

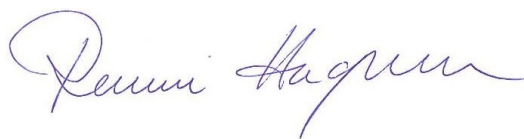
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PATENTTI- JA REKISTERIHALLITUS

on tänään myöntänyt 15 päivänä joulukuuta 1967 annetun patenttilain siihen myöhemmin tehtyine muutoksineen nojalla oheisen patenttijulkaisun mukaisen patentin. Patentinhaltijan nimi, keksinnön nimitys ja patenttihakemuksen tekemispäivä käyvät ilmi patenttijulkaisun etusivulta.

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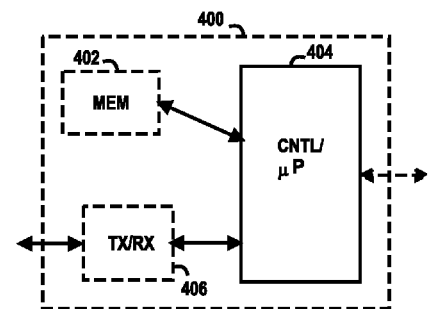
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The invention relates to an apparatus comprising: at least one processor and at least one memory including a computer program code, the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus at least to: obtain a list of suitable external display devices, wherein the external display devices are on the list in a priority order, the obtaining being carried out in the priority order, and couple, in the priority order, to at least one of the external display devices on the list for showing content.

Keksintö liittyy laitteeseen, joka käsittää: ainakin yhden prosessorin ja ainakin yhden muistin, joka sisältää tietokoneohjelmakoodia, ainakin yhden muistin ja tietokoneohjelmistokoodin ollessa konfiguroitu ainakin yhden prosessorin kanssa aiheuttamaan laitteen ainakin saamaan luettelo sopivista ulkoisista näyttölaitteista, jossa ulkoiset näyttölaitteet ovat luettelossa prioriteettijärjestyksessä, saaminen suoritetaan prioriteettijärjestyksessä, ja kytkeytymään prioriteettijärjestyksessä ainakin yhteen luettelon ulkoisista näyttölaitteista sisällön näyttämiseksi.



Cooperation of Device and Display

Field

The invention relates to apparatuses, methods, systems, computer programs, computer program products and computer-readable media.

5 Background

The following description of background art may include insights, discoveries, understandings or disclosures, or associations together with disclosures not known to the relevant art prior to the present invention but provided by the invention. Some such contributions of the invention may be
10 specifically pointed out below, whereas other such contributions of the invention will be apparent from their context.

Mobile devices usually contain a small, or at least relatively small, display. However, a need to couple the mobile device to one or more external displays (such as a monitor, portable display monitor, video projector, near eye
15 display or TV) often exists, for instance to watch movies, news or sport, play different games or be in social media by using a bigger screen. Sometimes a need to show content to a plurality of persons exists, and an external display or projector suits well to that kind of activity.

Brief description

20 The invention relates to apparatuses, methods, and computer programs which are characterized by what is stated in the independent claims. The preferred embodiments are disclosed in the dependent claims.

According to an aspect of the present invention, there is provided an apparatus comprising: at least one processor and at least one memory
25 including a computer program code, the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus at least to: obtain a list of suitable external display devices, wherein the external display devices are on the list in a priority order, the obtaining being carried out in the priority order; send a use request to an
30 external display device having the highest priority on the list; receive a respon-

se to the use request from the external display device; and in response to receiving a permission to use the external display device, couple to the external display device for showing content; in response to not receiving a permission to use the external display, send a use request to an external
5 display device having the next highest priority on the list, and repeat the sending to an external display device having the next highest priority on the list until a permission to use is received.

According to an aspect of the present invention, there is provided an apparatus comprising: at least one processor and at least one memory
10 including a computer program code, the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus at least to: obtain a list of user devices enabled to use the apparatus as an external display, wherein the user devices are on the list in a priority order, and wherein a user device enabled to use the apparatus is in the
15 list regardless whether or not it is coupled to the apparatus; receive a use request from a user device that is not coupled to the apparatus; check the priority of the user device from the list; and acknowledge the use request if the user device has the highest priority on the list of user devices, wherein a permission to use the apparatus triggers a coupling process between the
20 apparatus and the user device.

According to yet another aspect of the present invention, there is provided a method comprising: obtaining a list of suitable external display devices, wherein the external display devices are on the list in a priority order, the obtaining being carried out in the priority order; sending a use request to
25 an external display device having the highest priority on the list; receiving a response to the use request from the external display device; and in response to receiving a permission to use the external display device, coupling to the external display device for showing content; in response to not receiving a permission to use the external display, sending a use request to an external
30 display device having the next highest priority on the list, and repeating the sending to an external display device having the next highest priority on the list until a permission to use is received.

According to yet another aspect of the present invention, there is provided a method comprising: obtaining a list of user devices enabled to use the apparatus as an external display, wherein the user devices are on the list in a priority order, and wherein a user device enabled to use the apparatus is
5 in the list regardless whether or not it is coupled to the apparatus; receiving a use request from a user device that is not coupled to the apparatus; checking the priority of the user device from the list, and acknowledging the use request if the user device has the highest priority on the list of user devices, wherein a permission to use the apparatus triggers a coupling process between the
10 apparatus and the user device.

According to yet another aspect of the present invention, there is provided a computer program embodied on a computer-readable storage medium, the computer program comprising program code for controlling a process to execute a process, the process comprising: obtaining a list of
15 suitable external display devices, wherein the external display devices are on the list in a priority order, the obtaining being carried out in the priority order; sending a use request to an external display device having the highest priority on the list; receiving a response to the use request from the external display device; and in response to receiving a permission to use the external display
20 device, coupling to the external display device for showing content; in response to not receiving a permission to use the external display, sending a use request to an external display device having the next highest priority on the list, and repeating the sending to an external display device having the next highest priority on the list until a permission to use is received.

According to yet another aspect of the present invention, there is provided a computer program embodied on a computer-readable storage medium, the computer program comprising program code for controlling a process to execute a process, the process comprising: obtaining a list of user
25 devices enabled to use an apparatus as an external display, wherein the user devices are on the list in a priority order, and wherein a user device enabled to use the apparatus is in the list regardless whether or not it is coupled to the apparatus; receiving a use request from a user device that is not coupled to
30

the apparatus; checking the priority of the user device from the list, and acknowledging the use request, if the user device has the highest priority on the list of user devices, wherein a permission to use the apparatus triggers a coupling process between the apparatus and the user device.

5 List of drawings

Some embodiments of the present invention are described below, by way of example only, with reference to the accompanying drawings, in which

- 10 Figure 1 illustrates an example of a system;
- Figure 2 is a flow chart,
- Figure 3 is another flow chart,
- Figure 4 illustrates examples of apparatuses, and
- Figure 5 illustrates other example of apparatuses.

