ARCHITECTURE FOR ACCESSING HEALTH CARE SERVICES SEAMLESSLY ACROSS DEVICES

DESCRIPTION

[0001]   As required, detailed embodiments of the present invention are disclosed herein; however, it is to be understood that the disclosed embodiments are merely exemplary of the invention that may be embodied in various and alternative forms. The figures are not necessarily to scale; some features may be exaggerated or minimized to show details of particular components. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a representative basis for teaching one skilled in the art to variously employ the present invention.

[0002]   An architecture for monitoring healthcare sensor readings and providing notifications to designated caregiver(s) via multiple device endpoints (set-top box, tablet, and mobile phone) and allowing the caregiver to take action upon the notification(s) is contemplated.

[0003]   An architecture is proposed whereby information collected from healthcare sensors in the home can be aggregated and then rules applied to determine if certain thresholds have been met, which would prompt notification(s) to be sent to one or more devices.

[0004]   The components may include: an overall architecture; a use of the TV as a device for health care related communication; a use of Voice APIs for dynamic (i.e., non-fixed end user) communications (one-way or two-way); a use of Video APIs for display on the TV and Tablet platforms, and integration with voice communications; and use of augmented alerts to provide health care related information.

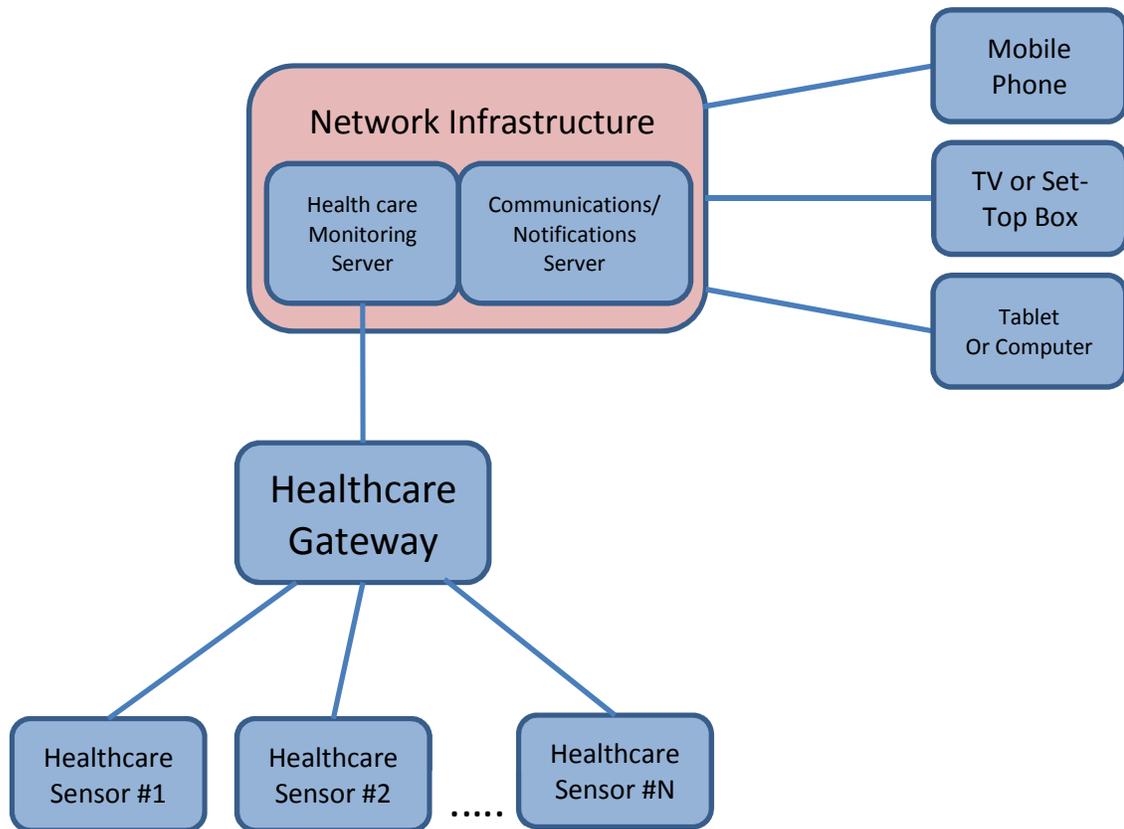[0005]   The logical elements may include the following:

[0006]   *   The **healthcare sensors** are devices used to help monitor the condition of an individual while in their home. Such devices may include, but are not limited to, blood pressure monitors, fall sensors, weight scales, motion sensors, etc. These devices communicate both wired and wirelessly with a healthcare gateway, also located in the home.

