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Inventor(s)	Bindouski; Uladzimir et al.

METHOD, SYSTEM AND APPARATUS FOR ACCESSING A USER INTERFACE OF A MOBILE COMPUTER

Abstract

Remote access to the user interface of a mobile computer is carried out by simultaneous use of the screen broadcast function and the data reception functionality of the interface of peripheral input devices of this mobile computer to interact with a remote control computer via an IP network. Routing of mobile computer screen broadcast streams to the control computer can be carried out on a local network, e.g., through DHCP or mDNS (DNS-SD) services, and relaying to other networks through an appropriate proxy server. The conversion of IP manipulation data coming from the control computer to the mobile computer interface is carried out using a gateway with IP and HID interfaces. The invention can be implemented both on the basis of one device with Bluetooth HID or USB HID options, and on the basis of a local network of a mobile computer containing routers and gateways with appropriate properties.

Inventors: **Bindouski; Uladzimir (Minsk, BY), Kuchun; Siarhei (Minsk, BY)**

Applicant: **3HAND LLC** (Wilmington, DE)

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS [0001] This application is a divisional of U.S. application Ser. No. 19/033,426, filed Jan. 21, 2025, which is a divisional of U.S. application Ser. No. 18/886,401, filed Sep. 16, 2024 (now U.S. Pat. No. 12,223,222, issued Feb. 11, 2025), which is a divisional of U.S. application Ser. No. 18/501,606, filed Nov. 3, 2023 (now U.S. Pat. No. 12,118,265, issued Oct. 15, 2024), which claims the benefit of U.S. App. No. 63/431,051, filed Dec. 8, 2022, each of which is incorporated herein by reference in its entirety.

TECHNICAL FIELD OF THE INVENTION
[0002] The present invention generally relates to technology for remote computer control and, more specifically, to remote access to a user interface of a mobile computer while simultaneously using a built-in screen broadcasting functions and receiving data by the user interface of the mobile computer from HID peripheral input devices.
BACKGROUND OF THE INVENTION
[0003] Currently, remote computer management services provided for private and corporate users have become an integral part of the information technology market. The volume of this segment of the IT market tends to constantly grow, including in response to the widespread transition to remote work without the need for the employee to be physically present in the office.
[0004] In addition, the number of potentially remotely controlled mobile computers is constantly growing due to the increasingly popular BYOD (Bring Your Own Device) trend, which allows corporations to provide employees with access to internal networks remotely using mobile devices according to their choice. At the same time, these mobile devices are managed and configured for correct corporate use remotely with minimal disruption to employees' schedules. Typically, most BYOD devices are computers with mobile operating systems.
[0005] For remote access to a PC with the appropriate operating system (for example, a server, PC, laptop, MacBook, desktop computer, etc.), the technologies have already been sufficiently developed and are quite satisfactory for users. In the case of remote access to server equipment, KVM switches are sometimes used to switch the interfaces of peripheral devices of the managed computer to the corresponding peripheral devices of the managing computer. In other cases, remote access operators provide services based on a system in which a remote user accesses a managed computer through appropriate applications installed on the control and managed computers, which communicate with each other through a network environment provided by the respective service providers.
[0006] There are patented methods and systems (for example, US20050202388A1, US20050201404A1, U.S. Pat. No. 7,114,018B1, U.S. Pat. No. 7,260,624B2, etc.) using a remote access or interaction device that physically connects to the user interfaces of the managed PC and broadcasts the corresponding traffic from (or to) peripheral devices of the control computer. It is clear that these concepts relate only to PCs with a physical video interface and are not used in practice, since PC users are quite satisfied with the above-mentioned solutions that are easier to use.

[0007] The presented new technology is distinguished by the fact that it is based on the simultaneous use of the built-in screen broadcast function of a mobile computer and the functionality of the interface of peripheral input devices (including HID devices) of the mobile computer. In addition, the claimed invention can be implemented both on the basis of the same access device with interface options for peripheral input devices and relay of screen broadcast streams, and on the basis of a local network of the presence of a mobile computer, already containing physical or logical components with the appropriate properties.
[0008] The capabilities of remote control of computers with a mobile operating system (for example, iOS or Android) differ from the capabilities of remote control of a PC due to the increased level of required user security, since a mobile computer is a much more personalized device and may contain a large amount of confidential data about a specific user. In addition, security requirements for specific features of mobile computers change regularly as the functionality of mobile computers increases.
[0009] The option to share the screen of a mobile computer on a remote computer is implemented by almost all remote access operators for Android and iOS mobile computers, which are used in huge quantities by the vast majority of users. Recently, it has become possible to remotely access the user interface of most Android mobile computers using an application and plugin that corresponds to a specific hardware platform of the mobile computer. Remote access to the user interface of iOS mobile computers (iPadOS) is still not available, since the manufacturer of these computers includes serious restrictions in its operating system for third-party developers in accordance with its security policy.
[0010] It is clear that there is a request among many users to implement remote access to the user interface of mobile computers running iOS (iPadOS). In addition, it is known that among BYOD devices, the majority of computers are iOS (iPadOS).
[0011] Therefore, there is a need to provide an alternative technology for remote access to the user interface of mobile computers while maintaining the manufacturer's security requirements for the benefit of ordinary users.

SUMMARY OF THE INVENTION

[0012] In order to understand the essence of the invention, the concept of the invention is first briefly described below. It is well known that Android and iOS (iPadOS) mobile computers have a built-in function for broadcasting the screen on a local network to a display device (TV, monitor of another computer, etc.). Using a proxy server with the appropriate properties, the screen of this mobile computer can also be broadcast to other networks, including via the Internet. In addition, Android and iOS (iPadOS) mobile computers have a built-in function to receive input manipulation data from peripheral input devices, including HID devices.
[0013] Access to the user interface of a mobile computer in the proposed concept is carried out by simultaneous use of the built-in screen broadcast function and the built-in functionality of receiving data by the interface of peripheral input devices of the mobile computer to interact with a remote control computer via an IP network. Routing of outgoing screen broadcast streams to the control computer can be carried out on the local network through the appropriate services (for example, DHCP or mDNS (DNS-SD)), to other networks-through the appropriate proxy server (for example, Avahi). Conversion of IP data arriving (incoming) from the control computer to the interface of peripheral input devices of the mobile computer is carried out by an appropriate gateway with IP interfaces and interfaces for HID devices.
[0014] Thus, the system for accessing the user interface of a mobile computer, implemented on the basis of the proposed method, controls the outgoing and incoming data flow of screen translation and manipulation of the interface of peripheral input devices, respectively.
[0015] The present invention can be implemented both on the basis of the same device with interface options for HID devices and relaying screen broadcast streams, and on the basis of a local network of the presence of a mobile computer containing physical or logical routers, gateways and

a proxy server with corresponding properties.
[0016] For example, you can add these functions to the functionality of any “standard” network devices: routers, wireless routers, computers, a gateway for IoT devices, smartphones, smart speakers, etc. It is also possible to use compact devices based on microcomputers, for example in the format of IoT devices. The invention is applicable to control the user interface of computers of any type and format, including computers manufactured by Apple Corporation.
[0017] Next, as an example, we will briefly consider some new capabilities and exemplary scenarios for using the technical results of the proposed method for remote access to the user interface of a mobile computer in the smartphone format, unknown in the previous level of technology.
[0018] For example, a user's smartphone is connected to a wireless network that is created in a household, office or any educational institution and contains the appropriate functionality for relaying mobile computer screen broadcast data to the control computer and converting IP data arriving at the mobile HID device interface computer from a peripheral input device of a remote control computer.
[0019] If it is necessary to remotely access this smartphone, the user activates the screen broadcast function to the corresponding “receiving” device (logical or physical) and connects via the Bluetooth HID connection of the smartphone interface to the corresponding conversion gateway (logical or physical). Next, the control computer located on the same local or global network gains access to the user interface of this smartphone.
[0020] The smartphone user controls remote manipulation of the user interface and can interrupt remote control at any time. Since the Bluetooth coverage area, when using appropriate repeaters, is comparable to the Wi-Fi coverage area, the user can move freely within the wireless network access area.
[0021] Another scenario for the application of the claimed invention involves the use of a small-sized device equipped with Bluetooth and Wi-Fi interfaces with the function of relaying smartphone screen broadcast data to the control computer and the function of converting IP manipulation data coming to the HID interface of the smartphone from the peripheral input device of the remote control computer.
[0022] This device has one connection to the local Wi-Fi network of the presence of the user's smartphone, and a second connection via Bluetooth to the HID interface of the device of this smartphone. The user interface access device functions simultaneously as a relay of smartphone screen broadcast data to the control computer and as a gateway for converting the HID interface manipulation data of a given smartphone from IP to HID protocols from the control computer. In this scenario, the application of the claimed invention is more mobile and is applicable in any networks at the request of the user. Otherwise, the functionality of the technology is the same in both examples.
[0023] To display the broadcast of the smartphone screen on the monitor of the control computer and broadcast the manipulation data of the peripheral input devices of the smartphone from the peripheral input devices of the control computer, the corresponding software of the control computer is used. For example, a keyboard and pointing devices (mouse, joystick, touchpad, etc.) can be used as peripheral devices of the control computer.
[0024] In addition, to control the user interface of a mobile computer, you can use the corresponding options of the Android (Switch Access) and iOS (Switch Control) mobile operating systems, when the peripheral devices of the control computer in the form of hardware switches or corresponding keyboard buttons functionally replace pointing peripheral devices. These options link various actions on the smartphone user interface to changes in the state of the physical keys on the host computer's keyboard, allowing interaction with the smartphone's touch screen. Accordingly, interaction with the user interface of the controlled smartphone is carried out through the keyboard buttons of the control computer.

