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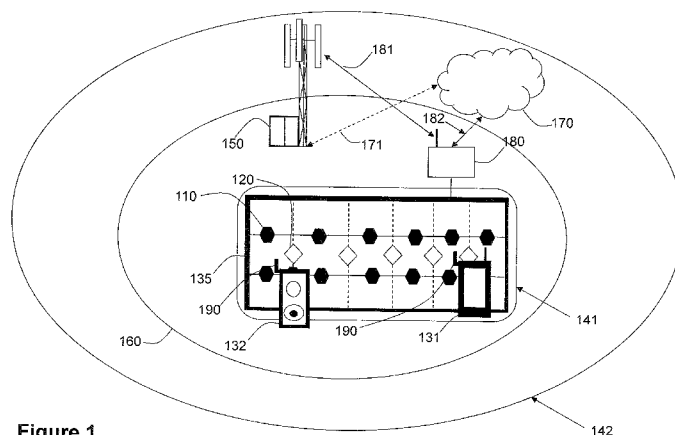


Figure 1

(57) **Abstract:** A grid of communication points adapted to be attached to or embedded in a surface is provided. The grid of communication points is configured to detect an electronic device. This detection is performed when electronic device is located within a determined distance from at least one of the communication points in the grid of communication points, via a communication link between the electronic device and said at least one of the communication points. The grid of communication points is further configured to provide assistance to the detected electronic device, via said at least one of the communication points or via another one of the communication points in the grid of communication points. The assistance comprises radio access to a communications network, wherein the grid of communication points comprises a grid of near field devices, and/or wireless power supply, wherein the grid of communication points comprises a wireless supply grid.



# ELECTRONIC DEVICE, GRID OF COMMUNICATION POINTS AND METHODS FOR PROVIDING ASSISTANCE TO AN ELECTRONIC DEVICE

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## TECHNICAL FIELD

The present invention relates to methods and apparatus for providing assistance to an electronic device, which assistance comprises radio access to a communications network or wireless power supply.

## BACKGROUND

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Communication devices such as terminals are also known as e.g. User Equipments (UE), mobile terminals, wireless terminals and/or mobile stations. Terminals are enabled to communicate wirelessly in a cellular communications network or wireless communication system, sometimes also referred to as a cellular radio system or cellular networks. The communication may be performed e.g. between two terminals, between a terminal and a regular telephone and/or between a terminal and a server via a Radio Access Network (RAN) and possibly one or more core networks, comprised within the cellular communications network.

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Terminals may further be referred to as mobile telephones, cellular telephones, laptops, or surf plates with wireless capability, just to mention some further examples. The terminals in the present context may be, for example, portable, pocket-storable, hand-held, computer-comprised, or vehicle-mounted mobile devices, enabled to communicate voice and/or data, via the RAN, with another entity, such as another terminal or a server.

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The cellular communications network covers a geographical area which is divided into cell areas, wherein each cell area being served by an access node such as a base station, e.g. a Radio Base Station (RBS), which sometimes may be referred to as e.g. "eNB", "eNodeB", "NodeB", "B node", or BTS (Base Transceiver Station), depending on the technology and terminology used. The base stations may be of different classes such as e.g. macro eNodeB, home eNodeB or pico base station, based on transmission power and thereby also cell size. A cell is the geographical area where radio coverage is provided by the base station at a base station site. One base station, situated on the base station site, may serve one or several cells. Further, each base station may support one or several communication technologies. The base stations communicate over the air interface operating on radio frequencies with the terminals within range of the base stations. In the context of this disclosure, the expression Downlink (DL) is used for the transmission path

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from the base station to the mobile station. The expression Uplink (UL) is used for the transmission path in the opposite direction i.e. from the mobile station to the base station.

In 3rd Generation Partnership Project (3GPP) Long Term Evolution (LTE), base stations, which may be referred to as eNodeBs or even eNBs, may be directly connected to one or more core networks.

3GPP LTE radio access standard has been written in order to support high bitrates and low latency both for uplink and downlink traffic. All data transmission is in LTE controlled by the radio base station.

Electronic devices such as the communication devices described above require power to be able to operate. While some electronic devices are configured to exclusively receive Direct Current (DC) power from batteries, most electronic devices are configured to receive Alternating Current (AC) from an external source, whether as a direct power source, or as a means to recharge rechargeable batteries in the electronic devices. This group of electronic devices requires adapters to receive the AC power, typically, from a power outlet in a wall.

This results in different electronic devices requiring their own adapter type, with different manufacturers requiring different adapters for each one of their electronic device models. This not only increases the manufacturing costs, which in turn increases the cost of the devices, but also, results in a cumbersome process in order to obtain the power supply from the power outlet in the wall. Moreover, this also results also in an inconvenient requirement of having to transport, along with the electronic device, the specific adapter for an electronic device model and manufacturer in order to be able to obtain AC power for that device. If such electronic devices are placed on the wall, by for example, hanging, the presence of one or multiple wires may be cumbersome, and poor connectivity may create a fire risk.

Wireless access to a communications network is provided locally, through a Wireless Area Network (WAN), or a Personal Area Network (PAN) via for example, a wireless router or wireless access point for a WAN, and Bluetooth/Z-Wave like adapters, or dongles, for a PAN, which communicate via radio links with electronic devices adapted, i.e., configured, to communicate with the communications network. However, these access points require a wired connection to the communications network through, e.g., an RJ-45 wall outlet or socket, network cable wall plate, computer network socket wall outlet, or Ethernet wall jack in the wall. Moreover, each of these access points requires their own power cord to be able to obtain AC power from a power outlet in the wall. This not only adds again cost to production, but it also results in a cumbersome way to obtain power and access to the communications network, for example, by requiring space to place the access point.

## SUMMARY

It is an object of embodiments herein to provide a way of improving the access of electronic devices to an AC power source and to a communication network.

According to a first aspect of embodiments herein, the object is achieved by a grid of communication points for providing assistance to an electronic device. The electronic device is configured to communicate with the grid of communication points. The grid of communication points is adapted to be attached to or embedded in a surface. The grid of communication points is configured to detect the electronic device. This detection is performed when electronic device is located within a determined distance from at least one of the communication points in the grid of communication points. This is performed via a communication link between the electronic device and said at least one of the communication points. The grid of communication points is further configured to provide assistance to the detected electronic device. This is performed via said at least one of the communication points or via another one of the communication points in the grid of communication points. The assistance comprises at least one of: radio access to a communications network, wherein the grid of communication points comprises a grid of near field devices, and wireless power supply, wherein the grid of communication points comprises a wireless supply grid.

According to a second aspect of embodiments herein, the object is achieved by a method in a grid of communication points for providing assistance to an electronic device. The electronic device is configured to communicate with the grid of communication points. The grid of communication points is adapted to be attached to or embedded in a surface. The grid of communication points detects the electronic device. This detection is performed when the electronic device is located within a determined distance from at least one of the communication points in the grid of communication points. This is performed via a communication link between the electronic device and said at least one of the communication points. The method further comprises providing assistance to the detected electronic device. This is performed via said at least one of the communication points or via another one of the communication points in the grid of communication points. The assistance comprises at least one of: radio access to a communications network, wherein the grid of communication points comprises a grid of near field devices, and wireless power supply, wherein the grid of communication points comprises a wireless supply grid.

According to a third aspect of embodiments herein, the object is achieved by a method in an electronic device for obtaining assistance from a grid of communication points. The electronic device is configured to communicate with the grid of communication points. The

grid of communication points is adapted to be attached to or embedded in a surface. The method comprises detecting the grid of communication points. This detection is performed when the electronic device is located within a determined distance from at least one of the communication points in the grid of communication points. This is performed via a  
5 communication link between the electronic device and said at least one of the communication points. The electronic device obtains assistance from the grid of communication points. This is performed via said at least one of the communication points or via another one of the communication points in the grid of communication points. The assistance comprises at least one of: radio access to a communications network, wherein  
10 the grid of communication points comprises a grid of near field devices, and wireless power supply, wherein the grid of communication points comprises a wireless supply grid.

According to a fourth aspect of embodiments herein, the object is achieved by an electronic device for obtaining assistance from a grid of communication points. The grid of communication points is adapted to be attached to or embedded in a surface. The electronic  
15 device comprises a detecting circuit configured to detect the grid of communication points. This detection is performed when the electronic device is located within a determined distance from at least one of the communication points in the grid of communication points. This is performed via a communication link between the electronic device and said at least one of the communication points. The electronic device further comprises an obtaining  
20 circuit configured to obtain assistance from the detected grid of communication points. The obtaining is performed via said at least one of the communication points or via another one of the communication points in the grid of communication points. The assistance comprises at least one of: radio access to a communications network, wherein the grid of communication points comprises a grid of near field devices, and wireless power supply,  
25 wherein the grid of communication points comprises a wireless supply grid.

By providing radio access to the communications network and/or wireless power supply to the electronic device, through the grid of communication points adapted to be attached to or embedded in a surface, a method is provided that greatly simplifies and optimizes access of electronic devices to an AC power source and/or to a communication  
30 network. No special adapters may be needed to connect the electronic device to the surface, e.g., a wall, in order to obtain power. Thus, radio access to the communications network and/or wireless power supply may not be made cumbersome for the user of an electronic device by involving visible wires on the surface.

A further advantage of some embodiments disclosed herein is to allow electronic devices mounted on or hanging from a wall, or placed on a surface, independence from battery power.

Another advantage of some embodiments disclosed herein is that upon the event of placing an electronic device on a surface, such as mounting and dismounting, or hanging up and bringing down from a wall, the electronic device may be noticed by the grid of communication points and may be used for triggering actions. For example, a video streaming may start the moment a monitor is hung on the wall comprising the grid of communication points. Thus, the usage of the electronic devices may be greatly simplified for the users of the electronic devices.

A further advantage of some embodiments disclosed herein is that the networking of the devices may also be solved wirelessly by the grid of communication points. Thus, no additional devices, such as a modem, may be needed to obtain access to a communications network. Thus, usage of the electronic devices may not be encumbered by wires hanging from or around a wall or surface due to the connections associated with a device providing access to a communications network.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the disclosure and are incorporated in and constitute a part of this application, illustrate certain non-limiting embodiment(s) of the invention. In the drawings:

Figure 1 illustrates a schematic block diagram of a grid of communication points and a communications network, according to some embodiments.

Figure 2 is a flowchart depicting embodiments of a method in a grid of communication points, according to some embodiments.

Figure 3 is a flowchart depicting embodiments of a method in an electronic device, according to some embodiments.

Figure 4 is a schematic diagram depicting embodiments of a method in a grid of communication points, and electronic device, and a communications network, according to some embodiments.

Figure 5 is a block diagram of a grid of communication points that is configured according to some embodiments.

Figure 6 is a block diagram of an electronic device that is configured according to some embodiments.

## DETAILED DESCRIPTION

Further to the issues associated with usage of electronic devices mentioned earlier, some electronic devices may be hung from a wall, for example, in the case of loudspeakers, screens, digital picture frames, etc... When hanging these electronic devices to a wall, a frequent problem is the cumbersome cables required to connect the devices at least to the AC power source in the wall. This also applies when placing some electronic devices on other surfaces such as a table top.

It is an object of embodiments herein to provide a way of improving the access of electronic devices to an AC power source in a surface, such as e.g., a wall or a board, and the access to a communication system in such a surface by addressing the problems described above. That is, it is an object of embodiments herein to provide assistance to an electronic device so that its usage is not encumbered for a user of the electronic device by requirements to a wired connection. The wired connection may be to provide power to the electronic device, or to provide access to a communication system.

For this purpose, some embodiments herein comprise a grid of communication points that may contain circuits that allow wireless power supply. This may comprise sending coils, or other communication points capable of transmitting energy such as laser communication points or microwaves, in the grid of communication points that, in combination with a controller, may generate an electromagnetic field. An electronic device may then draw power from the electromagnetic field through a receiving coil in the electronic device.

