail in the following
embodiments.

15 Fig. 1 illustrates a schematic diagram of a window processing system provided by an
embodiment of present disclosure, comprising a client 102 and a cloud server 104 that is
communicatively coupled to the client 102.

The client 102 is configured to send, based on a window processing instruction submitted
by a user for a cloud application in a cloud desktop, a window processing request for the cloud
20 application to the cloud server 104.

The cloud server 104 is configured to capture a currently active window screen of the cloud
application based on the received window processing request, and return the window screen to
the client 102 as a virtual window.

The client 102 is configured to present the received virtual window according to a
25 pre-created window processing style layout, in response to the window processing instruction.

In the embodiments of present disclosure, a quantity of the client 102 is not limited, but
generally there are a plurality of clients 102. The client 102 may be any device with a
communication capability and a screen display capability, such as a smart phone, a tablet
computer, a desktop computer, a wearable device or a game console. Compared with a physical
30 server, the cloud server 104 is actually a service platform deployed in cloud and capable of
providing comprehensive service capabilities for various Internet users.

The cloud application refers to an application program running in cloud based on cloud
computing technology. Since the cloud application runs on the cloud server 104, the client 102
does not require a download or installation, the configuration of the client 102 is also not

considered, and the running of the application program can be realized just through a network. In actual applications, the client 102 may also be a zero terminal having a display, and as a carrier for carrying the server (cloud), the zero terminal can display the currently active window of the application program in cloud by the display.

5 The cloud application may be an independent application program, and the user can operate the cloud application by simply communicating with the cloud server 104 using the client 102. The cloud application may also belong to an application platform, and the user can log in the cloud application platform by inputting a user name and a password through the client 102, and then select and run one cloud application from various applications of the cloud application
10 platform, wherein the cloud application includes, but is not limited to, various application products running in cloud, such as games, news, social activities and life.

 In a case where the user sends a running request for a target cloud application to the cloud server 104 through the client 102, the cloud server 104 may transmit window parameter information of an active window of the target cloud application to the client in a form of video
15 stream for display.

 Since there is no limit to a quantity of cloud application that can run simultaneously in the cloud server 104, in a case where only a single cloud application runs, the client 102 in this embodiment of present disclosure is further configured to send, based on a window processing instruction submitted by the user for a single cloud application in the cloud desktop, a window
20 processing request for the single cloud application to the cloud server.

 The cloud server 104 is configured to capture a currently active window screen of the single cloud application based on the received window processing request, and return the window screen to the client 102 as a virtual window.

 The client 102 is configured to present the received virtual window according to a preset
25 single window processing style layout in response to the window processing instruction.

 Alternatively, in a case where a plurality of cloud applications run simultaneously in the cloud server 104, the client 102 in the embodiment of present disclosure is further configured to send, based on a multi-window processing instruction submitted by the user for at least two cloud applications in the cloud desktop, a multi-window processing request for the at least two
30 cloud applications to the cloud server 104.

 The cloud server 104 is configured to capture at least two currently active window screens of the at least two cloud applications based on the received multi-window processing request, and return the at least two window screens to the client 102 as virtual windows.

 The client 102 is configured to present the received virtual windows according to a

pre-created multi-window processing style layout in response to the window processing instruction.

In a case where there is any running cloud application in the cloud desktop (a quantity of the running cloud application may be one or more), the user can send a window processing instruction to the client 102, so that the client 102 sends a window processing request to the cloud server 104. Since each running cloud application in the cloud server 104 corresponds to an active window, after the cloud server 104 receives the window processing request, if the window processing request is for a single cloud application, a currently active window screen of the single running cloud application is captured, and if the window processing request is for a plurality of cloud applications, a plurality of currently active window screens of the plurality of running cloud applications are captured, i.e., screenshots of the windows of one or more running cloud applications are taken, and the window screens obtained from the screenshots are returned to the client 102 as a virtual window.

In above, the window processing instruction may be a window display instruction, the window processing request is a window display request, and the window processing style layout is a window display style layout.

In addition, if the client 102 sends a window display request for a single cloud application, the cloud server 104 takes a screenshot of the currently active window screen of the running single cloud application and returns the single screenshot to the client 102. If the client 102 sends a multi-window display request for a plurality of cloud applications, the cloud server 104 takes screenshots of currently active window screens of a plurality of running cloud applications to obtain a plurality of window screens of the plurality of cloud applications. The cloud server 104 may return all of the plurality of window screens obtained to the client 102 as virtual windows, or return a part of the window screens of the plurality of window screens obtained from the screenshots to the client 102 as a virtual window. A specific quantity of the returned virtual windows may be determined based on the actual need of the user, which is not limited here.

The client 102 presents the received screenshots according to the window processing style layout, so as to respond to the window processing instruction of the user.

In actual applications, after the cloud server 104 captures a plurality of currently active window screens of a plurality of cloud applications, the plurality of window screens may be transmitted to the client 102 through a single-channel video stream or multiple channels of video streams. In order to save the resource occupancy of the client, the transmission is preferably made through a single-channel video stream in the embodiment of present disclosure.

Further, the client 102 may create different window display style layouts for different

quantities of virtual window in advance, so that when different quantities of virtual window are received, they all can be presented through the window display style layouts corresponding to the number thereof. Alternatively, the client 102 may create a window display style layout in advance, and a quantity of virtual window that can be displayed in this window display style layout is as large as possible. When different quantities of virtual window are received by the client 102, they can be presented according to this window display style layout.

In the process of creating the window display style layout, different window display sizes can be set for different windows. As illustrated in Fig. 1, in the set window display style layout, Windows 1 to 4 have larger window display sizes than Windows 5 and 6. In actual applications, the virtual window of the target cloud application may be displayed at a fixed position in the window display style layout, and a fixed window display size may be set. For example, for a cloud application of payment, its virtual window may be set at Window 1 in Fig. 1, with a larger window display size than other windows.

Taking the multi-window display style layout illustrated in Fig. 1 as an example, if the window display style layout corresponds to a case where a quantity of virtual window is 6, the client 102 will present the received virtual window according to the window display style layout when receiving six virtual windows returned by the cloud server 104. If the window display style layout is a universal one and not related to a quantity of virtual window received, the client 102 can present the virtual windows according to this window display style layout when receiving one, two, ... or six virtual windows, i.e., if 1 virtual window is received, it may be presented in any one of Windows 1 to 6 in Fig. 1, and if two, three, ... or six virtual windows are received, they may be presented in any 2, 3, ... or 6 windows of Windows 1 to 6 in Fig. 1.

