Attorney Docket No.
~~VOLTP001~~VOLTP018.5.C2

PATENT APPLICATION

Methods and Systems for Assigning e-Keys to Users to Access and Drive Vehicles

INVENTORS: **Angel A. Penilla**
Sacramento, California
U.S. Citizen

Albert S. Penilla
Sunnyvale, California
U.S. Citizen

Methods and Systems for Assigning e-Keys to Users to Access and Drive Vehicles

By Inventors:
Angel A. Penilla
Albert S. Penilla

Claim of Priority

[0001] The present application is a continuation in part of U.S. Application No. 13/824,158 filed on March 15, 2013, entitled "Methods and Systems for Defining Vehicle User Profiles and Managing User Profiles via Cloud Systems and Applying Learned Settings to User Profiles" which is incorporated by reference.

[0002] The present application claims priority to U.S. Provisional Patent Application No. 61/745,729, filed on December 24, 2012, and entitled "METHODS AND SYSTEMS FOR ELECTRIC VEHICLE (EV) CHARGING, CHARGING SYSTEMS, INTERNET APPLICATIONS AND

USER NOTIFICATIONS", which is herein incorporated by reference. This Application is also a continuation-in-part of US Application No. 13/452,882, filed April 22, 2012, and entitled "ELECTRIC VEHICLE (EV) RANGE EXTENDING CHARGE SYSTEMS, DISTRIBUTED NETWORKS OF CHARGE KIOSKS, AND CHARGE LOCATING~~–~~

~~MOBILE APPS~~

~~INVENTORS:~~

Angel A. ~~Penilla~~

~~San Jose, California~~
~~U.S. Citizen~~

~~Albert S. Penilla~~
~~Sunnyvale, California~~
~~U.S. Citizen~~

~~ELECTRIC VEHICLE (EV) RANGE EXTENDING CHARGE SYSTEMS, DISTRIBUTED NETWORKS OF CHARGE KIOSKS, AND CHARGE LOCATING~~ MOBILE APPS", which

~~*By Inventors:*~~

~~Angel A. Penilla~~

~~Albert S. Penilla~~

~~CLAIM OF PRIORITY~~

~~[0001]~~ ~~The present~~ invention claims priority to ~~U.S.~~US Provisional ~~Patent~~ Application No. 61/478,436,

filed on April 22, 2011, ~~and entitled Electric Vehicle (EV) Range Extending Charge Systems, Distributed Networks~~all of ~~Charge Kiosks, and Charge Locating Mobile Apps", which is herein~~ which are incorporated herein by reference.

~~CROSS REFERENCE TO RELATED APPLICATION~~

~~**[0002]** This application is related to US Patent Application No. _____ (Atty. Docket No. VOLTP002) entitled "Methods and Systems for Processing Charge Availability and Route Paths for Obtaining Charge for Electric Vehicles", filed on the same date as the present application, and which is herein incorporated by reference.~~

Field of the embodiments

[0003] The present invention relates to systems and methods ~~that enable operators of electric~~ for managing user profiles for vehicles ~~(EV) to extend their range by utilizing auxiliary charging batteries. Also disclosed are systems for defining a network of charge dispensing kiosks,~~ and ~~mobile applications for obtaining~~ exchange of information ~~about available dispensing kiosks, availability of charge, reservations for charge, and purchasing of charge remotely~~with cloud-based processing systems.

BACKGROUND

[0004] Electric vehicles have been utilized for transportation purposes and recreational purposes for quite some time. Electric vehicles require a battery that

~~powers an electric motor, and in turn propels the vehicle in the desired location. The drawback with electric vehicles is that the range provided by batteries is limited, and the infrastructure available to users of electric vehicles is substantially reduced compared to fossil fuel vehicles. For instance, fossil fuel vehicles that utilize gasoline and diesel to operate piston driven motors represent a majority of all vehicles utilized by people around the world. Consequently, fueling stations are commonplace and well distributed throughout areas of transportation, providing for easy refueling at any time. For this reason, fossil fuel vehicles are generally considered to have unlimited range, provided users refuel before their vehicles reach empty.~~

~~[0005]~~ ~~On the other hand, owners of electric vehicles must carefully plan their driving routes and trips around available recharging stations. For this reason, many electric vehicles on the road today are partially electric and partially fossil fuel burning. For those vehicles that are pure electric, owners usually rely on charging stations at their private residences, or specialty recharging stations. However specialty recharging stations are significantly few compared to fossil fuel stations. In fact, the scarcity of recharging stations in and around populated areas has caused owners of electric vehicles to coin the phrase *"range anxiety,"* to connote the possibility that their driving trips may be limited in range, or that the driver of the electric vehicle will be stranded without recharging options. It is this problem of range anxiety that prevents more than electric car enthusiasts from switching to pure electric cars, and abandoning their expensive fossil fuel powered vehicles.~~

~~[0006]~~ ~~It is in this context that embodiments of the invention arise.~~

[0004] Vehicles, such as motorized vehicles and electric vehicles have been around for some time. Vehicles provide a means that enable humans to drive from place to place. In today's world, vehicles have become an indispensable mode of transportation, and provide the freedom to travel at any time of day and for various distances. Vehicles can

be publically operated or can be privately owned. Humans most commonly operate vehicles, no matter the type, whether electric or combustion engine based. In recent years, technology has been advancing to allow for better wireless inte1facing and networking with vehicles.

[0005] It is in this context that embodiments of the invention arise.

SUMMARY

[0007] Embodiments are described with reference to methods and systems for providing auxiliary charging mechanisms that can be integrated or coupled to a vehicle, to supplement the main battery of a vehicle. The auxiliary charging mechanism can be in the form of an auxiliary battery compartment that can receive a plurality of charged batteries. The auxiliary battery compartment can be charged without the vehicle, and can be installed or placed in the vehicle to provide supplemental charge to the vehicles main battery. Thus, if the main battery becomes drained/used, the auxiliary battery compartment, having a plurality of charged batteries, can resume providing charge to the vehicle.

[0008] In one embodiment, the auxiliary battery compartment is configured to hold a plurality of smaller batteries, referred to herein as "volt bars." A volt bar should also be interchangeably viewed to be a "charge unit." The charge unit is a physical structure that holds charge, as does a battery. A charge unit can also be a fraction of charge, which may be contained in a physical structure.

[0009] Broadly speaking, a volt bar is a battery that can be inserted into an auxiliary battery carrier. The auxiliary battery carrier, or compartment, can be lifted by human and placed into a vehicle, such as the trunk of the vehicle. The auxiliary charging carrier can then be removed from the vehicle to provide charge to the volt bars contained within the auxiliary battery carrier. For instance, owners of electric vehicles can purchase an auxiliary battery carrier and fill the auxiliary battery carrier with a plurality of volt bars.

[0010] In one embodiment, the user will charge all of the volt bars by charging the auxiliary battery carrier before the auxiliary battery carrier is placed into the vehicle. In

one embodiment, the auxiliary battery carrier, and its volt bars can be charged utilizing the charge provided from the main battery. For instance, if the vehicle is charged overnight utilizing the primary charging receptacle, and the auxiliary battery carrier is connected to the vehicle (containing volt bars), the volt bars in the auxiliary battery carrier will also be charged. In one embodiment, once the main battery and the vehicle are charged, the charge will then be transferred to the volt bars contained in the auxiliary battery carrier. As such, charging the vehicle will accomplish the task of charging the main battery as well as the auxiliary battery carrier that includes a plurality of volt bars. In another embodiment, the volt bars can be directly inserted into slots defined on the vehicle itself. In this example, manufacturers will design compartments that can accept one or more volt bars, thus eliminating the need for an auxiliary batter carrier. The compartments can be on the side of a vehicle with or without a door, in the trunk, in the passenger compartment, etc. So long as volt bars can be accepted into a receptacle and the volt bar(s) can provide charge to the vehicle or axillary charge to the main battery, the placement of the volt bar(s) is, in one embodiment, a design configuration.

[0011] In one embodiment, the volt bars utilized in the auxiliary battery carrier can be replaced with fresh batteries purchased while the user of the electric vehicle is on a trip or a distance from the user's home base. For instance, volt bars can be sold utilizing a kiosk system. The kiosk system would, in one embodiment, store available volt bars that can be purchased by drivers of electric vehicles while away from their home base. For example, the kiosk system will provide one or a plurality of receptacles for receiving volt bars that are depleted in charge, and dispense charged volt bars to users desiring to extend the range of their trip. The kiosk, in one embodiment, will be

coupled to a power source that can then recharge the volt bars and make them available to other users that trade in their charge de-pleaded volt bars.

[0012] If the user wishes to purchase volt bar without first returning a charged the depleted volt bar, the user can be charged a separate fee that is higher than if the user had returned a depleted volt bar. The kiosk system would preferably be connected to the Internet so that users of electric vehicles could access an application that would identify locations of kiosk systems with available volt bars. In one embodiment, the application would include software that communicates with an application sitting in a central hub that manages all of the kiosk systems deployed in the field. The kiosk systems will also report the status of available volt bars, volt bars returned and in charging mode, available charging slots, inventory of volt bars, discounts available at particular kiosk systems, and potential damage to volt bars that have been returned. By compiling this information, the kiosk system can interface with the central hub, which provides information to users accessing an Internet application (mobile application), so that users can locate the closest kiosk system or the closest kiosk system having discounts.

[0013] In one embodiment, the discounts provided by the specific kiosk systems can be programmed based on the desire to sell more volt bars at certain kiosk systems with excess inventory, or to encourage virtual routing of volt bars throughout geographic regions. For example, if trends are detected by software operating on the central hub that volt bars are migrating from East to West, a depleted inventory may be found in the East. To encourage load balancing of inventory, discounts can be provided in the West, which would then cause migration of volt bars toward the east. In one embodiment, each of the kiosk systems would be enabled with software that communicates with the central hub, and the software would be utilized to provide the

most efficient information regarding inventory, and operational statistics of each kiosk system deployed throughout a geographic region (e.g., geo-location)

[0014] In another embodiment, each kiosk system may be configured with an interface that receives payment data from the users. Example payment receipts may include credit card swiping interfaces, touchscreens for facilitating Internet payment options (PayPal), coupon verification, and communication of deals with friends through a social networking application. These applications can be facilitated by software operating at the kiosk station, or by software executing on the users mobile device, or a combination of both. In still another embodiment, each of the volt bars that are installed in the various kiosk stations will be tracked using tracking identifiers. In one embodiment, without limitation, the tracking can be facilitated using **RFID** tags. The **RFID** tags can be tracked as users purchase, return, and charge the depleted volt bars at the various kiosk stations.

[0015] Additionally, the volt bars will include memory for storing information regarding number of charges, the health of the battery cells, the current charging levels, and other information. Additionally, the volt bars can store information regarding the various kiosk stations that the volt bars have been previously been installed in, or received from. All of this information can be obtained by the software running at the kiosk station, and communicated to the central hub. The central hub can therefore use this information to monitor the health of the various volt bars and can inject new volt bars into the system at various locations when it is detected that the inventory is reaching its end of life.

[0016] In still another embodiment, the central hub can direct maintenance vehicles to remove damaged volt bars from kiosks, or insert new volt bars at certain kiosk locations. Because the central hub will know the frequency of volt bar utilization at

each of the kiosk locations, the central hub can dispatch maintenance vehicles and personnel to the most optimal location in the network of kiosk stations.

[0017] In another embodiment, a system for providing auxiliary charge to a main battery of an electric vehicles is provided. The system includes an auxiliary battery for holding a plurality of charge units, the auxiliary battery being connectable to the main battery of the electric vehicle, the plurality of charge units being rechargeable and being replaceable from within the auxiliary battery, such that replacing particular ones of the plurality of charge units with charge units with more charge increases a total charge of the auxiliary battery. Also provided is a kiosk for storing a plurality of charge units, the kiosk having, (i) slots for storing and recharging the plurality of charge units; (ii) control systems for communicating over a network, the control system includes logic for identifying inventory of charging units in the kiosk and logic for processing payments and fee adjustments for charge units provided or received in the slots of the kiosk. The system also includes a display for providing an interface for enabling transactions to provide or receive charge units to customers. The system further provides a central processing center that communicates with, (i) a plurality of said kiosk over a network, the central processing center configured to provide for centralized rate changes to prices to charge for the charge units at each of the plurality of kiosks, wherein changing the price of the charge units is specific to each of the kiosks and is based on a plurality of metrics, including availability at each kiosk and discounts, and (ii) a plurality of vehicles, the plurality of vehicles being provided with access to availability information of charge units at each of said kiosks, the availability information being custom provided to the plurality of vehicles based on geo-location.

[0018] Another embodiment is for a method for providing charge options to drivers of

~~electric vehicles. The method includes receiving data concerning charge providing~~

availability from charge locations, receiving a request from processing logic of an electric vehicle, the request identifying a desire to obtain charge, and determining a current location of the electric vehicle. The method further includes determining identification of charge locations in proximity to the electric vehicle and determining any sponsored rewards offered by the charge locations. The method communicates to the electric vehicle a path to one of the charge locations, the path identifying a sponsored reward offered at the charge location for the path.

[0019] Yet another embodiment, a computer processed method for providing charge options to drivers of electric vehicles is provided. The electric vehicles have wireless access to a computer network. The method includes receiving data concerning charge providing availability from charge locations and receiving data concerning sponsored rewards offered by the charge locations and rules for offering the sponsored rewards. The method receives a request from processing logic of an electric vehicle, and the request identifies a desire to obtain charge in route between a current location of the vehicle and a destination location. The method includes generating a plurality of paths that can be traversed by the electric vehicle between the current location and the destination location, where each of the paths identify possible charge locations at which the electric vehicle can be charged. Each of the possible charge locations identifying any sponsored rewards offered if the electric vehicle obtains charge at the possible charge locations. The method includes forwarding the plurality of paths as options to the user of the electric vehicle via a user interface. The sponsored rewards are identified to the user to enable tradeoffs between length of path and reward obtained.

[0006] The methods, systems and apparatus include electronics of vehicles that drive display devices in vehicles and communicate wirelessly with Internet services.

[0007] Methods and systems provide access to cloud services over the Internet for

managing a user profile of a vehicle on a cloud processing system connected to the Internet. One example method includes receiving requests to access the user profile to define settings for one or more vehicles. The method includes receiving input for user settings at the vehicle using the cloud processing system. The method includes processing the input over time to learn behavior associated with the input to the use settings. The method includes transmitting settings to the vehicle to be automatically implemented based on the learned behavior. In one example, the profile is associated with a plurality of vehicle types and the method includes detecting a violation of a setting or an incompatible setting in the profile that is user defined via the user account. The method can then automatically send a notification to a predefined administrator of the profile. The method being executed by a processor.

[0008] The profile can be transferred to one or more vehicles, can be set for a temporary period of time, can be set with wireless payment systems, and is accessible over the Internet to accept changes or updates.

[0009] In one embodiment, a user can assign an ad advisor account to any individual. The Advisor account can be for any duration, and the duration can be set by the user. In one embodiment, the advisor account can be assigned to a guest driver of a vehicle. The guest driver can be, for example, a friend, a known individual, a service person, a valet person or valet service, etc. The creation of an advisor account can therefore be for a short duration, or long duration, or permanently, or until the account is canceled, stopped, revoked, expires, or eliminated by the person/user that issued or created the

advisor account. In one embodiment, the advisor account can act to provide access to a vehicle.

[0010] In one embodiment, access can be by way of electronic keys (e.g., e-keys), which can be sent by a vehicle owner/admin to some person or entity. For example, the user-owner of the vehicle canassign a valet with access to the vehicle by going on an application (App or website) on a computing device (e.g., mobile or non-mobile device), identifying the recipient, identifying a mode for conununicating with the recipient (e.g., text, email, message, notification, etc.), selecting the advisor account privileges (e.g., what type of access, speed limits, geographic restrictions, amount of time thee-keys will be valid (or else expire)), and requesting that e-keys be sent to the recipient.

[0011] In one example, the app on the user's mobile device can request that a message be sent to the recipient, so that the recipient can receive thee-keys and be granted access to the vehicle. In one embodiment, the recipient may have a mobile device or computing device (e.g., smartphone, tablet computer, laptopcomputer, personal digital assistant, smartwatch, computer glasses, or the like), on which a communication can be received that provides instructions for obtaining/validating/using thee-keys. In one example, a message can be sent to the recipient, which may provide instmctions on how to activate thee-keys. In one embodiment, the message may have a link to an application that can be launched, which can be used to complete the activation and access with the vehicle. In another embodiment, a simple linkcan be sent, which when selected will link the user to a webpage, which provides instructions for activating the access for thee-keys.

[0012] In one embodiment, application or webpage can identify that e-keys were sent to the individual recipient and will also identify the vehicle (e.g., brand, year, model, color, license plate, or more or less data), may identify the restrictions, and may identify the duration during which thee-keys will remain active. After the duration (or earlier if

thee-keys are cancelled by the user), thee-keys will discontinue to work. If, for some reason, the recipient still needs access to the vehicle, the original message or link can provide a method for allowing the user to request more time. The user (e.g., owner of the vehicle) can therefore, via the app or website, reactivate thee-keys.

[0013] In some embodiments, thee-keys when active will provide a graphical user interface on the device of the recipient, which may allow access, such as icon buttons to unlock, lock, start and stop the vehicle. The app can also send notifications to the recipient, if for example, the user wishes to provide the recipient with more time or less time. While thee-keys are active, in one embodiment, the vehicle can report back activity of the vehicle, while under the care/use of the recipient. The user may have access to audio input or cameras, to communicate with the driver/recipient. The vehicle use history can also be saved to a server, such that the recipient's use activity can be audited, or viewed or accessed.

[0014] In one embodiment, a method is provided. The method includes receiving a request, at a server, to grant e-keys to a recipient for use of a vehicle, the vehicle being pre-associated to a user account. The method fu1ther includes generating a unique access code, at the server, in response to receiving the request. The method then encrypts the access code, at the server, using a vehicle public key associated with the vehicle, the vehicle public key is associated with the user account. The method includes sending the encrypted access code to the recipient for receipt by a device of the recipient. The encrypted access code is defined for transmission to the vehicle by way of the device of the recipient, and the encrypted access code is associated with instructions to cause the vehicle to decrypt the access code using a private key of the vehicle and to transmit the access code after decryption back to the device of the recipient along with privilege settings for the use of the vehicle. The access code received from the vehicle functions

as e-keys for the vehicle that enable access to use of the vehicle in accordance with conditions defined in the privilege settings.

[0015] In some embodiments, a device ID of the device of the recipient is caused to be transfen-ed with the encrypted access code to the vehicle, the device ID being a code that identifies the recipient's device, such that access of the vehicle using the access code is limited to the device of the recipient having the device ID.

[0016] In some embodiments, the access and use of the vehicle using the access code remains valid while the device of the recipient is detected to be within a communication range of the vehicle, and when the device of the recipient is detected to be outside of the communication range of the vehicle the vehicle invalidates the access code and disallows further use.

[0017] In some embodiments, thee-keys provide access to at least one of operating functions of the vehicle, or opening the vehicle, or starting the vehicle, using user interfaces of the vehicle, or turning-off the vehicle.

[0018] In some embodiments, a method may include receiving metadata along with the request to grant thee-keys, the metadata includes the privileges settings, the privilege settings defining types of functional access of the vehicle, expiration data for the access code.

[0019] In some embodiments, the e-keys enable graphical icons on a screen of the device to be active for use of the vehicle, at least one of the graphical icons on the screen enabling unlocking of the vehicle, turning on of the vehicle, or locking the vehicle.

[0020] In some embodiments, thee-keys enable graphical icons on a screen associated with an application executed on the device, thee-keys being active enables use of the vehicle via the application, the application enabling at least unlocking of the vehicle, turning on of the vehicle, or locking the vehicle.

[0021] In some embodiments, the device is one of a sma1tphone, or a smartwatch, or smart glasses, or a portable device, or a computer, or a digital assistant.

[0022] In some embodiments, the privilege settings include a time code defining a length of during which thee-keys will remain active.

[0023] In one embodiment, a method, executed by a processor, is used for assigning e-keys to enable access and use of a vehicle using thee-keys. The method includes receiving, at a server, a request to generate e-keys for a vehicle associated with a user account, the request identifying a recipient and metadata defining privileges of use for thee-keys. The method includes generating an access code for the request, the access code being unique for the request. The method fmther includes encrypting the access code and at least part of the metadata to generate encrypted e-keys and sending the encrypted e-keys to a device of the recipient. The encrypted e-keys are confi gmed for wireless transfer to the vehicle from the device of the recipient. The wireless transfer includes transfer of a device ID of the device of the recipient, and the encrypted e-keys are configured to be decrypted by the vehicle and the access code is associated with the device ID on the vehicle. The access code is transmitted to the device of the recipient from the vehicle, such that the vehicle provides access for use to the device when the access code is used by the device having the device ID. The access code functions as the e-keys for the vehicle and the metadata includes privileges for use of the vehicle while using thee-keys.

[0024] In some embodiments, the server receives data during the use of thee-keys, the data including at least use metrics of the vehicle, the use metrics being stored by the server as history of use for the e-keys.

[0025] In some embodiments, the server, upon receiving a request to cancel thee-keys, sends deactivation instructions to one or both of the device of the recipient and the vehicle.

[0026] In some embodiments, a plurality of requests to generate e-keys for the vehicle is received by the server from time to time, such that a plurality of e-keys can be generated for the vehicle and thee-keys that are generated are associated with the user account, and any one of the generated e-keys are removable from being active via the user account.

[0027] In some embodiments, a plurality of e-keys for the vehicle are producible, the plurality of e-keys can co-exist. In some embodiments, only one e-key is associated with active use of the vehicle at one time. In some embodiments, a particular e-key in use with the vehicle can swapped for another e-key having access to the vehicle, such that each e-key has the same or different privileges. In some embodiments, a priority order of e-keys is defined, such that higher level priority e-keys are placed in use over lower priority e-keys, when devices associated with the e-keys are within a communication distance of the vehicle.

[0028] In some embodiments, each of a plurality of activated e-keys is associated with different or same privilege settings, as defined in the request to assign thee-keys.

[0029] In some embodiments, each e-keys is associated with an expiration time, and upon reaching the expiration time, thee-keys are invalidated.

[0030] Some embodin1ents fmther include receiving interface data with the vehicle during use by the recipient, the interface data being examined to determine learned patterns, the learned patters identifying recommendations to the recipient for settings of the vehicle.

[0031] In one embodiment, a method for gaining access toe-keys for access to a vehicle using a smartphone is provided. The method includes receiving at the smartphone a message indicating that e-keys were granted to the user of the smartphone. The message includes encrypted e-keys that contain a generated access code. The generated access code being unique for the message. The method includes transmitting the encrypted e-keys to a vehicle using a wireless protocol, a device ID of the smartphone being sent to the vehicle along with the encrypted e-keys. The method also includes receiving activated e-keys from the vehicle at the smartphone. The activated e-keys include the access code, and the access code enables one or more graphical user interface controls that when selected provide to unlock the vehicle, start the vehicle, turn-off the vehicle, and lock the vehicle.

[0032] In some embodiments, a plurality of requests to generate e-keys for the vehicle is received by the server from time to time, such that a plurality of e-keys can be generated for the vehicle and thee-keys that are generated are associated with a user account, and any one of the generated e-keys are removable from being active via the user account.

[0033] In one embodiment, thee-keys can be sent to any person, via a communication message. Thee-keys, in one embodiment, are sent to a user in a message so that the recipient can get a graphical user interface that allows the recipient to activate thee-keys and then open the car, tum on the car, drive the car, turn off the car, lock the car, etc.

BRIEF DESCRIPTION OF DRAWINGS

~~**[0020]** The invention may best be understood by reference to the following description taken in conjunction with the accompanying drawings.~~

~~**[0021]**~~**[0034]** Figure 1 ~~illustrates a broad~~shows example profiles settings for a vehicle, and association to roles, in accordance with one embodiment.

[0035] Figure 2 shows additional role settings for different users, in accordance with one embodiment.

[0036] Figures 3-5 show additional vehicle profile settings, in accordance with one embodiment.

[0037] Figures 6-9B show example pairing of a vehicle ~~having~~to a user profile, and examples of a shared vehicle transfers of profiles for limited use of the profiles on the shared vehicles, in accordance with one embodiment.

[0038] Figure 10 illustrates validation method for enabling a profile on a vehicle and biometric validatjon, in accordance with one embodiment.

[0039] Figure 11 illustrates various settings for a profile and adjustments that can be made over the Internet via a device, e.g., using a portable device or the vehicle electronics and displays, and remote controls and settings in accordance with one embodiment.

[0040] Figure 12 describes a system in which a user interacts with a model view controller software environment useful for processing APPS using APis on vehicles with vehicle operating systems capable of processing computer code, in accordance with one embodiment.

[0041] Figure 13A describes how vehicle on board computer with input output system useful for accepting input, processing input and displaying results in conjunction with stored computer readable programs or functions in the fom1s of APPs may be structmed,

in accordance with one embodiment.

[0042] Figure 13B describes one example of how stored data and function declarations may be compiled to provide intermediary access to a vehicle's computer controlling vehicle systems, in accordance with one embodiment.

[0043] Figure 13C describes a set of computer readable and executable code that can be compiled together by a third party APP developer in the form of an APP, in accordance with one embodiment.

[0044] Figure 14 describes the stepped flow of events as a user interacts with an APP, in this case, an HYAC APP, in accordance with one embodiment.

[0045] Figure 15 Describes fmther ways an APP may take, process and produce results, in accordance with one embodiment.

[0046] Figure 16A describes an ecosystem where an APP in conjunction with a vehicle API may work together to make assumptions, make decisions and take actions, in accordance with one embodiment.

[0047] Figure 16B describes how one of many types of inputs into an assumption and reasoning logic module can be compiled over time, in accordance with one embodiment.

[0048] Figure 16C describes one example of what an assumption and reasoning logic module may produce using the data points collected on an ongoing basis in Figure 16B, in accordance with one embodiment.

[0049] Figure 16D describes an example list of decision the decision and action engine may take based on information provided by the assumption and reasoning logic module and sets of assumptions created, in accordance with one embodiment.

[0050] Figures 17-25 define methods and systems for assigning advisor accounts for accessing data regarding the vehicle.

[0051] Figures 26-35 illustrate methods and systems for assigning e-keys for enabling access of a vehicle to a remote user.

DETAILED ~~main~~EMBODIME TS

[0052] Embodiments of the present invention define methods, systems and apparatus for use in vehicles. The methods, systems and apparatus include electronics of vehicles that drive display devices in vehicles and communicate wirelessly with Internet services.

[0053] The Internet services provide access to cloud services. The cloud services provide access to user accounts and access to settings, configurations, applications and other customization defined by the user. Customization can include user interface customization of a vehicle display or displays. The customization can include the ability to select specific applications **(APPS)** to be activated by the vehicle and interfaced via the display or displays, voice input, touch input, etc. Toe customization is also provided with a learning engine that learns use behavior by the user or patterns of behavior of multiple users, and automatically implements settings or programming to aspects of the user interface, or provides recommendations or notifications with recommendations. The programming can include automatic programming at certain times, days, months, years, etc., and can be updated or molded over time as the user continues to use the vehicle UL

[0054] In one embodin1ent, a user can assign and add advisor account to any individual. The Advisor account can be for any duration, and the duration can be set by the user. In one embodiment, the advisor account can be assigned to a guest driver of a vehicle. The guest driver can be, for example, a friend, a known individual, a service person, a valet person or valet service, etc. The creation of an advisor account can therefore be for a short duration, or long duration, or permanently, or until the account is canceled, stopped, revoked, expires, or eliminated by the person/user that issued or created the advisor account. In one embodiment, the advisor account can act to provide access to a vehicle.

[0055] In one embodiment, access can be by way of electronic keys (e.g., e-keys), which can be sent by a vehicle owner/admin to some person or entity. For example, the user-owner of the vehicle canassign a valet with access to the vehicle by going on an application (App or website) on a computing device (e.g., mobile or non-mobile device), identifying the recipient, identifying a mode for communicating with the recipient (e.g., text, email, message, notification, etc.), selecting the account privileges (e.g., what type of access, speed limits, geographic restrictions, amount of time thee-keys will be valid (or else expire)), and requesting that e-keys be sent to the recipient.

[0056] In one embodin1ent, a user can access cloud services for a vehicle manufacturer and identify the particular vehicle from selected choices. The user can then identify a customization profile for the vehicle by defining the look and feel of a UI di.splay, arrangement of vehicle controls on displays, add and associate third party APPS to the vehicle display, and save the configuration.

[0057] The configuration, in one embodiment, is saved to the profile of the user. In one embodiment, the profile is saved on a database of a specific vehicle manufacturer that offers the customization option. In still other embodiments, once a configuration is saved to the profile account of a user, thatconfiguration can be shared to other vehicles of the user. In still other embodiments, when a user buys a new car, the custom configuration can be transferred either entirely or partially to the new vehicle. In some embodiments, if the vehicle has more or less system functions, the customization can be adjusted automatically or the user can be provided with options to update the customization to add or delete features. In one embodiment, the customization will be facilitated via a website. In one embodiment, the website may be of the vehicle manufacturer. In one embodiment, the website of the vehicle manufacturer can allow the user to add APPS that are created by third parties. The third paities can create APPS that

communicate with APIs of the system components of specific vehicles of the manufacturer. Once APPS are selected, the user can add them to the custom user interface (UI) display.

[0058] The user can also be allowed to anange the APPS or icons of APPS in a specific custom arrangement that is saved to the user's profile. In one embodiment, the user's profile can also be run on various vehicles, other than those owned by the user. For instance, if the user is renting a vehicle and the vehicle has access to cloud services, the user can enter his user name and password (or other identifiers), which log the user into the cloud services and saved profiles. 'Ihe saved profiles will then enable logic to build a custom UI for the user based on the vehicle being driven. ln one embodiment, the system components and APIs of the system components of the rented vehicle can be paired or linked to the user's saved APP selections.

[0059] The user's saved Ul configuration may also be transfened to the display of the rented (or other vehicle) vehicle. A best-fit configuration can also be generated using the user's profile selections, so that the configuration provided for the other vehicle will closely resemble or appear as it does for the configured vehicle. [n other embodiments, the user's use metrics can be monitored. The use metrics can include use of **APPS,** use be of system components of the vehicle, use of the vehicle, environment conditions, and historical actions taken by the user via the input/output controls of the vehicle (e.g., buttons, levers, keys, fobs, display selections, display interface actions, communication actions, etc.).