In other embodiments, an electronic device placed on a surface, e.g., mounted to a wall, or near the wall, may not need access to an AC power source in the wall, but it may require access to a communications network for data transmission or reception. An example of electronic device according to these embodiments may be a display that may be used to show a video that is streaming from a communications network. Another example may be a speaker that wants to be connected to a receiver in order to get a sound signal. For this purpose, some embodiments herein comprise a grid of communication points that may provide access to the communications network. The grid of communication points is adapted to be attached to or embedded in a surface. In some particular embodiments, the grid of communication points is attached to or embedded in a wallpaper.

Embodiments will now be described more fully hereinafter with reference to the accompanying drawings, in which examples of the claimed embodiments are shown. This

claimed embodiments may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure may be thorough and complete, and may fully convey the scope of the claimed embodiments to those skilled in the art. It should also be noted that  
5 these embodiments are not mutually exclusive. Components from one embodiment may be tacitly assumed to be present/used in another embodiment.

**Figure 1** depicts a schematic representation of an embodiment of a communications system wherein embodiments herein may be implemented. Further detailed description on  
10 the characteristics of some components of the system will be provided following the discussion of methods described herein.

Figure 1 depicts a **grid of communication points 110, 120**, in which embodiments herein may be implemented. The grid of communication points 110, 120 is for providing assistance to an **electronic device 131, 132**. The electronic device 131, 132 which is  
15 configured to communicate with the grid of communication points 110, 120, is described below.

The grid of communication points 110, 120 may comprise a **grid of near field devices 110**, such as Near Field Communication, NFC, devices, and/or a **wireless power supply grid 120**. The grid of near field devices 110 and the wireless power supply grid 120 will be  
20 described further down below. The total number of communication points in the grid of communication points 110, 120 may be customized according to criteria that will be apparent to one of skill in the art. The example represented in Figure 1 is not limiting.

The grid of communication points 110, 120 is configured to detect the electronic device 131, 132 when it is located within a determined distance from at least one of the  
25 communication points in the grid of communication points 110, 120. This is typically a short distance, in the range of a few centimeters, for example, between 1-20 centimeters.

The detection is implemented via a communication link between the electronic device 131, 132 and said at least one of the communication points.

In some embodiments, to detect comprises to identify the electronic device 131, 132.

30 The grid of communication points 110, 120 is also configured to provide assistance to the detected electronic device 131, 132 via said at least one of the communication points or via another one of the communication points in the grid of communication points 110, 120, which assistance comprises at least one of: a. radio access to a **communications network 141, 142**, wherein the grid of communication points 110, 120 comprises the grid of near field

devices 110, and b. wireless power supply, wherein the grid of communication points 110, 120 comprises the wireless power supply grid 120.

The grid of communication points 110, 120 is adapted to be attached to or embedded in a surface, such as for example, a board, a wall, a wallpaper 135, or a table top. In some  
5 embodiments the grid of communication points 110, 120 is attached to or embedded in the wallpaper 135 or the board. The wallpaper 135 may comprise multiple layers of paper. In between these layers, at regular distances, may be placed the devices in the grid of near field devices 110, e.g., the NFC chips. Also, between the paper layers there may be  
10 conductive material that may wire the devices in the grid of near field devices 110 to each other. In some embodiments, the conductive material may wire the devices in the grid of near field devices 110 to a controller in the wall where the wallpaper 135 is placed, as described below. This wiring may be actual wires or it may be made of conductive material printed on a layer of the grid of communication points 110, 120. In some embodiments,  
15 electronic circuitry of the communication points in the grid of communication points 110, 120 may be printed on the back side of the wallpaper 135 in a similar way the printed circuit boards are printed using flexible materials.

In some embodiments, the detection may be achieved by the grid of near field devices 110. The grid of near field devices 110 may be configured to detect the electronic device  
20 131, 132, when the electronic device 131, 132 is located within the determined distance from at least one of the communication points in the grid of communication points 110. For example, when a display monitor is mounted on a wall where the wallpaper is placed 135 for streaming video from the internet. In these embodiments, this is a determined distance from at least one of the communication points in the grid of near field devices 110. This may be  
25 achieved by each of the communication points, e.g., devices, in the grid of devices 110. In these embodiments, the electronic device 131, 132, as described later, is configured to be detected by the grid of near field devices 110.

The grid of near field devices 110 may be configured to provide to the electronic device 131, 132, radio communication access to the communications network 141, 142,  
30 when the electronic device 131, 132 is within the determined distance from at least one of the communication points in the grid of communication points 110. In these embodiments, the electronic device 131, 132 is configured to obtain the radio communication access to the communications network 141, 142 from the grid of near field devices 110. For example, in some embodiments, the grid of near field devices 110 may be a grid of Near Field  
35 Communication (NFC) devices, wherein each device in the grid comprises a NFC chip. In

these embodiments, the electronic device 131, 132 may comprise an NFC tag, i.e., NFC chip, to enable detection and/or radio access to the communications network 141, 142 by the grid of near field devices 110. That is, it may be NFC enabled, i.e., have NFC hardware, and support the respective communication standards. This may comprise, e.g., exchanging identities or to carry traffic to/from the backend communication network 141, 142, such as, for example, a LAN or the public internet. In these embodiments, radio communication access to a communications network 141, 142 may utilize the already established NFC channel.

In these embodiments, the detection may be implemented by the NFC chips comprising the grid of near field devices 110 in the grid of communication points 110, 120, and in the electronic device 131, 132. NFC chips are able to detect other chips approaching and/or being close, i.e., within the determined distance from at least one of the communication points in the grid of communication points 110. This capability may be utilized in some embodiments herein. The NFC chips in the grid of near field devices 110 in the grid of communication points 110, 120 that are close to the electronic device 131, 132 may notice and identify the electronic device 131, 132.

The electronic device 131, 132 may in turn recognize the NFC chips in the grid of near field devices 110. Thus, the electronic device 131, 132 may notice that it is placed near a surface with an active grid of communication points 110, 120. Both the grid of communication points 110, 120 and the NCF chips in the electronic device 131, 132 may exchange identification information with each other.

The determined distance may be determined by the manufacturer of the devices in the grid of near field devices 110, and may vary slightly from manufacturer to manufacturer and from model to model. For example, in some embodiments this determined distance may be in the range of a few centimeters, as mentioned before.

In other embodiments, the grid of near field devices 110 may comprise devices other than NFC devices, which have similar functional characteristics to the NFC devices. For example, in some embodiments, the grid of near field devices 110 may comprise devices with a short communication range, so that location information may be provided with a simple method. The short range means that only a few devices of the grid of near field devices 110 may be in range of the electronic device 131, 132, so that the location may be determined. Wireless communication technologies having a larger range so that, in principle, all receivers in the grid of communication points 110, 120 are in range, may provide a more complicated location protocol of the electronic device 131, 132.

In some embodiments, the communications network 141, 142, may comprise a Local Area Network (LAN) 141, such as for example, an Ethernet network, a WiFi network, or an Asymmetric Digital Subscriber Line (ADSL) network.

5 In some embodiments, the communications network 141, 142 may comprise a cellular communications network 142 which for example may be a network such as a Long-Term Evolution (LTE), e.g. LTE Frequency Division Duplex (FDD), LTE Time Division Duplex (TDD), LTE Half-Duplex Frequency Division Duplex (HD-FDD), Wideband Code Division Multiple Access (WCDMA), Universal Terrestrial Radio Access (UTRA) TDD, Global System for Mobile communications (GSM) network, GSM/Enhanced Data Rate for GSM Evolution  
10 (EDGE) Radio Access Network (GERAN) network, EDGE network, network comprising of any combination of Radio Access Technologies (RATs) such as e.g. Multi-Standard Radio (MSR) base stations, multi-RAT base stations etc., any 3rd Generation Partnership Project (3GPP) cellular network, Worldwide Interoperability for Microwave Access (WiMax), or any cellular network or system. Thus, the communications network 141, 142 may comprise one  
15 of: a local wireless communications network 141, a cellular communications network 142, and a combination of local and cellular communications network 141, 142.

The cellular communications network 142 may comprise a **radio network node 150**. The radio network node 150 may be, for example, a base station such as e.g. an eNB,  
20 eNodeB, or a Home Node B, a Home eNode B, femto Base Station, BS, pico BS or any other network unit capable to serve a device or a machine type communication device in a cellular communications network 142. In some particular embodiments, the radio network node 150 may be a stationary relay node or a mobile relay node. The communications network 142 covers a geographical area which is divided into cell areas, wherein each cell  
25 area is served by a radio network node such as radio network node 150, although, one network node may serve one or several cells. In the example depicted in Figure 1, the radio network node 150 serves a **cell 160**. Also in the example depicted in Figure 1, the cell 160 covers the area where the grid of communication points 110, 120 is located. However, in other embodiments, the cell 160, or any other cell in the cellular communications network  
30 142 for that matter, may not cover the area where the grid of communication points 110, 120 is located. The radio network node 150 may be, e.g., a macro eNodeB, a home eNodeB or a pico base station, based on transmission power and thereby also on cell size. Typically, the cellular communications network 142 may comprise more cells similar to cell 160, served by their respective network nodes. This is not depicted in Figure 1 for the sake of simplicity.  
35 The radio network node 150 may support one or several communication technologies, and

its name may depend on the technology and terminology used. In 3GPP LTE, radio network nodes, which may be referred to as eNodeBs or even eNBs, may be directly connected to one or more core networks.

5           In some embodiments, such as in that depicted in Figure 1, the radio network node 150 may provide access to **an internet 170** through a **communication pathway 171** with a core network (not depicted). The core network may comprise a network node (not depicted). The network node may be, for example, a “centralized network management node” or “coordinating node”, which may also be a radio network node, which coordinates radio  
10 resources with one or more radio network nodes and/or user equipments. Some examples of the coordinating node are a gateway node such as Packet Data Network Gateway (P-GW) or Serving Gateway (S-GW) network node or femto gateway node, a macro node coordinating smaller radio nodes associated with it, etc...

15           The radio network node 150 and any of the networks in the core network (not depicted in Figure 1) may be collectively referred to herein as a node 150.

          In some embodiments, such as in that depicted in Figure 1, the radio network node 150 may also communicate with the grid of near field devices 110, and/or the wireless power  
20 supply grid 120 through a **controller 180** over a **radio link 181**. Each of the grid of near field devices 110 and the wireless power supply grid 120 in the grid of communication points 110, 120 may be connected to the controller 180. The controller 180 hosts applications that control the grid of communication points 110, 120. For example, in the embodiments in which the grid of devices 100 is a grid of NFC devices or chips, the NFC chips may report  
25 the presence and identity of the electronic device 131, 132 to the controller 180. The controller 180 may in turn provide communication to the internet over a **link 182**.

          The controller 180 may perform other functions when connected with the wireless power supply grid 120, as described below.

          In some embodiments, there may be one controller 180 for an entire room, or for an  
30 entire surface, e.g., wall or there may be several controllers 180, each of them being responsible for a segment of the surface, e.g., wall, so that the control of the grid of communication points 110, 120 is partitioned in reasonably sized controlling domains. Only one controller 180 is depicted in Figure 1. These controllers 180 may also communicate with each other.

In some embodiments, the controller 180 may be comprised in the grid of communication points 110, 120. In other embodiments, the controller 180 may be separate from the grid of communication points 110, 120.

5        The electronic device 131, 132 is an electronic device adapted, i.e., configured, to be in communication with at least one of: the grid of near field devices 110 and the wireless power supply grid 120. For example, in the embodiments in which the grid of near field devices 110 is a grid of NFC devices, as described earlier, the first electronic device 131 may comprise an NFC tag, allowing it to receive communications from the NFC devices in  
10        the grid of near field devices 110.