The cloud server returns the captured operational window screen of the cloud application currently running in the cloud desktop to the client as a virtual window, and the client performs window processing by presenting the virtual windows (screenshots), thus avoids establishing multiple channels of video streams between the client and the cloud server, reducing the resource occupancy of the client, and realizing window processing through a single-channel video stream to meet the user's need of window processing.

Further, the client 102 is further configured to send, based on a window processing instruction submitted by the user for a cloud application in the cloud desktop, a window processing request for the cloud application to the cloud server 104, wherein the window processing request carries a quantity of foreground application window and/or background application window and identification information of each window.

The cloud server 104 is further configured to receive the window processing request,

capture an operational window screen of the foreground application window and/or the background application window based on the window processing request, and return the operational window screen to the client 102 as a virtual window.

Specifically, in a case where a plurality of cloud applications are running in the cloud server 104, if a display mode of the client 102 is a single window display mode, the client 102 can only display an active window of any one of the running cloud applications through a single window, i.e., only one foreground application window is existed, and an active window of another running cloud application can only serve as a background application window. Therefore, when the user sends a window processing instruction to the client 102, the window processing instruction carries the numbers of the foreground application window and the background application window, and the identification information of each window.

After receiving the window processing instruction sent by the user, the client 102 sends a window processing request to the cloud server 104 according to the numbers of the foreground application window and the background application window and the identification information of each window carried in the instruction.

Similarly, after receiving the window processing request, the cloud server 104 captures an operational window screen of a plurality of running cloud applications, wherein the active windows of the plurality of cloud applications include a foreground application window and a background application window, i.e., screenshots of the foreground application window and the background application window are taken, and results of the screenshots are returned to the client 102 as a virtual window.

The client 102 presents the received virtual window according to the window processing style layout, so as to respond to the window processing instruction of the user.

During specific implementation, after receiving the virtual window returned by the cloud server 104, the client 102 may adjust a position and/or a size of the virtual window according to a pre-created window processing style layout, and present the virtual window according to the adjustment.

The cloud server returns the captured window screen of the foreground application window and the background application window currently running in the cloud desktop to the client as a virtual window, and the client performs window processing by presenting the virtual window (screenshots), thus avoids establishing multiple channels of video streams between the client and the cloud server, reducing the resource occupancy of the client, and realizing window processing through a single-channel video stream to meet the user's need of window processing.

During specific implementation, the cloud server 104 is further configured to set

identification information for the virtual window to establish a mapping between the identification information and the virtual window, and return the mapping to the client 102.

Specifically, after the cloud server 104 captures the currently active window screen of the cloud applications and before the window screen is returned as a virtual window to the client 102,
5 it is needed to set identification information for the virtual window to establish a mapping between the identification information and the virtual window, and return the mapping and the virtual window to the client, wherein different identification information points to unique virtual windows respectively.

In addition, after the client 102 receives the mapping and performs window processing on
10 the virtual windows, the user may submit a virtual window activation instruction for any target virtual window in the window processing screen.

Accordingly, the client 102 is further configured to send a window activation request to the cloud server 104 according to the window activation instruction submitted by the user for the target virtual window, wherein the window activation request carries identification information
15 of the target virtual window.

The cloud server 104 is further configured to receive the window activation request, determine, based on the identification information, a target cloud application corresponding to the target virtual window, obtain a to-be-output video stream corresponding to the target cloud application, and transmit the to-be-output video stream to the client 102.

20 The client 102 is further configured to receive and display the to-be-output video stream as a real window screen of the target cloud application in foreground.

Specifically, after receiving the window activation instruction submitted by the user for the target virtual window, the client 102 may determine the identification information of the target virtual window according to the mapping between the identification information and the virtual
25 window returned by the cloud server 104, and send a window activation request for the target virtual window to the cloud server 104 based on the identification information of the target virtual window, so that the cloud server 104 determines, based on the identification information, the target virtual window in response to the window activation request, and determines a target cloud application corresponding to the target virtual window, thereby transmitting a to-be-output
30 video stream of the target cloud application to the client 102. The client 102 receives and displays the to-be-output video stream as the real window screen of the target cloud application in foreground, thereby activating the target virtual window.

Since the window activation request submitted by the client 102 carries identification information of the target virtual window, after receiving the window activation request, the cloud

server 104 may determine a target virtual window which has a mapping with the identification information and a target cloud application corresponding to the target virtual window according to the mapping between the identification information and the virtual window, so as to obtain a to-be-output video stream corresponding to the target cloud application and transmit the
5 to-be-output video stream to the client 102.

In addition, when the user submits a window activation instruction for the target virtual window to the client, window parameters such as a window size and a window display position of a real window of the target cloud application may be added into the window activation instruction, so as to realize a flexible display effect of the real window.

10 Different from the current window processing technology, which dynamically displays the real active windows of various application programs, the embodiment of present disclosure presents screenshots (virtual windows) of active windows of the cloud applications to realize the multi-window static display. When the user selects to activate the static virtual windows, the cloud server 104 transmits video streams to the client 102 through a single-channel video stream
15 to activate corresponding real windows, thus avoids establishing multiple channels of video streams, helping to reduce the resource occupancy of the client, and realizing window processing through a single-channel video stream to meet the user's need of window processing.

By means of window processing, the client uses the screenshots from the cloud server to simulate the real windows for the user, and presents the screenshots in a tiled way for the
20 convenience of the user's browse. When the user selects one of the screenshots, the cloud server activates a corresponding real window for the user, which is beneficial to improving the user experience.

During specific implementation, the cloud server 104 is further configured to encode the to-be-output video stream to generate encoded data and transmit the generated encoded data to
25 the client 102.

The client 102 is further configured to receive and decode the encoded data, and obtain the window operation screen and present the window operation screen in foreground.

Specifically, after obtaining the to-be-output video stream, the cloud server 104 may transmit the to-be-output video stream to the client 102. In actual applications, the cloud server
30 104 may encode the to-be-output video stream and transmit encoded data obtained by encoding to the client 102, and the client 102 decodes the encoded data and configures a corresponding display window according to a decoding result, so that the window operation screen obtained by decoding can be presented in foreground by the display window.