[0060] These historical actions can then be used to define learned actions. The learned actions can be analyzed to change configuration settings in the user's saved profile. For instance, if the user uses a particular APP every day at a particular time, that APP icon can be surfaced to the display or preset to start. The APP can then provide information

to the user at about the same time the user normally needs the infonnation. Other historical use patterns can be monitored and such data can be saved to the user's profile.

[0061] The data can then be used by algorithms that build assumptions based on historical inputs by a user as well as environmental inputs, location inputs, vehicle diagnostic inputs, internet connected marketing deals, the user's calendar, traffic conditions as well as news. The assumptions the algorithm builds are then processed into decisions and actions by an additional algorithmic process to activate local or remote audio and visual ale1ts, change vehicle systems, display infonnation on a vehicle's displays and request a decision from a user locally or remotely tocomplete an action.

[0062] A number of embodiments are described below, with reference to spe.cific in1plementations that refer to vehicles, but such in1plementationsshould be broadly construed to include any typeof vehicle, structure or object. Without limitation, vehicles can include any type of moving object that can be steered, and can include vehicles that are for human occupancy or not. Vehicles can include those that are privately owned, owned by corporations, commercially operated vehicles, such as buses, automobiles, trucks, cars, buses, trains, trolleys, etc. Example vehicles can include those that are combustion engine based, electric engine (EV) based, hybrids, or other types of energy source vehicles.

[0063] A cloud processing system, as described herein, will include systems that are operated and connected to the Internet or to each other using local networking communication protocols. A cloud processing system can be defined as an interconnected and distributed physical or virtual software defined network that utilizes virtual or physical processing and storage machines that enable various applications and operating systems to facilitate the communication with and between various client devices (vehicles, user devices, structures, objects etc.).

[0064] The communication with and between the various client devices will enable the cloud processing system to deliver additional processing inforn1ation, data, and real-time metrics concerning data obtained from other processing systems as well as client feedback data. The distributed nature of the cloud processing system will enable users of various vehicles, structures and objects to access the Internet, and be presented with more flexible processing power that will provide the requested services in a more effective manner.

[0065] The processing systems can be defined from various data centers that include multiple computing systems that provide the processing power to execute one or more computer readable programs. 111e processing of the computer readable programs can produce operations thatcan respond to requests made by other processing systems that may be local toa vehicle's electronic system. For example, a vehicle can include electronics that utilize memory and a processor to execute program instructions to provide services.

[0066] In other embodiments, the electronics of a vehicle can synchronize with a user's pmtable electronics. The user's electronics can include, for example mobile devices that include smartphones, tablet computers, laptop computers, general-purpose computers, special purpose computers, etc. The various computing devices of the vehicle, and or the computing devices of the user (smart devices) can be connected to the Internet or to each other. Provided that a user has access or account access to the cloud service, the cJoud processing services on the Internet can provide additional processing information to the electronics of the vehicle.

[0067] The wfreless communication can incJude cellular tower communication that couples and communicates through various networks to the Internet, to provide access to cloud processing 120. Other methods can include providing Wi-Fi communication to

local Wi-Fi transmitters and receivers, which communicate with cloud processing 120. Other types of communication can include radio frequency communication, such as 802.11.ac, 802.1lad and subsequent wireless networking protocols, Bluetooth communication or combinations of Wi-Fi and Bluetooth. It should be understood that vehicle electronics can communicate with cloud processing 120 via any number of communication methods, so long as exchanges of data can be made with cloud processing 120 from time to time.

[0068] The communication can be made by vehicle electronics while the vehicle is on or when the vehicle is off, so long as communication and processing circuitry of vehicle electronics has a power source. The power source can include battery ~~and an auxiliary~~power that powers vehicle electronics tocommunicate with cloud processing 120 when vehicle is turned off. When vehicle is turned on, the battery that drives vehicle electronics can be recharged.

[0069] Still further, certain applications can increase in size when being used or decrease in size to enable selection at a later time. For example, selecting the temperature system component may expand the system component to a larger space, thus temporarily removing other displayed components. The user can also select other buttons to access other system controls, other apps, or modify or add applications or system controls. When modifications are made, the modifications are saved to a user database and profile of the user, as managed by cloud services.

[0070] Cloud services will therefore allow any future modifications to be made to the custom configuration at any time and from any computer connected to the Internet. Still fu1tber, the custom configuration can be transfen-ed to a second vehicle. If the custom configuration is transferred to a second vehicle, the system can select the system components for the second vehicle and attempted do a best match of applications

available for the second vehicle that resemble or match the ones used in a first vehicle. Specific settings, anangements and other features may also be transferred to a second vehicle, by simply transferring the custom configuration to a second vehicle.

[0071] In one embodiment, the functions of the specific applications illustrated in the display will be monitored and restricted depending on safety considerations while driving. For example, if the interfacing functionality requires more interactivity with the display, or requires a reading of text or inputting text, those functions will be disabled during operation of the vehicle. Once the vehicle comes to a stop, or is placed in Park, certain of these functions will be activated. In other embodiments, other safety considerations will allow for applications to shift from outputting text to outputting audio or voice. The input can also be changed from touchscreen, button touches, selections, and/or voice input. In still other embodin1ents, safety considerations can allow certain user inte1face components to move about the display to provide easier reading while driving or automatic conversion of text to audio.

[0072] For example, content being displayed in the center panel display of the vehicle, can be automatically shown in the dashboard display region of the vehicle, such as in front of the steering wheel. In still other embodin1ents, some content or display data can be moved from the center console or the display in front of the steering wheel to the windshield of the vehicle in a heads-up display area. Accordingly, algorithms executed by the applications and applications of the manufacturer, can cooperate to provide functionality to the application features and interfaces, while maintaining safety parameters defined by rules. The safety parameters will therefore allow content of the user interface to be shifted around to various displays of the vehicle, or translated to voice or audio at certain points in time.

[0073] These settings and customizations can be made through the web/cloud services and tools provided by the website of, for example the manufacturer of the vehicle. In one embodiment, the cloud services provided by the manufacturer can be provided by a partner of the manufacturer. The partners of the manufacturer can include software companies that develop, host, or manage certain functionality provided by the vehicle manufacturer. In other embodiments, the partner software companies can integrate tools or components with tools and components of the vehicle manufacturer. This provides for integration with one or more cloud services, software services, Internet services, and services provided by systems of vehicles or systems of the vehicle manufacture. In either case, whether the software and logic is designed and constructed by one or more entities, the cloud services provided by the vehicle manufacturer or the website that provides the tools for customization will appear as a unified simple to use interface for the user. As mentioned above, the cloud services can provide databases for saving the user profile and data associated with the user account.

[0074] The user profile can include settings made by the user, customizations made by the user, identification of applications purchased or added to the vehicle customizations, etc. Still further, the user profile data can be part or be associated with the user account. In this manner, the user that customized a user interface can access the Internet at any time, whether through the vehicle or through any other computing device having access to the Internet and make changes, modifications, or access control features of the vehicle remotely. In one embodiment, the profile of the user can be accessed from any vehicle, such as rented vehicles or shared vehicles. Settings and profile data can then be shared for a period of time on any vehicle and use data on that vehicle can be stored.

[0075] When the user is not using the vehicle, the custom configuration can be turned off or locked out for another session. Once the user wants to start a new session, the user

can log back in and the custom configuration returns. In other embodiments, the custom configuration will automatically turn off when the user is not driving the vehicle or has not logged into the vehicle. In other embodiments, the custom configuration can be automatically turned on when the user is detected. The user can be detected using biometrics, login credentials, image detection of the face, fingerprint detection, retina scans, etc. In some embodiments, biometrics can include data used to identify the user, such as face recognition, fingerprint reading, retina scans, voice detection, or combinations thereof. Still further, the custom configuration can be transfened to other vehicles.

[0076] If the user wishes to use his or her custom configuration in another vehicle, the user can login to the custom configuration or user account from another vehicle. If the other vehicle does not have all the system components needed to define the custom configuration, the custom configuration can be supplemented with other similar components automatically. In other embodiments, the custom configuration can be transferred from one vehicle to another, or when the user buys a new vehicle. In another embodiment, the custom configuration can be adjusted based on the driver. The custom configuration can also be preset remotely from the Internet, using the cloud services. The custom configuration can also be configured to provide limited use of certain systems or the vehicle, such as when a guest is driving the vehicle. In other embodiments, restrictions can be placed on the vehicle speed, location of driving, and automatic notifications for the user or the master user of the vehicle. The master user of the vehicle can have a master account with administrator credentials.

[0077] In still another embodiment, the vehicle can be loaned to a child of driving age (under 21/18 years of age), and the child can be provided with restricted use of the vehicle. When the child exceeds or does not follow the restrictions of the vehicle,

automatic notifications can be provided to the user that is the administrator of the vehicle. The notifications can be by cell phone, smartphone, tablet computer, mobile device, text messages, phone calls, commendations of phone calls and text, audio messages, audible sounds, vibrations, and commendations thereof. History use of the vehicle can also be maintained in cloud services. The history use can provide the user with information as to where the vehicle has been, the speed or events, violations that occurred when use of the vehicle etc. The configuration can also provide messages to the driver warning the driver of when the vehicle has exceeded a restriction, or is approaching a restriction in use, driving area, speed, etc.

[0078] The screen displays can have various configurations, placements, sizes, number of pages, tabs, etc., and the user can provide controls for some or all of the interfaces and controls in certain locations. The selection can be enabled for third-party applications. The third-party applications can be selected from the vehicle site, or by providing links to third-party sites. The third-party applications can be pre-identified by the site and displayed to the user if they are compatible with the pa1ticular vehicle selected. In another embodiment, the third-party applications can all be shown to the user whether or not they arecompatible with the vehicle. Upon binding/pairing or attempting to find application for the vehicle, compliance as to whether the applications operate or comply with the particular vehicle can be made.

[0079] In one embodiment, certain third-party applications can be reviewed by the vehicle site administrators before they are made available to users for selection. In other embodin1ents, the third-party applications can be approved or disapproved. In still other embodin1ents, the third-party applications can be augmented with restrictions made by the vehicle manufacturer, or dictated by law. The restrictions can be applied, based on the anticipated interfacing with the vehicle interfaces, to ensure safety during driving.

For instance, if a particular application requires entry of text, navigation of controls, or other activities that would distract the driver during operation of the vehicle, such vehicle controls or application controls for application interfaces can be temporarily disabled, or can be automatically transferred to a heads up display, or can switch to talce audio vocal input from the user. In some embodiments, when the vehicle has come to a stop or is place to park, certain controls or interfaces can be re-enabled, or moved back to original display location or converted back from voice input to touch input. In one embodiment, tools provided by the vehicle site or third-party site can provide for customization of the layout of the display screens of the user interface.

[0080] The customization can include organizing or laying out system inte1fa.ces as well as application interfaces, such as those interfaces provided by 3rd parties. In one embodin1ent, interface rules a.re applied to determine if the system interfaces can be replaced with third-party application inte1fa.ces, while providing access to the control interfaces via the APis of the systems. For example, if the user wants to provide a custom speed indicator, the speed indicator must be compliant (via APis and/or mapping) with the system interfaces so that the speed readings can be populated to the third-party application. In one embodiment, rules can be integrated with or applied to the applications and system user interfaces for when the vehicle is moving. As mentioned above, such rules can limit interactivity with certain user interfaces while the vehicle is moving to prevent unsafe driving. In one embodiment, the custom user interface is saved to the user profile.

[0081] The user profile may contain settings, such as selections of the user interface components associated with the system of the vehicle, as well as user interface is provided by third-party applications. In addition, the user profile can contain and store settings provided by the user. The settings provided by the user, as mentioned is this

disclosure can also be learned settings based on use. The settings can further include remote access settings, as well as settings allow the user to control vehicle components from a remote location or a remote computer. The setting can also include providing access to the user account to view historical driving patterns, recent driving activities, the perfonnance of the vehicle during specific driving sessions, the perfonnance of specific vehicle components, etc.

[0082] In one embodiment, the custom user interface configuration can be transferred to the vehicle. The custom configuration, as mentioned above is stored in the database of the vehicle manufacturer, or a database held by a 3rd party that cooperates with the vehicle manufacturer to provide cloud services. The database, in one embodiment, is a network accessible storage which allows access to the user to program and modify the user interface using any computer or device having access to the lntemet, including the vehicle itself or a third-party vehicle. The method then proceeds to operation where the custom user interface can be activated in managed for Internet connectivity for components of the custom interface. For example, the vehicle's Internet access protocols can be set, or registered with an Internet provider or service provider for the cloud services. The service provider for the cloud services can be the vehicle manufacturer, a company cooperating with the vehicle manufacturer, a third-patty company, or combinations thereof.

[0083] In one embodiment, the method/logic can also enable local communication with mobile devices that may be in the vehicle. The enablement may be provided by allowing synchronization with the computing system of the vehicle, or with the computing communications of the portable device. For example, the local communication can be paired automatically, based on a preset pairing process where pairing keys are entered. This provides for automatic settings and synchronization when the user enters the vehicle

with the portal device. As mentioned above, user interfaces associated with applications loaded on the user's portal device can also synchronize to the display screens of the vehicle, as predefined by the user.

[0084] In one embodiment, vehicle settings are saved to either a memory number button on the vehicle or synced to a key fob, or accessible via an interface or voice activation. In one example, a vehicle operator profile is provided to allow users to maintain their individualized profiles, settings and accounts for vehicles from any internet connected device or be able to login to their vehicle physically in or near the vehicle by the use of a fob, thumb print, eye scan and or manual login using an input device that interacts with the vehicle's login system.

[0085] In one embodin1ent, the profile can be managed at a user account saved to a central or cloud distributed system, to manage access. Any vehicle can be abstracted so that any user can log into any vehicle if they have an account that allows access to that vehicle. For instance, a vehicle owner with the role of "administrator" (e.g., an administrator of a user account that has a profile associated therewith or multiple/sub profiles) can create logins for his or her vehicle(s) for additional users such as his or her children, spouse, mechanic, and valet driver among other applications. Logins can be created for individuals or for roles such as the role of "child" where all users with the role "child" would have the same vehicle specifications applied to the vehicle they will be logging into. Similarly, the role of valet can be given and shared by any valet driver.

[0086] The purpose of abstracting vehicle operators from the vehicle itself is a shift from the current state of the a1t in which settings are vehicle specific- each vehicle typically only having the ability to store 1-3 sets of settings, to where vehicle settings are user specific and 1-n logins can be managed through an access management system. The embodiments defined herein allow each user to apply his or her settings to any

vehicle based on their login information in which they provide their login and password. When a user logs into a vehicle, the vehicle will determine locally on board and/or communicate remotely with a central or distributed access management system to detennine the validity of the login presented to the system. If the user's login is recognized, the system will apply settings and use privileges to the vehicle prescribed by the login.

[0087] Logins can have "role" specific settings and privileges or settings and privileges set only by the administrator that cannot be overridden by the user of the login. For instance, an administrator may create a login for "John" their 16-year-old son. The administrator can apply settings to John's login that John cannot override such as the maximum speed the vehicle can travel. For instance, Although the vehicle may have the ability to travel at a speed of 130 mph, John's login will only allow the vehicle to travel at a speed up to 90 mph. Additionally, every login may have settings that the user of the login can toggle to their liking such as the list of radio stations they would like pre-programed every time they log in to any vehicle that accepts their login.

[0088] Logins can control all aspects of a vehicle's behavior and can be attributed to individuals or roles. These settings can be toggled via a network connected device such as a computer, web application, smart-phone or directly on the vehicle. Administrators can decide which settings are locked for specific logins or roles, which are open for the login user to toggle and which settings are to be enforced depending on the tin1e of year, or time or day etc., or when a condition or event is detected.

[0089] Login settings that can be set and remotely administered include but are not limited to, driving characteristics (rate of speed, fuel consumption guidelines) location based settings (GPS aided travel restrictions, travel radius boundaries, dynamically loading maps, dynamically loading directions, dynamically loading fuel, charge and

battery service and purchase locations etc.), time of day based use restrictions (day driving only for example), automatic purchase settings (financial institution linking for automatic purchasing of fuel, charge time, batteries, car washes, etc.), fuel settings (Electric only, fuel only, hybrid only etc.), refueling routing and purchase (incentive based re-fueling maps, incentive based refueling offers etc.) driving characteristic settings (sport, comfortable, soft, off-road, high perfonnance, economy mode), entertainment system settings (radio memory settings, internet access or resttiction, streaming services settings), comfort & **HV**AC settings (climate control, seat positions, seat heater/cooler, suspension/ride settings, entry lighting, remote start, remote stopetc.) tracking/meti-ic settings (camera/video recording guidelines, mileage, top speed, average speed, MPG, wear and tear settings and notifications, historical travel maps).

[0090] Automatic purchase settings can be processed in response to requests from the vehicle. The request can be, for example, to transact a payment is for one of a car wash service, a fast food service, a toll road service, a goods purchase service, a rental service, a lease service, or combinations thereof.

[0091] Additionally, combinations of settings or setting profiles (such as "sport" where your seat moves to sport position for additional support, suspension stiffens, throttle response becomes aggressive etc.) can be set as well instead of individually setting use characteristics. In one embodiment, logins are user specific, not vehicle specific, so any family member can use their login on any family vehicle and the vehicle will perform based on the metrics and resttictions dictated by the login used to operate the vehicle.

[0092] Companies or entities can create and manage logins to company vehicles for delivery drivers, car washers, and mechanics among other applications. Each login can be configured to provide or restrict access based on the user logged into the vehicle. A company may only allow a delivery vehicle to tt·avel at a maximum speed of 80 mph to

limit reckless driving. A company may create a role of "local delivery only" where a driver with that login can only drive the vehicle within their territory. Breaches in ten-itory travel will result in a recorded event and notification to the vehicle administrator as well as the vehicle operator. A grace period will be given to re-route back into the driver's territory before more aggressive vehic1e disabling mechanisms are deployed. The driver will be given visual and audio cues as to how to avoid vehicle disabling.

[0093] ~~carrier~~A dealership can grant "test drive" logins to potential customers, which allows them to operate less than 100mph and only within a 5-mile radius. In one embodiment, ale1ts or notifications can be automatically triggered if violations in the restrictions are detected. A dealership may also grant a "demo" login for instance which showcases the vehicle's capabilities, available APPS, features and benefits. Variations of the "demo" login can be used on variations of potential buyers. A" 18-24 year old demo" may be useful for enticing that demographic and showcases the vehic1e's features 18-24 year olds are most receptive to.

[0094] A valet can be given a password to login only as "Valet" which will impose restrictions on trunk operation, vehicle speed operation, vehicle location notification settings etc. A recording option can be provided, which can set a recording within and around the vehicle when in the valet mode. This way, the user can login to see what the valet driver did while in possession the car, in case the owner feels that something is not correct when the vehicle is returned to the owner. Additionally, while the valet is driving the car, a notification can be provided to the valet that will ale1t the valet that recording is in progress, and their face can be shown on the display while the valet parks the car.

[0095] A user may set the valet login to alert the user that left the vehic1e with a valet that the car has traveled beyond the allowed radius or has reached a speed greater than 100mph, for example. This alert can be sent wirelessly to an email address, texted via

mobile phone number or sent to a mobile device having a login-profile mobile application capable of sharing current vehicle location, speed, fuel status among other metrics. 1he last logged in user of the vehicle or vehicle administrator can send visual, audio or auto override notifications to the valet letting them know they need their car back, they are traveling too fast or even auto shut down to prevent theft.

[0096] A parent can set up a login to the family vehicle for their child that only allows the child to drive within a certain radius. For example the vehicle may only be used to drive between home and school. A map can be outlined on the account management interface by a parent when setting up the child's login to support the home to school restriction intended.

[0097] In one embodiment, a parent or company may give a child or company driver a login that also can"ies a financial allowance connected to one or more financial institutions administered through the access management and/or login management system by administrators. For instance, a child may have the need to re-fuel the vehicle by purchasing either traditional fuel, battery units, and or charging time but a parent does not want to give a general credit card to the child. The parent will set a budget for fuel purchase for the given login and the login will then allow the vehicle will communicate with the fuel, battery, and or charge-dispensing unit automatically using a wired or wireless communication systems funding the purchase automatically up to the allotted budget set in the login of the vehicle.

[0098] In one embodiment, these features are useful for fleet vehicles where company vehicle users currently use a corporate credit card to purchase fuel where fraud may exist in the fonn of using company credit cards, or company fuel accounts to fuel personal vehicles. The new system ensures only the company owned vehicle is approved to

purchase the trnditional fuel, battery, charging time and also maintains metrics on which logged in user consumed fuel and re-fueled which vehicle.

[0099] In one embodin1ent, a process is created so that some or all manufacturers use the same type of login/access management system. By way of example, any user can log into any vehicle from any brand in so far as they have account creation access or a recognized login. Once logged in, each vehicle will receive and impose the login-based settings as long as the manufacturer supports the login/access system.

[00100] Figure **1** shows various methods a user can interact with a vehicle login system, in accordance with one embodiment. The user may use any network-connected device ranging from a mobile computer, mobile phone, mobile network device all connecting to a remote converged or distributed network cloud system. The user may also interact with the vehicle login system directly on or near the vehicle. The user supplies login credentials toa vehicle login interface which are sent to the remote distributed or centralized user login authentication system or onboard vehicle authentication system. The processing logic receiving the login credentials processes the data and returns an authentication response to the user attempting to log in. If the authentication is a success, the vehicle the user attempted tolog into has vehicle settings applied to it and the user is allowed to operate the vehicle. If the authentication is a failure, the user is presented with a failed access notification on the login interface.

[00101] Figure 2 shows two different types of users and an example of how the user is organized, in accordance with one embodiment. In this example, User 1 is an administrator of a vehicle login system over vehicles he or she owns. User 1 has the ability to add or remove logins, roles and vehicles to his login system. Since User 1 is an administrator, he or she can add more logins and or roles to the system to allow a family member to have access to the family vehicles for instance. In this case, a family member

"User 2" is shown. The administrator has given this family member a login named User 2 and has granted two roles to User 2. User 1 may only want User 2 to have access to a certain vehicle and toce1tain roles only. User 1 may only want User 2 to have access to the vehicle for the purposes of traveling between school and home. In this case User 1 has created a role that is applied to User 2, which only allows the vehicle to travel within certain restrictions and geographical locations.

[00102] In this example, User 2 does not have the ability to alter his or her login, role or vehicle since they do not have administrator access. However, User 1 can make changes on behalf of User 2. The full range of settings over a vehicle that applies to a given role or login is a super set of settings. User 2 may have access to a subset of settings that User 1 allows changes to by User 2.

[00103] Figure 3 shows a graphical representation of a example set of settings an administrator such as User 1 may have to administer logins, roles, and vehicles. Figure 3 further expands the depth of settings, including but not limited to, vehicle administration, adding or deleting users and roles, vehicle global settings that apply to all roles and logins, adding or deleting vehicles among other settings.

[00104] Figure 4 shows one sample of many potential configuration settings for a given vehicle. In this case, User 2 has a login created for him or her named "CHILD". 1his login contains a set of settings that may or may not be configurable by User 2 since User 2 is not an administrator, only a subset of settings are open to him or her to alter. The drawing illustrates the settings that are user editable and admin only or restricted. The left column lists the type of settings conesponding on the same row on the right column. These settings are examples and may be altered, added to, or subtracted from in different embodiments. For instance, fuel use settings allow an admin in this case to choose what type of fuel the user login CHILD is allowed to use while logged into the

vehicle. Similarly, location based settings allows an administrator to draw out a map of the area the user login CHILD is allowed to travel within while logged into the vehicle.

[00105] Figure 5 describes extended settings from Figure 4. Tiris figure describes additional vehicle settings that are configurable by the user with the login "CHILD" and those that are only configurable by User one being the Administrator. Figure 5 also describes a subset of settings a user login CHILD in this case is allowed tochange. For example, the user login CHILD is allowed to select his or her radio stations, streaming services, and Internet access settings for a unified experience in any vehicle they log into using this log in. Similarly, the user login CHILD can access driving modes and set the vehicle mode to sport for instance. It should be understood that the example "CHILD" profile is just that, an example, and any type of user profile may be set with the defined privileges and/or restrictions.

[00106] Figure 6 illustrates an example of utilizing a profile of the user, to access cloud services 120, and a database 115, in accordance with one embodiment of the present invention. In this example, a user may utilize a connected device 110 to access cloud services 120. Using the connected device 110, the user, in this case Bob, is accessing his universal profile settings. His profile settings may include settings that have been selected before in earlier sessions, or default settings implemented by a vehicle manufacturer, or another user such as an administrator. In the example, the user may access paiticular active settings managed by cloud services 120 which can cause Bob's profile in database 115 to be updated.

[~~0022~~] 00107] In one embodiment, Bob's profile can include specific settings, preferences, use history, and learned settings from earlier uses of one or more vehicles. The profile settings defined by Bob, are then transferred by cloud services 122 one or more vehicles utilized by Bob. For example, if the user wishes to utilize his regular

everyday car, the profile settings may already be stored on the vehicle. If the user wishes to utilize a different vehicle, such as a friend's vehicle, a rented vehicle, a shared vehicle, a temporary vehicle, a loaner vehicle, a test drive vehicle, a company vehicle, etc., the user's profiles can also be transferred to that vehicle.

[00108] The user profiles can include standard settings that may be set at the various vehicles, or custom settings that can be selected for the user based on learned settings over time by use of various vehicles. In one embodiment, the user profiles are continuously updated and store to a database 115, which is accessible by cloud services 120. Database 115 may include data storage, such as cloud storage, data center databases, distributed databases, local storage on vehicles, network storage, and the like.

[00109] Figure ~~2~~7 illustrates ~~a more detailed picture of the auxiliary battery carrier, designed to receive one or more batteries (volt bars),~~an example of a user (Bob) that may wish to utilize a car 200, in accordance with one embodiment of the present invention. For example, the car 200 may be a shared vehicle, such as those commonly shared in urban cities. Shared vehicles are those that belong to a company and where the company provides accounts to users to access the vehicles for specific trips, specific times, periods of time, etc. Users that share those vehicles typically park the vehicles at different locations throughout an urban city. Users wishing to find a vehicle to use can access an application or website having access to an Internet connected application to find the vehicle closest to the particular user.

~~**[0023]** Figure 3 illustrates a detailed block diagram of a vehicle interfaced with an auxiliary battery carrier, and interfaced~~**[00110]** Once the user has located a proximate vehicle, such as car 200, the user may approach the vehicle so as to utilize the vehicle 200. In one embodiment, when the user approaches the vehicle, and comes in close proximity to the vehicle as detected by the geo-location of the users mobile device, a pairing request can be detected. The pairing request may be triggered once the

proxin1ity zone of the car 200 and the proximity zone of the user substantially or partially overlap. The proximity zone's may

overlap when the user comes in close proximity to the vehicle, such as within a few feet, within a mile, or the user has touched or bumped the vehicle.

[00111] The pairing request may be automatically sent by the users device to cloud services 120. The pairing request can include sending the model of the vehicle 200, that may have been obtained by the users mobile device from the vehicle 200 directly. In the illustrated example, the pairing request by the users mobile device can include identification of the vehicle that the user has come in close proximity to. A pairing module 170, can then communicate with a mapping engine 118 that detennines information associated with ~~a main battery of the vehicle while being interfaced~~car 200.

[00112] An automaker database 116 can include data regarding a plurality of vehicles, including standard user interfaces, configuration interfaces, and other information necessary to provide user Bob with a ~~CPU~~custom interface for vehicle 200.

[00113] The mapping engine 118, in this example includes a map or that communicates with the automakers database to identify the settings, applications, APis, or modules that allow integration of Bob's user profile from the user profiles database 160 so that Bob's profile can be sent to car 200. In the illustrated example, the mapping engine, the of the mapper, will obtain Bob's profile 160 for cloud services and obtain vehicle information for the user interfaces of the vehicle desired for use by the user.

[00114] The mapping engine 118 will the transfer Bob's profile to vehicle 200. At this point, the user, Bob, can be provided with an interface on a mobile device to allow access to the vehicle. The user interface can include a plurality of screens with instructions, check infom1ation, cost infonnation, billing information, etc. As illustrated in figure 7, the users mobile device can provide various notifications, such as identifying to the user that the user standing next to a blue model M7 from maker C. The user interface can ask Bob if Bob wishes to pair settings to the specific vehicle 200. [f Bob

desires to actually utilize the shared vehicle 200, the pairing request may be initiated as mentioned above.

[00115] Figure 8 illustrates another embodiment where the user Bob has utilized his mobile device 100a to define or access a plurality of settings. In one embodiment, the user may register 214 with a car sharing service, such as via a user interface or application having access to the Internet and the company providing the service. Cloud se1vices 120 can then provide access to the profile database 160 where Bob's profile may be stored. The profile 160 may be accessible to 3rd parties, such as car sharing service.

[00116] Also shown in cloud services 120 is the car database 116/115. The car database can then be provided with information from the car sharing company 210 that identifies the cars that the company owns and that are shared with the service. The car data including assigned IDs to the vehicles and cars can be stored in the car database 116/115. Additional data can be supplemented from vehicle manufacturers 212. The cloud services 120, in accordance with one embodiment, can include logic for profile identification for vehicles 224, logic for proximity detection 222, user request logic 220, and other managing logic for receiving request from users, managing databases from a car sharing database, managing data from vehicle manufacturers,and receiving request to manage profiles an axis vehicles.

[00117] As illustrated, when the user Bob approaches the vehicle 200, the Bob's mobile device 110a can identify the closest car, which may be car A. In this example, Bob is identified to be proximate to the car having an ID 1528ABC. In one embodiment, when the user comes in proximity to the car 200, the car can beep or light up when enabled, it can open the doors to allow the user to access the vehicle when the logic has paired the user to the vehicle, the profile of the user can be transferred to the vehicle, the use of the vehicle is managed by the user's online account (storing hist01ical use data and

any billinginfon11ation), automatic payment for use can be made from predefined payment aITangements stored in the profile, and use of the vehicle can be restricted to predefined rules, based on the profile. Accordingly, the profile database 160 can include both profiles of the user, such as user settings, as well as profile restrictions that may be set by the car sharing service.

[00118] Figure 9A shows one example process for utilizing user profile settings from a registered user and utilizing settings of a shared vehicle network, in accordance with one embodiment of the present invention. In this illustration, operation 300 receives the user profile settings from a registered user of a shared vehicle network. The registered users profile can be obtained from a cloud services profile, such as the profile used for a number of vehicles which may be in or outside of the shared vehicle network.