In some embodiments, the electronic device 131, 132 may be adapted to be in direct communication with at least the cellular communications network 142. In these  
15        embodiments, the electronic device 131, 132 may be, for example, a wireless communication device such as a UE, which is also known as e.g. mobile terminal, wireless terminal and/or mobile station, or, for example, a pico base station. In these embodiments, the electronic device 131, 132 is wireless, i.e., it is enabled to communicate wirelessly in a communications network, sometimes also referred to as a cellular radio system or cellular network, such as the cellular communications network 142. The communication may be  
20        performed e.g., between two electronic devices 131, 132, between an electronic device 131, 132 and a regular telephone and/or between an electronic device 131, 132 and a server. The communication may be performed e.g., via a RAN and possibly one or more core networks, comprised within the wireless network, such as the cellular communications network 142.

25        A number of electronic devices 131, 132 may be located in the communications network 141, 142. In the example scenario of Figure 1, only two electronic devices are shown, the first electronic device 131, and the second wireless device 132. Any reference herein to the electronic device 131, 132 is meant to comprise a reference to the first electronic device 131, and the second wireless device 132.

30        In the embodiments in which the electronic device 131, 132 is adapted to be in direct communication with at least the cellular communications network 142, the electronic device 131, 132 may further be referred to as a mobile telephone, as depicted in Figure 1 as a non-limiting example for a **first electronic device 131**, cellular telephone, or laptop with wireless capability, just to mention some further examples. The electronic device 131, 132 in the  
35        present context may be, for example, portable, pocket-storable, hand-held, computer-

comprised, or vehicle-mounted mobile devices, a Personal Digital Assistant, a tablet computer, Machine-to-Machine devices, a picture frame, a display monitor, a loudspeaker, as depicted in Figure 1 as a non-limiting example for a **second electronic device 132**, devices equipped with a wireless interface, such as a printer or a file storage device, and a radio network unit capable of communicating over a radio link in a cellular communications system, such as the cellular communications network 142.

The wireless power supply grid 120 may be configured to detect the electronic device 131, 132, when the electronic device 131, 132 is located within the determined distance from at least one of the communication points in the grid of communication points 110. For example, when a display monitor is mounted on a wall where the wallpaper 135 is placed for recharging its batteries. In these embodiments, this is a determined distance from at least one of the communication points in the wireless power supply grid 120. This determined distance from at least one of the communication points in the wireless power supply grid 120 may be the same as the determined distance from at least one of the communication points in the grid of near field devices 110 in some embodiments. In other embodiments, it may be a different distance. In some embodiments, the electronic device 131, 132 may be configured to be detected by the wireless power supply grid 120.

Similarly to the determined distance from at least one of the communication points in the grid of near field devices 110, the determined distance from at least one of the communication points in the wireless power supply grid 120 may be determined by the manufacturer of the wireless power supply grid 120, and may vary slightly from manufacturer to manufacturer and from model to model. For example, in some embodiments determined distance from at least one of the communication points in the wireless power supply grid 120 may be in the range of a few centimeters, such as 5cm, 10cm or 20cm, for example. In other embodiments, this distance may be in the range of several meters, depending on physical parameters of the underlying energy transmission method.

The wireless power supply grid 120 is configured to provide to the electronic device 131, 132, wireless power supply, when the electronic device 131, 132 is located within the determined distance from at least one of the communication points in the grid of communication points 110, i.e., in these embodiments, the determined distance from at least one of the communication points in the wireless power supply grid 120. In these embodiments, the electronic device 131, 132 may be further configured to obtain the wireless power supply from: the grid of near field devices 110.

In order to achieve this, the wireless power supply grid 120 may, for example, comprise a grid of coils in the grid of communication points 110, 120. In other embodiments, the wireless power supply grid 120 may comprise other communication points capable of transmitting energy such as laser communication points or microwaves.

In some embodiments, the wireless power supply grid 120 may be connected to the controller 180, and together they may generate an electric current into at least a part of the wireless power supply grid 120. This may be implemented by the coils in the wireless power supply grid 120, together with the controller 180 that the wireless power supply grid 120 may be connected to. The coils in the wireless power supply grid 120 may be individually wired to the controller 180 in the wall, so that the controller 180 may individually power them. In the embodiments wherein the grid of communication points 110, 120 is attached to or embedded in the wallpaper 135, all the coils and wires in the wireless power supply grid 120 may also be in between the layers of the wallpaper 135. In these embodiments, the electronic device 131, 132, for example, may comprise a receiver of the wireless power provided by the wireless power supply grid 120, such as a receiving coil. Energy transport may be through induction. An AC current in the coil in the grid of communication points 110, 120 may induce a current in the coil in the electronic device 131, 132, thus transmitting energy. The electronic device 131, 132 may then draw power from the electromagnetic field through the receiving coil in the electronic device 131, 132.

In some embodiments, the wireless power supply may be provided to the whole surface of the grid of communication points 110, 120 and throughout the volume created by a radius of the determined distance from at least one of the communication points in the wireless power supply grid 120 surrounding the wireless power supply grid 120. In other embodiments, the wireless power supply may be provided in a restricted area of a determined size around a particular area surrounding one or a few communication points in the wireless power supply grid 120. This particular area may be determined by the manufacturer of the wireless power supply grid 120, or may be configurable by an operator of the wireless power supply grid 120.

In some further embodiments, the grid of communication points 110, 120 may comprise a combination of the grid of near field devices 110 and the wireless power supply grid 120. That is, in these embodiments the grid of communication points 110, 120 may comprise both, the grid of near field devices 110 and the wireless power supply grid 120.

In some embodiments, the electronic device 131, 132, e.g., the first electronic device 131, may be solely adapted to be in communication with the grid of near field devices 110. In other embodiments, the electronic device 131, 132, e.g., the second electronic device 132, may be solely adapted to be in direct communication with the wireless power supply grid 120 in the grid of communication points 110, 120. In other embodiments the electronic device 131, 132 may be adapted to be in communication with the grid of near field devices 110, and may be further adapted to be in direct communication with the wireless power supply grid 120 in the grid of communication points 110, 120.

The electronic device 131, 132 may gain access to the functionality provided by the grid of communication points 110, 120 described herein when they are located within the determined distance from at least one of the communication points in the grid of communication points 110. In some particular embodiments, the electronic device 131, 132 may come within the determined distance from at least one of the communication points in the grid of communication points 110 by being located on a surface, such as a table top where the grid of communication points 110, 120 may be located, or close to a wall where the grid of communication points 110, 120 may be located. If the grid of communication points 110, 120 is placed in a wall or the wallpaper 135, the electronic device 131, 132 may come within determined distance from at least one of the communication points in the grid of communication points 110 by being mounted or hung up on the wall where the grid of communication points 110, 120 is located. In these embodiments, the electronic device 131, 132 may be hung from the wall from a **hanger 190** adapted to attach to the electronic device 131, 132.

In some of the embodiments in which the grid of communication points 110, 120 is attached to or embedded in the wallpaper 135, the wallpaper 135 may comprise wallpaper strips. The wallpaper strips may be of different sizes. A non-limiting example may be for example a strip which is 1 meter wide and 2 meter high. In other embodiments, a strip of grid of communication points 110, 120 may be, for example, 2 meter wide and 1 meter high. Similarly, in other embodiments, the grid of communication points 110, 120 may be attached to or embedded in a board, e.g., a free standing board, or in a table top, or table top cover.

Further features of the grid of communication points 110, 120 and its components as well as of the electronic device 131, 132 will be provided further down below.

Examples of embodiments of a method in a grid of communication points 110, 120 for providing assistance to an electronic device 131, 132 configured to communicate with the grid of communication points 110, 120, will now be described with reference to a flowchart depicted in **Figure 2**.

The grid of communication points 110, 120 is adapted to be attached to or embedded in a surface, such as e.g., a wall, a board or a wallpaper 135. In some embodiments, the grid of communication points 110, 120 is attached to or embedded in the wallpaper 135.

The method comprises the following actions, which actions may be taken in any suitable order. Dashed lines of some boxes in Figure 2 indicate that the action is not mandatory, while continued lines of some boxes in Figure 2 indicate that the action is mandatory.

In some embodiments, the electronic device 131, 132 may be one of: a mobile telephone, a laptop with wireless capability, portable, pocket-storable, hand-held, computer-comprised, or vehicle-mounted mobile devices, a Personal Digital Assistant PDA, a tablet computer, Machine-to-Machine M2M devices, a picture frame, a display monitor, a loudspeaker, devices equipped with a wireless interface, such as a printer or a file storage device, and a radio network unit capable of communicating over a radio link in a cellular communications system, such as, for example, a pico base station.

Also as mentioned earlier, the communications network 141, 142 may comprise one of: a local wireless communications network 141, a cellular communications network 142, and a combination of local and cellular communications network 141, 142.

Additional details of the embodiments herein, provided in regards to the description of Figure 1, may not be repeated here for the sake of simplicity.

#### **Action 200**

In this action, the grid of communication points 110, 120 detects the electronic device 131, 132 when it is located within a determined distance from at least one of the communication points in the grid of communication points 110, 120 via a communication link between the electronic device 131, 132 and said at least one of the communication points. In the embodiments in which the grid of communication points 110, 120 comprises the grid of near field devices 110 which is the grid of NFC devices, detecting may be implemented by, for example, NFC chips that recognize the electronic device 131, 132 once it is in range, i.e., within the determined distance from at least one of the communication points in the grid of communication points 110.

In some of the embodiments in which the grid of communication points 110, 120 comprises the wireless power supply grid 120, detection may also be implemented through the wireless power supply grid 120, when the charging circuits in the wireless power supply grid 120 are on. In some embodiments, wireless power supply grid 120 may always be on. In other embodiments, the charging circuits in the wireless power supply grid 120 may only be powered on from time to time, e.g., every couple of seconds, and for a short while, e.g., a second, to detect if an electronic device such as the electronic device 131, 132 is present. The control of the powering of the charging circuits in the grid 120 may be implemented in some embodiments, by the controller 180.

A further feature of some embodiments described herein may be that the hanging or proximity of the electronic device 131, 132 to grid of communication points 110, 120, may trigger some actions such as starting a video stream towards the electronic device 131, 132 or powering up the wireless charging circuits in the wireless power supply grid 120 that are closest to the electronic device 131, 132. For this, identification of the electronic device and its location may be helpful. Also, as part of the identification, a capabilities and requirements profile may be transferred. In some embodiments, this may communicate to the controller 180 how the current in the wireless charging circuits may need to be, in order to power the electronic device 131, 132. It may then adapt, for example, the frequency or the alternating current.

The issue arises of how the grid of communication points 110, 120 may assist in identifying the electronic device 131, 132 that is near the surface, e.g. a wall where the wallpaper 135 may be placed. As mentioned above, the grid of near field devices 110 in the grid of communication points 110, 120 may, in some embodiments, be the grid of NFC devices. These devices allow both-way communication and may be connected, in some embodiments to the controller 180 for a surface, or a surface segment, in the embodiments in which the controller 180 controls a surface segment, e.g., a wall segment.

When the electronic device 131, 132 is hung on or near the grid of communication points 110, 120, the electronic device 131, 132 and the, for example, NFC device closest to the location of the grid of communication points 110, 120 where the electronic device 131, 132 is mounted or located may communicate. The grid of communication points 110, 120 may then, in some embodiments, identify that the electronic device 131, 132 is hung on or near the grid of communication points 110, 120, e.g., near the wallpaper 135. The grid of communication points 110, 120 may also identify the electronic device 131, 132 by determining its identity and its location on the grid of communication points 110, 120, as described earlier.