If the target cloud application is a video playing application, the to-be-output video stream

may include screen data and/or audio data corresponding to the currently active window of the target cloud application. The cloud server 104 encodes the to-be-output video stream, i.e., encodes the screen data with a screen encoding function to obtain screen encoded data, and/or encodes the audio data with an audio encoding function to obtain audio encoded data,
5 encapsulates the screen encoded data and the audio encoded data, and transmits encapsulated data to the client 102 through a network.

In addition, as mentioned above, the cloud application includes, but is not limited to, various application products running in cloud, such as games, news, social activities and life. Since different products have different requirements on the image quality, the to-be-output video
10 streams corresponding to the currently active windows of different cloud applications may be encoded through encoding standards with different code rates. For example, for the video or interactive application products such as games, it is needed to adopt an encoding technology with a higher code rate to perform video stream encoding. For the text or non-interactive application products such as news, it is possible to adopt an encoding technology with a lower code rate to
15 perform video stream encoding. In actual applications, video stream encoding may be carried out through video encoding standards such as H264 and H265, so as to meet the image quality requirements of different cloud applications while reducing the data transmission amount, thereby improving the data transmission efficiency.

After capturing the operational window screen of the target application, the cloud server
20 104 performs a network transmission after encoding and compressing the operational window screen because of the huge amount of data, which is beneficial to increasing the data transmission efficiency and improving the user experience quality.

In the embodiment of present disclosure, the client 102 is further configured to send a window switching request to the cloud server 104 based on the window switching instruction
25 submitted by the user.

The cloud server 104 is further configured to receive the window switching request, capture a window operation screen of a foreground application window, obtain a to-be-output video stream corresponding to a to-be-switched target virtual window in a background application window, and transmit the to-be-output video stream to the client 102.

30 The client 102 is further configured to receive the to-be-output video stream and display the to-be-output video stream in foreground as a real window screen of the target cloud application.

Specifically, since a plurality of cloud applications can simultaneously run in the cloud server 104, in a case where a plurality of (at least two) cloud applications simultaneously run in the cloud desktop, if a display mode of the client 102 is the single window display mode, the

client 102 can only display an active window of any one of the running cloud applications through a single window, i.e., only one foreground application window is existed, and the active window of another running cloud application can only serve as background application window. Therefore, when the user submits a window switching instruction to the client 102 and the client
5 102 sends a window switching request to the cloud server 104, the window switching request may carry the identification information of the currently active window and the identification information of the to-be-switched target virtual window.

After receiving the window switching request, the cloud server 104 needs to capture the window operation screen of the foreground application window before window switching, and
10 return an captured result to the client 102 for storage. The purpose is to save the display screen of the foreground application window before switching, so that when the foreground application window before switching is switched to run in foreground again, displaying can be started from a display screen corresponding to the captured result.

After the window operation screen of the foreground application window is captured, the
15 to-be-output video stream corresponding to the to-be-switched target virtual window in the background application window is obtained, and the to-be-output video stream is transmitted to the client 102; alternatively, the to-be-output video stream is encoded, and obtained encoded data is transmitted to the client 102, and the client 102 decodes the encoded data and displays a decoding result in foreground as a real window screen of the target cloud application.

20 Similarly, after capturing the operational window screen of the to-be-switched target application, the cloud server 104 performs a network transmission after encoding and compressing the operational window screen because of the huge amount of data, which is beneficial to increasing the data transmission efficiency and improving the user experience quality.

25 During specific implementation, the client 102 is further configured to send a window operation screen rendering request to the cloud server 104 according to a window operation screen rendering instruction submitted by the user for a target virtual window, wherein the window operation screen rendering request carries identification information of the target virtual window.

30 The cloud server 104 is further configured to receive the window operation screen rendering request, determine, based on the identification information, a target cloud application that corresponds to the target virtual window, render a to-be-rendered screen content corresponding to the target cloud application, and transmit a rendered window operation screen to the client 102.

Specifically, the cloud server 104 obtains the to-be-output video stream corresponding to a to-be-switched target virtual window in a background application window, and transmits the to-be-output video stream to the client 102. It can be understood that the cloud server 104 activates a dynamic real window of the target cloud application for the client, which is suitable for the video or interactive application products such as games. If the target cloud application is a static non-interactive application product, the user sends a cloud application activation request to the cloud server 104 through the client 102, which can be understood as that the user sends a window operation screen rendering instruction of the target virtual window to the cloud server 104 through the client 102, while the cloud server 104 renders the to-be-rendered screen content corresponding to the target cloud application and sends the rendered window operation screen to the client 102, and the client 102 presents a static window of the activated target cloud application to the user.

In addition, after rendering the to-be-rendered screen content corresponding to the target cloud application and obtaining the rendered window operation screen, the cloud server 104 may encode the window operation screen to generate encoded data and send encoded data to the client 102. The client 102 decodes the encoded data and displays a decoding result in foreground as a real window screen of the target cloud application.

Different activation modes are adopted for different types of cloud applications, i.e., by transmitting video streams or a single screen to the client 102, the image quality requirements of different cloud applications are met while the data transmission amount is reduced, which is beneficial to increasing the data transmission efficiency.

In one embodiment of present disclosure, after receiving the window processing request submitted by the client 102, the cloud server 104 captures an operational window screen of a cloud application currently running in the cloud desktop, and returns the operational window screen to the client 102 as a virtual window, and the client 102 performs window processing by presenting the operational window screen, i.e., the client 102 takes window screenshot of the cloud application returned by the cloud server 104 as a virtual window so as to statically present multiple windows, thus avoids establishing multiple channels of video streams between the client 102 and the cloud server 104, reducing the resource occupancy of the client 102, and realizing window processing through a single-channel video stream to meet the user's need of window processing.

In a case where the window processing request is a multi-window display request, after receiving the multi-window display request submitted by the client 102, the cloud server 104 captures an operational window screen of at least two cloud applications currently running in the

cloud desktop, and returns the operational window screen to the client 102 as virtual windows, so that the client 102 can perform multi-window display by presenting the virtual windows (screenshots), thus avoids establishing multiple channels of video streams between the client 102 and the cloud server 104, reducing the resource occupancy of the client 102, and realizing
5 multi-window display through a single-channel video stream to meet the user's need of multi-window display. By means of multi-window display, the client 102 uses the screenshots from the cloud server 104 to simulate real windows for the user, and presents the screenshots in a tiled way for the convenience of the user's browse. When the user selects one of the screenshots, the cloud server 104 activates a corresponding real window for the user, which is beneficial to
10 improving the user experience.

