Aspects of a method and system for managing energy costs utilizing a broadband gateway are provided. In this regard, a broadband gateway may determine usage patterns for one or more electronic devices communicatively coupled to the broadband gateway. The broadband gateway may control tasks performed and/or to be performed based on the patterns of use and based on a pricing structure for energy supplied to the broadband gateway and/or the one or more electronic devices. Controlling tasks to be performed may comprise, for example, scheduling performance of the tasks. Exemplary tasks may comprise downloading multimedia content and configuring a state of operation of the one or more electronic devices. In an exemplary embodiment of the invention, a state of operation of the electronic device(s) may be configurable between a plurality of states comprising: a powered-off state, a standby state, and a powered-on state.
FIG. 1B
302. User brings up GUI

304. User configures settings

306. Track user content consumption patterns

308. Perform actions at times based on user patterns and based on energy costs

FIG. 3A

322. Configuration triggering event (e.g., by scheduler or by change in settings)

324. High likelihood of use during current period? Configure device into power on state

328. Moderate likelihood of use during current period? Configure device into standby state

332. Configure device into power off state

334. Wait for next triggering event

FIG. 3B
User brings up GUI

User configures settings

Detect triggering event while monitoring energy pricing and consumption

User has configured profile to be notified of changes in energy pricing? Y: Communicate notification via one or more electronic devices

User has configured profile to automatically manage energy consumption? N:

Devices configured and/or other actions taken to manage energy costs

FIG. 4
METHOD AND SYSTEM FOR MANAGING ENERGY COSTS UTILIZING A BROADBAND GATEWAY

CLAIM OF PRIORITY


[0002] The above stated application is hereby incorporated herein by reference in its entirety.

INTEGRATION OF THE INVENTION

[0003] This application also makes reference to

[0004] U.S. patent application Ser. No. ____ (Attorney Docket No. 23397US02) filed on even date herewith;

[0005] U.S. patent application Ser. No. ____ (Attorney Docket No. 23398US02) filed on even date herewith;

[0006] U.S. patent application Ser. No. ____ (Attorney Docket No. 23399US02) filed on even date herewith;

[0007] U.S. patent application Ser. No. ____ (Attorney Docket No. 23400US02) filed on even date herewith;

[0008] U.S. patent application Ser. No. ____ (Attorney Docket No. 23401US02) filed on even date herewith;

[0009] U.S. patent application Ser. No. ____ (Attorney Docket No. 23402US02) filed on even date herewith;


[0012] U.S. patent application Ser. No. ____ (Attorney Docket No. 23405US02) filed on even date herewith;

[0013] U.S. patent application Ser. No. ____ (Attorney Docket No. 23406US02) filed on even date herewith;


[0015] U.S. patent application Ser. No. ____ (Attorney Docket No. 23408US02) filed on even date herewith;

[0016] U.S. patent application Ser. No. ____ (Attorney Docket No. 23409US02) filed on even date herewith;

[0017] U.S. patent application Ser. No. ____ (Attorney Docket No. 23410US02) filed on even date herewith;


[0019] U.S. patent application Ser. No. ____ (Attorney Docket No. 23412US02) filed on even date herewith;

[0020] U.S. patent application Ser. No. ____ (Attorney Docket No. 23413US02) filed on even date herewith;

[0021] U.S. patent application Ser. No. ____ (Attorney Docket No. 23414US02) filed on even date herewith;

[0022] U.S. patent application Ser. No. ____ (Attorney Docket No. 23415US02) filed on even date herewith;

[0023] U.S. patent application Ser. No. ____ (Attorney Docket No. 23416US02) filed on even date herewith;

[0024] U.S. patent application Ser. No. ____ (Attorney Docket No. 23417US02) filed on even date herewith;

[0025] U.S. patent application Ser. No. ____ (Attorney Docket No. 23418US02) filed on even date herewith;

[0026] U.S. patent application Ser. No. ____ (Attorney Docket No. 23419US02) filed on even date herewith;

[0027] U.S. patent application Ser. No. ____ (Attorney Docket No. 23420US02) filed on even date herewith;

[0028] U.S. patent application Ser. No. ____ (Attorney Docket No. 23421US02) filed on even date herewith;

[0029] U.S. patent application Ser. No. ____ (Attorney Docket No. 23422US02) filed on even date herewith;

[0030] U.S. patent application Ser. No. ____ (Attorney Docket No. 23423US02) filed on even date herewith;

[0031] U.S. patent application Ser. No. ____ (Attorney Docket No. 23424US02) filed on even date herewith;

[0032] U.S. patent application Ser. No. ____ (Attorney Docket No. 23425US02) filed on even date herewith;

[0033] U.S. patent application Ser. No. ____ (Attorney Docket No. 23426US02) filed on even date herewith;

[0034] U.S. patent application Ser. No. ____ (Attorney Docket No. 23427US02) filed on even date herewith;

[0035] U.S. patent application Ser. No. ____ (Attorney Docket No. 23428US02) filed on even date herewith;

[0036] U.S. patent application Ser. No. ____ (Attorney Docket No. 23429US02) filed on even date herewith;

[0037] U.S. patent application Ser. No. ____ (Attorney Docket No. 23430US02) filed on even date herewith;

[0038] U.S. patent application Ser. No. ____ (Attorney Docket No. 23431US02) filed on even date herewith;

[0039] U.S. patent application Ser. No. ____ (Attorney Docket No. 23432US02) filed on even date herewith;

[0040] U.S. patent application Ser. No. ____ (Attorney Docket No. 23433US02) filed on even date herewith;

[0041] U.S. patent application Ser. No. ____ (Attorney Docket No. 23434US02) filed on even date herewith;

[0042] U.S. patent application Ser. No. ____ (Attorney Docket No. 23435US02) filed on even date herewith;

[0043] Each of the above stated applications is hereby incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

[0044] Certain embodiments of the invention relate to a broadband gateway. More specifically, certain embodiments of the invention relate to a method and system for managing energy consumption utilizing a broadband gateway based on usage patterns.

BACKGROUND OF THE INVENTION

[0045] With the continuous growth of digital television or broadcast multimedia, and/or broadband access, which may be used in conjunction with online businesses, social networks, and/or other online services and applications, users may desire having access to a larger number of providers and/or a broader range of content in a manner that is flexible and/or suits the users' lifestyles. Most users connect to the Internet using web browsers running on personal computers (PCs). Furthermore, most households may have one or more televisions that may be used to view television and/or multimedia broadcasts. Television broadcasts may include terrestrial TV, Cable-Television (CATV), satellite TV and/or Internet Protocol television (IPTV) based broadcasts. To ensure against unauthorized reception and/or use of TV and/or multimedia broadcast, service providers may require use of dedicated set-top boxes (STBs) that may be used to encrypt broadcast signals communicated from the service providers to generate suitable video and/or audio streams that may be played via televisions and/or other display/playback devices in the household. Furthermore, STBs and/or TVs may support Internet access. Thus, rather than using a computer to access the Internet, a user may find it more convenient to use the flat screen televisions and/or monitors in homes for the same purpose. To do so, for example, an STB connected to a
flat screen television may be provided with web browsing software and protocols, and Internet connectivity, which may enable the user to easily access the Internet or check their electronic mail (email), for example, from a convenient and comfortable location such as their living room.