Furthermore, as will be explained later, the electronic device 131, 132 may now identify that it has been placed near the grid of communication points 110, 120, e.g., mounted or hung from the wall where the wallpaper 135 is placed, and it may obtain an indication of where, as this information corresponds to the identifier of that particular local communication point in the grid of communication points 110, 120, in this example NFC device, it is communicating with.

Through the, for example, NFC device, the grid of communication points 110, 120 may now determine that electronic device 131, 132 is located nearby, e.g., mounted or hung from the wall where the wallpaper 135 is placed, that needs wireless power, and it may enable the respective source circuits only in that segment of the grid of communication points 110, 120, where the electronic device 131, 132 is located. Also, specific parameters of the power supply may be exchanged through the, for example, NFC device. This way the device might for example communicate its power consumption so that the power provided by the sender may be adapted. The electronic device 131, 132 and the grid of communication points 110, 120 may together optimize the electromagnetic field.

Thus, in some embodiments, detecting comprises identifying the electronic device 131, 132.

#### **Action 201**

In this action, the grid of communication points 110, 120 may determine a location of the electronic device 131, 132. This is an optional action. As described earlier, location may be used by the controller 180 for several functions. For example, it may enable only communication points in the grid of communication points 110, 120, e.g., charging circuits, that are close to the location of the electronic device 131, 132. Another example is that the controller 180 may route communication also to those circuits that are related to the location of the electronic device 131, 132. Also, the communication content may change depending on the location.

In these embodiments, as described earlier, the location may be determined by where the electronic device 131, 132 is in range, i.e., within the determined distance from at least one of the communication points in the grid of communication points 110.

In the embodiments in which action 201 is implemented, an advantage of determining the location of the electronic device 131, 132 may be that the location of the electronic device 131, 132 is known to the backend services. This may, for example, enable the controller 180 to activate only those communication points in the grid of communication

points 110, 120, e.g., charging circuits, that are close to the electronic device 131, 132. This also may enable the grid of communication points 110, 120 to serve multiple electronic devices, such as the first electronic device 131 and the second electronic device 132, located within range of the grid of communication points 110, 120 at once, because different communication points on the grid of communication points 110, 120, e.g., different locations in the wallpaper 135, may serve a respective electronic device 131, 132 individually. On a broader scope, the information about the location of the electronic device 131, 132 being e.g., attached to a particular location within a particular wallpaper 135 in a particular building may be used in order to provide a certain service. That is, the backend service may deduce from the location of the electronic device 131, 132, e.g., that the electronic device 131, 132 is in a certain room or in a certain position on a wall, the type of the contents it may need to feed/get to/from the electronic device 131, 132. For example, a video stream shown by the electronic device 131, 132 may be a different one depending on the location of the electronic device 131, 132. The selection of the correct stream may be done automatically based on the knowledge of the location of the electronic device 131, 132 reported to the streaming backend application by the grid of communication points 110, 120.

#### Action 202

The grid of communication points 110, 120 may receive at least one of: a. a capability information from the electronic device 131, 132, regarding adaptability to one or more services provided by the grid of communication points 110, 120, and b. a service request from the electronic device 131, 132. This is an optional action.

In these embodiments, receiving may be implemented by, for example, communication through NFC. The electronic device 131, 132 may use an NFC link in order to send its profile and an NFC chip in the grid of near field devices 110 may then send this information through to the controller 180. The controller 180 may then, for example, activate the power circuits in the wireless power supply grid 120, based on the NFC detected position and considering the parameters that were transmitted via NFC.

Capability information may comprise charging requirements and parameters, e.g., frequency needed and functional capabilities. For example, a video playback device may state its resolution and supported video codecs.

The one or more services provided by the grid of communication points 110, 120 may comprise, for example, video streaming, access to information from the internet 170, and wireless charging.

In these embodiments, the service request may comprise, for example, a website access request, e.g., http, or any other service request through a suitable protocol, e.g., http, ftp, smtp, SIP, REST, SOAP. The wall may provide low level network access, such as for example, IP based networking. Any application level protocol may be used.

5

**Action 203**

In some embodiments, the grid of communication points 110, 120 may send one of: the capability information and the service request, received from the electronic device 131, 132 to the communications network 141, 142. This is an optional action.

10

In some of these embodiments, the grid of communication points 110, 120 may send one of: the capability information and the service request, received from the electronic device 131, 132 to the node 150 in the communications network 142.

In these embodiments, sending may be implemented by NFC. NFC may provide, for example, an Internet Protocol, IP, link over which any service request may be done.

15

In some embodiments, and in response to this action, the grid of communication points 110, 120 may receive one or more data transmissions from the communications network 141, 142.

**Action 204**

20

In some embodiments, the electronic device 131, 132 mounted to, or near the grid of communication points 110, 120 may not need access to an AC power source in the wall where the grid of communication points 110, 120 is placed, but it may require access to the communications network 141, 142 for data transmission or reception. An example of these embodiments may be a display that may be used to show a video that is streaming from the communications network 141, 142. Another example may be a speaker that may be connected to a receiver in order to obtain a sound signal.

25

As mentioned above, some embodiments herein may utilize the already established NFC channel for this purpose. However, existing techniques such as Radio-Frequency Identification, RFID, have limited bandwidth. This may be addressed in some embodiments herein by using the circuits used for providing wireless power in the wireless power supply grid 120 for creating a wireless power supply. In these embodiments, a communications network signal from the communications network 141, 142 may be modulated into the power transmitting field. A receiver in the electronic device 131, 132 configured to use this feature may then utilize filters in order to separate the data signal from the power.

30

In some embodiments, the grid of communication points 110, 120 may comprise the wireless power supply grid 120 and the grid of near field devices 110. In some of these embodiments, the grid of communication points 110, 120 may modulate a network signal provided by the grid of near field devices 110, onto a power transmitting field provided by the wireless power supply grid 120. This is an optional action.

In some of these embodiments, when utilizing multiple frequency bands for parallel data transmission channels with individual data-rates, the effects of disturbances on the power transmission link may be limited and the data-rate may be optimized. Power Line Communication may be similar on a wired power link.

In some embodiments, the NFC link and the wireless power data link may be used together. For example, the NFC link may be used for low-bandwidth control information, while the wireless power link may be used for higher bandwidth payload such as, for example, the sound or video stream.

#### **Action 205**

In this action, the grid of communication points 110, 120 provides assistance to the detected electronic device 131, 132 via said at least one of the communication points or via another one of the communication points in the grid of communication points 110, 120. The assistance comprises at least one of: a. radio access to the communications network 141, 142, wherein the grid of communication points 110, 120 comprises the grid of near field devices 110, and b. wireless power supply, wherein the grid of communication points 110, 120 comprises the wireless power supply grid 120. This is performed when the electronic device 131, 132 is located within the determined distance from at least one of the communication points in the grid of communication points 110, 120. As stated earlier, the electronic device 131, 132 may be comprised in the communications network 141, 142.

The radio access may be provided by the grid of near field devices 110 in the grid of communication points 110, 120. As stated earlier, the grid of near field devices 110 may be, in some embodiments, the grid of NFC devices. Radio access to the communications network 141, 142 may be provided through the controller 180. The grid of near field devices 110 may communicate to the controller 180, which then relays the communication to the communications network 141, 142.

For example, in some embodiments, the grid of communication points 110, 120 may be placed in a room, such as an indoor room, having no coverage from the cellular communications network 142. In these embodiments, the electronic device 131, 132 may be, for example a pico base station. The pico base station may gain access to the cellular

communications network 142 via the local communications network 141, and thus provide extended cellular coverage within the room.

In another example, the first electronic device 131 may be a loudspeaker. The loudspeaker may be hung on the wall where the grid of communication points 110, 120 is placed from the hanger 190, and this may trigger the playback of music obtained from the second electronic device 132, which may be a telephone storing music, such as a song playlist. This may be achieved through communication among the first electronic device 131 and the second electronic device 132 through the communications network 141, 142. In this case, the local communications network 141.

In yet another example, the electronic device 131, 132 may be a display monitor. The display monitor may be hung on the wall where the grid of communication points 110, 120 is placed, and this may trigger the play of a video streamed from the cellular communications network 142. The display monitor may gain access to the cellular communications network 142 via the local communications network 141.

The wireless power supply may be provided by the wireless power supply grid 120 in the grid of communication points 110, 120. This may be implemented by the wireless power supply grid 120 being connected to the controller 180, and together they may generate an electric current into at least a part of the wireless power supply grid 120. This may be implemented, for example, by the controller 180 connecting the respective wireless power supply grid 120 in the grid of communication points 110, 120 with a suitable alternating current.

Examples of embodiments of a method for obtaining assistance from the grid of communication points 110, 120, the electronic device 131, 132 being configured to communicate with the grid of communication points 110, 120, will now be described with reference to a flowchart depicted in **Figure 3**.

As stated earlier, the grid of communication points 110, 120 is adapted to be attached to or embedded in a surface, such as a wall or wallpaper 135.

In some embodiments, the electronic device 131, 132 may be one of: a mobile telephone, a laptop with wireless capability, portable, pocket-storable, hand-held, computer-comprised, or vehicle-mounted mobile devices, a Personal Digital Assistant PDA, a tablet computer, Machine-to-Machine M2M devices, a picture frame, a display monitor, a loudspeaker, devices equipped with a wireless interface, such as a printer or a file storage

device, and a radio network unit capable of communicating over a radio link in a cellular communications system, such as a pico base station.

The method comprises the following actions, which actions may be taken in any suitable order. Dashed lines of some boxes in Figure 3 indicate that the action is not mandatory, while continued lines of some boxes in Figure 3 indicate that the action is mandatory.

As mentioned earlier, the communications network 141, 142 may comprise one of: the local wireless communications network 141, the cellular communications network 142, and the combination of local and cellular communications network 141, 142.

The electronic device 131, 132, as stated earlier, may be comprised in the communications network 141, 142.

Additional details of the embodiments herein, provided in regards to the description of Figures 1 and/or 2, may not be repeated here for the sake of simplicity.

#### **Action 300**

The electronic device 131, 132 detects the grid of communication points 110, 120, when the electronic device 131, 132 is located within the determined distance from at least one of the communication points in the grid of communication points 110, 120 via the communication link between the electronic device 131, 132 and said at least one of the communication points, as described earlier.

In some embodiments, detecting may comprise identifying a configuration point within the grid of communication points 110, 120, as well as another electronic device 131, 132. For example, the first electronic device 131 may identify the second electronic device 132.

#### **Action 301**

This is an optional action. The electronic device 131, 132 may send to the grid of communication points 110, 120 at least one of: a) the capability information regarding adaptability to one or more services provided by the grid of communication points 110, 120, and b) the service request, as described earlier.

The capability information, the one or more services, and the service request have also been described earlier in relation to Figure 2.

**Action 302**

The electronic device 131, 132 obtains assistance from the grid of communication points 110, 120 via said at least one of the communication points or via another one of the communication points in the grid of communication points 110, 120.

5       The assistance comprises at least one of: a. radio access to the communications network 141, 142, wherein the grid of communication points 110, 120 comprises the grid of near field devices 110, and b. wireless power supply, wherein the grid of communication points 110, 120 comprises the wireless power supply grid 120.

10       In some embodiments, as mentioned earlier, the grid of near field devices 110 may be the grid of NFC devices.

**Action 303**

15       In some embodiments, the grid of communication points 110, 120 comprises the wireless power supply grid 120 and the grid of near field devices 110. In some of these embodiments, the electronic device 131, 132 may demodulate a network signal obtained from the grid of near field devices 110, onto a power transmitting field obtained from the wireless power supply grid 120. This is an optional action.

