



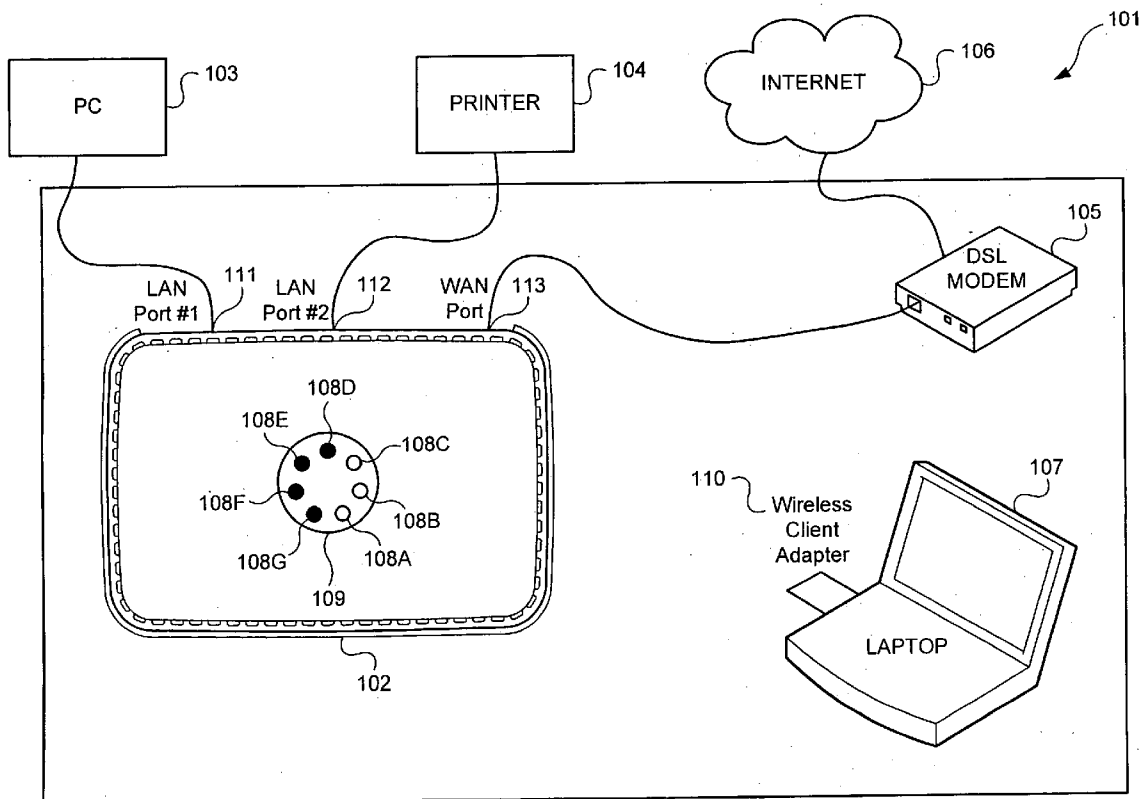
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(19) **United States**(12) **Patent Application Publication****Rada et al.**(10) **Pub. No.: US 2007/0002846 A1**(43) **Pub. Date:****Jan. 4, 2007**(54) **PERIPHERAL DEVICE WITH VISUAL INDICATORS TO SHOW UTILIZATION OF RADIO COMPONENT**(76) Inventors: **Patrick Rada**, San Jose, CA (US);
Smiley Kuntjoro, Fremont, CA (US)

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PALO ALTO, CA 94304-1050 (US)(21) Appl. No.: **11/173,888**(22) Filed: **Jun. 30, 2005****Publication Classification**(51) **Int. Cl.****H04Q 11/00** (2006.01)**H04L 12/50** (2006.01)(52) **U.S. Cl.** **370/358**(57) **ABSTRACT**

An embodiment of the invention is directed to a method involving a client device and a computer network peripheral device. An embodiment is disclosed including transmitting data within the computer network, receiving content from among the transmitted data, determining an aspect of streamed content, and controlling a visual user output on the peripheral device, based on the determined aspect of the content, and streaming the content to the client device. The client device may comprise at least one of the devices selected from the following: a personal computer, a media player, a game station, a television, a monitor, a high-definition television (HDTV), a wireless access point (AP) client, a wireless satellite receiver, or a personal video recorder. The computer network peripheral device may comprise a router, a modem, or a firewall. Other embodiments are directed to other methods as well as various devices.