Fig. 2 illustrates a processing flowchart of a window processing method provided by an embodiment of present disclosure, comprising steps 202 to 206.

Step 202: receiving a window processing request submitted by a client for a cloud application in a cloud desktop.

15 Step 204: capturing a currently active window screen of the cloud application based on the window processing request.

Step 206: returning the window screen to the client as a virtual window.

The window processing method provided by the embodiment of present disclosure is applied to a cloud server, which is actually a service platform deployed in cloud and capable of
20 providing comprehensive service capabilities for various Internet users.

The cloud application refers to an application program running in cloud based on cloud computing technology. Since the cloud application runs on the cloud server, the client does not require a download or installation, the configuration of the client is also not considered, and the running of the application program can be realized just through a network. In actual applications,
25 the client may also be a zero terminal having a display, and as a carrier for carrying the server (cloud), the zero terminal can display the currently active window of the application program in cloud by the display.

The cloud application may be an independent application program, and the user can operate the cloud application by simply communicating with the cloud server using the client. The cloud
30 application may also belong to an application platform, and the user can log in the cloud application platform by inputting a user name and a password through the client, and then select and run one cloud application from various applications of the cloud application platform, wherein the cloud application includes, but is not limited to, various application products running in cloud, such as games, news, social activities and life.

In a case where the user sends a running request for a target cloud application to the cloud server through the client, the cloud server may transmit window parameter information of an active window of the target cloud application to the client in a form of video stream for display. Thus, in a case where there is any running cloud application in the cloud desktop (a quantity of the running cloud application may be one or more), the user can send a window processing instruction to the client, so that the client sends a window processing request to the cloud server. After receiving the window processing request, the cloud server captures a window screen of a plurality of running cloud applications, i.e., take screenshots of the windows of the plurality of running cloud applications, and returns the screenshots to the client as a virtual window. The client presents the received screenshots according to a window processing style layout, so as to respond to the window processing instruction of the user.

Optionally, the method further comprises:

setting identification information for the virtual window to establish a mapping between the identification information and the virtual window, and returning the mapping to the client.

Optionally, capturing the currently active window screen of the cloud application based on the window processing request comprises:

capturing a window screen of a foreground application window and/or a background application window based on the window processing request, and returning the window screen to the client as a virtual window.

Optionally, the method further comprises:

receiving a window activation request submitted by the client for a target virtual window;

determining a target cloud application corresponding to the target virtual window, based on identification information of the target virtual window carried in the window activation request; and

obtaining a to-be-output video stream corresponding to the target cloud application, and transmitting the to-be-output video stream to the client.

Optionally, transmitting the to-be-output video stream to the client comprises:

encoding the to-be-output video stream, and transmitting the generated encoded data to the client.

Optionally, the to-be-output video stream comprises screen data and/or audio data corresponding to a currently active window of the target cloud application.

Accordingly, transmitting the to-be-output video stream to the client comprises:

encoding the screen data with a screen encoding function, and/or encoding the audio data with an audio encoding function.

Optionally, receiving the window processing request submitted by the client for the cloud application in the cloud desktop comprises:

receiving a multi-window processing request submitted by the client for at least two cloud applications in the cloud desktop.

5 Accordingly, capturing the currently active window screen of the cloud application based on the window processing request comprises:

capturing at least two currently active window screens of the at least two cloud applications based on the multi-window processing request.

Optionally, receiving the window processing request submitted by the client for the cloud
10 application in the cloud desktop comprises:

receiving a window processing request submitted by the client for a single cloud application in the cloud desktop.

Accordingly, capturing the currently active window screen of the cloud application based on the window processing request comprises:

15 capturing a currently active window screen of the single cloud application based on the window processing request.

In one embodiment of present disclosure, after receiving the window processing request (window display request) submitted by the client, the cloud server captures the operational window screen of the cloud application currently running in the cloud desktop, and returns the
20 operational window screen to the client as a virtual window, so that the client can perform window processing by presenting the virtual windows (screenshots), thus avoids establishing multiple channels of video streams between the client and the cloud server, reducing the resource occupancy of the client, and realizing window processing through a single-channel video stream to meet the user's need of window processing.

25 A schematic solution of a window processing method applied to a cloud server in this embodiment is described above. It should be noted that the technical solution of the window processing method belongs to a same concept as the technical solution of the above window processing system. For any detail not described concretely in the technical solution of the window processing method, please refer to the description of the technical solution of the above
30 window processing system.

In correspondence with the above method embodiment, present disclosure further provides an embodiment of a window processing apparatus. Fig. 3 illustrates a schematic diagram of a window processing apparatus provided by one embodiment of present disclosure. As illustrated in Fig. 3, the apparatus comprises:

a receiving module 302 configured to receive a window processing request submitted by a client for a cloud application in a cloud desktop;

a capturing module 304 configured to capture a currently active window screen of the cloud application based on the window processing request;

5 a returning module 306 configured to return the window screen to the client as a virtual window.

Optionally, the apparatus further comprises:

an identification information setting module configured to set identification information for the virtual window to establish a mapping between the identification information and the virtual
10 window, and return the mapping to the client.

Optionally, the capturing module 304 comprises:

a capturing sub-module configured to capture a window screen of a foreground application window and a background application window based on the window processing request, and return the window screen to the client as a virtual window.

15 Optionally, the apparatus further comprises:

a window activation request receiving module configured to receive a window activation request submitted by the client for a target virtual window;

a target cloud application determining module configured to determine a target cloud application corresponding to the target virtual window based on identification information of the
20 target virtual window carried in the window activation request;

a video stream transmitting module configured to obtain a to-be-output video stream corresponding to the target cloud application and transmit the to-be-output video stream to the client.

Optionally, the video stream transmitting module comprises:

25 a first encoding sub-module configured to encode the to-be-output video stream to generate encoded data and transmit the generated encoded data to the client.

Optionally, the to-be-output video stream comprises screen data and/or audio data corresponding to a currently active window of the target cloud application.

Accordingly, the video stream transmitting module comprises:

30 a second encoding sub-module configured to encode the screen data with a screen encoding function, and/or encode the audio data with an audio encoding function.

Optionally, the receiving module 302 comprises:

a first receiving sub-module configured to receive a multi-window processing request submitted by the client for at least two cloud applications in the cloud desktop.