[0025] The application scenarios of the claimed invention are given above only as an example to understand the essence of the invention and do not cover all possible interpretations and applications, which are limited only by the claims and its equivalents. Next, the essence of the invention is discussed in more detail in accordance with the claimed claims.
[0026] The technical problem to which the claimed invention is aimed can be formulated as the development of a method for accessing the user interface of a mobile computer, taking into account the fact that access to the user interface is carried out under the control of the user using the built-in functions of the mobile computer.
[0027] In some embodiments, the technical result is achieved by a method of access to a user interface of a mobile computer from a controlling computer, the method including: simultaneously using an embedded function of broadcast of a screen of the mobile computer and an embedded function of data reception by an interface of peripheral input devices of the mobile computer; using the embedded function of broadcast of the screen of the mobile computer for broadcasting of the screen of the mobile computer on the controlling computer; using the embedded function of reception data representing manipulation by the interface of the peripheral input devices of the mobile computer coming over a network from a peripheral input device of the controlling computer after converting IP into corresponding protocols of manipulating, by the interface, the peripheral devices of input of the mobile computer; displaying a broadcast of the screen of the mobile computer on the screen of the controlling computer; and manipulating by the interface of the peripheral input devices of the mobile computer corresponding ones of the peripheral input devices of the controlling computer.
[0028] Thus, aspects of the proposed method set forth in this patent application, along with the simultaneous use of the screen broadcast function and the function of receiving HID interface manipulation data, provide the technical result of remote access to the user interface of a mobile computer (including, in addition, computers of any type) for interaction with a remote control computer via a network via IP (FIG. **1**).
[0029] A summary of the material necessary to understand the essence of the invention will be presented below in the order of content of the claims.
[0030] In one aspect, the present invention includes a method that includes broadcasting the screen of a mobile computer to a control computer on a local network (FIG. **2**). That is, the managed mobile computer and the managing computer are connected to the same local network, and routing of mobile computer screen broadcast streams to the managing computer can be carried out, for example, through DHCP or mDNS (DNS-SD) services.
[0031] In another aspect, this invention includes a method that includes relaying live streams of a mobile computer screen to a control computer to other networks (for example, corporate networks), including through a global network (FIG. **1**). That is, the managed mobile computer and the control computer can be connected through a network gateway, through other local networks or via the Internet, and relaying of mobile computer screen broadcast data from the local network to the control computer can be carried out through an appropriate proxy server, for example, Avahi.
[0032] In another aspect, the present invention includes a method that includes a corresponding conversion gateway for converting IP data supplied to a mobile computer input peripheral interface from a control computer input peripheral into corresponding mobile computer input peripheral interface manipulation protocols (FIG. **1**). That is, the conversion of IP manipulation data into the HID protocol is carried out by the corresponding gateway with IP and HID interfaces.
[0033] One embodiment of this aspect comprises connecting the IP interface of the conversion gateway to the local network presence of the mobile computer and directly connecting the interface of the input device of the conversion gateway to the corresponding interface of the mobile computer (FIGS. **1** and **2**). That is, in this case, the manipulation data comes to the IP interface of the conversion gateway from the local network of the presence of the mobile computer and then, after conversion, through a direct wired or wireless connection to the HID interface of the mobile

computer.
[0034] One aspect of this embodiment comprises directly connecting the mobile computer's input peripheral interface to the additional input device interfaces without a conversion gateway, which are used to access the mobile computer's user interface in conjunction with broadcasting the mobile computer's screen to the host computer's monitor (FIG. **3**). That is, in the case where the mobile computer and the control computer are operated simultaneously and are physically accessible by the same user, the conversion gateway is not used, and input devices (such as a mouse and keyboard) are connected directly to the mobile computer interface, which are manipulated by the control user computer, while simultaneously using the display of the mobile computer screen on the monitor of the control computer to manipulate the graphical interface of the mobile computer. Thus, the user directly from his personal computer receives legal and secure access to control the user interface of his mobile computer.
[0035] Another embodiment of the aspect of using the conversion gateway includes connecting the IP interface of the conversion gateway to a network other than the local network of the presence of the mobile computer and an HID interface for directly connecting to the corresponding HID interface of the mobile computer (FIG. **4**). That is, in this case, manipulation data arrives at the IP interface of the conversion gateway after appropriate routing from other networks (including the Internet) and then after conversion through a direct wired or wireless connection to the HID interface of the mobile computer.
[0036] In yet another aspect, the present invention includes a method that includes screen casting and manipulation data conversion from IP to HID implemented by the local presence network functionality of a mobile computer (FIG. **1**). That is, this local network already contains routers and gateways with the appropriate properties. Thus, the mobile computer has the ability to broadcast the screen and receive HID interface manipulation data using the functionality of the local network without installing additional equipment for each remote access session.
[0037] In a further aspect, the present invention includes a method that includes screen broadcasting and IP to HID manipulation data conversion implemented by the functionality of the same device with a mobile computer screen broadcast data relaying function and an IP manipulation data conversion function coming to HID interface (FIG. **5**). This device has one connection to the mobile computer's local presence network and a second connection to the mobile computer's HID interface. The device functions simultaneously as a screen broadcast data relay and as a gateway for converting HID interface manipulation data from IP to HID protocols.
[0038] In another aspect, the present invention includes a method that includes broadcasting a screen and receiving interface manipulation data over a mobile IP network to which a mobile computer is connected (FIG. **6**). That is, access to the user interface is carried out via a mobile IP network quickly anywhere and at any time at the user's request. And the functions of screen relaying and converting manipulation data from IP to HID can be performed, for example, by a mobile device with the appropriate characteristics, which is located on the same network as the mobile computer, accessed through a wireless access point activated on the mobile computer.
[0039] In a further aspect, the present invention includes a method that includes screen translation and conversion of interface manipulation data from IP into mobile computer user interface control commands implemented by the functionality of third-party applications installed on the mobile computer (FIG. **7**). That is, users, in principle, have the opportunity to use not only the “ready-made” functionality of the user interface of a mobile computer, but also third-party applications installed by users, developed based on the screen broadcast functions of the operating system. In addition, users also have the opportunity to install third-party applications that convert commands in IP format from a remote control computer into commands for controlling the graphical interface of a mobile computer using the functions of the operating system without the use of logical and hardware network resources and third-party equipment. For example, you can use the appropriate accessibility options of the Android operating system (Switch Access).

[0040] In yet another aspect, the present invention includes a method that includes activating screen casting functions and an HID interface directly by a user of a mobile computer. That is, both the screen translation function and the HID interface access function are activated directly by the user. Thus, an appropriate level of safety in the practical use of the claimed invention is achieved.
[0041] In a further aspect, the present invention includes a method that includes accessing a user interface of any type of computer from a control computer. That is, the invention is applicable to control the user interface of computers of any type and format, but to a greater extent it is relevant for computers with mobile operating systems (for example, iOS, iPadOS), since existing technologies at the previous level of technology are more applicable to computers of other types formats. (FIG. **1**).
[0042] As a consequence of the application of the technical result of the method described above, an invention is claimed for a system for accessing the user interface of a mobile computer from a control computer.
[0043] The technical problem to be solved by the claimed invention can be formulated as the development of a new system containing the appropriate hardware and logical components necessary to access the user interface of a mobile computer from the first and second control computer using the built-in functions of the mobile computer.
[0044] The technical result is that the mobile computer adequately responds to manipulation of the interface of the peripheral input devices of the mobile computer by the corresponding peripheral input devices of the first and second control computer, and is achieved through the use in several aspects of the system for accessing the user interface of the mobile computer (FIG. **8**), comprising:
[0045] a mobile computer that has one a local network connection for user-activated screen casting, and a second user-activated input peripheral interface connection to the conversion gateway, [0046] a gateway for converting IP manipulation data received from a control computer into an appropriate format for an input peripheral device interface of a mobile computer, which includes an IP interface connected to a computer network for receiving input peripheral input device manipulation data in IP format from the control computer and the interface, connected directly to the peripheral input device interface of the mobile computer to transmit manipulation data of the peripheral input device to the mobile computer from the control computer, [0047] a router, which is connected by its interfaces to the local network of the mobile computer and any other computer network for routing screen broadcast data on the local network and through the corresponding proxy server to any other computer network, [0048] a proxy server for relaying mobile computer screen broadcast streams to the control computer on other networks, [0049] the first control computer, which is connected to the local network of the mobile computer, for receiving data broadcast of the mobile computer screen from the local network, followed by displaying this screen broadcast on the monitor of the first control computer, and transmitting manipulation data in IP format to the IP interface of the conversion gateway via a local network for manipulating the interface of the mobile computer's peripheral input devices the corresponding peripheral input devices of the first control computer, [0050] a second control computer, which is connected to any other computer network accessible from the local network of the mobile computer to receive mobile computer screen broadcast data from any other network, followed by displaying this screen broadcast on the monitor of the second control computer, and transmitting manipulation data in IP format to the IP interface of the conversion gateway through any other network to manipulate the interface of the mobile computer's peripheral input devices the corresponding input peripheral devices of the second control computer.
[0051] A presentation of the material necessary to understand the essence of the invention of this system will be presented below in the order of content of the claims.
[0052] In one aspect, the present invention includes a system that further includes a second control computer that is connected to a global computer network. That is, the managed mobile computer and the control computer can be connected via the Internet. Retransmission of mobile computer

screen broadcast data from the local network to the control computer is carried out through the appropriate proxy server. And the manipulation data from the control computer arrives after appropriate routing from the Internet to the IP interface of the conversion gateway and then, after conversion, through a direct wired or wireless connection to the HID interface of the mobile computer.