~~**[0024]** Figure 4 illustrates a detailed diagram of a vehicle having a main battery that is replaceable or rechargeable, and interfaced with an auxiliary battery carrier, in accordance with one embodiment of the present invention.~~

~~**[0025]** Figure 5 illustrates another detailed diagram of a main battery of the vehicle, partitioned into a plurality of segments, in accordance with one embodiment of the present invention.~~

~~**[0026]** Figure 6 illustrates a main battery of a vehicle capable of being interfaced with an auxiliary battery carrier that can receive volt bars, and can be interfaced to a power source, in accordance with one embodiment of the present invention.~~

~~**[0027]** Figure 7 illustrates an embodiment where the main battery is interfaced with the auxiliary battery carrier, and a CPU controls the flow of charge between the two,~~

~~depending on their level of charge, in accordance with one embodiment of the present invention.~~

~~**[0028]** Figure 8 illustrates another embodiment where the main battery of the vehicle is being directly charged, and the auxiliary battery is charged once the CPU detects that the main battery has been fully charged, in accordance with one embodiment of the present invention.~~

~~**[0029]** Figure 9 illustrates an embodiment where the auxiliary battery is triggered to start being accessed by the main battery once the main battery reaches a particular depletion level~~**[00119]** In another embodiment, the profile may be the profile set by the shared vehicle network, based on the service contract entered by the user. In operation 302, vehicle IDs for each vehicle assigned to a shared vehicle network are received by cloud services 120. Cloud services 120 will therefore maintain a user database 160 with a plurality of user profiles.

[00120] Cloud services can also maintain a vehicle inventory database 310 for the shared vehicle network. Servers 350, which operate cloud services 120, and therefore managing access da1abase 160 and 310, as well as provide logic for providing access to vehicles, unlocking vehicles, and transfening user profiles to specific vehicles. In operation 360, the servers 350 may receive a request to locate a vehicle on a map from a computing device. The request may be provided with reference to the user's current location, using GPS or the like. The request is then processed by servers 350, and servers 350 communicate the forward a list of available vehicles proximate to the user or for the users identified area inoperation 362. In operation 364, a selection request is

received from the user for a specific vehicle and a reservation is made for the use of the vehicle for a set period of time.

[00121] In operation 366, a command is sent to the vehicle the signal alert when the user is detected to approach the vehicle within a particular distance, notifying the user that the vehicle is the vehicle that the user reserved. This provides for a method of allowing the user to easily identify the vehicle that the user reserved. For example, if the user is instructed to go to a specific parking lot to identify the vehicle that was reserved, the user would have a difficult time identifying which vehicle it is that the user reserved. However, by allowing cloud services to signal to the vehicle to sound the alam1, turn on a light, beep, for make any other identifying gesture, the user caneasily identify the vehicle in the parking lot.

[00122] In operation 368, a user inte1face is provided to the user's mobile device that will provide a notification to the user indicating that the person/user has arrived at the vehicle. In operation 370, the users profile is transferred to the vehicle. The transfer of the profile will allow the settings of the user to automatically be set in the vehicle. The settings can include, for example, temperatm-e, radio settings, seat settings, meter settings, air settings, etc.

[00123] In operation 372, the settings that are made by the user when in the vehicle or adjustment settings can be sent back to the user profile. Thus, when the user offering the vehicle and making changes to his or her profile, those changes can also be communicated back to the profile database in cloud services 120. This provides for a continuous feedback loop over time, to allow the users profile settings to be managed and maintained current to the users best liked preferences. The operation then proceeds to B in Figure 9B.

[00124] In operation 374, it is detected that the user has completed use of the vehicle upon some user entry at a computing device. The computing device may be computing device of the vehicle, or a mobile device. The entry can be, for example, the user logging out of the vehicle indicating that the user has terminated use of the vehicle. At logout, the vehicle's original profile settings will then be returned, and the users custom profile settings will be terminated.

[00125] In operation 378, a report sent back to the server regarding the use of the vehicle and the charges to the users account for the use. In one embodiment, the use reporting can occur continuously while the user is driving vehicle. In operation 380, the drivers session log can be saved user profile, keeping a history of the user's travels. In operation 382, survey data can be requested of the user regarding the vehicle use. Because the user was utilizing a shared vehicle, feedback from the user can be helpful to potential future users that may want to rent or utilize vehicles from the same company.

[00126] The user may be provided with options to publish likes and dislikes or commentary to a social network 390. Ratings can also be transferred to rating companies, such as those that allow internet users to view user comments, reviews, complaints, etc. The social network 390 can allow the data to beopen data 394, or data that is shared with friends 392. In operation 384, problems with shared vehicle can be reported to the vehicle network to allow repairs before making the vehicle available for reuse. Cloud services for the shared vehicle network can then be updated in cloud services 120. For example, if the vehicle has been identified as having some mechanical malfunction, the cloud services can update that vehicle as being out of service, so that discovery of that vehicle does not cause users to access that specific vehicle that may be out of commission.

[00127] Figure 10 illustrates a user (Bob) entering the vehicle, such as a shared vehicle 200, in accordance with one embodiment of the present invention. In this example, the user has been identified by the vehicle, such as using a camera 402. The camera 402 may use face detection 406 to automatically identify the user, and set the users preferences and settings for the vehicle automatically. In some embodiments, this allows verification that the user driving the vehicle 200, from theshared network, is the driver that unlocked the vehicle from a remote location (such as a mobile device). In this example, the vehicle 200 may also include a plurality of cameras. such as cameras 404, 408, 410, 412, 402, etc. Any one of these cameras can be accessed from a remote location, if the user's profile provides access, or the privacy setting allows such access.

[00128] These cameras can be used to detect and monitor the exterior portions of the vehicle as the vehicle drives around, as well as interior portions of the vehicle. These cameras can be used by the vehicle sharing company to monitor the status of the vehicle, and the location where the vehicle is parked. In one embodiment, the user who has rented the vehicle can set a privacy setting to disable certain cameras. In one embodiment, a speaker 420 can be activated to allow the vehicle to speak and communicate with the user. Vehicle electronics and logic 400 can be in communication with cloud services 120.

[00129] Cloud services 120 can also be in communication with user profiles 160. In one embodiment, the user profiles 160 can also include specific profiles for registered users. In one embodiment, the registered users can include a family of users. A specific family can have a number of drivers or users that have been registered with a service. For example, the database can include users ABC123xi (such code is only an example, and any form of ID/code can be used), and the users can include a particular family or group of people. The group of people can also be a group associate with a company, a

sharing service, a group established for a particular event, or other types of groupings. TI1e vehicles can therefore be monitored for use by the specific users in a particular family or group. In one embodiment, the particular family and groups can be associate with their own profile history settings, which include data from their previous uses.

[00130] **In** one embodiment, figure 10 illustrates a process utilize to communicate between vehicles, users, and cloud services. In operation 450, a vehicle with communications is provided with cloud services. The cloud services will be in account, software, or inte1face that allows communication with cloud services 120. In operation 452, the user in the vehicle may be detected, and the face of the driver or other biometric data can be used to identify the specific user sitting in the car. The detection of the user can, in one embodin1ent be enabled or restricted based on privacy settings desired by the user.

[00131] In operation 454, the user may be identified and the users profile can be automatically ret1ieved from cloud services and the user profile 160. The preferences settings for the user can be identified from the database in operation 456, and the settings can be applied in operation 458. The settings can be applied to the vehicle for the identified user. When the user terminates use of the vehicle, the settings can't be deactivated, or return to a neutral setting.

[00132] Figure 11 illustrates an example of particular types of settings that can be set, or recorded, or accessed, in accordance one embodin1ent of the present invention. In one example, cameras 480 can be provided as options for access by the user. The cameras can be accessed to view historical uses by the user, or can be access to view current and live video of the vehicle. For example, if the user has rented a vehicle for a period of time, and parked it in a specific location, the user can monitor the vehicle from a remote device connected to the Internet.

[00133] Record settings 482 can also be set by the user, the vehicle provider, or cloud services. A plurality ofrecording options and access can be set or adjusted by the user from a remote location. Remote access 484 also provides the user with options to control specific features of the vehicle. The control the vehicle can be set for a period of time when the users profile is associated with the vehicle.

[00134] In a car sharing environment, the remote access of the vehicle can be enabled during the period of time when the user is assigned or the users account is assigned to that vehicle. In examples where the user owns the vehicle or is more tightly connected to the vehicle, the remote access can be provided by entering axis control information, credentials, passwords, usemames, and biometric data or combinations of one or more.

[00135] In still other embodiments, user interfaces are provided to provision customized data regarding available charge station locations. In one embodiment, users having other devices, such as smartphones or portable electronics can obtain data, which can be shared with other user interfaces. The sharing can be by way of a sync operation, that can be automatic when the user enters the vehicle or on demand by the user. In other embodin1ents, the application or program rnnning on the user portable electronic device can continue to execute the processing, while allowing the display of the vehicle to show all activity on the display. For example, if the vehicle electronics are not capable for processing an application or access a cloud service, the portable device can act as the agent for the vehicle electronics. In one embodiment, the display and I/O of the EV simply acts as a passive interface, while the processing or accessing to cloud processing is done by the user's portable electronics (e.g., smartphone or the like).

[00136] In some embodiments, the user's portable device is already programmed with access codes, passwords, etc., so the user may wish to use the portable electronics

instead of having to program the vehicle. This is important when users share a vehicle. If users share a vehicle, one user may have the electronics programmed to their likes or dislikes. By allowing programming, data settings, etc., to be shared or synced (e.g., temporarily or not), users can more easily share vehicles, while keeping the settings that the user is used to having.

[00137] In still another embodiment, allowing the user's smart phone or portable electronics to sync with an EV, users of rental cars can more easily step into cars with pre-programmed settings. Thus, users that temporarily use vehicles need not won-y about programming the car's settings upon entering the car, but simply sync with the vehicle to allow the vehicle to iun display, IO and services based on the custom settings of the user's portable device.

[00138] This processing that allows users to sync a vehicle with a user's custom settings stored in the user's po1table device can also have application to car sharing environments. In big cities, companies allow users to locate vehicles in a proximity to their current location, and simply enter the vehicle using their membership code. In addition to providing users with access to the vehicle, the user/driver's settings can be synced to the vehicle. This can include settings of the seats, the mirrors, the temperature, the radio stations, and the Internet apps to display on the car's display, etc. Custom information, such as prior uses of the car, cost for driving, etc., can be displayed on the car's display, via the sync data from the user's portable device. The sync data can be obtained at any time, such as by using the user's portable Internet link, etc.

[00139] In one embodiment, a user's EV or non-EV vehicle can be in communication with cloud services, and the cloud services can be interfaced with data from various entities that pmvide power for the grid, provide charging units (CUs), provide discounts to charge at patticular CUs, geo location services, mapping services,

live traffic data, etc. Toe user of the EV can communicate with the vehicles electronics via a display unit and its associated electronics, can provide input via touch or voice, can request data regarding routs to local charge stations, cost estimates at the various charge locations, how crowded the charge stations are at the various locations, etc.

[00140] The cloud se1vices 120 are also accessible via a computer that has access to the Internet, a smart device (e.g., smart phone, tablet, etc.), etc. Thus, data can be acquired from various sources and data can be consumed by various sources. The data that is acquired, shared or accessed can be launched on the user's device and then transferred to share in real-ti.me with the display and/or electronics of the vehicle. Thus, a unified access display can be customized to the user, regardless of the vehicle that the user chooses todrive. This is in contrast to current models that customize settings for one vehicle owner or owners.

[00141] In one embodiment, the user's settings are seamlessly transferred to the vehicle the user chooses to drive. This is especially useful for cases where a user drives many cars, but wishes to keep his settings constant. Settings can include cloud services, or local settings such as seat positions for the size of the user, mirror positions, radio stations, weather stations, history of routs taken, favorite locations to visit, etc. The application that allows syncing of a user's settings on a portable device to the vehicle electronics is especially useful for car sharing applications, which is common in large cities and may expand in the future. As car sharing increases, it is most useful to allow a user to save his/her settings in their mobile device, instead of relying on the fixed settings of the vehicle. In another embodiment, it is also possible for a user to type in their universal login code (e.g., user name/ password) into the car display, and all of the user's settings are transfe1Ted to the vehicle whiJe the user is driving the EV. Once the user stops using the EV, the car can go back to the normal mode for another user to

login. The data regarding the user's settings would, in this embodiment, be saved in the cloud.

[00142] In one embodiment, user interfaces of a mobile device can share data with the vehicle's display and native apps. App unification allows EV system to display APPS on the user's smartphone device in an opt-in PAIR mode. In one embodiment, this allows one person to enter another's EV, share apps on the EV display while in the EV, and when the person leaves the EV, the Apps de-pair. This auto-sync facilitates sharing of data and also allows users to unify their settings across any number of vehicles the user may drive.

[00143] In one embodiment, the synchronization will enable users to universally transfer settings from portable devices to electronics of a vehicle. In some embodiments, the vehicle that the user wishes to drive is not his vehicle. For instance, the vehicle may be a friend's vehicle, a rented vehicle or a shared vehicle. If the user has programmed settings in bis or her device, the settings that are useful for the vehicle will be transferred to the vehicle. Settings can include travel speed restrictions, car seat settings, minor settings, remote access to home controls (e.g., lighting, garage doors, etc.), radio settings, sateilite radio settings, internet settings, etc. In some cases, only some settings are directly transferrable. In other embodiments, a database can be accessed to find a translation metric. The translation metric can include mapping tables that allow for settings to be transferred between functions of one vehicle to other vehicles. In one embodiment, vehicle makers can upload their translation metric for each model and the mapping tables can be used to provide the sync operation.

[00144] Figure 12 describes a system in which a user interacts with a model view controller software environment 1800 useful for processing APPS using APis 130 on vehicles with vehicle operating systems 129 capable of processing computer code. The

APPS can execute profile retrieval, updates, and sync operations. The model view controller paradigm 1800 shows basic interaction, control, processing, and updating of data useful for manipulating and viewing resulting actions by ta vehicle mnning an APP in such a system. Such a system useful for running APPS on vehicle operating systems will accept inputs by a user 121, cloud services 120 via data streams, vehicle systems feedback and data streams 1812 used by a controller 1804 that may constantly poll electrical, capacitive and physical sensors, and input streams to detect if interactions 1808 such as network passive updates, network active updates, user touch, user speech, user input, user selection among others has been triggered.

[00145] Each input 1804 will then trigger manipulation of the system's model 1802 portion of the APP software paradigm thus invoking stored routines within APPS 104 which then in tum interact with the vehicle's API system 130 built upon the vehicle's operating system 129. Depending on the app presented to the user 121, the input may trigger stored routines or functions on APP software or operating system level restricted stored routines or functions.

[00146] After the processing of stored procedure code is manipulated with arguments provided by the controller 1804 inputs, visual and or sensory results are presented to the user in the view 1806 portion of the model view controller paradigm. These sensory outputs, data streams, electrical signals may all be translated as additional options, results, dynamic updating, audio or visual graphical user interface changes 1810 on any of the user's connected display devices. The user will notice these results visually or audibly but may also feel or detect changes in the vehicle's mechanical systems. Updates from the model 1802 may also be used to toggle vehicle settings 1814 which in tum may invoke changes in the vehicle's physical, mechanical and electrical systems 128.

[00147] Finally, the system controller 1804 may receive additional updates from the vehicle systems affected or additional user 121, cloud services 120, vehicle systems feedback inputs 1812 to re-engage the user in a cyclical fashion. If no inputs are sensed, the system's controller will continue to poll its electrical and data I/O systems for input on a continuous basis.

[00148] The model view controller paradigm 1800 described is one example of the software input output lifecycle that may be used to invoke, manipulate, process, update portions of computer readable code such as APPS 104 using an inten11ediary API 130 to communicate with the vehicle's operating system 130. However, APPS 104 may be run on physically wired, wirelessly connected or remote devices having processing abilities to translate the computer readable code in APPS into actionable invocations on one or more vehicles in order to facilitate or utilize the vehicle's electrical and mechanical systems in prescribed or customizable fashions.

[00149] Figure 13A describes how vehicle on board computer with input out put system 1900 useful for accepting input, processing input and displaying results in conjunction with stored computer readable programs or functions **in** the forms of APPs 104 may be structured. Although system 1900 describes one way to provide vehicle on board computing power to run APPs 104, the atTangement of the vehicle computer 1906 may be altered or arranged in differing fashions with differing connection routing in order to achieve the same. In this example, vehicle on board computer 1906 may be comptised of components such as the network interface 1910, memory 1912, a central processing unit 1914, an input output buffer useful for streaming data 1916, storage 1908 having the ability to store computer data in long tem1or short ten11 fashion useful for stored computer code procedures in the form of an operating system 129, intermediary stored procedure code in the form of APIs 130, stored subsets of computer code

procedures APPs 104 interacting with API 130 as an intermediary to the operating system 129.

[00150] In this example, the vehicle computer 1906 has the ability to transmit, receive and process infonnation using wired or wireless connections. One such wireless connection is provided by a wireless data sending and receiving antenna 1928 connected to a network inte1face 1910 useful for pairing with and communicating data with portable or stationary wireless devices which may or may not be part of a network 1902. Such wireless devices include but are not limited to wireless displays 210b, portable smart phones 210a, portable computers, 210c and even stationary objects, structures, buildings, toll bridges, other vehicles etc. The vehicle's network interface 1910 through antenna 1928 may also communicate with cloud services 120 to receive instructions from a remote location that invokes stored programs such as APPs 104 on the vehicle's computer.

[00151] The vehicle may also send and receive data wirelessly in order to establish a connection with a peer-to-peer ad-hoc network. Invocations may result in output data streams interpreted by wireless devices 210b, 210a, 210c as well as wired devices such as wired displays 210d or vehicle integrated display devices such as windshield heads up projected display or integrated glass displays 210e. All data streams generated by APPs 104 stored on the vehicle's computer may also be triggered by wired devices such as vehicle sensors 1918, vehicle electrical systems 1920, vehicle electrical systems 1922, engine control systems 1924, vehicle diagnostics systems 1926, user input as well as environmental input.

[00152] A user and or vehicle may find system 1900 useful in one example, where the user drives the vehicle past an electronic toll bridge where a fee is required to pass the toll bridge. The vehicle's computer will communicate wirelessly as it passes the

stationary structure transmitting and receiving information with it as it drives by.'Ihe user's vehicle may have an APP 104 installed on the vehicle computer 1906 that can process the input using the computer's wireless antenna 1928, network interface 1910, input output system, 1916 automatically responding to the toll bridge with payment information. Once the payment is received and processed, the APP 104 receives information from the stationary wireless to11taking device which is then stored either 1oca11y on the vehicle's storage 1908 or remotely using cloud services 120. The results of the transaction are then sent via data stream from the compute code mnning on the APP 104 to a display device(s) where the user can visually confirm that the toll was paid, accepted and show the user's remaining balance all through the GUI displayed for APP 104.

[00153] Figure 13B describes one example of how stored data and function declarations may be compiled to provided intermediary access toa vehicle's computer controlling vehicle systems 1950. Such routines, data and functions may be arranged in such a way that lin1ited access is given to third party code on APPs 104 to manipulate certain unrestricted operating system functions and vehicle systems. Such a method of providing the intermediary allowed stored function set to third party code can be refened to as an API 130.

[00154] In this example of an API 130, computer readable code is ananged in such a fashion that the type of API is described and in this case, an API that allows third party control of the vehicle's HAVC system is declared. A declaration may be useful for reserving the vehicle's computer long tenn and short-term memory in order to rnn stored procedures. The shown declaration 1954 describes an example set of data that may reference memory locations and theiT contents. The contents of these memory location may be modified by stored procedures 1956 or functions.

[00155] This HVAC API 130 has the ability to store data relating to the vehicle's temperature, status, target temperature, split zone temperate, data from electrical and mechanical sensors, calendar dates, enor info1mation among others. Invocable functions 1956 are the methods by which a third patty APP 104 may manipulate data 1954 on board a computer. Free access is not given to the restricted data on a vehicle's computer, thus a structured method or methods are described for user by third party APP developers.

[00156] These functions 1956 that may or may not take arguments in order to execute may include functions in the example HVAC API that update temperatures for both the left and right or given zones of the vehicle, toggle are conditioning, allow visual skins on the APP GUI, manipulate schedules and displays etc. The HVAC API 130 described is one example of how one API can control one vehicle system. There may be variations of the APis for multiple vehicle systems or one superset API that allows access to all of the vehicle's systems through stored procedures or methods.

[00157] Figure 13C describes a set of computer readable and executable code 1970 that can becompiled together by a third pa1ty APP 104 developer in the fom1 of an APP. The APP 104 uses structured programming languages to execute stored functions allowed by the vehicle's system API 130. In this example, the APP is a third party I-IVAC app that allows a GUI to be displayed toa user giving them the option to adjust the temperature on the left or right side of the vehicle up or down. In this case, the APP's GUI has provided a data stream to the APP letting it know that the user has selected to set the temperature on the left side of the vehicle to 80 degrees and the right side of the vehicle to 76 degrees.

[00158] 1ne APP 104 will then use functions available from the vehicle's API 130 to manipulate the data on the vehicle's storage system which in tum will be

electrically polled by sensors, data streams etc. to manipulate the vehicle's electrical and mechanical HYAC systems. The user will notice the result visually by the data provided by the APP to the GUI as well as environmentally as the temperature is changed in the vehicle.

[00159] Figure 14 describes the stepped flow of events 2000 as a user interacts with an APP 104, in this case, an HVAC APP 104. The GUI shown for APP 104 describes the first step 2002 where a user physically interacts with a sensor, screen, voice system etc. polling to see if an input has been received. The user's input in 2002 has been interpreted by the app to raise the temperature on the left hand side of the vehicle to 80 degrees and maintain the temperature on the right hand side of the vehicle at 76 degrees. TI1is input invokes step 2004, which calls a stored function on the APP 104 that is API 130 allowable with arguments. The stored function may invoke other helper or associate functions within the API 130 in step 2006, which all in tern invokes restricted computer readable code at the operating system and or kernel level in step 2008. These invocations wiJI then in turn command mechanical and or electrical systems in step 2005 in order to achieve the :requested response in step 2002.

[00160] The results of the commands on the vehicles systems are based back to the vehicle's operating system or kernel level in step 2012 which then updates data on the API 130 in step 2014 that the APP 104 is polling, such as updating the display to show the resulting temperature in step 2016. The results of a function that is invoked at the API 130 level updating the display produces a data stream translatable and displayable by the vehicle's screen showing the APP 104's GUIin 2018.

[00161] Figure 15 describes further example ways an APP 104 may take, process and produce results 2100. Figure 14 shows a way to interact with an APP 104 locally but a vehicle computer system may relay data, inputs and information to the APP while

connected to a wide area network, local area network, cloud process 120 or private cloud. A remote action to invoke change on an APP 1808 may be initiated via a network and pass to the APP running on the vehicle 160 using the vehicle's antenna 1928 or wired interface. An APP 104 running virtually on a network or cloud services 120 may also take input remotely and process the results accordingly.

[00162] Some of the inputs and results 2102 that an APP can take and produce locally or remotely include but are note limited to the set 2104 that can receive an action, react to an action, control an action, manipulate data models, report changes to a view or GUI, record events or incidents, learn the types of requests being submitted, learn the times ofrequest being submitted over time, learn the days of the year the requests are being submitted over time, generalize and interpret requests, assume user intent in order to automatically invoke changes, automatically and pre-emptively act on behalf of a user, fine tune learned user behavior etc.

[00163] The learned behavior (e.g., learned settings that provide for automatic programming) can be assigned to particular applications, particular sub-features of applications, to particular native system features of the vehicle, or combination of one or more thereof. The learned settings can also be managed via an interface, which shows to the user settings that have been learned and provides the user with options to modify learned settings.

[00164] The modifications of the learned settings can be made via the vehicle display or any other device having access tocloud services. The learned settings can also be communicated to the user via notifications. Such as,*"We noticed you like your truck temperature at 3 pm to be 60 degrees? Please confirm,"* or*"We noticed you like your car temperature at 8 am to be 75 degrees, this will be preset for you automatically,"* or*"We have detected your favorite settings, please login to your account to see settings*

we have programmed for you or make updates," or other similar notifications via the vehicle or to any connected device over the Internet.

[00165] In other cases, notifications may not be sent. In some cases, the settings will just occur automatically. In some examples, notifications can be provided with a link or access to a user interface of an application. Via the application, the user can manage, set, control or view any aspect of the connected vehicle. In some cases, the settings can be manually adjusted by the user way from the auto settings. In such cases, the manual setting can be learned and can be provided more weighting since the user took the time to correct an auto setting. Thus, various levels of weighting or importance can be given to learned settings. In other embodiments, the learned settings can be compared against learned settings of other vehicle owners having access to cloud processing. Using data from these different user profiles, learned settings can be obtained or generated.

[00166] Generation or analysis can be by way of overlap processes, cluster analysis algorithms, Connectivity based clustering, centroid-based clustering, clustering model most closely related to statistics is based on distribution models, cluster validation, density-based clustering, KNN/profiJe similarity, collaborative filtering, content-based filtering, hybrid recommender systems, mobile recommender systems, cross-sectional analysis, similarities in particular data types or settings, concentration in similar settings by particular demographics, and other similarity analysis calculators and aggregators. These settings can then be recommended to the user or can be automatically added to the profile. Recommender systems can the user the analyzed data to generate the custom recommendations for settings to users' profiles.

[00167] Figure 16A describes an ecosystem where an APP 104 in conjunction with a vehicle API 130 may work together to make assumptions, make decisions and

take actions 2200. API and APP code together can be arranged in such a fashion that creates an assumption and reasoning logic module 2216. This Assumption and reasoning logic module can take inputs from various systems and data streams including but not limited to GPS 2206, calendars 2208, traffic conditions 2204, local news 2202, past data of user behavior and interaction 2210, vehicle diagnostics 1926, user preferences 2214, user login profiles 506, environmental interpretations by sensors 2212, marketing deals 2224 among others. These inputs can be local and physical or remote and abstract via a network. The assumption and reasoning logic module 2216 compiles data from these sources to invoke decisions and actions on a decision and action engine 2218.

[00168] This decision and action engine 2218 has the ability to execute on what the assumption and reasoning logic module has determined needs to be done. The decision and action engine has the ability to produce ale1ts, both local, on screen, audibly, visually or remotely on a remote display device 210a-e using a data network. The decision and action engine 2218 also has the ability to change vehicle controls automatically on behalf of a mer without user action based on assumptions made by the assumption and reasoning logic module 2216. Additionally, the decision and action engine has the ability to request a decision from the user preemptively in order to change vehicle controls.

[00169] This may be achieved locally or remotely requiring input from a user to proceed. For instance, the assumption and reasoning logic engine has determined that the user may want to have his or her car automatically started at 7:55 am because the user typically starts the car at 8 am. Starting the car at five minutes early will allow the system to heat the vehicle to the user's typical liking. However, the assumption and reasoning logic may have only reached a level of confidence of 75% where 80% confidence is required to act without user input. Thus, the system, being only 75% sure that the car

should be turned on will automatically send the user an alert requesting a decision on whether or not to turn the vehicle on. Once the user 121 provides an decision remotely on their remote device 210a, the decision engine 2218 updates the assumption module 2216 so that it can augment it's assumptions for an updated level of confidence on the next action trigger. These actions by the user automatically and continually update the assumption and reasoning logic module 2216 in order to fine tune the level of confidence on acting without user input and learn the user's behavior for future decisions.

[00170] Figure 16B describes how one of many types of inputs into an assumption and reasoning logic module 2216 can be compiled over time. Although inputs can come from many sources, this particular example focuses on input into the assumption and reasoning logic module 2216 from past data originating and triggered by user behavior in order for module 2216 to learn. Past actions 2210 are logged intoa database either locally on the vehicle computer or remotely which are fed into to module 2216. In this example, data about when the user's actions are stored, along with unique identifiers that will allow assumptions to be made in the future.

[00171] These identifiers include times, dates, rates, capacities, temperatures, frequency, degrees, distance, etc. In this example, the system has been keeping track of when the user has been starting his or her engine in the morning on weekday sand weekends. The system harvests all data points associated with given events. These data points 2210 are purely mined data points and no assumptions or reasoning occurs at this point. This data will be used by the assumption and reasoning *logic* 2216 to detennine future actions.

[00172] Figure 16C describes one example of what an assumption and reasoning logic module 2216 may produce using the data points co11ected on an ongoing basis in Figure 16B. Over time, using inputs that are continually harvested by a user's action,

assumptions are made and refined to aid in making decisions for a user in advance or behalf. Module 2216 has taken the inputs provided by 2210 past data and behavior to determine that before a decision can be made, the user's local or network-stored calendar should be polled to determine how the user's schedule might impact the system's pending actions. For instance, if the system had detennined that the user typically starts his vehicle at 8am but the user's calendar shows a meeting at 730am located at a location that does not match the current location, the vehicle may assume that the car should be started at 725. They system will determine its level of confidence of the decision and may poll the user for a decision.

[00173] The system, by using prior data points has stored assumptions based on conditions, the day it is, the temperature of the environment and historical events, that the user will most likely sta1t the vehicle's engine between 803am and 805am, and if the temperature is in the 30s inside the vehicle, the user will most likely set the interior temperature to between 70 and 80 degrees, it is not likely that the user will use the are conditioning unit, if there is ice on the windshield, the user wi_ll most likely defrost the windshield for 7 minutes before departure, the user usually drives between 15 and 18 miles at this tin1e of day, the user typically starts the vehicle again in the afternoon between 505pm and 510pm, if the temperature is in the mid 70s, the user usually activates the AC and sets the temperature to 65 degrees, typical weekend behavior, the user typically makes frequents stops, does not have a set time the vehicle is statted, uses certain APPs at certain times and has a history of certain destinations as recorded by GPS.

[00174] Figure 16D describes an example list of decision the decision and action engine 2218 may take based on information provided by the assumption and reasoning logic module 2216 and sets of assumptions created. The decision and action engine 2218

will attempt, using a degree of confidence to anticipate what the user will want todo in tern1s of engine sta1t and stop, location destinations, preferences of temperature, driving habits and poll vehicle capacities to ensure the intended path the user usually takes is attainable. For example, the user usually drives a distance **in** the morning at a certain time, however, the vehicle's fuel supply will not allow for that distance to be traveled. Thus, the decision and action engine polls the user as a reminder that the user should begin their intended travel sooner than usual to allow for refueling time.