Accordingly, the capturing module 304 comprises:

A first capturing sub-module configured to capture at least two currently active window screens of the at least two cloud applications based on the multi-window processing request.

Optionally, the receiving module 302 comprises:

- 5 a second receiving sub-module configured to receive a window processing request submitted by the client for a single cloud application in the cloud desktop.

Accordingly, the capturing module 304 comprises:

a second capturing sub-module configured to capture a currently active window screen of the single cloud application based on the window processing request.

- 10 A schematic solution of a window processing apparatus according to this embodiment is described above. It should be noted that the technical solution of the window processing apparatus belongs to a same concept as the technical solution of the above window processing method. For any detail not described concretely in the technical solution of the window processing apparatus, please refer to the description of the technical solution of the above
15 window processing method.

Fig. 4 illustrates a processing flowchart of another window processing method provided by an embodiment of present disclosure, comprising steps 402 to 406.

- Step 402: sending, based on a window processing instruction submitted by a user for a cloud application in a cloud desktop, a window processing request for the cloud application to a
20 cloud server;

Step 404: receiving a currently active window screen of the cloud application captured by the cloud server based on the window processing request; and

- Step 406: in response to the window processing instruction, taking the window screen as a virtual window and presenting the virtual window according to a pre-created window processing
25 style layout.

The window processing method provided by the embodiment of present disclosure is applied to a client 102, which may be any device with a communication capability and a screen display capability, such as a smart phone, a tablet computer, a desktop computer, a wearable device or a game console.

- 30 Compared with a physical server, the cloud server is actually a service platform deployed in cloud and capable of providing comprehensive service capabilities for various Internet users.

The cloud application refers to an application program running in cloud based on cloud computing technology. Since the cloud application runs on the cloud server, the client does not require a download or installation, the configuration of the client is also not considered, and the

running of the application program can be realized just through a network. In actual applications, the client may also be a zero terminal having a display, and as a carrier for carrying the server (cloud), the zero terminal can display the currently active window of the application program in cloud by the display.

5 The cloud application may be an independent application program, and the user can operate the cloud application by simply communicating with the cloud server using the client. The cloud application may also belong to an application platform, and the user can log in the cloud application platform by inputting a user name and a password through the client, and then select and run one cloud application from various applications of the cloud application platform,
10 wherein the cloud application includes, but is not limited to, various application products running in cloud, such as games, news, social activities and life.

 In a case where the user sends a running request for a target cloud application to the cloud server through the client, the cloud server may transmit window parameter information of an active window of the target cloud application to the client in a form of video stream for display.
15 Thus, in a case where there is any running cloud application in the cloud desktop (a quantity of the running cloud application may be one or more), the user can send a window processing instruction to the client, so that the client sends a window processing request to the cloud server. After receiving the window processing request, the cloud server captures a window screen of a plurality of running cloud applications, i.e., take screenshots of the windows of the plurality of
20 running cloud applications, and returns the screenshots to the client as a virtual window. The client presents the received screenshots according to a window processing style layout, so as to respond to the window processing instruction of the user.

 Optionally, the method further comprises:

 sending a window activation request to the cloud server according to an activation
25 instruction submitted by the user for a target virtual window, wherein the window activation request carries identification information of the target virtual window.

 Optionally, the method further comprises:

 receiving a to-be-output video stream returned by the cloud server, wherein the to-be-output video stream corresponds to a target cloud application that corresponds to the target virtual
30 window, which is determined based on the identification information; and

 displaying the to-be-output video stream in foreground as a real window screen of the target cloud application.

 Optionally, the method further comprises:

 receiving encoded data returned by the cloud server, wherein the encoded data is generated

by encoding the to-be-output video stream by the cloud server; and

decoding the encoded data to obtain the window operation screen and present the window operation screen in foreground.

Optionally, sending, based on a window processing instruction submitted by the user for the
5 cloud application in the cloud desktop, the window processing request for the cloud application to the cloud server comprises:

sending, based on a multi-window processing instruction submitted by the user for at least two cloud applications in the cloud desktop, a multi-window processing request for the at least two cloud applications to the cloud server.

10 Accordingly, receiving the currently active window screen of the cloud application captured by the cloud server based on the window processing request comprises:

receiving at least two currently active window screens of the at least two cloud applications captured by the cloud server based on the multi-window processing request.

Optionally, sending, based on a window processing instruction submitted by the user for the
15 cloud application in the cloud desktop, the window processing request for the cloud application to the cloud server comprises:

sending, based on a window processing instruction submitted by the user for a single cloud application in the cloud desktop, a window processing request for the single cloud application to the cloud server.

20 Accordingly, receiving the currently active window screen of the cloud application captured by the cloud server based on the window processing request comprises:

receiving a currently active window screen of the single cloud application captured by the cloud server based on the window processing request.

In one embodiment of present disclosure, after receiving the window processing request
25 (window display request) submitted by the client, the cloud server captures the operational window screen of the cloud application currently running in the cloud desktop, and returns the operational window screen to the client as virtual windows, so that the client can perform window processing (window displaying) by presenting the virtual windows (screenshots), thus avoids establishing multiple channels of video streams between the client and the cloud server,
30 reducing the resource occupancy of the client, and realizing window processing through a single-channel video stream to meet the user's need of window processing.

A schematic solution of another window processing method applied to a cloud server in this embodiment is described above. It should be noted that the technical solution of the window processing method belongs to a same concept as the technical solution of the above window

processing system. For any detail not described concretely in the technical solution of the window processing method, please refer to the description of the technical solution of the above window processing system.

In correspondence with the above method embodiment, present disclosure further provides
5 an embodiment of a window processing apparatus. Fig. 5 illustrates a schematic diagram of a window processing apparatus provided by one embodiment of present disclosure. As illustrated in Fig. 5, the apparatus comprises:

a sending module 502 configured to send, based on a window processing instruction submitted by a user for a cloud application in a cloud desktop, a window processing request for
10 the cloud application to a cloud server;

a receiving module 504 configured to receive a currently active window screen of the cloud application captured by the cloud server based on the window processing request; and

a presenting module 506 configured to take the window screen as a virtual window, and present the virtual window according to a pre-created window processing style layout, in
15 response to the window processing instruction.

Optionally, the apparatus further comprises:

a window activation request sending module configured to send a window activation request to the cloud server according to an activation instruction submitted by the user for a target virtual window, wherein the window activation request carries identification information
20 of the target virtual window.