Description of some embodiments

15 The following embodiments are only examples. Although the specification may refer to “an”, “one”, or “some” embodiment(s) in several locations, this does not necessarily mean that each such reference is to the same embodiment(s), or that the feature only applies to a single embodiment. Single features of different embodiments may also be combined to provide
20 other embodiments. Furthermore, words “comprising” and “including” should be understood as not limiting the described embodiments to consist of only those features that have been mentioned and such embodiments may also contain also features, structures, units, modules etc. that have not been specifically mentioned.

25 Embodiments are applicable to any user device, such as a user terminal, as well as to any network element, relay node, server, node, corresponding component, and/or to any communication system or any combination of different communication systems that support required functionalities. The communication system may be a wireless communication
30 system or a communication system utilizing both fixed networks and wireless networks. The protocols used, the specifications of communication systems, apparatuses, such as servers and user terminals, especially in wireless

communication, develop rapidly. Such development may require extra changes to an embodiment. Therefore, all words and expressions should be interpreted broadly and they are intended to illustrate, not to restrict, embodiments.

In the following, different exemplifying embodiments will be described using, as an example of an access architecture to which the 5 embodiments may be applied, a radio access architecture based on long term evolution advanced (LTE Advanced, LTE-A). It is obvious for a person skilled in the art that the embodiments may also be applied to other kinds of communications networks having suitable means by adjusting parameters and 10 procedures appropriately. Some examples of other options for suitable systems are the universal mobile telecommunications system (UMTS) radio access network (UTRAN or E-UTRAN), long term evolution (LTE, the same as E-UTRA), wireless local area network (WLAN or WiFi), worldwide interoperability for microwave access (WiMAX), Bluetooth®, personal 15 communications services (PCS), ZigBee®, wideband code division multiple access (WCDMA), systems using ultra-wideband (UWB) technology, sensor networks, mobile ad-hoc networks (MANETs) and Internet Protocol multimedia subsystems (IMS).

Figure 1 depicts examples of simplified system architectures only 20 showing some elements and functional entities, all being logical units, whose implementation may differ from what is shown. The connections shown in Figure 1 are logical connections; the actual physical connections may be different. It is apparent to a person skilled in the art that the system typically 25 comprises also other functions and structures than those shown in Figure 1.

The embodiments are not, however, restricted to the system given as an example but a person skilled in the art may apply the solution to other communication systems provided with necessary properties.

Figure 1 shows a part of a radio access network based on E-UTRA, LTE, LTE-Advanced (LTE-A) or LTE/EPC (EPC = evolved packet core, EPC is 30 enhancement of packet switched technology to cope with faster data rates and growth of Internet protocol traffic). E-UTRA is an air interface of Release 8

(UTRA= UMTS terrestrial radio access, UMTS= universal mobile telecommunications system).

Figure 1 shows user devices 100 and 102 configured to be in a wireless connection on one or more communication channels 104 and 106 in a cell with a (e)NodeB 108 providing the cell. The physical link from a user device to a (e)NodeB is called uplink or reverse link and the physical link from the NodeB to the user device is called downlink or forward link.

The NodeB, or advanced evolved node B (eNodeB, eNB) in LTE-Advanced, is a computing device configured to control the radio resources of communication system it is coupled to. The (e)NodeB may also be referred to as a base station, an access point or any other type of interfacing device including a relay station capable of operating in a wireless environment.

The (e)NodeB includes transceivers, for example. From the transceivers of the (e)NodeB, a connection is provided to an antenna unit that establishes bi-directional radio links to user devices. The antenna unit may comprise a plurality of antennas or antenna elements. The (e)NodeB is further connected to core network 110 (CN). Depending on the system, the counterpart on the CN side can be a serving gateway (S-GW, routing and forwarding user data packets), packet data network gateway (P-GW), for providing connectivity of user devices (UEs) to external packet data networks, or mobile management entity (MME), etc.

A communications system typically comprises more than one (e)NodeB in which case the (e)NodeBs may also be configured to communicate with one another over links, wired or wireless, designed for the purpose. These links may be used for signalling purposes.

The communication system is also able to communicate with other networks, such as a public switched telephone network or the Internet 112. The communication network may also be able to support the usage of cloud services. It should be appreciated that (e)NodeBs or their functionalities may be implemented by using any node, host, server or access point etc. entity suitable for such a usage.

The user device typically refers to a portable computing device that includes wireless mobile communication devices operating with or without a subscriber identification module (SIM), including, but not limited to, the following types of devices: a mobile station (mobile phone), smartphone, 5 personal digital assistant (PDA), handset, device using a wireless modem (alarm or measurement device, etc.), laptop and/or touch screen computer, tablet, game console, notebook, portable media player, and multimedia device.

The user device is configured to perform one or more of user equipment functionalities. The user device may also be called a subscriber 10 unit, mobile station, mobile device, remote terminal, access terminal, user terminal or user equipment (UE) just to mention but a few names or apparatuses. The user device may be a mobile device which may also be called as handheld device, handheld computer or simply handheld.

Mobile devices usually contain a small, or at least relatively small, 15 display. However, a need to couple the mobile device to one or more external displays (such as a monitor, portable display monitor, video projector, near eye display or TV) often exists, for instance to watch movies, news or sport, play different games or be in social media by using a bigger screen. Sometimes a need to show content to a plurality of persons exists, and an external display or 20 projector is well-suited to that kind of activity. It should be appreciated that an external display may also be another mobile device. Additionally, desktops may be coupled wirelessly to an external display device. Even a need to co-work with available content by using multiple personal displays or one common display may exist. The usage of an external display may be personal or a 25 shared experience with a larger amount of audience. It should be appreciated that displays may also cooperate in such a manner that one is a primary display and another one is a secondary display. Multiple wired (e.g. different cables with different connectors) and wireless (e.g. WiFi, Bluetooth, cellular network, wireless high definition multimedia interface (HDMI), near field 30 communication (NFC), etc.) mechanisms are available to couple devices and displays together.

When displays are wirelessly coupled, a complex initiation process is typically needed before the connection is established. It is even possible that a device and display may not be connected together without the aid of a professional. Thus a need to generate a more straightforward and automatic procedure to connect a mobile device and an external display exists.

It should be understood that, in Figure 1, user devices are depicted to include 2 antennas only for the sake of clarity. The number of reception and/or transmission antennas may naturally vary according to a current implementation.

Further, although the apparatuses have been depicted as single entities, different units, processors and/or memory units (not all shown in Figure 1) may be implemented.

One embodiment may be carried out by a device configured to operate as a user device, such as a mobile device. The embodiment starts in block 200 of Figure 2.

In block 202, a list of suitable external display devices is obtained, wherein the devices are in a priority order. The list is obtained in the priority order.

A user device may obtain or have an access to a list of external display devices which are able to automatically show the selected content of the user device. The list may comprise information on external devices' properties and/or capabilities, such as on a screen size, video codec and transmission formats they support (e.g. do they support high definition TV). The list may be stored in the memory of the user device or it may be loaded from a remote storage unit according to a need. The remote storage unit may be provided as a cloud service, for example.