[0007] * The **healthcare gateway** is a device that that provides two-way wired and wireless communications with the healthcare sensors in the home. Healthcare sensors report their readings to the gateway, which in turn, sends the information to the healthcare monitoring server. Commands coming from the healthcare monitoring server also flow through the healthcare gateway to the healthcare sensors to initiate actions on the sensors, such as turning them on/off or setting configuration parameters. The presence of such a health care gateway can help translate device specific communications into a normalized mechanism, although it is conceivable that the devices communicate directly (i.e., without a gateway).

[0008] * The **health care monitoring server** is an addition to the network infrastructure that receives communications from the healthcare gateway and may also send commands through the healthcare gateway to the healthcare sensors. It's responsible for storing the data (sensor readings), configuring thresholds based upon the healthcare sensor data, and applying rules to the data to determine if those thresholds have been met.
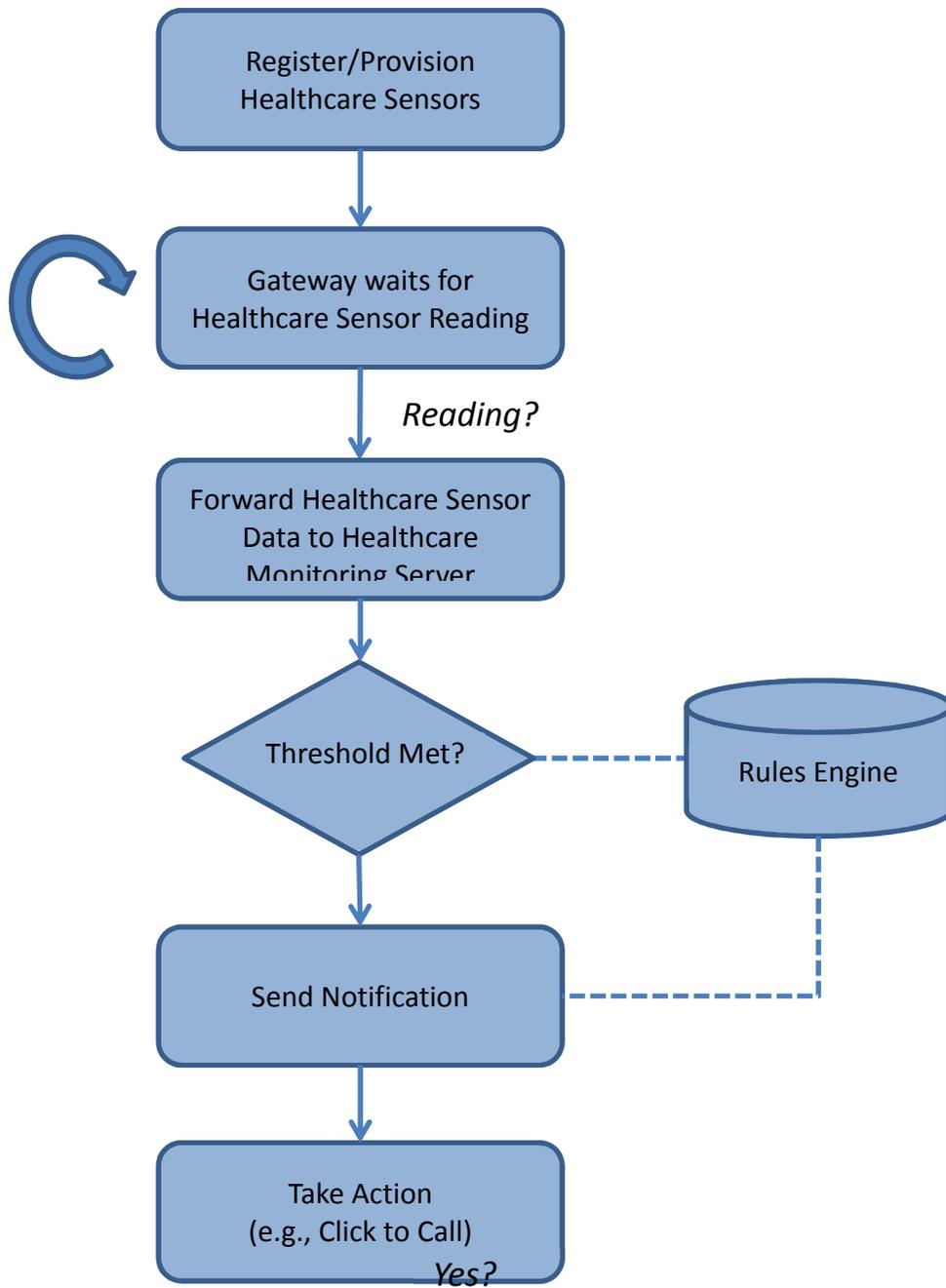
[0009] * The **communications/notifications server** is another addition to the network infrastructure that is responsible for initiating all notifications to consumer electronic devices that are a result of a threshold being met by the healthcare sensors. It can use a variety of communications protocols and applications.