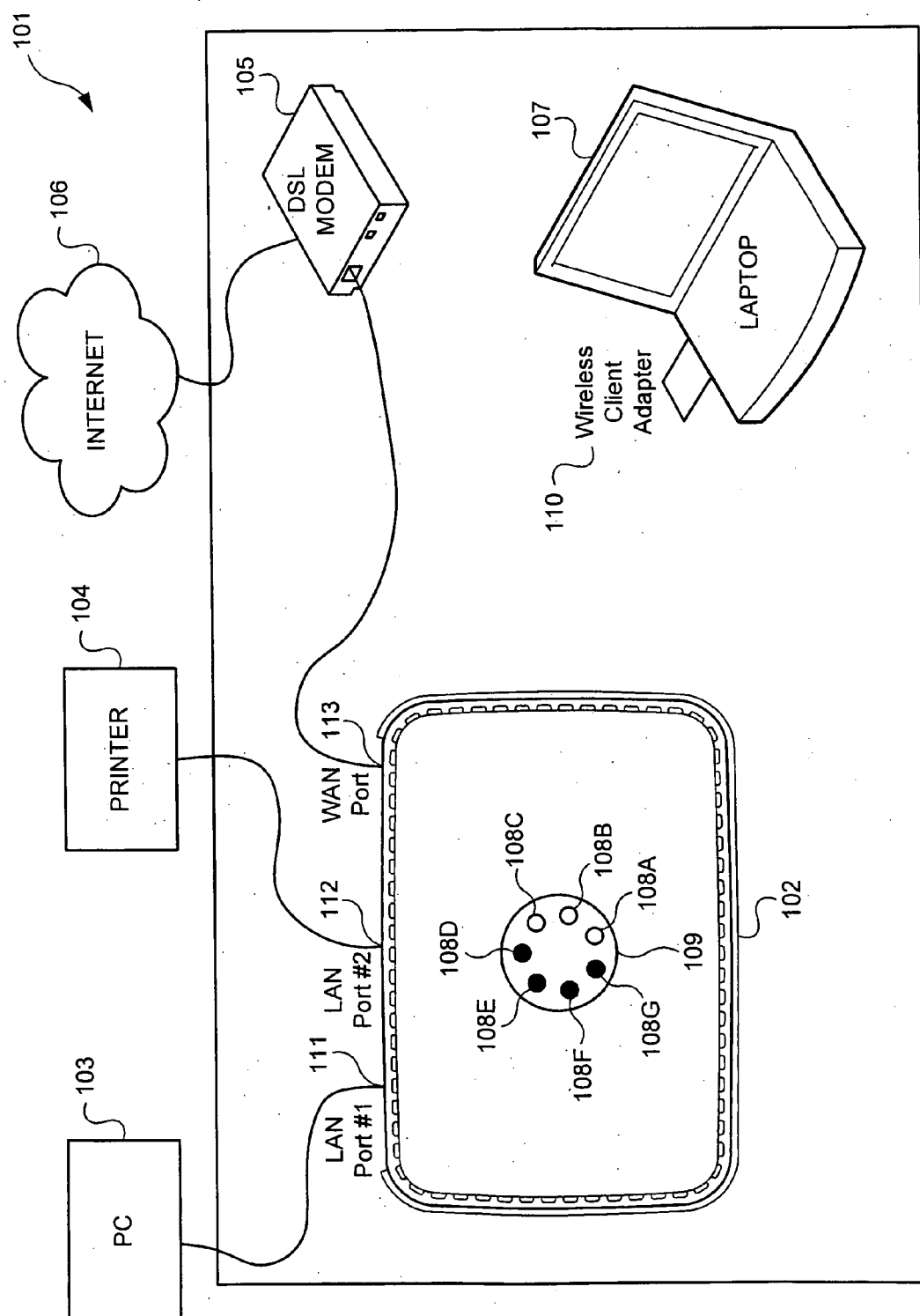


Figure 1A

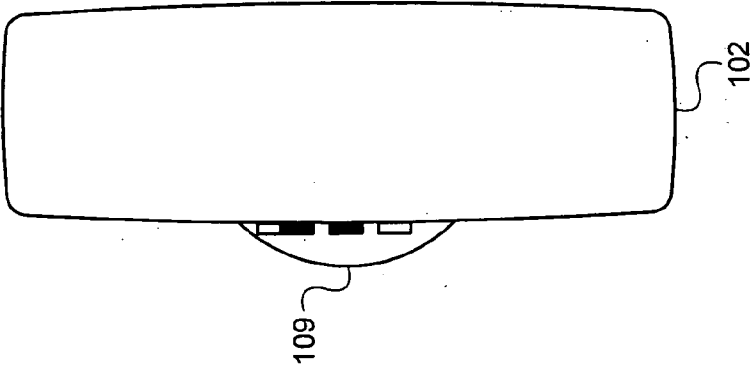


Figure 1C

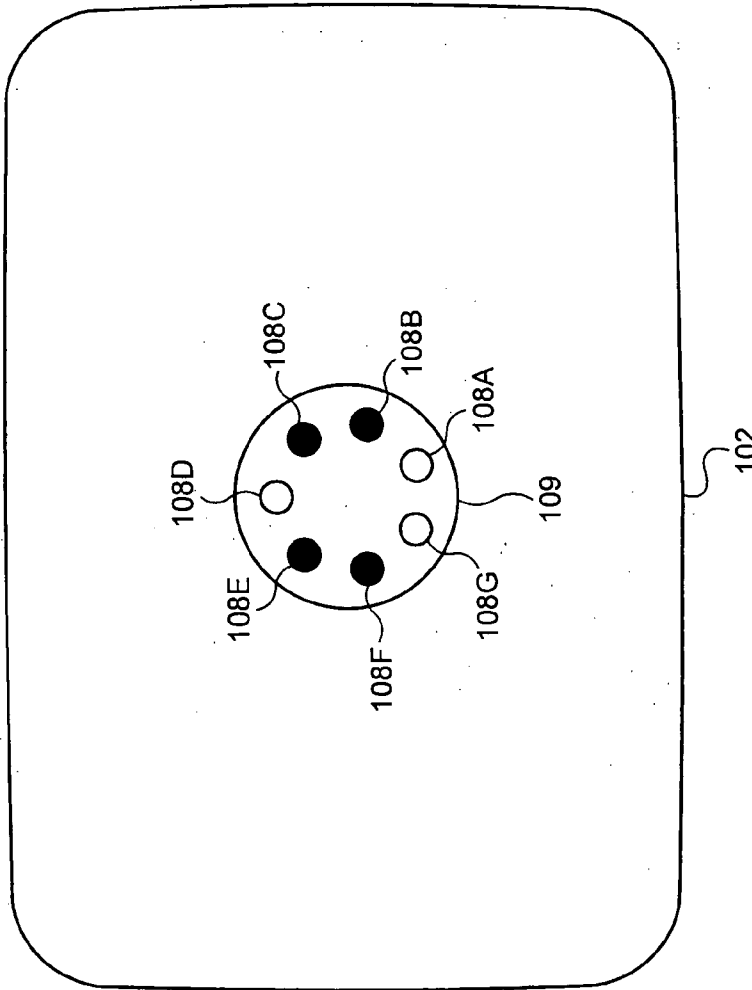


Figure 1B

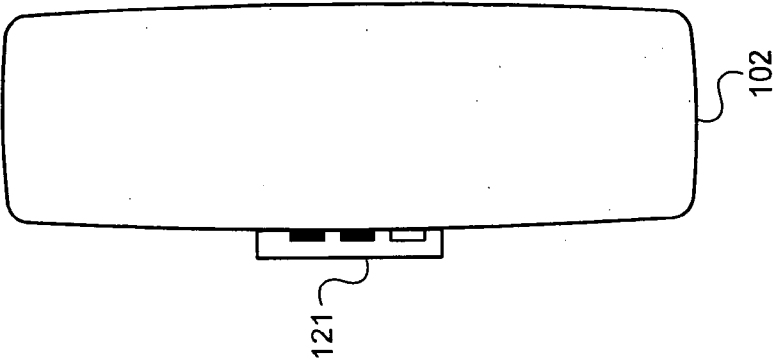


Figure 1E

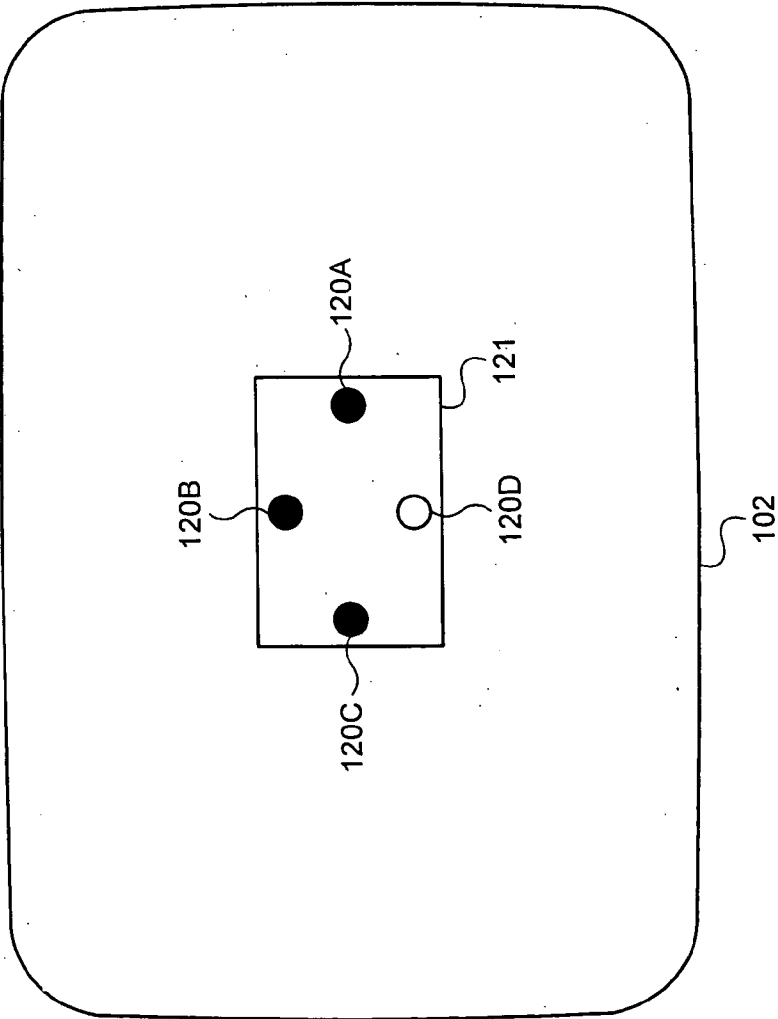


Figure 1D

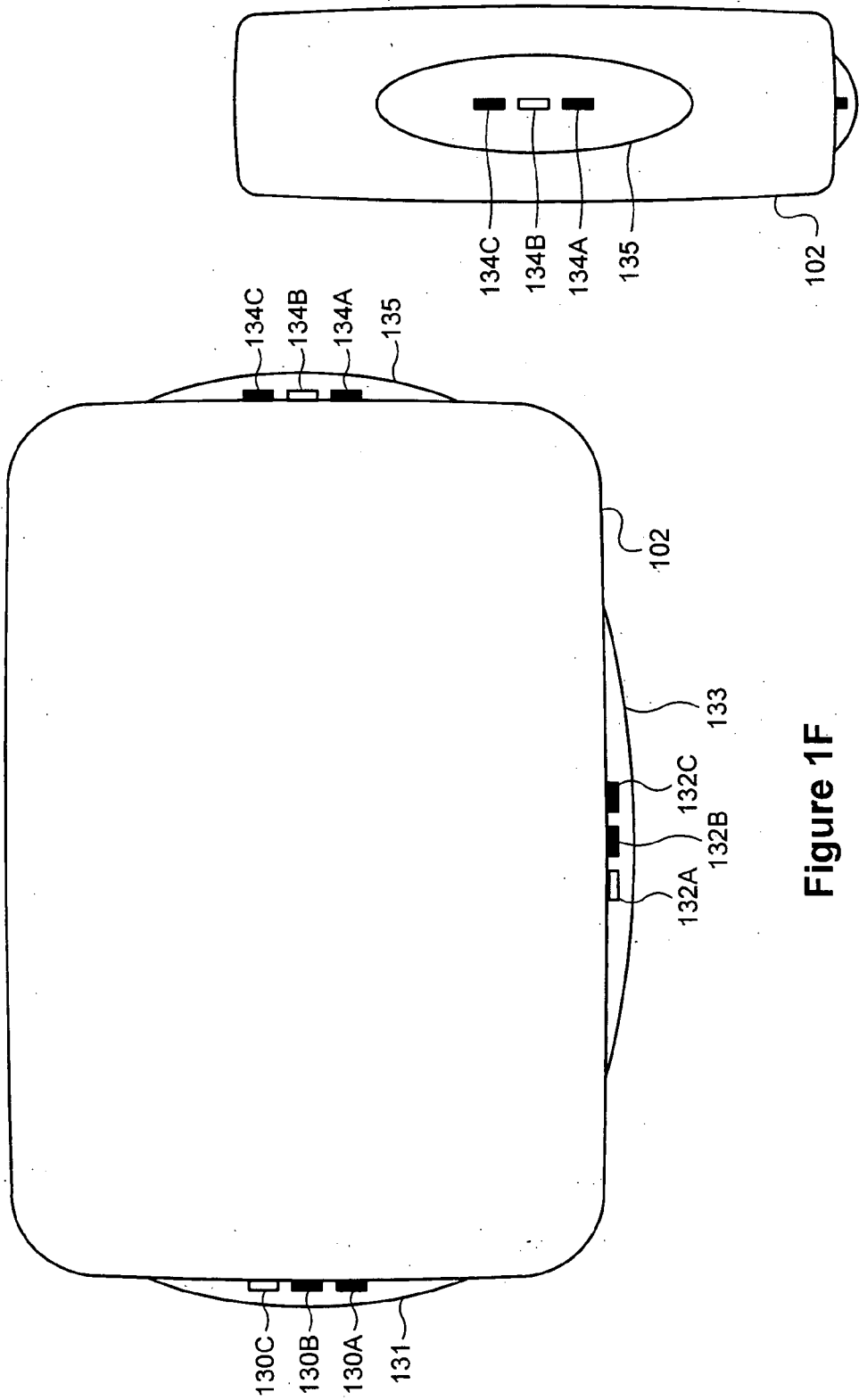


Figure 1F

Figure 1G

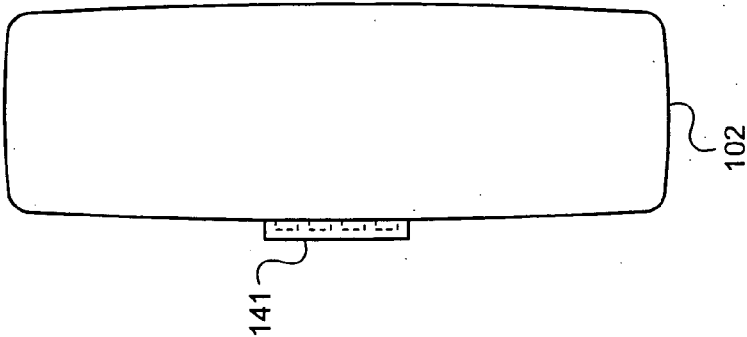


Figure 1I

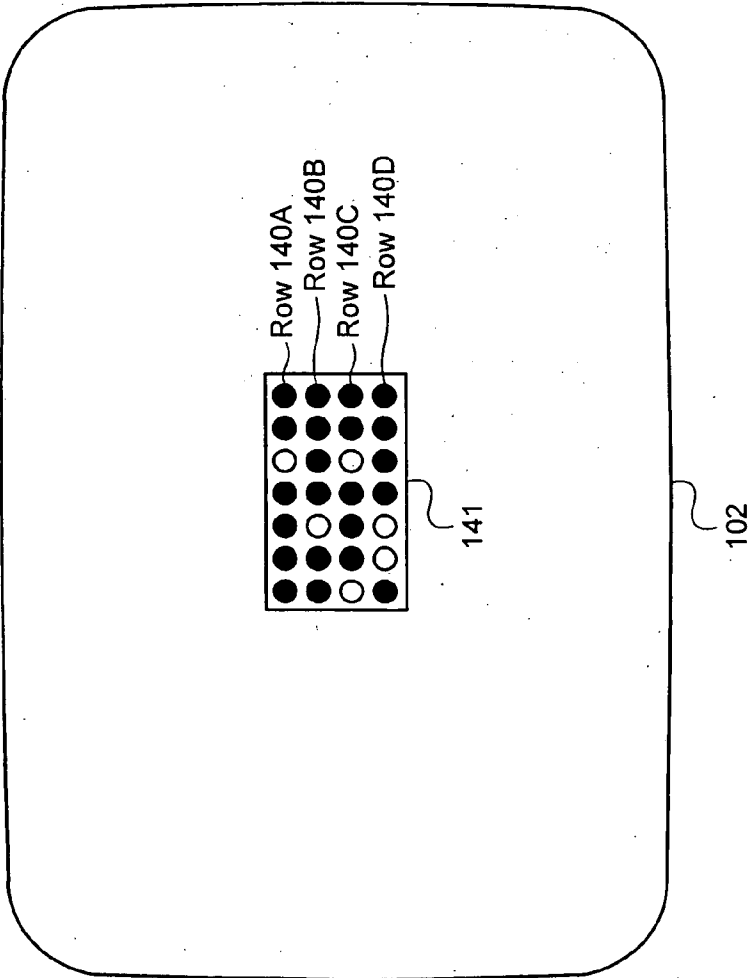


Figure 1H