The list of devices is arranged in a priority order, typically in an ascending order. The list may be adapted according to changes in environment or needs, such as adding or removing devices, or changing the priority order. The length of the list may also be adaptable. Thus, the list may comprise a varying number of devices. Additionally, it is possible to form

clusters of individual external displays. Hence, one device on the list may comprise one or more physical devices.

Wireless connection mechanism may be any connection mechanism supported by both devices, such as WiFi, Bluetooth, cellular,
5 wireless HDMI or NFC.

The distance of devices, that is to say the distance between a user device and an external display, may be measured based on signal strength. Also other mechanisms to measure a distance between devices may be used. The distance of devices may contribute to the order of priority. For instance, if
10 a user device is close or moves closer to an external display device, the priority of this display device may be raised up on the list, and if the display device is at least relatively far away or moves further away from the user device, its priority may be dropped, respectively. That makes the personal usage of the display device easier, but does not affect the projector usage of
15 the display device (to at least notable extent). Taking the distance of devices into consideration enables other users to use available display devices in a more flexible way. It also enables users to switch to a closer display device when moving around.

Additionally, the user that has the highest priority to an external
20 display may give up the priority and then the user having the next highest priority may use the external display device. If the higher priority user device needs to use the display device later on, it may request the display device from the user device currently using the external display device and some kind of “handshake” procedure may take place. The lower priority user may simply be
25 dropped or it may be directed to another display device.

The list may be obtained by delivery and/or request of the list in the priority order: when a user device needs an access to an external display device, it may request the list from an internal memory or an outside storage. The list may be required in a priority order, for example one display device at a
30 time, or the list may simply be required and delivered in the priority order from the memory or storage, for example one display device at a time.

In block 204, coupling to at least one of the external display devices on the list for showing content is carried out in the priority order.

Coupling may be carried out wirelessly using any suitable technique and/or procedure. Coupling is carried out in the priority order that is to say the user device having the highest priority gets the access to the display device. In the case the user device does not have the highest priority to the display device it prefers, it may try the next one on the list and so on until it finds an external display device it is able to use. Another option is that it may queue and wait for its turn.

When an external display starts showing content, the user in question gets an indication, such as a sound effect and/or an icon on an integrated display of the user device the user is using, in order the user is aware of the content being visible on the display. Sound effect may be heard from the user device and/or from the display device. The user may stop the delivery by giving the priority away.

It should be appreciated that some rules or procedures to automate the usage of external displays may be made. For example, certain sport games may be automatically directed to an external display device.

The embodiment ends in block 206. The embodiment is repeatable in many ways. One example is shown by arrow 208 in Figure 2.

Another embodiment may be carried out by a device configured to operate as an external display. The embodiment starts in block 300 of Figure 3.

In block 302, a list of user devices enabled to use the apparatus as an external display is obtained. The devices are on the list in a priority order.

An external display device may have or have an access to a list of user devices whose content it is able to show automatically. The list may comprise information on the external display devices user devices may or wish to use. The list may be stored in the memory of the display device or it may be loaded from a remote storage unit according to a need. The remote storage unit may be provided as a cloud service, for example.

The list of devices is arranged in a priority order, typically in an ascending order. The list may be adapted according to changes in environment or needs, such as adding or removing devices, or changing the priority order. The length of the list may also be adaptable. Thus, the list may
5 comprise a varying number of devices. Additionally, it is possible to form clusters of individual external displays. Hence, one device on the list may comprise one or more physical devices.

Wireless connection mechanism may be anything supported by both devices, such as WiFi, Bluetooth, cellular, wireless HDMI or NFC.

10 In block 304, at least one use request is obtained.

A use request may be a message from a user device informing the need to use an external display device. The message may be conveyed wirelessly.

In block 306, a use request from a user device having the highest
15 priority on the list of user devices is acknowledged.

In general, an external display device is typically always used by the highest priority user. In the case no one of the user devices on the priority list uses the external display device, no content may be shown. Otherwise, typically, some content is shown on the display, when the display is on.

20 The user that has the highest priority to a display device may give up the priority and then the user having the next highest priority may use the external display device. If the higher priority user device needs to use the display device later on, it may request the display device from the current user device and some kind of "handshake" procedure may take place. The lower
25 priority user may simply be dropped or it may be directed to another display device. This control function may be provided by the display device, a network or carried out as a cloud service.

In one embodiment, user devices outside the list of user devices are informed on displaying capacity, if no user devices on the list of user devices
30 are available or no use requests are obtained.

If no content is shown on an external display (no priority devices available or no access requests obtained), the display device may inform other

user devices nearby about free display capacity. This enables other users to use available display devices in a more flexible way. It also enables users to switch to a closer display device when moving around. A new user device may be asked about its willingness to show content on the display device in question. Additionally, the user device may also be added to the priority list. In adding a user device to the list, distance between it and the user device may be taken into consideration (see details on considering the distance above). Additionally, distances to user devices nearby may be measured based on signal strength as a part of informing to find out probable candidate user devices for content showing.

Additionally, an external display may inform a user device when it starts showing content, for instance by an indication, such as a sound effect and/or an icon on an integrated display of the user device, in order the user is aware of the content being visible on the display. Sound effect may be heard from the user device and/or from the display device.

The embodiment ends in block 308. The embodiment is repeatable in many ways. One example is shown by arrow 310 in Figure 3. The example shows an option, wherein the list is obtained in advance, for example as a regular update.

The steps/points, signaling messages and related functions described above in Figures 2 or 3 are in no absolute chronological order, and some of the steps/points may be performed simultaneously or in an order differing from the given one. Other functions may also be executed between the steps/points or within the steps/points and other signaling messages sent between the illustrated messages. Some of the steps/points or part of the steps/points can also be left out or replaced by a corresponding step/point or part of the step/point.

An embodiment provides an apparatus which may be user device, such as a mobile device, or any other suitable apparatus capable to carry out processes described above in relation to Figure 2.

It should be appreciated that an apparatus may include or otherwise be in communication with a control unit, one or more processors or other

entities capable of carrying out operations according to the embodiments described by means of Figure 2. It should be understood that each block of the flowchart of Figure 2 and any combination thereof may be implemented by various means or their combinations, such as hardware, software, firmware,
5 one or more processors and/or circuitry.

Figure 4 illustrates a simplified block diagram of an apparatus according to an embodiment.

As an example of an apparatus according to an embodiment, it is shown apparatus 400, such as a node, including facilities in control unit 404
10 (including one or more processors, for example) to carry out functions of embodiments according to Figure 2. The facilities may be software, hardware or combinations thereof as described in further detail below.

In Figure 4, block 406 includes parts/units/modules needed for reception and transmission, usually called a radio front end, RF-parts, radio
15 parts, radio head, etc.

Another example of apparatus 400 may include at least one processor 404 and at least one memory 402 including a computer program code, the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus at least to: obtain a list of
20 suitable external display devices, wherein the external display devices are on the list in a priority order, the obtaining being carried out in the priority order, and couple, in the priority order, to at least one of the external display devices on the list for showing content.