[0046] Further limitations and disadvantages of conventional and traditional approaches will become apparent to one of skill in the art, through comparison of such systems with some aspects of the present invention as set forth in the remainder of the present application with reference to the drawings.

BRIEF SUMMARY OF THE INVENTION

[0047] A system and/or method is provided for managing energy costs via a broadband gateway, substantially as illustrated and/or described in connection with at least one of the figures, as set forth more completely in the claims.

[0048] These and other advantages, aspects and novel features of the present invention, as well as details of an illustrated embodiment thereof, will be more fully understood from the following description and drawings.

BRIEF DESCRIPTION OF SEVERAL VIEWS OF THE DRAWINGS

[0049] FIG. 1A is a block diagram illustrating an exemplary communication system that comprises a home network serviced by a broadband gateway, in accordance with an embodiment of the invention.

[0050] FIG. 1B is a diagram illustrating an exemplary graphical user interface for managing energy costs via a broadband gateway, in accordance with an embodiment of the invention.

[0051] FIG. 1C is a block diagram illustrating an exemplary user interface generated by a broadband gateway for configuring energy efficient management in a home network, in accordance with an embodiment of the invention.

[0052] FIG. 2 is a block diagram illustrating an exemplary broadband gateway, in accordance with an embodiment of the invention.

[0053] FIG. 3A is a flowchart illustrating exemplary steps for performing tasks in a broadband gateway based on usage patterns and user preferences, in accordance with an embodiment of the invention.

[0054] FIG. 3B is a flowchart illustrating exemplary steps for controlling a state of operation of one or more electronic devices communicatively coupled to a broadband gateway, in accordance with an embodiment of the invention.

[0055] FIG. 4 is a flowchart illustrating exemplary steps for managing energy consumption via a broadband gateway based on variable energy pricing, in accordance with an embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0056] Certain embodiments of the invention may be found in a method and system for managing energy costs utilizing a broadband gateway. In various embodiments of the invention, a broadband gateway may determine usage patterns for one or more electronic devices communicatively coupled to the broadband gateway. The broadband gateway may enable communication with a plurality of devices and may be operable to handle at least one physical layer connection to at least one corresponding network access service provider. The broadband gateway may control tasks performed and/or to be performed based on the patterns of use and based on a pricing structure for energy supplied to the broadband gateway and/or the one or more electronic devices. Controlling tasks to be performed may comprise, for example, scheduling performance of the tasks. During times of higher energy consumption and/or prices, the broadband gateway may power off those of the electronic devices which, based on the patterns of use, are not likely to be utilized during such times. Exemplary tasks may comprise downloading multimedia content and configuring a state of operation of the one or more electronic devices. In an exemplary embodiment of the invention, a state of operation of the electronic device(s) may be configurable between a plurality of states comprising: a powered-off state, a standby state, and a powered-on state. The electronic device(s) may comprise lighting, heating ventilation and air conditioning (HVAC) controls, or other environmental controls. The broadband gateway may be operable to determine changes in consumption of energy and/or cost of such as whether energy prices have increased or will increase. The broadband gateway may be operable to send a notification of the change to the electronic device(s). The notification may indicate present power consumption and/or historical power consumption by the broadband gateway and/or the electronic device(s). The electronic device(s) may comprise a power strip that is operable to monitor energy consumed via its one or more outlets, and report the energy consumption to the broadband gateway. The power strip may communicate with the broadband gateway wirelessly or utilizing power line communication.

[0057] FIG. 1A is a block diagram illustrating an exemplary communication system that comprises a home network serviced by a broadband gateway, in accordance with an embodiment of the invention. Referring to FIG. 1A, there is shown a home network 100a, a plurality of distribution networks 110, a plurality of service providers 120, and a plurality of content providers 130. The home network 100a may be serviced by a broadband gateway 102. Also shown in FIG. 1 are additional home networks 100b, . . . , 100n, an emergency services provider network 140, and a utility company network 142. Each of the home networks 100b, . . . , 100n may also be serviced by a broadband gateway 102.

[0058] The service providers 120 may comprise various entities which may provide various services to the devices 104 via the gateway 102 and/or to the gateway 102 itself. The services may include, but are not limited to, multimedia, television, Internet, phone, Ethernet, multimedia over coax alliance (MoCA), passive optical network (PON), and/or cellular services, for example. Some of the service providers 120 may comprise network access service providers which provide physical layer connections to the gateway 102. Such physical layer connections may then be utilized to access, and/or may be part of, one or more of the distribution networks 110. In this regard, “network access service provider” as utilized herein, is distinguished from the more generic term “service provider” which may encompass services other than providing physical layer access to a network. Cable television providers, plain old telephone service (POTS) providers, digital subscriber line (DSL) providers, cellular providers, WiMAX providers, and satellite providers are examples of network access service providers.

[0059] The content providers 130 may generate, capture, and/or package content, such as multimedia content, that may be distributed to end-users. The content may comprise, for example, audio, video, e-book, gaming, and/or other content.
The content may be, for example, downloadable and/or streaming, rented and/or purchased. In some instances, a content provider and a service provider may be separate. In some instances, a single provider may provide both content and services. For example, an entity that functions as a network access service provider may also provide content and/or services other than network access and, thus, that entity may also be accurately referred to as a “content provider” and/or a “service provider.” Content and/or services that are provided by a content provider 130 and/or a service provider 120 may be provided to the gateway 102 via a physical connection provided by a network access service provider 120.

[0060] The plurality of distribution networks 110 may comprise one or more networks that may be operable to enable wireless, optical, and/or wired communication among a plurality of entities based on one or more networking and/or communication infrastructures. In this regard, the plurality of distribution networks 110 may be utilized to enable distributing multimedia content generated by the content providers 130, directly and/or via the service providers 120, to end-users. The network connectivity available via the plurality of distribution networks 110 may be based on one or more communication standards and/or protocols. The plurality of distribution networks 110 may comprise, for example, the Internet 110a, a CATV network 110b, a satellite television (TV) network 110c, a wireless local area network/wireless area network (LAN/WAN) 110d, and/or a cellular network 110e.

[0061] The Internet 110a may comprise a system of interconnected networks to enable exchange of data between a plurality of nodes, based on one or more networking standards, including, for example, the Internet Protocol (IP). For example, the Internet 110a may enable connectivity among a plurality of private and public, academic, business, and/or government nodes and/or networks. The physical connectivity may be provided in the Internet 110a via, for example, the Public Switched Telephone Network (PSTN), copper wires, fiber-optic cables, wireless interfaces, and/or other protocols and/or standards-based interfaces. The transport functionality may be performed in the Internet 110a based on, for example, one or more protocols, such as the Transmission Control Protocol/Internet Protocol (TCP/IP), for example. The CATV network 110b may comprise suitable distribution nodes, systems, and/or subnetworks that may enable forwarding of communication between CATV providers and a plurality of cable-TV consumers. For example, the CATV network 110b may comprise a network of fiber optics and/or coaxial cables for use in CATV broadcasts. The satellite TV network 110c may comprise suitable distribution nodes, systems, and/or subnetworks that may enable communication of satellite TV broadcast by satellite TV providers to a plurality of consumers. For example, the satellite network 110c may comprise a plurality of orbiting satellite nodes and/or one or more terrestrial centers in a satellite-TV system.