20       **Figure 4** is a summarized schematic diagram of examples of the communications that may occur in embodiments herein, between the electronic device 131, 132, which is represented in the embodiment of this Figure as ED, the grid of near field devices 110, which is represented in the embodiment of this Figure as DG, the wireless power supply grid 120, which is represented in the embodiment of this Figure as WPG, and the communications  
25       network 141, 142, which is represented in the embodiment of this Figure as NW. The reference numbers in the Figure correspond to the actions just described in reference to Figures 2 and 3. Thus, a description for these actions will not be repeated for the sake of simplicity.

30       To perform the method actions in the grid of communication points 110, 120 described above in relation to Figure 2 for providing assistance to an electronic device 131, 132 configured to communicate with the grid of communication points 110, 120, the grid of communication points 110, 120, as described earlier in relation to Figure 1, may comprise the following arrangement depicted in **Figure 5**. Some of the features of the grid of  
35       communication points 110, 120 were already described in relation to the description of

Figures 1 and 2. For example, the grid of communication points 110, 120 is adapted to be attached to or embedded in a surface. In some embodiments, also as described earlier, the grid of communication points 110, 120 may comprise the controller 180. In some embodiments, the grid of communication points 110, 120 may comprise the following  
5 features.

In some embodiments, the grid of communication points 110, 120 may comprise a **detecting circuit 501** configured to detect the electronic device 131, 132 when it is located within the determined distance from at least one of the communication points in the grid of  
10 communication points 110, 120 via the communication link between the electronic device 131, 132 and said at least one of the communication points.

In some embodiments, the grid of communication points 110, 120 may comprise a **providing circuit 502** configured to provide assistance to the detected electronic device  
15 131, 132 via said at least one of the communication points or via another one of the communication points in the grid of communication points 110, 120, which assistance comprises at least one of: a. radio access to the communications network 141, 142, wherein the grid of communication points 110, 120 comprises the grid of near field devices 110, and  
b. wireless power supply, wherein the grid of communication points 110, 120 comprises the  
20 wireless power supply grid 120.

In some embodiments, wherein the grid of communication points 110, 120 comprises the wireless power supply grid 120 and the grid of near field devices 110, the grid of communication points 110, 120 may further comprise a **modulating circuit 503** configured  
25 to modulate the network signal configured to be provided by the grid of near field devices 110, onto the power transmitting field configured to be provided by the wireless power supply grid 120.

In some embodiments, the grid of communication points 110, 120 may further  
30 comprise a **receiving circuit 504** configured to receive at least one of: a. the capability information from the electronic device 131, 132, regarding adaptability to one or more services provided by the grid of communication points 110, 120, and b. the service request from the electronic device 131, 132.

In some embodiments, the grid of communication points 110, 120 may further comprise a **sending circuit 505** configured to send one of: the capability information and the service request, received from the electronic device 131, 132 to the node 150 in the communications network 141, 142.

5

In some embodiments, the grid of communication points 110, 120 may further comprise a **determining circuit 506** configured to determine the location of the electronic device 131, 132.

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The embodiments in the grid of communication points 110, 120 herein for providing assistance to an electronic device 131, 132 configured to communicate with the grid of communication points, may be implemented through one or more processors, such as a **processing circuit 507** in the grid of communication points 110, 120 depicted in Figure 5, together with computer program code for performing the functions and actions of the  
15 embodiments herein. The program code mentioned above may also be provided as a computer program product, for instance in the form of a data carrier carrying computer program code for performing the embodiments herein when being loaded into the grid of communication points 110, 120. One such carrier may be in the form of a CD ROM disc. It may be however feasible with other data carriers such as a memory stick. The computer  
20 program code may furthermore be provided as pure program code on a server and downloaded to the grid of communication points 110, 120.

The grid of communication points 110, 120 may further comprise a **memory circuit 508** comprising one or more memory units. The memory circuit 508 may be arranged to be  
25 used to store data such as, the information modulated, received, sent or determined by the processing circuit 507 in relation to applications to perform the methods herein when being executed in the grid of communication points 110, 120. Memory circuit 508 may be in communication with the processing circuit 507. Any of the other information processed by the processing circuit 507 may also be stored in the memory circuit 508.

30

In some embodiments, information such as information from the first electronic device 131 or the second electronic device 132 may be received through a **receiving port 509**. In some embodiments, the receiving port 509 may be, for example, connected to the controller 180. In other embodiments, the grid of communication points 110, 120 may receive  
35 information from another structure in the communications network 141, 142 through the

receiving port 509. Since the receiving port 509 may be in communication with the processing circuit 507, the receiving port 509 may then send the received information to the processing circuit 507. The receiving port 509 may also be configured to receive other information.

5           The memory circuit 508 may be in communication with the processing circuit 507 and the receiving port 509.

          The processing circuit 507 may be further configured to signal information, such as the capability information or the service request, to the node 150 in the communications network  
10   142, through a **sending port 508**, which may be in communication with the processing circuit 507, and the memory circuit 508.

          Those skilled in the art will also appreciate that the modulating circuit 501, the receiving circuit 502, the sending circuit 503, and the determining circuit 504 described  
15   above may refer to a combination of analog and digital circuits, and/or one or more processors configured with software and/or firmware (e.g., stored in memory) that, when executed by the one or more processors such as the processing circuit 507, perform as described above. One or more of these processors, as well as the other digital hardware, may be included in a single application-specific integrated circuit (ASIC), or several  
20   processors and various digital hardware may be distributed among several separate components, whether individually packaged or assembled into a system-on-a-chip (SoC). In some of embodiments not depicted in Figure 5, one or more of these processors may be located within the grid of devices 110, the wireless power supply grid 120, and/or the controller 180.

25

          To perform the method actions in the electronic device 131, 132 described above in relation to Figure 3 for obtaining assistance from the grid of communication points 110, 120, the electronic device 131, 132 as described earlier in relation to Figure 1, comprises the following arrangement depicted in **Figure 6**. Some of the features of the electronic device  
30   131, 132 were already described in relation to the description of Figures 1, 2 and 3. In addition, in some further embodiments, the electronic device 131, 132 may comprise the following features.

          The electronic device 131, 132 may be configured to be comprised in the communications network 141, 142.

In some embodiments, the electronic device 131, 132 may be one of: a mobile telephone, a laptop with wireless capability, portable, pocket-storable, hand-held, computer-comprised, or vehicle-mounted mobile devices, a Personal Digital Assistant PDA, a tablet computer, Machine-to-Machine M2M devices, a picture frame, a display monitor, a  
5 loudspeaker, devices equipped with a wireless interface, such as a printer or a file storage device, and a radio network unit capable of communicating over a radio link in a cellular communications system, such as a pico base station.

The grid of communication points 110, 120 is adapted to be attached to or embedded in a surface.

10 The electronic device 131, 132 comprises a **detecting circuit 601** configured to detect the grid of communication points 110, 120, when the electronic device 131, 132 is located within the determined distance from at least one of the communication points in the grid of communication points 110, 120 via the communication link between the electronic device 131, 132 and said at least one of the communication points.

15 In some embodiments, the detecting circuit 601 is further configured to identify the configuration point within the grid of communication points 110, 120, as well as another electronic device 131, 132.

The electronic device 131, 132 further comprises an **obtaining circuit 602** configured  
20 to obtain assistance from the detected grid of communication points 110, 120 via said at least one of the communication points or via another one of the communication points in the grid of communication points 110, 120. The assistance comprises at least one of: a. radio access to the communications network 141, 142, wherein the grid of communication points 110, 120 comprises the grid of near field devices 110, and b. wireless power supply, wherein  
25 the grid of communication points 110, 120 comprises the wireless power supply grid 120.

In some embodiments, the grid of near field devices 110 may be the grid of Near Field Communication, NFC, devices.

In some embodiments, the communications network 141, 142 may comprise one of: the local wireless communications network 141, the cellular communications network 142,  
30 and the combination of local and cellular communications network 141, 142.

In some particular embodiments, the grid of communication points 110, 120 comprises the wireless power supply grid 120 and the grid of near field devices 110, and wherein the electronic device 131, 132 further comprises a **demodulating circuit 603** configured to

demodulate the network signal obtained from the grid of near field devices 110, onto the power transmitting field obtained from the wireless power supply grid 120.

In some embodiments, the electronic device 131, 132 may comprise a **sending circuit 604** configured to send to the grid of communication points 110, 120 at least one of: a) the capability information regarding adaptability to one or more services provided by the grid of communication points 110, 120, and b) the service request.

The embodiments herein in the electronic device 131, 132 for obtaining assistance from the grid of communication points 110, 120 may be implemented through one or more processors, such as a **processing circuit 605** in the electronic device 131, 132 depicted in Figure 6, together with computer program code for performing the functions and actions of the embodiments herein. The program code mentioned above may also be provided as a computer program product, for instance in the form of a data carrier carrying computer program code for performing the embodiments herein when being loaded into the in the electronic device 131, 132. One such carrier may be in the form of a CD ROM disc. It may be however feasible with other data carriers such as a memory stick. The computer program code may furthermore be provided as pure program code on a server and downloaded to the electronic device 131, 132.

The electronic device 131, 132 may further comprise a **memory circuit 606** comprising one or more memory units. The memory circuit 606 may be arranged to be used to store data such as, the information received by the processing circuit 605 in relation to applications to perform the methods herein when being executed in the electronic device 131, 132. Memory circuit 606 may be in communication with the processing circuit 605. Any of the other information processed by the processing circuit 605 may also be stored in the memory circuit 606.

In some embodiments, information from the grid of near field devices 110 in the grid of communication points 110, 120 may be received through a **receiving port 607**. In some embodiments, the receiving port 607 may be, for example, connected to the one or more antennas in the electronic device 131, 132. In other embodiments, the electronic device 131, 132 may receive power from the wireless power supply grid 120 in the grid of communication points 110, 120 through the receiving port 607. Since the receiving port 607 may be in communication with the processing circuit 605, the receiving port 607 may then

send the received information to the processing circuit 605. The receiving port 607 may also be configured to receive other information.

The information received by the processing circuit 605 in relation to methods herein, may be stored in the memory circuit 606 which, as stated earlier, may be in communication with the processing circuit 605 and the receiving port 607.

The processing circuit 605 may be further configured to send or signal information to, for example, the grid of near field devices 110 in the grid of communication points 110, 120, through a **sending port 608**, which may be in communication with the processing circuit 605, and the memory circuit 606.

Those skilled in the art will also appreciate that the detecting circuit 601, the obtaining circuit 602, the demodulating circuit 603 and the sending circuit 604 described above may refer to a combination of analog and digital circuits, and/or one or more processors configured with software and/or firmware (e.g., stored in memory) that, when executed by the one or more processors such as the processing circuit 605, perform as described above. One or more of these processors, as well as the other digital hardware, may be included in a single application-specific integrated circuit (ASIC), or several processors and various digital hardware may be distributed among several separate components, whether individually packaged or assembled into a system-on-a-chip (SoC).

In the above-description of various embodiments of the present invention, it is to be understood that the terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of this specification and the relevant art and will not be interpreted in an idealized or overly formal sense expressly so defined herein.

When an element is referred to as being "connected", "coupled", "responsive", or variants thereof to another element, it can be directly connected, coupled, or responsive to the other element or intervening elements may be present. In contrast, when an element is referred to as being "directly connected", "directly coupled", "directly responsive", or variants thereof to another element, there are no intervening elements present. Like numbers refer

to like elements throughout. Furthermore, "coupled", "connected", "responsive", or variants thereof as used herein may include wirelessly coupled, connected, or responsive. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. Well-known functions or constructions may not be described in detail for brevity and/or clarity. The term "and/or" includes any and all combinations of one or more of the associated listed items. "Mounted" or "hung" are used indistinctively.