Yet another example of an apparatus comprises means 404 (406)
25 for obtaining a list of suitable external display devices, wherein the external display devices are on the list in a priority order, the obtaining being carried out in the priority order, and means 404 (406) for coupling, in the priority order, to at least one of the external display devices on the list for showing content.

It should be understood that the apparatuses may include or be
30 coupled to other units or modules etc., such as radio parts or radio heads, used in or for transmission and/or reception. This is depicted in Figure 4 as optional block 406.

Although the apparatuses have been depicted as one entity in Figure 4, different modules and memory may be implemented in one or more physical or logical entities.

An embodiment provides an apparatus which may be an external display or any other suitable apparatus capable to carry out processes described above in relation to Figure 3.

It should be appreciated that an apparatus may include or otherwise be in communication with a control unit, one or more processors or other entities capable of carrying out operations according to the embodiments described by means of Figure 3. It should be understood that each block of the flowchart of Figure 3 and any combination thereof may be implemented by various means or their combinations, such as hardware, software, firmware, one or more processors and/or circuitry.

Figure 5 illustrates a simplified block diagram of an apparatus according to an embodiment.

As an example of an apparatus according to an embodiment, it is shown apparatus 500, such as a node, including facilities in control unit 504 (including one or more processors, for example) to carry out functions of embodiments according to Figure 3. The facilities may be software, hardware or combinations thereof as described in further detail below.

In Figure 5, block 506 includes parts/units/modules needed for reception and transmission, usually called a radio front end, RF-parts, radio parts, radio head, etc.

Another example of apparatus 500 may include at least one processor 504 and at least one memory 502 including a computer program code, the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus at least to: obtain a list of user devices enabled to use the apparatus as an external display, wherein the user devices are on the list in a priority order and obtain at least one use request, acknowledge a use request from a user device having the highest priority on the list of user devices.

Yet another example of an apparatus comprises means 504 (506) for obtaining a list of user devices enabled to use the apparatus as an external display, wherein the user devices are on the list in a priority order and means 504 (506) for obtaining at least one use request, means 504 (506) for acknowledging a use request from a user device having the highest priority on the list of user devices.

It should be understood that the apparatuses may include or be coupled to other units or modules etc., such as radio parts or radio heads, used in or for transmission and/or reception. This is depicted in Figure 5 as optional block 506.

Although the apparatuses have been depicted as one entity in Figure 5, different modules and memory may be implemented in one or more physical or logical entities.

An apparatus may in general include at least one processor, controller or a unit designed for carrying out control functions operably coupled to at least one memory unit and to various interfaces. Further, the memory units may include volatile and/or non-volatile memory. The memory unit may store computer program code and/or operating systems, information, data, content or the like for the processor to perform operations according to embodiments. Each of the memory units may be a random access memory, hard drive, etc. The memory units may be at least partly removable and/or detachably operationally coupled to the apparatus. The memory may be of any type suitable for the current technical environment and it may be implemented using any suitable data storage technology, such as semiconductor-based technology, flash memory, magnetic and/or optical memory devices. The memory may be fixed or removable.

The apparatus may be, include or be associated with at least one software application, module, unit or entity configured as arithmetic operation, or as a program (including an added or updated software routine), executed by at least one operation processor. Programs, also called program products or computer programs, including software routines, applets and macros, may be stored in any apparatus-readable data storage medium and they include

program instructions to perform particular tasks. Computer programs may be coded by a programming language, which may be a high-level programming language, such as objective-C, C, C++, C#, Java, Pascal, etc., or a low-level programming language, such as a machine language, or an assembler.

5 Modifications and configurations required for implementing functionality of an embodiment may be performed as routines, which may be implemented as added or updated software routines, application circuits (ASIC) and/or programmable circuits. Further, software routines may be downloaded into an apparatus. The apparatus, such as a node device, or a
10 corresponding component, may be configured as a computer or a microprocessor, such as single-chip computer element, or as a chipset, including at least a memory for providing storage capacity used for arithmetic operation and an operation processor for executing the arithmetic operation.

 Embodiments provide computer programs embodied on a
15 distribution medium, comprising program instructions which, when loaded into electronic apparatuses, constitute the apparatuses as explained above. The distribution medium may be a non-transitory medium.

 Other embodiments provide computer programs embodied on a computer readable storage medium, configured to control a processor to
20 perform embodiments of the methods described above. The computer readable storage medium may be a non-transitory medium.

 The computer program may be in source code form, object code form, or in some intermediate form, and it may be stored in some sort of carrier, distribution medium, or computer readable medium, which may be any
25 entity or device capable of carrying the program. Such carriers include a record medium, computer memory, read-only memory, photoelectrical and/or electrical carrier signal, telecommunications signal, and software distribution package, for example. Depending on the processing power needed, the computer program may be executed in a single electronic digital computer or it
30 may be distributed amongst a number of computers. The computer readable medium or computer readable storage medium may be a non-transitory medium.

The techniques described herein may be implemented by various means. For example, these techniques may be implemented in hardware (one or more devices), firmware (one or more devices), software (one or more modules), or combinations thereof. For a hardware implementation, the apparatus may be implemented within one or more application specific integrated circuits (ASICs), digital signal processors (DSPs), digital signal processing devices (DSPDs), programmable logic devices (PLDs), field programmable gate arrays (FPGAs), processors, controllers, micro-controllers, microprocessors, digitally enhanced circuits, other electronic units designed to perform the functions described herein, or a combination thereof. For firmware or software, the implementation may be carried out through modules of at least one chip set (e.g., procedures, functions, and so on) that perform the functions described herein. The software codes may be stored in a memory unit and executed by processors. The memory unit may be implemented within the processor or externally to the processor. In the latter case it may be communicatively coupled to the processor via various means, as is known in the art. Additionally, the components of systems described herein may be rearranged and/or complimented by additional components in order to facilitate achieving the various aspects, etc., described with regard thereto, and they are not limited to the precise configurations set forth in the given figures, as will be appreciated by one skilled in the art.

It will be obvious to a person skilled in the art that, as technology advances, the inventive concept may be implemented in various ways. The invention and its embodiments are not limited to the examples described above but may vary within the scope of the claims.

Claims

1. An apparatus (400) comprising:
 at least one processor (404) and at least one memory (402)
 including a computer program code, the at least one memory (402) and the
 5 computer program code being configured to, with the at least one processor
 (404), cause the apparatus at least to:
- obtain (202) a list of suitable external display devices (500), wherein
 the external display devices (500) are on the list in a priority order, the
 obtaining being carried out in the priority order,
- 10 **characterized** in that the at least one memory (402) and the
 computer program code are further configured to, with the at least one
 processor (404), cause the apparatus at least to :
- send a use request to an external display device having the highest
 priority on the list,
- 15 receive a response to the use request from the external display
 device, and
- in response to receiving a permission to use the external display
 device, couple (204) to the external display device for showing content,
 in response to not receiving a permission to use the external
 20 display, send a use request to an external display device having the next
 highest priority on the list, and repeat the sending to an external display device
 having the next highest priority on the list until a permission to use is received.
2. The apparatus (400) of claim 1, wherein the at least one memory
 (402) and the computer program code are further configured to, with the at
 25 least one processor (404), cause the apparatus to:
- adapt the list of suitable external display devices by adding devices,
 removing devices and/or changing the priority order.
3. The apparatus of claim 1 or 2, wherein the at least one memory
 (402) and the computer program code are further configured to, with the at
 30 least one processor (404), cause the apparatus to:
- measure distance to at least one external display device on the list
 based on signal strength for adjusting the priority order.
4. The apparatus (400) of any preceding claim, wherein the at least
 one memory (402) and the computer program code are further configured to,
 35 with the at least one processor (404), cause the apparatus to:

renounce a priority on the list and request at least one of the external display devices for use later on, if a need exists.