[0053] In another aspect, the present invention includes a system that includes a conversion gateway and a proxy server implemented in the same device format (FIG. **8**). That is, this device has one connection to the local network of the mobile computer, and a second connection to the HID interface of the mobile computer. The device functions simultaneously as a screen broadcast data relay and as a gateway for converting HID interface manipulation data from IP to HID. For example, you can add these functions to the functionality of any “standard” network devices: routers, wireless routers, computers, gateways for IoT devices, smartphones, smart speakers, etc. It is also possible to use compact devices based on microcomputers.

[0054] In another aspect, the present invention includes a system that includes suitable interfaces of any type for mobile computer input peripherals and a conversion gateway. That is, the mobile computer interacts with the conversion gateway directly through a connection pre-established by the user between similar wired or wireless interfaces. For example, USB or Bluetooth.

[0055] One embodiment of this aspect includes a system that includes interfaces for HID mobile computer input peripherals and a conversion gateway. That is, mobile computers can use not only peripheral input device protocols with individual profiles and drivers, but also universal HID protocols to manipulate the input interface. Thus, in this case, the gateway converts manipulation data from IP to HID protocols.

[0056] In a further aspect, the present invention includes a system that includes suitable IP interfaces of any type for connecting a mobile computer to a network. That is, a mobile computer can be connected to a local network using both wireless (for example, Wi-Fi) and wired (for example, Ethernet) interfaces to broadcast the screen on a local or global network.

[0057] In yet another aspect, the present invention includes a system that includes input interfaces of a first and second control computer equipped with at least one peripheral device of a keyboard and a pointing device. That is, it is assumed that the user interface of the mobile computer is accessed using at least one peripheral input device of the first or second control computer, such as a keyboard or a computer mouse. In addition, the simultaneous use of these and other peripheral input devices is assumed.

[0058] As an embodiment of the technical result of the method and system described above, a device is claimed for accessing the user interface of a mobile computer from a control computer, implemented on the basis of a smartphone.

[0059] The technical problem to which the claimed invention is aimed can be formulated as the development of a new smartphone functionality for accessing the user interface of a managed mobile computer from the managing computer using the built-in functions of the managed mobile computer.

[0060] The technical result is that the mobile computer adequately responds to manipulation of the HID interface of the mobile computer by the peripheral input devices of the control computer, and is achieved through the use in several aspects of an appropriately configured smartphone to access the user interface of the mobile computer (FIG. **9**) which includes: [0061] wireless Wi-Fi interface of a smartphone connected to the local network of a mobile computer for receiving on the local network and transmitting to any other computer network data from broadcasting the mobile computer screen to the control computer, and receiving IP data for manipulating the interface of peripheral input devices of the mobile computer from the control computer; [0062] a proxy server function for relaying mobile computer screen broadcast streams to the control computer to other networks; [0063] a gateway function for converting IP manipulation data received from the control computer into an appropriate format for an input peripheral interface of the mobile computer,

which includes an IP interface connected to a computer network for receiving IP manipulation data in IP format from the control computer and Bluetooth HID interface connected directly to the Bluetooth interface of the mobile computer input peripheral devices to transmit the manipulation data of the input peripheral device to the mobile computer from the control computer; [0064] Bluetooth HID interface of a smartphone for direct connection with the same type of mobile computer interface with subsequent transmission of manipulation data from the control computer to the HID Bluetooth interface of the mobile computer after appropriate conversion of the IP to the Bluetooth HID protocol of the mobile computer interface; [0065] in this case, a device for accessing the user interface of a mobile computer implemented on the basis of a smartphone functions simultaneously as a proxy server for relaying broadcast data of the mobile computer screen to the control computer in any other networks and as a gateway for converting manipulation data of the Bluetooth HID interface of the mobile computer from protocols IP in HID from the control computer.

[0066] A summary of the material necessary to understand the essence of the embodiment of the invention, implemented on the basis of a suitably configured smartphone, is presented below in the order of content of the claims.

[0067] One aspect of the invention includes an implementation of a device for accessing a user interface of a mobile computer based on any type of computer. It is obvious that the necessary functionality can be implemented on the basis of a computer of any type with appropriate interfaces and software (FIG. **9**).

[0068] One embodiment of this aspect of the invention includes an implementation of a device for accessing a user interface comprising suitable interfaces of any type. That is, the access device can use: for connecting to the local network of a mobile computer, both a wired Ethernet interface and a wireless Wi-Fi interface; and for direct connection to the interface of peripheral input devices of a mobile computer, both a wired USB interface and a wireless Bluetooth interface.

[0069] In some embodiments, an access device to a user interface of a mobile computer configured as a smartphone includes: a wireless Wi-Fi interface of the smartphone connected to a local network of the mobile computer and configured for: reception in a local network and transmission to any other computer network of screen broadcast data of the mobile computer to a controlling computer, and reception of IP of data of manipulation by the interface of peripheral input devices of the mobile computer from the controlling computer; function a proxy server for relaying of screen broadcast streams of the mobile computer to the controlling computer over other networks; and function a gateway for converting of IP data of manipulation arriving from the controlling computer into a format compatible for the interface of the peripheral input devices of the mobile computer containing an IP interface connected to a computer network for obtaining the data of manipulation of the peripheral input device in IP format from the controlling computer and a Bluetooth HID interface, connected directly to a Bluetooth interface of the peripheral input devices of the mobile computer for transmission of manipulation data of the peripheral input device to the mobile computer from the controlling computer; and a Bluetooth HID interface of the smartphone for direct connection with the Bluetooth HID interface of the mobile computer with a subsequent transfer to the HID Bluetooth interface of the mobile computer of the data of manipulation from the controlling computer after conversion of IP into Bluetooth HID protocol of the interface of the mobile computer; and wherein the access device to the user interface of the smartphone simultaneously functions as the proxy server configured to relay screen broadcast data of the mobile computer to the controlling computer in any other networks and as conversion gateway for converting the manipulation data of Bluetooth HID interface of the mobile computer from IP to HID from the controlling computer.

[0070] The next several embodiments of this aspect contain implementations of additional functionality of “network” devices in terms of relaying mobile computer screen broadcast data and converting mobile computer HID interface manipulation data. For example, you can supplement

with these functions the functionality of any “standard” network devices: routers, wireless routers, gateways for IoT devices, etc. (FIG. **9**).
[0071] Several more variants of this aspect contain the implementation of additional functionality of computers and servers that are operated directly by private and corporate users, in terms of relaying mobile computer screen broadcast data and converting data for manipulating the HID interface of a mobile computer. For example, you can add these functions to the functionality of microcomputers, mobile computers, desktop computers, smart speakers, etc. (FIG. **9**).
[0072] It has already been noted above that the presented inventions are applicable to computers of any type, but to a greater extent they are relevant for computers with mobile operating systems (for example, iOS or iPadOS), since the technologies existing in the previous level of technology are already applied to computers with other operating systems.
[0073] In addition, the technological advantages of the present invention make it possible to implement a service for accessing the user interface of almost any mobile device without using corresponding third-party mobile applications. Accordingly, the presented new technology can be used to develop application solutions absolutely within the framework of the security policy of mobile operating systems without installing additional functions directly on the mobile computer.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0074] The accompanying drawings included herein illustrate several aspects of the invention with their respective embodiments by way of accessing a user interface of a mobile computer in a smartphone format and, together with the description, serve to explain the principles of the invention for any type of computer.
[0075] FIG. **1** illustrates the general principles of a method for accessing the user interface of a mobile computer from a control computer that is connected to a network other than the local network of the mobile computer.
[0076] FIG. **2** illustrates a method for accessing the user interface of a mobile computer from a control computer on a local network.
[0077] FIG. **3** illustrates a method for accessing the user interface of a mobile computer from a control computer, which contains a direct connection of the interface of peripheral input devices of the mobile computer with the interfaces of additional input devices that are used to access the user interface of the mobile computer together with broadcasting the screen of the mobile computer to the monitor of the control computer without participation conversion gateway.
[0078] FIG. **4** illustrates a method for accessing the user interface of a mobile computer from a control computer, which includes connecting the IP interface of the conversion gateway to a network other than the local network of the mobile computer and directly connecting the interface of the input device of the conversion gateway to the corresponding interface of the mobile computer.
[0079] FIG. **5** illustrates a method for accessing the user interface of a mobile computer, which includes broadcasting the screen to the control computer and converting interface manipulation data from IP into the corresponding protocols for manipulating the interface of peripheral input devices of the mobile computer, implemented by the functionality of the same device connected to the local network of the mobile computer.
[0080] FIG. **6** illustrates a method for accessing a user interface of a mobile computer, which includes broadcasting the screen and receiving IP interface manipulation data through a mobile IP network to which the mobile computer is connected.
[0081] FIG. **7** illustrates a method for accessing the user interface of a mobile computer, which includes broadcasting the screen and converting interface manipulation data from IP into control