As used herein, the terms "comprise", "comprising", "comprises", "include", "including", "includes", "have", "has", "having", or variants thereof are open-ended, and include one or more stated features, integers, elements, steps, components or functions but does not preclude the presence or addition of one or more other features, integers, elements, steps, components, functions or groups thereof. Furthermore, as used herein, the common abbreviation "e.g.", which derives from the Latin phrase "exempli gratia," may be used to introduce or specify a general example or examples of a previously mentioned item, and is not intended to be limiting of such item. The common abbreviation "i.e.", which derives from the Latin phrase "id est," may be used to specify a particular item from a more general recitation.

Example embodiments are described herein with reference to block diagrams and/or flowchart illustrations of computer-implemented methods, apparatus (systems and/or devices) and/or computer program products. It is understood that a block of the block diagrams and/or flowchart illustrations, and combinations of blocks in the block diagrams and/or flowchart illustrations, can be implemented by computer program instructions that are performed by one or more computer circuits. These computer program instructions may be provided to a processor circuit of a general purpose computer circuit, special purpose computer circuit, and/or other programmable data processing circuit to produce a machine, such that the instructions, which execute via the processor of the computer and/or other programmable data processing apparatus, transform and control transistors, values stored in memory locations, and other hardware components within such circuitry to implement the functions/acts specified in the block diagrams and/or flowchart block or blocks, and thereby create means (functionality) and/or structure for implementing the functions/acts specified in the block diagrams and/or flowchart block(s).

These computer program instructions may also be stored in a tangible computer-readable medium that can direct a computer or other programmable data processing apparatus to function in a particular manner, such that the instructions stored in the computer-readable medium produce an article of manufacture including instructions which

implement the functions/acts specified in the block diagrams and/or flowchart block or blocks.

A tangible, non-transitory computer-readable medium may include an electronic, magnetic, optical, electromagnetic, or semiconductor data storage system, apparatus, or device. More specific examples of the computer-readable medium would include the following: a portable computer diskette, a random access memory (RAM) circuit, a read-only memory (ROM) circuit, an erasable programmable read-only memory (EPROM or Flash memory) circuit, a portable compact disc read-only memory (CD-ROM), and a portable digital video disc read-only memory (DVD/BlueRay).

The computer program instructions may also be loaded onto a computer and/or other programmable data processing apparatus to cause a series of operational steps to be performed on the computer and/or other programmable apparatus to produce a computer-implemented process such that the instructions which execute on the computer or other programmable apparatus provide steps for implementing the functions/acts specified in the block diagrams and/or flowchart block or blocks. Accordingly, embodiments of the present invention may be embodied in hardware and/or in software (including firmware, resident software, micro-code, etc.) that runs on a processor such as a digital signal processor, which may collectively be referred to as "circuitry," "a module" or variants thereof.

It should also be noted that in some alternate implementations, the functions/acts noted in the blocks may occur out of the order noted in the flowcharts. For example, two blocks shown in succession may in fact be executed substantially concurrently or the blocks may sometimes be executed in the reverse order, depending upon the functionality/acts involved. Moreover, the functionality of a given block of the flowcharts and/or block diagrams may be separated into multiple blocks and/or the functionality of two or more blocks of the flowcharts and/or block diagrams may be at least partially integrated. Finally, other blocks may be added/inserted between the blocks that are illustrated, and/or blocks/operations may be omitted without departing from the scope of the invention. Moreover, although some of the diagrams include arrows on communication paths to show a primary direction of communication, it is to be understood that communication may occur in the opposite direction to the depicted arrows.

Many different embodiments have been disclosed herein, in connection with the above description and the drawings. It will be understood that it would be unduly repetitious and obfuscating to literally describe and illustrate every combination and subcombination of these embodiments. Accordingly, all embodiments can be combined in any way and/or

combination, and the present specification shall support claims to any such combination or subcombination.

## CLAIMS:

1. A grid of communication points (110, 120) for providing assistance to an electronic device (131, 132) configured to communicate with the grid of communication points (110, 120), which grid of communication points (110, 120) is adapted to be attached to or embedded in a surface, and which grid of communication points (110, 120) is configured to:
  - detect the electronic device (131, 132) when it is located within a determined distance from at least one of the communication points in the grid of communication points (110, 120) via a communication link between the electronic device (131, 132) and said at least one of the communication points, and to provide assistance to the detected electronic device (131, 132) via said at least one of the communication points or via another one of the communication points in the grid of communication points (110, 120), which assistance comprises at least one of:
    - a. radio access to a communications network (141, 142), wherein the grid of communication points (110, 120) comprises a grid of near field devices (110), and
    - b. wireless power supply, wherein the grid of communication points (110, 120) comprises a wireless supply grid (120).
2. The grid of communication points (110, 120) of claim 1, wherein the grid of near field devices (110) is a grid of Near Field Communication, NFC, devices.
3. The grid of communication points (110, 120) of any of claims 1-2, wherein the grid of communication points (110, 120) comprises the wireless power supply grid (120) and the grid of near field devices (110), and wherein the grid of communication points (110, 120) further comprises a *modulating circuit* (503) configured to modulate a network signal configured to be provided by the grid of near field devices (110), onto a power transmitting field configured to be provided by the wireless power supply grid (120).
4. The grid of communication points (110, 120) of any of claims 1-3, wherein the grid of communication points (110, 120) is attached to or embedded in a wallpaper (135) or a board.

5. The grid of communication points (110, 120) of any of claims 1-4, wherein to detect comprises to identify the electronic device (131, 132).
6. The grid of communication points (110, 120) of any of claims 1-5, further comprising a  
5 *receiving circuit* (504) configured to receive at least one of:
- a. a capability information from the electronic device (131, 132),  
regarding adaptability to one or more services provided by the grid  
of communication points (110, 120), and
  - b. a service request from the electronic device (131, 132).
- 10 7. The grid of communication points (110, 120) of any of claims 1-6, further comprising a  
*determining circuit* (506) configured to determine a location of the electronic device  
(131, 132).
- 15 8. A method in a grid of communication points (110, 120) for providing assistance to an  
electronic device (131, 132) configured to communicate with the grid of  
communication points (110, 120), which grid of communication points (110, 120) is  
adapted to be attached to or embedded in a surface, and the method comprising:
- 20 *detecting* (200) the electronic device (131, 132) when it is located within a  
determined distance from at least one of the communication points in the grid of  
communication points (110, 120) via a communication link between the  
electronic device (131, 132) and said at least one of the communication points,  
and
- 25 *providing* (205) assistance to the detected electronic device (131, 132) via  
said at least one of the communication points or via another one of the  
communication points in the grid of communication points (110, 120), which  
assistance comprises at least one of:
- a. radio access to a communications network (141, 142), wherein the  
grid of communication points (110, 120) comprises a grid of near  
30 field devices (110), and
  - b. wireless power supply, wherein the grid of communication points  
(110, 120) comprises a wireless supply grid (120).
- 35 9. The method of claim 8, wherein the grid of near field devices (110) is a grid of Near  
Field Communication, NFC, devices.

10. The method of any of claims 8-9, wherein the grid of communication points (110, 120) comprises the wireless power supply grid (120) and the grid of near field devices (110), and wherein the method further comprises *modulating* (204) a network signal provided by the grid of near field devices (110), onto a power transmitting field provided by the wireless power supply grid (120).
11. The method of any of claims 8-10, wherein the grid of communication points (110, 120) is attached to or embedded in a wallpaper (135) or a board.
12. The method of any of claims 8-11, wherein detecting comprises *identifying* the electronic device (131, 132).
13. The method of any of claims 8-12, further comprising *receiving* (202) at least one of:
- a. a capability information from the electronic device (131, 132), regarding adaptability to one or more services provided by the grid of communication points (110, 120), and
  - b. a service request from the electronic device (131, 132).
14. The method of any of claims 8-13, further comprising *determining* (201) a location of the electronic device (131, 132).
15. A method in an electronic device (131, 132) for obtaining assistance from a grid of communication points (110, 120), the electronic device (131, 132) being configured to communicate with the grid of communication points (110, 120), which grid of communication points (110, 120) is adapted to be attached to or embedded in a surface, and the method comprising:
- detecting* (300) the grid of communication points (110, 120) when the electronic device (131, 132) is located within a determined distance from at least one of the communication points in the grid of communication points (110, 120) via a communication link between the electronic device (131, 132) and said at least one of the communication points, and
  - obtaining* (302) assistance from the grid of communication points (110, 120) via said at least one of the communication points or via another one of the communication points in the grid of communication points (110, 120), which assistance comprises at least one of:

- a. radio access to a communications network (141, 142), wherein the grid of communication points (110, 120) comprises a grid of near field devices (110), and
- b. wireless power supply, wherein the grid of communication points (110, 120) comprises a wireless supply grid (120).

16. The method of claim 15, wherein the grid of near field devices (110) is a grid of Near Field Communication, NFC, devices.

17. The method of any of claims 15-16, wherein the grid of communication points (110, 120) comprises the wireless power supply grid (120) and the grid of near field devices (110), and wherein the method further comprises *demodulating* (304) a network signal obtained from the grid of near field devices (110), onto a power transmitting field obtained from the wireless power supply grid (120).

18. An electronic device (131, 132) for obtaining assistance from a grid of communication points (110, 120), which grid of communication points (110, 120) is adapted to be attached to or embedded in a surface, the electronic device (131, 132) comprising:

a *detecting circuit* (601) configured to detect the grid of communication points (110, 120), when the electronic device (131, 132) is located within a determined distance from at least one of the communication points in the grid of communication points (110, 120) via a communication link between the electronic device (131, 132) and said at least one of the communication points, and

an *obtaining circuit* (602) configured to obtain assistance from the detected grid of communication points (110, 120) via said at least one of the communication points or via another one of the communication points in the grid of communication points (110, 120), which assistance comprises at least one of:

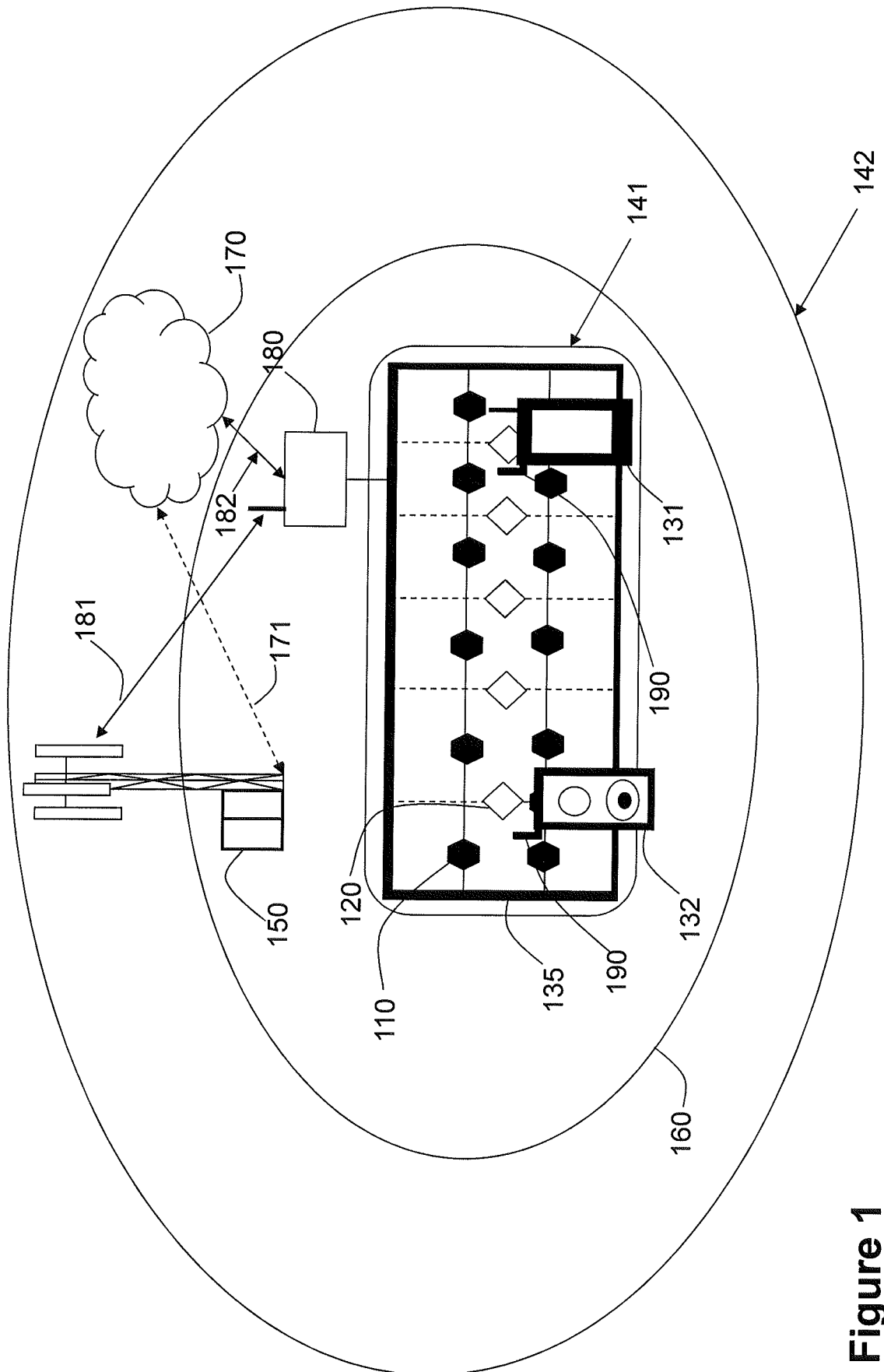
- a. radio access to a communications network (141, 142), wherein the grid of communication points (110, 120) comprises a grid of near field devices (110), and
- b. wireless power supply, wherein the grid of communication points (110, 120) comprises a wireless supply grid (120).