[00175] In one embodiment, at a remote location, a user is able to access a user interface for an application, which provides users access to user accounts. A user account can be for a user and the user can add one or more vehicles, objects, data or appliances for remote reporting, viewing and control. In one embodin1ent, a user is an owner or user of a vehicle. The user can register the vehicle with a remote service.

[00176] The remote service can be accessed over the Internet, such as via a website or application of a portable device. The remote service can provide a multitude of cloud services for the user, such as remote control features, remote viewing services, remote alarm controls, remote camera activation, remote audio/video recording of the vehicle (i.e., areas around the vehicle and inside the vehicle). In one embodin1ent, the vehicle is able to connect to the Internet (e.g., when the vehicle engine is off, on, and/or is occupied or un-occupied) to allow a user, via a remote cloud service, to access features of the vehicle. The vehicle can be accessed when running, when parked, when stopped, when moving, etc. The vehicle and its audio recording devices and video cameras can be accessed from remote locations, to allow users to remotely communicate with the vehicle or with people riding or residing inside the vehicle.

[00177] The remote communication can also allow a person to communicate remotely with people standing outside (or inside) of a vehicle. For instance, if a user is

accessing his or her vehicle from a remote location, cameras installed in and/or on the vehicle allow the remote user to see a person standing proximate to the vehicle. The remote user can then communicate with a person standing proximate to the vehicle using microphones and speakers of the vehicle.

[00178] In some embodiments described herein, vehicles, structures and objects may include circuitry and communication logic to enable communication with a cloud processing system over the Internet.

[00179] In one embodiment, the services provided by the electronic systems of a vehicle can include services that access the various components or subsystems of a vehicle, such as door locks, service histories, user profiles, audio settings, entertainment settings, mapping functions, communications systems, telecommunication synchronization systems, speakers, heating and cooling functions, auto-engine start/shut-off remotely via smart devices, remote heating/cooling initiation, remote face-to-face conferencing, etc. The electronic systems within a vehicle can also provide a user interface, such as a graphical user interface. The graphical user inte1face can include a plurality of buttons, controls and transceivers to receive input from a user.

[00180] The input from a user can also be provided by voice input, facial recognition, eye-retina scans, fingerprint scans, a combination of biometrics, or via a capacitive or regular touchscreen contained or displayed within the vehicle, the vehicle's glass, doors, dashboard, etc.

[00181] In one embodiment, vehicles can maintain infonnation regarding where they are, where they are heading and their destination maintained which is maintained by OPS and navigation systems on board. The information collected and maintained by every vehicle may be mutually exclusive, meaning that *only* each individual vehicle is

aware of its own heading, rate of speed and cunent location. This information, in one embodiment is crowd sourced and/or crowd shared/consumed for use in for accident avoidance or other communication. By networking vehicles within a certain radius together, all individually location-aware vehicles become aware of all other vehicles in their sphere of influence. Vehicles may network with vehicles in their range using wireless communication systems such as but not limited to Wi-Fi, Wi-Gig LTE, cellular, radio, near field communication or other methods.

[00182] In one embodiment, the communications of the vehicle and electronics of the vehicle will enable direct communication with a user of the vehicle. The user of the vehicle can include, for instance, the owner of the vehicle, a driver of the vehicle, or any third party having access to the vehicle (either to drive the vehicle, to monitor the vehicle remotely, etc.)

[00183] The access to the data can also be encrypted to prevent unauthorized access to the data. GPS and mapping services can also be in communication with the cloud processing 120 provide data concerning the locations of the vehicles and activities that occurred to the vehicles when at particular locations. The cloud processing 120 can be access by the vehicles themselves using their electronics and communications, via mobile devices, from home, from work, etc.

[00184] In some embodiments, the vehicles may establish peer-to-peer links to facilitate fast transfer of data. In other embodiments, vehicles may link toeach other using pairing algorithms that allow the vehicles to exchange data using WiFi, Bluetooth, near field communication (NFC), or some other short range communication protocol.

[00185] A user's APP homepage may also include dynamically updating sections in which the most important infonnation at a given time may be displayed or surfaced to

a user. If a user has parked in a certain parking area, he or she may want to monitor metrics related to incidents that may have occu1Ted to his or her vehicle, vehicles around his or her vehicle, any dynamically received alerts, as well as precaution levels. Additionally, a user may choose to configure his or her **APP** homepage to display the most pertinent audio and video feeds to their needs.

[00186] In one embodiment, the vehicles can communicate directly with each other via a temporary pairing process. The temporary pairing process can be automatically enabled when vehicles become too close to each other, for example. When this happens, local communication between the vehicles, such as a peer-to-peer connection, Wi-Fi connection, NFC connection, or Bluetooth connection can be established to enable the vehicles to share information concerning their proximity to one another.

[00187] This local communication will enable one or both vehicles to take con-ection actions or alert a driver to change course or tTigger automatic collision prevention measures (e.g., more aggressive notifications to one or both operators, slow the speed of one or more vehicles, change the driving direction of one or more vehicles, etc.). Once the close proximity communication occurs and some corrective action is made, the data regarding the occurrence and the actions taken can be communicated to the cloud system for storage. The information can then be viewed by a registered user having access to an account for the vehicle(s).

[00188] Figures 17-30B define methods and systems for assigning advisor accounts for accessing data regarding the vehicle, and also describe the use of electronic keys (e-keys), in accordance with several embodiments.

[00189] In one embodiment, users of vehicles may wish to provide advisors with access to select data associated with a vehicle. For example, a vehicle owner may decide

to make a user account for an advisor. The advisor, in one embodiment, can be any person or entity. The advisor, in one embodiment, may be a service person, a dealership service department, a mechanic, an auto shop, a consultant that provides auto advice, or a fiend of the vehicle owner. In one embodiment, an owner of a vehicle can define particular aspects of the vehicle data, as being available for providing or sharing with an advisor. The aspects can include, for example, maintenance type information or vehicle status.

[00190] Other aspects can include, without limitation, engine indicator data, tire status, tire air pressure, oil level, transmission fluid level, oil grade level, electric vehicle battery status, battery charge level, battery faults, temperature over heating data, service date expiration, mileage data, next service time, coolant level or status, transmission faults, air filter state, wiper change/status, brake pads, brake fluid, tire rotation, remote diagnostics rnquests, history data, etc. In one embodiment, a user of a vehicle can define or establish an advisory account, which will be provided with limited or select access to specific vehicle data, so that the advisor can process the data and provide recommendations to the user.

[00191] For instance, certain vehicle data can include data that is not personal or sensitive. The vehicle data can then be used by the advisor to process the data, examine the data, and based on some expertise or knowledge, the advisor can provide some recommendation to the user. The recommendation can include, for example, notifying the user that the vehicle needs some service or action. The recommendationcan include, for example, sending the user information regarding the recommendation and suggesting available times, dates, etc., to allow scheduling of an appointment.

[00192] In one embodiment, the communication from the advisor can be in the form of an email, a notification, a phone ca11, a text message, or combinations thereof.

TI1e communications can include, for example, icons, links or graphics to allow the user to accept a schedule time for brining in the vehicle for service. In one embodiment, when the engine light comes on, the advisor is notified, and the advisor can contact the user to tell the user that the engine light is critical or not, and the advisor can be allowed to do remote diagnostics to better define the significance of the engine light warning. The advisor can then provide more infonned advice to the user. In one embodiment, the advisor account is lin1ited to the predefined data that the user wishes to provide access to.

[00193] In one embodiment, when the advisor is given an advisor account by a user, the advisor may be provided with an email, link, phone number, text, message, etc., which will allow the advisor to login to an advisor portal of cloud processing. The advisor portal will provide the user with a website that shows the cunent vehicle status for each of the vehicles that the advisor is monitoring or for which the advisor was provided an advisor account.

[00194] The advisor portal will allow the advisor to set logic or rules to be ale1ted when ce1tain types of important data is received for particular vehicles. For instance, if the advisor is monitoring a plurality of vehicles, the advisor may wish to know when particular vehicles see a particular type of fault or error, which may be important enough for the advisor to handle immediately. The advisor may see that a certain user's car is running too hot, the advisor may be notified or alerted so that the advisor can contact the user of the monitored vehicle. The advisor can execute or cause to execute remote monitoring procedures to query the vehicle to see what other condition are, so that a proper recommendation can be provided.

[00195] In one embodiment, the user can add a mechanic or auto repair shop and assign them an adviser account. The adviser account would get access to specific vehicles (that pre-allow access), and the user can define specific vehicle data for which

access or privileges are provided. For instance, as a user drives around, the car may detect a fault, and the adviser may get a message or notification regarding the fault. 11le adviser can then communicate with the user to provide his/her technical advice, reco11m1end actions to take, recommend to come in for service, or the advisor can pre-order a part needed for the service, or notify the user that a part of the vehicle is defective or is on recall.

[00196] The adviser account can be defined for auto dealers, mechanics, service stations, persons having vehicle knowledge or expertise, etc. Dealers that provide service (e.g., service departments) can receive selected notifications regarding the vehicle health, and based on the degree of se1iousness, the dealer/service center can ask you to bring the car in. Currently, dealers rely on users to notify them when warning lights go off. If the problem is serious, and the driver ignores the warning lights the car can get damaged. In one embodiment, these methods/systems provide ways to share specific vehicle maintenance data with select entities. The reporting by the car can be saved to a log/database of events that are repo1ted, and the adviser/dealer can reply to the notices to communicate instmctions or recommendations.

[00197] Figure 17 illustrates a block diagram of a process where a vehicle (CAR-A) is associated with vehicle data, settings and control 500, and the vehicle is connected or connectable with the Internet and cloud services 120. In one embodiment, the vehicle can produce a plurality of types of data, such as vehicle status, vehicle service, vehicle location, vehicle users, and vehicle control, etc. The type of data that a vehicle produces can essentially be lin1itless, and will depend on the type of vehicle, activity of vehicle, the types of users, the location of the vehicle, features the vehicle, use of the vehicle, etc. Additionally, various aspects of the vehicle can be controlled remotely via the Internet,

and through cloud services 120 in response to control systems, algorithms, methods, circuits, and the like.

[00198] In one embodiment, cloud services 120 can include a customer account database that includes a plurality of customers. Customers may be customers that have registered with a service that manages or provide access to features of a vehicle. The service may be a separate company from a dealer, or it may be a dealership, it may be a car service center, a private service, a friend, or an Internet service, etc. In one example, the customer database has is a plurality of customers that have registered with the service to enable issuance and management of user accounts for their vehicles that have been registered with the service(s).

[00199] In this example, the customers include customer A, customer B, customer C ... customer N. In one embodiment, each customer may register one or more vehicles for the service. For example, customer A is shown to have two vehicles 502 (CAR-A and CAR-B). For CAR-A, the customer may have user accounts 504. The user accounts 504 can include different types of accounts. One such account can be those associated with drivers that may be driving the vehicle. The drivers will each have different roles, that defined the type of user and associated privileges. For example, one user may be administrator (admin), wherein administrators are usually the owners, the person that leased the vehicle, or a person that has some control over the vehicle. In other embodiments, the administrator may be the dealership for the service provider.

[00200] Other users can be assigned as drivers, such as teenagers of the family, valet drivers, guest drivers, etc. Each of these drivers can be associated with their own user account, which provides specific privileges (use capabilities, restrictions, limits, parameters, etc.). In another embodiment, user accounts viewed as advisors 506 can also be created. As noted above, advisor accounts are those that provide third parties with

access to the vehicle or access to data about the vehicle. Such parties can include dealerships, mechanics, service people, personal advisors, friends, etc. Each advisor account can be assigned a different role, which is linked to a level of privilege. TI1e more privileges that are provided to an advisor account, the more data that the advisor can receive, access, or control.

[00201] In one embodiment, if the dealer is an advisor having an advisor accounts, the owner the vehicle can define the level of privileges provided to the dealership. The level of privileges can identify what aspects of the car the user wishes to allow the dealership to know or be made aware of. For instance, the advisor account can set that the vehicle will automatically provide certain data to the dealership. Such data can include the status of the vehicle, engine light data, health information about the vehicle, malfunctions of the vehicle, service information of the vehicle, etc. However, because the advisor account can be specifically tailored to only provide certain information and privileges to the dealer, the owner or admin of the vehicle can define the specific advisor accounts to share only certain sub-sets of information.

[00202] For example, certain infom1ation that would likely not be shared can include, location of the vehicle, history of routs of the vehicle, radio station data, Internet communications, camera data, voice data, or other information that may be private or sensitive to the user. Of course, this information can be shared if desired. In essence, the advisor account can be defined to provide only the information that the user wishes to share with that specific advisor. This allows for information sharing about the vehicle to be spliced down to the specific featm-e and data and the specific recipient of the data via the advisor account.

[00203] Thus, the information can be parsed to various advisors, by defining multiple advisor accounts. For instance, the user can define an advisor account for a tire

dealership and a separate advisor account for an oil changing service station (e.g., for the same vehicle). The vehicle can then automatically transmit data to the service provider, or cloud services, which can then allow the entities associated with the advisor counts to see the data coming from the vehicle or posted by the vehicle to a website. The operators of the services for which the advisor accounts were assigned can then communicate with the user and provide advice regarding the operation of the vehicle, infom1ation about updates, warnings, service scheduling, or provide for remote access to the vehicle diagnostics and make changes when necessary.

[00204] Therefore, by providing this level of detail to specific advisor accounts, the user can predefine what type of data will be shared with the advisor accounts while not sharing data that is sensitive to the user, administrator, owner, or proprietor of the vehicle.

[00205] In one embodiment, cloud services 120 wi11 be defined by a plurality of servers, storage, dash-board data websites, graphical user inte1face APis, processors, user interfaces, and the like. The configuration of services offered via cloud services 120 can depend on the service provider. As noted above, the service providers can include any number of entities. Entities can include car dealerships, service providers, mechanics, private entities, individuals, etc.

[00206] In one embodiment, the service provider operating a cloud service 120 can include a vehicle interface 508. Vehicle interface 508 is logic that will enable cloud services 120 to communicate with the electronics and software with specific vehicles. Different vehicles have different APis, systems, software, firmware, etc., and the vehicle interface 508 can facilitate the handshake between cloud services 120 and a specific vehicles. Vehicle interface 508 can include database 512 for vehicle data. Additionally, the vehicle intetface file a can include or have contact with vehicle control logic 510,

which manages the inte1facing with the specific vehicles. For example, if one vehicle type requires a specific algorithm, packet structure, API, etc., the vehicle interface 508 will utilize that communication protocol.

[00207] Vehicle control logic 510 can further provide the APis and commands that are necessary to provide or obtain infonnation associated with the vehicle. The information can requests for data from the vehicle, and can include instructions to the vehicle to perform certain executable tasks. Executable tasks can include, for example, running diagnostics, testing component parts or functions, communicating with occupants of the vehicle, etc. Cloud services 120 can also include logic for managing privileges 514, which can interface with user account settings 516 and can also manage the access and notification requirements or privileges 518.

[00208] Accordingly, each of the customer accounts can include a plurality user accounts, and each of the user accounts can be associated with specific user account settings that define the privileges for that account, whether it be a driver account or an advisor account.

[00209] Figure 18 illustrates an example a vehicle being associated with advisor accounts 506 and driver accounts 520. Advisor accounts 506 can include, for example a dealership, a mechanic, and other entities that will have restricted access to data of the vehicle or specific suites of infonnation regarding the vehicle and/or access to communicate or control features functions or pa1ts of the vehicle from a remote location.

[00210] The drivers 520 can also include a plurality of drivers, which may have predefined access to the vehicle. Some accounts can also be associated with temporary drivers, such as valets, mechanics, service people, friends, etc. In one embodiment, the driver can place the car in the valet account mode when the vehicle is provided to a valet for parking. In the valet mode, the vehicle will have restricted use parameters, and will

also provide for reporting back to the user in case violations occur in accordance with the predefined privileges assigned to a valet. Examples of violation can include, driving too fast, driving out of an area, accelerating too fast, stopping too fast, parking too close to a strncture or other vehicle, coming in contact with a structure or another vehicle, slamming the door, turning on the radio, changing personal user settings such as seats and mirrors, etc.

[00211] Cloud services 120 can therefore assign the advisor accounts and the driver accounts accordingly and manage the privileges associated with those accounts. TI1e cloud services will also enable efficient communication with the vehicle to provide and place/set the various accounts at different times.

[00212] Figure 19 illustrates an example of a computing device, which may have a plurality of user interface icons for assigning new driver accounts 532, or advisor accounts 538, in accordance with one embodiment of the present invention. Using Add driver account 532, the user can defined the roles of the driver 534. The roles of the driver can also include a set of privileges 536. For example, the driver account can be for a teenager and the role can be set to limit the speed, or provide notifications when the teenager has driven the car beyond a particular area or geographic location.

[00213] The privileges can also moderate access to the speed of the vehicle, and used during specific periods of time. For setting an advisor account, the user can set advisor account and defined the roles 540, and set the privileges 542. The diagrams on device 530, maybe part of a user interface that includes icons and buttons that allow the user to select, edit and add accounts, or management of the accounts that the previously set.

[00214] Accessing the accounts that have been previously set can also allow access to the history database. The history database can include infonnation regarding

the use of the vehicle when the vehicle was controlled under a specific user account, or the types of actions taken by an advisor via an advisor account. Access to these user interfaces can also be through a website provided by the service provider. The website can provide access to the user by user name and password, or other credentials. This access will therefore be tied to a user account. The user account can include identifying information of the user, the vehicle, privileges, encryption keys, etc. The user, upon access, can view the historical use of the vehicle, assign new accounts, revoke accounts, remove accounts, store historical info1mation, and communicate with holders of the accounts.

[00215] For instance, the user can log in to website and communicate with their advisors if advisers had left a message for the user/owner of the vehicle. In one case, the advisor account of a dealership may have left a message for the owner indicating that the engine light is on and the vehicle must not be driven due to a recall. Via the website, the dealership may propose certain dates for the service or an appointment to have the vehicle picked up or serviced. These messages may also be transfened to the users mobile device, and urgent communicationscan be sent by e-mail, text, notification, phone calls, voice messages, or any combination thereof.

[00216] Figure 20 illustrates an example of an advisor account 550, where the user has selected the type of user for that advisor account 552, in accordance with one embodiment of the present invention. In this example, the user may select the type of advisor account to be for a mechanic, a dealer, a service station, service center, a dealer in sales, a third party, etc. For this illustration, the advisor accounts 550 is for a mechanic, and the user can defined the role 554 of the advisor account when mechanic. The mechanic may be given access to specific features of the car but not access to other features of the car.111e features can be associate with different levels of privileges, and

the user can use selection buttons, icons, tick boxes, radio buttons, touch screens, keyboards, etc., to select some or all or none of the specific privileges for each of the types of functions or actions or data that may be accessible or usable by the mechanic using advisor account 550.

[00217] For illustration, the roles 554 can define access the various features, for example engine light, oil level or pressure, battery status, electric powertrain, phone lists, temperature, cooling system, charging system, radio settings, entertainment settings, geo-location data, histo1ical data, advisers history, etc. This listing of features or information regarding the vehicle is only exemplary, and should be understood that more features can be accessible depending on the type of vehicle and the type of features provided by the vehicle. Additionally, the advisor account can be associated with specific ones of the features and for each feature that is associated with the advisor account, the levels of privileges can also be defined.

[00218] Figure 21 illustrates an example where a user having an advisor accounts can communicate with an advisor application to receive advisor data regarding the vehicle. The advisor data is data that is provided by the advisors in response to the advisor receiving data from the vehicle. The data from the vehicle, in one embodiment, is automatically sent by the vehicle over the Internet/cloud services 120. As discussed above, the type of data sent tocloud services from the vehicle will depend on the advisor account and the privileges for the specific features and/or control provided to the advisor user. As shown, advisor data 559 is transferred to cloud services 120. Cloud services will receive the advisor data 560, and it will process the advisor data using advisor logic 562.

[00219] In one example, the advisor logic 562 will include programs that will define what will happen to the data that is received. Some of the received data will be

processed to generate recommendations, some data will be processed and added to a log, some data will be send and processed to automatically notify the vehicle owner about a vehicle event. Certain of thedata will produce or require that action items be repo1ted to the advisor. Advisors will receive data 566 from the vehicles that were assigned to the advisors, and in return the advisors can provide feedback to the vehicle owners.

[00220] In some embodiments, an advisor will have advisory accounts from many vehicles (such as a dealership advisor), and the dealership can provide feedback to the different vehicle owners. Advisor responses and advisor feedback is then forwarded to the user in operation 568. This forwarding of the advice can include automatically generated notifications, messages, or custom notifications as feedback based on the advisor data 559 received from the vehicle over time or for one event. The vehicle owner or user will then receive advice 570 from the advisor account reporting back to the user, based on the data provided by the vehicle automatically, based on the advisor accounts.

[00221] Figure 22 illustrates an example of various vehicles in communication with cloud services 120. Cloud services 120 is also in communication with vehicle users 586 and advisors 588. The type of information received from vehicles can include any number of metiics associated with features, functions, pm.ts, operation, etc. For purposes of example only, some system features can include engine oil, tire rotation, tire health, oil filter, battery, brake pads, wipers, coolant, transmission fluid, air filter, remote diagnostics, etc. Cloud services can include a number of operations and systems and programs that operate on the data, notify vehicle owners, receive data from vehicles, hold and exchange data between advisors and vehicle owners, etc. In one example, cloud services can include an operation where a database storage vehicle state data 574 is managed.

[00222] Additional data can include advisors settings and user defined settings 576. Also included are privileged verification modules 578 which assign privileges to the various user accounts and manage enforcement of the privileges defined by the users for each of the various accounts.

[00223] Advisor account logic 580 is also provided, which allows advisors the custom defined what programs, actions, or operation will take place either automatically or require notification to the advisor when vehicle data is received from vehicles placed in their advisor care. The advisor account logic 580 can also provide access to the advisors via website, which aJlows advisors to view, access, communicate, adjust, control, and interface with features that were provided by the user in the privileges for that advisor account.

[00224] The advisors not having access to certain features, as defined by the advisor account will not be allowed access via the website and the advisor account logic 580 will restrict that access. Advisor notification logic 582 is also provided, which provides for communication modules that will interface between the user, the vehicle, and the advisor. The communication modules can also include interfaces for communicating with users via third-pa1ty applications, such as e-mails, notifications, social media, text, web applications, and general messages.

[00225] Advisors module 584 is also provided, which provides for management of the advisor accounts, creation of advisor accounts, management of advisor feedback logic, and historically tracking actions taken or not taken by advisors using the advisor accounts 584 on specific vehicles.

[00226] Figure 23 illustrates an example where a plurality of vehicles 586 exchange advisor account data 590 with cloud services 120. Cloud services 120 will then communicate with the various advisors 588. The advisors and be an auto shop, such

as Roy's Auto, a dealership, a car care service, etc. The various owners of the vehicles can therefore define specific advisor accounts for different types of features, functions, or parts of the vehicle. Data seen from the advisors 588 is therefore provided as advisor feedback to the users 592. The advisor feedback can include recommendations for service, scheduling of appointments, providing advice, providing remote diagnostics, providing messages and notifications to the users that assigned the advisor accounts. The communications, messages, notifications from the advisors will then be sent back to the vehicle users 586.

[00227] Accordingly, data is passively sent from the vehicles to cloud services 120 as the advisor account data 590, and only specific data is sent to the specific advisor accounts. The advisor accounts will receive only that data identified by the privileges set in the advisor accounts assigned to them by the vehicle users. The vehicle users will then receive information back from the advisors, as set by the owners/admins of the vehicles. Some owners/admins may only use one advisor account for a limited feature, such as oil changes, and no more. This is possible as well as the other extreme where many advisor accounts are set up for different parts or same parts of the vehicle.

[00228] Figure 24 illustrates an example of an advisor portal 600. The advisor portal 600 may be a website provided to an advisor that has been provided an advisor account by a vehicle owner Bob 604, which is a customer 602. Bob may have various cars set up with advisor accounts with the same advisor. For the specific cars that Bob has assigned to this advisor, the advisor can view specific information regarding the car and can provide communications back to Bob regarding the car. In this example, the advisor can view current vehicle status 606, vehicle faults 608, warning lights 610, recommended actions 612, and can interface with the information via graphical user interfaces to expose more data if privileges were provided. The advisor can also provide

specific communications to the vehicle owner Bob. A note to Bob 614 can be generated to notify Bob that his car is low on oil and recommends a service. Bob can also be notified that the warning light is on and can provide a recommended/appointment date and time 616. The message can also be sent to Bobregarding his brakes, along with a recommended scheduling time 618.

[00229] Cloud services 120 can then communicate the advisors responses to Bob, and the car can communicate car data back tocloud services 120. In this manner, information that is traditionally only stored in the vehicle and accessible when the vehicle is taken in for service can now be automatically transferred to those advisors that have knowledge about the vehicle and can provide feedback in substantial real-time.

[00230] Figure 25 illustrates an example where Bob utilizes cloud services 120 to assign multiple and different advisor accounts for the same vehicle. In this example, an adviser account has been set up for an oil service station 620. Advisor account bas been set up for a tire shop 622. And advisor account has been set up for a dealer 624. Because advisor accounts can be set up for specific pa1ts or functions of vehicle, is possible to assign specific advisor accounts for specific functions of the vehicle, while excluding other functions. The advisor account for the oil service station will not have access to the tire inforn1ation of the vehicle. In this example, the tire shop will likewise not have access to the oil service infonnation of the vehicle. Cloud services 120 will manage sending only the infonnation that relates to that specific advisor account to their advisor accounts, and in accordance with the privileges. Advisor accounts are assignable 626 to different entities for different categories of vehicle modes, vehicle parts, vehicle conditions, vehicle states, etc.

[00231] Figure 26 illustrates an example where the vehicle owner Bob has assigned advisor account to a valet, in accordance with one embodiment of the present-~~invention.~~

[0030] Figure 10 illustrates another embodiment where the main battery and the auxiliary battery are each capable of providing power to a motor directly, without transferring charge between either of the batteries, in accordance with one embodiment of the present invention.

[0031] Figure 11 illustrates an embodiment of the volt bar (battery) that is dimensionally sized to fit within a slot of the auxiliary battery carrier, in accordance with one embodiment of the present invention.

[0032] Figure 12 illustrates the auxiliary battery carrier with a plurality of slots capable of receiving one or more volt bars that will be charged once placed in one of the slots, in accordance one embodiment of the present invention.

[0033] Figure 13a illustrates a kiosk system that can receive volt bars in a used condition (depleted), can charge depleted volt bars to a suitable charge level, and can dispense fully charged volt bars from the kiosk (referred to herein as a volt box), in accordance with one embodiment of the present invention.

[0034] Figure 13b illustrates a detailed diagram of the face panel of the kiosk system of figure 13a, which represents one example interface of the kiosk, in accordance with one embodiment of the present invention.

[0035] Figure 13c illustrates one example form factor of a battery service module, that can output or receive volt bars in a service station environment (potentially alongside a conventional fossil fuel pump or nearby location), in accordance with one embodiment of the present invention.

[0036] Figure 13d illustrates an example battery service kiosk that can be expandable in a modular form by adding or subtracting kiosk units to satisfy demand at particular locations, in accordance with one embodiment of the present invention.

[0037] Figure 13e illustrates one example logic diagram for processing battery data associated with batteries received at the kiosk, batteries dispensed at the kiosk, and associated payment transactions, in accordance with one embodiment of the present invention.

[0038] Figure 14a illustrates one embodiment of an interface including a plurality of indicators at a volt box, that can receive and dispense volt bars for use by electric vehicles (in auxiliary battery carriers, or pre-manufactured slots in the vehicle), in accordance with one embodiment of the present invention.

[0039] Figure 14b illustrates another embodiment of a volt box (kiosk location) that additionally includes one or more charging cables that can be directly connected to an electric vehicles plug for efficient recharging at a remote location away from the user's base location (home), in accordance with one embodiment of the present invention.

[0040] Figure 15 illustrates an embodiment where in auxiliary battery carrier can be charged from any number of sources, and the volt bars can be used to charge and power

any number of electric vehicles, or electric equipment, in accordance with one embodiment of the present invention.

[0041] Figure 16a illustrates one embodiment of the present invention that allows for volt box location (kiosk location) tracking of inventory and tracking of movement of volt bars among the various kiosk locations (defining the service network), in accordance with one embodiment of the present invention.

[0042] Figure 16b illustrates another embodiment where volt box locations can be in communication with a central hub, where the central hub collects information regarding the number of empty, ready, charged, and otherwise utilized volt bars that can be purchased/rented by users at the volt box (kiosk) locations, in accordance with one embodiment of the present invention.

[0043] Figure 17invention. illustrates an example data structure and data communication transferred between a central hub and a volt box, and periodic automatic push update of volt box memory data, in accordance one embodiment of the present invention.

[0044] Figure 18 illustrates another embodiment of a data structure (providing data) to a hub processing center (that communicates with full box stations) and the exchange of information, such as reservation data, in accordance with one embodiment of the present invention. In one embodiment, the hub is a type of central processing center, and the central processing center can have one or more processing systems and the systems can be localized or distributed and interconnected in any location in the world.

[0045] Figure 19 illustrates another embodiment of a mobile/network reservation transaction and the transfer of data between the mobile application, the hub processing center, and the memory of a volt box (computing system managing the kiosk), in accordance with one embodiment of the present invention.

[0046] Figure 20a illustrates an embodiment of logic that tracks information regarding the status of volt bars in the various kiosk stations, interfacing with mobile smart phone applications, load balancing algorithms, and service route information, in accordance with one embodiment of the present invention.

[0047] Figure 20b illustrates an example data exchange between a volt box and the central hub for periodic updates, exception alerts and database updating including but not limited to load balancing and heat map schemas, in accordance with one embodiment of the present invention.

[0048] Figure 20c illustrates an example data structure used in the processing, action, reply and logging of action requests from volt boxes in the field in accordance with one embodiment of the present invention.

[0049] Figure 20d describes one method of incentive driven virtual load balancing and rebalancing of volt bars in a given network of volt boxes in given regions, in accordance with one embodiment of the present invention.

[0050] Figure 21 illustrates a volt box use case in which a user requests to exchange volt bars where the number of return volt bars equal the requested volt bars, as well as logic for confirming validity of the request, exception handling, re-routing of the request and remote reservation for the request, in accordance with one embodiment of the present invention.

[0051] Figure 22 illustrates one method of purchase and volt bar dispensing as requested in figure 21, communication of volt bar with volt box and damage detection with transaction results transmitted to the central hub, in accordance with one embodiment of the present invention.