commands for the user interface of the mobile computer, implemented by the functionality of third-party applications installed on the mobile computer.
[0082] FIG. **8** is a simplified block diagram that illustrates an exemplary representation of a mobile computer user interface access system with relevant components.
[0083] FIG. **9** is a simplified block diagram that illustrates an exemplary implementation of a mobile computer user interface access device based on a suitably configured smartphone in interaction with components of an example mobile computer user interface access system.
DETAILED DESCRIPTION OF THE INVENTION
[0084] The following material contains detailed descriptions and drawings of various exemplary implementations in accordance with aspects and embodiments of the claimed invention to provide a fuller understanding of the relevant technical results to those skilled in the art. The following detailed description does not limit the invention, the scope of which is defined by the claims.
[0085] Aspects and embodiments of the present inventions provide a method, system, and apparatus for accessing a user interface of a mobile computer.
[0086] FIG. **1** illustrates the general principles of the method of accessing the user interface of a mobile computer (smartphone) **102** from a control computer **158**, which is connected to any other network **134** other than the local network **118** of the mobile computer (smartphone) **102**, including through a global network **134**.
[0087] The claimed invention is illustrated in FIG. **1** can be applied to any type of computer **112**. Since the application of the present invention is most relevant to mobile computers, FIG. **1** and other drawings, a controllable mobile computer will be illustrated as an example in the format of a smartphone **102**.
[0088] The smartphone **102** has one IP connection via the IP interface **116** with the IP interface **122** of the proxy server **120** via a local wired or wireless network **118** via channel **110**, a second direct wired or wireless interface connection **106** for the HID **104** of the smartphone **102** with the corresponding interface **146** conversion gateway **142**. The IP interface **130** of the proxy server **120** via channels **126** and **124** through the router **138** and the global or any other network **134** is connected to the IP interface **160** of the control computer **158**. In turn, the IP interface **132** of the conversion gateway **142** via channels **140** and **136** via the router **138** and the global or any other network **134** are also connected to the wired or wireless IP interface **160** of the control computer **158**. All IP interfaces of the proxy server **120** and the conversion gateway **142** are connected to the local network **118** of the smartphone **102**.
[0089] Thus, the control computer **158**, via an IP network, receives broadcast streams of the screen of the smartphone **172** to the monitor **168** and transmits manipulation data of the input devices **156** for the corresponding interface **104** of the smartphone **102**. It will be understood that these information flows can be coordinated through a server or web server **173**. In this case, the functions of the application **164** can be performed by a regular web browser. This option does not affect the essence of the invention and for a more intelligible presentation of the material will not be discussed below. A more detailed description of the interaction of the control computer **158** with the user interface of the smartphone **102** is presented below.
[0090] The user of the smartphone **102** activates, by means of the user interface and the built-in function of the operating system **114**, the broadcast of the screen via channel **108** through the IP interface **116** of the smartphone **102** to the corresponding interface **122** of the proxy server **120** via channel **110**. For example, in the case of an iOS smartphone, technology can be used AirPlay, and in the case of an Android smartphone, Chromecast technology can be used. Next, the proxy server **120** in transaction **128** through interface **130** relays the screen broadcast traffic of the smartphone **102** via channels **126** and **124** through the router **138** and network **134** to the IP interface **160** of the control computer **158**. Then, through channel **162**, the screen broadcast data is sent to the corresponding application **164** for the remote control of the smartphone **102**. Application **164** processes the broadcast data of the screen of the smartphone **102** and then, via channel **170**,

displays the projection of the screen **172** of the smartphone **102** on the monitor **168**.
[0091] Next, the user of the smartphone **102** activates, through the user interface, a direct wired or wireless connection **106** of the input device interface **104** of the smartphone **102** to the corresponding interface **146** of the conversion gateway **142**. For example, Bluetooth or USB interfaces may be used.
[0092] The user of the control computer **158** then views the projection of the screen **172** of the smartphone **102** on the monitor **168** using input devices **156** (for example, a keyboard and mouse), and manipulates the user interface **104** of the smartphone **102** as follows. The UI manipulation data of the smartphone **102** comes from input devices **156** via a wired or wireless connection (Bluetooth or USB) via channel **154** to the corresponding interface **166**. Then, via channel **152**, the UI manipulation data of the smartphone **102** is received by the remote access application **164**, which transforms the manipulation data into the appropriate format for transmission over the IP network, and then sends them via channel **148** to the wired or wireless IP interface **160** of the computer **158**. Then the UI manipulation data through interface **160**, network **134** and router **138** are sent via channels **136** and **140** to the IP interface **132** of the conversion gateway **142**.
[0093] Next, the conversion gateway **142** in transaction **144** converts the manipulation data from the IP format into the physical and logical protocol (Bluetooth or USB) of the input interface **104** of the smartphone **102** and transmits it through the interface for HID **146** over channel **106** to the corresponding interface **104** (Bluetooth or USB) smartphone **102**. As a result, the smartphone **102** adequately responds to remote manipulation of the UI of the smartphone **102** by the corresponding peripheral input devices **156** of the control computer **158**.
[0094] FIG. **2** illustrates a method for accessing the user interface of a mobile computer (smartphone) **202** from a control computer **238** on a local network **206**. That is, the managed mobile computer **202** and the control computer **238** are connected to the same local network **206**.
[0095] The smartphone **202** has one IP connection **220** via the IP interface **218** with the IP interface **234** of the control computer **238** via a local wired or wireless network **206**, a second direct wired or wireless interface connection **208** for the HID **204** of the smartphone **202** with the corresponding interface **252** of the conversion gateway **248**.
[0096] In turn, the IP interface **246** of the conversion gateway **248** via channel **236** via the local network **206** is also connected to the wired or wireless IP interface **234** of the control computer **238**. All IP interfaces of the control computer **238** and the conversion gateway **248** are connected to the local network **206** of the smartphone **202**.
[0097] Thus, the control computer **238**, through the local IP network **206**, receives broadcast streams of the screen of the smartphone **212** to the monitor **214** and transmits input device manipulation data for the corresponding interface **204** of the smartphone **202**. It will be understood that these information flows can be coordinated through a server or web server **253**. In this case, the functions of the application **230** can be performed by a regular web browser. This option does not affect the essence of the invention and for a more intelligible presentation of the material will not be discussed below. A more detailed description of the interaction of the control computer **238** with the user interface of the smartphone **202** is presented below.
[0098] The user of the smartphone **202** activates, by means of the user interface and the built-in function of the operating system **226**, the broadcast of the screen via channel **216** through the IP interface **218** and then via channel **220** to the corresponding interface **234** of the control computer **238**. For example, in the case of an iOS smartphone, AirPlay technology can be used, and in the case of an Android smartphone, Chromecast technology can be used. Then, via channel **232**, the screen broadcast data is sent to the corresponding application **230** for remote control of the smartphone **202**. Application **230** processes the screen broadcast data of the smartphone **202** and then, via channel **224**, displays the projection of the screen **212** of the smartphone **202** on the monitor **214**.
[0099] Next, the user of the smartphone **202** activates, through the user interface, a direct wired or