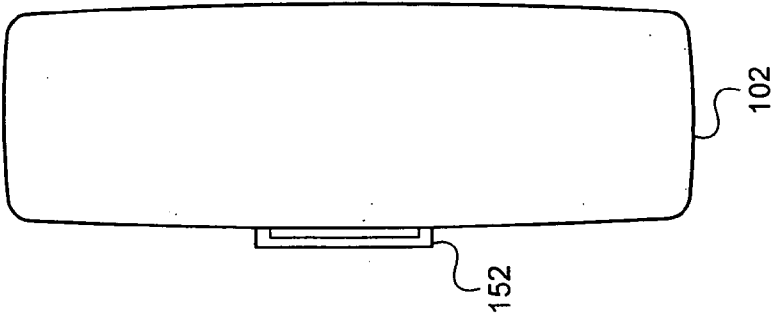


Figure 1K

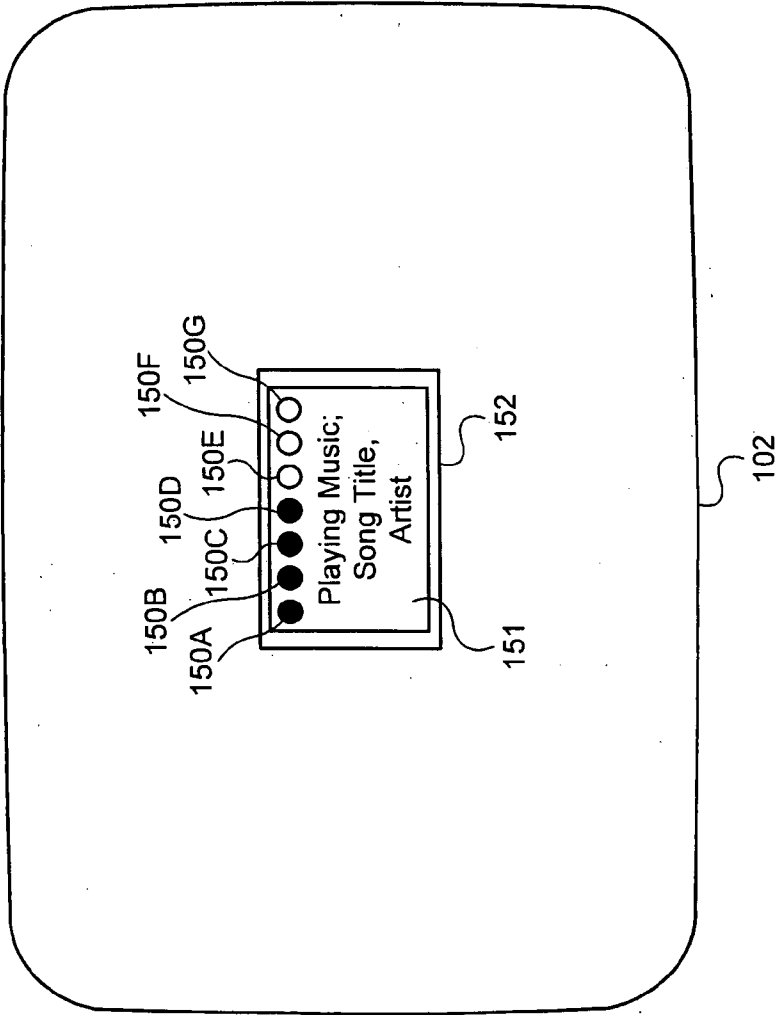


Figure 1J

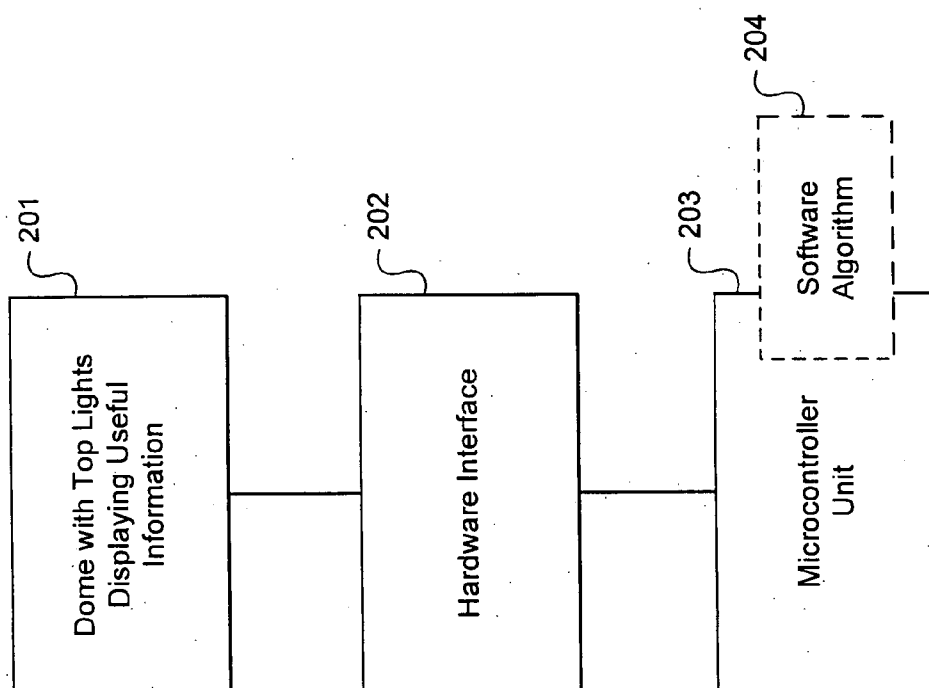


Figure 2

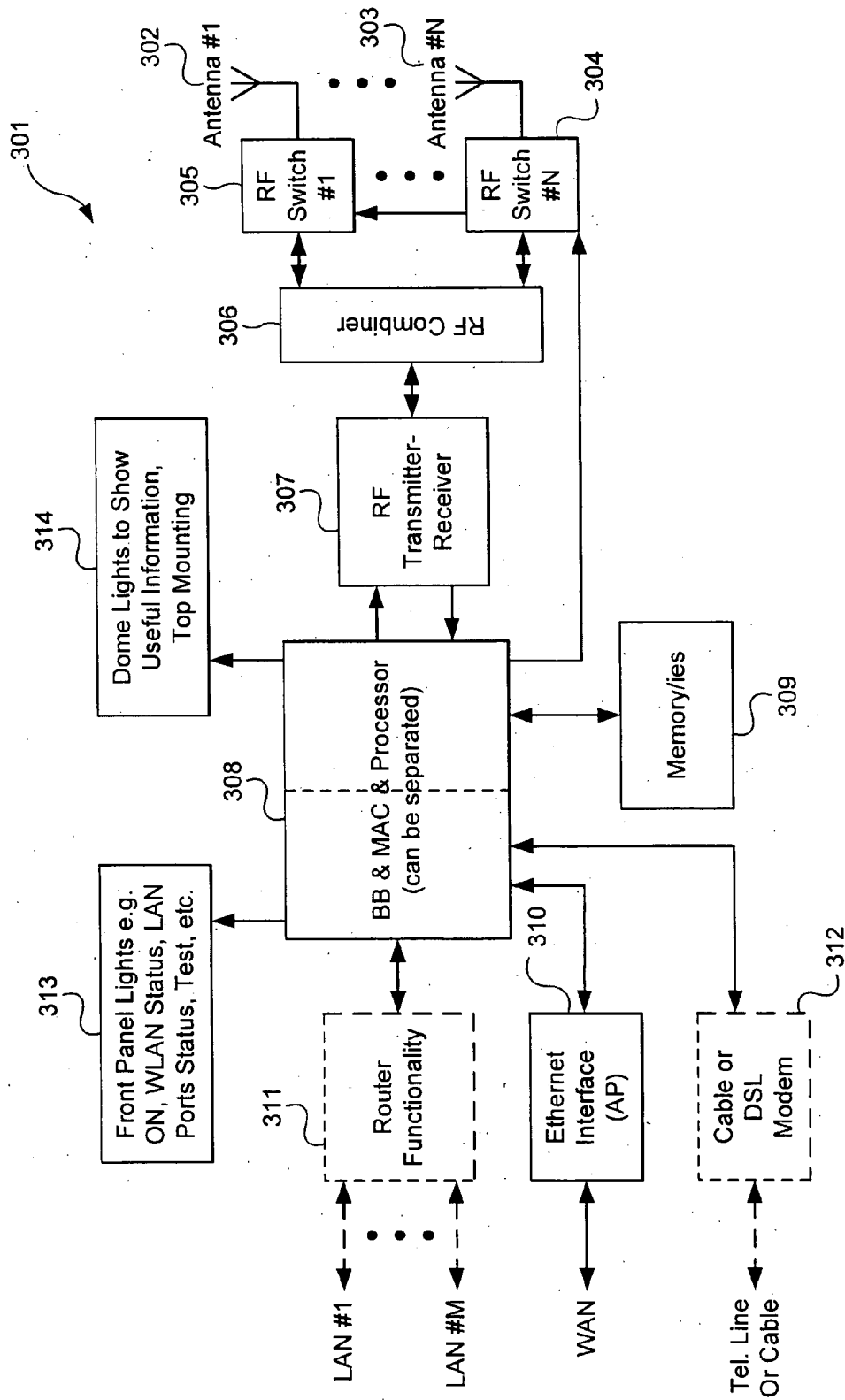


Figure 3

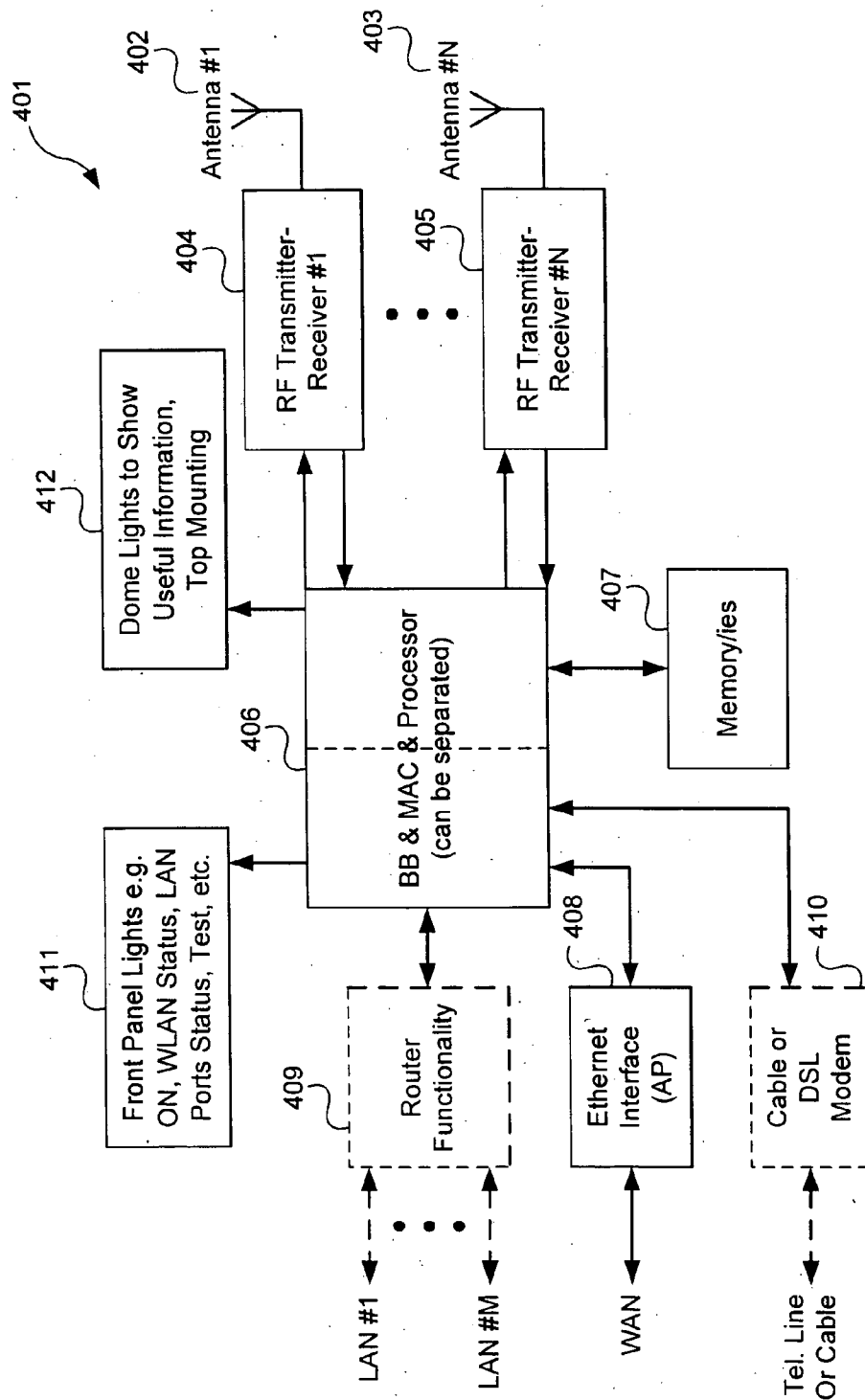


Figure 4

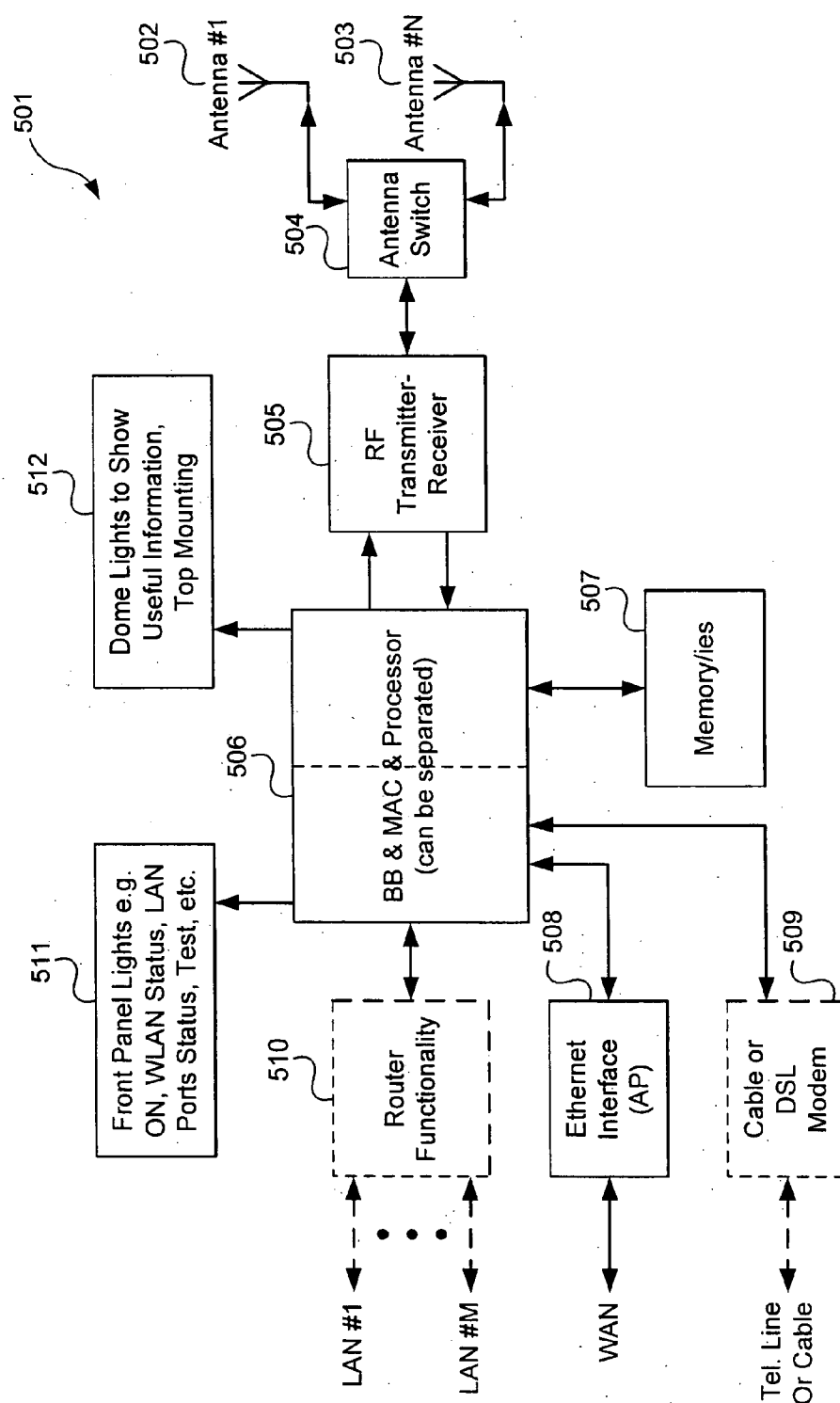


Figure 5

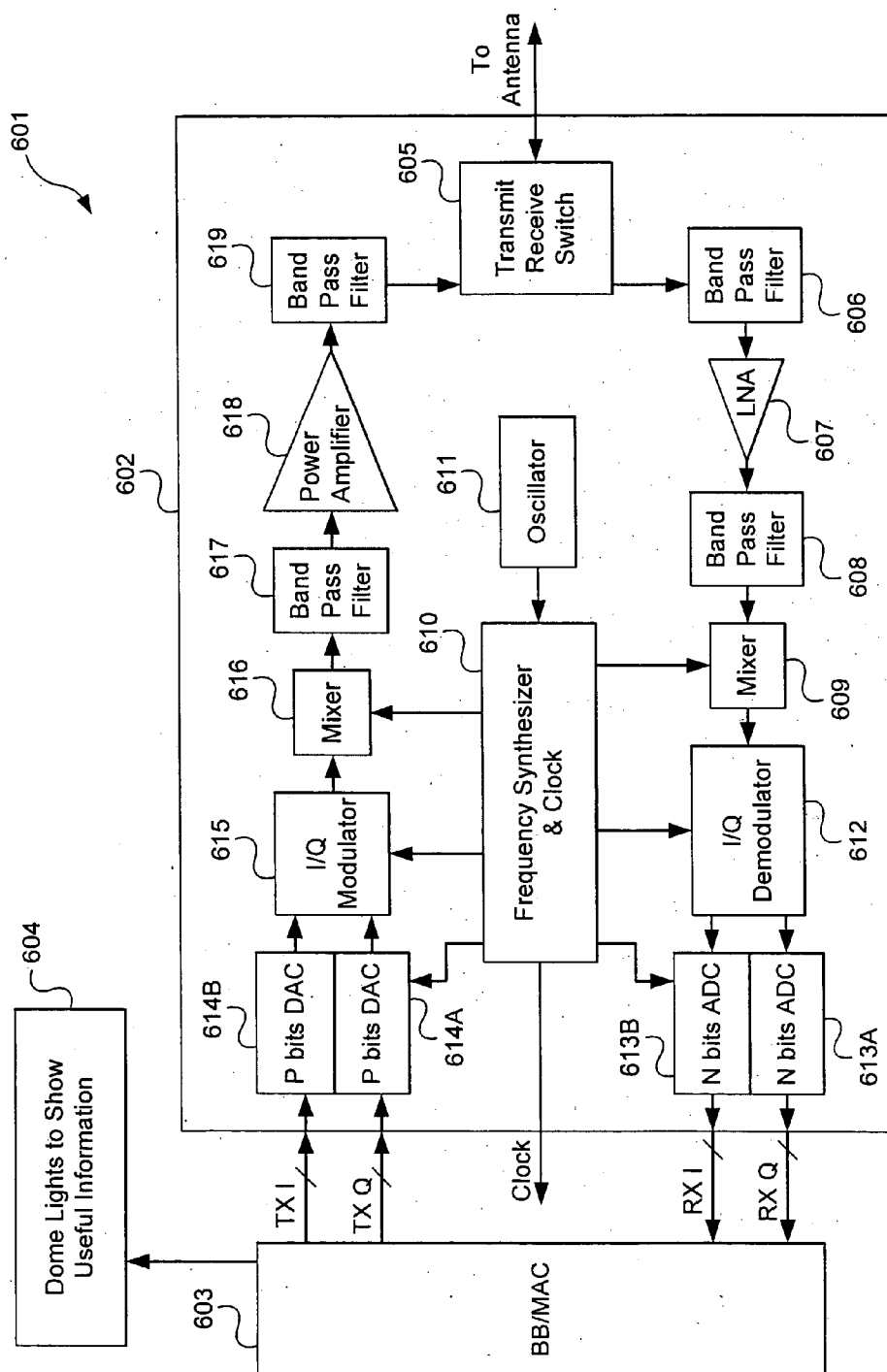


Figure 6

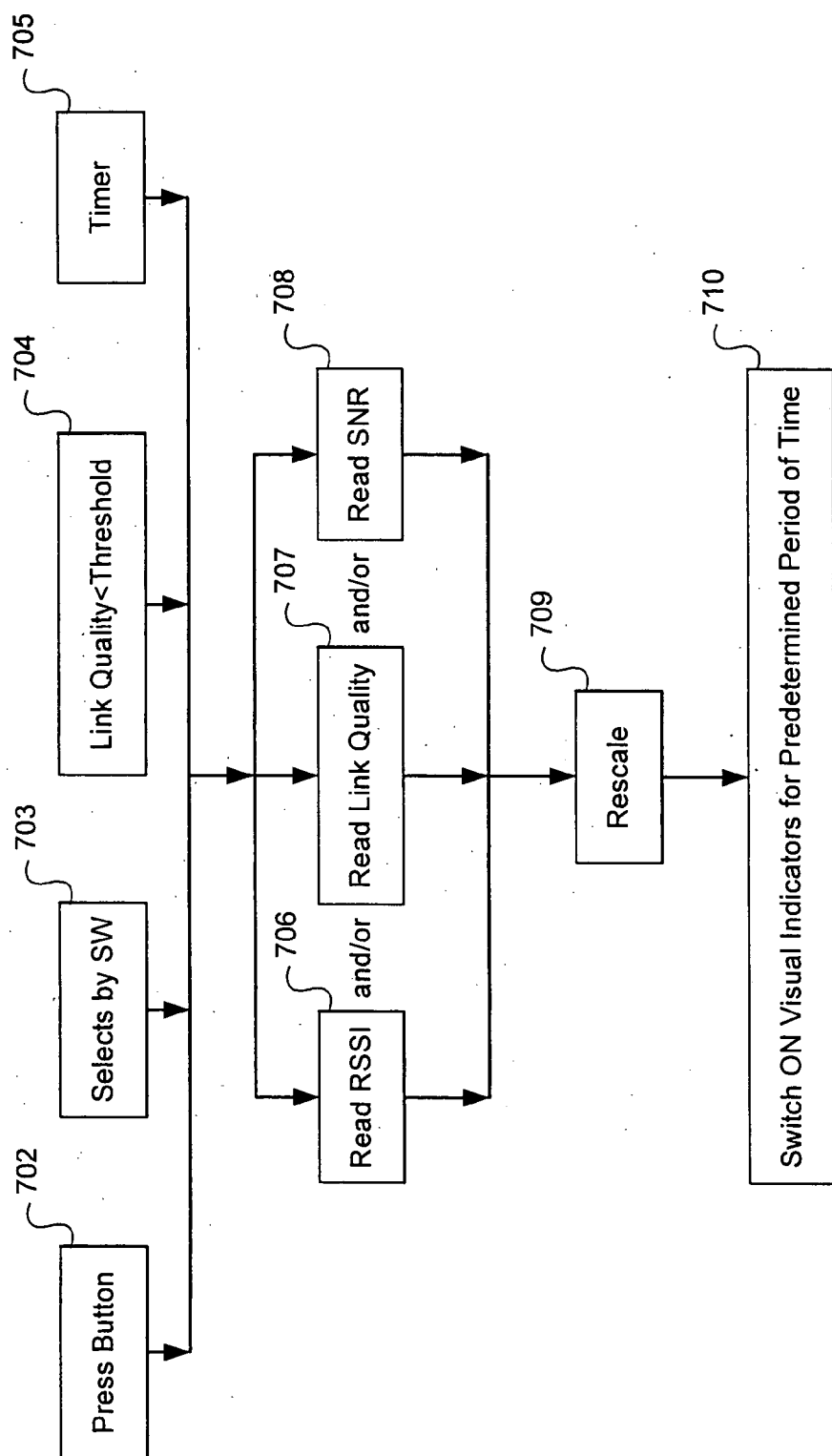
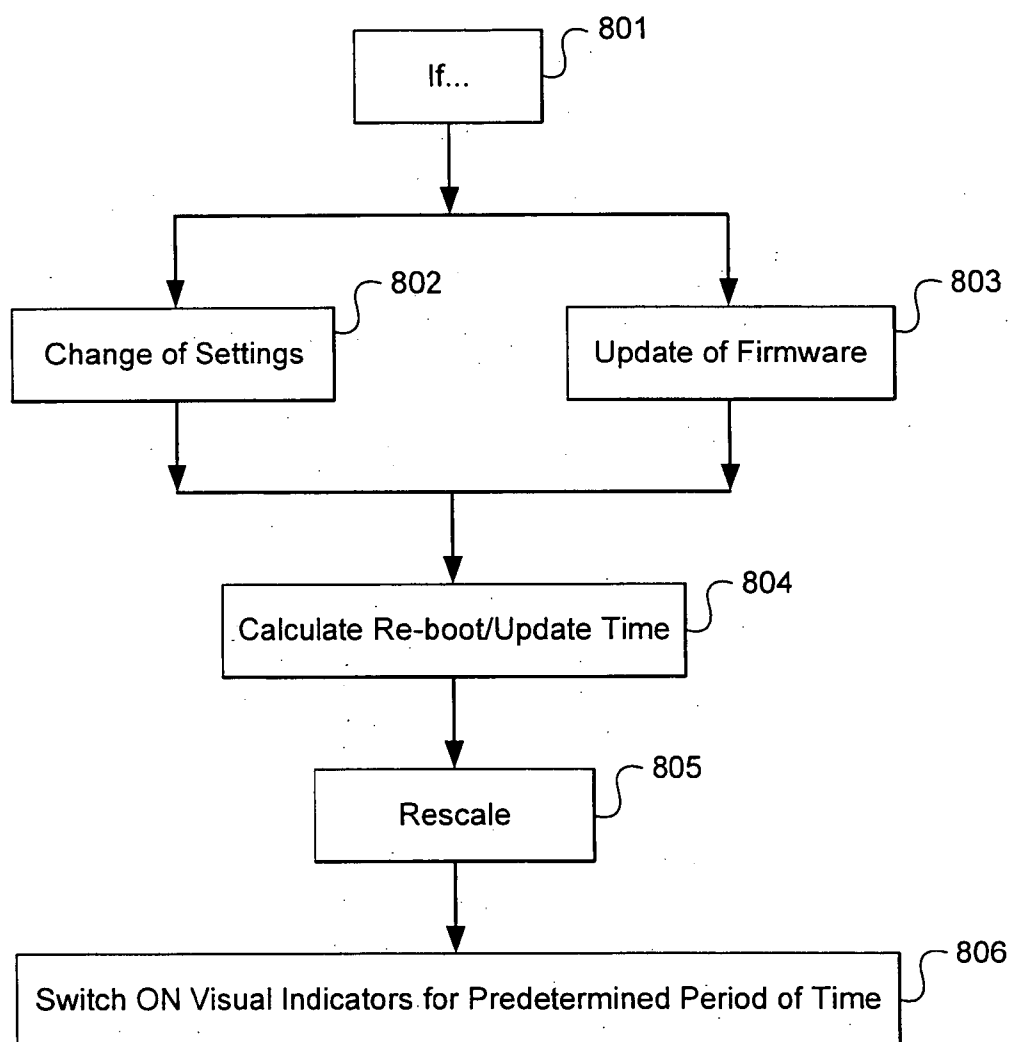