5. The apparatus (400) of any preceding claim, wherein the at least one memory (402) and the computer program code are further configured to, with the at least one processor (404), cause the apparatus to:

obtain an indication, when at least one of the external display devices starts showing content directed to it.

6. The apparatus (400) of any preceding claim, wherein the at least one memory (402) and the computer program code are further configured to, with the at least one processor (404), cause the apparatus to:

stop showing content by renouncing a priority of the external display device on the list.

7. The apparatus (400) of any preceding claim, the apparatus comprising a user device.

8. A computer program comprising program instructions which, when loaded into the apparatus, carry out the operations of any preceding claim 1 to 6.

9. An apparatus (500) comprising:

at least one processor (504) and at least one memory (502) including a computer program code, **characterized** by the at least one memory (502) and the computer program code being configured to, with the at least one processor (504), cause the apparatus (500) at least to:

obtain (302) a list of user devices (400) enabled to use the apparatus as an external display, wherein the user devices (400) are on the list in a priority order, and wherein a user device enabled to use the apparatus is in the list regardless whether or not it is coupled to the apparatus;

receive (304) a use request from a user device that is not coupled to the apparatus;

check the priority of the user device from the list; and

acknowledge (306) the use request if the user device has the highest priority on the list of user devices, wherein a permission to use the apparatus triggers a coupling process between the apparatus and the user device.

10. The apparatus (500) of claim 9, wherein the at least one memory (502) and the computer program code are further configured to, with the at least one processor (504), cause the apparatus to:

adapt the list of user devices by adding devices, removing devices and/or changing the priority order.

11. The apparatus (500) of claim 9 or 10, wherein the at least one memory (502) and the computer program code are further configured to, with the at least one processor (504), cause the apparatus to:

generate and convey an indication to the user device when starting showing content obtained from it.

12. The apparatus (500) of any preceding claim 9 to 11, wherein the use request is a message from a user device conveyed wirelessly.

10 13. The apparatus (500) of any preceding claim 9 to 12, wherein the at least one memory (502) and the computer program code are further configured to, with the at least one processor (504), cause the apparatus to:

inform user devices outside the list of user devices on displaying capacity, if no user devices on the list of user devices are available or no use requests are obtained.

14. The apparatus (500) of claim 13, wherein the informing comprises measuring distances to user devices nearby based on signal strength.

15 15. The apparatus (500) of any preceding claim 9 to 14, the apparatus comprising a display device.

16. A computer program comprising program instructions which, when loaded into the apparatus, carry out the operations of any preceding claim 9 to 14.

17. A method comprising:

25 obtaining (202) a list of suitable external display devices, wherein the external display devices are on the list in a priority order, the obtaining being carried out in the priority order,

characterized by

30 sending a use request to an external display device having the highest priority on the list,

receiving a response to the use request from the external display device, and

in response to receiving a permission to use the external display device, coupling (204) to the external display device for showing content,

35 in response to not receiving a permission to use the external display, sending a use request to an external display device having the next

highest priority on the list, and repeating the sending to an external display device having the next highest priority on the list until a permission to use is received.

5 18. The method of claim 17, further comprising:
adapting the list of suitable external display devices by adding,
removing devices and/or changing the priority order.

 19. The method of claim 17 or 18, further comprising:
measuring distance to at least one external display device on the list
based on signal strength for adjusting the priority order.

10 20. The method of any preceding claim 17 to 19, further comprising:
renouncing a priority on the list and requesting at least one of the
external display devices for use later on, if a need exists.

 21. The method of any preceding claim 17 to 20, further comprising:
obtaining an indication, when at least one of the external display
15 devices starts showing content directed to it.

 22. The method of any preceding claim 17 to 21, further comprising:
stopping showing content by renouncing a priority on the list.

 23. An apparatus (400) comprising means for carrying out the
method according to any one of claims 17 to 22.

20 24. A method **characterized** by comprising:
obtaining (302) a list of user devices enabled to use the apparatus
as an external display, wherein the user devices are on the list in a priority
order, and wherein a user device enabled to use the apparatus is in the list
regardless whether or not it is coupled to the apparatus;

25 receiving (304) a use request from a user device that is not coupled
to the apparatus;

 checking the priority of the user device from the list, and
 acknowledging (306) the use request if the user device has the
highest priority on the list of user devices, wherein a permission to use the
30 apparatus triggers a coupling process between the apparatus and the user
device.

 25. The method of claim 24, further comprising:
adapting the list of user devices by adding devices, removing
devices and/or changing the priority order.

35 26. The method of claim 24 or 25, further comprising:

generating and conveying an indication to a user device when starting showing content obtained from it.

27. The method of any preceding claim 24 to 26, wherein the use request is a message from a user device conveyed wirelessly.

5 28. The method of any preceding claim 24 to 27, further comprising:
informing user devices outside the list of user devices on displaying capacity, if no user devices on the list of user devices are available or no use requests are obtained.

29. The method of claim 28, wherein the informing comprises
10 measuring distances to user devices nearby based on signal strength.

30. An apparatus (500) comprising means for carrying out the method according to any one of claims 24 to 29.

31. A computer program embodied on a computer-readable storage medium, the computer program comprising program code for controlling a
15 process to execute a process, the process comprising:

obtaining (202) a list of suitable external display devices, wherein the external display devices are on the list in a priority order, the obtaining being carried out in the priority order,

characterized by

20 sending a use request to an external display device having the highest priority on the list,

receiving a response to the use request from the external display device, and

25 in response to receiving a permission to use the external display device, coupling (204), to the external display device for showing content,

30 in response to not receiving a permission to use the external display, sending a use request to an external display device having the next highest priority on the list, and repeating the sending to an external display device having the next highest priority on the list until a permission to use is received.

32. A computer program embodied on a computer-readable storage medium, the computer program comprising program code for controlling a process to execute a process, the process being **characterized** in that it comprises:

35 obtaining (302) a list of user devices enabled to use an apparatus as an external display, wherein the user devices are on the list in a priority

order, and wherein a user device enabled to use the apparatus is in the list regardless whether or not it is coupled to the apparatus;

receiving (304) a use request from a user device that is not coupled to the apparatus;

- 5 checking the priority of the user device from the list, and
 acknowledging (306) the use request, if the user device has the highest priority on the list of user devices, wherein a permission to use the apparatus triggers a coupling process between the apparatus and the user device.