wireless connection of the interface for the input devices **204** of the smartphone **202** to the corresponding interface **252** of the conversion gateway **248**. For example, Bluetooth or USB interfaces may be used.
[0100] The user of the control computer **238** then views the projection of the screen **212** of the smartphone **202** on the monitor **214** using input devices **210** (for example, a keyboard and mouse), and manipulates the user interface of the smartphone **202** as follows. The UI manipulation data of the smartphone **202** comes from input devices **210** via a wired or wireless connection (Bluetooth or USB) via channel **222** to the corresponding interface **228** of the control computer **238**. Then, via channel **240**, the UI manipulation data of the smartphone **202** is received by the remote access application **230**, which transforms the manipulation data into the appropriate format for transmission over the IP network, and then sends them via channel **242** to the wired or wireless IP interface **234** of the computer **238**. Then the UI manipulation data through the interface **234**, network **206** is sent via channel **236** to the IP interface **246** of the conversion gateway **248**.
[0101] Next, the conversion gateway **248** in transaction **250** converts the manipulation data from the IP format into the physical and logical protocol (Bluetooth or USB) of the input interface **204** of the smartphone **202** and transmits it through the interface for HID **252** via channel **208** to the corresponding interface **204** (Bluetooth or USB) smartphone **202**. As a result, the smartphone **202** adequately responds to remote manipulation of the UI of the smartphone **202** by the corresponding peripheral input devices **210** of the control computer **238**.
[0102] FIG. **3** illustrates a method for accessing the user interface of a mobile computer (smartphone) **306** from a control computer **322**, which contains a direct connection of the interface of peripheral input devices **304** of the mobile computer (smartphone) **306** with the interfaces of additional input devices **314** without the participation of a conversion gateway, which are used to access the user interface of the mobile computer together with the broadcast of the screen **316** of the mobile computer (smartphone) **306** to the monitor **318** of the control computer **322**.
[0103] That is, the smartphone **306** and the control computer **322** are operated simultaneously and are physically accessible by the same user, and the input devices (such as mouse and keyboard) **314** are connected directly to the interface of the smartphone **306**, which are manipulated by the user of the personal computer **322**, simultaneously using the display **316** of the smartphone **306** on the monitor **318** of his personal computer **322** to manipulate the graphical interface of the smartphone **306**. Thus, the user directly from his personal computer **322** has legal and secure access to control the user interface of his smartphone **306**.
[0104] Preliminarily, the smartphone **306** has one IP connection **310** via an IP interface **320** to the IP interface **332** of the control computer **322** via a local wired or wireless network **312**, a second direct wired or wireless interface connection **302** to the HID **304** of the smartphone **306** with associated input devices **314**. IP The interfaces of the control computer **322** and the smartphone **306** are connected to the local network **312**.
[0105] Thus, the control computer **322**, through the local IP network **312**, receives broadcast streams of the screen **316** of the smartphone **306** to the monitor **318**.
[0106] The transfer of manipulation data occurs directly from user input devices **314**, which are connected directly to the interface **304** of the smartphone **306**. A more detailed description of the interaction of the control computer **322** with the user interface of the smartphone **306** is presented below.
[0107] The user of the smartphone **306** activates, through the user interface and the built-in function of the operating system **326**, the broadcast of the screen via channel **308** through the IP interface **320** of the smartphone **306** to the corresponding interface **332** of the control computer **322** via channel **310**. For example, in the case of an iOS smartphone, AirPlay technology can be used, and in the case of an Android smartphone, Chromecast technology can be used. Then, via channel **330**, the screen broadcast data is sent to the corresponding application **328** for remote control of the smartphone **306**. Application **328** processes the screen broadcast data of the smartphone **306** and

then, via channel **324**, displays the projection of the screen **316** of the smartphone **306** on the monitor **318**.
[0108] Next, the user of the smartphone **306** enables, via the user interface, direct wired or wireless connection of the interface for input devices **304** of the smartphone **306** to the input devices **314**. For example, Bluetooth or USB interfaces may be used.
[0109] The user of the control computer **322** then views the projection of the screen **316** of the smartphone **306** on the monitor **318**, using input devices **314** (for example, a keyboard and mouse) to manipulate the user interface of the smartphone **306**. Thus, the manipulation data of the UI of the smartphone **306** comes from input devices **314** through a wired or wireless connection (Bluetooth or USB) channel **302** to the interface **304** of the smartphone **306**. As a result, the smartphone **306** adequately responds to the manipulation of the UI of the smartphone **306** by the corresponding peripheral input devices **314**, which are controlled by the user of the computer **322**.
[0110] FIG. **4** illustrates a method for accessing the user interface of a mobile computer (smartphone) **402** from a control computer **452**, which includes connecting the IP interface **436** of the conversion gateway **438** to a network **432** other than the local network **416** of the mobile computer (smartphone) **402** and a direct connection to the input device interface **442** of the conversion gateway **438** with the corresponding interface **404** of the mobile computer (smartphone) **402**.
[0111] That is, in this case, the manipulation data, after appropriate routing, arrives at the IP interface **436** of the conversion gateway **438** from other networks **432** (including the Internet and other mobile networks). Once converted into transactions **440**, this data is transferred from the interface to the HID **442** via a direct wired or wireless connection **406** to the HID interface **404** of the mobile computer (smartphone) **402**.
[0112] The Previously, smartphone **402** has one IP connection **410** via IP interface **414** to IP interface **418** of proxy server **426** via local wired or wireless network **416** over channel **410**, a second direct wired or wireless interface connection **406** to HID **404** of smartphone **402** with corresponding interface **442** conversion gateway **438**. The IP interface **430** of the proxy server **426** via channels **424** and **420** through the router **422** and the global or any other network **432** is connected to the IP interface **454** of the control computer **452**. In turn, the IP interface **436** of the conversion gateway **438** via channels **434** via the global or any other network **432** is also connected to the wired or wireless IP interface **454** of the control computer **452**. The IP interfaces of the proxy server **426** are connected to the local network **416**. The IP interface **436** of the conversion gateway **438** is connected to any other network **432**, other than the network **416**.
[0113] Thus, the control computer **452**, via an IP network, receives broadcast streams of the screen of the smartphone **402** in the form of a projection of the screen **466** onto the monitor **464** and transmits manipulation data of the input devices **446** for the corresponding interface **404** of the smartphone **402**. A more detailed description of the interaction of the control computer **452** with the user interface smartphone **402** is presented below.
[0114] The user of the smartphone **402** activates, through the user interface and a built-in function of the operating system **412**, the screen broadcast via channel **408** through the IP interface **414** of the smartphone **402** to the corresponding interface **418** of the proxy server **426** via channel **410**. For example, in the case of an iOS smartphone, technology can be used AirPlay, and in the case of an Android smartphone, Chromecast technology can be used. Next, the proxy server **426** in transaction **428** through interface **430** relays the screen broadcast traffic of the smartphone **402** via channels **424** and **420** through the router **422** and network **432** to the IP interface **454** of the control computer **452**. Then, through channel **456**, the screen broadcast data is sent to the corresponding application **458** for the remote control of the smartphone **402**. The application **458** processes the screen broadcast data to display the screen of the smartphone **402** and then, via channel **462**, displays the projection of the screen **466** of the smartphone **402** to the monitor **464**.
[0115] The user of the smartphone **402** then activates, through the user interface, a direct wired or

wireless connection of the smartphone input device interface **404** to the corresponding interface **442** of the conversion gateway **438**. For example, Bluetooth or USB interfaces may be used.
[0116] The user of the control computer **452** then views the projection of the screen **466** of the smartphone **402** on the monitor **464** using input devices **446** (such as a keyboard and mouse), and manipulates the user interface of the smartphone **402** as follows. The UI manipulation data of the smartphone **402** comes from the input devices **446** through a wired or wireless connection (Bluetooth or USB) to the channel **444** to the corresponding interface **460**. Next, through the channel **450**, the UI manipulation data of the smartphone **402** is received by the remote access application **458**, which transforms the manipulation data into the appropriate format for transmissions over the IP network, and then sends them via channel **448** to the wired or wireless IP interface **454** of the computer **452**. Then the UI manipulation data via interface **454**, network **432** is sent via channel **434** to the IP interface **436** of the conversion gateway **438**.
[0117] Next, the conversion gateway **438** in transaction **440** converts the manipulation data from the IP format into the physical and logical protocol (Bluetooth or USB) of the input interface **404** of the smartphone **402** and transmits it through the interface for HID **442** over channel **406** to the corresponding interface **404** (Bluetooth or USB) smartphone **402**. As a result, the smartphone **402** adequately responds to remote manipulation of the smartphone UI **402** by the corresponding input peripheral devices **446** of the control computer **452**.
[0118] FIG. **5** illustrates a method for accessing the user interface of a mobile computer (smartphone) **502**, which includes broadcasting the screen to the control computer **582** and converting interface manipulation data from IP into the corresponding protocols for manipulating the interface of peripheral input devices **504** of the mobile computer (smartphone) **502**, implemented by the functionality of one and the same the same device **566** connected to the local network **516** of the mobile computer (smartphone) **502**. That is, you can use almost any device **566** connected to the local network **516**, containing the functions of relaying mobile computer screen broadcast data and converting IP protocols of manipulation data coming to the HID interface mobile computer (smartphone) **502**.
[0119] This device **566** has one IP connection **512** to the local network **516**, and a second connection **514** to the HID interface **504** of the mobile computer (smartphone) **502**. The device functions simultaneously as a relay (proxy server **538**) of screen broadcast data and as a gateway for conversion **550** HID **504** interface manipulation data from IP to HID protocols. For example, these functions can complement the functionality of any “standard” network devices: routers **540**, wireless routers **542**, computers **556**, gateway for IoT devices **554**, smartphones **570**, smart speakers **562**, laptops **568**, tablets **564**, etc. So It is also possible to use compact devices based on a **560** microcomputer, for example, in the IoT device format.
[0120] In the following, the proxy server **538** and the conversion gateway **550** appear as an additional function of the device **566**, which can be implemented in the format of any device connected to the local network **516**.
[0121] The smartphone **502** has one IP connection **512** via the IP interface **510** with a proxy server **538** via a local wired or wireless network **516** via channel **512**, a second direct wired or wireless interface connection **514** for the HID **504** of the smartphone **502** with a corresponding conversion gateway **550** interface **552**. The IP interface **522** of the proxy server **538** via channels **524** and **518** through the router **520** and the global or any other network **548** is connected to the IP interface **584** of the control computer **582**. In turn, the IP interface **544** of the conversion gateway **550** via channels **534**, **536** and **530** via the router **520** and the global or any other network **548** are also connected to the wired or wireless IP interface **584** of the control computer **582**. All IP interfaces of the proxy server **538** and the conversion gateway **550** are connected to the local network **516** of the smartphone **502**.
[0122] Thus, the control computer **582**, via an IP network, receives broadcast streams of the screen of the smartphone **596** to the monitor **594** and transmits manipulation data of the input devices **580**

to the corresponding interface **504** of the smartphone **502**. A more detailed description of the interaction of the control computer **582** with the user interface of the smartphone **502** is presented below.