[0010] * The devices that can receive notifications include any consumer devices, such as: a **mobile phone**, **tablet computer**, a TV (if it is capable), or **set-top box**.

Figure 1: Logical Elements

[0011]

[0012]   An algorithm for how the software would work when a healthcare sensor is triggered is presented in Figure 2.

Register/Provision
Healthcare Sensors

Gateway waits for
Healthcare Sensor Reading

Reading?

Forward Healthcare Sensor
Data to Healthcare
Monitoring Server

Threshold Met?

Rules Engine

Send Notification

Take Action
(e.g., Click to Call)

Yes?

[0013]   **Figure 2 Healthcare Sensor Triggered Algorithm**

[0014] <u>Proposed enhancement of communications</u>

[0015] Rather than specialized devices (e.g., a specific hand held), have provided mostly one-way display of messages (e.g., an alert) and have had pre-fixed actions (e.g., call emergency services), this architecture calls for:

[0016] * Using any end device for notifications, including the TV (a commonly available consumer device) – as long as it supports the assumptions that follow

[0017] * Development and/or utilization of applications that can enable voice and video communication

[0018] * Integration of notifications and voice and video communications in a dynamic manner to allow for configuration of notifications and video communications

[0019] <u>End-device assumptions</u>

[0020] Devices (e.g., tablets, mobile phones, TVs) either have built-in support, or allow for video input (e.g., via an STB for TV), for the following abilities:

[0021] * Applications

[0022] * Alerts (e.g., pop-up notifications)

[0023] * Cross-platform APIs (e.g., Web services based, or proprietary,)

[0024] * Microphone and speaker for voice and video communications

[0025] * Camera for two-way video communications

[0026] <u>Notifications</u>

[0027] In the case where an event is reported by one or more health care sensors, e.g., "grandma has fallen down", this will trigger activity in the health care monitoring server, which directs the communication/notification server to send alerts to the caregivers, via the configured devices. In addition:

[0028]   *   Use of Voice APIs for instant one- or two-way communications

[0029]   *   Any alerts are coupled with Voice APIs (e.g., web services based options) for the caregiver to be able to make voice calls within the alert notification. The voice calls can be initiated based on configuration (e.g., neighbor, doctor) or via integration with a contact list on the device (e.g., if it is a phone). It is to be noted that the Voice APIs are not limited to phones. They can be used within browser.

[0030]   *   Use of Video APIs for display on the TV and Tablet platforms, and integration with voice communications

[0031]   *   For those devices who can support video (one-way or two-way) then the alerts can allow for video conferencing (one-way or two-way) with the other end-device. This is most useful when the caregiver and the person being monitored (e.g., grandma) can see each other, but one can also perceive the usefulness with one-way communication (e.g., to reassure Grandma, or to view current status).

[0032]   <u>Use of augmented alerts to provide health care related information</u>

[0033]   In addition to notifications, and the ability to communicate, the increasingly richer end-devices can be used to display "augmented" information. For instance, the health care monitoring server can share relevant information from other devices, both: at the time of the event (e.g., "Grandma had a fall") and dynamically when the alerts are being viewed or acted on. Such information can include, but not limited to, vitals, such as blood pressure and heart rate. It can also include historical data (e.g., graphs from previous days/weeks/months, or previous incidents). This can be especially useful if one of the recipients is a health care provider.

[0034]   **<u>Implementation</u>**

[0035]   The implementation of the interfaces described in this architecture can be implemented using:

[0036]   *   Web services (e.g., RESTful or SOAP-based)

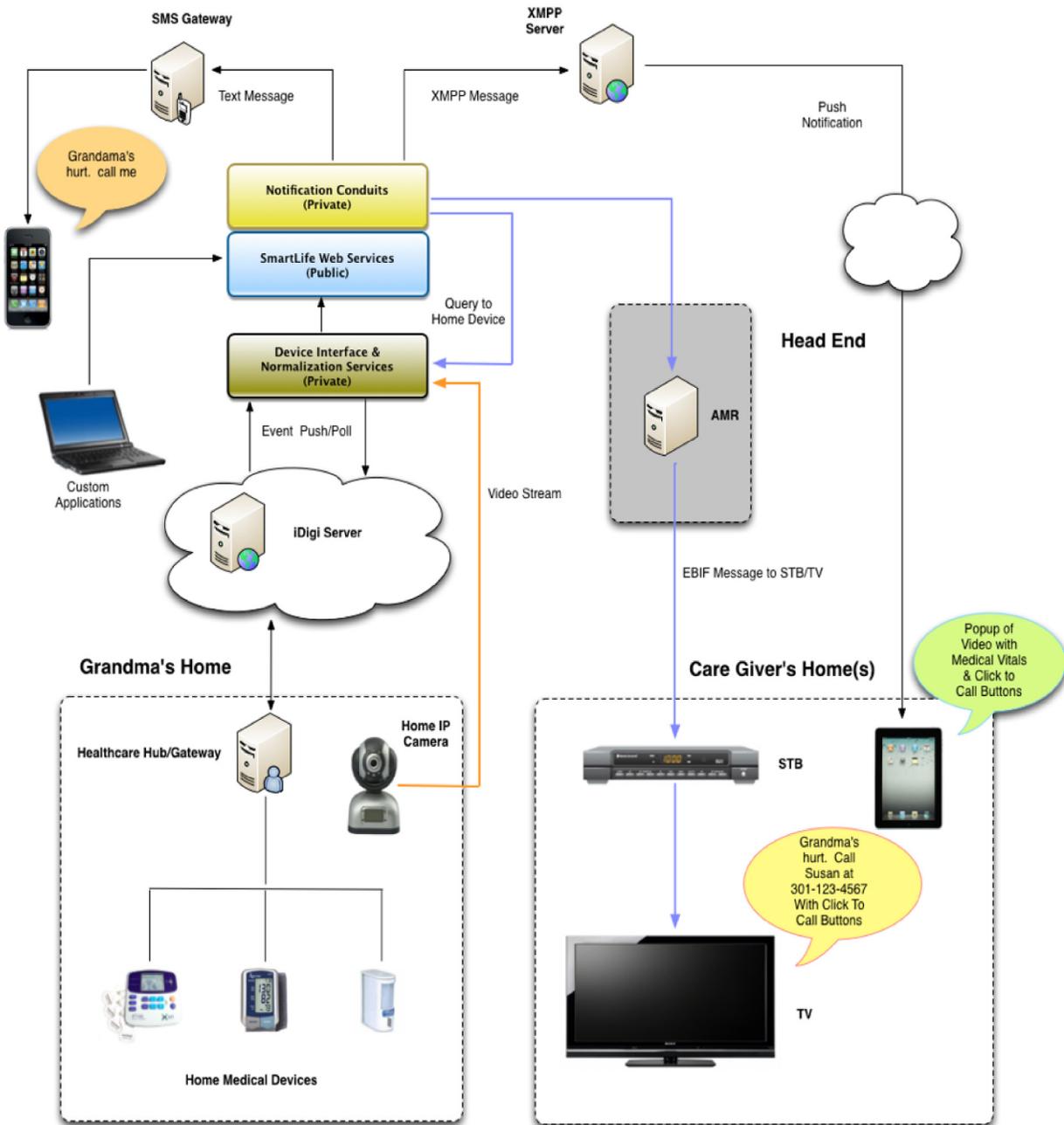**[0037]**   *   Messaging services (e.g., XMPP, SMS)

[0038]   *   TV or STB middleware (e.g., Tru2way, EBIF etc.)

[0039]   *   Voice APIs (e.g., Twillio)

[0040]   *   Video APIs (e.g., SIP-based)

[0041]   **<u>Sample Architecture with the Cable Architecture</u>**

[0042]   The following diagram provides a sample implementation with the cable architecture, using "Aging-in-Place" as the example health care service.

[0043]   Figure 3 Implementation within a Cable Infrastructure

[0044]   In Figure 3, the Notification Conduits implement the functionality to support the Communication/Notification service and the iDigi Server implements the functionality to support the Healthcare Monitoring service described within this document. The SmartLife Web Services is a set of public Web Services to support the development of third party applications that want to consume services provided by this infrastructure. An AMR (Asynchronous Message Relay) is component in a

cable headend that provides a TCP interface to enable server-side applications to send UDP datagrams asynchronously to a digital cable set-top box.