Patenttivaatimukset

1. Laite, joka käsittää:

ainakin yhden prosessorin (404) ja ainakin yhden muistin (402), joka sisältää tietokoneohjelmakoodia, ainakin yhden muistin (402) ja tietokoneohjelmakoodin ollessa konfiguroitu ainakin yhden prosessorin (404) kanssa aiheuttamaan, että laite ainakin:

saa (202) luettelon sopivista ulkoisista näyttölaitteista (500), jossa ulkoiset näyttölaitteet (500) ovat luettelossa prioriteettijärjestyksessä, saaminen suoritetaan prioriteettijärjestyksessä,

tunnettu siitä, että ainakin yksi muisti (402) ja tietokoneohjelmakoodi on lisäksi konfiguroitu ainakin yhden prosessorin (404) kanssa aiheuttamaan, että laite ainakin:

lähettää käyttöpyynnön ulkoiselle näyttölaitteelle, jolla on luettelossa korkein prioriteetti,

vastaanottaa vastauksen käyttöpyyntöön ulkoiselta näyttölaitteelta, ja

vasteena ulkoisen näyttölaitteen käyttöluvan vastaanottamiselle, kytkeytyy (204) näyttölaitteeseen sisällön näyttämiseksi;

vasteena sille, ettei vastaanoteta ulkoisen näyttölaitteen käyttöluvaa, lähettää käyttöpyynnön ulkoiselle näyttölaitteelle, jolla on luettelossa seuraavaksi korkein prioriteetti, ja toistaa lähettämistä ulkoiselle näyttölaitteelle, jolla on luettelossa seuraavaksi korkein prioriteetti, kunnes käyttöluva vastaanotetaan.

2. Patenttivaatimuksen 1 mukainen laite (400), jossa ainakin yksi muisti (402) ja tietokoneohjelmakoodi on lisäksi konfiguroitu ainakin yhden prosessorin (404) kanssa aiheuttamaan, että laite:

sovittaa sopivien ulkoisten näyttölaitteiden luetteloa lisäämällä, poistamalla laitteita ja/tai muuttamalla prioriteettijärjestystä.

3. Patenttivaatimuksen 1 tai 2 mukainen laite (400), jossa ainakin yksi muisti (402) ja tietokoneohjelmakoodi on lisäksi konfiguroitu ainakin yhden prosessorin (404) kanssa aiheuttamaan, että laite:

mittaa signaalivoimakkuuden perusteella etäisyyden ainakin yhteen luettelon ulkoisen näyttölaitteeseen prioriteettijärjestyksen sovittamiseksi.

4. Jonkin edellisen patenttivaatimuksen mukainen laite (400), jossa ainakin yksi muisti (402) ja tietokoneohjelmakoodi on lisäksi konfiguroitu ainakin yhden prosessorin (404) kanssa aiheuttamaan, että laite:

5 luopuu prioriteetista luettelossa ja pyytää ainakin yhtä ulkoisista näyttölaitteista käytettäväksi myöhemmin, jos tarve on olemassa.

5. Jonkin edellisen patenttivaatimuksen mukainen laite (400), jossa ainakin yksi muisti (402) ja tietokoneohjelmakoodi on lisäksi konfiguroitu ainakin yhden prosessorin (404) kanssa aiheuttamaan, että laite:

10 saa indikaation, kun ainakin yksi ulkoisista näyttölaitteista alkaa näyttämään sille ohjattua sisältöä.

6. Jonkin edellisen patenttivaatimuksen mukainen laite (400), jossa ainakin yksi muisti (402) ja tietokoneohjelmakoodi on lisäksi konfiguroitu ainakin yhden prosessorin (404) kanssa aiheuttamaan, että laite:

15 lopettaa sisällön näyttämisen luopumalla luettelon prioriteetista.

7. Jonkin edellisen patenttivaatimuksen mukainen laite (400), joka käsittää käyttäjälaitteen.

8. Tietokoneohjelma, joka käsittää ohjelmaohjeita, jotka laitteeseen ladattuina suorittavat jonkin edellisen patenttivaatimuksen 1 - 6 mukaiset toiminnot.

20 9. Laite (500), joka käsittää:

ainakin yhden prosessorin (504) ja ainakin yhden muisti (502), joka sisältää tietokoneohjelmakoodia, **tunnettu** siitä, että ainakin yksi muisti (502) ja tietokoneohjelmakoodi on konfiguroitu ainakin yhden prosessorin (504) kanssa aiheuttamaan, että laite (500) ainakin:

25 saa (302) laitetta ulkoisena näyttönä käyttämään sallittujen käyttäjälaitteiden (400) luettelon, jossa käyttäjälaitteet (400) ovat luettelossa prioriteettijärjestyksessä, ja jossa laitetta käyttämään sallittu käyttäjälaite on luettelossa riippumatta siitä, onko se kytkettyynyt laitteeseen;

30 vastaanottaa (304) käyttöpyynnön käyttäjälaitteelta, joka ei ole kytkettyynyt laitteeseen;

tarkastaa käyttäjälaitteen prioriteetin luettelosta; ja

hyväksyy (306) käyttöpyynnön käyttäjälaitteelta, jos käyttäjälaitteella on käyttäjälaitteiden luettelon korkein prioriteetti, jolloin lupa käyttää laitetta liipaisee kytkentäprosessin laitteen ja käyttäjälaitteen välille.

10. Patenttivaatimuksen 9 mukainen laite (500), jossa ainakin yksi muisti (502) ja tietokoneohjelmakoodi on lisäksi konfiguroitu ainakin yhden prosessorin (504) kanssa aiheuttamaan, että laite:

5 sovittaa sopivien käyttäjälaitteiden luetteloa lisäämällä, poistamalla laitteita ja/tai muuttamalla prioriteettijärjestystä.

11. Patenttivaatimuksen 9 tai 10 (500), jossa ainakin yksi muisti (502) ja tietokoneohjelmakoodi on lisäksi konfiguroitu ainakin yhden prosessorin (504) kanssa aiheuttamaan, että laite:

10 generoi ja siirtää indikaation käyttäjälaitteelle, kun aloitetaan siltä saadun sisällön näyttäminen.

12. Jonkin edellisen patenttivaatimuksen 9 - 11 mukainen laite (500), jossa käyttöpyyntö on käyttäjälaitteesta langattomasti siirretty sanoma.

13. Jonkin edellisen patenttivaatimuksen 9 - 12 mukainen laite (500), jossa ainakin yksi muisti (502) ja tietokoneohjelmakoodi on lisäksi konfiguroitu ainakin yhden prosessorin (504) kanssa aiheuttamaan, että laite:

15 tiedottaa käyttäjälaitteiden luettelon ulkopuolisille käyttäjälaitteille näyttökapasiteetista, jos käyttäjälaitteiden luettelon käyttäjälaitteita ei ole saatavilla tai ei saada käyttöpyyntöjä.

14. Patenttivaatimuksen 13 mukainen laite (500), jossa tiedottaminen käsittää etäisyyden mittaamisen lähellä oleviin käyttäjälaitteisiin signaali-voimakkuuden perusteella.