[0123] The user of the smartphone **502** activates, through the user interface and the built-in function of the operating system **506**, the broadcast of the screen via channel **508** through the IP interface **510** of the smartphone **502** to the corresponding interface **528** of the proxy server **538** via channel **512**. For example, in the case of an iOS smartphone, technology can be used AirPlay, and in the case of an Android smartphone, Chromecast technology can be used. Next, the proxy server **538** in transaction **526** through interface **522** relays the screen broadcast traffic of the smartphone **502** via channels **524** and **518** through the router **520** and network **548** to the IP interface **584** of the control computer **582**. Then, through channel **586**, the screen broadcast data is sent to the corresponding application **588** for the remote control of the smartphone **502**. The application **588** processes the screen broadcast data to display the screen of the smartphone **502** and then, via channel **592**, displays the projection of the screen **596** of the smartphone **502** to the monitor **594**.

[0124] The user of the smartphone **502** then activates, through the user interface, a direct wired or wireless connection **514** of the input device interface **504** of the smartphone **502** to the corresponding interface **552** of the conversion gateway **550**. For example, Bluetooth or USB interfaces may be used.

[0125] The user of the control computer **582** then views the projection of the screen **596** of the smartphone **502** on the monitor **594** using input devices **580** (eg, a keyboard and mouse), and manipulates the user interface **504** of the smartphone **502** as follows. The UI manipulation data of the smartphone **502** comes from the input devices **580** through a wired or wireless connection (Bluetooth or USB) to the channel **578** to the corresponding interface **590**. Then, via channel **576**, the UI manipulation data of the smartphone **502** is received by the remote access application **588**, which transforms the manipulation data into the appropriate format for transmissions over the IP network, and then sends them via channel **574** to the wired or wireless IP interface **584** of the computer **582**. Then the UI manipulation data through interface **584**, network **548** and router **520** are sent via channels **530**, **534** and **536** to the IP interface **544** of the conversion gateway **550**.

[0126] Next, the conversion gateway **550** in transaction **546** converts the manipulation data from the IP format into the physical and logical protocol (Bluetooth or USB) of the input interface **504** of the smartphone **502** and transmits it through the interface for HID **552** over channel **514** to the corresponding interface **504** (Bluetooth or USB) smartphone **502**. As a result, the smartphone **502** adequately responds to remote manipulation of the smartphone UI **502** by the corresponding input peripheral devices **580** of the control computer **582**.

[0127] FIG. **6** illustrates a method for accessing the user interface of a mobile computer (smartphone) **602** to interact with a control computer **668**, which includes broadcasting a screen **614** and receiving manipulation data by the IP interface **622** of a mobile computer (smartphone) **602** via a mobile IP network with Internet access **656**, to which mobile computer (smartphone) **602** is connected.

[0128] That is, the user interface is accessed via a mobile IP network quickly anywhere and at any time at the user's request. The corresponding functions of screen relay (proxy server application **652**) and conversion of manipulation data from IP to HID (conversion gateway application **640**) can be performed, for example, on a specially configured mobile device (for example, smartphone **646**), which is located in the same local Wi-Fi-Fi network **612** with a mobile computer (smartphone) **602**. Access to the local Wi-Fi network **612** is carried out through a wireless access point **616** activated on the mobile computer (smartphone) **602**.

[0129] The proxy server application **652** and the conversion gateway application **640** are additional functions of the access device (smartphone **646**), which can be implemented in the format of any device connected to the local network **612**, and are hereinafter referred to as the proxy server **652** and gateway conversion **640**.

[0130] The smartphone **602** has one IP connection via IP interfaces **616** and **632** with a proxy server **652** via local wireless network **612** via channels **610** (via IP interface **638**) and **620** (via IP interface **636**), a second IP connection **618** via IP interface **616** to conversion gateway **640** via local wireless network **612** (via IP interface **632**), and another direct wireless connection **606** interface for HID **604** (Bluetooth) smartphone **602** to conversion gateway **640** (interface **648**) via corresponding smartphone interface **654** (Bluetooth) **646**.
[0131] In addition, the IP interface **636** of the proxy server **652** via channels **620**, **624** and **628** via the Wi-Fi IP interface **616** and the IP interface of the mobile network **622**, the mobile IP network with Internet access **656** is connected to a wired or wireless IP interface **670** control computer **668**.
[0132] In turn, the IP interface **634** of the conversion gateway **640** via channels **618**, **626** and **630** via the Wi-Fi IP interface **616** and the IP interface of the mobile network **622**, the mobile IP network with Internet access **656** is also connected to a wired or wireless IP interface **670** control computer **668**.
[0133] Thus, the control computer **668**, via an IP network, receives broadcast streams of the screen **682** of the smartphone **602** to the monitor **678** and transmits manipulation data of the input devices **664** for the corresponding interface **604** of the smartphone **602**. A more detailed description of the interaction of the control computer **668** with the user interface of the smartphone **602** is presented below.
[0134] The user of the smartphone **602** activates, through the user interface and the built-in function of the operating system **614**, the screen broadcast via channel **610** through the IP interface **616** of the smartphone **602** to the corresponding interface **638** of the proxy server **652** through the IP interface **632** of the smartphone **646**. For example, in the case of an iOS smartphone, the AirPlay technology can be used, and in the case of an Android smartphone, Chromecast technology can be used. Next, the proxy server **652** in transaction **644** through interface **636** relays the screen broadcast traffic of the smartphone **602** via channels **620**, **624** and **628** via Wi-Fi IP interfaces **632** and **616**, IP interface of the mobile network **622**, mobile IP network with Internet access **656** to the IP interface **670** of the control computer **668**. Then, via channel **672**, screen broadcast data is sent to the corresponding application **674** for remote control of the smartphone **602**. Application **674** processes the screen broadcast data to display the screen of the smartphone **602** and then, via channel **680**, displays the projection of the screen **682** of the smartphone **602** on the screen monitor **678**.
[0135] Next, the user of the smartphone **602** activates, via the user interface, a direct wireless connection between the Bluetooth interface **604** for the input devices of the smartphone **602** and the corresponding interface **648** of the conversion gateway **640** via the Bluetooth interface **654** of the smartphone **646**.
[0136] The user of the control computer **668** then views the projection of the screen **682** of the smartphone **602** on the monitor **678** using input devices **664** (eg, a keyboard and mouse), and manipulates the user interface of the smartphone **602** as follows. The UI manipulation data of the smartphone **602** comes from the input devices **664** through a wired or wireless connection (Bluetooth or USB) to the channel **662** to the corresponding interface **676**. Next, through the channel **660**, the UI manipulation data of the smartphone **602** is received by the remote access application **674**, which transforms the manipulation data into the appropriate format for transmissions over the IP network, and then sends them via channel **658** to the wired or wireless IP interface **670** of the computer **668**. Then the UI manipulation data via interface **670** and network **656** is sent via channels **630**, **626** and **618** via IP interfaces **622** of the mobile network and **616**, **632** Wi-Fi networks **612** to IP interface **634** conversion gateway **640**.
[0137] Next, the conversion gateway **640** in transaction **642** converts the manipulation data from the IP format into the physical and logical protocol (Bluetooth) of the input interface **604** of the smartphone **602** and transmits it through the interface for HID **648** and Bluetooth interface **654** over channels **650** and **606** to the corresponding Bluetooth interface **604** smartphone **602**. As a

result, the smartphone **602** adequately responds to remote manipulation of the smartphone UI **602** by the corresponding input peripheral devices **664** of the control computer **668**.
[0138] FIG. **7** illustrates a method for accessing the user interface of a mobile computer (smartphone) **702**, which includes broadcasting the screen **718** and converting interface manipulation data from IP into control commands for the user interface **708** of the mobile computer (smartphone) **702**, implemented by the functionality of third-party applications **728** and **710**, respectively, installed on mobile computer (smartphone) **702**, to interact with the control computer **748** via networks **716** and **736**.
[0139] That is, users are in principle able to use not only the “out-of-the-box” functionality of the mobile computer user interface, but also third-party applications (for example, **728** with proxy functionality) developed based on the operating system's screen broadcasting functionality **718**. In addition, it is possible to develop and install a third-party application (for example, **710** with conversion gateway functionality), which converts commands in IP format from the remote control computer **748** into control commands for the graphical interface **708** of the mobile computer (smartphone) **702** using the functions of the operating system without use of logical and hardware resources of the network and third-party equipment. For example, you can use the appropriate accessibility options of the Android operating system (Switch Access).
[0140] Preliminarily, the smartphone **702** has the following IP connections through a wired or wireless IP interface **720** and a local wired or wireless network **716**. One IP connection of a proxy server application **728** on channels **724**, **730** and **732** through a router **738** and other networks or the Internet **736** to the wired or wireless IP interface **750** of the control computer **748** to broadcast the screen **718**. A second IP connection of the conversion gateway application **710** via channel **714** to receive manipulation data from the user interface of the smartphone **702** through the router **738** via channel **734** from other networks or the Internet **736** from the wired or wireless IP interface **750** control computer **748**.
[0141] Thus, the control computer **748**, via an IP network, receives broadcast streams of the screen **762** of the smartphone **702** to the monitor **760** and transmits manipulation data of the input devices **746** for the corresponding user interface of the smartphone **702**. A more detailed description of the interaction of the control computer **748** with the user interface of the smartphone **702** is presented below.
[0142] The user of the smartphone **702** activates, through the user interface and a built-in function of the operating system **718**, the screen broadcast via channel **722** through the IP interface **720** of the smartphone **702** to the proxy server application **728** installed on the smartphone **702**, via channels **724** through the network **716**. For example, in the case An iOS smartphone can use AirPlay technology, and an Android smartphone can use Chromecast technology.
[0143] Then, the proxy server application **728** in transaction **726** relays the screen broadcast traffic of the smartphone **702** through the network **716** and interface **720** on channels **730** to the router **738** and then on channels **732** through the network **736** to the IP interface **750** of the control computer **748**. Further along the channel **752**, the screen broadcast data is supplied to the corresponding application **754** for remote control of the smartphone **702**. The application **754** processes the screen broadcast data to display the screen of the smartphone **702** and then, via channel **758**, displays the projection of the screen **762** of the smartphone **702** on the monitor **760**.
[0144] The user of the control computer **748** then views the projection of the screen **762** of the smartphone **702** on the monitor **760** using input devices **746** (eg, a keyboard and mouse), and manipulates the user interface of the smartphone **702** as follows. The UI manipulation data of the smartphone **702** comes from the input devices **746** through a wired or wireless connection (Bluetooth or USB) to the channel **744** to the corresponding interface **756**. Next, through the channel **742**, the UI manipulation data of the smartphone **702** is received by the remote access application **754**, which transforms the manipulation data into the appropriate format for transmissions over the IP network, and then sends them via channel **740** to the wired or wireless IP