19. The electronic device (131, 132) of claim 18, wherein the grid of near field devices (110) is a grid of Near Field Communication, NFC, devices.

20. The electronic device (131, 132) of any of claims 18-19, wherein the grid of communication points (110, 120) comprises the wireless power supply grid (120) and the grid of near field devices (110), and wherein the electronic device (131, 132) further comprises a *demodulating circuit* (603) configured to demodulate a network signal a network signal obtained from the grid of near field devices (110), onto a power transmitting field obtained from the wireless power supply grid (120).

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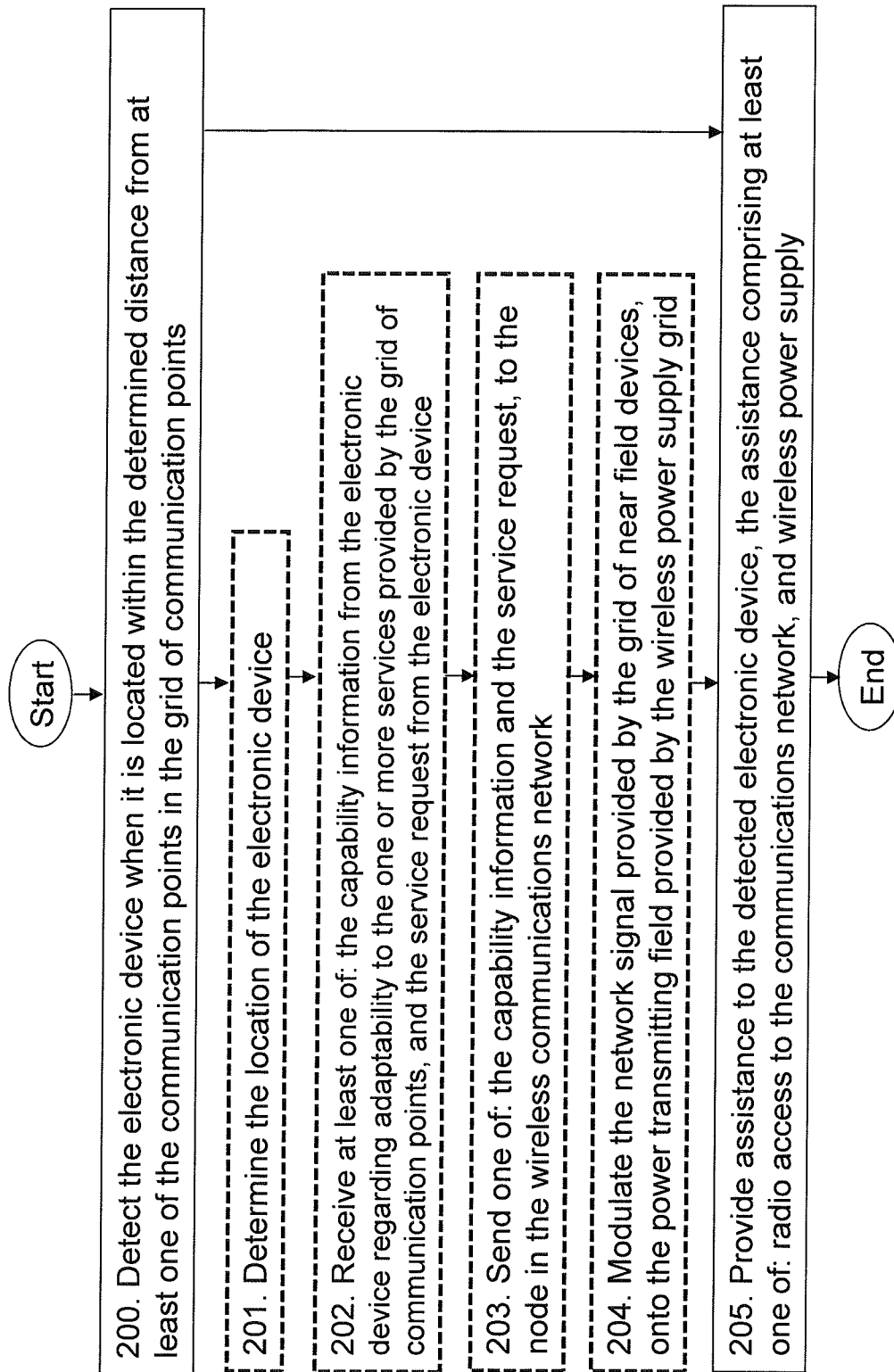