[0052] Figure 23 illustrates one method of volt box-to-volt box reservation with pre-payment and reservation completion through the central hub, in accordance with one embodiment of the present invention.

[0053] Figure 24 illustrates a volt box use case in which a user requests to purchase volt bars without exchange, as well as logic for confirming validity of the request, exception handling, re-routing of the request and remote reservation for the request, in accordance with one embodiment of the present invention.

[0054] Figure 25 illustrates one method of purchase and volt bar dispensing as requested in figure 24, communication of volt bar with volt box and damage detection with transaction results transmitted to the central hub, in accordance with one embodiment of the present invention.

[0055] Figure 26 illustrates one method of volt box-to-volt box reservation for the requested transaction in figure 24 with pre-payment and reservation completion through the central hub, in accordance with one embodiment of the present invention.

[0056] Figure 27 illustrates a volt box use case in which a user requests to purchase volt bars with an un-even volt bar exchange, as well as logic for confirming validity of the request, exception handling, re-routing of the request and remote reservation for the request, in accordance with one embodiment of the present invention.

[0057] Figure 28 illustrates one method of purchase and volt bar dispensing as requested in figure 27, communication of volt bar with volt box and damage detection with transaction results transmitted to the central hub, in accordance with one embodiment of the present invention.

[0058] Figure 29 illustrates one method of volt box-to-volt box reservation for the requested transaction in figure 27 with pre-payment and reservation completion through the central hub, in accordance with one embodiment of the present invention.

[0059] Figure 30 illustrates a volt box use case in which a user requests to return volt bars for deposit refund, as well as logic for confirming validity of the request, exception handling, in accordance with one embodiment of the present invention.

[0060] Figure 31 illustrates one method of volt bar return where the volt box used for return validates the number of volt bars requested to be returned, the condition of each volt bar tendered, validity of volt bar ownership as well as the calculation of refund, deposit of refund and service requests along with transaction results transmitted to the central hub, in accordance with one embodiment of the present invention.

[0061] Figure 32 illustrates a volt box use case in which a user requests to purchase charging time at a volt box location, as well as logic for confirming validity of the request, exception handling, re-routing of the request and remote reservation for the request, in accordance with one embodiment of the present invention.

[0062] Figure 33 illustrates one method of volt box-to-volt box reservation for the requested transaction in figure 32 with pre-payment and reservation completion through the central hub, in accordance with one embodiment of the present invention.

[0063] Figure 34 illustrates one method of volt box location charge time purchase, visual user cues and central hub update procedure, in accordance with one embodiment of the present invention.

[0064] Figure 35 illustrates and example instance of a computer or mobile application used for two way communication, administration, metric analysis, commerce gateway, loyalty reward status and administration among other customizable functionality

working in conjunction with the volt box network and central hub as viewed by the user and dependent on details of the user's account, in accordance with one embodiment of the present invention.

[0065] Figures 36A-36C illustrate example locations for placing an auxiliary battery in a vehicle and communication with an existing vehicle or one retrofitted to receive additional batteries of varying sizes or form factors, in accordance with one embodiment of the present invention.

[0066] Figures 37A-C illustrates internet cloud processing for route generation and charge availability, for vehicles (or internet connected devices) that connect to the cloud (e.g., network processing connected to the internet and storage), in accordance with one embodiment of the present invention.

[0067] Figure 38 illustrates an example system that monitors systems and data associated with a vehicle, and methods and systems for processing such information to provide live interactive data for informed decision making, in accordance with one embodiment of the present invention. In one embodiment, the system of Fig. 38 can rich data, including data from systems that collect operational information. Such operational information is sometimes referred to as a vehicles "black box." Thus, the data is not limited to black box data, but also data obtained from the Internet, data input by the user and data collected from car manufacturers and social networks.

[0068] Figures 39 and 40 illustrate examples of a paths taken by electric vehicles and options for receiving charge along that paths, the paths can be sponsored or not sponsored, and metrics concerning the paths are provided to drivers of the EVs, and the charge can be either connections to charge stations (for conventional charging of the

~~native vehicle battery) or stocking/restocking of volt bars to augment the native battery or both, in accordance with one embodiment of the present invention~~ Using cloud services 120, Bob can utilize his mobile device to assign on the spot an advisor account to the valet, who will utilize his or her mobile device to access the vehicle. It is example, the advisor account is able to transfer electronic keys (e-keys) to the valet for use via his mobile device. In operation 628, Bob assigns a temporary advisor account to the valet. In operation 630, the account will provide the valet with access the vehicle, such as for unlocking/locking and turning on the vehicle. In this example, metadata sets the level of privileges for the vehicle during the use of the electronic keys.

[00232] Figure 27 illustrates an example where electronic keys are assigned to an advisor account. In operation 632, that entity that is to receive an advisor account is identified. The identification of the entities can be by way of sending an entity e-mail, a text message, a notification, a near field communication (NFC) signal, a bump signal, a Bluetooth signal, a **WiFi** signal, or some electronic transfer signal or signals. In operation 634, the privileges are set for the advisor account, where specific vehicle aspects are enabled for the vehicle.

[00233] Infom1ation regarding data reporting can be set, remote access privileges can be set, local access can be set for using the vehicle (such as starting the vehicle opening the vehicle, locking the vehicle, unlocking the vehicle, restricting speeds, restricting distances, etc.). In operation 636, the advisor account is generated. The advisor account is then sent to the target recipient in operation 638. Sending the advisor account to enable use of the vehicle, in one embodiment includes sending encrypted e-keys to the recipient.

[00234] The target recipients can be the person to which the advisor account is being set. For example, the advisor account can be for a mechanic, a dealership, a

service station, a valet attendant, a person, a corporation, and entity, etc. In the case of

the valet, the advisor account can be sent to the recipient user or person working at the valet station. The valet account will then be received operation 639. The valet account will provide access 640 to the vehicle. As noted above, the access may include unlocking the vehicle, enabling sta1ting of the vehicle, locking the vehicle, etc. This will allow the valet to drive the vehicle for the restricted privileges set by the valet account 642. During the use of the valet accounts, the vehicle will maintain a history of the use of the vehicle and will provide reports or save the infonnation toa log on a server or on the vehicle. In one embodiment, the vehicle can provide reporting 644 regarding any potential damage to the vehicle while it was under the care of the valet.

[00235] In some embodiments, the valet account can be set using the vehicle electronics. For example, the user can go to a screen of the vehicle, select the type of account which will enable use of the vehicle under those privileges for a period of time.

[00236] Figure 28 illustrates an example of the assignment of electronic keys (e-keys) by Bob to a valet. In this example, Bob utilizes his smart phone 652 to transfer electronic key 652 the valet's device 651. The valet's device 651 is the recipient of the electronic keys. In one embodiment, the electronic keys transferred by Bob are sent to the valet by way of cloud services 120. For example, Bob can request that keys be sent to the valet, and the request is sent to the server operating in cloud services 120. The request can include information regarding the privileges, limitations, and/or metadata associated with the request for the electronic keys that are to be sent to the valet. The valet can then use the electronic Keys to use the vehicle in accordance with the privileges set by the requesting user (Bob).

[00237] In this example, cloud services can maintain information regarding the monitored use of the vehicle during the assignment of the electronic keys to the valet. A history can be regarding the use. The history can include vehicle functionality, vehicle

use, as well as occupant information such as camera data, audio data, exterior conditions, camera conditions exterior to the vehicle, breach violations, attempted thefts, actual theft, damage data, etc. while the account is active. The issuing user can also request that the account be deactivated, deleted, or turned off at any time. Reporting regarding the use of the vehicle can also be managed by cloud services which will inform Bob of any activity or specific activity about the vehicle while the valet utilizes the vehicle using thee-keys assigned to the valet. The assignment of the electronic keys can also have an expiration time, time frame, and an expiration time or date or combinations thereof.

[00238] Figure 29 illustrates an example where an owner of the vehicle Bob, is able to assign electronic keys (e-keys) 650 to any number of users. The keys can be assigned to users with various privilege settings. Additionally, the electronic keys can be sent to users that are remote from the user. For example, if Bob left bis car at home, while at work Bob can e-mail. text, message, or send electronic keys to a person that may need access to the vehicle that is remote from Bob. The user (e.g., Bob) can be at a location remote from the vehicle or can be standing next the vehicle or be in the vehicle when assignment of electronics is made. In one embodiment, the electronic keys can be assigned to a number of users, where the privileges are different for the same. The electronic keys for each user can be associated with a different expiration time and privilege priority level.

[00239] Each e-key, in one embodiment, will include a unique access code or substantially unique access code. The unique access code can be generated by a server, such as cloud services 120. In other embodiments, the access code can be generated by the vehicle electronics/logic/programs or can be generated by a mobile device or other computing system that is separate from a server. In other embodiments, the access codes can be generated on a remote device from the server or on the server itself. The unique

generation of access codes enables each electronic keyed to be different for each user and each e-key can expire at any time set by a requesting user orcan be canceled at any time from a device having access to the Internet.

[00240] Thus, multiple e-keys can co-exist. In one embodiment, if more than one person wishing to access or tide in the car has an e-key, one of the e-keys can open and tum on the car. If a user with an e-key having higher levels of privileges is tiding in the car, the car can either automatically transfer to the higher level or ask for permission to transfer privileges from higher level e-keys, even if thee-keys that first accessed the vehicle were lower level in privilege setting.

[00241] Figures 30A and 30B are illustrative examples of having electronic keys transfen-ed to a guest that requires access to the vehicle. The electronic keys 650 can be transfetTed to the vehicle and verified by the vehicle or cloud services or both, before access is given to the guest. The communication by the guest to the vehicle can be performed using any number of wireless communications, such as radio communication, Wi-Fi communication, Bluetooth communication, etc. 111e device of the guest, who is the recipient of the electronic keys can be of any type of the device. Example devices can include smart phones, tablet computers, computer glasses, wristwatch computers, computer chips, thumb drive computers, or any other device having the capability of storing data, processing data, and exchanging data either wirelessly or via some wired connection.

[00242] Figures 26-35 illustrate methods and systems for assigning e-keys for enabling access of a vehicle to a remote user, and related account privileges, as defined in several exemplary embodiments.

[00243] In one embodiment, a user can assign an ad advisor account toany individual. The Advisor account can be for any duration, and the duration can be set by

the user. In one embodiment, the advisor account can be assigned to a guest driver of a vehicle. The guest driver can be, for example, a friend, a known individual, a service person, a valet person or valet service, etc. The creation of an advisor account can therefore be for a short duration, or long duration, or permanently, or until the account is canceled, stopped, revoked, expires, or eliminated by the person/user that issued or created the advisor account. In one embodiment, the advisor account can act to provide access to a vehicle.

[00244] In one embodiment, access can be by way of electronic keys (e.g., e-keys), which can be sent by a vehicle owner/admin to some person or entity. For example, the user-owner of the vehicle can assign a valet with access to the vehicle by going on an application (App or website) on a computing device (e.g., mobile or non-mobile device), identifying the recipient, identifying a mode for communicating with the recipient (e.g., text, email, message, notification, etc.), selecting the advisor account privileges (e.g., what type of access, speed limits, geographic restrictions, amount of time thee-keys will be valid (or else expire)), and requesting that e-keys be sent to the recipient.

[00245] Figure 31A illustrates an example where a user, John, utilizing his mobile device 702, is able to communicate and send e-keys to another user (Bob). In this example, the sending of e-keys will include the sending of the request to a server, which may be operated by cloud services 120. At the server, the server will generate an access code for the vehicle (car - B). Tue access code will then be encrypted by the server and then sent as encrypted e-keys 722 to Bob's device 704. Bob's device 704 may be a mobile device, such as a smart phone. The mobile device will include screen having interfaces and icons, and the ability to receive messages, notifications, text messages, and

e-mail. In one embodiment, a notification will be received by Bob indicating that John has provided e-keys to Bob.

[00246] In figure 32, Bob utilizing his mobile device 704 will b:ansfer the encrypted e-keys 720 to the vehicle that belongs to John (car- B). In one embodiment, the receipt of the encrypted e-keys 720 will also include code, logic, or program instructions that will request that the device ID of Bob's device 704 should be transferred to the vehicle along with the encrypted e-keys 720. At the vehicle, the vehicle will receive the encrypted e-keys and the device ID of Bob's device 704. The vehicle will hold a private key to unlock an un-encrypt the encrypted e-keys 720.

[00247] The encryption by the server of the-keys utilize a public key that is associated with John's car, and held in or associated with an account managed for John. In this manner, John's car, holding the private key in memory can decrypt the encrypted e-keys 720. At the vehicle, the decrypted e-keys will be bound, associated, or paired with the device ID that transferred thee-keys in operation 730.

[00248] Because Bob transferred the encrypted e-keys 720 to the vehicle, Bob's device ID is associated with the encrypted e-keys that were transfeITed to the vehicle. This will assure that future accesses using e-keys that are activated for the car - B will be from the device 704 that received thee-keys from the owner. The target device that receives thee-keys is the recipient device that is identified by the user that requested that thee-keys be provided to the recipient. In operation 732, as mentioned.above, the vehicle private key is used to decrypt thee-keys to get access toan access code. The access code is the code that will enable thee-keys to be activated e-keys 724. In operation 734, the access code is bound to the device ID, as mentioned above. The access code is then sent as activated e-keys 724 back to Bob's device 704. Bob's device

704 can now access the vehicle in accordance with the privileges set by John, the owner of the vehicle.

[00249] Figure 33 illustrates an example where Bob utilizes his device 704 to activate, open, lock, tum on, unlock, John's vehicle (car-B). The access by Bob is facilitated by the activated e-keys 724, which are used via device 704 having the device ID that is paired or associated with the access code associated with the activated e-keys 724.

[00250] Figure 31B illustrates an example of operations that may be performed by cloud services 120 when a request to send e-keys to a recipient is received. Cloud services can receive the request 741. The request can include identification of the recipient and the privileges defined by the requester for that issuance of e-keys to the recipient and identification of the device that will receive thee-keys.

[00251] In one embodiment, the exact device that is to receive thee-keys is not identified in advance, but only the communication modes to identify the user. For example, the user may have multiple devices that can receive messages. The device that actually receives the message and communicates with the vehicle will be the device that will receive and be able to use the activated e-keys when the transaction to use thee-keys is made with the vehicle. Once thee-keys are activated on one device, thee-keys cannot be activated on other devices un1ess new e-keys are requested again.

[00252] In operation 742, the request is associated. with the user account making the request. The user account will be John's account, which will have predefined information associated with the vehicles that John is able to assign e-keys for. Additionally, the user account for John can also include templates that John can use to assign e-keys with various privileges. Some templates can be assigned to teenage users, spouses, mechanics, valet attendants, etc. In this manner, the user does not need to

assign the specific individual privileges each time e-keys are assigned, but simply can assign a template of a group of privileges for the specific assignment.

[00253] In operation 743, the server will generate a unique access code. The unique access code can be generated by a number generator, and alphanumeric random generator, in incremental number generator, or any other generation device that can generate codes that are unique or substantially unique. In operation 744, the access code is encrypted using the vehicles public key, which is held by the server. The public key held by the server enables encryption of the access code and any associated metadata, privileges, or communication data or codes, which will be sent to the recipient device for accessing of the vehicle. In operation 745, the encrypted e-keys are sent to the recipient. In this example, the encrypted e-keys 720 are sent to Bob and received by device 704.

[00254] Figure 34 illustrates examples of various assignments of e-keys 750 and the generation of unique codes 752, as transactions bet\veen users and servers of cloud service 120. In the example shown, various e-keys can be assigned by John to vatious different parties. Each e-key assignment can be associate with a different unique code generated by the server. Each unique code can then be used to associate those e-keys with the same vehicle, but assigned to different devices/people with different privileges. The different e-keys having different access codes can then be encrypted and sent to the user for access of the vehicle.

[00255] In other embodiments, the access codes are not encrypted and will enable direct access to the vehicle when the e-keys are sent directly to a recipient. In that embodin1ent, a user can send e-keys directly from one smart phone to another sma1t phone or one device to another device without the need for server involvement. Assignment of e-keys in this manner may have lower levels of security, but the assignment of e-keys can still be associate with uniquely associated access codes. The

unique access codes can be generated by the mobile devices using applications, and expiration, cancellation or revoking of assignee-keys can be made or conducted via the mobile device (or any computing device, including the electronics of the vehicle). In some embodiments, the mobile device will communicate with the server and in other embodiments no server communication will be needed.

[00256] Figure 35 illustrates an example where a request is sent by John via device 702 to cloud services 120. Cloud services 120 can generate the unique access code which is thenencrypted in a message and sent as enc1ypted e-keys 720 to the recipient, Bob, who receives it via device 704. The request sent by the requester can include an action request. The action can be to send e-keys to Bob. The requester will identify Bob's contact data, such as e-mail, text, notifications, messages, NFC, etc. and can defined privileges for use. The duration that thee-keys will remain active can also be set by the requester. Metadata defining the active state of thee-keys can also be managed by the request, including deactivating codes or self-destructing access code routines when violations occur.

[00257] In one example, the appon the user's mobile device can request that a message be sent to the recipient, so that the recipient can receive thee-keys and be granted access to the vehicle. In one embodiment, the recipient may have a mobile device or computing device (e.g., smartphone, tablet computer, laptop computer, personal digital assistant, smartwatch, computer glasses, or the like), on which a communication can be received that provides instmctions for obtaining/validating/using thee-keys. In one example, a message can be sent to the recipient, which may provide instructions on how to activate thee-keys.

[00258] In one embodiment, the message may have a link to an application that can be launched, which can be used to complete the activation and access with the

vehicle. In another embodiment, a simple link can be sent, which when selected will link the user to a webpage, which provides instructions for activating the access for the e-keys.

[00259] In one embodiment, application or webpage can identify that e-keys were sent to the individual recipient and will also identify the vehicle (e.g., brand, year, model, color, license plate, or more or less data), may identify the restrictions, and may identify the duration during which thee-keys will remain active. After the duration (or earlier if thee-keys are cancelled by the user), thee-keys will discontinue to work. If, for some reason, the recipient still needs access to the vehicle, the original message or link can provide a method for allowing the user to request more time. The user (e.g., owner of the vehicle) can therefore, via the app or website, reactivate thee-keys.

[00260] In some embodiments, thee-keys when active will provide a graphical user inte1face on the device of the recipient, which may allow access, such as icon buttons to unlock, lock, start and stop the vehicle. The appcan also send notifications to the recipient, if for example, the user wishes to provide the recipient with more time or less time. While thee-keys are active, in one embodiment, the vehicle can report back activity of the vehicle, while under the care/use of the recipient. The user may have access to audio input or cameras, to communicate with the driver/recipient. The vehicle use history can also be saved to a server, such that the recipient's use activity can be audited, or viewed or accessed.

[00261] In one embodiment, the e-keys can be sent to any person, via a communication message. Thee-keys, in one embodiment, are sent to a user in a message so that the recipient can get a graphical user interface that allows the recipient to activate thee-keys and then open the car, turn on the car, drive the car, turn off the car, lock the car, etc.

[00262] For security purposes, e-keys are generated at a server, which may be managed by a server to execute cloud services. The server may receive requests from registered users who may wish to assign e-keys to some individual or entity. The request is associated to the user account, as managed by the service. If the user has multiple vehicles, the request may further include identification of the vehicle, such as CAR-A or CAR-B, etc. At the server, the server is configured to execute the generation of access codes for a particular request. The access codes can be uniquely generated by the server, for each received request. In one embodiment, the access code format or form is set, so that a vehicle knows what to expect and reject access codes that do not meet the format or fon11. Once the access code is generated for the request, the access code is encrypted using a public key of the vehicle, which is assigned a public/private key pair.

[00263] In one embodiment, the public/private key pair can be re-generated from time to time, if the user feels that a security breach has taken place. Usually, however, one public/private key pair may serve for a life of a vehicle. Theserver keeps and maintains the public key and the private key is stored in storage/memory of the electronics of the vehicle. Although traditional encryption may make the public key freely available, in one embodiment, the public key is only referred to as "public" for purposes of defining the encryption logic, but preferably the public key is kept private or securely held by the server. The private key can be stored or programmed when the vehicle is registered with a service or at any other time, when the public/private key pair are re-generated for security purposes. The transfer of the private key to the vehicle can take place over any wired or wireless network, or by transfer via some connector, plug, memory card, thumb drive, etc. In any event, the private key is stored and kept secure by the vehicle.

[00264] In one embodiment, in addition to the access code being encrypted, other data can also be encrypted along with the access code. Such other data can include, for instance, metadata. The metadata may include a number of contIOl information/parameters, programming information, privileges defined by the requesting user, the expiration time of thee-keys, code/logic for self-deleting the access code of the e-keys on the recipient's device when the expiration time is reached, etc. In some embodiments, the device of the recipient, once the access code has been activated, can communicate with the server in a background mode. The communication can include, for instance, having the server de-activate the access code if the issuing user decides to cancel the access code.

[00265] For ease of discussion, reference will be made to encrypting the access code, but it should be understood that other data may also be encrypted. The encrypted access code is then sent to the recipient, as identified by the requesting user. The recipient will, in one embodiment, receive the message that teJls the recipient that he/she has received e-keys, and toclick on a link or select a button provided or associated with the message when the recipient is within communication distance to the vehicle. The recipient can then approach the vehicle, e.g., at wireless communication distance (e.g., WiFi, Bluetooth, NFC, radio, etc.). The device of the recipient, upon the recipient selecting the button or link, will cause the device of the recipient to transfer the encrypted access code (e.g., e-keys) to the vehicle.

[00266] In addition, a device ID of the device that sent the encrypted e-keys to the vehicle will also be received by the vehicle. The vehicle, because it has the private key of the public/privatekey pair, will be able to decrypt the access code. The vehicle will then bind the access code with the device ID. The access code, being bound or associated with the device ID will be returned to the recipient's device, which will be the

activated e-keys. The activated e-keys will therefore allow the recipient, using the device with the device ID to use screens, graphical user interfaces, apps,or buttons on the screen or device to actively use the vehicle.

[00267] The activated e-keys will, however, only be active for the period of time set by the vehicle owner that sent the request to grant thee-keys to the user. As used herein, the device ID can be any type of device identifier, such as a model number, a code, a serial number, an alphanumeric string, a numeric string, a simple number codes, or any type of identifying data. In one embodiment, the device ID is a MAC address of the recipient's device.

[00268] A cloud services website, which may be managing the generation of e-keys will set metadata that defines what the limits or restrictions or parameters of the e-keys are, such as how long the-keys will be active. In one embodiment, the generation of thee-keys can be for a predefined set period of time, e.g., such as 1 hour, 1 day, 1 week, 2 weeks, 1 month, 1 minute, 2 minutes, 30 seconds, or until cancelled or eliminated by the user. For example, thee-keys can be generated as a spare e-key for a person's wife or child. In that case, the-keys may not expire, until the account is cancelled, thus deleting the key pair validation and associated encryption.

[00269] In one embodiment, each e-key generated is unique, as the generated access code was unique for the specific request. A random number generator can be used to provide access codes. Each unique e-key, being unique, can be cancelled and eliminated without affecting other issued e-keys. The number of e-keys generated can therefore be essentially unlimited, as each e-key is unique. In one embodiment, each e-key assigned to a recipient can be associated with a log of activity. The log can identify what driving took place, where the vehicle was driven, speeds, damage sustained, radio

stations listened to, conversations had, images of drivers during that time, etc. In some embodiments, the level of monitoring can be more lin1ited.

[00270] In some embodiments, the level of monitoring can be provided in a message, at the same time thee-keys are assigned to a recipient. In this manner, each recipient will know in advance what monitoring is occurring on the vehicle while the vehicle is used with the issued e-keys associated with the account. or advisor account. In some embcxliments, more monitoring will be acceptable, such as when the vehicle is driven by a valet. In some embodin1ents, less monitoring is more acceptable, such as when a spouse is driving the vehicle.

[00271] The recipient user, in one embodiment will have a computing device for receiving thee-keys. The computing device may be a phone, a watch, a computer chip, or some processing device or storage. TI1e recipient, once receiving thee-keys from a server can then access a link or icons on an app or website of his/her device. The recipient is instructed to press a button or select an icon or link to initiate access with the target vehicle. The action taken by the recipient will cause data packets to be transferred to the electronics of the vehicle. The data packets can include, for example, the encrypted e-keys (e.g., having the access code).

[00272] The encrypted e-keys will be accepted and/or validated by the vehicle, and in one embodiment, can also include receipt of the device ID of the recipient desiring the access. Once validated, the recipient will have access to the vehic1e. The access may, for example, be in response to the user selecting buttons, icons or app controls on his device, e.g., smartphone or the like. Each time the device sends control data to the vehicle, the control data (e.g., to open the vehicle, start the vehicle, etc.), in one embodiment, the control data can be sent with the server as well for tracking use.

[00273] As noted above, thee-keys can be assigned for any period of time, e.g., such as a very temporary period of time or for a longer period of time. For example, a user can assign e-keys to a friend if the user is far from home and the friend needs access to the vehicle that may still be at home. The e-keys can expire, based on the defined period of time for thee-keys. Thee-keys can be managed by the user on a website, such as a site managed by cloud services. The user can see all e-keys that have been assigned in the past, which e-keys are active, deactivate any e-keys, see use history associated with any previously assigned e-keys, etc.

[00274] In another embodiment, a user can also receive notifications when a vehicle is being accessed, driven or used in a manner that is in violation of the privileges assigned to thee-keys. For instance, if thee-keys were assigned to a valet and the valet attempts to speed excessively during the use of thee-keys, the user can be notified of the privilege breach or violation. In one embodiment, the account associated with thee-keys can act to automatically deactivate thee-keys upon detecting a violation.

[00275] In one embodiment, instead of waiting for a user to request thate-keys be sent to a recipient, the recipient may directly request e-keys. For instance, if the vehicle is one that is from a car sharing entity, the user may wish to access a particular car parked as some location. TI1e car may be identified by serial number or some other identifier. The user, in one embodiment, using an application of the car entity can request e-keys. The request can be processed similar to when a user shares his/her keys with an individual. The requesting user waits for the server to issue encrypted e-keys, which are transferred to the vehicle for decryption and verification. The vehicle can then issue activated e-keys to the user for opening the car, starting tl1ecar, locking the car, etc. In one embodiment, the user can continue using the vehicle until a pre-determined period of time or during a time that the user wishes to use the vehicle. Vehicle use can be

communicated, for the used e-keys, back to the vehicle sharing entity. lhe vehicle sharing entity can then bill the user for the time used and any incidentals.

[00276] Accordingly, it should be understood that the issuing or sharing of e-keys facilitates access and use of vehicles for any defined duration. It should be further understood that issued e-keys can also be issued to multiple individuals at one time. For example, a vehicle owner can have an active set of e-keys on his/her phone. The vehicle owner may also have a set of e-keys active for a child of the home. The vehicle owner may also activate e-keys for service people, mechanics, valet people, etc. These e-keys can co-exist and can all be active at any particular point in tin1e. If both there are two users that wish to ride and/or drive the car, the first user to activate the access via thee-keys will be thee-keys that are logged as active. More specifically, if a husband and wife wish to go to an even in the vehicle, and the wife is the first to activate the vehicle using here-keys, the e-keys used to activate the vehicle will be the ones that are associated with the active use.

[00277] In one embodiment, if the user that activated the vehicle with bis/here-keys does not proceed to drive or ride in the vehicle, thee-keys may be disabled in a safe manner. Thus, in one embodiment, a background signal between the device used to activate thee-keys will communicate with the vehicle to confinn that the device is in the vehicle. In one embodiment, the background signal operates as a tether.

[00278] In still another embodiment, if a vehicle is stolen, the owner can access the website or app, and immediately cancel all e-keys for the vehicle. This will act to safely stop the vehicle, e.g., by slowing down the vehicle if it is in motion, or lock the vehicle, report GPS coordinates, etc. The vehicle can, in one embodin1ent report activity, camera data, voice data, or any other monitoring data associated with the condition that caused thee-keys to be violated.

[00279] In other embodiments, the vehicle can also pa1ticipate and communicate with the server of cloud services to pe1fon11 either initial assignment of the access codes, verification or monitoring.

[00280] Reporting data and history of use can also be logged separately for each e-key that is active or was active. As noted above, thee-keys can be assigned for particular privileges. In one embodiment, the privileges can be assigned by selecting tick boxes, icons, drop down menus, time durations, set limitations, conditions, etc. In some embodiments, a template can be provide for users. A template can have certain predefined privileges that match the assignment of thee-keys. For instance, a template can be provide for a valet, a mechanic, a service store, a child, a spouse. The templates can be pre-defined by the system and can also be adjusted or customized by the owner of the vehicle or admin of the vehicle. Furthermore, although specific reference is made to a vehicle, the embodiment can also be used for other types of devices, homes, strnctures, real estate lock boxes, lock boxes, safes, robots, electronics, etc.

[00281] The various embodiments may be embodied in computer readable media, which is saved in storage. The storage may be saved on cloud storage, data centers, or the like, which are accessible over the Internet. The access may be wired or wireless. In vehicles, the connection to the Internet may be wireless, and the connection can be continuous or non-continuous depending connection. Code on the vehicle electrons can execute at least some of the method operations when not connected and other operations are executed jointly between vehicle electronics (e.g., memory, code and processors of a vehicle) and cloud processing, which may in1plement one or more servers, either virtual or not.

[00282]

DETAILED DESCRIPTION

[0069] Embodiments are described methods and systems for providing auxiliary charging mechanisms that can be integrated or coupled to a vehicle, to supplement the main battery of a vehicle. The auxiliary charging mechanism can be in the form of an auxiliary battery compartment that can receive a plurality of charged batteries. The auxiliary battery compartment can be charged with or without the vehicle, and can be installed or placed in the vehicle to provide supplemental charge to the vehicles main battery. Thus, if the main battery becomes depleted, the auxiliary battery compartment, having a plurality of charged batteries, can resume providing charge to the vehicle.

[0070] Figure 1 illustrates a broad embodiment of a vehicle having a main battery and an auxiliary battery carrier, in accordance with one embodiment of the present invention. As shown, a vehicle 10 is provided with a main battery 14. Main battery 14 can be installed in any configuration on a vehicle, and as shown, the main battery 14 is preferably installed near a lower section of vehicle 10. Installation of the battery 14 near the lower section (i.e., underneath section) will enable automated handling for replacement of main battery 14. For example, main battery 14 may be removed by automated handling equipment when vehicle 10 reaches a battery replacement location, or shop.