Optionally, the apparatus further comprises:

a video stream receiving module configured to receive a to-be-output video stream returned by the cloud server, wherein the to-be-output video stream corresponds to a target cloud application that corresponds to the target virtual window, which is determined based on the
25 identification information;

a displaying module configured to display the to-be-output video stream in foreground as a real window screen of the target cloud application.

Optionally, the apparatus further comprises:

an encoded data receiving module configured to receive encoded data returned by the cloud
30 server, wherein the encoded data is generated by encoding the to-be-output video stream by the cloud server; and

a decoding module configured to decode the encoded data to obtain the window operation screen and present the window operation screen in foreground.

Optionally, the sending module 502 comprises:

a first sending sub-module configured to send, based on a multi-window processing instruction submitted by the user for at least two cloud applications in the cloud desktop, a multi-window processing request for the at least two cloud applications to a cloud server.

Accordingly, the receiving module 504 comprises:

- 5 a first receiving sub-module configured to receive at least two currently active window screens of the at least two cloud applications captured by the cloud server based on the multi-window processing request.

Optionally, the sending module 502 comprises:

- a second sending submodule configured to send, based on a window processing instruction
10 submitted by the user for a single cloud application in the cloud desktop, a window processing request for the single cloud application to the cloud server;

Accordingly, the receiving module 504 comprises:

- a second receiving sub-module configured to receive a currently active window screen of the single cloud application captured by the cloud server based on the window processing
15 request.

A schematic solution of another window processing apparatus in this embodiment is described above. It should be noted that the technical solution of the window processing apparatus belongs to a same concept as the technical solution of the aforementioned another window processing method. For any detail not described concretely in the technical solution of
20 the window processing apparatus, please refer to the description of the technical solution of the aforementioned another window processing method.

With reference to Fig. 6, an application of the window processing method provided in present disclosure in an interactive scene is taken as an example to further explain the window processing method. Fig. 6 illustrates a schematic diagram of an interaction of a window
25 processing method provided by an embodiment of present disclosure, and the specific steps comprise steps 602 to 620.

Step 602: receiving, by a client, a multi-window display instruction from a user.

Specifically, the multi-window display instruction is submitted by the user for at least two cloud applications in a cloud desktop.

- 30 Step 604: sending, by the client, a multi-window display request for the at least two cloud applications to a cloud server.

Step 606: performing, by the cloud server, ID numbering on at least two active windows of the at least two cloud applications.

The cloud server establishes a mapping between the at least two active windows and ID

numbers.

Step 608: capturing, the cloud server, a window screen of the at least two active windows.

Step 610: returning, by the cloud server, the ID numbers and the window screen to the client.

5 Specifically, the cloud server returns the window screen to the client as a virtual window, and returns the mapping between the active window and the ID numbers to the client.

Step 612: presenting, by the client, the received virtual window according to a pre-created multi-window display style layout.

Step 614: receiving, by the client, an activation instruction submitted by the user for a target
10 virtual window.

Step 616: sending, by the client, a window activation request for the target virtual window to the cloud server.

Specifically, the window activation request carries identification information of the target virtual window.

15 Step 618: activating, by the cloud server, the target virtual window, and presenting a real window of the activated target cloud application in foreground.

Specifically, the cloud server determines, based on the identification information, a target cloud application corresponding to the target virtual window, and obtains a to-be-output video stream corresponding to the real window of the target cloud application.

20 Step 620: transmitting, by the cloud server, the to-be-output video stream corresponding to the real window of the target cloud application to the client.

Step 622: presenting, by the client, the to-be-output video stream in foreground as the real window screen of the target cloud application.

In one embodiment of present disclosure, after receiving the multi-window display request
25 submitted by the client, the cloud server captures an operational window screen of at least two cloud applications currently running in the cloud desktop, and returns the operational window screen to the client as a virtual window, so that the client can perform multi-window display by presenting the virtual windows (screenshots), thus avoids establishing multiple channels of video streams between the client and the cloud server, reducing the resource occupancy of the client,
30 and realizing multi-window display through a single-channel video stream to meet the user's need of multi-window display. By means of multi-window display, the client uses the screenshots from the cloud server to simulate real windows for the user, and presents the screenshots in a tiled way for the convenience of the user's browse. When the user selects one of the screenshots, the cloud server activates a corresponding real window for the user, which is

beneficial to improving the user experience.

Fig. 7 illustrates a structural block diagram of a computing device provided by an embodiment of present disclosure. Components of the computing device 700 include, but are not limited to, a memory 710 and a processor 720. The processor 720 is connected to the memory 710 through a bus 730, and a database 750 is configured to store data.

The computing device 700 further comprises an access device 740 that enables the computing device 700 to communicate via one or more networks 760. Examples of the networks include a Public Switched Telephone Network (PSTN), a Local Area Network (LAN), a Wide Area Network (WAN), a Personal Area Network (PAN) or a combination of communication networks such as the Internet. The access device 740 may comprise one or more of any type of wired or wireless network interface (e.g., network interface card (NIC)), such as an IEEE802.11 Wireless Local Area Network (WLAN) wireless interface, a World Interoperability for Microwave Access (Wi-MAX) interface, an Ethernet interface, a Universal Serial Bus (USB) interface, a cellular network interface, a Bluetooth interface, and a Near Field Communication (NFC) interface, etc.

In one embodiment of present disclosure, the above components of the computing device 700 and other components not illustrated in Fig. 7 may also be connected to each other, for example, through a bus. It should be understood that the structural block diagram of the computing device illustrated in Fig. 7 is for the purpose of demonstration only, rather than limiting the scope of present disclosure. Those skilled in the art can add or substitute other components as needed.

The computing device 700 may be any type of stationary or mobile computing device, including a mobile computer or a mobile computing device (e.g., a tablet computer, a personal digital assistant, a laptop computer, a notebook computer, a netbook, etc.), a mobile phone (e.g., a smart phone), a wearable computing device (e.g., a smart watch, smart glasses, etc.) or other types of mobile devices, or a stationary computing device such as a desktop computers or PC. The computing device 700 may also be a mobile or stationary server.

In which, the memory 710 is configured to store computer-executable instructions, and the processor 720 is configured to execute the computer-executable instructions to implement the steps of the window processing method.

A schematic solution of a computing device of this embodiment is described above. It should be noted that the technical solution of the computing device belongs to a same concept as the technical solution of the above window processing method. For any detail not described concretely in the technical solution of the computing device, please refer to the description of the

technical solution of the above window processing method.