[0045]   Rather than health care services are being offered independently, i.e., without tie-in into everyday devices – esp. the TV, which may be done because the health care providers do not provide video or voices services on their own (traditionally), and hence, go 'over the top'. With a desire for 'differentiation' from over-the-top, the present invention contemplates integrating these health care services with existing capabilities.
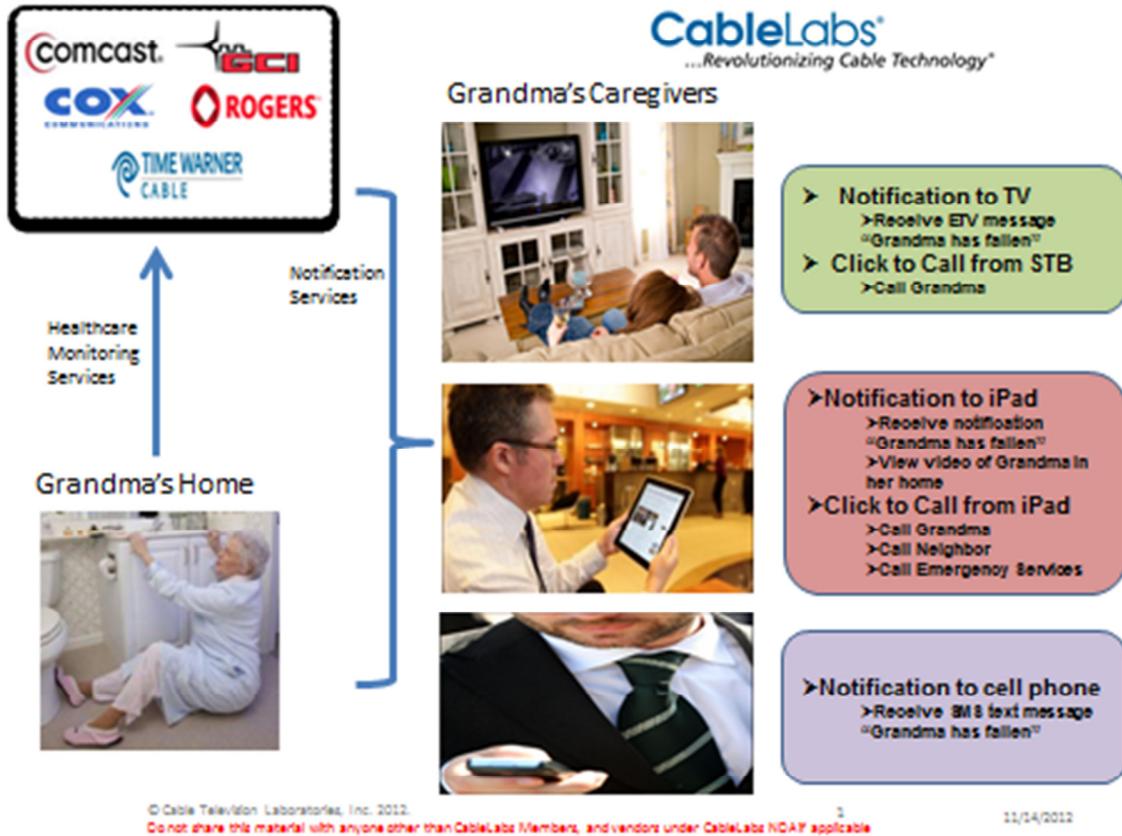
[0046]   From a consumer standpoint, this solves a few different issues:

[0047]   *   No new devices are needed

[0048]   *   There is no need to scramble for communication when an alert is received, various options are integrated into the alert

[0049]   *   There is no need to "look up" related data, the augmented information provides it automatically.

[0050]   One aspect of the present invention contemplates combining home healthcare monitoring services with notifications to a caregiver when health care sensors are triggered to the set-top box via an ETV application using EBIF, notification to an iPad using XMPP messaging, and SMS test messaging to a mobile phone via an SMS gateway. The notification to the iPad and the STB also include the ability to click to call to establish a voice call between the person that received the notification and another party to get the person being monitored for health conditions some help if necessary. The notifications can contain health care information from the healthcare sensors in the home.

[0051]   While exemplary embodiments are described above, it is not intended that these embodiments describe all possible forms of the invention. Rather, the words used in the specification are words of description rather than limitation, and it is understood that various changes may be made without departing from the spirit and scope of the invention. Additionally, the features of various implementing embodiments may be combined to form further embodiments of the invention.