interface **750** of computer **748**. Then the UI manipulation data via interface **750**, network **736** and router **738** are sent via channels **734**, **714** via network **716** and IP interface **720** to the application **710** conversion gateway.
[0145] Next, the conversion gateway application **710** in transaction **712** converts the manipulation data from the IP format into control commands for the user interface **708** of the mobile computer (smartphone) **702**, which are transmitted via channel **706** for execution to the corresponding operating system functions for the user interface of the smartphone **702**. As a result, the smartphone **702** adequately responds to remote manipulation of the smartphone UI **702** by the corresponding peripheral input devices **746** of the control computer **748**.
[0146] FIG. **8** is a simplified block diagram that illustrates an exemplary representation of a system for accessing the user interface of a mobile computer (smartphone) **804** from both a local network and other networks or the Internet, with relevant components to best illustrate the invention.
[0147] System according to FIG. **8** contains the following main components: a mobile computer in the format of a smartphone **804**, a first control computer **832** connected to a local network **814**, a second control computer **882** connected to another computer network **866** accessible from the local network **814**, a gateway **874** for converting IP protocols of the smartphone UI manipulation data **804**, a proxy server **850** for relaying broadcast streams of the smartphone screen **804** to the second control computer **882** to other networks **866**, a router **848** connected to the local network **814** and any other computer network **866**. The IP interfaces of any system components can be wired or wireless. The system components contain suitable IP interfaces of any type for connecting to an IP network.
[0148] System according to FIG. **8** implements access to the user interface of the smartphone **804** from the first control computer **832** connected to the local network **814**, and the second control computer **882** connected to another computer network **866** accessible from the local network **814**. Thus, both options for accessing the smartphone UI will be discussed below **804**: from local network **814** and from any other network or Internet **866**.
[0149] To access the UI of the smartphone **804** from the local network **814**, the system components are pre-connected as follows. Smartphone **804** has one IP connection **820** via IP interface **816** to IP interface **840** of control computer **832** via local wired or wireless network **814**, a second direct wired or wireless interface connection **808** to the HID **806** of smartphone **804** to the corresponding interface **880** of conversion gateway **874**.
[0150] Thus, the control computer **832**, through the local IP network **814**, receives broadcast streams of the screen **862** of the smartphone **804** to the monitor **844** and transmits manipulation data of the input devices **802** for the corresponding interface **806** of the smartphone **804**. A more detailed description of the interaction of the control computer **832** with the user interface of the smartphone **806** presented below.
[0151] The user of the smartphone **804** activates, through the user interface and the built-in function of the operating system **824**, the broadcast of the screen via channel **818** to the IP interface **816** and then via channel **820** to the corresponding interface **840** of the control computer **832**. For example, in the case of an iOS smartphone, AirPlay technology can be used, and in the case of an Android smartphone, Chromecast technology can be used. Then, via channel **842**, the screen broadcast data is sent to the corresponding application **836** for remote control of the smartphone **804**. Application **836** processes the screen broadcast data to display the screen of the smartphone **804** and then, via channel **846**, displays the projection of the screen **862** of the smartphone **804** on the monitor **844**.
[0152] Next, the user of the smartphone **804** activates, through the user interface, a direct wired or wireless connection of the input device interface **806** of the smartphone **804** to the corresponding interface **880** of the conversion gateway **874**. The interfaces **806** and **880** to be connected can be any type of interface. For example, Bluetooth or USB interfaces can be used, including using the HID protocol.

[0153] The user of the control computer **832** then views the projection of the screen **862** of the smartphone **804** on the monitor **844** using input devices **802** (eg, a keyboard and mouse), and manipulates the user interface of the smartphone **804** as follows. The UI manipulation data of the smartphone **804** comes from the input devices **802** through a wired or wireless connection (Bluetooth or USB) channel **822** to the corresponding interface **834** of the control computer **832**. Next, through the channel **826**, the UI manipulation data of the smartphone **804** is received by the remote access application **836**, which transforms the manipulation data into the appropriate format for transmission over the IP network, and then sends them via channel **830** to the wired or wireless IP interface **840** of the computer **832**. Then the UI manipulation data through the interface **840**, network **814** is sent via channel **860** to the IP interface **876** of the conversion gateway **874**.
[0154] Next, the conversion gateway **874** in transaction **878** converts the manipulation data from the IP format into the physical and logical protocol (Bluetooth or USB) of the input interface **806** of the smartphone **804** and transmits it through the interface for HID **880** over channel **808** to the corresponding interface **806** (Bluetooth or USB) smartphone **804**. As a result, the smartphone **804** adequately responds to remote manipulation of the smartphone UI **804** by the corresponding input peripheral devices **802** of the control computer **832**.
[0155] To access the smartphone UI **804** from any other network or Internet **866**, the system components are pre-connected as follows. Smartphone **804** has one IP connection via IP interface **816** to IP interface **852** of proxy server **850** via local wired or wireless network **814** over channel **812**, a second direct wired or wireless interface connection **808** to HID **806** of smartphone **804** to corresponding interface **880** of conversion gateway **874**. The IP interface **856** of the proxy server **850** via channels **858** and **864** through the router **848** and the global or any other network **866** is connected to the IP interface **890** of the control computer **882**. In turn, the IP interface **876** of the conversion gateway **874** via channels **872** and **868** through the router **848** and the global or any other network **866** is also connected to the wired or wireless IP interface **890** of the control computer **882**. All IP interfaces of the proxy server **850** and the conversion gateway **874** are connected to the local network **814** of the smartphone **806**.
[0156] Thus, the control computer **882**, via an IP network, receives broadcast streams of the screen of the smartphone **896** to the monitor **895** and transmits manipulation data of the input devices **897** to the corresponding interface **806** of the smartphone **804**. A more detailed description of the interaction of the control computer **882** with the user interface of the smartphone **804** is presented below.
[0157] The user of the smartphone **804** activates, through the user interface and a built-in function of the operating system **824**, the screen broadcast via channel **810** through the IP interface **816** of the smartphone **804** to the corresponding interface **852** of the proxy server **850** via channel **812**. For example, in the case of an iOS smartphone, technology can be used AirPlay, and in the case of an Android smartphone, Chromecast technology can be used. Next, the proxy server **850** in transaction **854** through interface **856** relays the screen broadcast traffic of the smartphone **804** via channels **858** and **864** through the router **848** and network **866** to the IP interface **890** of the control computer **882**. Then, through channel **891**, the screen broadcast data is sent to the corresponding application **892** for the remote control of the smartphone **804**. The application **892** processes the screen broadcast data to display the screen of the smartphone **804** and then, via channel **894**, displays the projection of the screen **896** of the smartphone **804** to the monitor **895**.
[0158] The user of the smartphone **804** then activates, through the user interface, a direct wired or wireless connection of the smartphone input device interface **806** to the corresponding interface **880** of the conversion gateway **874**. For example, Bluetooth or USB interfaces may be used.
[0159] The user of the control computer **882** then views the projection of the screen **896** of the smartphone **804** on the monitor **895** using input devices **897** (eg, a keyboard and mouse), and manipulates the user interface **806** of the smartphone **804** as follows. The UI manipulation data of the smartphone **804** comes from the input devices **897** through a wired or wireless connection

(Bluetooth or USB) to the channel **888** to the corresponding interface **893**. Then, via the **886** channel, the UI manipulation data of the smartphone **804** is received by the remote access application **892**, which transforms the manipulation data into the appropriate format for transmissions over the IP network, and then sends them via channel **884** to the wired or wireless IP interface **890** of the computer **882**. Then the UI manipulation data through interface **890**, network **866** and router **848** are sent via channels **868** and **872** to the IP interface **876** of the conversion gateway **874**.