[0071] Alternatively, main battery 14 can be placed in any location suitable for ergonomic placement on, attached, or integrated with body structures of vehicle 10. Although vehicle 10 is illustrated to be a car, vehicle 10 can take on any configuration such as, a sports car, a utility car, a truck, a pickup, an industrial vehicle, a delivery vehicle, a 3 wheeled vehicle, a 2 wheeled vehicle, etc. In one embodiment, vehicle 10 can be a 100% electric vehicle, a partial electric vehicle and fossil fuel powered vehicle (hybrid), or variations thereof.

[0072] Vehicle 10 is illustrated with a charging port 17 that couples to main battery 14. Charging port 17 will enable standardized charging of vehicle 10 at designated charging stations, such as power charger 18. Power charger 18 can be installed at the vehicles home-base, or can be installed at various locations designated for charging for a fee.

[0073] In one embodiment, an auxiliary battery carrier 16 can be inserted into a compartment of the vehicle 10 and is configured for electrical connection to main battery 14. Auxiliary battery carrier 16, in one embodiment, is configured to be placed into the compartment by a human, and is configured with suitable handles for lifting the auxiliary battery carrier 16 into and out of vehicle 10. The handles can be provided on the sides of auxiliary battery carrier 16 to provide for an ergonomic lifting procedure of the auxiliary battery carrier 16 into and out of vehicle 10.

[0074] Still further, the auxiliary battery carrier 16 can be provided with wheels and an handle, so that the unit can be pulled on wheels, similar to travel luggage transport systems. For instance, the handle can be compressed or slid into a side of the auxiliary battery carrier, and when transport is needed, the handle can be extended out to allow pulling, as facilitated by wheels attached to the bottom of the auxiliary battery carrier 16.

[0075] Auxiliary battery carrier 16 may be coupled to a power charger 18 before being placed into vehicle 10. As noted above, power charger 18 can be located at the vehicle user's home or can be located at any distributed charging location throughout the globe.

[0076] In one embodiment, auxiliary battery carrier 16 can be charged by plugging a receptacle into a common wall outlet, and allowing the auxiliary battery carrier 16 to

charge all volt bars 20 contained in the auxiliary battery carrier 16 for a period of time. In one embodiment, the auxiliary battery carrier 16 can also itself include a battery cell that is rechargeable with sufficient voltage charge. In this embodiment, the auxiliary battery carrier 16 can provide charge to the vehicle 10 even when no volt bars 20 are contained within the auxiliary battery carrier 16. In another embodiment, the auxiliary battery carrier 16 will not include a battery cell, and all charge storage will be held in the respective volt bars 20 installed therein.

[0077] Auxiliary battery carrier 16, in one embodiment, can be defined from molded plastic with molded handles for ease of handling and protection of the volt bars contain therein. The molded plastic is configured, in one embodiment, to provide a rugged cushioning to the auxiliary battery carrier 16 in case of accidental dropping, accidental impacts, and overall rigidity. The molded plastic can, in one embodiment include cushioning on the exterior surfaces, and may include a lid for enclosing the volt bars 20 contained therein. As will be shown below, the auxiliary battery carrier 16 can also include plugs, cables, and interfaces for allowing interconnection with charging outlets, and interfaces with vehicle 10.

[0078] As illustrated in figure 1, auxiliary battery carrier 16 is electrically coupled to main battery 14. This illustration is, in one embodiment a logical connection between auxiliary battery 16 and main battery 14. Thus, it will be understood that the electric connection between the auxiliary battery carrier 16 and the main battery 14 can take on any configuration. Interconnections can be by way of receptacles built into vehicle 10 in the vicinity of auxiliary battery carrier 16. Interconnections can be by way of extension wires or cables that coupled to or adjacent to the charging port 17. Interconnections can be by way of circuit panel plugs that interconnect to circuitry.

[0079] Broadly speaking, the circuitry can include, in one embodiment, central processing units, logic, memory, and other electrical and/or computing modules to enable interconnections between auxiliary battery carrier 16 and main battery 14. Additionally, software can control interfaces between auxiliary battery carrier 16 and main battery 14, such as to detect the presence of auxiliary battery carrier 16, control the transfer of voltage between the auxiliary battery carrier 16 and the main battery 14, or the electric motor of vehicle 10, and to interface with electronics, modules, and communication devices that may be integrated within the auxiliary battery carrier 16.

[0080] Accordingly, it should be understood that auxiliary battery carrier 16 can be removed from vehicle 10 for charging, can be charged on vehicle 10, can be interconnected to vehicle 10, can be interconnected to standard charging port 17, and can be refilled with auxiliary batteries (volt bars) with refresh charges to extend the life of charge provided by auxiliary battery carrier 16. Thus, the placement of auxiliary battery carrier 16 on the vehicle 10 can take on any configuration, depending on the definition of the vehicle and its available storage compartments or location suitable for supporting the auxiliary battery carrier 16.

[0081] In one embodiment, the main battery 14 and the batteries that define the volt bars 20 can be constructed using any number of battery technologies, or technologies that can store charge or energy. Additionally, main battery 14 can be configured in any number of formats, and can be integrated in any portion of a vehicle. In one embodiment, any portion of the vehicle can be converted into an electric storage compartment. For example, parts of a vehicle's floorboard can define the electric storage compartment, and thus may act as main battery 14. In another embodiment, the outer shell or frame of the vehicle can be integrated with cavities or structures that are

~~suited for storing electric power.~~

[0082] Thus, although main battery 14 is shown as a single unit, the placement and distribution on the vehicle can vary. Furthermore, the main battery 14 can work in conjunction with a hybrid system, that enables charging of the main battery 14 during use of the system. Charging in the hybrid vehicle can be by way of collection of energy from braking functions, or the like. Other ways of collecting energy can be by way of collecting energy from the use of the vehicle's shock absorbers. As a vehicle traverses terrain, the vehicle's shocks absorb energy and/or resist movement. These types of energy collection systems can, in one embodiment, be recollected to the main battery 14 or can be transferred to the auxiliary batteries of the vehicle.

[0083] The control of such transfer can be managed by an on-board computer and controlled by a processor. In another embodiment, the control can be carried out dynamically from a remote location. For instance, the vehicle can be connected to the internet. If local conditions change, such as the weather or type of terrain being traversed, the vehicle can be automatically controlled to transfer or collect energy from certain systems, which can be prioritized over others. Still further, solar cells on vehicles can also be configured to collect energy and such solar cells can be controlled to transfer energy to either the main battery 14 or the auxiliary battery carrier 16. **[0084]** It should be understood that in addition to standard battery technology, storage of electric energy can also be accomplished using alternate or emerging technologies. One such technology is referred to as ultra-capacitor technology. Broadly speaking, an ultra-capacitor is a device for the efficient storage of power. An ultra-capacitor is also known as a double-layer capacitor, which polarizes an electrolytic solution to store energy electrostatically. Even though it is an electrochemical device, no chemical reactions are involved in its energy storage mechanism. This mechanism is highly reversible, and allows the ultra-

~~capacitor to be charged and discharged hundreds of~~

thousands of times. An ultra-capacitor also has a lifetime that is greater than conventional batteries, and is resistant to changes in temperature, shock, overcharging, and provides for rapid charging. These types of batteries also require less maintenance than conventional batteries and are more environmentally friendly because they lack common toxic chemicals utilized in standard batteries.

[0085] It is anticipated that charge storage technology will continue to improve over time to provide additional charge capacity, lighter weight, and smaller form factors. As such improvements continue to evolve, the embodiments described herein which refer to "batteries," should be broadly construed to include any type of electric fuel storage.

[0086] Figure 2 illustrates a more detailed picture of the auxiliary battery carrier, designed to receive one or more batteries (volt bars), in accordance with one embodiment of the present invention. As shown, auxiliary battery carrier 16 can include a number of slots that are defined for receiving volt bars 20. Will include charge receptacles (not shown) that will mate with complementary receptacles defined within the auxiliary battery carrier 16. Thus, charge can be transferred from volt bar 20 and auxiliary battery carrier 16 once inserted within the slots of auxiliary battery carrier 16.

[0087] It should be understood that any number of volt bar's 20 can be installed in an auxiliary battery carrier 16. The larger the auxiliary battery carrier 16 becomes, the heavier the carrier will be for human listing and installation. If the auxiliary battery carrier 16 is designed for commercial purposes, auxiliary battery carrier 16 can be defined to have a larger footprint, and can be installed using suitable machinery. For example, auxiliary battery carrier 16 can be defined for use in construction vehicles, and the number of volt bars 20 capable of being installed in a larger auxiliary battery carrier 16 can be numerous. To handle the increase in weight, specialized vehicles, or

standard construction vehicles (e.g. forklifts) can be used to lift auxiliary battery carrier 16 into and out of vehicle 10. Thus, the size of auxiliary battery carrier 16 is modular, and can be made to receive more or less volt bars 20. In still another embodiment, the size of volt bars 20 can be varied, such that larger sized volt bars 20 can be inserted into a suitably sized auxiliary battery carrier 16 having associated slots.

[0088] In still another embodiment, the volt bars 20 can be designed in ultra large size capacity. The ultra large size can be configured for installation into a large container. The large container can be, for example, a typical shipping container converted into a power source. The shipping container can then be delivered to specific sites for use at special events, construction sites, or the power special equipment at office space locations. The modular construction of a large container having volt bars 20 can then be managed by a separate distribution system that allows users to request and have delivered specific large containers with suitable battery capacity for the desired tasks.

[0089] In one embodiment, auxiliary battery carrier 16 can include an antenna 15. Antenna 15 can be configured to communicate with electronics and software/firmware of auxiliary battery carrier 16. Antenna 15 can be used to allow auxiliary battery carrier 16 to communicate with a remote server over the Internet, and report the status of auxiliary battery carrier 16. For example, if a user driving vehicle 10 experiences a decrease charged in main battery 14, and an associated decrease charge in auxiliary battery carrier 16, auxiliary battery carrier 16 can include firmware/hardware/software that will enable communication to a central hub.

[0090] The central hub can then generate a message that will be communicated to the driver of vehicle 10. The message can include an identification of the closest kiosk that has suitable volt bars 20 that can be purchased to replenish depleted contained

~~in~~

auxiliary battery carrier 16. The user can also be provided with messages that identify special deals for obtaining volt bars, and deals for exchanging depleted volt bars. In one embodiment, the message can be communicated to the user's smart phone, a display panel on vehicle 10, or other personal electronics of the user. Communication between auxiliary battery carrier 16 and the devices utilized by the user to receive messages can be managed using any number of protocols, such as Wi-Media, near field communication (NFC), Wi-Fi, Bluetooth, radio communication, wired communication, etc.

[0091] Figure 3 illustrates a detailed block diagram of a vehicle interfaced with an auxiliary battery carrier, and interfaced directly with a main battery of the vehicle while being interfaced with a CPU, in accordance with one embodiment of the present invention.

[0092] Vehicle 12 can include a number of standard components, as well as components for interfacing with the auxiliary battery carrier 16. As shown, the vehicle can be provided with charge via a power charger 18 by connection to charging port 17. Main battery 14 is connected to auxiliary battery carrier 16 by way of a power interface 29. In one embodiment, data interface 22 is associated with each Main battery 14 and auxiliary battery 16. Data interface 22 provides the link by which a central processing unit (CPU) 31 can communicate with main battery 14 and the auxiliary battery carrier 16. For purposes of general description, it should be understood that CPU 31 can be defined in any number of form factors and configurations.

[0093] For instance, CPU 31 can be part of a digital signal processor, a printed circuit board with circuitry, general logic, logic and memory, firmware, or circuitry that can sense the status of the main battery 14 and auxiliary battery carrier 16, and can communicate data to other modules or circuitry. Broadly speaking, some link or

interconnection is provided between main battery 22 and auxiliary battery carrier 16, so that appropriate interfaces can be made between the batteries, in one embodiment of the present invention. Power interface 29 can provide the interface for exchanging charge between the charge contained in ancillary battery carrier 16 and the main battery 14, as will be described in more detail below. Auxiliary battery carrier 16 is shown capable of receiving a plurality of volt bars 20, and can be equipped with an antenna 15 for communicating with a remote server or with circuitry/software of vehicle 12.

[0094] Continuing with the description of components that may be part of an electric vehicle 12, a motor controller 30 is shown interfacing with main battery 14. Motor controller 30 be shown interfacing with electric motor 30, and electric motor 30 is shown interfacing with transmission 34. Transmission 34 is shown interfacing with differential 36, which interfaces with the wheels 38.

[0095] The general description of components/parts of vehicle 12 are provided as exemplary components only, and shall not limit other configurations of electric vehicles that may include additional components/parts or omit certain components/parts. In general, vehicle 12 should be configured with sufficient components and infrastructure to enable main battery 14 and/or auxiliary battery carrier 16 (and volt bars 20) to provide power to vehicle 12 to enable propulsion in the desired direction.

[0096] Figure 4 illustrates a detailed diagram of a vehicle having a main battery that is replaceable or rechargeable, and interfaced with an auxiliary battery carrier, in accordance with one embodiment of the present invention.

[0097] As shown, figure 4 illustrates an embodiment where the main battery of a vehicle can be replaced from a location defined under the vehicle. The main battery 14 can be coupled to the auxiliary battery carrier 16 by way of power interface 29. Power

~~interface 29 is also coupled to the motor controller 30 that interfaces with the electric~~

motor 32 of the vehicle. As shown, the volt bars 20 are independently chargeable and can be hand insertable and removed from the auxiliary battery carrier 16, depending on the needs of the vehicle.

[0098] Also illustrated is antenna 15 that can be integrated with the auxiliary battery carrier 16 for communication of status associated with auxiliary battery carrier 16. It is noted herein that antenna 15, being coupled to the auxiliary battery carrier 16 allows for independent communication by the auxiliary battery carrier 16, separate from any communication being performed by the vehicles electronics or communication systems.

[0099] By separating these two communications systems, it is possible for communication between the auxiliary battery carrier and distributed hubs that managed the availability of volt bars throughout the network, without interference by communications systems of the vehicle. Additionally, by separating the communications systems of auxiliary battery carrier 16 from the vehicle, it is possible for the auxiliary battery carrier 16 to independently communicate with the central hub when the auxiliary battery carrier is in or out of the vehicle.

[00100] Figure 5 illustrates another detailed diagram of a main battery of the vehicle, partitioned into a plurality of segments, in accordance with one embodiment of the present invention. In this embodiment, the main battery 14 of the vehicle 12 is partitioned into a plurality of insertable and removable battery segments 14a-14d. Although only four segments are shown, it is possible for the partitioning to be performed in any number of segments. By segmenting the main battery, it is possible for a battery charge detector and selecter to replace only those segments that need replacing.

[00101] For example, if the vehicle 12 drives into a battery changing station, the battery changing station can have a system of replacement actuators 52a-52d, that can connect to the various main battery segments 14, and facilitate removal and replacement with a fresh battery. In the example shown, the replacement actuators 52 each include sensors 54a-54d that coupled to each of the main battery segments 14. The sensors are configured to communicate with a control interface defined at a surface of the main battery segments. The control interface will communicate with a computer 56 through a port 50 which will identify the charging level of the various battery segments. If a particular battery segments is substantially full, that battery segment will be allowed to remain in the vehicle.

[00102] Alternatively, if a particular battery segment is only partially depleted, the driver will be given the option to replace the battery segment with a fresh fully charged battery segment. In one embodiment, the vehicle owner will be given a credit for the remaining battery charge left in the battery segment, so that the vehicle owner will be charged only for that charge that is purchased. For example, if main battery segment 14b is only 12% charged, if that battery segment is replaced, the driver will be charged for the charge value of 88%. In still another embodiment, when the user of the vehicle drives into the battery replenishment station, a control system dashboard can be presented to the user of the vehicle to allow the user to enter into a display screen how much battery replacement is desired.

[00103] For instance, if the driver the vehicle only wants to spend to replace one battery segment at that particular time due to budgetary issues, only one segment can be replaced. By segmenting the main battery, and providing options to the user of the vehicle, the user is provided with more flexibility of only charging the main battery with the amount of charge they desire to pay for at any particular time. In still another

embodiment, while the main battery is being replaced in a segmented manner, it is possible for vehicle 12 also be coupled to a receptacle that charges the auxiliary battery carrier 16, and its volt bars 20 contained therein. In still another embodiment, the volt bars can be manually replaced at the station during the charging of the main battery 14.

[00104] Alternatively, the battery changing station can also automatically remove volt bars from a compartment of the vehicle and reinsert charged volt bars into the vehicle at the same time or during the same session of replacing or charging of the main battery. Accordingly, the flexibility of charging, and partitioning batteries out of vehicle will provide users with more options for charging, depending on their driving necessities, and targeted budgets.

[00105] Additionally, by providing display screens to the users to allow selection of their desired charging parameters at a charging station, the user will have control over which battery sections, segments, volt bars, or systems will be recharged (whether completely recharged or partially recharged), and may credit users for any charge remaining on a particular battery segment when a new battery segment is reinserted into the vehicle.

[00106] Figure 6 illustrates a main battery of a vehicle capable of being interfaced with an auxiliary battery carrier that can receive volt bars, and can be interfaced to a power source, in accordance with one embodiment of the present invention.

[00107] In this embodiment, the main battery 14 is shown having a power interface 29b, that couples to a power interface 29a of the auxiliary battery carrier 16. Coupling of the power interfaces 29 will occur when the auxiliary battery carrier 16 is coupled to the vehicle. As illustrated, the main battery 14 is coupled to a charging port

17. The charging port 17 will typically be the charging outlet on the vehicle that will receive a connector that couples to power. For example, in a home configuration, the receptacle can be provided with a connection to the power grid of the home. The receptacle is then connected to the charging port 17 of the vehicle when charging of the vehicles main battery 14 is desired.

[00108] As shown, a plurality of volt bars 20 can be inserted or removed from the auxiliary battery carrier 16. The volt bars 20, when inserted in the auxiliary battery carrier 16, can be charged when the auxiliary battery carrier 16 is connected to a power source by way of a connector 22. Over time, the volt bars can be replaced with new volt bars, or volt bars purchased at kiosk locations throughout a charging network of volt bars and dispensing units. As noted before, an antenna 15 can be provided with auxiliary battery carrier 16 to enable independent communication by the auxiliary battery carrier 16 to a central hub over the Internet. The central hub, although identified as "central," can be defined by a plurality of distributed hubs located in a cloud network topology that may include private, public or hybrid cloud technologies that are installed throughout a particular territory.

[00109] For example, one network of central hubs can be distributed throughout a particular continent of the globe, a particular country, a particular county, a particular state, or particular city. A larger scale interconnected network can then manage the distributed central hubs to allow interchange of information and transfer of volt bars to the desired kiosk locations depending on need and depending on the flow patterns of the volt bars 20. As described herein, flow patterns mean that volt bars when picked up at certain kiosk locations will then be dropped off at other kiosk locations. If more people pickup volt bars at particular locations and travel in the same direction, more volt bars will gather at that direction where volt bars travel the most.

Thus, because volt bars can be tracked, it is possible to define and track the flow patterns of the volt bars throughout the network.

[00110] Figure 7 illustrates an embodiment where the main battery is interfaced with the auxiliary battery carrier, and a CPU controls the flow of charge between the two, depending on their level of charge, in accordance with one embodiment of the present invention. In this embodiment, the main battery 14 is shown having a low charging level, and the auxiliary battery carrier 16 is shown having a higher charging level. In one embodiment, is possible for the auxiliary battery carrier 16 to transfer charged to the main battery 14 during operation. Control of the charging flow between the auxiliary battery carrier 16 and the main battery 14 can be by way of a central processing unit 31. The central processing unit 31 is generally shown as a block diagram.

[00111] However, it should be understood that central processing unit 31 can include any number of electronics, control systems, and software for coupling the auxiliary battery carrier 16 to the main battery 14. The coupling can be by way of connectors between the auxiliary battery carrier 16 and connectors on the vehicle, which then interface to main battery 14.

[00112] Figure 8 illustrates another embodiment where the main battery of the vehicle is being directly charged, and the auxiliary battery is charged once the CPU detects that the main battery has been fully charged, in accordance with one embodiment of the present invention. As shown, the charge level in the main battery 14 is completely full, as power charger has been delivered to the charging port 17 of main battery 14. In this embodiment, charge flow can be directed from the main battery 14 to the auxiliary battery carrier 16.

[00113] Again, CPU 31 can be used to control the charge flow between the main battery 14 and auxiliary battery carrier 16. In some embodiments, CPU 31 will direct that no charge between the two systems will occur, and the auxiliary battery carrier will directly supply charge to the electric motor for power. As such, it is not necessary that the auxiliary battery carrier be directly or indirectly connected to main battery 14, as vehicles can provide their own separate connection between the auxiliary battery carrier 16 and the electric motor. It is again noted that the auxiliary battery carrier 16 can be integrated as part of the car, by way of a plurality of slots defined in some compartment on the vehicle. Those particular slots can then be coupled to the electric motor, or coupled to the main battery, or both.

[00114] Figure 9 illustrates an embodiment where the auxiliary battery is triggered to start being accessed by the main battery once the main battery reaches a particular depletion level, in accordance with one embodiment of the present invention. In this embodiment, the control systems can trigger that the auxiliary battery carrier 16 is accessed by the main battery 14 for additional charged only when the main battery 14 reaches a threshold. In this example, ¼ charge or less will trigger the transfer of charge. Of course, it should be understood that any threshold value can be set, and ¼ is only an example for illustrating the monitoring of charge contained in each of main battery 14 an auxiliary battery 16. In still another embodiment, additional charge bars 20 can be inserted into auxiliary battery carrier 16 at any particular point in time.

[00115] Figure 10 illustrates another embodiment where the main battery and the auxiliary battery are each capable of providing power to a motor directly, without transferring charge between either of the batteries, in accordance with one embodiment of the present invention.

[00116] Figure 11 illustrates an embodiment of the volt bar (battery) that is dimensionally sized to fit within a slot of the auxiliary battery carrier, in accordance with one embodiment of the present invention. In this example, a particular volt bar 20 can include various dimensional sides. A particular volt bar 20 can be provided with advertisements from various sponsors in physical, static or electronically and dynamically delivered form, and can include charge indicators 21, LED buttons, RF ID for transmission and receiving, and can include a slider protector 25. The slider protector 25 is configured to protect the electrodes 21a and 21b. The slider is configured to be slid up to expose the electrodes when the volt bar is inserted into the auxiliary battery carrier 16 or into a slot of the vehicle. The advertisement can also change dynamically by way of an LED screen, and can change based on codes provided by transmissions received from the antenna of the auxiliary battery carrier 16. The dimensional sizes of a volt bar 20 can change depending on the form factor of the carrier, or the form factor of the slots in the vehicle.

[00117] Additionally, various slider technology, or connector technology can be used to allow exposure of the electrodes when necessary for connection with the auxiliary battery carrier or the receiving slot such as direct contact or wireless charge and discharge technologies. Accordingly, the form factor illustrated here in is only provided as one example. Other examples can include form factor such as tubular form factors, elongated form factors, cylinder form factors, etc. the charge indicator 21 can be provided in the form of a digital display, a plurality of LEDs, or a mechanical indicator.

[00118] The LED buttons can also provide information regarding the health of the volt bar, the life of the volt bar, serial numbers of the volt bar and other information. The **RFID** can be used to track the when volt bar 20 is inserted into and out of auxiliary

battery carriers, or received from or inserted into kiosk locations, and can be tracked globally for their movement around the network. When a volt bar reaches its lifespan, a kiosk will confiscate the volt bar so that further introduction into the network can be prevented. Confiscated volt bars can then be replaced by service technicians.

[00119] Figure 12 illustrates the auxiliary battery carrier with a plurality of slots capable of receiving one or more volt bars that will be charged once placed in one of the slots, in accordance one embodiment of the present invention. In this example, the auxiliary battery carrier is shown receiving a particular volt bar 20. A universal plug can be provided on the auxiliary battery carrier 16 that will allow connection to a charging station. Alternatively, a cable 27 can be used to connect to a power outlet, or connect directly to the vehicle. The power outlet can be a basic outlet plug 27 to allow connection to any standardized plug for receiving electrical power. When the auxiliary battery carrier 16 is full of volt bars 20, the volt bars contained within auxiliary battery carrier 16 can be charged.

[00120] Figure 13a illustrates a kiosk system that can receive volt bars in a used condition (depleted), can charge depleted volt bars to a suitable charge level, and can dispense fully charged volt bars from the kiosk (referred to herein as a volt box), in accordance with one embodiment of the present invention. As illustrated, a kiosk location is shown, and is referred to herein as a volt box. The volt box is an expandable charging station 60. The charging station 60 can also include direct charging ports 60b and can include a plurality of slots for dispensing volt bars 20 in section 60a. The volt box can include a screen 64 for allowing a user to interface with the kiosk location and allow the user to purchase any number of volt bars. A payment interface 66 is also provided to allow user to purchase the volt bars.

[00121] Charging stations 60 can also be deployed as a mobile unit the can be dropped off at any particular location, such as a storefront, or outside of a big box chain store. Once dropped off they can be deployed, connected to the Internet, and can be powering the volt bars inserted therein. Charge can be received by the electrical grid, a gas generator, a fuel cell generator, solar panels, or can be charged from a service charging vehicle. The kiosk will include a service ports 61 that will allow service technicians to empty volt bars that have been confiscated as they may have reached their lifespan, or insert new volt bars when the kiosk location is less than full or is in need of additional volt bars due to flow patterns that drive volt bars to other kiosk locations.

[00122] As shown, direct charging ports 60b include a retractable charging cord 73 with a charging plug so that vehicles can drive up and receive charge from the kiosk location, those charging their main battery. At the same time, the user can purchase any number of volt bars for use in their auxiliary battery carrier 16 or in preformed slots defined on the vehicle itself. An antenna 62 is also shown providing the volt box access to communicate with the network of other volt boxes, and/or the central hub. By providing this communication, it is possible the track how full or empty the volt box charging station is, and service vehicles can be deployed to replenish, and/or service the particular charging stations 60.

[00123] As illustrated, charging is performed through a plurality of interfaces 74, or a single interface 74, depending on the configuration and location of the volt box station in the deployed network.

[00124] Figure 13b illustrates a detailed diagram of the face panel of the kiosk system of figure 13a, which represents one example interface of the kiosk, in accordance with one embodiment of the present invention. The indicator lights or

insignias can be provided on the face of the kiosk location to indicate the charging level of the particular volt bars inserted therein. In some cases, volt bars inserted into slots will only be partially charged, and thus will not be available for purchase. Light indicators can be provided to illustrate which volt bars can be removed from the kiosk location. In another embodiment, the volt bars are mechanically pulled into the kiosk location and served to the user in a dispensing manner.

[00125] The dispensing system can then be handled internally to the volt box so that a single slot is provided for receiving used volt bars and dispensing new volt bars. As such, users approaching a kiosk location may empty the used volt bars from their auxiliary battery carrier and insert them into the kiosk location to receive a credit for the volt bar unit. If the credit is received by returning a user volt bar, the user is only charged a nominal fee for the charge when a new or recharged volt bar is dispensed.

[00126] Figure 13c illustrates one example form factor of a battery service module, that can output or receive volt bars in a service station environment (potentially alongside a conventional fossil fuel pump or nearby location), in accordance with one embodiment of the present invention.

[00127] Figure 13d illustrates an example battery service kiosk, that can be expandable in a modular form by adding or subtracting kiosk units to satisfy demand at particular locations, in accordance with one embodiment of the present invention. In this example, kiosk locations can be added in a connected manner to existing kiosk locations to expand the capacity of the modular system. By doing this, one kiosk can include the display interface 105, the battery in slot 109, the battery out slot 111, and the card swipe/ pin pad 107 information.

[00128] Figure 13e illustrates one example logic diagram for processing battery data associated with batteries received at the kiosk, batteries dispensed at the kiosk, and associated payment transactions, in accordance with one embodiment of the present invention. This example shows a battery management system 60c, that includes several subsystems. A battery processing system 200 is shown including a control system 213. The control system 213 is coupled to a plurality of modules that control the receiving and dispensing of volt bars at a particular kiosk location, in one example. As shown, the battery processing system 200 includes a battery hold module 205, a battery charge module 207, a battery diagnostic module 203, a battery in queuing module 201, a battery auxiliary service module 209, and a battery out queuing module 211.

[00129] These systems are then connected to the battery service module or battery service kiosk 60. As shown, the battery in slot 109 is coupled to the battery in queuing module 201. When the battery is received, the battery is then put through a battery diagnostic module 203 where the battery diagnostic module will determine if the battery should be held or confiscated by battery hold module 205. If the battery is in good condition, the battery charge module 207 will charge the battery and allow the battery to be dispensed to a battery out queuing module 211, which in turn allows the battery to be output by the battery out slot 111. Again, the control systems described herein are only representative of one example and the control systems for receiving used or uncharged volt bars and dispensing new volt bars at particular kiosk locations can be modified to account for the volume of volt bars being dispensed, the form factor of the kiosk location, and other factors.

[00130] Figure 14a illustrates one embodiment of an interface including a plurality of indicators at a volt box, that can receive and dispense volt bars for use by electric vehicles (in auxiliary battery carriers, or pre-manufactured slots in the

~~vehicle),~~

in accordance with one embodiment of the present invention. As shown, an example of a volt box 60a having a plurality of volt bars is shown. Depleted volt bars 20 can be inserted into open slots, while users can purchase and remove charged volt bars from ready slots. The volt bars can then be inserted into an auxiliary battery carrier 16 that are external to the car or integrated within the car, or can be placed into the car.

[00131] Figure 14b illustrates another embodiment of a volt box (kiosk location) that additionally includes one or more charging cables that can be directly connected to an electric vehicles plug for efficient recharging at a remote location away from the user's base location (home), in accordance with one embodiment of the present invention.

[00132] Figure 15 illustrates an embodiment where in auxiliary battery carrier can be charged from any number of sources, and the volt bars can be used to charge and power any number of electric vehicles, or electric equipment, in accordance with one embodiment of the present invention. This example shows that the power source can be delivered to any number of vehicles or appliances that consume electric power. A volt box 16 can be charged from various power sources, and can be inserted into various transportation vehicles, or appliances. The examples shown are various cars, motorcycles, home appliances, mobile appliances, recreational appliances, general lighting equipment, emergency lighting equipment, or charging power sources.

[00133] Figure 16a illustrates one embodiment of the present invention that allows for volt box location (kiosk location) tracking of inventory and tracking of movement of volt bars among the various kiosk locations (defining the service network), in accordance with one embodiment of the present invention.