15. Jonkin edellisen patenttivaatimuksen 9 - 14 mukainen laite (500), joka käsittää näyttölaitteen.

16. Tietokoneohjelma, joka käsittää ohjelmaohjeita, jotka laitteeseen 25 ladattuina, suorittavat jonkin edellisen patenttivaatimuksen 9 - 14 mukaiset operaatiot.

17. Menetelmä, joka käsittää:

30 saadaan (202) luettelo sopivista ulkoisista näyttölaitteista, jossa ulkoiset näyttölaitteet ovat luettelossa prioriteettijärjestyksessä, saaminen suoritetaan prioriteettijärjestyksessä,

tunnettu siitä, että

lähetetään käyttöpyyntö ulkoiselle näyttölaitteelle, jolla on luettelossa korkein prioriteetti,

vastaanotetaan vastaus käyttöpyyntöön ulkoiselta näyttölaitteelta, ja

vasteena ulkoisen näyttölaitteen käyttöluvan vastaanottamiselle, kytkeydytään (204) näyttölaitteeseen sisällön näyttämiseksi;

vasteena sille, ettei vastaanoteta ulkoisen näyttölaitteen käyttölu-
paa, lähetetään käyttöpyyntö ulkoiselle näyttölaitteelle, jolla on luettelossa seu-
5 raavaksi korkein prioriteetti, ja toistetaan lähettämistä ulkoiselle näyttölaitteelle,
jolla on luettelossa seuraavaksi korkein prioriteetti, kunnes käyttöluva vastaan-
otetaan.

18. Patenttivaatimuksen 17 mukainen menetelmä, joka lisäksi käsit-
tää:

10 sovitaan sopivien ulkoisten näyttölaitteiden luetteloa lisäämällä,
poistamalla laitteita ja/tai muuttamalla prioriteettijärjestystä.

19. Patenttivaatimuksen 17 tai 18 mukainen menetelmä, joka lisäksi
käsittää:

15 mitataan signaalivoimakkuuden perusteella etäisyys ainakin yhteen
luettelon ulkoisen näyttölaitteeseen prioriteettijärjestyksen sovittamiseksi.

20. Jonkin edellisen patenttivaatimuksen 17 - 19 mukainen mene-
telmä, joka lisäksi käsittää:

luovutaan prioriteetista luettelossa ja pyydetään ainakin yhtä ulkoi-
sista näyttölaitteista käytettäväksi myöhemmin, jos tarve on olemassa.

20 21. Jonkin edellisen patenttivaatimuksen 17 - 20 mukainen mene-
telmä, joka lisäksi käsittää:

saadaan indikaatio, kun ainakin yksi ulkoisista näyttölaitteista alkaa
näyttämään sille ohjattua sisältöä.

25 22. Jonkin edellisen patenttivaatimuksen 17 - 21 mukainen mene-
telmä, joka lisäksi käsittää:

lopetetaan sisällön näyttäminen luopumalla luettelon prioriteetista.

23. Laite (400), joka käsittää välineitä jonkin patenttivaatimuksen 17
- 22 mukaisen menetelmän suorittamiseksi.

24. Menetelmä, **tunnettu** siitä, että se käsittää:

30 saadaan (302) laitetta ulkoisena näyttönä käyttämään sallittujen
käyttäjälaitteiden luettelo, jossa käyttäjälaitteet ovat luettelossa prioriteettijär-
jestyksessä, ja jossa laitetta käyttämään sallittu käyttäjälaite on luettelossa
riippumatta siitä, onko se kytkeytynyt laitteeseen;

35 vastaanotetaan (304) käyttöpyyntö käyttäjälaitteelta, joka ei ole kyt-
keytynyt laitteeseen;

tarkastetaan käyttäjälaitteen prioriteetti luettelosta; ja hyväksytään (306) käyttöpyyntö käyttäjälaitteelta, jos käyttäjälaitteella on käyttäjälaitteiden luettelon korkein prioriteetti, jolloin lupa käyttää laitetta liipaisee kytkentäprosessin laitteen ja käyttäjälaitteen välille.

5 25. Patenttivaatimuksen 24 mukainen menetelmä, joka lisäksi käsittää:

sovitetaan sopivien käyttäjälaitteiden luetteloä lisäämällä, poistamalla laitteita ja/tai muuttamalla prioriteettijärjestystä.

10 26. Patenttivaatimuksen 24 tai 25 mukainen menetelmä, joka lisäksi käsittää:

generoidaan ja siirretään indikaatio käyttäjälaitteelle, kun aloitetaan siltä saadun sisällön näyttäminen.

27. Jonkin edellisen patenttivaatimuksen 24 – 26 mukainen menetelmä, jossa käyttöpyyntö on käyttäjälaitteesta langattomasti siirretty sanoma.

15 28. Jonkin edellisen patenttivaatimuksen 24 - 27 mukainen menetelmä, joka lisäksi käsittää:

tiedotetaan käyttäjälaitteiden luettelon ulkopuolisille käyttäjälaitteille näyttökapasiteetista, jos käyttäjälaitteiden luettelon käyttäjälaitteita ei ole saatavilla tai ei saada käyttöpyyntöjä.

20 29. Patenttivaatimuksen 28 mukainen menetelmä, jossa tiedottaminen käsittää etäisyyden mittaamisen lähellä oleviin käyttäjälaitteisiin signaali-voimakkuuden perusteella.

30. Laite (500), joka käsittää välineitä jonkin patenttivaatimuksen 24 - 29 mukaisen menetelmän suorittamiseksi.

25 31. Tietokoneohjelma tallennettuna tietokoneella luettavalle tallennusvälineelle, tietokoneohjelman käsittäessä ohjelmakoodia prosessin ohjaamiseksi prosessin suorittamiseen, prosessin käsittäessä:

30 saadaan (202) luettelo sopivista ulkoisista näyttölaitteista, jossa ulkoiset näyttölaitteet ovat luettelossa prioriteettijärjestyksessä, saaminen suoritetaan prioriteettijärjestyksessä,

tunnettu siitä, että

lähetetään käyttöpyyntö ulkoiselle näyttölaitteelle, jolla on luettelossa korkein prioriteetti,

vastaanotetaan vastaus käyttöpyyntöön ulkoiselta näyttölaitteelta, ja

vasteena ulkoisen näyttölaitteen käyttöluvan vastaanottamiselle, kytkeydytään (204) näyttölaitteeseen sisällön näyttämiseksi;

vasteena sille, ettei vastaanoteta ulkoisen näyttölaitteen käyttölu-
paa, lähetetään käyttöpyyntö ulkoiselle näyttölaitteelle, jolla on luettelossa seu-
5 raavaksi korkein prioriteetti, ja toistetaan lähettämistä ulkoiselle näyttölaitteelle,
jolla on luettelossa seuraavaksi korkein prioriteetti, kunnes käyttölupa vastaan-
otetaan.