[0160] Next, the conversion gateway **874** in transaction **878** converts the manipulation data from the IP format into the physical and logical protocol (Bluetooth or USB) of the input interface **806** of the smartphone **804** and transmits it through the interface for HID **880** via channel **808** to the corresponding interface **806** (Bluetooth or USB) smartphone **804**. As a result, the smartphone **804** adequately responds to remote manipulation of the smartphone UI **804** by the corresponding input peripheral devices **897** of the control computer **882**.

[0161] In addition, the functionality of the proxy server **850** and conversion gateway **874** can be built into any system component included in the local network. For example, according to the link, **870** the additional functionality of the proxy server **850** and conversion gateway **874** can be built into a personal computer, tablet, smartphone, IoT microcomputer, or router **848**.

[0162] FIG. **9** is a simplified block diagram that illustrates an exemplary implementation of a mobile computer **902** user interface access device **916** based on a suitably configured smartphone **916** in interaction with components of an exemplary mobile computer **902** user interface access system.

[0163] The corresponding functions for screen relay (proxy server application **952**) and conversion of manipulation data from IP to HID (conversion gateway application **942**) are performed by a specially configured mobile device (smartphone **916**), which is located in the same local Wi-Fi network **910** with a mobile computer (smartphone) **902**.

[0164] In practice, instead of the smartphone **916**, you can use any device **960** connected to the local network **910**, containing the functions of relaying mobile computer screen broadcast data and converting IP protocols of manipulation data arriving at the HID interface of the mobile computer (smartphone) **902**. For example, you can supplement with these functions the functionality of any "standard" network devices: routers **940**, wireless routers **956**, computers **968**, gateway for IoT devices **966**, smart speakers **974**, laptops **972**, tablets **962**, etc. It is also possible to use compact devices based on microcomputer **964**, for example, in the format of an IoT device.

[0165] The proxy server application **952** and the conversion gateway application **942** are an optional feature of the access device (smartphone **916**), which can be implemented in the format of any device connected to the local network **910**, and are hereinafter referred to as the proxy server **952** and gateway conversion **942**.

[0166] The smartphone **902** has one IP connection via the IP interface **908** with the proxy server **952** via the local wireless network **910** via channel **918** (via IP interfaces **908**, **926** and **932**) and another direct wireless Bluetooth connection **906** interface for the HID **904** smartphone **902** with conversion gateway **942** via the corresponding interface **958** (Bluetooth) of the smartphone **916**.

[0167] In addition, the IP interface **930** of the proxy server **952** is connected via channels **924** and **920** via Wi-Fi IP interface **926**, router **938** and any IP network with Internet access **954** to the wired or wireless IP interface **986** of the control computer **984**.

[0168] In turn, the IP interface **928** of the conversion gateway **942** via channels **922** and **934** via Wi-Fi IP interface **926**, router **938** and any IP network with Internet access **954** is connected to the wired or wireless IP interface **986** of the control computer **984**.

[0169] Thus, the control computer **984**, via an IP network, receives broadcast streams of the screen **998** of the smartphone **902** to the monitor **996** and transmits manipulation data of the input devices **982** for the corresponding interface **904** of the smartphone **902**. A more detailed description of the interaction of the control computer **984** with the user interface of the smartphone **902** is presented

below.
[0170] The user of the smartphone **902** activates, through the user interface and the built-in function of the operating system **914**, the broadcast of the screen via channel **912** through the IP interface **908** of the smartphone **902** to the corresponding interface **932** of the proxy server **952** via channel **918**. For example, in the case of an iOS smartphone, technology can be used AirPlay, and in the case of an Android smartphone, Chromecast technology can be used. Next, the proxy server **952** in transaction **948** through interface **930** relays the screen broadcast traffic of the smartphone **902** via channels **924** and **920** via Wi-Fi IP interface **926**, router **938**, any IP network with Internet access **954** to the IP interface **986** of the control computer **984**. Then, via channel **988**, the screen broadcast data is sent to the corresponding application **990** for remote control of the smartphone **902**. Application **990** processes the screen broadcast data to display the screen of the smartphone **902** and then, via channel **994**, displays the projection of the screen **998** of the smartphone **902** on the monitor **996**.
[0171] Next, the user of the smartphone **902** activates, through the user interface, a direct wireless connection between the input device interface **904** of the smartphone **902** and the corresponding interface **946** of the conversion gateway **942** via the Bluetooth interface **958** of the smartphone **916**.
[0172] The user of the control computer **984** then views the projection of the screen **998** of the smartphone **902** on the monitor **996** using input devices **982** (for example, a keyboard and mouse), and manipulates the user interface of the smartphone **902** as follows. The UI manipulation data of the smartphone **902** comes from the input devices **982** through a wired or wireless connection (Bluetooth or USB) to the channel **980** to the corresponding interface **992**. Next, via channel **978**, the UI manipulation data of the smartphone **902** is received by the remote access application **990**, which transforms the manipulation data into the appropriate format for transmissions over the IP network, and then sends them via channel **976** to the wired or wireless IP interface **986** of the computer **984**. Then the UI manipulation data via interface **986** and network **954** is sent via channels **934** and **922** through router **938**, Wi-Fi network **910** to IP interface **926** of smartphone **916** to IP interface **928** of conversion gateway **942**.
[0173] Next, the conversion gateway **942** in transaction **944** converts the manipulation data from the IP format into the physical and logical protocol (Bluetooth) of the input interface **904** of the smartphone **902** and transmits it via the Bluetooth interface for HID **958** via channels **950** and **906** to the Bluetooth interface **904** of the smartphone **902**. As a result, the smartphone **902** adequately responds to remote manipulation of the smartphone UI **902** by the corresponding peripheral input devices **982** of the control computer **984**.
[0174] As noted above, the technological advantages of the presented invention make it possible to implement a service for accessing the user interface of almost any mobile device (including mobile computers manufactured by Apple Corporation) without using corresponding third-party mobile applications. Accordingly, the presented new technology can be used to develop application solutions absolutely within the framework of the security policy of mobile operating systems and without installing additional functions directly on the managed mobile computer.
[0175] The drawings and descriptions above are intended primarily to provide an understanding of the principles of the invention and prospects for practical application in the presented embodiments. It is clear that after reading the above material, specialists in this field may suggest some other options for implementing these inventions. Accordingly, the present invention is limited only by the following claims and their equivalents, but is not limited by the foregoing description.

Claims

1. A system of access to a user interface of a mobile computer from a controlling computer, the system comprising: a mobile computer that has one connection to a local network for broadcasting of a screen of the mobile computer, and a second connection of an interface of peripheral input

devices of the mobile computer to a conversion gateway, the conversion gateway for converting Internet Protocol (IP) format data corresponding to a manipulation of a peripheral input device of the controlling computer and arriving from the controlling computer into a format appropriate for the interface of the peripheral input devices of the mobile computer, the conversion gateway including an IP interface for reception of the IP format data corresponding to the manipulation of the peripheral input device of the controlling computer from the controlling computer, and a peripheral device output interface connected directly to the interface of the peripheral input devices of the mobile computer for transmission of data representing the manipulation of the peripheral input device of the controlling computer to the mobile computer from the controlling computer, a first controlling computer connected to the local network of the mobile computer and configured to: receive data of the screen broadcast data representing the broadcast of the screen of the mobile computer from the local network and to display the broadcast of the screen of the mobile computer on a monitor of the first controlling computer, and transmit data representing the manipulation of the peripheral input device of the controlling computer in the IP format to the IP interface of the conversion gateway on the local network to cause a manipulation by the interface of the peripheral input devices of the mobile computer that corresponds to the manipulation of the peripheral input device of the first controlling computer, a second controlling computer connected to any other computer network accessible from the local network of the mobile computer and configured to: receive data of the screen broadcast data representing the broadcast of the screen of the mobile computer from any other network and to display the broadcast of the screen of the mobile computer on a monitor of the second controlling computer, and transmit data representing the manipulation of the peripheral input device of the controlling computer in the IP format to the IP interface of the conversion gateway through any other network to cause a manipulation by the interface of the peripheral input devices of the mobile computer that corresponds to the manipulation of the peripheral input devices of the second controlling computer.

2. The system according to claim 1, wherein the second controlling computer is connected to a global computer network.

3. The system according to claim 1, further comprising: a router connected to the local network of the mobile computer for routing screen broadcast data representing a broadcast of the screen of the mobile computer on at least the local network; and a proxy server for relaying the screen broadcast data representing the broadcast of the screen of the mobile computer to the controlling computer to other networks, wherein the conversion gateway and the proxy server are implemented as one device.

4. The system according to claim 1, further comprising one or more Bluetooth or USB interfaces interconnecting the interface of the peripheral input devices of the mobile computer and the conversion gateway.

5. The system according to claim 4, further comprising one or more HID interface interconnecting the interface of the peripheral input devices of the mobile computer and the conversion gateway.

6. The system according to claim 1, wherein the mobile computer includes one or more IP interfaces for a connection of the mobile computer to the local network.

7. The system according to claim 1, wherein the input interfaces of the first and second controlling computers include at least one peripheral device of any type selected from a keyboard and a pointing device.