[00134] Figure 16b illustrates another embodiment where volt box locations can be in communication with a central hub, where the central hub collects information regarding the number of empty, ready, charged, and otherwise utilized volt bars they can be purchased/rented by users at the volt box (kiosk) locations, in accordance with one embodiment of the present invention. This example illustrates how a hub processing center 302 couples to a service network 300. The hub processing center at 302 will include a number of operational units. The units can include payment servers 306, reservation servers 310, volt box unit interface servers 304, load balancing and heat mapping engines 308, mobile application interface servers 312, service and service route optimization engines 314, interfaces through wide area networks and local area networks and private/public/hybrid cloud infrastructures 316, and databases 318. The payment servers receive payments from the users and redeem payments from payment interface businesses.

[00135] The reservation servers 310 will allow users to reserve volt bars at particular volt box kiosk locations ahead of time. This ensures that users are able to obtain their volt bars at the destination they are approaching or have discovered that volt bars are available. By allowing users to advance reserve volt bars, users arriving at the kiosk location will not be discouraged if they find out that the volt bars that were indicated to be available are no longer available.

[00136] The load balancing and heat map engine 308 is configured to track the flow patterns of the volt bars around a particular network. If volt bars are accumulating at particular kiosk locations, the load balancing engine can institute discounts at particular kiosk locations to influence the automatic distribution of the volt bars to other locations where volt bars are in short supply, or move volt bars away from locations where volt bars are accumulating. The heat map can identified in real time

the movement of volt bars by tracking the **RFID's** on the various volt bars as they traverse the locations in the network.

[00137] For instance, as volt bars are removed from vehicles and inserted into kiosk locations, the volt bars can be analyzed to see where the volt bar originated, and where the volt bars have been from a historical mapping perspective. If volt bars appear to accumulate more in a particular location, the heat map will indicate a higher heat level, or indicator of where volt bars may be accumulating. The mobile application interface can then relay this information to users who are attempting to locate volt bars in the network. The mobile application interface server is configured to provide information to users on smart phones, or similar devices, or computer interfaces connected to the Internet.

[00138] An application can then track the user's current location and can inform the user of the closest kiosk location for obtaining a volt bar. The user can be provided with options to purchase an advance reserve the volt bars from those locations. The user can also be provided with discounts if the heat map desires to move certain volt box inventory away from certain kiosk locations to other kiosk locations. The discounts can influence users to obtain volt bars from certain volt boxes as opposed to others, thus automatically load balancing the distribution of volt bars throughout the network.

[00139] Having information of the locations with volt bars, the status of volt bars, and the flow patterns, the service and service route optimization engine 314 can direct service agents to the most efficient locations to provide service. The service can include replacing volt bars that are identified to be past their useful life, replenish volt bars, and/or service the kiosk infrastructure. As shown in figure 16a, the various volt box locations 60 can be tracked using GPS information, address information, or

previously defined location information. IP address locations and cell tower accessing can also be used.

[00140] Accordingly, the hub processing unit 302 is intelligently interfaced with the network to allow management of the various kiosk locations and ensure efficient distribution of volt bars to the various vehicles, and to provide information to users through mobile devices, computer interfaces, and allow for efficient and ease of purchase and reservation when volt bars are desired. By providing this information to users in a dynamic manner, users of electric vehicles will not be challenged with range anxiety when operating their electric vehicles from location to location throughout the globe.

[00141] Knowing that kiosk locations are available, and their ability to reserve, purchase, or identify availability of volt bars, and associated discounts, users are empowered with information that will enable efficient purchasing and utilization of energy for their electric vehicles. Social networks can also be accessed to determine if any comments or referrals are being made about specific locations, or if problems are being experienced at certain locations. Social networks can also be tapped to identify if certain locations are liked over other locations, and if certain features are particularly good or fall below some accepted standard.

[00142] Figure 17 illustrates an example data structure and data communication transferred between a central hub and a volt box, and periodic automatic push update of volt box memory data, in accordance one embodiment of the present invention. This embodiment shows that each location can be managed and the quantity of volt bars each location can be tracked by the central processing hub, to efficiently utilize the volt bars throughout the network. As shown, the volt box locations (kiosk locations) can be

distributed throughout a city at different street addresses. Service personnel can then be routed to the specific streets of a city to perform the servicing operations.

[00143] The most efficient routes can then be predefined for the service technicians so that service can be made at each volt box location. This embodiment illustrates that each volt box location 60 can collect a plurality of data that can be relayed to the hub processing center 302. Based on the information collected by the hub processing center 302, on-demand information can be provided to the system for setting the price of each volt bar, and other parameters at specific volt box locations.

[00144] For example, the periodic updates can be pushed to the volt box memory data so that the charging stations can provide efficient pricing information, and adjustments based on market conditions. Memory 60-1 illustrates the various information data that can be stored at the volt box 60, and communicated to the hub processing center 302.

[00145] Figure 18 illustrates another embodiment of a data structure (providing data) to a hub processing center (that communicates with full box stations) and the exchange of information, such as reservation data, in accordance with one embodiment of the present invention. This example illustrates a generic reservation push update of the volt box memory data. In this example, reservation data can be pushed to the volt box when obtained by the hub processing center 302. As noted above, when users reserve volt bars at specific volt box locations, the volt box locations need to update their information so that the reservation can be set.

[00146] Figure 19 illustrates another embodiment of a mobile/network reservation transaction and the transfer of data between the mobile application, the hub processing center, and the memory of a volt box (computing system managing the

kiosk), in accordance with one embodiment of the present invention. In this example, the mobile/network reservation push update is made to the volt box memory data. For example, a reservation request data from another volt box can be received or from a computer or mobile application in step 330. The hub processing center 302 will then receive this information from the memory and will be in communication with the memory of the volt box to reserve resources for the given time limit. The reservation data is received from 320, in response to the setting by the hub processing center 302.

[00147] Figure 20a illustrates an embodiment of logic that tracks information regarding the status of volt bars in the various kiosk stations, interfacing with mobile smart phone applications, load balancing algorithms, and service route information, in accordance with one embodiment of the present invention. This also illustrates an example of the processing of volt bars, such as managing damaged volt bars 402 and generating a route for pickup 404, when service operations are performed. Empty volt bar information 406 can then be communicated to a load balancer 410. The load balancer 410 can also receive information from ready charged volt bars 408. This information can then be communicated to a mobile smart phone application 412. Logic can then be processed in operation 414, to deploy pickup of volt bars or redistribution of volt bars.

[00148] The redistribution or pickup can then be managed by a route generator 416 where replacement of damaged volt bars 420 can occur during a route. In still another embodiment, the price can be adjusted in real time to encourage or discourage use of particular kiosk locations by module 418. Mobile notifications can also be generated to customers of particular sales or discounts based on the desired encouragement to move or flow volt bars to or from specific kiosk location is s by module 422. System 400 is provided as an example of the management systems that

can controlled to achieve specific load-balancing, notifications, and management communications to users of the network.

[00149] Figure 20b illustrates an example data exchange between a volt box and the central hub for periodic updates, exception alerts and database updating including but not limited to load balancing and heat map schemas, in accordance with one embodiment of the present invention. In this specific process 450, the volt box uses a network including but not limited to cellular, WAN, LAN and or satellite to attempt to establish a connection with a server in the central hub in 452. The connection request sent to the server in 454 enters into a queue for processing.

[00150] When the server acknowledges the requesting volt box's connection attempt, the server will send identification and security information requirements back to the volt box in 456. The requesting volt box then sends the identification and security information requested by the server in 458 to establish the network handshake and commence data exchange described in 460. Once data exchange channels are open between the volt box and the server, the volt box sends an action code to the server, 462, at which point the server in 464 will determine if the code sent by the volt box is a routine check-in code. If the code sent by the volt box to the server is not a routine check-in code, the server will receive the code as exception data in 476 and subsequently tag the volt box that sent the code for service and update all dependant systems in 480.

[00151] If the code sent to the server in 462 and checked in 464 was a routine check-in code then the routine check in status on the sever is updated and the server subsequently sends update data to the requesting volt box's memory with up to date information. Data stores pertaining to the requesting volt box on the central processing hub and servers are updated after either a routine check-in code or an exception

~~code~~

has been successfully processed by the server, 470. Additional dependant systems and schemas are updated to provide the most up to date aggregate data and reporting after each and every individual volt box is updated in 472. When all updating has completed the connection between the requesting volt box and the server is closed, 474.

[00152] Figure 20c illustrates an example data structure used in the processing, action, reply and logging of action requests from volt boxes in the field in accordance with one embodiment of the present invention. The data structure and communication shown describes how a plurality of volt boxes, 60, communicates to a data structure within the hub processing center that receives action requests in an organized fashion for processing.

[00153] Logic at the hub processing center cycles through data segments in the data structure to individually address action requests using methodologies including but not limited to first in last out, last in first out, priority queuing, and weighted fair queuing. After the hub processing center processes an action request, a sync is performed with the volt box that sent the now processed action request. Additionally, an action request history storage data structure and database is updated with details specific to each processed action request such as identifying information for the requesting volt box, action requested, action performed, when it was performed and any additional notes, data points, tracking and reporting necessary to catalog and warehouse data related to action request handling.

[00154] Figure 20d describes one method of incentive driven virtual load balancing and rebalancing of volt bars in a given network of volt boxes in given regions, in accordance with one embodiment of the present invention. In this example of the embodiment, regions are shown to work in conjunction with one another for load balancing of volt bars. Three regions are shown with varying number of volt bars

located in aggregate total from the entirety of volt boxes designated as residing within the given region.

[00155] Region 1 shows to have 51,375 volt bars while region 3 only holds 15,200 volt bars. In order to maintain a steady inventory of volt bars across all regions, each volt box will advertise an incentive to exchange, purchase or drop off volt bars at a volt box in a region that is running low on volt bar inventory. When the inventory in a certain region is low as compared to other regions, volt boxes in that particular region may de-incentive consumers by raising the price of volt bars at a volt box accordingly.

[00156] Volt bar inventory may run low or high for a variety of reasons such as high demand due to a high traffic event close by or low demand due to a bedroom community in which most commuters are away for most of the day. Pricing will fluctuate to stabilize and load balance the availability of volt bars across all regions. Regions may be comprised of sub regions or be part of a larger regions. Regions also have the ability to become part of other regions dynamically and similarly individual volt boxes may be assigned to any given region based on demand, load balancing and strategy.

[00157] Figure 21 illustrates a volt box use case in which a user requests to exchange volt bars where the number of return volt bars equal the requested volt bars, as well as logic for confirming validity of the request, exception handling, re-routing of the request and remote reservation for the request, in accordance with one embodiment of the present invention. This example embodiment is described by flow 500 with continuation **B** on Figure 22 and continuation C on Figure 23. In this example of the embodiment, a user requests to exchange volt bars at a volt box where the amount of fully charged volt bars requested equal the amount of discharged or spent volt bars the user will deposit into the volt box in 502. The user will enter the

~~amount_of_volt_bars~~

required for their transaction and the system will determine, 504 if there are sufficient fully charged volt bars available to fill the user's request.

[00158] If there are enough fully charged volt bars to fill the users order, a transaction price along with an escrow price will be calculated presented to the user. The transaction price will be based on a successful transaction in which the same amount of fully charged volt bars tendered to the user equals the discharged volt bars deposited. If the user fails to deposit any amount of volt bars required to successfully complete the transaction, a penalty fee will be deducted from the escrow paid by the user in 510. If the user does not accept the quote and pricing offered by the volt box, 514, the user proceeds to 512.

[00159] If the volt box in 514 determines that the user has accepted the pricing presented in 510 (see fig 22), the volt box will ask for payment in one of the available forms including but not limited to cash, NFC, credit, pre-paid volt box code or a volt box credit account number in 522. Alternatively, if the user is reserving/purchasing volt bars via application on a network connected device, payment will be taken over the network as well. The volt box will then determine in 524 if the payment was successful. If the payment was not successful, the volt box or application on a network connected device will give the user the option to try to tender payment again in 526. If the user does not opt to try again the use case ends. In one embodiment, the volt box and network servers are updated with transaction results data.

[00160] If the payment is successful initially or after subsequent attempts in 524, then the volt box, volt box kiosk or application on a network connected device will make the number of fully charged volt bars available for removal of the volt box and designate their location in the volt box either visually and or audibly in 528. The user then performs the exchange in 530 where the user's spent volt bars are deposited into

the same bays, available bays, slots or mechanism for depositing volt bars. The volt box then communicates with the volt bars via **RFID** or other wired or wireless communication method to determine if the correct amounts of depleted volt bars have been deposited in 532. The volt box also gathers information regarding the state of each volt bar at the time of deposit.

[00161] After the deposit has been completed, the volt box calculates if there is a refund due to the user or if the transaction has been completed in 534. If the volt box determines that damaged volt bars have been detected, an exception code is sent to the server at the processing hub that tags the volt box for volt bar replacement service. The volt box communicates data to the server about the transaction including but not limited to where the volt bars were tendered, the charge cycles the volt bar has completed, the user(s) the volt bar has been used by and other identifying information for reporting metrics and data warehousing.

[00162] The volt box then places the bay(s) containing the damaged volt bar(s) out of service as well as the volt bar(s) themselves by deactivating them. If no volt bars in 536 were determined to be damaged the use case ends after the server on the volt box network is updated with pertinent information regarding the transaction. If at 504 the volt box, volt box kiosk or application on a network connected device determines there are not sufficient fully charged volt bars at the volt box to fill the user's order, the volt box interface will suggest the user request the available maximum volt bars from the volt box in 506. If the new quantity is accepted in 508 then the user continues to 510.

[00163] If the user does not accept the new quantity of available fully charged volt bars available for transaction, the volt box will calculate and display using information from the volt box network which of the nearest volt box locations can

~~fill the users requested volt bar exchange quantity. The volt box will use incentive, load~~

balancing information from the server at the processing hub to display the user's options sorted by price, distance and or both in 512. The volt box in 516 will suggest the best value or incentives option for the user and allow the user to reserve the volt bars at the location described by the volt box in 516. If the user does not reserve the volt bars suggested by the volt box the use case ends without further action, and a server may be updated.

[00164] However, if the user does accept one of the qualifying volt box transaction sites, the volt box sends a request to the volt box reservation system to hold the volt bars requested at the volt box location indicated for the user while the user tenders payment in 520. (see fig 23) The volt box will ask for payment in one of the available forms including but not limited to cash, pre-paid volt box code or a volt box account number in 540. The volt box will then determine in 542 if the payment was successful. If the payment was not successful, the volt box or application on a network connected device will give the user the option to try again in 544. If the user does not opt to try again the volt box will notify the server at the processing hub to release the volt bars from reservation at the target volt box to make them available in the general pool of reservable / exchangeable/ purchasable volt bars in 546.

[00165] If the payment is successful initially or after subsequent attempts in 542, then the volt box, volt box kiosk or application on a network connected device where the payment transaction in was completed will send a confirmation to the target volt box through the volt box network to retain the requested amount of volt bars for at least a pre determined number of minutes or hours in 548. The volt box will also produce a code for the user to take to the target volt box to redeem the pre purchased volt bar transaction. In one embodiment, the volt box network will update the user's account with reservation data accessible through any network connected device to view

metrics and data related to all interactions the user has with the volt box network. When the user arrives at the target volt box holding reservation data for the user's transaction, the user will enter the code to redeem his or her transaction. The volt box will compare the code to code data on the server through the network to determine the validity and dispense as needed in 550.

[00166] If the user does not perform the transaction at the target volt box within the allotted time, the volt bars will be released into the available pool and the user will be credited. After the user performs his or her transaction the use case ends without further action. In one embodiment, a server may be updated.

[00167] Figure 22 illustrates one method of purchase and volt bar dispensing as requested in figure 21, communication of volt bar with volt box and damage detection with transaction results transmitted to the central hub, in accordance with one embodiment of the present invention.

[00168] Figure 23 illustrates one method of volt box to volt box reservation with pre-payment and reservation completion through the central hub, in accordance with one embodiment of the present invention.

[00169] Figure 24 illustrates a volt box use case in which a user requests to purchase volt bars without exchange, as well as logic for confirming validity of the request, exception handling, re-routing of the request and remote reservation for the request, in accordance with one embodiment of the present invention. In this example, flow 600 can continue to D on Figure 25 and continue to E on Figure 26. In this example of the embodiment, a user requests to purchase volt bars at a volt box without tendering spent volt bars in 602. The user will enter the amount of volt bars the user wishes to purchase and the system will determine, 604 if there are sufficient fully

charged volt bars available to fill the user's request. If there are enough fully charged volt bars to fill the users order, a transaction price along with an escrow price will be calculated presented to the user.

[00170] The transaction price will be based on the number of fully charged volt bars requested by the user using the latest pricing information from the volt box network in 610. If the user does not accept the quote and pricing offered by the volt box, 614, the user proceeds to 612. If the volt box in 614 determines that the user has accepted the pricing presented in 610 (see, fig 25) the volt box will ask for payment in one of the available forms including but not limited to cash, NFC, credit, pre-paid volt box code or a volt box credit account number in 622. Alternatively, if the user is reserving/purchasing volt bars via application on a network connected device, payment will be taken over the network as well.

[00171] The volt box will then determine in 624 if the payment was successful. If the payment was not successful, the volt box or application on a network connected device will give the user the option to try to tender payment again in 626. If the user does not opt to try again the use case ends. In one embodiment, the volt box and network servers are updated with transaction results data. If the payment is successful initially or after subsequent attempts in 624, then the volt box, volt box kiosk or application on a network connected device will make the number of fully charged volt bars available for removal of the volt box and designate their location in the volt box either visually and or audibly in 628. The user then removes the volt bars from the volt box in 630. After the removal of volt bars is complete, the volt box calculates if there is a refund due to the user or if the transaction has been completed in 632. After removal at 630 and calculation at 632 is complete, the volt box updates the volt box network

with the results of the transaction to update all dependant data structures, data stores and data warehouses, 634.

[00172] If at 604 the volt box, volt box kiosk or application on a network connected device determines there are not sufficient fully charged volt bars at the volt box to fill the user's order, the volt box interface will suggest the user request the available maximum volt bars from the volt box in 606. If the new quantity is accepted in 608 then the user continues to 610. If the user does not accept the new quantity of available fully charged volt bars available for transaction, the volt box will calculate and display using information from the volt box network which of the nearest volt box locations can fill the users requested volt bar quantity. The volt box will use incentive, load balancing information from the volt box network to display the user's options sorted by price, distance and or both in 612. The volt box in 616 will suggest the best value or incentives option for the user and allow the user to reserve the volt bars at the location described by the volt box in 616.

[00173] If the user does not reserve the volt bars suggested by the volt box the use case ends without further action, and the server may be updated. However, if the user does accept one of the qualifying volt box transaction sites, the volt box sends a request to the volt box reservation system to hold the volt bars requested at the volt box location indicated for the user while the user tenders payment in 620. (see fig 26) The volt box will ask for payment in one of the available forms including but not limited to cash, pre-paid volt box code or a volt box account number in 636. The volt box will then determine in 638 if the payment was successful. If the payment was not successful, the volt box or application on a network connected device will give the user the option to try again in 640. If the user does not opt to try again the volt box will notify the server at the processing hub to release the volt bars from reservation at the target volt

box to make them available in the general pool of reservable/ exchangeable/ purchasable volt bars in 642.

[00174] If the payment is successful initially or after subsequent attempts in 638, then the volt box, volt box kiosk or application on a network connected device where the payment transaction in was completed will send a confirmation to the target volt box through the volt box network to retain the requested amount of volt bars for at least a pre determined number of minutes or hours in 644. The volt box will also produce a code for the user to take to the target volt box to redeem the pre purchased volt bar transaction.

[00175] Additionally, the volt box network may update the user's account with reservation data accessible through any network connected device to view metrics and data related to all interactions the user has with the volt box network. When the user arrives at the target volt box holding reservation data for the user's transaction, the user will enter the code to redeem his or her transaction. The volt box will compare the code to code data on the server through the network to determine the validity and dispense as needed in 646.

[00176] If the user does not perform the transaction at the target volt box within the allotted time, the volt bars will be released into the available pool and the user will be credited. After the user performs his or her transaction the use case ends without further action, and the servers may be updated.

[00177] Figure 25 illustrates one method of purchase and volt bar dispensing as requested in figure 24, communication of volt bar with volt box and damage detection with transaction results transmitted to the central hub, in accordance with one embodiment of the present invention.

[00178] Figure 26 illustrates one method of volt box-to-volt box reservation for the requested transaction in figure 24 with pre-payment and reservation completion through the central hub, in accordance with one embodiment of the present invention.

[00179] Figure 27 illustrates a volt box use case in which a user requests to purchase volt bars with an un-even volt bar exchange, as well as logic for confirming validity of the request, exception handling, re-routing of the request and remote reservation for the request, in accordance with one embodiment of the present invention by flow 700 with continuation to F on Figure 28 and continuation to G on Figure 29. In this example of the embodiment, a user requests to exchange volt bars at a volt box where the amount of fully charged volt bars requested does not equal the amount of discharged or spent volt bars the user will deposit into the volt box in 702.

[00180] The user will enter the amount of volt bars he or she would like to purchase along with the amount of spent volt bars he or she will be depositing into the volt box and the system will determine, 704 if there are sufficient fully charged volt bars available to fill the user's request and if the volt box has the capability to capture the amount of spent volt bars the user wishes to deposit. If the volt box can fill the order for the user, a transaction price along with an escrow price will be calculated presented to the user.

[00181] The transaction price will be based on a successful transaction in which the user receives the amount of volt bars they require and deposit the amount of spent volt bars they indicated they wished to turn into the volt box. The volt box will determine if a penalty fee will be deducted from the escrow paid by the user in 710 or if a refund is required after the actual transaction takes place using the information gathered at this point. If the user does not accept the quote and pricing offered by the volt box, 714, the user proceeds to 712. If the volt box in 714 determines that the

~~user~~

has accepted the pricing presented in 710 (see, fig 28), the volt box will ask for payment in one of the available forms including but not limited to cash, NFC, credit, pre-paid volt box code or a volt box credit account number in 722. Alternatively, if the user is reserving/purchasing volt bars via application on a network connected device, payment will be taken over the network as well. The volt box will then determine in 724 if the payment was successful.

[00182] If the payment was not successful, the volt box or application on a network connected device will give the user the option to try to tender payment again in 726. If the user does not opt to try again the use case ends, and the volt box and network servers may be updated with transaction results data. If the payment is successful initially or after subsequent attempts in 724, then the volt box, volt box kiosk or application on a network connected device will make the number of fully charged volt bars available for removal of the volt box and designate their location in the volt box either visually and or audibly in 728. The user then performs the exchange in 730 where the user's spent volt bars are deposited into the same bays, available bays, slots or mechanism for depositing volt bars.

[00183] The volt box then communicates with the volt bars via **RFID** or other wired or wireless communication method to determine if the correct amounts of depleted volt bars have been deposited in 732. The volt box also gathers information regarding the state of each volt bar at the time of deposit. After the deposit has been completed, the volt box calculates if there is a refund or penalty is due to the user or if the transaction has been completed in 734. If the volt box determines that damaged volt bars have been detected, an exception code is sent to the server at the processing hub that tags the volt box for volt bar replacement service. The volt box communicates data to the server about the transaction including but not limited to where the volt bars were

tendered, the charge cycles the volt bar has completed, the user(s) the volt bar has been used by and other identifying information for reporting metrics and data warehousing. The volt box then places the bay(s) containing the damaged volt bar(s) out of service as well as the volt bar(s) themselves by deactivating them. If no volt bars in 736 were determined to be damaged the use case ends after the server on the volt box network is updated with the transaction results.

[00184] If at 704 the volt box, volt box kiosk or application on a network connected device determines the requested volt bar/ return volt bar combination is not available to fill the user's order, the volt box interface will suggest the user request the best available combination currently available at the volt box. 706. If the new quantity is accepted in 708 then the user continues to 710. If the user does not accept the new quantity combination for the transaction, the volt box will calculate and display using information from the volt box network which of the nearest volt box locations can fill the users requested volt bar exchange combination quantity. The volt box will use incentive, load balancing information from the server at the processing hub to display the user's options sorted by price, distance and or both in 712. The volt box in 716 will suggest the best value or incentives option for the user and allow the user to reserve the volt bars at the location described by the volt box in 716.

[00185] If the user does not reserve the volt bars suggested by the volt box the use case ends without further action, and the server may be updated. However, if the user does accept one of the qualifying volt box transaction sites, the volt box sends a request to the volt box reservation system to hold the volt bars requested at the volt box location indicated for the user while the user tenders payment in 720. (see fig 29) The volt box will ask for payment in one of the available forms including but not limited to cash, pre-paid volt box code or a volt box account number in 740. The volt box will

then determine in 742 if the payment was successful. If the payment was not successful, the volt box or application on a network connected device will give the user the option to try again in 744. If the user does not opt to try again the volt box will notify the server at the processing hub to release the volt bars from reservation at the target volt box to make them available in the general pool of reservable/ exchangeable/ purchasable volt bars in 746. If the payment is successful initially or after subsequent attempts in 742, then the volt box, volt box kiosk or application on a network connected device where the payment transaction in was completed will send a confirmation to the target volt box through the volt box network to retain the requested amount of volt bars for at least a pre determined number of minutes or hours in 748. The volt box will also produce a code for the user to take to the target volt box to redeem the pre purchased volt bar transaction.

[00186] In one embodiment, the volt box network may update the user's account with reservation data accessible through any network connected device to view metrics and data related to all interactions the user has with the volt box network. When the user arrives at the target volt box holding reservation data for the user's transaction, the user will enter the code to redeem his or her transaction. The volt box will compare the code to code data on the server through the network to determine the validity and dispense as needed in 750. If the user does not perform the transaction at the target volt box within the allotted time, the volt bars will be released into the available pool and the user will be credited. After the user performs his or her transaction the use case ends without further action, and the servers may be updated.

[00187] Figure 28 illustrates one method of purchase and volt bar dispensing as requested in figure 27, communication of volt bar with volt box and damage detection

with transaction results transmitted to the central hub, in accordance with one embodiment of the present invention.

[00188] Figure 29 illustrates one method of volt box-to-volt box reservation for the requested transaction in figure 27 with pre-payment and reservation completion through the central hub, in accordance with one embodiment of the present invention

[00189] Figure 30 illustrates a volt box use case in which a user requests to return volt bars for deposit refund, as well as logic for confirming validity of the request, exception handling, re-routing of the request and remote reservation for the request, in accordance with one embodiment of the present invention by flow 800 with continuation to **H** on Figure 31. In this example, a user requests to return volt bars to a volt box in varying stages of charge for a refund. The return of the volt bar to a volt box may be triggered by a variety of reasons in 802 including but not limited to, exchange for a fully charge volt bar, return for a refund, defective volt bar return, transaction where the user wishes to purchase a certain amount of volt bars and return an certain amount of volt bars where the amounts do not necessarily require to match.

[00190] The user deposits volt bars they have previously purchased at a volt box in 806 at which point the volt box communicates with the volt bars that were tendered in 808. The volt bar deposit aggregate information is collected in 810 including the amount of volt bars deposited among other metrics. The volt box system then cycles through 1-n volt bars deposited processing each one individually in 836 while the number of volt bars left to process is greater than 0. For each volt bar in 838 the volt box will determine if the volt bar tendered is operational or if it is malfunctioning form. If the volt bar is malfunctioning, the volt box uses additional data collected from the volt bar and the volt box network in 840 to determine if the volt bar is within a reasonable charge/discharge life span. If the volt bar is determined to be

reasonably malfunctioning, the user is refunded their escrow previously paid to remove the at one point fully charged volt bar from a volt box.

[00191] If the volt bar is malfunctioning and is not reasonably at the end of its life, the user is altered and to volt box network server is updated with the issue data and logging information in 844 for the user to follow up to determine why the volt box did not provide a refund in 848. The volt box then tags itself using the volt box network for service and alerts the hub processing center to add the volt box to the service routing system in 850. If the volt bar in 838 was not malfunctioning at the time of deposit, the system will determine if the volt bar has been reported stolen in 842. If the volt bar is determined to be stolen using information gathered from the volt bar in conjunction with information gathered from the server at the hub processing center using the volt box network, then the user proceeds to 844.

[00192] However, if at 842 the volt bar is determined to not be stolen, the volt box in 846 will confirm that the volt bar meets the criteria for escrow refund. If the volt bar does not meet the refund criteria, the user proceeds to 844. However, if the volt bar passes all tests and is determined in 846 to qualify for a refund in 846, a refund is provided for the user by adding it to his or her volt box credit account, credit card or voucher in 852.

[00193] Figure 31 illustrates one method of volt bar return where the volt box used for return validates the number of volt bars requested to be returned, the condition of each volt bar tendered, validity of volt bar ownership as well as the calculation of refund, deposit of refund and service requests along with transaction results transmitted to the central hub, in accordance with one embodiment of the present invention.

[00194] Figure 32 illustrates a volt box use case in which a user requests to purchase charging time at a volt box location, as well as logic for confirming validity of the request, exception handling, re-routing of the request and remote reservation for the request, in accordance with one embodiment of the present invention by flow 900 with continuation to Jon Figure 34 and continuation to Kon Figure 33. In this example of the embodiment, a user requests to purchase charging time at a volt box charging station where one or more charging stations are present at a given location in 902 through a central kiosk transaction and payment system.

[00195] If the kiosk determines that at least one of the charging stations at the particular site is available in 904, a transaction price determined and displayed in a form including but not limited to price per time unit, price per volt, price per watt or price per amp of charging will be calculated and displayed to the user based on a floating pricing system using an incentive based load balancing algorithm on the volt box network server in 908. If the user does not accept the quote and pricing offered by the volt box, 908, the user proceeds to 912. If the volt box in 914 determines that the user has accepted the pricing presented in 908, (see fig. 34) the volt box will ask for payment for either a specific amount of time or units the user has requested or pre-qualifies the user using a credit card for a maximum transaction and waits to determine final time or units actually consumed to charge the users account. Alternatively, the user may simply pay cash and the charge purchased with the amount of cash will dispense until the units or time has elapsed.

[00196] The volt box charging station kiosk will allow payment in one of the available forms including but not limited to cash, NFC, credit, pre-paid volt box code or a volt box credit account number in 934. Alternatively, if the user is reserving/purchasing charging units via application on a network connected device,

payment will be taken over the network as well. The volt box will then determine in 936 if the payment was successful. If the payment was not successful, the volt box or application on a network connected device will give the user the option to try to tender payment again in 938. If the user does not opt to try again the use case ends, and the volt box and network servers may be updated with transaction results data. If the payment is successful initially or after subsequent attempts in 936, then the volt box, volt box kiosk or application on a network connected device will make the charging station available for use and designate their location in the volt box charging station either visually and or audibly in 940.