Figure 7

**Figure 8**

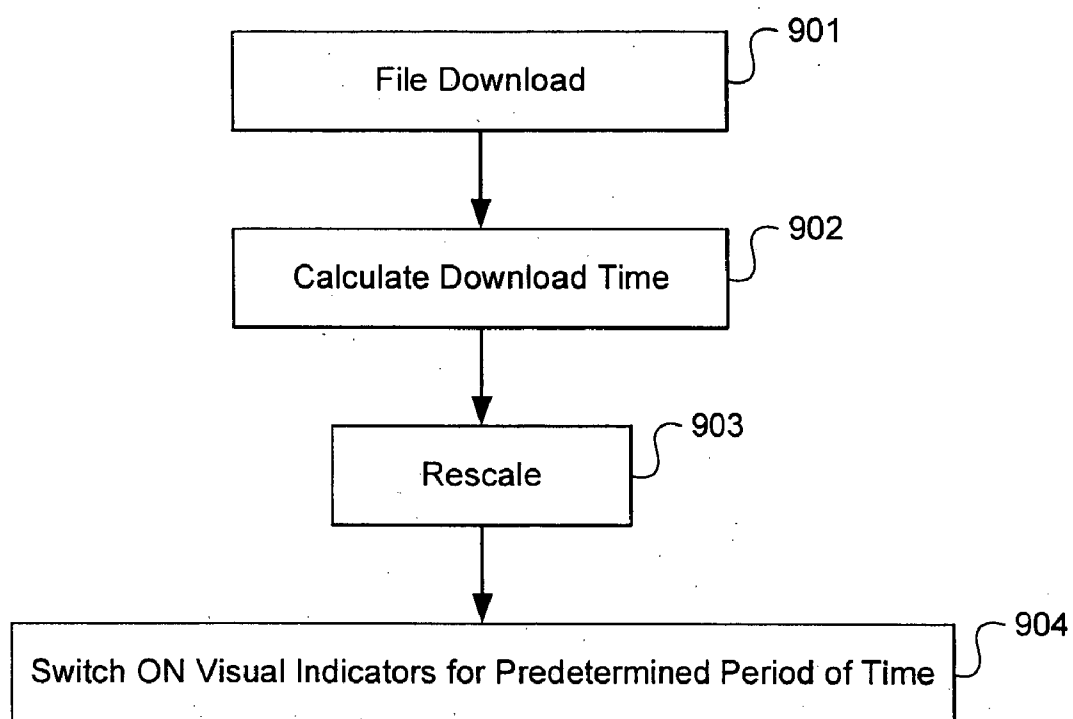


Figure 9

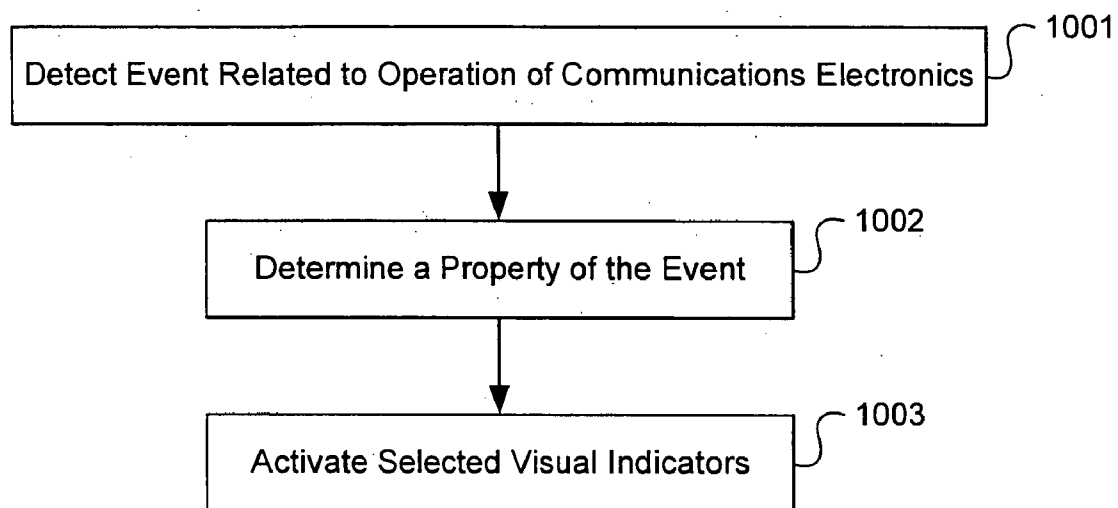


Figure 10

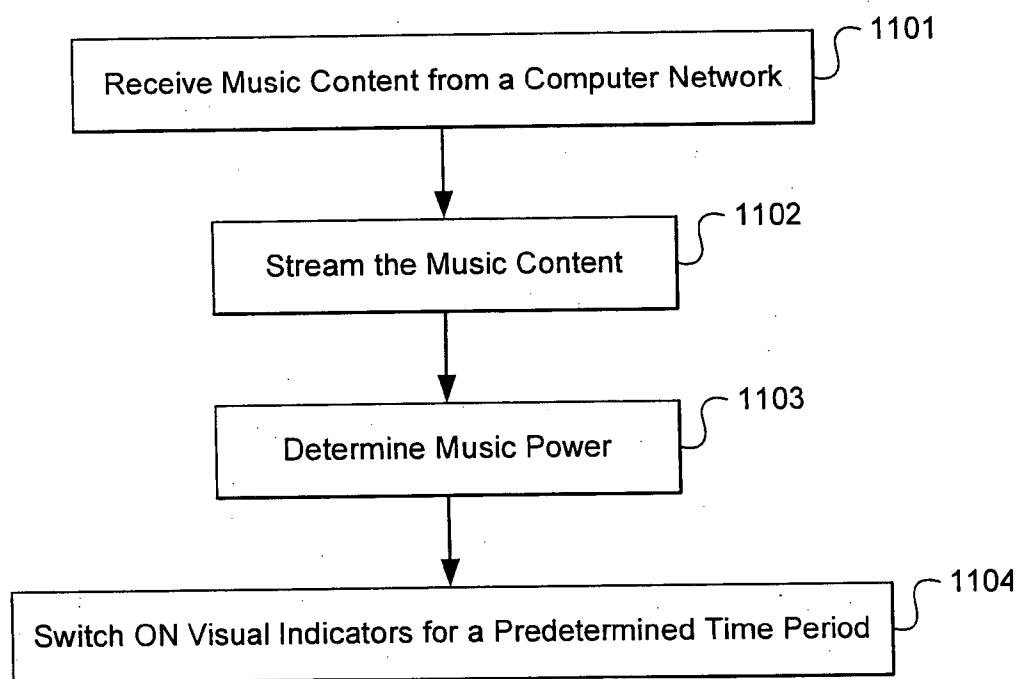
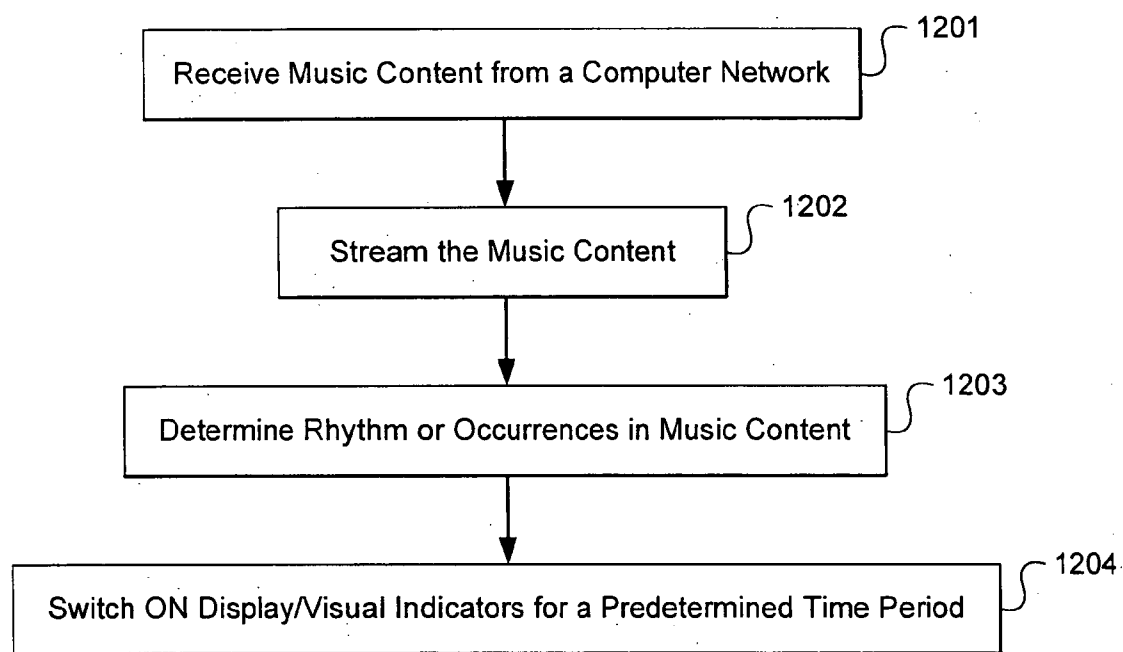


Figure 11

**Figure 12**

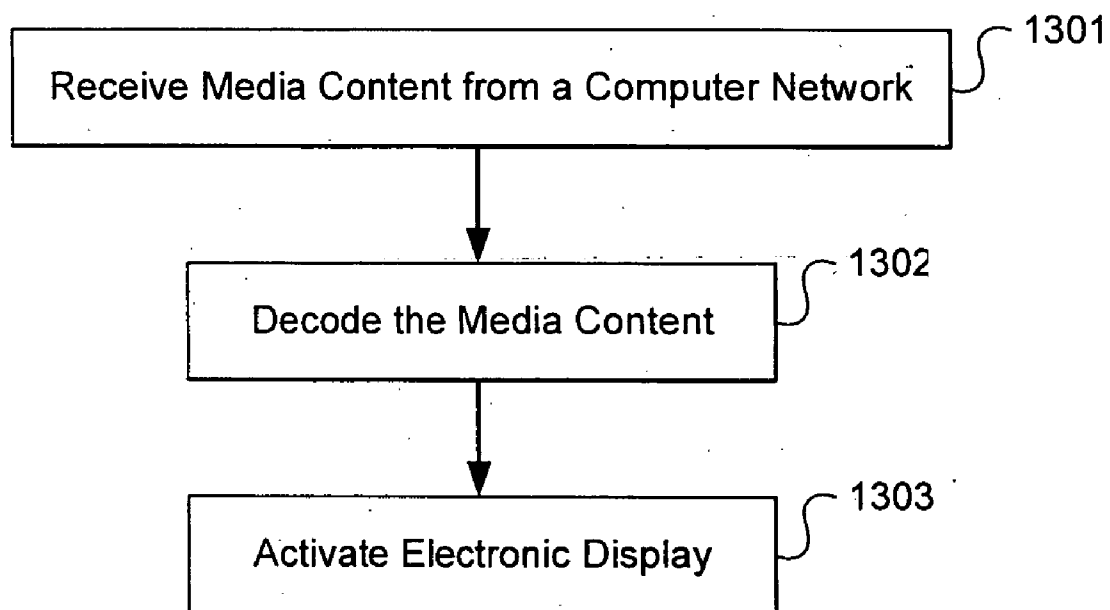


Figure 13

PERIPHERAL DEVICE WITH VISUAL INDICATORS TO SHOW UTILIZATION OF RADIO COMPONENT

CROSS-REFERENCE

[0001] This application is related to the following United States patent applications:

[0002] Utility patent application for Peripheral Device with Visual Indicators to Show Utilization of Radio Component, Ser. No. _____ [Attorney Docket No. 25907.714.201], invented by Patrick Rada and Smiley Kuntjoro and filed concurrently herewith; and

[0003] Design patent application for Peripheral Device, Ser. No. _____ [Attorney Docket No. 25907.731], invented by Larry Kerila, Michelle Yu and Patrick Rada, filed concurrently herewith.

[0004] Each of the foregoing applications are incorporated herein by reference in their entirety.

BACKGROUND OF THE INVENTION

[0005] As information processing, distribution and sharing through computers evolves, there is an increasing demand for networks and other forms of interconnectivity between computers. Users turn to solutions, such as network connections, wired and wireless, in order to provide increasing communication and availability of information. Some forms of networks, which may include local area networks (LANs), wide area networks (WANs), or a LAN/WAN and its internet service provider's network, may have network peripheral components that help to interconnect, or act as nodes for, or access points for, the computers or other devices to the applicable network. Such network peripheral components may comprise routers, modems, firewalls, or other components. A router is a device that forwards data along networks. A modem enables a computer to transmit data over, for example, telephone or cable lines. A firewall provides for some security, as they are frequently used to prevent unauthorized Internet users from accessing private networks connected to the Internet, especially intranets, and can be implemented in both hardware and software, or a combination of both.

[0006] As the use of network peripheral components proliferates, more users will be called upon to install, maintain, and support such components. These users may encounter problems in understanding and operating such components.

INCORPORATION BY REFERENCE

[0007] All publications and patent applications mentioned in this specification are herein incorporated by reference to the same extent as if each individual publication or patent application was specifically and individually indicated to be incorporated by reference.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. 1A is a system diagram of an electronic communications system with a computer network peripheral device with a plurality of electronically controllable visual indicators, according to an embodiment of the invention.

[0009] FIG. 1B and FIG. 1C are front and side view diagrams, respectively, of a computer network peripheral

device with a plurality of electronically controllable visual indicators and a circular dome, according to an embodiment of the invention.

[0010] FIG. 1D and FIG. 1E are front and side view diagrams, respectively, of a computer network peripheral device with a plurality of electronically controllable visual indicators and an angular cover, according to an embodiment of the invention.

[0011] FIG. 1F and FIG. 1G are front and side view diagrams, respectively, of a computer network peripheral device with a plurality of electronically controllable visual indicators located on the edge of the network peripheral device and a plurality of domes, according to an embodiment of the invention.

[0012] FIG. 1H and FIG. 1I are front and side view diagrams, respectively, of a computer network peripheral device with a plurality of electronically controllable visual indicators arranged in a plurality of rows, according to an embodiment of the invention.

[0013] FIG. 1J and FIG. 1K are front and side view diagrams, respectively, of a computer network peripheral device with an electronic display, according to an embodiment of the invention.

[0014] FIG. 2 is a high level block diagram of a computer network peripheral device, according to an embodiment of the invention.

[0015] FIG. 3 is a block diagram of a computer network peripheral device that includes a plurality of antennas with respective switches to select them independently, a combiner and one RF transmitter-receiver, according to an embodiment of the invention.

[0016] FIG. 4 is a block diagram of a computer network peripheral device that includes a plurality of antennas with respective RF transmitter-receivers capable of multiple inputs-multiple outputs, according to an embodiment of the invention.

[0017] FIG. 5 is a block diagram of a computer network peripheral device that includes a plurality of antennas with a single antenna switch, and a single RF transmitter-receiver, according to an embodiment of the invention.

[0018] FIG. 6 is a detailed block diagram of an RF transmitter-receiver coupled to a processor, according to an embodiment of the invention.

[0019] FIG. 7 is a flow diagram of receiving information that a trigger event has occurred, reading and determining level of received signal quality, and switching on visual indicators, according to an embodiment of the invention.

[0020] FIG. 8 is a flow diagram of receiving information that a trigger event has occurred, changing setting or updating firmware, calculating re-boot and/or update time and switching on visual indicators, according to an embodiment of the invention.

[0021] FIG. 9 is a flow diagram of downloading a file, calculating download time, and switching on visual indicators, according to an embodiment of the invention.

[0022] FIG. 10 is a flow diagram of detecting and determining a property of an event related to operation of

communications electronics, and switching on visual indicators, according to an embodiment of the invention.

[0023] FIG. 11 is a flow diagram of receiving and streaming music content, determining music power, and switching on visual indicators, according to an embodiment of the invention.

[0024] FIG. 12 is a flow diagram of receiving and streaming music content, and switching on visual indicators, according to an embodiment of the invention.

[0025] FIG. 13 is a flow diagram of receiving and decoding media content, and activating visual indicators, according to an embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0026] An embodiment of the invention is directed to providing users of a computer network peripheral device, such as a wireless local area network (WLAN) router, with useful information, by the activation of visual indicators, such as light emitting diodes (LEDs), or an electronic display, such as a liquid crystal display (LCD). The useful information may comprise various types of information, such as the radio frequency (RF) signal strength of the antennas located within the WLAN router, progress of file download activity, a change of settings or an update in firmware related to the WLAN router, the status of update of code, the detection of an occurrence of an event, information about music content, such as music power, or rhythm of the music content, and/or information about a multimedia file.

[0027] FIG. 1A is a system diagram of an electronic communications system with a computer network peripheral device with a plurality of electronically controllable visual indicators, according to an embodiment of the invention. In the network peripheral device shown in FIG. 1A, visual indicators are electronically selected from among a plurality of visual indicators to show useful information.

[0028] FIG. 1A includes electronic communications system 101, which includes network peripheral device 102, computer system 103, printer 104, interface 105, and client device 107. Network peripheral device 102 includes visual indicators 108A through 108G, and cover 109. Client device 107 includes wireless client adapter 110.

[0029] Network peripheral device 102 is coupled to Internet 106 through interface 105. Computer system 103 and printer 104 are coupled to Internet 106 and to each other through network peripheral device 102. Client device 107 is coupled to Internet 106, computer system 103, and printer 104 through wireless client adapter 110 and network peripheral device 102. Network peripheral device 102 may comprise circuitry that reacts appropriately to communicate with such wireless node devices, according to an embodiment of the invention. Network peripheral device 102 has visual indicators 108A-108G and cover 109. Network peripheral device 102 also includes LAN connection ports 111 and 112, and wireless LAN port 113. Visual indicators 108A-108G may comprise light emitting diodes (LEDs), lamps, liquid crystal displays (LCDs), or other visual indicators, according to various embodiments of the invention. Visual indicators 108A-108G may be arranged in various patterns, such as circular, angular, square, rectangular, linear, a row, a

plurality of rows, oval or other pattern, according to various embodiments of the invention.

[0030] Network peripheral device 102 may comprise a wireless node or other network peripheral device. Accordingly, the network peripheral device comprises a bridge, an access point, a router, a gateway, a modem, a firewall, a client adapter, and/or other network peripheral device according to various embodiments of the invention. Interface 105 comprises a modem, such as a telephone modem, a DSL modem, or a cable modem, according to various embodiments of the invention. Interface 105 may also comprise a gateway, or a firewall, according to various embodiments of the invention. Computer system 103 and printer 104 are coupled to interface 105 through LAN connection ports 111 and 112, respectively. Network peripheral device 102 is coupled to interface 105 through wireless WAN port 113. In one embodiment of the invention, network peripheral device 102 provides wireless access and links the client device 107 to Internet 106, printer 104, computer system 103, and to any wireless client devices (WLAN) or other wired client devices (LAN) associated with network peripheral device 102. In one embodiment of the invention, network peripheral device 102 provides wireless access and links other client devices such as 107 to Internet 106, printer 104, computer system 103, and to any wireless client devices (WLAN) or other wired client devices (LAN) associated with network peripheral device 102.

[0031] Electronic communications system 101 may include one or several client devices, according to various embodiments of the invention. According to various embodiments of the invention, client device 107 may comprise the following items, alone or in combination, and which may be wired or wireless: a laptop, printer, video media player, audio media player, media player, game station, play station, television (TV), high-definition television (HDTV), monitor, access point client (to secondary LANs), satellite receiver, personal video recorder (PVR), digital video recorder (DVR), or other device. In one embodiment of the invention, client device 107 comprises a wireless media player that may stream audio and video content stored in computer system 103. In another embodiment of the invention, client device 107 comprises a wireless audio media player that may stream audio from a provider of audio content such as Rhapsody, through Internet 106. In another embodiment of the invention, client device 107 comprises a wireless TV that may stream content corresponding to a TV channel from a video provider through Internet 106. In another embodiment of the invention, client device 107 comprises a wireless play station that an end user may use to play games over Internet 106. In another embodiment of the invention, client device 107 comprises a wireless PVR that may automatically update its weekly TV program from a TV service provider site through Internet 106 or through a phone or cable connection. Network peripheral device 102 may comprise circuitry that reacts appropriately to communicate with such client devices, according to an embodiment of the invention.

[0032] According to an embodiment of the invention, network peripheral device 102 contains circuitry that activates one or more visual indicators from among visual indicators 108A-108G to show useful information. Accord-

ing to various embodiments of the invention, activation of visual indicators corresponds to the following, alone or in various combinations:

- [0033] Antenna RF signal strength;
- [0034] Progress of file download activity;
- [0035] Change of settings or an update in firmware;
- [0036] Status of update of code;
- [0037] Detection of an occurrence of an event;
- [0038] Information about music content, such as music power, or rhythm of the music content;
- [0039] Displaying the actual content of a video clip;
- [0040] Information about a multimedia file;
- [0041] Displaying the actual content of a multimedia file;
- [0042] Information about the speed of wireless data rate; and/or
- [0043] Information about what frequency band is used and/or what frequency channel is used.

Other variations are possible, such as varying the brightness of the respective indicators to show useful information similar to such useful information described above.

[0044] According to an embodiment of the invention, network peripheral device **102** contains a form of user interface, such as an on/off switch, capacitive coupling, voice recognition, a software application coupled to circuitry in the network peripheral device, or other user interface, whereby the user may reduce the intensity, or turn off and on, the visual indicators. The form of user interface may also activate or deactivate any of the displays described herein, such as streaming content, such as music, video, still image, slide show images, or other content on client device **107**, displaying the download data rate of information, displaying the level of radio signal quality of selected antennas, or other displays, according to various embodiments of the invention. In another embodiment of the invention, the user may successively perform the act required by the applicable form of user interface causing network peripheral device **102** to successively display the various displays discussed above. For example, in one embodiment of the invention, the user may successively press a switch four times that results in network peripheral device **102** successively displaying the download data rate of information, streamed content, such as music or video, the level of radio signal quality of selected antennas, and deactivating the display.

[0045] In another embodiment of the invention, the form of user action may be a form by which a user may trigger or validate an event. For example, in one embodiment of the invention, network peripheral device **102** may show a user that a virus has been detected (by flashing visual indicators, for example), and the user would perform the act required by the applicable form of user interface to acknowledge the virus detection warning. In such an embodiment, the form of user interface may be a switch adjoined to cover **109**, and by

pressing cover **109**, the user may acknowledge the virus detection warning, according to an embodiment of the invention.

[0046] Network peripheral device **102** may also include a removable cover that may be fitted to cover **109**, such as by snapping on or other mechanism, to cover the brightness of the visual indicators.

[0047] FIG. 1B and FIG. 1C are front and side view diagrams, respectively, of a computer network peripheral device with a plurality of electronically controllable visual indicators and a circular dome, according to an embodiment of the invention.

[0048] FIG. 1B shows network peripheral device **102**, which has visual indicators **108A-108G** and a cover, cover **109**. Visual indicators **108A-108G** are mounted onto network peripheral device **102** and protrude from its surface, according to an embodiment of the invention. Visual indicators **108A-108G** may comprise LEDs, or other forms of visual indicators as discussed herein, according to various embodiments of the invention. Visual indicators **108A-108G** may be arranged in various patterns. Cover **109** may comprise material such as plastic or other material and may be transparent or translucent and may be clear or have one of various colors such as blue, red, orange, yellow, or other colors. In another embodiment of the invention, cover **109** encloses visual indicators **108A-108G**. In various embodiments of the invention, cover **109** may have various shapes, such as rectangular, square, circular, oval, or other shape. FIG. 1B shows cover **109** as a circular dome. The ratio of the diameter of cover **109** to the longest dimension of the device in a planar view, as illustrated in FIG. 1B, may be different values, such as in a range of 0.10 to 0.50, or substantially 0.2, or other ranges in various embodiments of the invention. In another embodiment of the invention, visual indicators **108A-108G** are recessed inside network peripheral device **102** and the light of each indicator is brought to cover **109** by light pipes conductors. Light pipes may be placed in between visual indicators **108A-108G** and cover **109** for easier manufacturing, or to increase the light to the user, or to focus the light, and may be short to medium length, in various embodiments of the invention. The ratio of the diameter of cover **109** to the light pipe length may be different values such as in a range of 0.10 to 2.0, or substantially 0.3, or other ranges in various embodiments of the invention.

[0049] According to an embodiment of the invention, network peripheral device **102** contains circuitry that activates one or more visual indicators from among visual indicators **108A-108G** to show useful information. FIG. 1B shows visual indicators **108B**, **108C**, **108E** and **108F** activated and such activation provides information. For example, the activation of the visual indicators may correspond to antenna RF signal strength, or other useful information. FIG. 1C shows a profile of network peripheral device **102** and cover **109**.

[0050] FIG. 1D and FIG. 1E are front and side view diagrams, respectively, of a computer network peripheral device with a plurality of electronically controllable visual indicators and an angular dome, according to an embodiment of the invention.

[0051] FIG. 1D shows network peripheral device **102**, which has visual indicators **120A-120D** and cover **121**.

Visual indicators **120A-120D** are mounted onto network peripheral device **102** and protrude from its surface, according to an embodiment of the invention. Visual indicators **120A-120D** may comprise LEDs, or other forms of visual indicators as discussed previously, according to various embodiments of the invention. Visual indicators **120A-120D** may be arranged in various patterns. Cover **121** may comprise material such as plastic or other material and may be transparent or translucent and may be clear or have one of various colors such as blue, red, orange, yellow, or other colors. In another embodiment of the invention, cover **121** encloses visual indicators **120A-120D**. Note that generally covers of various shapes, other than a circular or oval dome, may be used in embodiments that are described herein as having a dome. For example, in various embodiments of the invention, cover **121** may have various shapes, such as rectangular, square, circular, oval, or other shape. FIG. 1D shows cover **121** as an angular cover. The ratio of the length of cover **121** to the longest dimension of the device in a planar view, as illustrated in FIG. 1D, may be different values, such as in a range of 0.3 to 0.7, or substantially 0.6, or other ranges, in various embodiments of the invention. Cover **121** may be flush with network peripheral device **102**, or may protrude above network peripheral device **102**, as shown in FIG. 1E. The protrusion may be up to $\frac{1}{2}$ its longest dimension, or even more, in various embodiments of the invention.

[0052] According to an embodiment of the invention, network peripheral device **102** contains circuitry that activates one or more visual indicators from among visual indicators **120A-120D** to show useful information, such as the various kinds of useful information described herein. FIG. 1D shows visual indicators **120A**, **120B** and **120C** activated and such activation provides information. For example, the activation of the visual indicators may correspond to antenna RF signal strength of antennas located inside network peripheral device **102**, or other useful information. FIG. 1E shows a profile of network peripheral device **102** and cover **121**.

[0053] FIG. 1F and FIG. 1G are the front and side view diagrams, respectively, of a computer network peripheral device with a plurality of electronically controllable visual indicators located on the edge of the network peripheral device and a plurality of domes, according to an embodiment of the invention.

[0054] FIG. 1F includes network peripheral device **102**, which has visual indicators **130A-130C**, cover **131**, visual indicators **132A-132C**, cover **133**, visual indicators **134A-134C**, and cover, cover **135**. Visual indicators **130A-130C** and cover **131** are mounted to the exterior edge of network peripheral device **102** and protrude from its surface, according to an embodiment of the invention. Visual indicators **132A-132C** and cover **133** are coupled to an edge of network peripheral device **102**. Visual indicators **134A-134C** and cover **135** are coupled to an edge of network peripheral device **102**. Visual indicators **130A-130C**, visual indicators **132A-132C**, and visual indicators **134A-134C** may comprise LEDs, or other forms of visual indicators as discussed herein, according to various embodiments of the invention. Visual indicators **130A-130C**, visual indicators **132A-132C**, and visual indicators **134A-134C** may be arranged in various patterns, such as in a linear pattern. In one embodiment of the invention, cover **131**, cover **133** and cover **135** are each

an ovular dome. Cover **131**, cover **133**, and cover **135** may comprise material such as plastic or other material and may be transparent or translucent and may be clear or have one of various colors such as blue, red, orange, yellow, or other colors. In another embodiment of the invention, cover **131**, cover **133**, and cover **135** enclose visual indicators **130A-130C**, **132A-132C**, and **134A-134C**, respectively. In various embodiments of the invention, cover **131**, cover **133**, and cover **135** may alternatively have various other shapes, such as rectangular, square, circular, oval, or other shape. FIG. 1F and FIG. 1G show cover **131**, cover **133**, and cover **135** as ovular domes. The ratio of the major axis of cover **135** to the shorter dimension of the device in a planar view, as illustrated in FIG. 1F, may be different values, such as in a range of 0.30 to 0.7, or substantially 0.5, or other ranges, according to various embodiments of the invention. Cover **131**, cover **133** and cover **135** may be flush with network peripheral device **102**, or may protrude above network peripheral device **102**, as shown in FIG. 1F and FIG. 1G. The protrusion may be up to $\frac{1}{2}$ its longest dimension, or even more, according to various embodiments of the invention.

[0055] According to an embodiment of the invention, network peripheral device **102** contains circuitry that activates one or more visual indicators from among visual indicators **130A-130C**, visual indicators **132A-132C**, and visual indicators **134A-134C** to show useful information. Various kinds of information as described herein may be shown. FIG. 1G shows a profile of network peripheral device **102** and cover **135**.

[0056] The visual indicators and the domes may be located in different parts of the network peripheral device, according to various embodiments of the invention. For example, in the embodiments of the invention represented in FIGS. 1A-1D, the dome has been located on the top of network peripheral device **102**. FIG. 1F shows cover **131** on the left edge of network peripheral device **102**, cover **133** on the bottom edge of network peripheral device **102**, and cover **135** on the right edge of network peripheral device **102**.

[0057] FIG. 1H and FIG. 1I are front and side view diagrams, respectively, of a computer network peripheral device with a plurality of electronically controllable visual indicators arranged in a plurality of rows, according to an embodiment of the invention.

[0058] FIG. 1H shows network peripheral device **102**, which has rows of visual indicators **140A-140D** and cover **141**. Rows of visual indicators **140A-140D** are mounted onto network peripheral device **102** and protrude from its surface, according to an embodiment of the invention. Visual indicators in rows of indicators **140A-140D** may comprise LEDs, or other forms of visual indicators as discussed previously, according to various embodiments of the invention. Rows of visual indicators **140A-140D** may be arranged in various patterns, such as rectangular, circular, or oval. Cover **141** may comprise material such as plastic or other material and may be transparent or translucent and may be clear or have one of various colors such as white, blue, red, orange, yellow, or other colors. In another embodiment of the invention, cover **141** encloses rows of visual indicators **140A-140D**. In various embodiments of the invention, cover **141** may have various shapes, such as rectangular, square, circular, oval, or other shape. FIG. 1H shows cover **141** as an angular cover. The ratio of the length

of cover **141** to the longest dimension of the device in a planar view, as illustrated in FIG. 1H, may be different values, such as in a range from 0.20 to 0.60, or substantially 0.4, or other ranges, in various embodiments of the invention. Cover **141** may be flush with network peripheral device **102**, or may protrude above network peripheral device **102**, as shown in FIG. 11. The protrusion may be up to $\frac{1}{2}$ its longest dimension, or even more, in various embodiments of the invention.

[0059] According to an embodiment of the invention, network peripheral device **102** contains circuitry that activates one or more visual indicators from rows of visual indicators **140A-140D** to show useful information. The activation of the visual indicators may correspond to various patterns, such as alpha-numeric characters, 'smileys,' moving patterns, simple and complex images, and other patterns, reflecting useful information. FIG. 11 shows a profile of network peripheral device **102** and cover **141**.

[0060] FIG. 1J and FIG. 1K are front and side view diagrams, respectively, of a computer network peripheral device with an electronic display, according to an embodiment of the invention. Visual indicators can be simulated and displayed in the electronic display.

[0061] FIG. 1J includes network peripheral device **102**, simulated visual indicators **150A-150G**, electronic display **151**, and cover **152**. Network peripheral device **102** is coupled to visual electronic display **151**, and to cover **152**. In one embodiment of the invention, electronic display **151** comprises a liquid crystal display (LCD). Visual indicators **150A-150G** may be simulated in electronic display **151**, and may comprise of marks, such as dots, squares, a solid line that increases in length, or other shapes, and may be arranged in various patterns, such as linear, circular, rectangular, and other patterns to show useful information, according to various embodiments of the invention.

[0062] In one embodiment of the invention, cover **152** encloses electronic display **151**. Cover **152** may comprise material such as plastic or other material and may be transparent or translucent and may be clear or have one of various colors such as blue, red, orange, yellow, or other colors. In various embodiments of the invention, cover **152** may have various shapes, such as rectangular, square, circular, oval, or other shape. FIG. 1J shows cover **152** as an angular dome. The ratio of the length of cover **152** to the longest dimension of the device in a planar view, as illustrated in FIG. 1J, may be different values, such as in a range from 0.20 to 0.60, or substantially 0.4, or other ranges, in various embodiments of the invention. Cover **152** may be flush with network peripheral device **102**, or may protrude above network peripheral device **102**, as shown in FIG. 1K. The protrusion may be up to $\frac{1}{2}$ its longest dimension, or even more, in various embodiments of the invention.

[0063] According to an embodiment of the invention, network peripheral device **102** contains circuitry that activates one or more visual indicators from visual indicators **150A-150G** to show useful information, such as antenna RF signal strength, or progress of file download.

[0064] According to an embodiment of the invention, network peripheral device **102** contains circuitry that activates the display of content on electronic display **151**. The content displayed on electronic display **151** may comprise a still

image or images, video content, movie content, and/or television content, alone or in various combinations. The content displayed on electronic display **151** may comprise a still image related to audio content, a video image related to music, to audio rhythms, to instantaneous audio level of the applicable audio source, or may comprise a video clip related to the applicable audio content, alone or in various combinations, in various embodiments of the invention.

[0065] In another embodiment of the invention, the content displayed on electronic display **151** comprises information about a file being downloaded. In one embodiment of the invention, the information displayed on electronic display **151** comprises identifiers of a music file being downloaded or played. FIG. 1J shows electronic display **151** displaying that a music file is being played, and the corresponding song title and artist of the music file.

[0066] FIG. 1K shows a profile of network peripheral device **102** and cover **152**. As illustrated in FIG. 1K, cover **152** may have a height of protrusion from network peripheral device **102**, according to an embodiment of the invention. Different values for the ratio of the height of cover **152** to the width of network peripheral device **102** are possible, such as in a range of 0.01 to 0.25, or substantially 0.5, according to various embodiments of the invention.

[0067] FIG. 2 is a high level blocks diagram of a computer network peripheral device, according to an embodiment of the invention. The network peripheral device uses a microcontroller unit, which includes some form of software algorithm, and hardware interface to activate visual indicators mounted to the network peripheral device to show useful information. FIG. 2 includes dome and visual indicators **201**, hardware interface **202**, microcontroller unit **203** and software algorithm **204**. Dome and visual indicators **201** are coupled to hardware interface **202**, which is coupled to microcontroller unit **203**. Microcontroller unit **203** includes software algorithm **204**.

[0068] Software algorithm **204** causes microcontroller unit **203** to receive or process useful information. Microcontroller unit **203** may comprise one or more processors, and/or base band electronics and media access control (MAC) logic, in various combinations, according to various embodiments of the invention.

[0069] Through hardware interface **202**, microcontroller unit **203** activates one or more visual indicators in dome and visual indicators **201** corresponding to the useful information. The one or more visual indicators may comprise LEDs, or other forms of visual indicators as discussed previously, according to various embodiments of the invention.

[0070] The activation of the visual indicators in dome and visual indicators **201** corresponds to antenna RF signal strength of antennas located inside the network peripheral device, or other useful information as defined herein, according to various embodiments of the invention.

[0071] FIG. 3 is a block diagram of a computer network peripheral device that includes a plurality of antennas with respective switches to select them independently, a combiner and one RF transmitter-receiver, according to an embodiment of the invention. In the network peripheral device shown in FIG. 3, a processing block is coupled to circuitry that receives a combined RF signal from a plurality of antennas and activates visual indicators from among a

plurality of visual indicators to show useful information. The useful information shown by the visual indicators may include information corresponding to the signals received from the antennas, such as overall RF signal strength, occurrence of an event, multimedia file streamed, and other useful information.

[0072] FIG. 3 includes network peripheral device 301, which includes antenna #1302 through antenna #N 303, RF switch #1305 through RF switch #N 304, RF combiner 306, RF transmitter-receiver 307, processing block 308, memory 309, interface 310, standard panel lights 313, and electronically controllable visual indicators 314. Additionally network peripheral device 301 may also include router functionality 311 and modem 312.

[0073] Antennas #1302 through #N 303 are coupled to RF switches #1305 through #N 304, respectively, which are each in turn coupled to RF combiner 306. Various numbers of antennas may be included, such as 1, 2, 3, or other numbers, such that N may equal 0, 1, 2, or other numbers, according to various embodiments of the invention. RF combiner 306 is coupled to RF transmitter-receiver 307, which is also coupled to processing block 308. Processing block 308 is also coupled to memory 309, interface 310, standard panel lights 313, and electronically controllable visual indicators 314. Memory 309 may include any various forms of storage or computer-readable memories such as, but not limited to, volatile memory (random access memory ("RAM")), non-volatile memory (read-only memory ("ROM")), flash memory, electronically erasable programmable read only memory (EEPROM), disk, and/or other storage devices that may include one or more of magnetic and optical storage media random access memory (RAM). Electronically controllable indicators 314 may comprise LEDs, or other forms of visual indicators as discussed previously, according to various embodiments of the invention. Processing block 308 may be also coupled to router functionality 311 and modem 312.

[0074] Processing block 308 may include one or more processors, and electronics and logic operable with data received from RF transmitter-receiver 307, in various combinations, according to various embodiments of the invention. The electronics and logic operable with the data received from RF transmitter-receiver 307 may comprise base band electronics and media access control (MAC) logic, respectively. The one or more processors, base band electronics and MAC logic are separated from each other, according to an embodiment of the invention. Various other configurations of the one or more processors, base band electronics and MAC logic located in processing block 308 are possible. For example, in another embodiment of the invention, the base band electronics and MAC logic are located within a single device, such device separated from the one or more processors.

[0075] RF switches #1305 through #N 304 switch antennas #1302 through #N 303, respectively, on or off. If antennas #1302 through #N 303 are switched on by RF switches #1305 through #N 304, respectively, RF combiner 306 is used to combine the RF signals from antennas #1302 through #N 303 into combined signal data. RF combiner 306 sends the combined signal data to RF transmitter-receiver 307, which then transmits the data to processing block 308. Memory 309 is used by processing block 308 to store and

access the data received from RF transmitter-receiver 307, and/or to store program code that controls network peripheral device 301.

[0076] Processing block 308 is coupled to an external device, such as a wide area network (WAN), through interface 310. Processing block 308 can be coupled to an external device wirelessly through antennas 302 to 303 by use of RF switches #1305 through #N 304, RF combiner 306 and RF transmitter-receiver 307. Electronics and logic in processing block 308 activate standard panel lights 313, such as indication of power, wireless LAN status, and LAN port status. Electronics and logic in processing block 308 also activate one or more electronically controllable visual indicators 314, the activation corresponding to useful information. In one embodiment of the invention, processing block 308 is also coupled to an external device, such as a LAN, through router functionality 311. In another embodiment of the invention, processing block 308 is also coupled to the Internet, through modem 312.

[0077] Antenna #1302 is switched on by RF switch #1305. The RF signal from antenna #1302 is sent to RF combiner 306. RF combiner 306 combines the RF signal received from antenna #1302 with any other RF signals corresponding to antenna #N 303. RF combiner sends the combined RF signal to RF transmitter-receiver 307, which then sends the combined RF signal to processing block 308. Processing block 308 uses base band electronics, MAC logic, processor and/or memory 309 to activate visual indicators 314 on network peripheral device 301 to show useful information corresponding to the combined RF signal received from RF transmitter-receiver 307. Processing block 308 also activates standard panel lights 313, and through interface 310, communicates with an external device, such as a computer system. Processing block 308 may connect an external device, such as a computer system, to the Internet through modem 312, or to other devices on a LAN #1 through LAN #N through router functionality 311. Various numbers of LANs may be included, such as 1, 2, 3, or other numbers, such that N may equal 0, 1, 2, or other numbers, according to various embodiments of the invention.

[0078] The activation of the visual indicators in dome and visual indicators corresponds to the signal strength of antennas #1302 through #N 303, or other useful information as defined herein, according to various embodiments of the invention.

[0079] FIG. 4 is a block diagram of a computer network peripheral device that includes a plurality of antennas with respective RF transmitter-receivers capable of multiple inputs-multiple outputs, according to an embodiment of the invention. In the network peripheral device shown in FIG. 4, a processing block is coupled to circuitry that receives signals from a plurality of antennas, through a plurality of RF transmitter-receivers corresponding to the antennas, and activates visual indicators from among a plurality of visual indicators to show useful information corresponding to the signals received from the antennas.

[0080] FIG. 4 includes network peripheral device 401, which includes each of the following elements, which are arranged similar to such elements of network peripheral device 301 in FIG. 3: antenna #1402 through antenna #N 403, processing block 406, memory 407, interface 408, standard panel lights 411, electronically controllable visual

indicators 412, router functionality 409 and modem 410. Network peripheral device 401 also includes RF transmitter-receiver #1404 through RF transmitter-receiver #N 405.

[0081] Antenna #1402 through antenna #N 403 are coupled to RF transmitter-receiver #1404 through RF transmitter-receiver #N 405, respectively, which are each in turn, coupled to processing block 406. Processing block 406 is also coupled to memory 407, interface 408, standard panel lights 411, and electronically controllable visual indicators 412. Processing block 406 may be also coupled to router functionality 409 and modem 410. Memory 407 may include any various forms of storage or computer-readable memories.

[0082] RF transmitter-receivers #1404 through #N 405 are used to transmit RF data corresponding to the RF signals from antennas #1402 through #N 403, respectively, directly to processing block 406. Processing block 406 uses electronics, logic, and/or processors to activate visual indicators 412 on network peripheral device 401 to show useful information corresponding to the RF signals received from RF transmitter-receivers #1404 through #N 405. The various functionalities of processing block 406, as they pertain to interface 408, router functionality 409, modem 410, and standard panel lights 411 are similar to the functionalities of processing block 308 with respect to such similar elements discussed in the description corresponding to FIG. 3.

[0083] FIG. 5 is a block diagram of a computer network peripheral device that includes a plurality of antennas with a single antenna switch, and a single RF transmitter-receiver, according to an embodiment of the invention. In the network peripheral device shown in FIG. 5, a processing block is coupled to circuitry that receives signals from a plurality of antennas, through a single transmitter-receiver, and activates visual indicators from among a plurality of visual indicators to show useful information corresponding to the signals received from the antennas, or useful information not related to the signal received by the antennas such as described above (e.g. progress of file download activity, a change of settings or an update in firmware related to the WLAN router, the status of update of code, the detection of an occurrence of an event, information about music content, such as music power, or rhythm of the music content, and/or information about a multimedia file).

[0084] FIG. 5 includes network peripheral device 501, which includes each of the following elements, which are arranged similar to such elements of network peripheral device 301 in FIG. 3: antenna #1502 through antenna #N 503, RF transmitter-receiver 505, processing block 506, memory 507, interface 508, standard panel lights 511, electronically controllable visual indicators 512, router functionality 510 and modem 509. Network peripheral device 501 also includes a single antenna switch 504.

[0085] Antenna #1502 through antenna #N 503 are coupled to antenna switch 504. Antenna switch 504 is also coupled to RF transmitter-receiver 505, which is in turn, coupled to processing block 506. Processing block 506 is also coupled to memory 507, interface 508, standard panel lights 511, and electronically controllable visual indicators 512. Processing block 506 may be also coupled to router functionality 510 and modem 509. Memory 507 may include any various forms of storage or computer-readable memories.

[0086] Antenna switch 504 switches on one or more of antennas #1502 through #N 503. The RF signal from the activated antennas is sent to RF transmitter-receiver 505, which then directly transmits the signals to processing block 506. Processing block 506 uses electronics, logic, and/or processors to active visual indicators 512 on network peripheral device 501 to show useful information corresponding to the RF signals received from RF transmitter-receiver 505 or other useful information as discussed above. The various functionalities of processing block 506, as they pertain to interface 508, router functionality 510, modem 509, and standard panel lights 511 are similar to the functionalities of processing block 308 with respect to such similar elements discussed in the description corresponding to FIG. 3.

[0087] FIG. 6 is a detailed block diagram of an RF transmitter-receiver coupled to a processor, according to an embodiment of the invention. For example the RF transmitter-receiver shown in detail in FIG. 6, may comprise RF transmitter-receivers 307, 404 through 405, and 505, as described above for FIG. 3, FIG. 4, and FIG. 5, respectively. In the electronic communications system shown in FIG. 6, information is exchanged between the processing block portion of a computer network peripheral device and one or more antennas through an RF transmitter-receiver block. The RF transmitter-receiver block allows the antenna(s) and the processing block to communicate with one another by receiving and transmitting RF signals between the antenna(s) and the processing block. The receiver path of the RF transmitter-receiver block receives radio signals from the antenna(s), filters, demodulates, digitizes, and passes the digitized signal to the processing block. The transmit path of the RF transmitter-receiver block receives a signal from the processing block, modulates, mixes, amplifies, and passes the signal to the antenna(s).

[0088] FIG. 6 includes electronic communications system 601, which includes RF transmitter-receiver block 602, processing block 603 and dome and visual indicators 604. RF transmitter-receiver block 602 includes switch 605, filter 606, amplifier 607, filter 608, mixer 609, frequency synthesizer and clock 610, oscillator 611, in-phase/quadrature (I/Q) demodulator 612, analog-to-digital converter (ADC) 613A, ADC 613B, digital-to-analog converter (DAC) 614A, DAC 614B, I/Q modulator 615, mixer 616, filter 617, amplifier 618, and filter 619.

[0089] RF transmitter-receiver block 602 is coupled to processing block 603, which is coupled to dome and visual indicators 604. Switch 605 is coupled to filter 606, which is coupled to amplifier 607, which is coupled to filter 608, which is coupled to mixer 609. Filter 606 may comprise a band pass filter, amplifier 607 may comprise a low noise amplifier (LNA), and filter 608 may comprise a band pass filter, according to various embodiments of the invention.

[0090] Mixer 609 is also coupled to I/Q demodulator 612 and frequency synthesizer and clock 610, which is coupled to oscillator 611. Frequency synthesizer and clock 610 is also coupled to I/Q demodulator 612, which is coupled to ADC 613A and ADC 613B. In one embodiment of the invention, ADC 613A and ADC 613B each comprise an analog-to-digital converter of a plurality of bits.

[0091] ADC 613A and ADC 613B are each coupled to the clock in frequency synthesizer and clock 610, and processing block 603. Processing block 603 is also coupled to DAC

614A and **DAC 614B**. In one embodiment of the invention, **DAC 614A** and **DAC 614B** each comprise a digital-to-analog converter of a plurality of bits. **DAC 614A** and **DAC 614B** are each coupled to the clock in frequency synthesizer and clock **610**, and I/Q modulator **615**. I/Q modulator **615** is coupled to mixer **616** and frequency synthesizer and clock **610**. Frequency synthesizer and clock **610** is also coupled to mixer **616**, which is coupled to filter **617**. Filter **617** is also coupled to amplifier **618**, which is coupled to filter **619**, which is coupled to switch **605**. Frequency synthesizer and clock **610** is also coupled to processing block **603**.

[0092] The following is a description of operation of the receive path of RF transmitter-receiver block **602**, according to an embodiment of the invention. The signal from an antenna is passed to processing block **603** through RF transmitter-receiver block **602**. Switch **605** receives a signal from one or more antennas and passes the signal to filter **606**. Filter **606** selects the signal in the desired frequency band and rejects outband noise or outband signals (interferences) and transmits the filtered signal to amplifier **607**. Amplifier **607** amplifies with low additional noise the signal and transmits the amplified signal to filter **608**, which filters the noise out of the desired frequency band. Filter **608** transmits the filtered signal to mixer **609**, which then uses on its local oscillator (LO) input a constant wave (CW) frequency generated by the synthesizer and clock **610** and oscillator **611**, to downconvert the signal to an intermediate frequency and transmit the signal to the I/Q demodulator **612**. The I/Q demodulator **612** then uses on its LO input a CW frequency generated by the synthesizer and clock **610** and oscillator **611**, to extract and separate the in-phase (I) and quadrature (Q) components of the signal received from mixer **609**. I/Q demodulator **612** sends an analog Q signal to ADC **613A**, and an analog I signal to ADC **613B**. ADC **613A** and ADC **613B** each convert the Q signal and I signal, respectively, from an analog signal to a digital signal, at a sampling rate given by the clock in synthesizer and clock **610**, and send the converted signals to processing block **603**. Processing block **603** uses the digital I and Q signals received, and circuitry, to activate visual indicators in dome and indicators **604** to show useful information. The visual indicators may comprise light emitting diodes (LEDs), lamps, liquid crystal displays (LCDs), or other visual indicators, according to various embodiments of the invention.

[0093] The following is a description of the transmit path of the RF transmitter-receiver block **602**, according to an embodiment of the invention. A signal from processing block **603** is transmitted to an antenna through RF transmitter-receiver block **602**. **DAC 614A** receives a digital Q signal from processing block **603** corresponding to the signal being transmitted. **DAC 614B** receives a digital I signal from processing block **603** corresponding to the signal being transmitted. **DAC 614A** and **DAC 614B** convert the Q signal and I signal, respectively, at a sampling rate given by the clock in synthesizer and clock **610**, from a digital signal to an analog signal, and send the converted signals to I/Q modulator **615**. I/Q modulator **615** uses on its LO input a CW frequency generated by the synthesizer and clock **610** and oscillator **611** to combine the analog I and Q signals into one signal, which is then transmitted to mixer **616**. Mixer **616** uses on its LO input a CW frequency generated by the synthesizer and clock **610** and oscillator **611** to upconvert the signal output by the I/Q modulator **615** into the desired frequency band and to the desired frequency

channel. Mixer **616** transmits the mixed signal to filter **617**, which filters out any outband mixing products and outband noise. Filter **617** transmits the filtered signal to amplifier **618**, which amplifies the signal to a higher level of power, and transmits the amplified signal to filter **619**. Filter **619** filters any outband noise frequency products (e.g. harmonics) resulting from the amplification of the signal and transmits the filtered RF signal to switch **605**. Switch **605** then sends the signal transmitted by processing block **603** to one or more antennas, in a format readable by the antenna(s).

[0094] FIG. 7 is a flow diagram of receiving information that a trigger event has occurred, reading and determining level of received signal quality, and switching on visual indicators, according to an embodiment of the invention. Based on a trigger event, such as a user pressing a button, link quality dropping below a given threshold, a timer expiring, or if queried by the user, circuitry in a computer network peripheral device will measure the signal quality of one or more antennas, and activate visual indicators located on the network peripheral device corresponding to the measured signal quality.

[0095] In one embodiment of the invention, circuitry in a computer network peripheral device measures signal quality of one or more antennas and activates visual indicators that show the antenna signal quality. The one or more visual indicators may comprise LEDs, or other forms of visual indicators as discussed herein, according to various embodiments of the invention. The network peripheral device may comprise wireless node or other network peripheral devices as described herein.

[0096] A trigger event may occur when a user presses a button (block **702**), queries signal quality of an antenna (block **703**), sets a predetermined signal quality threshold level and the threshold is reached (block **704**), sets a timer and the timer expires (block **705**), or similar event occurs. In one embodiment of the invention, the timer comprises a repetitive timer with a predetermined repetitive time. In one embodiment of the invention, the predetermined repetitive time is in the range of 300 milliseconds to 2,000 milliseconds.

[0097] Upon a trigger event, circuitry in the network peripheral device measures one or more signal strength parameters. In one embodiment of the invention, the signal strength parameter comprises receiver signal strength intensity (RSSI) (block **706**). In another embodiment of the invention, the signal strength parameter comprises power level after demodulation or link quality (block **707**). In another embodiment of the invention, the signal strength parameter comprises signal to noise ratio (SNR) (block **708**).

[0098] Circuitry in the network peripheral device determines a level of quality of the signal based on one or more of the measured signal strength parameters. In one embodiment of the invention, the level of quality of the signal is based solely on RSSI. In another embodiment of the invention, the level of quality of the signal is based solely on link quality. In another embodiment of the invention, the level of quality of the signal is based solely on SNR. In another embodiment of the invention, the level of quality of the signal is based on a combination of RSSI, link quality, and SNR.

[0099] The determined level of quality of the signal is normalized, or rescaled (block **709**). In one embodiment of

the invention, the normalization is comprised of a percentage. In another embodiment of the invention, the normalization is comprised of a number that corresponds to the number of a plurality of visual indicators coupled to the network peripheral device.

[0100] Circuitry in the network peripheral device activates zero or more visual indicators corresponding to the normalized determined level of quality of the signal by switching on the applicable number of visual indicators (block 710). The network peripheral device may include any possible number of visual indicators, such as 4, 5, 6, 7, 9, 11, 12, or other numbers, according to various embodiments of the invention. In one embodiment of the invention, the network peripheral device includes 10 visual indicators. If the normalized determined level of quality is zero, then assuming 10 visual indicators are included in the network peripheral device, zero indicators will be activated. If the normalized determined level of quality is 50%, then assuming 10 visual indicators are included in the network peripheral device, five indicators will be activated when using a linear scale. The scale used may be different types, such as logarithmic, exponential, or other scaling, according to various embodiments of the invention. If the normalized determined level of quality is 100%, then assuming 10 visual indicators are included in the network peripheral device, ten indicators will be activated when using a linear scale.

[0101] In one embodiment of the invention, the activated visual indicators will remain activated for a predetermined time period. Different predetermined time periods are possible, for example the predetermined time period may be in the range of 20 milliseconds to 5,000 milliseconds or 200 milliseconds or longer, or other ranges, according to various embodiments of the invention.

[0102] Circuitry in the network peripheral device may activate visual indicators in various sequences corresponding to one of normalized link quality, SNR, and RSSI, according to various embodiments of the invention. In one such embodiment of the invention, circuitry in the network peripheral device activates zero or more indicators corresponding to the normalized level of quality of the signal as indicated by RSSI for a predetermined time period, then activates zero or more indicators corresponding to the normalized level of quality of the signal as indicated by link quality for a predetermined time period, and finally activates zero or more indicators corresponding to the normalized level of quality of the signal as indicated by SNR for a predetermined time period. In one embodiment of the invention, the predetermined time period, between each activation of visual indicators corresponding to each RSSI, link quality, and SNR, is in the range of 300 milliseconds to 2,000 milliseconds.

[0103] FIG. 8 is a flow diagram of receiving information that a trigger event has occurred, changing setting or updating firmware, calculating re-boot time and/or update time and switching on visual indicators, according to an embodiment of the invention. Based on the detection by circuitry in a computer network peripheral device, such as a change of settings in or affecting the network peripheral device, or that firmware of the network peripheral device is being updated, circuitry in the network peripheral device will calculate the re-boot time and/or update time corresponding to the corresponding event, and activate visual indicators located on

the network peripheral device corresponding to calculated re-boot time and/or update time.

[0104] During the download of information, circuitry in a computer network peripheral device detects a change of setting in or affecting the network peripheral device (block 802), or that firmware of the network peripheral device is being updated (block 803). In one embodiment of the invention, the change in settings corresponds to a change in frequency channel being used by an electronic communications system.

[0105] Upon a detection of a change of setting, circuitry in the network peripheral device calculates the re-boot time associated with the change of setting (block 804). Upon detection of update of firmware, circuitry in the network peripheral device calculates the update and/or re-boot time associated with the update of firmware (block 804). Different re-boot times are possible, for example, the re-boot time may be in the range of 2 seconds to 180 seconds, or may be substantially 60 seconds, according to various embodiments of the invention.

[0106] The determined re-boot time is normalized, or rescaled (block 805). In one embodiment of the invention, the normalization is comprised of a percentage. In another embodiment of the invention, the normalization is comprised of a number that corresponds to the number of a plurality of visual indicators coupled to the network peripheral device.

[0107] Circuitry in the network peripheral device activates one visual indicator each time a proportional time segment of the normalized re-boot time is crossed (block 806). The network peripheral device may comprise wireless node or other network peripheral device. Accordingly, the network peripheral device comprises a bridge, an access point, a router, a gateway, a modem, a firewall, and/or a client adapter according to various embodiments of the invention. The one or more visual indicators may comprise LEDs, or other forms of visual indicators as discussed previously, according to various embodiments of the invention. The network peripheral device may include any possible number of visual indicators, such as 4, 5, 6, 7, 9, 11, 12, or other numbers, according to various embodiments of the invention. In one embodiment of the invention, the network peripheral device includes 10 visual indicators. If the re-boot time is 10 seconds, it will be normalized based on the 10 visual indicators, so that 1 visual indicator will be activated every 1 second until all 10 indicators are activated at the end of the 10 second re-boot time.

[0108] In one embodiment of the invention, the activated visual indicators will remain activated for a predetermined time period. Various predetermined time periods are possible, for example the predetermined time period may be in the range of 1 millisecond to 10,000 milliseconds, or other ranges, according to various embodiments of the invention.

[0109] FIG. 9 is a flow diagram of downloading a file, calculating download time, and switching on visual indicators, according to an embodiment of the invention. When a file is being downloaded through a computer network peripheral device, circuitry in the network peripheral device will calculate the download time corresponding to the size of the file, and activate visual indicators located on the network peripheral device corresponding to calculated download time.

[0110] A file is downloaded using a computer network peripheral device (block 901). The network peripheral device may comprise circuitry in the network peripheral device that calculates the download time associated with the size of the file being downloaded (block 902).

[0111] The calculated download time is normalized, or rescaled (block 903). In one embodiment of the invention, the normalization is comprised of a percentage. In another embodiment of the invention, the normalization is comprised of a number that corresponds to the number of a plurality of visual indicators coupled to the network peripheral device.

[0112] Circuitry in the network peripheral device activates one visual indicator each time a proportional time segment of the normalized download time is crossed (block 904). The network peripheral device may comprise wireless node or other network peripheral device. Accordingly, the network peripheral device comprises a bridge, an access point, a router, a gateway, a modem, and/or a client adapter according to various embodiments of the invention. The one or more visual indicators may comprise LEDs, or other forms of visual indicators as discussed previously, according to various embodiments of the invention. The network peripheral device may include any possible number of visual indicators, such as 4, 5, 6, 7, 9, 11, 12, or other numbers, according to various embodiments of the invention. In one embodiment of the invention, the network peripheral device includes 20 visual indicators. If the download time is 10 minutes, it will be normalized based on the 20 visual indicators, so that one visual indicator will be activated every 30 seconds until all 20 indicators are activated at the end of the 10 minute download time.

[0113] In one embodiment of the invention, the activated visual indicators will remain activated for a predetermined time period. Various predetermined time periods are possible, for example the predetermined time period may be in the range of 1 millisecond to 10,000 milliseconds, or other ranges, according to various embodiments of the invention.

[0114] FIG. 10 is a flow diagram of detecting and determining a property of an event related to operation of communications electronics, and switching on visual indicators, according to an embodiment of the invention. Based on the detection by circuitry in a computer network peripheral device related to the operation of communication electronics in the network peripheral device, circuitry in the network peripheral device will determine a property of corresponding event, and activate visual indicators located on the network peripheral device corresponding to determined property of the event.

[0115] Circuitry in a computer network peripheral device detects an event related to the operation of communications electronics coupled to the network peripheral device (block 1001). Events may include a file or virus being blocked by the network peripheral device, timer completion, receiving or sending an e-mail correspondence, a request to a targeted or forbidden web site, an attempted unauthorized access to the network peripheral device, or similar events.

[0116] Circuitry in the network peripheral device determines one or more properties of the event (block 1002) and activates one or more visual indicators coupled to the network peripheral device (block 1003) to convey useful

information regarding the event. In one embodiment of the invention, the useful information informs a user of the occurrence of an event, such as receipt of an e-mail correspondence. In another embodiment of the invention, the useful information warns a user of an event, such as an attempted unauthorized access to the network peripheral device. In another embodiment of the invention, the useful information is conveyance of urgency to a user of the occurrence of an event, such as completion of timer set by the user.

[0117] The network peripheral device may comprise wireless node or other network peripheral device. Accordingly, the network peripheral device comprises a bridge, an access point, a router, a gateway, a modem, and/or a client adapter according to various embodiments of the invention. The one or more visual indicators may comprise LEDs, or other forms of visual indicators as discussed herein, according to various embodiments of the invention. In one embodiment of the invention, the visual indicators comprise LEDs and are capable of emitting different colors. In one embodiment of the invention, the different colors correspond to different types of events, such as red for a virus detection, green for warnings, and blue for all other types of events detected.

[0118] In one embodiment of the invention, the visual indicators are activated to form various patterns reflecting useful information corresponding to an event. In one embodiment of the invention, all visual indicators are activated simultaneously for a predetermined time period according to a predetermined cycle time when a virus is detected. Various predetermined cycle times are possible, for example the cycle time may be in the range of 1,000 milliseconds to 5,000 milliseconds, or other ranges, according to various embodiments of the invention. Various predetermined time periods are possible, for example the predetermined time period may be in the range of 100 milliseconds to 4,900 milliseconds, or other ranges, according to various embodiments of the invention.

[0119] FIG. 11 is a flow diagram of receiving and streaming music content, determining music power, and switching on visual indicators, according to an embodiment of the invention. When a computer network peripheral device receives music content, circuitry in the network peripheral device streams the music content, determines music power associated with the music content, and activates visual indicators corresponding to determined music power.

[0120] Music content is received from a computer network (block 1101). Circuitry in a computer network peripheral device streams the music content (block 1102) and determines music power associated with the music content (block 1103). The music power may be calculated in various forms, for example, in one embodiment of the invention, instantaneous music power is calculated.

[0121] Circuitry in the network peripheral device activates one or more visual indicators from among a plurality of visual indicators coupled to a computer network peripheral device by switching on one or more visual indicators (block 1104) corresponding to the determined music power. The one or more visual indicators may comprise LEDs, or other forms of visual indicators as discussed herein, according to various embodiments of the invention. The network peripheral device may comprise wireless node or other network peripheral device as described herein. Circuitry in the net-

work peripheral device may include a decoder, according to an embodiment of the invention. The decoder may comprise an audio decoder, a music decoder, a still image decoder, such as a JPG or GIF decoder, a video decoder, an MPEG 1, 2, 3, or 4 decoder, or other decoder, according to various embodiments of the invention. The decoder may also comprise more than one decoder or a decoder with several standards, such as MPEG 2 and 4 (a multi-decoder), or other combinations, according to various embodiments of the invention.

[0122] The network peripheral device may include any possible number of visual indicators, such as 4, 5, 6, 7, 9, 11, 12, or other numbers, according to various embodiments of the invention. In one embodiment of the invention, the network peripheral device includes 5 visual indicators. If the music power is determined to be at 60% of the full music power, circuitry in the network peripheral device will active 3 of the 5 visual indicators corresponding to the 60% music power.

[0123] In one embodiment of the invention, circuitry in the network peripheral device cuts the music content block by block, performs a Fourier transform on respective blocks, of a predetermined set of frequency bins, and determines the instantaneous music power for each bin. In one embodiment of the invention the predetermined frequency is in the range of 20 Hz to 20 KHz. In one embodiment of the invention, the predetermined set of bins is ten. Circuitry in the network peripheral device activates one or more visual indicators from among a plurality of visual indicators coupled to network peripheral device by switching on one or more visual indicators corresponding to the determined instantaneous music power for each bin.

[0124] In one embodiment of the invention, the activated visual indicators will remain activated for a predetermined time period. Various predetermined time periods are possible, for example the predetermined time period may be in the range of 10 milliseconds to 5,000 milliseconds, or other ranges, according to various embodiments of the invention.

[0125] FIG. 12 is a flow diagram of receiving and streaming music content, and switching on visual indicators, according to an embodiment of the invention. When a computer network peripheral device receives music content, circuitry in the network peripheral device streams the music content, determines an aspect of the music content, such as its rhythm or occurrences in the music content, and activates visual indicators corresponding to determined aspect of the music content.

[0126] Music content is received from a computer network (block 1201). Circuitry in a computer network peripheral device streams the music content (block 1202) and determines rhythm of, or occurrences in, the music content (block 1203).

[0127] In one embodiment of the invention, circuitry in the network peripheral device activates one or more visual indicators from among a plurality of visual indicators coupled to network peripheral device by switching on one or more visual indicators (block 1204) corresponding to the determined rhythm of the music content. The one or more visual indicators may comprise LEDs, or other forms of visual indicators as discussed previously, according to various embodiments of the invention.

[0128] In one embodiment of the invention, circuitry in the network peripheral device activates an electronic display, such as an LCD or other display to show useful information related to the music content (block 1204). The electronic display may show various forms of useful information, such as graphics, pictures, video, or other displays related to the music content, according to various embodiments of the invention. In one embodiment of the invention, an emulation of music synthesizer is displayed on the electronic display with motion corresponding to the determined rhythm of the music content. In another embodiment of the invention, the useful information comprises one or more attributes of the music content. In one embodiment of the invention, the music content is a music file and the attributes displayed on the electronic display comprise song title, artist and current status of the music file, such as that it is currently playing or paused. In another embodiment of the invention, the music content is a music video, and circuitry in the network peripheral device displays a music video clip related to the music file on the electronic display. In another embodiment of the invention, circuitry in the network peripheral device displays a still image related to the music content, such as an album cover to the album of which the music file is a part.

[0129] The network peripheral device may comprise wireless node or other network peripheral device. Accordingly, the network peripheral device comprises a bridge, an access point, a router, a gateway, a modem, a firewall, and/or a client adapter according to various embodiments of the invention. Circuitry in the network peripheral device may include a decoder capable of decoding music, according to an embodiment of the invention. The decoder may comprise an MPEG 1, 2, 3, MPEG-4 decoder, or other decoder, according to various embodiments of the invention.

[0130] The pixel intensity of the electronic display may be adjusted by a user directly through an interface in the network peripheral device, or in response to an action by a user on software coupled to the network peripheral device, or through other means, according to various embodiments of the invention.

[0131] FIG. 13 is a flow diagram of receiving and decoding media content, and activating visual indicators, according to an embodiment of the invention. When a computer network peripheral device receives media content, circuitry in the network peripheral device decodes the media content, and activates an electronic display which displays the decoded media content.

[0132] Media content is received from a computer network (block 1301). Circuitry in a computer network peripheral device decodes the media content (block 1302). Circuitry in the network peripheral device may include a decoder capable of decoding music, still images and video, according to an embodiment of the invention. The decoder may comprise an MPEG 1, 2, 3, MPEG-4 decoder, or other decoder, according to various embodiments of the invention.

[0133] In one embodiment of the invention, circuitry in the network peripheral device activates one or more visual indicators from among a plurality of visual indicators coupled to the network peripheral device by switching on one or more visual indicators (block 1303) corresponding to the determined aspect of the media content. The network peripheral device may comprise wireless node or other

network peripheral device. Accordingly, the network peripheral device comprises a bridge, an access point, a router, a gateway, a modem, a firewall, and/or a client adapter according to various embodiments of the invention.

[0134] In one embodiment of the invention, circuitry in the network peripheral device activates an electronic display, such as a liquid crystal display (LCD) to show useful information related to the media content (block 1303). The media content may include a video file and the useful information displayed on the electronic display may comprise video title, source and current status of the video file, such as that it is currently playing or paused, according to an embodiment of the invention. Circuitry in the network peripheral device may display a still image, an animated image, a set of images, or a video clip related to the media content on the electronic display, according to various embodiments of the invention.

[0135] The pixel intensity of the electronic display may be adjusted by a user directly through an interface in the network peripheral device, or in response to an action by a user on software coupled to the network peripheral device, or through other means, according to various embodiments of the invention.

[0136] In one embodiment of the invention, the activated visual indicators and/or electronic display will remain activated for a predetermined time period. Different predetermined time periods are possible, for example, the predetermined time periods may be in the range of 10 milliseconds to 5,000 milliseconds, or 200 milliseconds or longer, according to various embodiments of the invention.

[0137] An embodiment of the invention is directed to a method involving a client device and a computer network peripheral device having an interface to a network, network communication electronics operable with the interface, and circuitry that communicates with the client device. The method includes transmitting data within the computer network, receiving content from among the transmitted data, determining an aspect of the content, controlling a visual user output on the device (the controlling based on the determined aspect of the content) and streaming the content to the client device. The client device may comprise at least one of the devices selected from the following: a personal computer, a media player, a game station, a television, a monitor, a high-definition television (HDTV), a wireless access point (AP) client, a wireless satellite receiver, or a personal video recorder. The client device may also comprise a wireless medial player. The computer network peripheral device may comprise a router, a modem, or a firewall. The visual user output may comprise a plurality of light emitting diodes (LEDs), a graphic display, or a liquid crystal display (LCD). The content may comprise audio content. In such a case (i) the aspect of the content may correspond to power, or rhythm of the audio content, or (ii) the method may also include cutting the audio content block by block, performing a Fourier transform of a predetermined set of bins for each block, and determining audio power for each bin, or (iii) the method may also include determining rhythm of the audio content, synchronizing the audio content with the determined rhythm, and controlling the visual user output based on the determined rhythm. The content may also comprise visual content. In such a case, the method may also include displaying a video clip corresponding to

the visual content on the visual user output, or displaying a movie, corresponding to the visual content, on the visual user output.

[0138] An embodiment of the invention is directed to a computer network peripheral device. The computer network peripheral device includes circuitry that communicates with a client device, an interface that receives content from a computer network, communication electronics operable with the interface (the communication electronics receives data included in content), circuitry that transmits data within the computer network, circuitry that streams the content to the client device, circuitry that determines an aspect of the content, and circuitry that controls a visual user output on the network peripheral device based on the determined aspect of the content. The client device may comprise at least one of the devices selected from the following: a personal computer, a media player, a game station, a television, a monitor, a high-definition television (HDTV), a wireless access point (AP) client, a wireless satellite receiver, or a personal video recorder. The client device may also comprise a wireless medial player. The visual user output may comprise a plurality of light emitting diodes (LEDs), a graphic display, or a liquid crystal display (LCD). The computer network peripheral device may also include a decoder, such as a video decoder or an audio decoder. The content may comprise visual content, in which case the device may also include a video decoder and circuitry that causes a display, on the visual user output, of moving video from the visual content.

[0139] An embodiment of the invention is directed to a wireless LAN peripheral device. The LAN peripheral device includes at least one antenna, base band electronics that receive and process information from the antenna, media access control (MAC) logic that is coupled to and receives the processed information from the base band electronics, circuitry that determines an aspect of content from the information received from the MAC logic, a visual user output, and circuitry that controls the visual user output, the controlling based on the determined aspect of the content. The visual user output may comprise a plurality of light emitting diodes (LEDs), a graphic display, or a liquid crystal display (LCD). The LAN peripheral device may include circuitry that causes the display of at least part of the video content on the visual user output.

[0140] An embodiment of the invention is directed to a wireless LAN peripheral device. The LAN peripheral device includes at least one antenna, base band electronics that receive and process information from the antenna, media access control (MAC) logic that is coupled to and receives the processed information from the base band electronics, a decoder that decodes content from the information received from the MAC logic, circuitry that determines an aspect of the content decoded by the decoder, a visual user output, and circuitry that controls the visual user output, the controlling based on the determined aspect of the content.

[0141] An embodiment of the invention is directed to a computer network peripheral device. The computer network peripheral device includes circuitry that communicates with a computer, at least one antenna, network communication electronics operable with the antenna, electronics that measure an aspect of radio signal quality of the antenna, electronics that determine a level of radio signal quality based on

the measured aspect of radio signal quality, a visual user output, and circuitry that controls visual user output, the controlling based on the determined level of radio signal quality. The aspect of radio signal quality of the antenna may comprise receive signal strength intensity (RSSI), power level after demodulation, link quality, or signal to noise ratio (SNR), or two or more of the foregoing. The computer network peripheral device may also include a router, a modem, a base band processor, and/or a media access control (MAC) processor. The visual user output may comprise a plurality of light emitting diodes (LEDs), a graphic display, or a liquid crystal display (LCD).

[0142] An embodiment of the invention is directed to a computer network peripheral device in which visual indicators are activated to show information. The computer network peripheral device includes circuitry that communicates with a computer, network communications electronics, circuitry that determines information regarding communication by the device, a visual user output, circuitry that controls the visual user output based on the information, a form of user input, and circuitry that activates or deactivates the visual user output based on action in the user input while not interrupting communication with the computer or communication through the network communication electronics. The form of user input may comprise an on/off switch. The form of use input may also correspond to a capacitive coupling circuit, the capacitive coupling circuit responsive to a user's touch to activate or deactivate the visual user output. The form of user input may also comprise a software application coupled to the circuitry, the software application responsive to a user's instruction to activate or deactivate the visual user output. The visual user output may comprise a plurality of light emitting diodes (LEDs), or a graphic display. The information may comprise quality of radio signal received by the device, or a video clip from video content received by the device. The computer network peripheral device may also include a router.

[0143] An embodiment of the invention is directed to a network peripheral device including logic that determines status of completion of a download of information to another device through the network peripheral device. The network peripheral device also includes: an interface that receives information from a computer network, communication electronics operable with the interface, a plurality of electronically controllable visual indicators, and circuitry that activates selected indicators from the plurality of indicators, the activation corresponding to status of completion of the download.

[0144] An embodiment of the invention is directed to a method involving download of information by a network peripheral device, which network peripheral device includes an interface that receives information from a computer network and communication electronics operable with the interface, and activating selected indicators from a plurality of indicators corresponding to status of completion of the download of information.

[0145] An embodiment of the invention is directed to a network peripheral device including logic that determines

status of completion of an update of code for the network peripheral device. The network peripheral device also includes: an interface that receives information from a computer network, communication electronics operable with the interface, a plurality of electronically controllable visual indicators, and circuitry that activates selected indicators from the plurality of indicators, the activation corresponding to status of completion of the update of code.

[0146] An embodiment of the invention is directed to a method involving a computer network peripheral device, which network peripheral device includes an interface that receives information from a computer network and communication electronics operable with the interface, and activating selected indicators from a plurality of indicators corresponding to status of completion of update code.

[0147] An embodiment of the invention is directed to a network peripheral device including logic that changes settings of the network peripheral device. The network peripheral device also includes: an interface that receives information from a computer network, communication electronics operable with the interface, a plurality of electronically controllable visual indicators, and circuitry that, upon change of the settings of the network peripheral device, progressively changes activation of indicators from the plurality of indicators, the activation corresponding to progress in a rebooting of the network peripheral device that occurs in connection with the change of settings.

[0148] An embodiment of the invention is directed to a method for changing the settings of a network peripheral device, which network peripheral device includes an interface that receives information from a computer network and communication electronics operable with the interface, and upon such change of settings, progressively activating selected indicators from a plurality of indicators corresponding to progress in a rebooting of the device that occurs in connection with the change of settings.

[0149] An embodiment of the invention is directed to a network peripheral device including logic that detects an event related to operation of communications electronics in the network peripheral device, and logic that determines a property of the event. The network peripheral device also includes: an interface that receives information from a computer network, communication electronics operable with the interface, a plurality of electronically controllable visual indicators, and circuitry that, upon detection of the event, activates indicators from the plurality of indicators, the activation corresponding to the determined property of the event.

[0150] An embodiment of the invention is directed to a method involving an event related to operation of communications electronics in a network peripheral device. The method includes determining a property of the event, and activating selected indicators from a plurality of indicators corresponding to the determined property of the event. The network peripheral device includes an interface that receives information from a computer network, and the communications electronics are operable with such interface.

[0151] Aspects of the systems and methods described herein may be implemented as functionality programmed into any of a variety of circuitry, including programmable logic devices (PLDs), such as field programmable gate arrays (FPGAs), programmable array logic (PAL) devices, electrically programmable logic and memory devices and standard cell-based devices, as well as application specific integrated circuits (ASICs). Some other possibilities for implementing aspects of the systems and methods include: microcontrollers with memory, embedded microprocessors, firmware, software, etc. Furthermore, aspects of the systems and methods may be embodied in microprocessors having software-based circuit emulation, discrete logic (sequential and combinatorial), custom devices, fuzzy (neural) logic, quantum devices, and hybrids of any of the above device types. Of course the underlying device technologies may be provided in a variety of component types, e.g., metal-oxide semiconductor field-effect transistor (MOSFET) technologies like complementary metal-oxide semiconductor (CMOS), bipolar technologies like emitter-coupled logic (ECL), polymer technologies (e.g., silicon-conjugated polymer and metal-conjugated polymer-metal structures), mixed analog and digital, etc.

[0152] It should be noted that the various functions or processes disclosed herein may be described as data and/or instructions embodied in various computer-readable media, in terms of their behavioral, register transfer, logic component, transistor, layout geometries, and/or other characteristics. Computer-readable media in which such formatted data and/or instructions may be embodied include, but are not limited to, non-volatile storage media in various forms (e.g., optical, magnetic or semiconductor storage media) and carrier waves that may be used to transfer such formatted data and/or instructions through wireless, optical, or wired signaling media or any combination thereof. Examples of transfers of such formatted data and/or instructions by carrier waves include, but are not limited to, transfers (uploads, downloads, e-mail, etc.) over the Internet and/or other computer networks via one or more data transfer protocols (e.g., HTTP, FTP, SMTP, etc.). When received within a computer system via one or more computer-readable media, such data and/or instruction-based expressions of components and/or processes under the systems and methods may be processed by a processing entity (e.g., one or more processors) within the computer system in conjunction with execution of one or more other computer programs.

[0153] Unless the context clearly requires otherwise, throughout the description and the claims, the words 'comprise,' 'comprising,' and the like are to be construed in an inclusive sense as opposed to an exclusive or exhaustive sense; that is to say, in a sense of 'including, but not limited to.' Words using the singular or plural number also include the plural or singular number respectively. Additionally, the words 'herein,' 'hereunder,' 'above,' 'below,' and words of similar import refer to this application as a whole and not to any particular portions of this application. When the word 'or' is used in reference to a list of two or more items, that

word covers all of the following interpretations of the word: any of the items in the list, all of the items in the list and any combination of the items in the list.

[0154] The above description of illustrated embodiments of the systems and methods is not intended to be exhaustive or to limit the systems and methods to the precise form disclosed. While specific embodiments of, and examples for, the systems and methods are described herein for illustrative purposes, various equivalent modifications are possible within the scope of the systems and methods, as those skilled in the relevant art will recognize. The teachings of the systems and methods provided herein can be applied to other processing systems and methods, not only for the systems and methods described above.

[0155] The elements and acts of the various embodiments described above can be combined to provide further embodiments. These and other changes can be made to the systems and methods in light of the above detailed description.

[0156] In general, in the following claims, the terms used should not be construed to limit the systems and methods to the specific embodiments disclosed in the specification and the claims, but should be construed to include all processing systems that operate under the claims. Accordingly, the systems and methods is not limited by the disclosure, but instead the scope of the systems and methods is to be determined entirely by the claims.

[0157] While certain aspects of the systems and methods are presented below in certain claim forms, the inventors contemplate the various aspects of the systems and methods in any number of claim forms. Accordingly, the inventors reserve the right to add additional claims after filing the application to pursue such additional claim forms for other aspects of the systems and methods.

1. A network peripheral device comprising:
 - a plurality of antennas;
 - network communications electronics operable with the antennas;
 - a plurality of electronically controllable visual indicators; and
 - circuitry that activates selected indicators from the plurality of indicators, the activation corresponding to selection of respective antennas from among the plurality of antennas.
2. The device of claim 1, including networking electronics.
3. The device of claim 1, including router functionality.
4. The device of claim 1, including a modem.
5. The device of claim 1, including a base band processor.
6. The device of claim 1, including a firewall.
7. The device of claim 1, including a media access control (MAC) processor.
8. The device of claim 1, wherein the visual indicators comprise light emitting diodes (LEDs).
9. The device of claim 1, wherein each visual indicator corresponds to a particular antenna among the plurality of antennas.

10. The device of claim 1, wherein the visual indicators are arranged in a pattern corresponding to an arrangement of antennas in the plurality of antennas.

11. The device of claim 1, wherein the visual indicators are arranged in a substantially circular pattern.

12. The device of claim 1, wherein the visual indicators may comprise marks on a display.

13. A wireless LAN device comprising:

a plurality of antennas;

base band electronics that receive and process information from the antennas;

media access control (MAC) logic that is coupled to and receives the processed information from the base band electronics;

an Ethernet interface coupled to the MAC logic;

a plurality of light emitting diodes (LEDs); and

circuitry that activates selected LEDs from the plurality of LEDs, the activation corresponding to selection of respective antennas from among the plurality of antennas.

14. The wireless LAN device of claim 13, wherein the base band electronics and MAC logic comprise a single processor.

15. (canceled)

16. (canceled)

17. The LAN device of claim 13, wherein the LEDs are switched on for a predetermined time period.

18. (canceled)

19. (canceled)

20. (canceled)

21. (canceled)

22. (canceled)

23. (canceled)

24. The LAN device of claim 13, including a dome covering the LEDs.

25. (canceled)

26. (canceled)

27. A computer network peripheral device comprising:

a housing;

communications electronics located within the housing;

a plurality of antennas;

a plurality of electronically controllable visual indicators mounted to the housing;

circuitry that activates selected indicators from the plurality of indicators, the activation corresponding to selection of respective antennas from among the plurality of antennas; and

circuitry that de-activates the visual indicators in response to a user action.

28. The device of claim 27, including a switch for receiving the user action.

29. The device of claim 27, including circuitry to detect the user action through capacitive coupling.

30. The device of claim 27, including a cover covering the plurality of visual indicators, and wherein the user action comprises touching the cover.

31. The device of claim 27, including a software application, and wherein the user action comprises use of the software application to control the circuitry that de-activates the visual indicators.

32. (canceled)

33. (canceled)

34. (canceled)

35. (canceled)

36. (canceled)

37. (canceled)

38. The device of claim 27, including a substantially circular dome covering the indicators.

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