32. Tietokoneohjelma tallennettuna tietokoneella luettavalle tallen-
nusvälineelle, tietokoneohjelman käsittäessä ohjelmakoodia prosessin ohjaa-
10 miseksi prosessin suorittamiseen, prosessin ollessa **tunnettu** siitä, että se kä-
sittää:

saadaan (302) laitetta ulkoisena näyttönä käyttämään sallittujen
käyttäjälaitteiden luettelo, jossa käyttäjälaitteet ovat luettelossa prioriteettijär-
jestyksessä, ja jossa laitetta käyttämään sallittu käyttäjälaite on luettelossa
15 riippumatta siitä, onko se kytkeytynyt laitteeseen;

vastaanotetaan (304) käyttöpyyntö käyttäjälaitteelta, joka ei ole kyt-
keytynyt laitteeseen;

tarkastetaan käyttäjälaitteen prioriteetti luettelosta; ja

hyväksytään (306) käyttöpyyntö käyttäjälaitteelta, jos käyttäjälait-
20 teella on käyttäjälaitteiden luettelon korkein prioriteetti, jolloin lupa käyttää lai-
tetta liipaisee kytkentäprosessin laitteen ja käyttäjälaitteen välille.

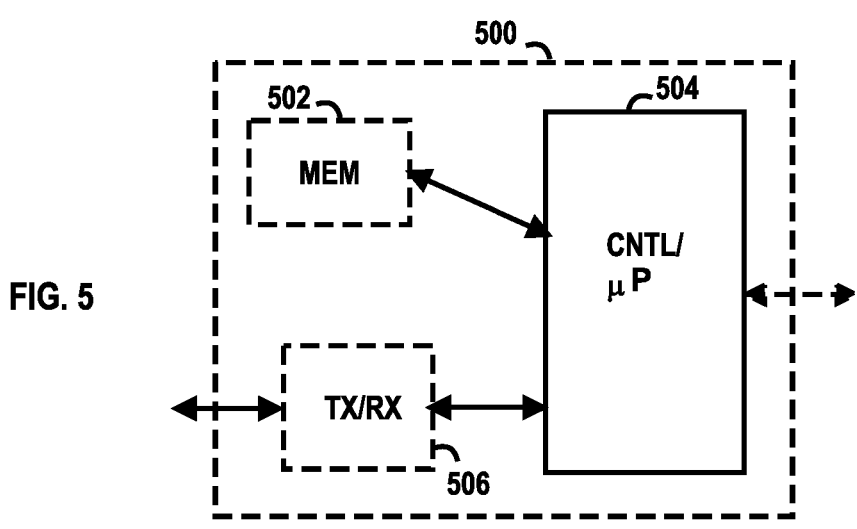
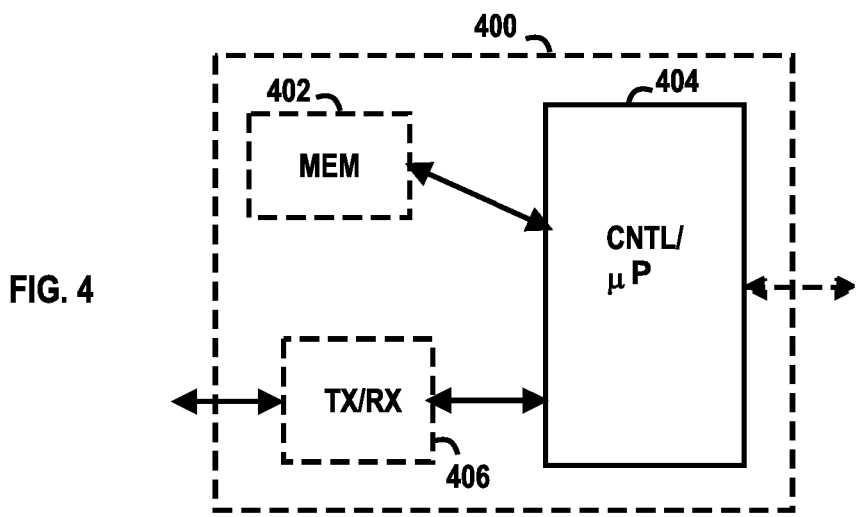
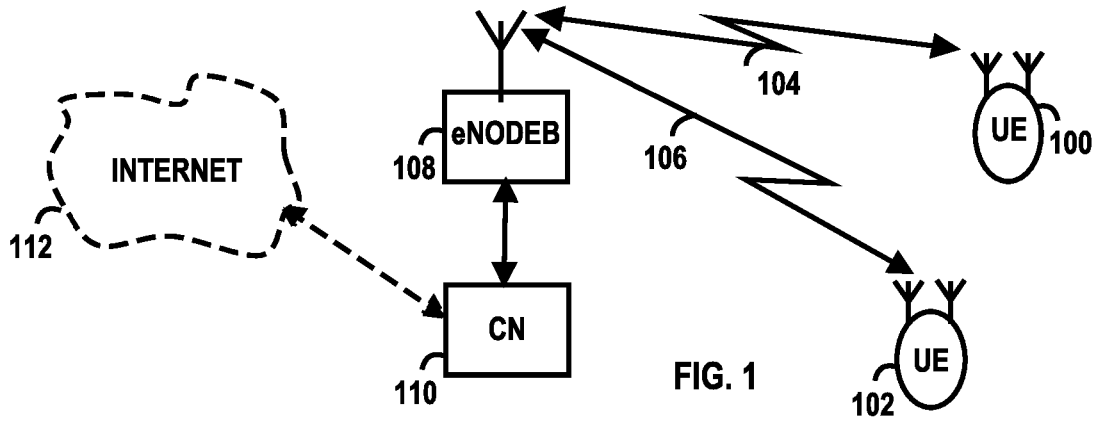


FIG. 2

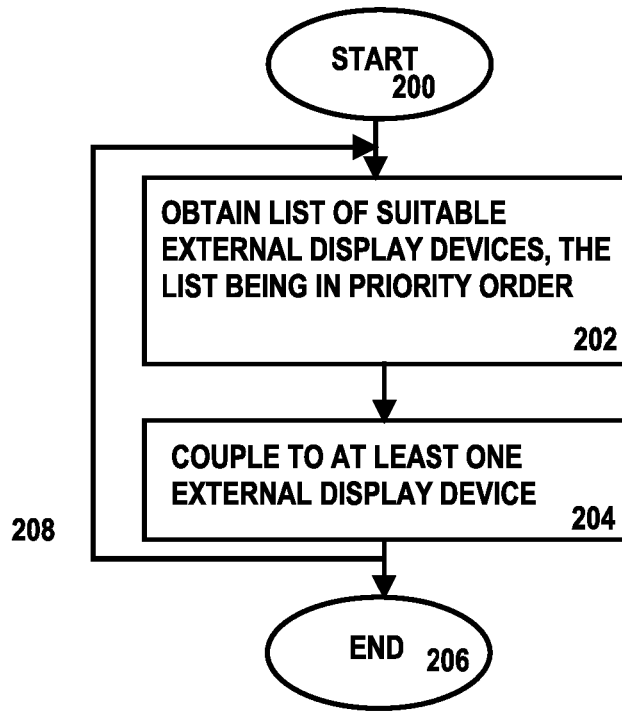


FIG. 3