[0062] The LAN/WAN network 110d may comprise suitable logic, circuitry, interfaces, and/or code that may be operable to enable implementation of one or more wired and/or wireless LAN or WAN standards and/or protocols. Exemplary WAN technologies comprise, for example, WiMAX-based networks. Exemplary LAN technologies may comprise, for example, those based on IEEE 802.11 standards, including, for example, WiFi-based networks. The cellular network 110e may comprise suitable logic, circuitry, interfaces and/or code that may be operable to enable communication via one or more cellular technologies. Exemplary cellular technologies may comprise Code Division Multiple Access (CDMA), wideband CDMA (WCDMA), CDMA1000, High-Speed Downlink Packet Access (HS-DSCH), Global System for Mobile Communications (GSM), General Packet Radio Services (GPRS), Enhanced Data Rates for Global Evolution (EDGE), and/or Universal Mobile Telecommunication System (UMTS). The cellular network 110e may comprise, for example, a plurality of control and/or switching nodes, and a plurality of base stations that enable transmission and/or reception of cellular based communications between the cellular network 110e and cellular capable devices.

[0063] The home network 100a may correspond to a location that may comprise a plurality of devices 104 which may be serviced and/or managed by the broadband gateway 102. In this regard, the location may be a residence (e.g., home, apartment), a small business, a school, a library, and/or other like settings in which users may want to obtain access to service and/or content provider networks. The broadband gateway 102 may be utilized in the home network 100a to provide connectivity between the home network 100a and the service providers 120 (and/or the content providers 130) via the distribution networks 110.

[0064] The broadband gateway 102 may comprise suitable logic, circuitry, interfaces, and/or code that may be operable to provide connectivity between one or more devices in a home network, such as the home network 100a, and a plurality of external networks. For example, the broadband gateway 102 may handle a plurality of broadband physical layer connections 108 to the distribution networks 110. The broadband physical layer connections 108 may comprise wired, optical, and/or wireless connections between the broadband gateway 102 and the distribution networks 110. The broadband gateway 102 may operate as an interface device that may allow one or more service and/or content providers to interact with various devices in the home network. In this regard, the broadband gateway 102 may be operable to perform and/or provide various services that may pertain to enabling and/or facilitating reception of content from one or more content providers, wherein the content may be delivered through one or more services providers. For example, the broadband gateway 102 may be operable to perform such operations as network access related processing (e.g., PHY/MAC, transport layer processing), encryption and/or decryption, user and/or account authentication, and/or at least some of video and/or audio processing operations that may be needed for consumption of multimedia content. The broadband gateway 102 may communicate with various devices in the home network 100, using wired and/or wireless communication links.

[0065] A single gateway 102 may be operable to handle multiple physical layer (i.e., layer 1 of the open-systems interconnection model (OSI)) connections 108 to multiple ones, or portions, of the distribution networks 110, where different ones or portions of the distribution network(s) 110 are owned, operated, leased, or otherwise associated with different network access service providers 120. For example, a first network access service provider 120 may provide network access to the gateway 102 via a DSL connection over twisted-pair cabling, and a second network access service provider 120 may provide network access to the gateway 102 via a cable television connection over coaxial cabling. In some instances, the gateway 102 may be operable to concur-
rently communicate over multiple physical layer connections 108 provided by multiple network access service providers 120.

[0066] The broadband gateway 102 may also be operable to provide and/or support various other, non-content related services in the home network 100. For example, the broadband gateway 102 may be operable to provide energy management in the home network 100a, by controlling and/or adjusting configuration of one or more devices in the home network to reduce power consumption for example. Energy may be distributed in the form of, for example, electricity and/or natural gas.

[0067] Devices serviced by, and/or connected with the broadband gateway 102 may comprise content consuming devices and/or other, non-content consuming household or home devices that may be operable to interact with the broadband gateway 102. For example, the broadband gateway 102 may service, and/or may communicate with a plurality of home devices 104a-104m in the home network 100a. The devices 104a-104m may each be referred to as a communication device or an electronic device. The home devices may comprise, for example, one or more of a television 104a, a laptop computer 104b, a smoke detector, a carbon monoxide detector, and/or a security alarm 104c, a computer and/or server 104d, a mobile phone 104e, a speaker 104f, an AM/FM radio 104g, a phone 104h, an appliance 104i (e.g., refrigerator), a digital video recorder (DVR) or personal video recorder (PVR) 104j, a thermostat or other environmental control(s) 104k, a power strip 104l, lighting systems and/or controls 104m, and/or a power meter 104n. The broadband gateway 102 may interact with each of the home devices 104a-104m via links 106a-106m, which may be supported by the broadband gateway 102 and the corresponding home device. For example, the link 106a between the broadband gateway 102 and the television 104a may comprise a High-Definition Multimedia Interface (HDMI) cable. The link 106b may comprise, for example, a wired Ethernet link, a wireless Ethernet link, a Universal Serial Bus (USB) link, or an IEEE 1394 link. The link 106c may comprise, for example, a two-wire link or a wireless link. The link 106d may comprise, for example, a wired Ethernet link, a wireless Ethernet link, a USB link, or an IEEE 1394 link. The link 106e may comprise, for example, a wired Ethernet link, a USB link, or a cellular link. The link 106f may comprise speaker wire and/or a wireless link. The link 106g may comprise, for example, AM and/or FM radio transmissions broadcast received using the broadband gateway 102. The link 106h may comprise, for example, a phone line. The link 106i may comprise, for example, a wired or wireless Ethernet link. The link 106j may comprise, for example, a wired or wireless link. The link 106k may comprise, for example, a wired or wireless link. The link 106l may comprise, for example, a wired or wireless link.

[0068] The power strip 104l may comprise one or more outlets and may comprise one or more plugs or other means of connecting to a power supply, such as a wall outlet. The power strip 104l may comprise suitable logic, circuitry, interfaces, and/or code that may be operable to measure and/or monitor energy consumed via one or more of its outlets, enable and disable consumption of power via one or more of its outlets, and/or limit current drawn via one or more of its outlets. The power strip 104l may be operable to communicate energy measurements via the link 106l. Also, enabling, disabling, limiting, or otherwise controlling power consumed via one or more outlets of the power strip 104l may be performed in response to messages received via the link 106l. The link 106l may comprise a wired or wireless link. The power strip 104l may be operable to communicate with the gateway 102 utilizing power line communication. For example, the gateway 102 may be plugged into an outlet of the power strip 106l and communicate with the gateway 102 via that outlet, or the gateway 102 and the power strip 104l may each be plugged into a common power distribution system.

[0069] As illustrated in FIG. 1, a plurality of home networks 100a, 100b, . . . , 100n may also be connected to the distribution networks 110. These home networks 100a, 100b, . . . , 100n may operate in substantially the same manner as the home network 100a. By having multiple home networks connected to the distribution networks 110, various applications, such as peer-to-peer communication and/or data aggregation operations may be possible by utilizing the broadband gateways 102 in the home networks.

[0070] In operation, the gateway 102 may track usage of the various devices 104a-104m and/or receive readings from the meter 104s to determine usage patterns of the devices 104 and/or usage patterns of users of the devices 104. In this regard, over a period of time, the gateway 102 may track, for example, a state of operation of one or more of the devices 104, energy consumed by one or more of the devices 104, bandwidth utilized by one or more of the devices 104, or any other metrics which may be utilized to determine or characterize usage patterns of the devices 104, the gateway 102, users of the devices 104, and/or users of the gateway 102. The usage patterns may be stored in memory in the gateway and may be utilized when making energy management decisions.

[0071] The gateway 102 may also be operable to determine the cost of energy consumed by the electronic devices 104, by the gateway 102, users of the devices 104, and/or users of the gateway 102. In this regard, the gateway 102 may communicate with a network or server of a utility company to determine an energy pricing structure for past, current, or future time periods. For example, the price of electricity may vary based on the time of day, the day of the week, and/or the time of the year. Additionally or alternatively, the price of energy may vary based on the amount of energy being used. For example, power may be delivered to a household at $X per kilowatt as long as the instantaneous power being consumed by a household is below Y kilowatts, but may increase to $Z per kilowatt when instantaneous power being consumed by a household is above Y kilowatts. Similarly, the first X kilowatt hours consumed may cost $Y each but additional kilowatt hours may cost $Z each. Energy pricing information may be communicated to the gateway 102 by a utility company or by another entity that collects and distributes energy pricing information.

[0072] The gateway 102 may perform tasks, or schedule tasks that it may later perform, based on the determined usage patterns of the devices 104, the gateway 102, users of the devices 104, and/or users of the gateway 102. Additionally or alternatively, the gateway 102 may perform tasks, or schedule tasks, that it may later perform, based the energy pricing structure. Additionally or alternatively, the gateway 102 may perform tasks, or schedule tasks, that it may later perform, to take advantage of government and/or utility company initiatives or programs that offer incentives for lowering power consumption. In various embodiments of the invention, during a particular time period, a state of operation of a device
104 may be configured based on the likelihood that the device 104 will be used during that time period. For example, the device 104 may be configured into a powered-off state in instances that there is a low probability that the device 104 will be used during the time period, configured into an intermediate-power state, such as a standby mode, in instances that there is a moderate probability that the device 104 will be used during the time period, and configured into a powered-on state in instances that there is a high probability that the device 104 will be used during the time period. A powered-off state may be one in which device 104 draws little or no current. A standby state may be a state in which the device 104 draws more power than the power off state in exchange for the device being able to enter a powered-on state more quickly. A powered-on state may be one in which the device 104 is ready for immediate, or almost-immediate, use. The gateway 102 itself, or portions thereof, may also be configured in a manner similar to the devices 104. That is, portions of the gateway, such as one or more processors and/or one or more communication interfaces, may be configured between various states of operation or the gateway 102 as a whole may be configured between various states of operation. Although three states of operation are utilized for illustration, any states and/or number of states may be utilized. For example, in various states of operation of a device, various portions of a device 104 may be enabled and/or disabled. The states of operation of a particular device 104 may be device-specific and/or depend on the components and/or features of the device 104.

Exemplary tasks which may be performed by the gateway 102 comprise downloading multimedia content and adjusting environmental controls, such as a thermostat 106; that controls a heating ventilation and air conditioning (HVAC) system, a motor that opens and closes window shades, a motor that opens and closes windows, and lighting controls. Other exemplary tasks comprise turning on and off a pool filter, a hot-water heater, or other household appliances. Scheduling of tasks to be performed by the broadband gateway may be based either or both of: the determined usage patterns and the energy pricing information.

In an exemplary scenario, energy may cost less between 12:00 AM and 5:00 AM on weekdays and a user associated with the gateway 102 may typically record a television program which airs at 7:00 PM Monday night but not watch the program until Tuesday night. In this scenario, the gateway 102 may schedule download of the program to the DVR 104 at 12:01 AM on Tuesday morning such that the program is available for viewing on Tuesday night.

In another exemplary scenario, energy may be more expensive from 7:00 AM to 5:00 PM and a resident of the location in which the gateway 102 resides may typically shower at 8:30 AM. Accordingly, the gateway 102 may control operation of the hot-water heater so that the hot-water is powered on between 8:00 AM and 9:00 AM, powered off between 9:00 AM and 5:00 PM, and powered back on at 5:00 PM such that hot water is available between 5:00 PM and 7:00 AM.

In another exemplary scenario, an energy pricing structure may be such that the price of energy per-unit (e.g., per kilowatt hour) or per-term (e.g., per month) is based on amount of energy consumed. Accordingly, when energy consumption in a household (or other location equipped with a gateway 110) approaches or surpasses a threshold, the gateway 102 may reconfigure one or more of the devices 104 in an attempt to reduce energy consumption below the threshold, or a corresponding threshold in instances that there is hysteresis. In this regard, when energy consumption goes above a pricing threshold during a time period, devices 104 that are normally, based on usage patterns, powered on during that time period may be controlled by the gateway 102 so that they are powered off. For example, usage patterns may dictate that a pool filter normally run between 2:00 AM and 5:00 AM, but on a day when there is abnormally high energy consumption at 6:00 AM, the gateway 102 may power off the pool filter to prevent crossing into a higher energy pricing tier.

In an exemplary embodiment, upon detecting that energy consumption is approaching or has crossed a pricing threshold, the gateway 102 may begin sequentially powering off devices until energy consumption is brought below the threshold. In this regard, the devices may be powered off in order of importance, or in order of likelihood that the devices will be used during the relevant time period. Order of importance may be determined based on user preferences and/or based on the function performed by the device. Additionally or alternatively, upon energy consumption crossing or approaching a pricing threshold, the gateway 102 may notify a user such that the user may make decisions and/or take action to manage his energy bill. For example, the gateway 102 may send the user a text message or email. As another example, the gateway 102 may display the message in a window on the television 104a. The notification may recommend devices, based on usage patterns or energy consumption, devices to be powered down or reconfigured. The notification may also indicate the current and/or past energy consumption by one or more of the devices 104. In this regard, the gateway 102 may be operable to generate a textual, graphical and/or other report of per-device energy consumption. The user may then manually take action and/or communicate with the gateway 102 and command the gateway 104 to perform one or more tasks. User configuration of the gateway 102 may be, for example, via a GUI displayed on the television 104a and/or via the Internet. Additionally or alternatively, user configuration of the gateway 102 may be, for example, by loading programs and/or scripts into the gateway 102. For example, the gateway 102 may run a Linux-based operating system and the user may be operable to write code for the gateway 102 and load the code into the gateway.

In an embodiment of the invention, the gateway 102 may be configured to generate notifications when energy consumption deviates from past and/or expected patterns. For example, if power consumption is typically low between time x and time y, then the gateway 102 may generate a notification that high energy consumption is detected between time x and time y.

In an embodiment of the invention, the gateway 102 may communicate with a utility company network 142, and/or other entity that manages a smart power grid, via the power grid and/or via the Internet. For example, the meter 104n may be coupled to the power grid and the gateway 102 may communicate with the power grid via the meter 104n. In an embodiment of the invention, communicating over the power grid may reduce exposure to security risks that are prevalent in the Internet.

FIG. 1B is a diagram illustrating an exemplary graphical user interface for managing energy costs via a broadband gateway, in accordance with an embodiment of the invention. Referring to FIG. 1B, the graphical user interface (GUI) generated by the broadband gateway 102 is displayed on the television 102a. In other instances the GUI may be
displayed on, for example, the PC 106b via a web-based interface. In this manner, the gateway 102 may be configured locally, via an infrared remote control, for example, and/or may be configured via a network (e.g., Internet) connection.

[0081] In FIG. 1B an “Energy Manager” tab 152 of the GUI is selected. Displayed in the energy manager tab 152 is a table displaying various devices 104 whose energy consumption may be managed via the broadband gateway 102. A column 156 of the table may identify the devices 104, the column 158 may display a current state of operation of the devices, the column 160 may display controls 164a-164n, the column 162 may display controls 166a-166n. Upon selection of a control 164a, corresponding to a device 104a, a window displaying the energy usage history and associated cost for device 104a may be displayed. Upon selection of a control 166a, corresponding to a device 104a, a window displaying the past, present, and scheduled state of operation of the device 104a may be displayed. For example a calendar depicting the state of operation of the device 104a displayed and the user may be enabled to interact with the calendar similar to the manner in which a personal electronic calendar may be manipulated. In this regard, the user may be operable to override the state of operation of the device 104a on specific days and times and/or may be operable to manipulate rules, criteria, preferences, etc. that are utilized to automatically populate the calendar. Additionally, the user may configure which events trigger notifications to be sent and to which devices those notifications should be sent.

[0082] FIG. 1C is a block diagram illustrating an exemplary user interface generated by a broadband gateway for configuring energy efficient management in a home network, in accordance with an embodiment of the invention. Referring to FIG. 1C, there is shown a user interface 180.

[0083] The user interface 180 may, for example, be displayed as part of an on-screen display (OSD) and/or may be accessible via a “menu” button. The user interface 180 may be generated directly by the broadband gateway 102, and/or by other devices based on data provided by the broadband gateway 102, to enable interactions between the broadband gateway 102 and users associated with the broadband gateway 102, in the home network 100a for example. The user interface 180 may be displayed using a display device connected to the broadband gateway 102, such as the television 104a for example. The user interface 180 may be utilized to communicate data and/or messages between the broadband gateway 102 and the television 104a, to enable communicating data that may be displayed using the user interface 180, and/or receiving user input, selection, and/or feedback which may be provided based on interactions with the user interface 180.

[0084] The exemplary user interface 180 may be utilized to enable users to setup the broadband gateway 102, and/or to control, configure and/or modify various applications and/or tasks, or aspects thereof, which may be provided by the broadband gateway 102. In an exemplary aspect of the invention, the user interface 180 may incorporate an energy management interface 182, which may be utilized to setup, configure, and/or manage energy usage by one or more users associated with the broadband gateway 102.

[0085] The energy management function 182 may comprise, for example, frames 192 and 194. The frame 192 may display a user directory which may be associated with energy management profiles of one or more users of one or more of the devices 104a-104n. The user directory may comprise a listing of users registered it otherwise associated with the gateway 102. Associated with each user entry may be two buttons 184 and 186. Upon selection or activation of button 184 by a user, by clicking on it for example, detailed information regarding an energy profile for the corresponding user may be displayed in the frame 194. For example, upon selecting the button 184 associated with a user, the frame 194 may display various controls for associating various devices 104 with a user. In this manner, information regarding that user’s energy consumption may be gathered by tracking energy consumption of the devices 104 associated with that user. The frame 194, after selecting the button 184 associated with a user, may also display controls for setting limits and/or requirements on the user’s energy consumption.

[0086] Selection and/or activation of button 186, by clicking on it for example, may enable displaying energy activities for the corresponding user in the frame 194. In this regard, a user’s energy consumption history and/or statistics may then be displayed in the frame 194 upon selection and/or activation of the button 186 corresponding to that user. The information may be arranged in variety of ways, and/or the display setting may be configurable and/or adjustable by the user using appropriate buttons and/or fields in the frame 194. For example, the user may be able to specify whether to display the average and/or actual energy consumption rates, for example monthly, weekly, daily, and/or daily, for a specific device within a specific duration.

[0087] The frame 192 may also comprise a button 188 which may selected to enable entering one or more passwords before proceeding with any selection of buttons 184 or 186. In this regard, a user password may be required before displaying any of the details on frame 192. Accordingly, failure to provide the correct password may prevent displaying frame 194. The frame 192 may also comprise a button 190 which may be selected to enable setting up a new user profile. User setup may be performed as a step-by-step procedure based on interactions using frame 194.

[0088] FIG. 2 is a block diagram illustrating an exemplary broadband gateway, in accordance with an embodiment of the invention. Referring to FIG. 2, the broadband gateway 102 may comprise suitable logic, circuitry, code, and/or interfaces that may be operable to provide connectivity between one or more networks, such as the distribution networks 110 shown in FIG. 1, for example, and one or more devices in a home network, such as the home devices 104a-104n in the home network 100a shown in FIG. 1. In this regard, the broadband gateway 102 may operate as an interface device that allows one or more devices in the home network to access one or more networks, and to access various services and/or content via those one or more networks. For example, the broadband gateway 102 may be utilized to enable interaction between the plurality of service providers 120 and/or the plurality of content providers 130, and the home devices 104a-104n.

[0089] The broadband gateway 102 may communicate with the various devices via a home network that may comprise wired, optical, and/or wireless communication links, such as the home network 100a. In this regard, the broadband gateway 102 may comprise suitable hardware and/or software to provide some or all of the functions and/or operations of one or more of a modem, a router, and a switch. The modem functions and/or operations may be those of a digital subscriber line (DSL) modem, a cable modem, and/or a wireless cable modem, for example. The router functions and/or operations may be those of a wireless router, for example. The
Switch functions and/or operations may be those of a network switch, or a local area network (LAN) switch, for example. In some instances, the broadband gateway 102 may communicate with the various devices in the home via more than one home network.

The broadband gateway 102 may comprise one or more modules. Each of these modules may comprise hardware, software, or a combination thereof that may be utilized to perform various operations associated with the broadband gateway 102. In an embodiment of the invention, the broadband gateway 102 may comprise a provider interface module 202, a processor module 204, a memory module 206, and a client network interface module 208. In some instances, the broadband gateway 102 may be such that the various modules listed above may be distributed over multiple devices where various ones of the devices may be local to, and/or remote from, one another. Moreover, the modules listed above are provided by way of illustration and not of limitation. Other configurations and/or architectures of the broadband gateway 102 may also be implemented. For example, the broadband gateway 102 may be a virtual gateway that is setup in a network by utilizing virtual machines (VMs) and/or next-generation (NG) data centers.

The provider interface module 202 may comprise suitable logic, circuitry, code, and/or interfaces that may be operable to receive data from and/or send data to one or more service/content providers via one or more physical layer connections 108 to one or more network access service providers. In this regard, each of the physical layer connections 108-108 may connect the gateway 110 to a different network access service provider. Each of the physical layer connections 108 may comprise a wired, optical, or wireless connection. Each of the physical layer connections 108 may utilize different physical media and/or different physical layer protocols. For example, the connection 108, may comprise a DSL over twisted-pair connection and the connection 108, may comprise a CATV over coaxial cable connection.

The processor module 204 may comprise suitable logic, circuitry, code, and/or interfaces that may be operable to process data received from the service/content providers and/or data received from one or more devices 104 in the home. Data from one or more devices 104 may comprise user input such as feedback regarding consumed content and responses to questionnaires, surveys, and polls. Data received from the service/content providers via one or more the physical layer connections 108-108 may be processed to make it suitable for communication to a device 108 and data from the one or more devices 104 may be processed to make it suitable for communication to the service/content providers via one or more the physical layer connections 108-108. In this regard, the processor module 124 may comprise one or more portions that are suitable to handle certain types of data such as video data and/or audio data, for example. The processor module 204 may also be operable to generate a graphical user interface (GUI) which may be manipulated via which a user may provide input. The GUI may be displayed as part of an OSD on a local device 104, such as a monitor or television, and may be manipulated via a remote control and/or other input device that communicates directly with the gateway 102. The GUI may be a web-based interface, and a user may interact with it via a computer and web browser. The GUI may be customized based on characteristics of the gateway 102, the device 104 coupled to the gateway, and the service and/or content providers associated with the gateway 102. The processors module 124 may utilize the memory 206 in performing its functions.

The memory module 206 may comprise suitable logic, circuitry, code, and/or interfaces that may be operable to store data utilized in the operations of the broadband gateway 102. For example, the memory module 206 may be utilized to store configuration data, parameters, device information, tracking and/or monitoring information, security information, and intermediate processing data, for example. The memory module 206 may comprise storage media that may be integrated in the broadband gateway 102 and/or may be removable such as a removable storage device. In an embodiment of the invention, device usage history, personal information, and/or other sensitive information may be stored securely in the memory module 206. Also, sensitive information, such as usage history, may be disassociated with identifying information prior to communicating the information over a network. In this manner, someone intercepting usage history information will have a difficult time of tying that usage history to a particular home. Furthermore, the broadband gateway 102 may support a “remote wipe” operation to delete sensitive information.

The client network interface module 208 may comprise suitable logic, circuitry, code, and/or interfaces that may be operable to receive data from and/or send data to one or more devices in the home network. The client network interface module 208 may be operable to support multiple communication protocols, standards, and/or data transport technologies. In this regard, the client network interface module 208 may handle one or more physical layer connections to one or more devices 104. For example, the client network interface module 208 may comprise, one or more wired and/or wireless Ethernet interfaces, one or more analog and/or digital audio outputs, one or more audio/video interfaces such as such as HDMI and DisplayPort, one or more USB interfaces, one or more IEEE 1394, and/or one or more telephone jacks.

The broadband gateway 102 may be operable to provide energy management by varying the configuration of one or more devices in the home network. The broadband gateway 102 may collect and/or store energy-related information of the devices in the home network and/or of the links in the home network, and may utilize such information to control the operation of the home devices. For example, the broadband gateway 102 may utilize channel capacity flexibility and content coding options to minimize and/or optimize power utilization. The broadband gateway 102 may also configure and/or manage the configuration of the network between the broadband gateway 102 and one or more service/content providers based on the energy-related information associated with the devices in the home. For example, at least a portion of the distribution networks 100 may be configured and/or managed in this manner. The broadband gateway 102 may be utilized to display energy-related metrics, including consumption trends and/or costs, for example, and to display any available credits/rewards that may be redeemed by an account holder. In some instances, when a device in the home network is a certified device, such as a California efficient display, for example, the broadband gateway 102 may be utilized to provide that information to a service/content provider and obtain rewards/credits associated with the use of such certified devices. Moreover, overall network power con-
sumption may be managed by sharing information among multiple interconnected broadband gateways.

[0096] The broadband gateway 102 may be operable to adapt and/or enable changes in a subscription model and/or in multimedia delivery characteristics based on the capabilities of the various devices in the home network. For example, high-definition video content may be delivered to certain type of devices, such as digital televisions (DTVs), while low-definition video content and/or text may be delivered to a different type of devices, such as personal mobile devices. In this regard, the broadband gateway 102 may be utilized to reduce bandwidth and/or processing power consumption in the home network. The broadband gateway 200 may also support and/or use multi-transport processing, which may be performed sequentially, in parallel, and/or utilizing distributed processing.

[0097] The gateway functionality associated with a user, such as security features, preferences, applications, electronic programming guides (EPGs), and user profile, for example, may be ported from the broadband gateway 102 to one or more other broadband gateways 102 in other locations. In some instances, a visitor may be allowed access to their content outside their service/content provider service area by, for example, classifying the access level for different users and/or by providing limited access to content. Moreover, the broadband gateway 102 may allow multiple user interface software structures by, for example, standardizing an interface to service/content providers and devices in the home network.

[0098] The broadband gateway 102 may be operable to broker and/or arbitrate with service/content providers the consumption of certain services, such as music and video, for example. In some instances, the broadband gateway 102 may perform content search, transport discovery, ranking, and/or sorting. These operations may be performed based on content quality, price, quality-of-service (QoS), and network protocols supported by the devices in the home network, such as service level agreements (SLAs), for example.

[0099] Various emergency-related services in the home network may be supported by the broadband gateway 102, including allowing first responders to provide alerts to a select group of users by accessing the broadband gateway 102 via secure links provided by the service/content providers. For example, the broadband gateway 102 may enable an emergency service provider, such as those associated with the emergency service provider network 140 described above in FIG. 1, to access one or more devices in the home network.

[0100] For peer-to-peer communication, the broadband gateway 102 may be utilized to allow enhanced content sharing in a service/content provider network. In this regard, the broadband gateway 102 may be utilized to construct a directory service for peer-to-peer connectivity with friends and family, for example. The broadband gateway 102 may be utilized to provide incentives to users who engage in peer-to-peer communication through, for example, the distribution networks 110. Moreover, the broadband gateway 102 may be utilized to match the content coding to the service type being consumed by the user and to make the necessary allocations through the network with respect to peer-to-peer or conventional Internet programming or broadcast programming.

[0101] The broadband gateway 102 may be utilized in connection with constrained network resources, such as time of day, traffic congestion, and the like, for example, to provide incentives for a user to accept a lower cost, lower quality of service that is dynamically configured for current network conditions. In some instances, the broadband gateway 102 may allow enhanced low latency service delivery to client devices in a home network.

[0102] The broadband gateway 102 may be operable to run or execute an agent to extract content, rating, copyright, language, privacy rules, and automatically add user-generated content, for example. Such agent may be run or executed in connection with the processor module 204 of the broadband gateway 102, for example. In some instances, the broadband gateway 102 may be operable to provide rating-related information or channel prediction to a service/content provider to assist with fast channel change.

[0103] Bandwidth optimization by, for example, placing future requests for bandwidth to a service/content provider and accepting the best timeslots provided in return may be enabled by the broadband gateway 102.

[0104] The broadband gateway 102 may be operable to combine and/or blend multiple contents for use as single content in the home network. Such combination may be performed in one or more of the modules of the broadband gateway 102. For example, the broadband gateway 102 may blend different video and audio contents for an event by accessing one or more service/content providers and providing automatic and/or manual content synchronization.

[0105] The protection, management, and/or tracking of confidential data, such as health and financial records, for example, by tagging the data may be provided by the broadband gateway 102. Only when a user authorizes the transfer of the confidential data will such data be stored and/or aggregated. The broadband gateway 102 may be operable to create a trusted rating mechanism for content. The broadband gateway 102 may be secure against external threats that may be downloaded from outside the home network and may provide a secure domain distribution in the home network. Automated and secured billing and payment services may also be provided by the broadband gateway 102.

[0106] The broadband gateway 102 may be operable to utilize client or home device profile information to select layered video service(s) and/or transmission. Such information may be stored, at least temporarily, in the memory module 206 of the broadband gateway 102. In some instances, the programming and/or enhanced video layers received by the broadband gateway 102 may be aggregated midstream by one or more network or routing nodes.

[0107] The broadband gateway 102 may support a reduction in the cost of unwatched content by using multi-tier billing for downloaded content, such as video content. The broadband gateway 102 may be utilized to provide a unified payment portal for collecting and/or aggregating charges from multiple service and/or content providers.

[0108] In operation, communications with the devices 104 via the home network interface module 208 may be utilized to determine usage of the devices 104, energy consumption of the devices 104, and/or other information regarding the devices 104. The information received via the module 208 may be processed by the processor module 204 to determine usage patterns of the devices 104. Information received and/or the determined usage pattern(s) may be stored in the module 206. Communications with the utility company network 142, or other entity hosting energy pricing information, via the module 202 may enable the gateway 102 to determine the pricing structure for energy delivered to the gateway 102 and the devices 104. The pricing structure may be stored in the
memory module 206. The processor module 204 may utilize the usage patterns and the pricing information to make determinations for managing energy consumption.

[0109] FIG. 3A is a flowchart illustrating exemplary steps for performing tasks in a broadband gateway based on usage patterns and user preferences, in accordance with an embodiment of the invention. Referring to FIG. 3A, the exemplary steps begin with step 302 in which a user of the gateway 102, or a device coupled to the gateway 102, brings up a graphical user interface of the gateway 102. In step 304, the user may interact with the graphical user interface to configure settings. For example, the user may configure notifications that would like to receive, information that should be tracked by the gateway 102 for managing energy costs, and preferences as to trade-offs between performance and energy savings. In step 306, the gateway 102 may collect information regarding operation of the devices 104 and utilize the collected information to determine patterns of use of the gateway 102 and the devices 104. In step 308, the gateway 102 may perform tasks to manage energy costs based on the determined patterns of use.

[0110] FIG. 3B is a flowchart illustrating exemplary steps for controlling a state of operation of one or more electronic devices communicatively coupled to a broadband gateway, in accordance with an embodiment of the invention. Referring to FIG. 3B, the exemplary steps begin with step 320 in which an event occurs that triggers the gateway 102 to configure a device 104 for the purpose of managing energy consumption and costs. The event may comprise, for example, present energy consumption rising above a threshold. Additionally or alternatively, the event may comprise a calendar or clock function of the gateway 102 signaling time of day, week, month, and/or year. In step 324, it may be determined whether there is a high likelihood of the device 104 being used during the current time period. In instances that there is the, the exemplary steps may advance to step 326 and the device may be configured into a powered-on state. In instances that the device 104 is not highly likely to be used during the current time period, the exemplary steps may advance to step 328. In step 328, it may be determined whether there is a moderate likelihood of the device 104 being used during the current time period. In instances that there is, the exemplary steps may advance to step 330 and the device may be configured into a standby state. In instances that there is less than a moderate likelihood of the device 104 being used during the current time period, the exemplary steps may advance to step 332. In step 332, the device 104 may be configured into a powered-off state. Configuring the state of the device 104 may comprise configuring the device itself, and/or may comprise configuring a power strip or outlet that the device 104 is plugged into.

[0111] FIG. 4 is a flowchart illustrating exemplary steps for managing energy consumption via a broadband gateway based on variable energy pricing, in accordance with an embodiment of the invention. Referring to FIG. 4, the exemplary steps begin with step 402 in which a user of the gateway 102, or a device operable to communicate with the gateway 102, brings up a graphical user interface of the gateway 102. In step 404, the user may interact with the graphical user interface to configure settings. For example, the user may configure notifications that would like to receive, information that should be tracked for managing energy consumption, and preferences as to trade-offs between performance and energy savings. In step 406, while monitoring energy consumption and energy pricing, the gateway 102 may detect an event that triggers one or more energy management tasks to be performed. An exemplary triggering event comprises approaching and/or being at a particular time of the day, week, month, or year at which energy prices change. Another exemplary triggering event comprises instantaneous or cumulative energy consumption by devices 104 and/or gateway 102 exceeding an energy pricing threshold.

[0112] Upon detecting the triggering event, the exemplary steps may advance to step 408 in which it is determined whether preferences have been configured such that a user is to be notified of the triggering event. If so, then in step 410 the gateway 102 may send one or more messages to one or more users. The notification may be sent to, for example, one or more of the devices 104 via one or more corresponding links 106 and/or via a distribution network 110. In step 412, it may be determined whether user preferences associated with the gateway 102 have been configured to automatically reconfigure or otherwise manage the devices 104 in response to the triggering event. If automatic energy management has not been enabled, then the steps may return to step 406. If automatic energy management has been enabled, then in step 414 the gateway 102 may reconfigure one or more devices 104.

[0113] Various aspects of a method and system for managing energy costs via a broadband gateway are provided. In an exemplary embodiment of the invention, a broadband gateway 102 may determine usage patterns for itself and/or for one or more electronic devices 104 communicatively coupled to the gateway 102. The broadband gateway 102 may enable communication with a plurality of devices 104 and may be operable to handle at least one physical layer connection 108 to at least one corresponding network access service provider 120. The broadband gateway 102 may control tasks performed and/or to be performed based on the patterns of use and based on a pricing structure for energy supplied to the gateway 102 and/or to the one or more electronic devices 104. Controlling tasks to be performed may comprise, for example, scheduling performance of the tasks. During times of higher energy consumption and/or prices, the broadband gateway 102 may power off those of the electronic devices 104 which, based on the determined usage patterns, are not likely to be utilized during such times. Exemplary tasks comprise downloading multimedia content and configuring a state of operation of the one or more electronic devices 104. In an exemplary embodiment of the invention, a state of operation of the electronic device(s) may be configurable between a plurality of states comprising: a powered-off state, a standby state, and a powered-on state. The electronic device(s) 104 may comprise lighting, such as lighting system 104a, heating ventilation and air conditioning (HVAC) controls, such as the thermostat 104d, or other environmental controls. The broadband gateway 102 may be operable to determine changes in consumption of energy and/or changes in the cost of energy such as whether the price of energy will increase. The broadband gateway may be operable to send a notification of the change to one or more of the electronic device(s) 104. The notification may indicate present power consumption and/or historical power consumption of the broadband gateway 102 and/or the electronic device(s) 104. The electronic device(s) 104 may comprise a power strip 104f that is operable to monitor energy consumed via its one or more outlets, and report the energy consumption to the broadband gateway 102.
The power strip 104 may communicate with the broadband gateway 102 wirelessly and/or utilizing power line communication.