An embodiment of present disclosure further provides a computer-readable storage medium storing computer instructions, which when executed by a processor, implement the steps of the window processing method.

5 A schematic solution of a computer-readable storage medium of this embodiment is described above. It should be noted that the technical solution of the storage medium belongs to a same concept as the technical solution of the above window processing method. For any detail not described concretely in the technical solution of the storage medium, please refer to the description of the technical solution of the above window processing method.

10 The specific embodiments of present disclosure are described above. Other embodiments are within the scope of the appended claims. In some cases, the actions or steps recited in the claims may be performed in a different sequence than in the embodiments and still achieve the desired result. In addition, the processes depicted in the drawings do not necessarily require the specific or consecutive sequences illustrated to achieve the desired result. In some embodiments,
15 multitasking and parallel processing are also possible or may be advantageous.

The computer instructions include computer program codes, which may be in a form of source codes, object codes, executable files or some intermediate forms. The computer readable medium may include any entity or apparatus capable of carrying the computer program codes, a recording medium, a U disk, a mobile hard disk, a magnetic disk, an optical disk, a computer
20 memory, a Read-Only Memory (ROM), a Random Access Memory (RAM), an electrical carrier signal, a telecommunication signal, a software distribution medium, etc. It should be noted that the contents contained in the computer-readable medium can be appropriately increased or decreased according to the requirements of the legislation and patent practice in the jurisdictions. For example, in some jurisdictions, the computer-readable medium may not include electrical
25 carrier signals or telecommunication signals depending on the legislation and patent practice.

It should be noted that, for the sake of simple description, all the aforementioned method embodiments are expressed as a series of action combinations, but those skilled in the art should know that the embodiments of present disclosure are not limited by the described action sequence, because according to the embodiments of present disclosure, some steps can be
30 performed in other sequences or at the same time. Secondly, those skilled in the art should also know that the embodiments described in present disclosure are all preferred embodiments, and the actions and modules involved are not necessarily essential for the embodiments in present disclosure.

In the above embodiments, the descriptions of various embodiment have their emphases,

respectively. For the parts that are not detailed in one embodiment, please refer to the relevant descriptions in other embodiments.

The preferred embodiments of present disclosure disclosed above are only used to help illustrate present disclosure. The optional embodiments neither describe all the details concretely,
5 nor limit the invention to the specific embodiments described. Obviously, many modifications and variations can be made according to the contents of the embodiments in present disclosure. These embodiments are selected and described in detail in present disclosure in order to better explain the principles and actual applications of the embodiments in present disclosure, so that those skilled in the art can well understand and utilize present disclosure. Present disclosure is
10 limited only by the claims and their full scope and equivalents.

CLAIMS

1. A window processing system comprising a client and a cloud server communicatively coupled to the client, wherein

5 the client is configured to send, based on a window processing instruction submitted by a user for a cloud application in a cloud desktop, a window processing request for the cloud application to the cloud server;

10 the cloud server is configured to capture a currently active window screenshot of the cloud application based on the received window processing request, and return the window screenshot to the client as a virtual window; and

15 the client is configured to statically present the received virtual window according to a pre-created window processing style layout, in response to the window processing instruction.

2. The system according to claim 1, wherein the cloud server is further configured to set identification information for the virtual window to establish a mapping between the
15 identification information and the virtual window, and return the mapping to the client.

3. The system according to claim 2, wherein the client is further configured to send a window operation screen rendering request to the cloud server according to a window operation screen rendering instruction submitted by the user for a target virtual window, wherein the window operation screen rendering request carries identification information of
20 the target virtual window; and

25 the cloud server is further configured to receive the window operation screen rendering request, determine, based on the identification information, a target cloud application that corresponds to the target virtual window, render a to-be-rendered screen content corresponding to the target cloud application, and transmit a rendered window operation screen to the client.

4. The system according to claim 1, wherein the client is further configured to send, based on a window processing instruction submitted by the user for a cloud application in the cloud desktop, a window processing request for the cloud application to the cloud server, wherein the window processing request carries a quantity of foreground application window and/or
30 background application window and identification information of each window;

 the cloud server is further configured to receive the window processing request, capture an operational window screenshot of the foreground application window and/or the background application window based on the window processing request, and return the operational window screenshot to the client as a virtual window.

5. The system according to claim 1 or 4, wherein the client is further configured to receive the virtual window in response to the window processing instruction, adjust a position and/or a size of the virtual window according to the pre-created window processing style layout, and present the virtual window according to the adjustment.

5 6. The system according to claim 2, wherein the client is further configured to send a window activation request to the cloud server according to an activation instruction submitted by the user for a target virtual window, wherein the window activation request carries identification information of the target virtual window.

7. The system according to claim 6, wherein the cloud server is further configured to
10 receive the window activation request, determine, based on the identification information, a target cloud application corresponding to the target virtual window, obtain a to-be-output video stream corresponding to the target cloud application, and transmit the to-be-output video stream to the client;

the client is further configured to receive the to-be-output video stream, and display the
15 to-be-output video stream in foreground as a real window screen of the target cloud application.

8. The system according to claim 3, wherein the cloud server is further configured to encode the window operation screen to generate encoded data and transmit the generated encoded data to the client.

20 9. The system according to claim 7, wherein the cloud server is further configured to encode the to-be-output video stream to generate encoded data and transmit the generated encoded data to the client.

10. The system according to claim 8 or 9, wherein the client is further configured to receive and decode the encoded data to obtain the window operation screen and present the
25 window operation screen in foreground.

11. The system according to claim 7, wherein the to-be-output video stream comprises screen data and/or audio data corresponding to a currently active window of the target cloud application;

the cloud server is further configured to encode the screen data with a screen encoding
30 function, and/or encode the audio data with an audio encoding function.

12. The system according to claim 1, wherein the client is further configured to send a window switching request to the cloud server based on a window switching instruction submitted by the user;

the cloud server is further configured to receive the window switching request, capture a

window operation screen of a foreground application window, obtain a to-be-output video stream corresponding to a to-be-switched target virtual window in a background application window, and transmit the to-be-output video stream to the client;

the client is further configured to receive the to-be-output video stream, and display the to-be-output video stream in foreground as a real window screen of the target cloud application.