Figure 2

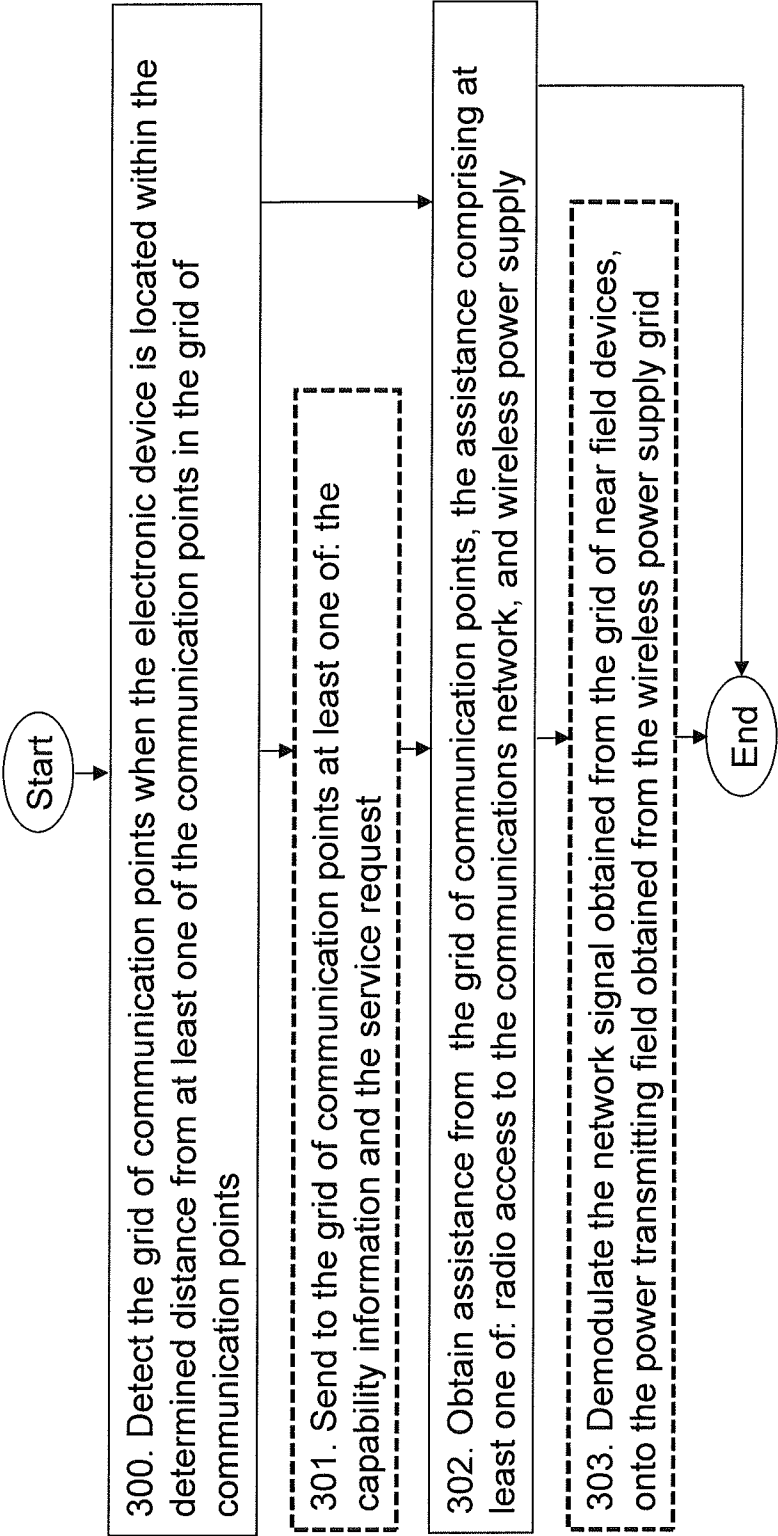


Figure 3

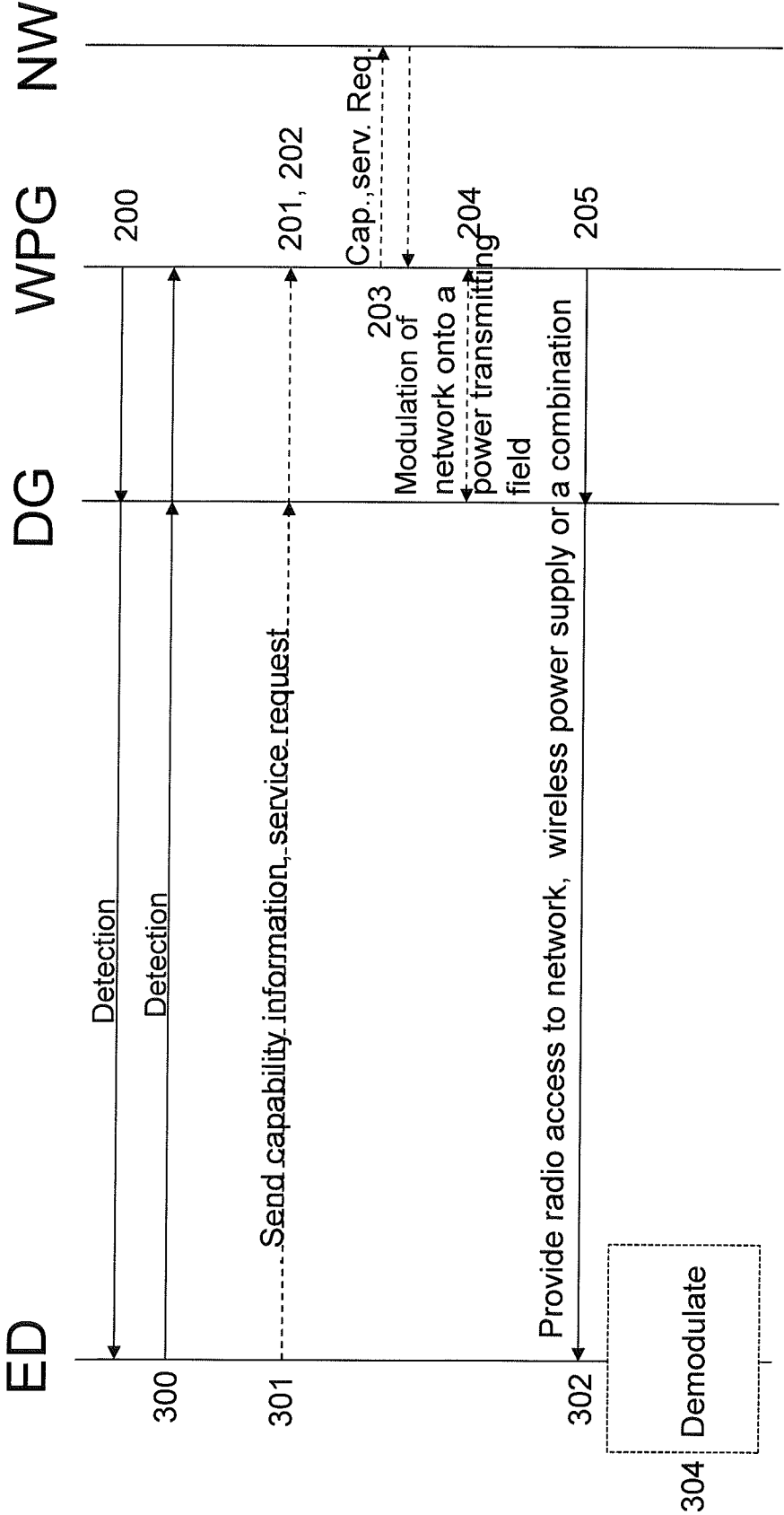
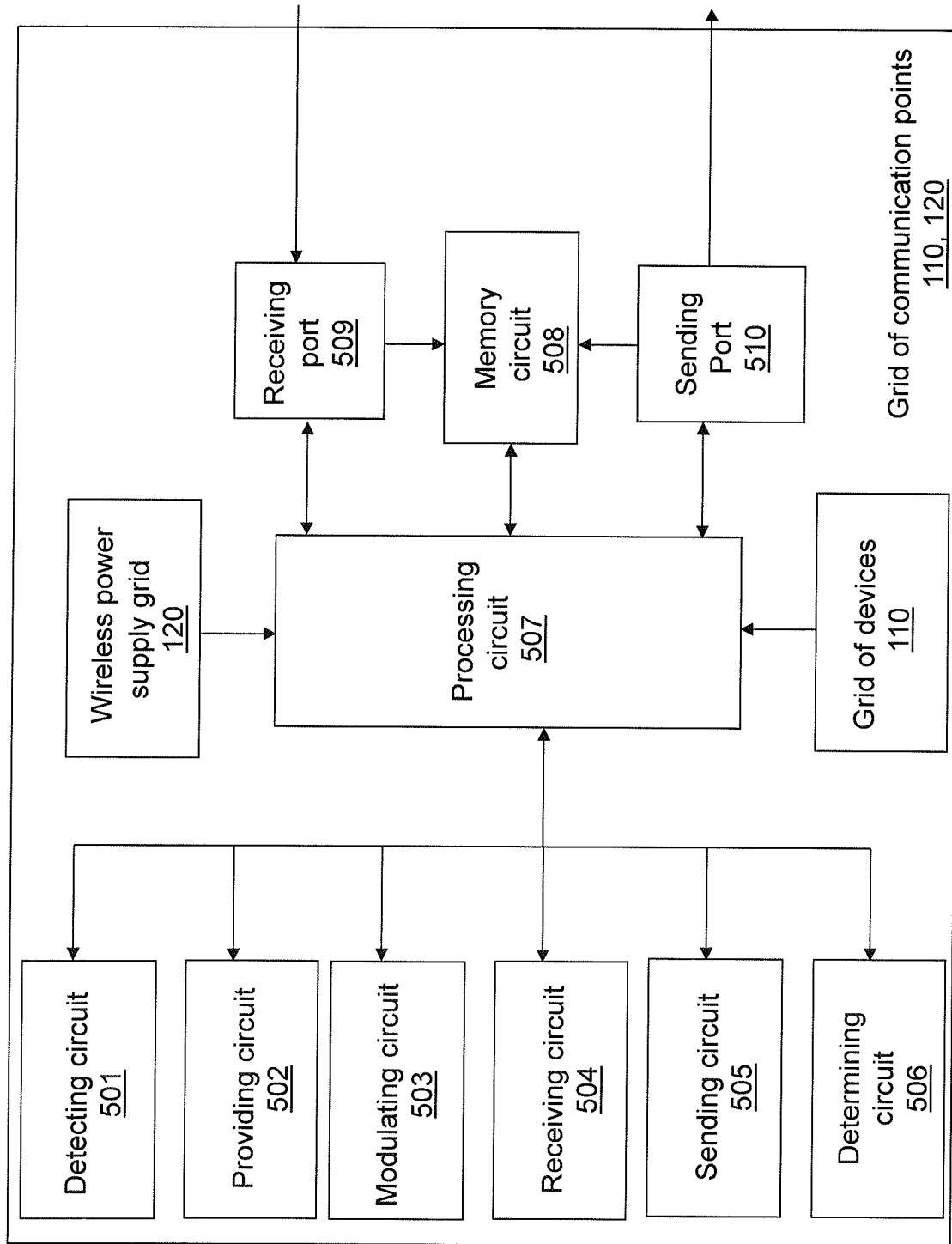


Figure 4

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**Figure 5**

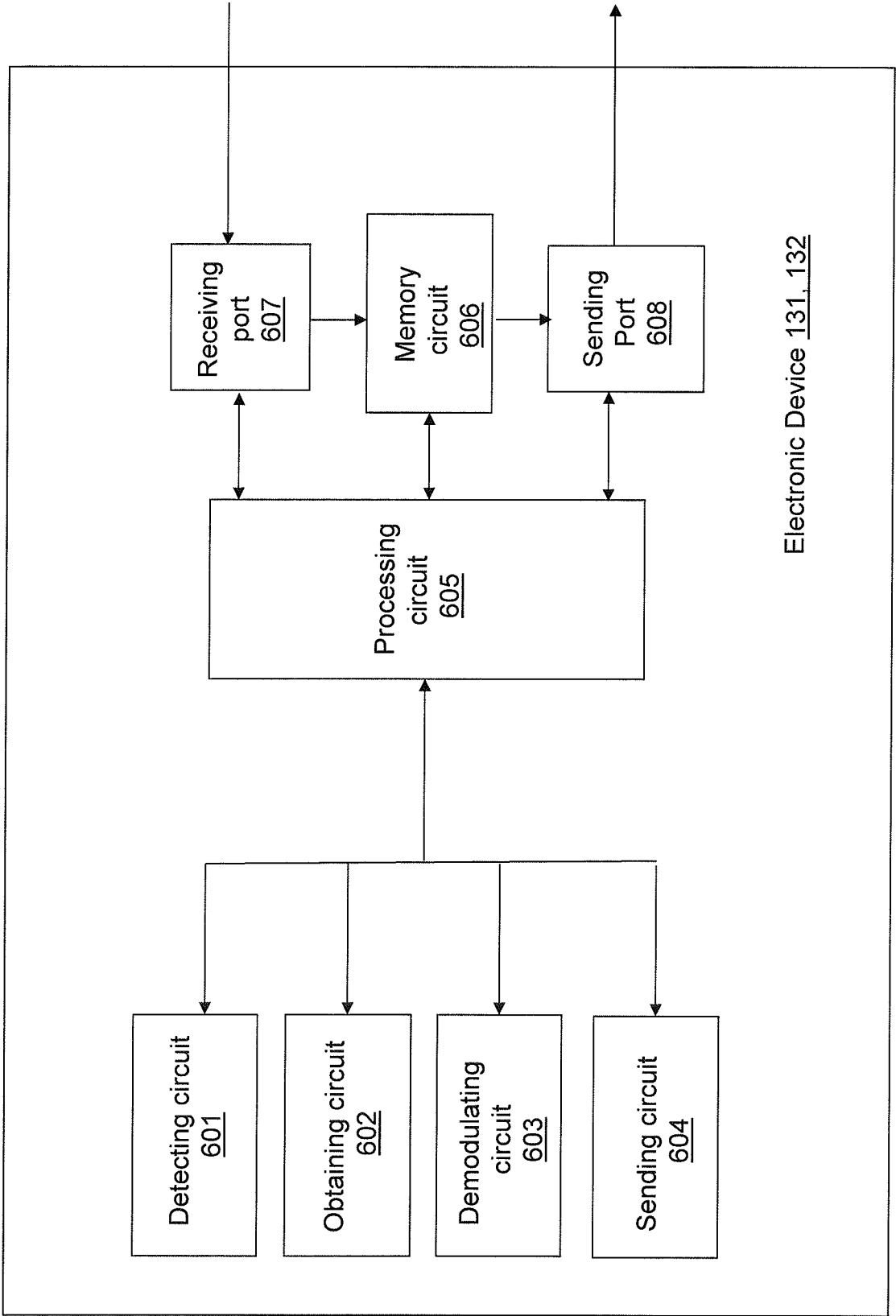


Figure 6

## INTERNATIONAL SEARCH REPORT

International application No

PCT/SE2013/050743

## A. CLASSIFICATION OF SUBJECT MATTER

INV. H04W4/00 H02J17/00  
 ADD. H04W88/04

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04W H02J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                                           | Relevant to claim No.                 |
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| Y         | paragraph [0007]<br>paragraph [0047]<br>paragraph [0051]<br>paragraph [0068] - paragraph [0072]<br>paragraph [0077]<br>paragraph [0079]<br><br>-----<br>-/-- | 2,4,6,7,<br>9,11,13,<br>14,16,19      |



Further documents are listed in the continuation of Box C.



See patent family annex.

## \* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;" document member of the same patent family

Date of the actual completion of the international search

13 February 2014

Date of mailing of the international search report

20/02/2014

Name and mailing address of the ISA/

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 Fax: (+31-70) 340-3016

Authorized officer

Orfanos, Georgios

## INTERNATIONAL SEARCH REPORT

International application No

PCT/SE2013/050743

| C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT |                                                                                                                     |                        |
|------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|------------------------|
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|                                                      | paragraph [0016]                                                                                                    |                        |
|                                                      | paragraph [0024]                                                                                                    |                        |
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|                                                      | paragraph [0031] - paragraph [0039]                                                                                 |                        |
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|                                                      | paragraph [0046]                                                                                                    |                        |
|                                                      | paragraph [0049]                                                                                                    |                        |
|                                                      | paragraph [0053]                                                                                                    |                        |
|                                                      | paragraph [0057]                                                                                                    |                        |
|                                                      | paragraph [0061]                                                                                                    |                        |
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|                                                      | paragraph [0058] - paragraph [0065]                                                                                 |                        |
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|                                                      | paragraph [0020] - paragraph [0021]                                                                                 |                        |
|                                                      | paragraph [0033]                                                                                                    |                        |
|                                                      | paragraph [0049]                                                                                                    |                        |
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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/SE2013/050743

| Patent document<br>cited in search report |    |            | Publication<br>date |            | Patent family<br>member(s) |  |            | Publication<br>date |  |
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