Other embodiments of the invention may provide a non-transitory computer readable medium and/or storage medium, and/or a non-transitory machine readable medium and/or storage medium, having stored thereon, a machine code and/or a computer program having at least one code section executable by a machine and/or a computer, thereby causing the machine and/or computer to perform the steps as described herein for managing energy costs utilizing a broadband gateway.

Accordingly, the present invention may be realized in hardware, software, or a combination of hardware and software. The present invention may be realized in a centralized fashion at least one computer system, or in a distributed fashion where different elements are spread across several interconnected computer systems. Any kind of computer system or other apparatus adapted for carrying out the methods described herein is suitable. A typical combination of hardware and software may be a general-purpose computer system with a computer program that, when being loaded and executed, controls the computer system such that it carries out the methods described herein.

The present invention may also be embedded in a computer program product, which comprises all the features enabling the implementation of the methods described herein, and which when loaded in a computer system is able to carry out these methods. Computer program in the present context means any expression, in any language, code or notation, of a set of instructions intended to cause a system having an information processing capability to perform a particular function either directly or after either or both of the following: a) conversion to another language, code or notation; b) reproduction in a different material form.

While the present invention has been described with reference to certain embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted without departing from the scope of the present invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the present invention without departing from its scope. Therefore, it is intended that the present invention not be limited to the particular embodiment disclosed, but that the present invention will include all embodiments falling within the scope of the appended claims.

What is claimed is:

1. A method for networking, the method comprising:
   - in a broadband gateway that enables communication with a plurality of devices, wherein said broadband gateway is operable to handle at least one physical layer connection to at least one corresponding network access service provider:
     determining usage patterns for one or more electronic devices communicatively coupled to said broadband gateway; and
   - controlling one or more tasks performed and/or to be performed by said broadband gateway based on said determined usage patterns and based on a pricing structure for energy supplied to said one or more electronic devices.

2. The method according to claim 1, wherein said at least one physical layer connection comprises a plurality of physical layer connections and said at least one corresponding network access service provider comprises a plurality of corresponding access service providers, and wherein each of said plurality of physical layer connections corresponds to a respective one of said plurality of corresponding access service providers.

3. The method according to claim 1, comprising, during times of higher energy prices, powering off those of said one or more electronic devices which, based on said usage patterns, are not likely to be utilized during said times.

4. The method according to claim 1, wherein said one or more tasks comprise downloading multimedia content.

5. The method according to claim 1, wherein said one or more tasks comprise configuring a state of operation of said one or more electronic devices.

6. The method according to claim 5, wherein a state of operation of said one or more electronic devices is configurable between a plurality of states comprising: a powered-off state, a standby state, and a powered-on state.

7. The method according to claim 5, wherein said one or more electronic devices comprise lighting, heating ventilation and air conditioning (HVAC) controls, or other environmental controls.

8. The method according to claim 1, comprising:
   - determining when energy prices have increased or will increase; and
   - sending a notification of said increase to said one or more electronic devices.

9. The method according to claim 8, wherein said notification indicates present power consumption and/or historical power consumption of said one or more electronic devices.

10. The method according to claim 1, wherein said one or more electronic devices comprise a power strip that is operable to monitor energy consumed via its one or more outlets, and report said energy consumption to said broadband gateway.

11. The method according to claim 1, wherein said power strip communicates with said broadband gateway utilizing one or both of wireless communication and power line communication.

12. A system for networking, the system comprising:
   - one or more circuits for use in a broadband gateway that enables communication with a plurality of devices, said one or more circuits being operable to:
     - handle at least one physical layer connection to at least one corresponding network access service provider;
     - determine usage patterns for one or more electronic devices communicatively coupled to said broadband gateway; and
     - control one or more tasks performed and/or to be performed by said broadband gateway, based on said determined usage patterns and based on a pricing structure for energy supplied to said one or more electronic devices.

13. The system according to claim 12, wherein said at least one physical layer connection comprises a plurality of physical layer connections and said at least one corresponding network access service provider comprises a plurality of corresponding access service providers, and wherein each of said plurality of physical layer connections corresponds to a respective one of said plurality of corresponding access service providers.

14. The system according to claim 12, wherein said one or more circuits are operable to, during times of higher energy prices, powering off those of said one or more electronic devices which, based on said usage patterns, are not likely to be utilized during said times.

15. The system according to claim 12, wherein said one or more electronic devices comprise downloading multimedia content.

16. The system according to claim 12, wherein said one or more electronic devices comprise configuring a state of operation of said one or more electronic devices.

17. The system according to claim 12, wherein said one or more electronic devices are configurable between a plurality of states comprising: a powered-off state, a standby state, and a powered-on state.

18. The system according to claim 12, wherein said one or more electronic devices comprise lighting, heating ventilation and air conditioning (HVAC) controls, or other environmental controls.

19. The system according to claim 12, wherein said one or more electronic devices comprise a power strip that is operable to monitor energy consumed via its one or more outlets, and report said energy consumption to said broadband gateway.

20. The system according to claim 12, wherein said power strip communicates with said broadband gateway utilizing one or both of wireless communication and power line communication.
prices, power off those of said one or more electronic devices which, based on said usage patterns, are not likely to be utilized during said times.

15. The system according to claim 12, wherein said one or more tasks comprise downloading multimedia content.

16. The system according to claim 12, wherein said one or more tasks comprise configuring a state of operation of said one or more devices.

17. The system according to claim 16, wherein a state of operation of said one or more electronic devices is configurable between a plurality of states comprising: a powered-off state, a standby state, and a powered-on mode.

18. The system according to claim 16, wherein said one or more electronic devices comprise lighting, heating ventilation and air conditioning (HVAC) controls, or other environmental controls.

19. The system according to claim 12, wherein said one or more circuits are operable to:

determine when energy prices have increased or will increase; and
send a notification of said increase to said one or more electronic devices.

20. The system according to claim 19, wherein said notification indicates present power consumption and/or historical power consumption of said one or more electronic devices.

21. The system according to claim 12, wherein said one or more electronic devices comprise a power strip that is operable to monitor energy consumed via its one or more outlets, and report said energy consumption to said broadband gateway.

22. The system according to claim 12, wherein said power strip communicates with said broadband gateway utilizing one or both of wireless communication and power line communication.

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