13. The system according to claim 1, wherein the client is further configured to send, based on a multi-window processing instruction submitted by the user for at least two cloud applications in the cloud desktop, a multi-window processing request for the at least two cloud applications to the cloud server;

the cloud server is configured to capture at least two currently active window screenshots of the at least two cloud applications based on the received multi-window processing request, and return the at least two window screenshots to the client as virtual windows;

the client is configured to present the received virtual windows according to a pre-created multi-window processing style layout in response to the window processing instruction.

14. The system according to claim 1, wherein the client is further configured to send, based on a window processing instruction submitted by the user for a single cloud application in the cloud desktop, a window processing request for the single cloud application to the cloud server;

the cloud server is configured to capture a currently active window screenshot of the single cloud application based on the received window processing request, and return the window screenshot to the client as a virtual window;

the client is configured to present the received virtual window according to a preset single window processing style layout in response to the window processing instruction.

15. A window processing method applied to a cloud server, comprising:
receiving a window processing request submitted by a client for a cloud application in a cloud desktop;

capturing a currently active window screenshot of the cloud application based on the window processing request; and

returning the respective window screenshot to the client as a virtual window for static presentation on the client.

16. The method according to claim 15, further comprising:
setting identification information for the virtual window to establish a mapping between the identification information and the virtual window, and returning the mapping to the client.

17. The method according to claim 16, wherein capturing the currently active window screenshot of the cloud application based on the window processing request comprises:

capturing a window screenshot of a foreground application window and/or a background application window based on the window processing request, and returning the respective window screenshot to the client as a virtual window.

18. The method according to claim 16, further comprising:

receiving a window activation request submitted by the client for a target virtual window; determining a target cloud application corresponding to the target virtual window, based on identification information of the target virtual window carried in the window activation request; and

obtaining a to-be-output video stream corresponding to the target cloud application, and transmitting the to-be-output video stream to the client.

19. The method according to claim 18, wherein transmitting the to-be-output video stream to the client comprises:

encoding the to-be-output video stream, and transmitting the generated encoded data to the client.

20. The method according to claim 19, wherein the to-be-output video stream comprises screen data and/or audio data corresponding to a currently active window of the target cloud application;

accordingly, transmitting the to-be-output video stream to the client comprises: encoding the screen data with a screen encoding function, and/or encoding the audio data with an audio encoding function.

21. The method according to claim 15, wherein receiving the window processing request submitted by the client for the cloud application in the cloud desktop comprises:

receiving a multi-window processing request submitted by the client for at least two cloud applications in the cloud desktop;

accordingly, capturing the currently active window screenshot of the cloud application based on the window processing request comprises:

capturing at least two currently active window screenshots of the at least two cloud applications based on the multi-window processing request.

22. The method according to claim 15, wherein receiving the window processing request submitted by the client for the cloud application in the cloud desktop comprises:

receiving a window processing request submitted by the client for a single cloud application in the cloud desktop;

accordingly, capturing the currently active window screenshot of the cloud application based on the window processing request comprises:

capturing a currently active window screenshot of the single cloud application based on the window processing request.

5 23. A window processing apparatus applied to a cloud server, comprising:
a receiving module configured to receive a window processing request submitted by a client for a cloud application in a cloud desktop;

a capturing module configured to capturing a currently active window screenshot of the cloud application based on the window processing request; and

10 a returning module configured to return the respective window screenshot to the client as a virtual window for static presentation on the client.

24. A window processing method applied to a client, comprising:

sending, based on a window processing instruction submitted by a user for a cloud application in a cloud desktop, a window processing request for the cloud application to a cloud server;

15 receiving a currently active window screenshot of the cloud application captured by the cloud server based on the window processing request; and

taking the respective window screenshot as a virtual window, and statically presenting the virtual window according to a pre-created window processing style layout, in response to the window processing instruction.

20 25. The method according to claim 24, further comprising:
sending a window activation request to the cloud server according to an activation instruction submitted by the user for a target virtual window, wherein the window activation request carries identification information of the target virtual window.

25 26. The method according to claim 25, further comprising:
receiving a to-be-output video stream returned by the cloud server, wherein the to-be-output video stream corresponds to a target cloud application that corresponds to the target virtual window, which is determined based on the identification information; and

displaying the to-be-output video stream in foreground as a real window screen of the target cloud application.

30 27. The method according to claim 26, further comprising:
receiving encoded data returned by the cloud server, wherein the encoded data is generated by encoding the to-be-output video stream by the cloud server; and

decoding the encoded data to obtain the window operation screen and present the window

operation screen in foreground.

28. The method according to claim 24, wherein sending, based on the window processing instruction submitted by the user for the cloud application in the cloud desktop, the window processing request for the cloud application to the cloud server comprises:

5 sending, based on a multi-window processing instruction submitted by the user for at least two cloud applications in the cloud desktop, a multi-window processing request for the at least two cloud applications to the cloud server;

 accordingly, receiving the currently active window screenshot of the cloud application captured by the cloud server based on the window processing request comprises:

10 receiving at least two currently active window screenshots of the at least two cloud applications captured by the cloud server based on the multi-window processing request.

29. The method according to claim 24, wherein sending, based on the window processing instruction submitted by the user for the cloud application in the cloud desktop, the window processing request for the cloud application to the cloud server comprises:

15 sending, based on a window processing instruction submitted by the user for a single cloud application in the cloud desktop, a window processing request for the single cloud application to the cloud server;

 accordingly, receiving the currently active window screenshot of the cloud application captured by the cloud server based on the window processing request comprises:

20 receiving a currently active window screenshot of the single cloud application captured by the cloud server based on the window processing request.

30. A window processing apparatus applied to a client, comprising:

 a sending module configured to send, based on a window processing instruction submitted by a user for a cloud application in a cloud desktop, a window processing request
25 for the cloud application to a cloud server;

 a receiving module configured to receive a currently active window screenshot of the cloud application captured by the cloud server based on the window processing request; and

 a presenting module configured to take the respective window screenshot as a virtual window, and statically present the virtual window according to a pre-created window
30 processing style layout, in response to the window processing instruction.

31. A computing device comprising a memory and a processor, wherein

 the memory is configured to store computer-executable instructions, and the processor is configured to execute the computer-executable instructions to implement the steps of the method according to any one of claims 15 to 22 or 24 to 29.

32. A computer readable storage medium storing computer instructions which, when executed by a processor, implement the steps of the method according to any one of claims 15 to 22 or 24 to 29.