[00197] The user then performs the connection 942 between the charging station via charging cord to a volt bar auxiliary battery unit or directly to the vehicle's main battery. While charging is progressing in 944, the volt box charging station communicates the current status of the charging station to the server on the volt box network to communicate metrics including but not limited to busy status, free status, estimated wait time and efficiency among other identifying and measurable data and again at the conclusion of the transaction. If at 904 the volt box, volt box kiosk or application on a network connected device determines there are no charging stations available, the volt box interface will suggest the user enter a queue and display an estimated wait time in 906. If the user accepts entering a queue in 910, the user proceeds to 908. If the user does not accept to enter a queue and agree to the estimated wait time, the volt box interface will calculate and display using information from the volt box network which of the nearest volt box locations can fill the users requested charging requirements and provide the option to rent a volt bar to reach the location, the volt bar rental quantity determined by the distance to the target charging station in 912.

[00198] The volt box interface will also use incentive, load balancing information from the server at the processing hub to display the user's options sorted by price, distance and or both in 912. The volt box interface in 916 will suggest the best value or incentives option for the user and allow the user to reserve the charging time/units and or volt bars at the location described by the volt box interface in 916. If the user does not reserve the volt bars suggested by the volt box the use case ends without further action, and the server may be updated. However, if the user does accept one of the qualifying volt box transaction sites, the volt box sends a request to the volt box reservation system to hold the volt bars and or charging station requested at the volt box location indicated for the user while the user tenders payment in 920 (see fig. 33).

[00199] The volt box interface will ask for payment in one of the available forms including but not limited to cash, pre-paid volt box code or a volt box account number in 920. The volt box interface will then determine in 924 if the payment was successful. If the payment was not successful, the volt box or application on a network connected device will give the user the option to try again in 926. If the user does not opt to try again the volt box, volt box kiosk or application on a network connected device will notify the server at the processing hub to release the charging station and or volt bars from reservation at the target volt box to make them available in the general pool of reservable/ exchangeable/ purchasable volt bars in 928.

[00200] If the payment is successful initially or after subsequent attempts in 924, then the volt box, volt box kiosk or application on a network connected device where the payment transaction in was completed will send a confirmation to the target volt box through the volt box network to retain the requested amount of volt bars and or charging station for at least a pre-determined number of minutes or hours in 930. The

volt box will also produce a code for the user to take to the target volt box to redeem the pre purchased volt bar transaction. In one embodiment, the volt box network may update the user's account with reservation data accessible through any network connected device to view metrics and data related to all interactions the user has with the volt box network.

[00201] When the user arrives at the target volt box holding reservation data for the user's transaction, the user will enter the code to redeem his or her transaction. The volt box will compare the code to code data on the server through the network to determine the validity and dispense as needed in 932. If the user does not perform the transaction at the target volt box within the allotted time, the volt bars and or charging station will be released into the available pool and the user will be credited. After the user performs his or her transaction the use case ends without further action.

[00202] Figure 33 illustrates one method of volt box-to-volt box reservation for the requested transaction in figure 32 with pre-payment and reservation completion through the central hub, in accordance with one embodiment of the present invention.

[00203] Figure 34 illustrates one method of volt box location charge time purchase, visual user cues and central hub update procedure, in accordance with one embodiment of the present invention.

[00204] Figure 35 illustrates and example instance of a computer, mobile application or network connected device used for two way communication, administration, metric analysis, commerce gateway, loyalty reward status and administration among other customizable functionality working in conjunction with the volt box network and central hub as viewed by the user and dependent on details of the user's account, in accordance with one embodiment of the present invention.

[00205] This example illustrates a smart phone or network connected device operating system 1000 having a plurality of applications. One application could be a volt box application 1002. When the user selects to run the volt box, the volt box application can produce a number of screens. For example my volt box screen can include general information 1004 regarding the status of a user's current volt bars, the range provided by my volt bars, the closest volt box to my current location, the deals of the day a particular ZIP code or region, any reservations I wish to make, the gifts they can be made to friends, referrals to and for friends to purchase volt bars, upgrades to volt bar infrastructure, hardware configuration upgrades or replacements, loyalty points, history information of my purchases, and the carbon footprint produced by the utilization of my volt bars.

[00206] Other information screens can also provide the total battery capability of each particular volt bar in a user's auxiliary battery carrier or slots on my vehicle 1006. Additional information can also include a carbon footprint graph 1010 showing the utilization of the user's volt bars, and the efficient utilization and purchasing of volt bars without requiring inefficient retrieval of volt bars. For example, if users obtain volt bars from locations that are near their current location or need, users reduce the amount of travel time to simply secure volt bars.

[00207] This reduction in travel time will cut down the carbon footprint produced by the simple act of obtaining the volt bars. Mapping functions can also be used. Maps 1014 can also be overlaid with social networking data, to provide additional real time information about charge locations, deals, coupons, pricing, and liked kiosk locations. Newsfeed data can also be accessed from various networks to provide rich data back to the user's application. The application can be run on any smart device, and the device can have access to cloud processing for immediate data

interfacing and/or local storage. Data can also be gathered from other internet sources, such as Wikipedias, Internet search sites etc., and data can be processed, compiled and presented back to the user's mobile device, vehicle display, etc. The application would also allow the user to remotely find, reserve and make purchases for a target volt box, any number of volt bars or charging time/units based on distance, price, zip code etc. in 1012.

[00208] Further information can also include loyalty points 1016 for purchases at various kiosk locations, and show bonuses provided to users that frequently utilize the volt bars. Additional dynamic information 1008 can be provided through the applications such as suggested travel speeds to conserve energy, maps for routing, better dynamic traffic information based on real-time information, and other settings. The user can also access heat map sourced deals 1018 to show where the network has decided that volt bars are accumulating and special discounts are being provided, coupon sharing, pricing, upgrade deals, and access to social networks to communicate deals to friends.

[00209] The deals to friends can be provided by way of a map that identifies the location of your friends and the possibility of giving your friend special points or the receipt of loyalty points for referring friends to specific kiosk locations. Additionally, ride sharing programs can also identify locations where people can be picked up if users desire to travel to the same location or same general area. All of these features can be integrated into the mobile app and internet website portals.

[00210] By providing this dynamic status information to users, users are better able to identify kiosk locations to obtain volt bars, and charge, as users traverse distances utilizing their electric vehicles. Range anxiety will thus be all but eliminated. Informed users and the ability to access charge when needed, solves these problems.

[00211] Figures 36-38 illustrate examples of an auxiliary battery being inserted into a compartment of a vehicle, in accordance with one embodiment of the present invention. In this illustration, the auxiliary battery can be installed into a trunk space of a vehicle, and the trunk space can have a compartment in the floor of the trunk. The top surface of the auxiliary battery can provide the surface of the trunk, instead of the previously defined surface. In one embodiment, auxiliary battery is a single unit that is installed into a compartment.

[00212] In other embodiments, the auxiliary battery can be one compartment that has multiple smaller compartments for receiving volt bars (charging units), or other battery type charging devices. Further, the auxiliary battery is shown interconnected to the main battery of the vehicle, or to a battery distribution or charge distribution handling unit. In other embodiments, the auxiliary battery can be inserted into side panels of the vehicle, in the front compartment of the vehicle, the floorboard of the vehicle, the site support structure of the vehicle, etc.

[00213] Figure 37A illustrates an example of cloud processing technology, which provides processing resources to connected vehicles through a distributed network. In one embodiment, the cloud processing can communicate with various charging stations using Internet connections, where charge Station metrics can be uploaded to the cloud processing system. The charge Station metrics can include availability of charge pumps, charge handles, charge plugs, charge mats (for wireless chagrining), volt bars, or other charge providing facilities.

[00214] Examples of such metrics can include the number of charge pumps available at particular period of time, historical availability times of the charge pumps, typical charge time estimates at particular charging stations, prices associated with the charge at the particular charging stations, feedback from customers through

~~social~~

networks, concerning the charging stations, and the like. The cloud processing can then process the charge Station status, traffic information associated with locations around or between charging stations and a user's current location, and provide specific suggested routes. The route generator can provide guided routes to the various charging stations (e.g., charge locations), based on the users immediate needs, desire for discounts, sponsored rewards, or the amount of time it will take to obtain access to a charge pump at a particular point in time. Broadly speaking, a discount is a reward and a reward is a discount, and a sponsored reward is a discount that is at least partially paid by another party for a the benefit of the recipient of the reward.

[00215] The driver location processor can communicate the information concerning drivers to the cloud processing logic, so as to provide the most effective information concerning charge availability to the various drivers. As illustrated in figure 37A, various drivers that communicate with the cloud processing unit can (e.g., over the internet wirelessly) be provided with specific routes or route options. For example, users in their particular vehicles may have a connected display or a portable device having access to the Internet. Based on the users location and charging needs, (and optionally the destination) the user can be provided with route options (e.g., one or more optional paths). The route options can be, for example, the fastest and most available charge Station (or charge providing devices) to the users current location, the cheapest charge available at a particular point in time, or information regarding charge prices for a particular future point in time.

[00216] Once the user selects a route option, the route generator can provide information concerning the charging station, and can also prepay or book a charging station slot. A charging station slot can include, for example a parking spot in front of a charging station. The charging station slot can be reserved if the user decides

~~the~~

prepay for the charging station, as a convenience. For example, if charging slots at a particular charge Station appear to be heavily used, a user can pre-reserve a charging slots ahead of time, so that when the user arrives at the charging station, the charging slot will be immediately available. This could be considered a convenience fee associated with pre-reserving of a charging slot, along a particular route. In another embodiment, the charging station can provide incentives to users to come to the particular charging station.

[00217] For example, if the user prepays for charge at a particular charging station, the charging station can provide a discount on the charge provided. For example, if the charging station wishes to fill a plurality a charging slots during a particular slow time, the charging station can communicate with the cloud processing and publish availability of its charging stations per particular period of time. A database associated with cloud processing will hold this information so it can be dynamically updated and accessed in real-time by users to fill their charging needs of their electric vehicles. During that particular period of time, the charging station can offer discounts or rewards to users so that drivers can decide to visit the charging station instead of another charging station. Still further, charging stations can offer discounts for users to use the particular charging station, and the discounts can be offered by more than one party or entity. For instance, if the charging stations are located near a particular business, that particular business can sponsor discounts or rewards at the charging station to drive traffic to or near that particular business. When users are charging their vehicles at the particular station near the particular business, users can spend their time at the particular business while there vehicle is being charged.

[00218] Potentially, the owners of the particular business that sponsored the discounts can increase traffic to their business and increase sales. In another embodiment, the owners of the particular business can offer discounts to their business products or services, if the business products or services or located near or beside the charging station. As will be described below, other embodiments can include having charging station pumps or handles or plugs, located in nontraditional charging station configurations. For example, charging plugs can be installed at various nontraditional locations, such as parking lots of retail stores. Other examples locations can include, without limitation, parks, city streets, parking garages, post offices, government areas, schools, offices complexes or campuses, coffee shops, malls, strip malls, box store parking lots, beach parking, homes, public roads, etc. If a large retail store has a large parking lot, a portion of that parking lot can be dedicated for charging plugs, which can be used by customers while the customers shop at the retail location. In such a situation, the owners of the retail store that have charging plugs assigned to particular parking spots, can publish availability of those charging plugs through the cloud processing network.

[00219] The cloud processing network can then publish availability and prices for users that may be driving around, or may be passing by the retail store along a particular path or route. In some embodiments, the retail store can offer significant discounts for charge, if users charge their vehicles at the charging plugs of the retail store. While the users charge their vehicles, the users may visit the retail store and purchase goods or services, which is a reward for the retailer that is offering the discount for the charge. In still another embodiment, retail stores having charge plugs can advertise availability of the charge plugs (and parking spots) in real time, and

provide discounts or deals to users that may wish to charge at the particular retail location.

[00220] The discounts can be for the goods and services of the retail store, or simple discounts on the charge provided by the charge plugs of the retail store. As noted above, one embodiment would allow the parking spots having the charge plugs to be reserved and advance, to provide additional convenience to users. In such a configuration, the parking spots can include mechanical barriers that lift and close to allow vehicles to come into and leave the particular parking spots. Thus if a parking spot is reserved, the mechanical barrier can remain closed until the vehicle having the code can communicate access to lift the mechanical barrier so that charging can commence immediately upon arriving at the reserved parking spot. In another embodiment, the charging station or plug can include a monitor or display that indicates whether or not the charging plug is reserved.

[00221] If the charging plug is reserved, no other user can park in front of the parking spot, or else received a ticket or fine for parking in a parking spot that's been reserved. The parking spot reservation for charge can be made in advance, such as while user is driving around looking for charge and the reservation is made by smart phone, or an integrated device of the vehicle that has access to the Internet. The transaction can also allow a user that is searching for charge to prepay for the charge using a graphical user interface or other exchange mechanism, associated with the route and reservation of a particular charge station or slot. In some embodiments, the charge stations or plugs can be placed in shared parking lots or locations where multiple retail outlets reside.

[00222] In such a case, multiple retailers can provide discounts to users to come and use the charging stations located at the retailers locations. These

~~discounts~~

can then be published to the cloud processing logic. These discounts can also be published dynamically at the request of the provider of the charge, using an Internet portal, that allows the user to participate in a network of charge stations that provide discounts. In such embodiments, the discounts can be provided by multiple retailers for their goods and services, and the plug can be located in the shared parking lot. Having this information, the cloud processing can communicate with a route generator to generate various routes (e.g., paths) that are optimized to the user's desired outcome.

[00223] The optimization can be to route a user for charge along a plurality of charge stations or plugs that provide discounts. If this is the goal of the user, the route may be longer than other routes, but the discounts may be greater. Such routes may be viewed as a sponsored path, that requires a user to traverse a particular route in order to obtain charge for their vehicle. The sponsored routes can change dynamically over time, as sponsors decide to add or remove discounts. Thus, a user that finds a good path may wish to buy now, to avoid losing the discount. If a particular charge station or chart plug has a lot of customers during a particular period to time, the discounts may drop dynamically. If the charge plug for station experiences low activity, the discounts may be increased dynamically. The dynamic adjustment of discounts can occur based on a preset number of rules (e.g., what discount, where offered, when offered, how long it lasts, incentives for fast buy, logic for combining discounts, logic for sharing costs of discounts with others, logic for reducing the cost of the charge, etc.), as set by the provider the charge and/or the sponsor.

[00224] Figure 37B illustrates an example of a charge station and its metrics, in accordance with one embodiment of the present invention. In this example, the charge station has 10 plugs and 6 plugs are in use at a particular period of time. The charge station can also have historical data that can provide estimates of when charge

~~plugs~~

would be available. Additionally, the charge station metrics can also provide charge cost estimates, which can be adjusted dynamically over time.

[00225] The cost for the charge can also be provided with a green rating, which signifies how efficient the charge station is in supplying charge, and the location and source of the charge provided by the charging station. If the charging station obtains charge from wind power, the green rating would be high. If the charge station receives its charge from fossil fuels, the green rating may be lower. If the charging station receives is charge from a variety of different sources, whether solar, wind, or fossil fuel, the green rating can be adjusted. This metric information can then be provided to the cloud processing to allow users of electric vehicles to decide whether or not to visit a particular charge station or charge plug.

[00226] In some embodiments, the price of the charge may be more expensive if the green rating is very high, but the charge value to the user may be high, if the user wishes to obtain a very high green rating, and a lower carbon footprint.

[00227] Figure 37C illustrates an example of route options for driver A, as shown in figure 30A, in accordance with one embodiment of the present invention. In this example, a display screen can be provided in the vehicle which would allow the user to be informed of where charge is available now for a certain price. The user can select to get a map route, get information regarding distance, get information regarding discounts, reserved charge plugs are stations, cancel request, or show lower rate charge options and distances associated with obtaining the lower cost charge.

[00228] This is only one example of the various options provided to the user through a graphical user interface. As noted above, the graphical user interface can be integrated with the vehicle, or can be part of a smart device that communicates with the

vehicle. The smart device that communicates with the vehicle can communicate using wireless technology so that metrics associate with the vehicle and location of the vehicle can be obtained and then communicated to the cloud processing to exchange information.

[00229] Figure 38 illustrates one example of metrics data that can be obtained by a transportation vehicle (TV), and communication to and from other networked TVs, in accordance with one embodiment of the present invention. In this example, information can be obtained from a particular vehicle, such as service and repair history, whether user is willing to sell or exchange the vehicle, the replacement cost of the vehicle versus repairing the vehicle, the replacement part cost of a vehicle, parts to replace for vehicle (as known from historical data of the same vehicle, or based on a current malfunction), the fuel rates, fuel locations for charge, route generators, modification suggestions for driving to increase performance, accident avoidance data, comparable vehicle current market price, recall information for the current vehicle, etc.

[00230] This information can be obtained from the vehicle or from the users of the vehicle. This information can also be obtained by the cloud processing which communicate with other systems connected to the Internet. Other systems can be data stores for information concerning the same vehicle, historical data concerning potential breakdown of the vehicle, price estimates of the vehicle, marketplace data concerning exchange the vehicle, etc. This information can be provided at the vehicle to the user through a computer user interface. On demand, the user can determine whether it's worthwhile to exchange the vehicle for another vehicle, and the potential of the current vehicle to break down.

[00231] Furthermore, the user may decide that it's time to exchange the vehicle for new vehicle, and market rates for the current vehicle based on actual vehicle data

~~of the~~

user's vehicle, can be used to identify its current market price. The current market price for replacement vehicle can also be obtained dynamically, and comparable data can be presented to the user in the user interface. Accordingly, the user would not have to input information concerning its vehicle into the user interface simply to figure out what the market price is. The data concerning the vehicle is inherently collected and stored in the vehicle memory based on vehicle use, age, accidents, condition, etc. Additionally, information concerning available vehicles near the user which may be for sale can also be attained dynamically and in real time.

[00232] For example if the user wishes to replace the vehicle, the user can simply click a button, select an icon, touch a screen, speak a command, gesture an input, etc., to figure out what his vehicle value is, the cost of a replacement vehicle, and the total cost after exchange. This information can be useful to the user in deciding whether or not to trade in the vehicle or remain with the current vehicle and make investments in repairs. As shown, the data exchange between vehicles and the vehicles and the cloud processing can be extensive, but such information can be made available to drivers of those vehicles to make informed decisions.

[00233] Figure 39 illustrates an example of various paths that a driver can make between point A and point **B.** For example, point A can be the current location of a vehicle, and point **B** can be the destination that the vehicle user wishes to traverse. If the user needs to travel to point **B** from point A, the system in the vehicle, as connected to the cloud processing, can determine various paths to take between A and B. In one embodiment, the user wishes to traversed directly to point **B,** and does not wish to receive any sponsor discount along the path.

[00234] This path would then generate a recommendation to the user to charge the vehicle at charging stations C1. In another embodiment, the user may wish to

~~traverse~~

the path between A and B, but receive some sponsored assistance in the charge or discount on a good or service. In this example, the system can generate a path between A and **B,** where the user may stop and charge at charging station C2 (or plug location). In this embodiment, the system will calculate that the user can traverse from point A to C2 with the current charge availability in the vehicle, and then arrive at point B. In another embodiment, the user may wish to select a different path 2, which is also a sponsored path that takes the user to charging stations or plugs C3 and C4, before reaching point B.

[00235] In this example, the user may have received additional discounts from the providers of the charge at C3 and C4, or from a sponsor that sponsored a discount at the charging stations or plugs C3 and C4. In this example, a retail outlet that sits proximate to the charging station or charging plugs can provide a discount to the users to charge their vehicles at C3 and C4, or they can provide a discount at the retail outlet, which would be proximate to the location of C3 and C4. The discount provided by the various retailers that sponsored the charging stations can be dynamically posted, so that drivers can obtain current and real-time discounts as they drive around and look for charge.

[00236] The drivers can also be provided with information of the duration of the discount, so that drivers can obtain the discount if they have the time to traversed the path, or avoid the path if the discount will not be present when the driver arrives at that application. In another embodiment, the logic in the vehicle or the processing system in the cloud processing can determine whether or not the user would be able to arrive at each of the charging stations or plugs to receive the sponsor discounts. This analysis can include, for example, reviewing traffic patterns, travel speeds and estimates to traversed the different distances, time of day, etc.

[00237] In another embodiment, the user may select to traversed path 3, which takes the user to charge provider *CS* and C6 before progressing on path B. In this illustration, it is shown that the user must go off path to travel to charge C6. However, it may be more beneficial for the user to travel to charge C6, as that location is offering a larger discount. In some embodiments, even though the user travels off path, the discounts offset the cost of going off path. In some embodiments, going off path can actually be faster if the particular charge stations or pumps or plugs are more available and there is less wait. In still another embodiment, the user may not actually have a path in mind, and the user may select to simply obtain charge and would be provided with path 4.

[00238] In this example, the users looking to charge the vehicle along a path that is sponsored. A currently sponsored path may be to charge C7. The user can be provided with an option of charge discounts, which can include discounting the cost of the charge itself, or discounts to retail or service providers that are proximate to the charge outlet. In such an embodiment, the data can be provided to the display of the users car or vehicle, or can be provided to the users device. For example, if the user wishes to obtain charge, and the users currently sitting in his or her office, (and the car is in the parking lot) the user can select it obtain a sponsored path to obtain charge. That sponsored path can identify the closest station, or a number of stations or plugs their offering particular discounts.

[00239] In some embodiments, the discounts are provided by a combination of the charge station and retail shops nearby. In other embodiments, the retail shops and plugs/charge providers can provide combined packages of discounts, which could drive users to their location. Accordingly, it should be understood that the dynamic generation of paths can be sponsored, such that the user can be provided

~~with~~

identification of charging locations along a particular path, and the discounts that may be provided along those particular paths.

[00240] Figure 40 illustrates an example of data that can be provided or associated with the various paths describe in figure 39, in accordance with one embodiment of the present invention. As shown, the path that is displayed by the system of the vehicle, or the processing provided by the cloud processing, can provide information that is displayed to the user.

[00241] Again, the information displayed to the user can be displayed in the vehicle's display screen or can be displayed on the users display device (e.g. smart phone, computer, tablet, etc.). In this example, path 1 can be selected such that the user simply wishes to obtain charge and the path is not a sponsored path. In this example, the user is provided with information, such as the mapping of the path, whether the reward or sponsor is provided, the estimated trip time with charge stopped, and estimated cost. This information is generated dynamically for the particular point in time when the user wishes to obtain charge. In path 1, the number stops is still 1, but the sponsored path is sponsored by big coffee company.

[00242] Big coffee company is going to provide a $2 off charge discount to the user, which lowers the price from $10 to $8 for the charge. The time increase in the charge time is only 2 min., but the discount was $2. For some people, the discount is not sufficient to overcome the additional amount of time taken to obtain the discount, but for others, the discount is sufficient. Sponsored path 2, illustrates that stops are provided and the sponsors are a quick stop market and a big coffee shop. The discount in this scenario is $4 off of the charge bill. The estimated time is now 17 min., which is 5 min. longer than an unsponsored path, but the discount is $4 off a $10 non-sponsored charge.

[00243] Path 3 illustrates an example where there are 2 stops, and the sponsors are box store and big coffee company. In this example, the discount is $5 off the charge bill. And the estimated time with charge stopped is also 17 min., while the total cost to the user for the charge would be $5. Path 4 would be another sponsored path where the number of stops is O between the current location and the charge location. In this example, the path is sponsored by big coffee company.

[00244] Big coffee company is providing a $1 off the charge bill (or a free coffee or discount on coffee), and the estimated time with charge stopped is 5 min. This example would be one where the user simply wishes to obtain charge now, but also wishes to obtain a discount. Map information (e.g., dynamically generated maps (street and satellite) on a display using internet provider data) can also be displayed on the users device or vehicle display, including any other options and discounts provided. This information can be provide using a global positioning map, with turn by turn directions, voice directions, voice activation, etc. Voice input and voice output is also possible for providing information regarding the sponsored paths. As the discounts changed during the day or different times, the different map options can also change. The providers of the discounts can also dynamically change your discounts over time based on the desired need to drive traffic to their locations or charge spots.

[00245] Accordingly, the generated maps/paths for users are incentivized to provide the user with the desired sponsored path for obtaining charge. Broadly speaking and without limitation, obtaining charge will include plugging the vehicle into a charging receptacle so as to charge the native battery of the vehicle. In another embodiment, obtaining charge can also include refilling on volt bars to replenish volt bars that have been used during the vehicle usage. In other embodiments, charge can be transferred

to a vehicle wirelessly (e.g., without plugging in an outlet or receptacle). Examples can include a transfer surface that the vehicle parts over, and the charge can be transferred wirelessly to the vehicle via conductors on the underside of the vehicle. The vehicle can simply part in the slot and once payment is made, the charge can start to flow capacitively or wirelessly to the electric vehicle.

[00246] As can be appreciated, the sponsored path process can provide a quick and efficient manner for allowing the user to identify their desired endpoint, and provide options for traversing a path to that and point. Along that endpoint, the user can be provided with discounts for charge by sponsors, which can influence or drive people to their charging outlets. The discounts can also be provided in a hybrid manner, such as providing discounts for the charge and discounts with in the retail outlets that are located proximate to the charging stations.

[00247] Providing this information to drivers in real time is efficient for both drivers and the retail locations. Drivers in their electric vehicles will need charge, and providers of the charge will benefit from driving users to their location. If the user is still progressing along their desired path, the providers of the discount are simply providing a service and driving customers to their location, where the drivers may purchase other goods and services while the vehicle is being charged.

[00248] Sponsored paths can therefore take on various forms, depending on the user's desire to seek faster charge times, lower charge rates, or even obtain charge for free. If the provider of the charge plug or the sponsor the charge plug wishes to pay for the charge altogether, the sponsored path can identify those particular charge locations and provide the user with options to traversed that path along their desired journey from point A to point **B.**

[00249] In one embodiment, the sponsored paths may be generated on electronics and circuitry of the vehicle, or by processing in the cloud processing system (e.g. networked Internet systems). In some embodiments, the sponsor paths may be processed partially on the vehicle and partially on the cloud processing system. In some embodiments, the sponsored paths would be dynamically generated on the cloud processing system, and the vehicle or smart phone of the user would simply connect to the cloud processing system.

[00250] The data exchange can therefore be dynamically set to be real time, such that providers of the discounts, providers of the charge, and drivers of the vehicles can exchange information. In this example, the provided to the charge can provide discount information, incentives, etc., and the drivers of the vehicles can provide information concerning their desired paths. The processing system can then generate a plurality of options for the user to traverse from point A to point **B.** For example, the user can select to traverse a sponsored path, to a particular address. The display the vehicle can then requested the user identify whether or not a sponsored path is desired.

[00251] If the sponsored path is desired, the vehicle to provide one or more options for traversing the path, and the metrics associated with traversing the various types of paths, as shown in figure 40. This information can also be provided to the user via voice input and voice output, to avoid excessive display data inside of a vehicle. In one embodiment, instead of relying on the user to request a sponsored path, the information regarding sponsored paths can be automatically pushed to the electric vehicle as the vehicle is driven around. For instance, if a reward is being offered ahead of the driving path, the navigation system can inform the user "You will need charge in X miles, and a reward X is being offered if you charge at location X in two

~~miles." These notifications can be pushed to the electric vehicle dynamically, and presented to the user's display on demand or can be provided as alert to the user. The alerts can be voice alerts, sound alerts, dashboard icons, gauges, or combinations thereof. Thus, the information regarding availability of charge and any rewards can be obtained dynamically by the user on demand or can be provided to the user dynamically using push notification. The notification method can also be programmed by the user, so that the notification is best received.~~

~~[00252]~~] It will be obvious, however, to one skilled in the art, that the present invention may be practiced without some or all of these specific details. In other

instances, well known process operations have not been described in detail in order not to unnecessarily obscure the present invention.

~~[00253] Embodiments~~[00283] The various embodiments defined herein may define individual implementations or can define implementations that rely on combinations of one or more of the defined embodiments. Further, embodiments of the present invention may be practiced with various computer system configurations including hand-held devices, microprocessor systems, microprocessor-based or programmable consumer electronics, minicomputers, mainframe computers and the like. The invention can also be practiced in distributed computing environments where tasks are ~~performed~~peifonned by remote processing devices that are linked through a wire-based or wireless network.

[~~00254~~00284] With the above embodiments in mind, it should be understood that the invention could employ various computer-implemented operations involving data stored in computer systems. These operations are those requiring physical manipulation of physical quantities. Usually, though not necessarily, these quantities take the ~~form~~fom1 of electrical or magnetic signals capable of being stored, transferred, combined, compared and otherwise manipulated.

~~[00255~~[00285] Any of the operations described herein that ~~form~~fonn part of the invention are useful machine operations. ~~The~~TI1e invention also relates to a device or an apparatus for ~~performing~~peiforming these operations. The apparatus can be specially constructed for the required

purpose, or the apparatus can be a general-purpose computer selectively activated or configured by a computer program stored in the computer. In ~~particular~~paiticular, various general-- purpose machines can be used with computer programs written in accordance with the teachings herein, or it may be more convenient to construct a more specialized apparatus to perform the required operations.

~~[00256~~

[00286] The invention can also be embodied as computer readable code on a computer readable medium. The computer readable medium is any data storage device that can store data, which can thereafter be read by a computer system. ~~The~~1he computer readable medium can also be distributed over a network-coupled computer system so that the computer readable code is stored and executed in a distributed fashion.

~~[00257] Although the foregoing~~**[00287]** It should be understood that various examples are shown herein, and the examples and figures should not limit a claimed embodiment to any specific example or figure. To the contrary, it should be understood that various embodiments are possible which can be made by combined features found in the illustrations, description and figures. Tims, some embodiments are possible for specific combinations of figures and parts taken from the various drawings, descriptions to define specific implementations, as supported by the description. Additionally, any of the flow diagrams should not require any embodiments to include any enumerated step, operation or order. Some operations may be taken in different orders from that show as examples in the figures, depending on the desired implantation, as suppotted by the description.

[00288] Although theforegoing invention has been described in some detail for purposes of clarity of understanding, it will be apparent that ~~certain~~ce1tain changes and modifications can be practiced within the scope of the appended claims. Accordingly, the present embodiments are to be considered as illustrative and not restrictive, and the invention is not to be limited to the details given herein, but may be modified within the scope and equivalents of the ~~appended~~description and claims.

~~What~~what is claimed is: