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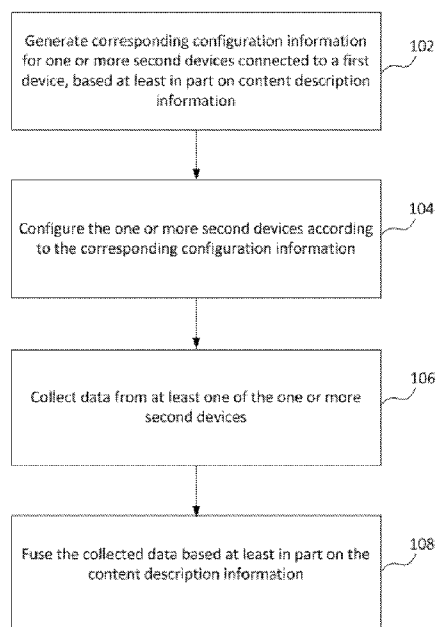


Fig.1

(57) Abstract: A method for management of interoperable devices may comprise: generating corresponding configuration information for one or more second devices connected to a first device, based at least in part on content description information; configuring the one or more second devices according to the corresponding configuration information; collecting data from at least one of the one or more second devices; and fusing the collected data based at least in part on the content description information.

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MANAGEMENT OF THE INTEROPERABILITY WITH HEALTH-RELATED DEVICES

FIELD OF THE INVENTION

The present disclosure generally relates to communications, and more specifically, relates to management of interoperable devices.

BACKGROUND

Communication service providers and device manufacturers are continually challenged to deliver value and convenience to consumers by, for example, providing compelling network services, applications, and contents. The development of communication technologies has contributed to an insatiable desire for new functionalities. One area of interest is the development of services and technologies for supporting care services with mobile Health (mHealth) systems and products. For aging people who live independently, a personal connected health system may help to bridge them with their care givers. However, not everyone has the Internet network in his/her home, nor is everyone able to operate various Electronic devices (Edevices) to interact with remotes stakeholders. Thus, it is desirable to design a mechanism for the user environment where a consumer has insufficient cyber knowledge to operate devices, or a consumer has no Internet connection, or a consumer has poor adherence towards a service provider's advices (for example, due to amnesia).

SUMMARY

The present description introduces a novel scheme to simplify personal operations and thus to improve efficiency, correctness and quality of services.

According to a first aspect of the present disclosure, there is provided a method

comprising: generating corresponding configuration information for one or more second devices connected to a first device, based at least in part on content description information; configuring the one or more second devices according to the corresponding configuration information; collecting data from at least one of the one or more second devices; and fusing the collected data based at least in part on the content description information.

According to a second aspect of the present disclosure, there is provided an apparatus comprising: at least one processor; and at least one memory comprising computer program code, the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus to perform at least the following: generating corresponding configuration information for one or more other apparatuses connected to the apparatus, based at least in part on content description information; configuring the one or more other apparatuses according to the corresponding configuration information; collecting data from at least one of the one or more other apparatuses; and fusing the collected data based at least in part on the content description information.

According to a third aspect of the present disclosure, there is provided a computer program product comprising a computer-readable medium bearing computer program codes embodied therein for use with a computer, the computer program codes comprising: code for generating corresponding configuration information for one or more second devices connected to a first device, based at least in part on content description information; code for configuring the one or more second devices according to the corresponding configuration information; code for collecting data from at least one of the one or more second devices; and code for fusing the collected data based at least in part on the content description information.

According to a fourth aspect of the present disclosure, there is provided an apparatus comprising: generating means for generating corresponding configuration

information for one or more other apparatuses connected to the apparatus, based at least in part on content description information; configuring means for configuring the one or more other apparatuses according to the corresponding configuration information; collecting means for collecting data from at least one of the one or more other apparatuses; and fusing means for fusing the collected data based at least in part on the content description information.

In accordance with an exemplary embodiment, the apparatus according to the second/fourth aspect of the present disclosure may comprise the first device, and the other apparatus according to the second/fourth aspect of the present disclosure may comprise the second device.

In accordance with an exemplary embodiment, the content description information may be associated with one or more content requirements from a service provider. The configuration information may indicate one or more data acquisition parameters for collecting the data from the at least one second device.

In accordance with an exemplary embodiment, said configuring the one or more second devices according to the corresponding configuration information may comprise: sending one or more configuration instructions generated from the corresponding configuration information to the respective second devices to configure behaviors of the respective second devices.

In accordance with an exemplary embodiment, said fusing the collected data based at least in part on the content description information may comprise: processing one or more content items related to the content description information, obtaining data corresponding to the one or more content items from the collected data, and generating a report based at least in part on the obtained data, according to the content description information.

In accordance with an exemplary embodiment, the content description information may be related to one or more of static content items, metadata content

items and interactive content items. The data collected from the at least one second device may comprise metadata corresponding to one or more metadata content items related to the content description information.

In accordance with an exemplary embodiment, the first device may be operable in an installation mode, an editing mode and a normal mode. For example, a connection between the first device and the second device may be established or removed in the installation mode, based at least in part on the content description information. One or more content requirements may be input to the first device from a service provider in the editing mode to update the content description information. At least one of a configuration operation, an interaction operation, a data collection operation and a data fusion operation of the first device may be performed in the normal mode.

In accordance with an exemplary embodiment, the interaction operation may comprise an information acquisition operation, an information rendering operation, a user notification operation or a login operation. For example, the information acquisition operation may comprise: presenting a questionnaire content of an interactive content item to a user, receiving feedback information towards the questionnaire content from the user, and converting the feedback information into metadata of a metadata content item linked to the interactive content item.

In accordance with an exemplary embodiment, the second device may be connected to the first device via a short-range communication link. The data collected from the at least one second device may comprise at least one of personal data, environmental data, operational status data and auxiliary data.

BRIEF DESCRIPTION OF THE DRAWINGS

The disclosure itself, the preferable mode of use and further objectives are best understood by reference to the following detailed description of the embodiments

when read in conjunction with the accompanying drawings, in which:

Fig.1 is a flowchart illustrating a method for management of interoperable devices in accordance with an embodiment of the present disclosure;

Fig.2 illustrates an exemplary instrument managing the interoperability with source devices in accordance with an embodiment of the present disclosure;

Fig.3 illustrates exemplary operations of a host in accordance with an embodiment of the present disclosure;

Fig.4 illustrates exemplary template editing operations in accordance with an embodiment of the present disclosure;

Fig.5 illustrates exemplary user interactions in accordance with an embodiment of the present disclosure;

Fig.6 illustrates an exemplary operating procedure under the normal mode in accordance with an embodiment of the present disclosure;

Fig.7 illustrates an exemplary information fusion procedure in accordance with an embodiment of the present disclosure; and

Fig.8 is a simplified block diagram of an apparatus suitable for use in practicing exemplary embodiments of the present disclosure.

DETAILED DESCRIPTION OF THE INVENTION

The embodiments of the present disclosure are described in details with reference to the accompanying drawings. Reference throughout this specification to features, advantages, or similar language does not imply that all of the features and advantages that may be realized with the present disclosure should be or are in any single embodiment of the disclosure. Rather, language referring to the features and advantages is understood to mean that a specific feature, advantage, or characteristic

described in connection with an embodiment is included in at least one embodiment of the present disclosure. Furthermore, the described features, advantages, and characteristics of the disclosure may be combined in any suitable manner in one or more embodiments. One skilled in the relevant art will recognize that the disclosure may be practiced without one or more of the specific features or advantages of a particular embodiment. In other instances, additional features and advantages may be recognized in certain embodiments that may not be present in all embodiments of the disclosure.

In many cases concerning health care, especially in developing countries, people may only have standalone home health devices (such as glucose meter, thermometer, etc.) in place, but still rely on hand-writing notes to record physiological measurements and subsequently bring such notes to care givers manually. Such way of information transferring has low efficiency, high risk of data loss and data error, low usability and low readability, which may result in poor interoperability between consumers and service providers.

In comparison to the solutions on the basis of manually-recorded-paper or Universal Serial Bus (USB) stick, methods, apparatus, and computer program products provided according to exemplary embodiments of the present disclosure can help people who need home care and primary care services with improved management of the interoperability with health-related devices. Such services may comprise, but not limited to, disease management, health management, health education, rehabilitation and/or the like. In particular, the offline-based solution proposed in the present disclosure can be implemented without the Internet connection.

Fig.1 is a flowchart illustrating a method for management of interoperable devices in accordance with an embodiment of the present disclosure. The method illustrated in Fig.1 may be performed, for example at a first device such as a host or

an instrument managing the interoperability with at least one second device. In an exemplary embodiment, the second device may be connected to the first device via a short-range communication link. For example, the second device may comprise a peripheral source device having a short distance from the first device. In most home or personal environments, the required data communication distance is short, thus low power transport technologies (such as Bluetooth Smart, ZigBee, Near Field Communication (NFC) or the like) can be leveraged. However, it will be realized that long-distance data communication technologies are also applicable to the proposed solution.

The first device in accordance with exemplary embodiments may comprise a portable device, a personal digital assistant (PDA), a user equipment, a desktop computer, a laptop computer, a tablet computer, a mobile station, a wireless terminal, a smart phone, or any other devices applicable to interoperability management as described herein. The second device in accordance with exemplary embodiments may comprise data source devices, information capture devices or data sensors, such as various health-related devices, which can provide data required by the first device for a target person such as a cared person. In an exemplary embodiment, the first device may be capable of collecting or obtaining the required data for the target person, and in that case the second device may be considered as an internal device or component of the first device.

According to the method illustrated in Fig.1, the first device may generate corresponding configuration information for one or more second devices connected to the first device, based at least in part on content description information, as shown in block 102. The content description information may be associated with one or more content requirements from a service provider such as a health management service provider. For example, the content requirements from the service provider may specify what contents and/or which type of contents are required by the service

provider, and optionally may indicate the way to render the contents.

In an exemplary embodiment, the content description information may be related to one or more of static content items, metadata content items and interactive content items. For example, the contents of a static content item may comprise texts or images, the contents of a metadata content item may comprise some elements indicating what metadata the service provider wishes to acquire and how to acquire such metadata, and the contents of an interactive content item may be any type of rich media information. The content description information may be stored as a template file or a part of the template file accessible to the first device.

The configuration information generated based at least in part on the content description information may indicate one or more data acquisition parameters for collecting data to the first device from the at least one second device. For example, the one or more data acquisition parameters may comprise, but not limited to, time of acquiring data, target person for acquiring data, type of the acquired data, time and format for transferring data, or any combination thereof. Additionally or alternatively, the configuration information may specify some solutions to address the device faults.

According to the corresponding configuration information, the first device may configure the one or more second devices in block 104, and collect data from at least one of the one or more second devices in block 106. For example, the collected data may comprise metadata corresponding to one or more metadata content items related to the content description information. In an exemplary embodiment, the data collected from the at least one second device may comprise at least one of personal data (such as health data), environmental data, operational status data and auxiliary data (such as contextual data).

In accordance with an exemplary embodiment, configuring the one or more second devices according to the corresponding configuration information may

comprise: sending one or more configuration instructions generated from the corresponding configuration information to the respective second devices to configure behaviors of the respective second devices. For example, a configuration instruction may indicate to set or delete at least one configuration of the corresponding second device. The configured behaviors of the second device may be related to data capturing, data transmission, device configuration, device operation and/or the like.

In block 108, the first device may fuse the collected data based at least in part on the content description information. In accordance with an exemplary embodiment, fusing the collected data based at least in part on the content description information may comprise: processing one or more content items related to the content description information; obtaining data corresponding to the one or more content items from the collected data; and generating a report based at least in part on the obtained data, according to the content description information.

For example, the first device may parse the content description information for obtaining content item information associated with a target person, retrieve data of the target person from the collected data (such as metadata) for the respective content items, render static and/or metadata contents associated with the target person according to the content description information, and generate a report (such as a health information summary report) based at least in part on the static and/or metadata contents for the target person (for example, in a printable format). Optionally, the generated report may be sent to a printer connected to the first device, so that a service provider can get the report for the target person.

In accordance with an exemplary embodiment, the first device may be operable in an installation mode, a normal mode or an editing mode. A connection between the first device and the second device may be established or removed in the installation mode, for example, based at least in part on the content description information. A

service provider may import or input one or more content requirements (for example, as template files or template instruction sets) to the first device in the editing mode to update the content description information. In the normal mode, at least one of a configuration operation, an interaction operation, a data collection operation and a data fusion operation may be performed at the first device as required.

According to an exemplary embodiment, the interaction operation may comprise an information acquisition operation, an information rendering operation, a user notification operation, a login operation and/or the like. For example, the information acquisition operation may comprise presenting a questionnaire content of an interactive content item to a user, receiving feedback information towards the questionnaire content from the user, and converting the feedback information into metadata of a metadata content item linked to the interactive content item. The information rendering operation may be performed for rendering user-specific information or some public information, such as medical science knowledge, educational information, subscription information and/or the like. The user notification operation may be utilized to inform a user of certain actions such as measuring some specified parameters, keeping an appointment, paring or maintaining the second device, and/or the like. The login operation may be initiated for the identification, authentication and authorization on the first device.

In an exemplary embodiment, the first device as described in connection with Fig.1 may be implemented as a central device to collect data automatically from one or more second devices such as home health devices. The way of collecting and reporting data may be defined in the content description information (for example, in the form of many pre-installed data collection templates) imposed by various service providers with whom a consumer is engaged. The first device may enable the collected data to be printed out in a predefined way, just by one button-press. The consumer may not have to need any cyber knowledge to use such device.

Here is an exemplary use case. The General Practitioner (GP) may make a biweekly appointment with an aging person (consumer) having chronic disease. The consumer can turn on a central device (such as the first device) and other home health devices (such as the second device). The central device may continuously and automatically collect data from other devices. When the next appointment time is coming, the central device may send a reminder to the consumer. The consumer can operate the central device (for example, press a button in the central device) to print out a formatted data summary, which format may be predefined by the GP. The consumer can simply bring that printed summary to the GP, and the GP can easily parse all information from the summary.

Fig.2 illustrates an exemplary instrument managing the interoperability with source devices in accordance with an embodiment of the present disclosure. The instrument 200 shown in Fig.2 comprises a communication unit 201, a data processing unit 202, a template editing interface 203, a human-computer interaction unit 204, and optionally a printing unit 205. The communication unit 201 may be used for transferring data, establishing connection, facilitating data storage and/or the like. The data processing unit 202 may be used for template related operations, various information (such as configuration information, questionnaire information, voice profile settings, etc.) generation and processing, data analysis, data fusion, and/or the like. The template editing interface 203 may be used for import/export template related information. The human-computer interaction unit 204 may be used for user interactions such as rendering contents, displaying notification information, receiving feedback information, and/or the like.

The instrument 200 may operate as a host which can work together and exchange data with multiple source devices 210 such as health-related devices. It will be realized that the instrument 200 may comprise more or less units than those shown in Fig.2. The instrument or host 200 may act as the first device for perform steps of

the method described with respect to Fig.1, for example by utilizing the same, equivalent or different units compared to those shown in Fig.2.

As shown in Fig.2, the host 200 can be used by a consumer 220, some machine installation personnel 230 or a template editor 240. The consumer 220 may comprise a cared person or his/her relatives. The machine installation personnel 230 may comprise the employee of device vendors or the consumer himself/herself. The template editor 240 may comprise a health management service provider.

In accordance with an exemplary embodiment, the data processing unit 202 may main some data such as template files, tables storing the configurations of data acquisition parameters, metadata and/or the like. A template file may contain a template identifier, a value indicating the amount of template content items contained in this file, one or more template content items, and/or the like. For example, a template content item may contain at least one of the following elements: a content, an identifier of this template content item, a content type of the template content item (such as a static content item, an interactive content item, a metadata content item and/or the like), a rendering method (for example, the way of presenting content items towards users), a rendering position, some triggering conditions of rendering respective template content items, and possible a mapping table (for example, storing the internal mapping between an interactive content item and an metadata content item). The mapping table may conditionally exist for indicating any linked relationship between two content items. If a template file contains no interactive content item (for example, related to questionnaire contents), it may not contain any mapping table.

For the static content item, its content may comprise texts or images, which can be directly placed at a given position in a report (such as a health information summary report to be printed). For the metadata content item, its content may contain at least one of the following elements: an identifier specifying the type of the

metadata to be acquired, an identifier of a target person, the format of the metadata required by a template editor, the schedule of data capturing as required by a template editor. These elements let the host 200 know what metadata a template editor 240 wishes to acquire. As such, the host 200 may generate data acquisition parameters based at least in part on these elements and store them as configurations for use by the data processing unit 202.

For the interactive content item, its content may be any type of rich media (such as video, audio, Scalable Vector Graphics (SVG), etc.) information, which can be directly rendered by the human-computer interaction unit 204 and be presented to a consumer 220. The interactive content may comprise a questionnaire content, medical science knowledge, educational information and/or the like. If it is a questionnaire content, it may be linked to a metadata content item in the same template file, so that the collected user feedback towards this questionnaire content can be associated to the linked metadata content item. In other words, the instrument 200 may treat the user feedback towards this questionnaire content in the same or similar way as device-measured data (such as metadata from the source device 210).

In an exemplary embodiment, metadata may be collected or generated by one or more source devices 210 (such as the second device described with respect to Fig.1) connected to the host 200. The host 200 can acquire metadata from the source devices 210. The source device 210 may be an external sensing device which can sense data (take measurement) and provide the sensed data to the host 200. Alternatively, the host 210 may be capable of sensing and providing the required data, and in this case, the host itself becomes the source device.

The metadata here can be further divided into several types, for example, the health data, the environmental data, the operational status data, and the auxiliary information. For example, the operational status data may describe working conditions of the source devices 210. The purpose of this data is to allow any

potential data user to judge the quality of the data provided by the very source device, or to initiate any device maintenance operation as needed. Typical examples of the operational status data may comprise the remaining battery power, the calibration value, the threshold value, the time accuracy, the calibration time of the source device, the malfunction of certain component, etc. The auxiliary information may comprise contextual information which can be leveraged to facilitate the analysis of the health status of a target person, for example, the demographics information of the cared person. The auxiliary information may be collected or generated by the source devices 210.

The metadata may contain at least one of the following content elements: an identifier specifying the type of the metadata, a timestamp specifying when the metadata was captured, an identifier specifying the source device from which the metadata was acquired, an identifier specifying the target person whom the metadata is about, the raw data (with one of the above metadata types), and the unit of this raw data if applicable. The unit of the raw data may refer to the unit of certain numeric measurement value (such as Celsius or Fahrenheit for a temperature value), which may facilitate to interpret a numeric measurement value correctly.

According to an exemplary embodiment, the tables storing the configurations of data acquisition parameters may contain a set of configurations which can be leveraged by the host 200 to configure its connectivity towards target source devices 210. The configuration may specify multiple technical parameters of acquiring metadata from a source device 210. For example, the configuration may contain at least one of the following elements: an identifier of this configuration itself, an identifier specifying the type of the metadata to be acquired, an identifier of a target person, an identifier of a source device, a list of pairs of identifiers (for example, a first identifier specifies the corresponding stored template file which need the metadata, a second identifier specifies the corresponding template content item in that

template file), the format of the metadata to be transmitted, the schedule of data capturing, the schedule of data transmission, some solutions addressing the device faults, a readiness flag specifying whether this configuration is fully executed by the source device or not, and so on.

With the facilitation of such configuration, the host 200 may also inform the source device 210 about: what data the host wishes to acquire, when such data may be acquired, from whom the data may be acquired, how the output data may be formatted, when such data may be transferred, how to deal with some expected device faults, and/or the like. The table storing the configurations of data acquisition parameters may be continuously maintained by the data processing unit 202, based at least in part on the current contents of template files and the established connections towards the source devices 210.

As shown in Fig.2, the host 200 can import some template instruction sets or template files from the template editor 240 or export some template contents to the template editor 240 via the template editing interface 203. In addition, the template editing interface 203 can transmit the template content items to be rendered to the human-computer interaction unit 204 and receive interactive feedback information to be converted to template instruction sets from the human-computer interaction unit 204. These operations and procedures will be detailed in connection with Fig.4.

Fig.3 illustrates exemplary operations of a host in accordance with an embodiment of the present disclosure. The host 200 as illustrated in Fig. 2 may operate under three operation modes: the installation mode, the normal mode and the editing mode. The source device 210, the consumer 220, the machine installation personnel 230 and the template editor 240 can communicate with the host 200 in different operation modes. For example, in the installation mode, a connection may be established between the source device 210 and the host 200, for example, as specified by the machine installation personnel 230. In the normal mode, the host 200

can interact with the consumer 220, and the source device 210 may be configured and then send metadata to the host 200. In the editing mode, the template editor 240 can input/import one or more template instruction sets or template files to the host 200. These operation modes will now be described in detail in connection with exemplary embodiments.

When the host 200 works under the installation mode, the machine installation personnel 230 can login to the host 200, for example, via the human-computer interaction unit 204, and perform some authentication and authorization processes. One or more source devices 210 (such as some peripheral devices of the host 200) may be setup for pairing with the host 200 by the machine installation personnel 230, so that the source device 210 can establish a wired or wireless connection with the host 200 via the communication unit 201.

In the context of device connectivity, “paring” two devices means to establish a lower-layer transport between them and to activate an application-level data exchange protocol between them, so that both devices are enabled to automatically interact according to the set protocol. Thus, the host 200 may be enabled to send/receive application-level data to/from the connected source device 210 in the normal mode. The source device 210 may collect data required by the host 200, such as health-related information, according to the tables storing configurations of data acquisition parameters which may be updated through the data processing unit 202. The installation mode also allows the machine installation personnel 230 to remove any established pairing between the source device 210 and the host 200.

When the host 200 works under the normal mode, it may generate configuration instructions (such as Set Configuration Instruction, Delete Configuration Instruction and/or the like) based at least in part on the data acquisition parameters, and then send the generated configuration instructions to the corresponding source device 210 in order to configure its behaviors (such as data capturing, data transmission, device

configuration, device operation and/or the like).

For example, the Set Configuration Instruction may contain at least one of the following elements: an identifier of the configuration originated this configuration instruction, an identifier specifying the type of the metadata to be acquired, an identifier of a target person, the format of the metadata to be transmitted, the schedule of data capturing, the schedule of data transmission, and some solutions addressing the device faults. The Delete Configuration Instruction may contain an identifier of the configuration to be deleted. The data processing unit 202 can use the Set Configuration Instruction to configure a source device 210, and use the Delete Configuration Instruction to delete an existing configuration on the source device 210.

According to an exemplary embodiment, the communication unit 201 can maintain the established connection with the corresponding source device 210 and send at least one configuration instruction (such as Set Configuration Instruction) to the source device 210 as needed. In response to executing the at least one configuration instruction and completing the corresponding configuration, the source device 210 may send feedback information to the host 200. Then the source device 210 may sense or collect the required data and/or generate the operational status data, and transmit such data to the host 200. For example, the source device 210 may take measurement from the consumer 220, while the consumer 220 can read the relevant data from the source device 210.

The host 200 can acquire data from the source device 210 following the configured data transmission schedule, and then store the data for use by the data processing unit 202. Optionally, the host 200 may acknowledge the reception of the metadata. The data processing unit 202 can parse the metadata received from the source device 210 through the communication unit 201. The host 200 may generate and send a Delete Configuration Instruction to the source device 210. By executing

the Delete Configuration Instruction, the source device 210 can delete the corresponding configuration, and optionally send feedback information to the host 200.

Under the normal mode, the host 200 can also interact with the consumer 220 via the human-computer interaction unit 204 (for example, through voice, button, etc.) to accomplish various user interaction sub-processes, such as rendering the user notification, the questionnaire content, the medical science educational information and login information, printing the health information summary report, maintaining the list of allowed template editors, and/or the like. Optionally, the consumer 220 may indicate the pairing between the source device 210 and the host 200 via the human-computer interaction unit 204.

When the host 200 works under the editing mode, it may import template instruction sets or template files from the template editor 240 via the template editing interface 203, and/or it may receive the template instruction sets from the template editor 240 via the human-computer interaction unit 204. In an exemplary embodiment, the data processing unit 202 and thus the host 200 are capable of receiving the template instruction sets or the template files from a device of the template editor 240 or the human-computer interaction unit 204 via the template editing interface 203. Optionally, the template editor 240 may export the template files from the host 200 via the template editing interface 203.

A template instruction set is intended to modify an existing template file stored in the host 200 by the data processing unit 202. The template instruction set may comprise a template identifier, one or more modification instructions, and/or the like. A modification instruction may specify which template content item in the identified template file would be modified and how it would be modified. As such, one or more particular template items may be altered, replaced, added or deleted via the template instruction sets.

In accordance with an exemplary embodiment, the template editor 240 can couple or physically connect his/her own device to the template editing interface 203 of the host 200, and complete the login process (such as identification, authentication and authorization) via the human-computer interaction unit 204 of the host 200, so that the template editor 240 could gain right to fully interact with the template editing interface 203. It will be appreciated that the template editor 240 may generate a template file by itself or obtain it from any other suitable entity.

Upon receiving a template file or a template instruction set, the data processing unit 202 can parse it in order to validate respective template instructions inside of it. Then the data processing unit 202 can either store the parsed template instructions as a new template file, or store the parsed template file, or update the existing template file (for example, according to the template identifier), or report any error information back to the template editor 240 via the template editing interface 203. Accordingly, the template editor 240 can obtain the error information through his/her own device's user interface and/or the human-computer interaction unit 204.

Fig.4 illustrates exemplary template editing operations in accordance with an embodiment of the present disclosure. As shown in Fig.4, the template editing interface 203 may be used a dedicated communication interface between the template editor 240 and the data processing unit 202. The template editing interface 203 can receive one or more template files or template instruction sets imported by the template editor 240 through the template editor's device 402 and transmit them to the data processing unit 202, for parsing and storing the template file or executing the template instructions and update the corresponding template file. The template editor 240 can export the template files from the data processing unit 202 via the template editing interface 203.

Alternatively or additionally, the template editor 240 can establish a connection with the template editing interface 203 via the human-computer interaction unit 204.

The human-computer interaction unit 204 can receive some interactive feedback information from the template editor 240, and then send it to the template editing interface 203 (for example, after appropriate format conversion). Alternatively or additionally, the template editing interface 203 may convert the received information into the template instruction set, and then send it to the data processing unit 202. The template editing interface 203 can present the content of the stored template file from the data processing unit 202 to the template editor 240 via the human-computer interaction unit 204.

Fig.5 illustrates exemplary user interactions in accordance with an embodiment of the present disclosure. As shown in Fig.5, the human-computer interaction unit 204 may be used as an interactive interface between a user 501 (such as the consumer 220, the machine installation personnel 230, the template editor 240 or the like) and the host. The human-computer interaction unit 204 may have one or more input/output channels such as speaker, non-touch screen, touch screen, microphone, light, vibration motor, button and/or the like, so as to receive interactive feedback information from the user 501 or present some specified content (such as interactive presentation content or template content) to the user 501.

In an exemplary embodiment, the human-computer interaction unit 204 can parse 503 the interactive feedback information 502 input by the user 501, and optionally convert 504 it into another format according to its type and the current operation mode of the host. The human-computer interaction unit 204 may convert the received information to the information which the template editing interface 203 can process, and transmit the converted information to the template editing interface 203. Correspondingly, the human-computer interaction unit 204 can render some content of a template file transmitted via the template editing interface 203 to the user 501 (such as a template editor). Alternatively or additionally, the human-computer interaction unit 204 may convert the received information to the information which

the data processing unit 202 can process, and transmit the converted information to the data processing unit 202.

In accordance with an exemplary embodiment, the data processing unit 202 can generate an instruction for user interaction 506, which may comprise some interactive presentation content, an interaction mode for this content, some handle(s) of one or more target output channels, and/or the like. The interactive presentation content may comprise the information to be presented to the user 501 via the specified target output channel(s) of the human-computer interaction unit 204. For example, the interactive presentation content may comprise the questionnaire 511, the medical science educational information 512, the user notification 513, or the information related to a login process for the user 501, such as information for identification, authentication and authorization 514.

The human-computer interaction unit 204 can parse the instruction for user interaction 506 sent from the data processing unit 202, execute the corresponding sub-process according to the instruction for user interaction 506, and then present certain interactive presentation content to the user 501 via one or more output channels specified in the instruction for user interaction 506. Optionally, the same interactive presentation content may be rendered via multiple output channels simultaneously (for example, via both screen and speaker).

The interaction mode for interactive presentation content may comprise a parameter indicating which type of user interaction sub-process the human-computer interaction unit 204 may use to render the interactive presentation content. The interaction sub-process may comprise a questionnaire collection sub-process 515, a medical science knowledge rendering sub-process 516, a user notification sub-process 517, a login sub-process 518 or the like.

In the questionnaire collection sub-process 515, in response to the corresponding triggering condition (such as time, event, context and/or the like) being fulfilled, the

host may render the questionnaire content 511 to the user 501 via the human-computer interaction unit 204, for example, according to the “rendering method” of the associated metadata template content items. The host can collect feedback information input by the user 501, convert the feedback information to metadata, and then store it for use by the data processing unit 202 according to the mapping table in the corresponding template file. For example, the questionnaire answers or interactive feedback information may be stored in a data repository as health data, environment data, auxiliary information or the like.

In the medical science knowledge rendering sub-process 516, in response to the corresponding triggering condition (such as time, event, context and/or the like) being fulfilled, the host may render and present the medical science educational information 512 to the user 501, for example, according to the “rendering method” of the associated interactive template content items.

In the user notification sub-process 517, in response to the corresponding triggering condition (such as time, event, context and/or the like) being fulfilled, the host may render the user notification 513 to the user 501, for example, according to the “rendering method” of the associated interactive template content items. In accordance with an exemplary embodiment, the data processing unit 202 can generate the user notification 513 according to the connection status or operational status data of one or more target source devices.

The user notification 513 can guide the user 501 to execute or complete one or more operations. For example, the one or more operations may involve: the machine installation personnel pairs a source device and the host by establishing a connection between them; the consumer executes source device maintenance (such as battery replacing, equipment calibration, etc.); the consumer performs health management (such as measuring parameters, taking the pill, seeing the doctor, etc.); the template editor imports a template file or inputs template instruction sets, etc.; the user (such

as the machine installation personnel, the consumer or the template editor) enters certain information as indicated by the human-computer interaction unit 204; and/or the like.

In the login sub-process 518, in response to the identification, authentication and authorization 514 being performed by the user 501 on the host, the host may render relevant guiding information and receive some user input via the human-computer interaction unit 204. The received user input may be sent to the data processing unit 202 for further processing. The host's decision to the user's login request may be sent back to the user 501 via the human-computer interaction unit 204.

Fig.6 illustrates an exemplary operating procedure under the normal mode in accordance with an embodiment of the present disclosure. The exemplary procedure may be performed by a data processing unit (such as the data processing unit 202 as shown in Fig.2) to store 602 the imported/input template files or template instruction sets for further processing 604.

For a template file, the data processing unit may analyze 606 it to verify 608 its template identifier. If the template identifier is a new identifier, the data processing unit may store 610 the template file as a new one; while if the template identifier is the same as an existing template identifier indicating an existing template file, the data processing unit may replace 612 the existing template file with this template file. For a template instruction set, the data processing unit may analyze 614 it, update 616 an existing template file indicated by the template identifier contained in the template instruction set, and store 618 the updated template file.

According to the content of a stored template file, the data processing unit can update 620 the table storing configurations of data acquisition parameters. For example, the data processing unit may take "an identifier specifying the type of the metadata to be acquired" from a template file to filter the connected source devices, in order to find at least one source device capable of providing such metadata. If

found, a configuration may be generated based at least in part on the information about this found source device, the concerned template file and its corresponding metadata content item. The initial value of a readiness flag for the configuration may be set as FALSE. In response to storage and/or update of a template file, the data processing unit may execute these operations for respective metadata content items contained by that template file.

According to the configurations of data acquisition parameters, the data processing unit may generate 622 a set of Set Configuration Instructions, and subsequently send them (for example sequentially or concurrently) to the corresponding source devices via the communication unit of the host, in order to configure the behaviors of the source devices. In case that a stored template file is deleted, all the configurations associated with it may be deleted from the table. The data processing unit may send multiple Delete Configuration Instructions to the corresponding source devices (for example sequentially or concurrently) with the respective identifiers of the configurations covered by this deleted template file.

In accordance with an exemplary embodiment, the source device may reject a Set Configuration Instruction due to its own reason (for example, insufficient capability), and correspondingly send a negative feedback to the host to indicate this case; otherwise, the source device executes 624 the received configuration instruction and then sends a positive feedback to the host. Upon receiving such positive feedback, the host can assume that the source device had fully executed the last configuration instruction it sent. In response to the previous Set Configuration Instruction being fully executed by the corresponding source device and a positive feedback being received, the data processing unit may send the next Set Configuration Instruction to the source device. In this case, the readiness flag of the previous configuration may be set to TRUE, which indicates that the configured source device is ready to send the wanted metadata whenever it is available. If two configurations with the same

identifier of configuration were sent, the one sent later may supersede the other one.

In accordance with an exemplary embodiment, the source device may sense, measure, generate and/or collect metadata according to the configuration by the host, and transmit the metadata to the host via the communication unit. The data processing unit of the host can parse and store the metadata received from the source device. As described with respect to Fig.5, the data processing unit can also receive the interactive feedback information from a user via the human-computer interaction unit. If the received interactive feedback information is the user feedback for the questionnaire content, the data processing unit may convert it into metadata and store it according to the mapping table in the corresponding template file. Otherwise, the data processing unit may parse it and optionally send a new instruction for user interaction to the human-computer interaction unit.

Some of the data or information parsed by the data processing unit may be fused with the associated template file to generate a report (such as a health information summary report). For example, such data or information may comprise personal data (such as health data), environmental data, auxiliary information provided by or via the source devices, and/or the like. On the other hand, the operational status data of the source devices may be used to generate a corresponding user notification for rendering to a user via the human-computer interaction unit.

Fig.7 illustrates an exemplary information fusion procedure in accordance with an embodiment of the present disclosure. This exemplary procedure may be performed by the data processing unit 202 of the host 200 as shown in Fig.2. According to an exemplary embodiment, the data processing unit can automatically fuse some metadata with their associated template file and then generate a report as required. In order to execute the information fusion, the data processing unit starts 702 to parse a template file, and retrieves 704 the information about the target subject and data layout structure from the template file. By processing 712 the content items

related to the template file sequentially or concurrently, the data processing unit can eventually generate 714 a report (such as a health information summary report in a printable format), and optionally send 716 the report to a printer (such as the printing unit 205 shown in Fig.2) for printing it out.

Specifically, the triggering condition for a template content item in this template file may be judged 706 in processing the content item. If this template content item is an interactive content item or its triggering condition is not fulfilled, this template content item may be skipped and the next one would be processed. According to the settings of each metadata content item in this template file, the acquired metadata from the target person may be retrieved 708 and supplied to this fusion process. For example, each static content or metadata related to this template file may be rendered 710 according to a method defined by its “rendering method” and at a position defined by its “rendering position”, as specified in the corresponding template content item.

Optionally, only static content items and metadata content items are processed, while the interactive content items may be skipped, considering that the interactive content in the template file is not printable or not intended to be printed out from the business perspective. It will be realized that those user feedbacks which had already been converted into metadata and stored for the associated metadata content item would be processed as the printable output. A user may choose to generate and print a report according to a suitable template via the human-computer interaction interface, for example, by just one button press.

The various blocks shown in Figs.1-7 may be viewed as method steps, and/or as operations that result from operation of computer program code, and/or as a plurality of coupled logic circuit elements constructed to carry out the associated function(s). The schematic flow chart diagrams described above are generally set forth as logical flow chart diagrams. As such, the depicted order and labeled steps are indicative of

specific embodiments of the presented methods. Other steps and methods may be conceived that are equivalent in function, logic, or effect to one or more steps, or portions thereof, of the illustrated methods. Additionally, the order in which a particular method occurs may or may not strictly adhere to the order of the corresponding steps shown.

Many advantages may be achieved by applying the solution proposed in accordance with exemplary embodiments, for example, lowering down the technical barriers, improving the efficiency of both consumers and service providers, improving the correctness of data collection and logging, enhancing the quality of care, and/or the like. In particular, the operation environment of the proposed solution may have no Internet connection, or only have a short distance connection (such as a sensor-to-device connection) in a personal-environment or home-environment. However, it will be appreciated that any other suitable communication technologies or connections (wired or wireless links) may be utilized for implementing the solution proposed in accordance with exemplary embodiments.

The proposed solution may be applicable to a cared person who cannot operate modern smart consumer devices and is not used to the Internet-based life. His/her health information can be automatically collected, fused and printed without any manual intervention, and such report is fully organized according to the requirement of a service provider (such as care giver). The proposed solution may also be applicable to the service provider who delivers health/disease management service to a cared person. An exemplary use case is to allow a cared person to easily obtain his/her health information summary report by just one button press.

The proposed solution allows a service provider (such as the template editor 240) to define what data he/she wishes to acquire from a cared person (such as the consumer 220) based at least in part on his/her professional clinical science knowledge. In another word, it is the service provider who defines what he/she wants

and eventually gets what he/she wanted. The functionality of the template file defined in the proposed solution is to comprehensively configure the behaviors of source devices, so as to setup the data capturing, setup the data transmission, render contents to a user, interact with a user, bring feedback information back to a service provider, and/or the like. One of the most important things is that the template file itself may initiate the data generation and drive the entire use case with a full-stack connection management process according to exemplary embodiments.

Fig.8 is a simplified block diagram of an apparatus suitable for use in practicing exemplary embodiments of the present disclosure. The apparatus 800 shown in Fig.8 may be configured to perform various operations and functions of the first device or the second device according to exemplary embodiments as described in connection with Figs.1-7. Particularly, the apparatus 800 may be configured to function as a host or a source device according to exemplary embodiments as described in connection with Figs.1-7.

The apparatus 800 may comprise a processor (PROC) 810, a memory (MEM) 820 which stores computer program codes (PROG) 830, and a suitable communication unit (COM) 840 (such as a transceiver, a receiver and/or a transmitter, optionally in communication with an antenna) for coupling or connecting to another apparatus such as a user equipment, a network entity, a communication node, a server, a client, a peripheral device, a database and so on. For example, the communication unit 840 may be configured to support the apparatus 800 to transmit/receive signals and messages to/from another apparatus. The processor 810 may be used for processing these signals and messages. In particular, the communication unit 840 may act as the communication unit described in connection with Figs.1-7. In this example only one processor and one memory are shown in Fig.8, but it will be appreciated that other examples may utilize more than one processor and/or more than one memory (for example, same or different processor/memory types).

The processor 810 may be embodied as various means for implementing the various functionalities of exemplary embodiments of the present disclosure comprising, for example, a microprocessor, a coprocessor, a controller, a general purpose computer, a special-purpose integrated circuit such as, for example, an Application Specific Integrated Circuit (ASIC), a Field Programmable Gate Array (FPGA), or a hardware accelerator, processing circuitry or the like. According to an exemplary embodiment, the processor 810 may be representative of a plurality of processors, or one or more multiple core processors, operating in concert. The processor 810 may, but need not, comprise one or more accompanying Digital Signal Processors (DSPs). In some exemplary embodiments, the processor 810 is configured to execute instructions stored in the memory device or instructions otherwise accessible to the processor 810. The processor 810 may be configured to operate such that the processor 810 causes the apparatus 800 to perform various functionalities described herein.

For example, the processor 810 may act as the data processing unit described in connection with Figs.1-7 to provide at least one of the following functionalities: generating instructions for user interaction; generating configuration instructions; parsing template files and template instruction sets; parsing metadata; analyzing the interactive feedback information entered by a user; storing metadata, configurations and/or template files in a memory device such as the memory 820; executing information fusion according to a template file; and the like.

The memory 820 may be one or more computer-readable storage media that may comprise volatile and/or non-volatile memory. In some exemplary embodiments, the memory 820 comprises Random Access Memory (RAM) including dynamic and/or static RAM, on-chip or off-chip cache memory, and/or the like. Further, the memory 820 may comprise non-volatile memory, which may be embedded and/or removable, and may include, for example, read-only memory, flash memory,

magnetic storage devices (for example, hard disks, floppy disk drives, magnetic tape, etc.), optical disc drives and/or media, non-volatile random access memory (NVRAM), and/or the like. The memory 820 may comprise a cache area for temporary storage of data. In this regard, at least a portion or the entire memory 820 may be included within the processor 810. Further, the memory 820 may be configured to store information, data, applications, computer-readable program code instructions, and/or the like for enabling the processor 810 and the apparatus 800 to carry out various functions in accordance with exemplary embodiments described herein. For example, the memory 820 may be configured to buffer input data for processing by the processor 810. Additionally or alternatively, the memory 820 may be configured to store instructions for execution by the processor 810.

For example, the processor 810 may configure the memory 820 to persistently store metadata, template files, tables containing the configurations of data acquisition parameters, and/or the like. Optionally, there may be some temporarily existed data or information in the memory 820, such as interactive feedback information, configuration instructions applicable to the communication unit, the exported report in printable format for the printing unit, some instructions for user interaction applicable to the interaction unit, and/or the like.

The computer program codes 830 may be stored on a memory device, such as the memory 820, and executed by a processor, such as the processor 810, to enable the apparatus 800 to operate in accordance with the exemplary embodiments, as discussed above. That is, the exemplary embodiments of the present disclosure may be implemented at least in part by computer software executable by the processor 810, or by hardware, or by a combination of software and hardware. As will be appreciated, any such computer program codes may be loaded onto a computer or other programmable apparatus from a computer-readable storage medium to produce a particular machine, such that the particular machine becomes means for

implementing the functions specified in the flowchart's block(s) or operation(s). These computer program codes may also be stored in a computer-readable storage medium that can direct a computer, a processor, or other programmable apparatus to function in a particular manner to thereby generate a particular machine or particular article of manufacture that becomes means for implementing the functions specified in the flowchart's block(s) or operation(s). The computer program codes may be retrieved from a computer-readable storage medium and loaded into a computer, processor, or other programmable apparatus to configure the computer, processor, or other programmable apparatus to execute operations to be performed on or by the computer, processor, or other programmable apparatus.

Alternatively or additionally, the apparatus 800 may comprise various means and/or components for implementing functions of the foregoing steps and methods in Figs.1-7. In an exemplary embodiment, the apparatus 800 may serve as the first device as described in Fig.1 and comprise: generating means for generating corresponding configuration information for one or more second devices connected to the first device, based at least in part on content description information; configuring means for configuring the one or more second devices according to the corresponding configuration information; collecting means for collecting data from at least one of the one or more second devices; and fusing means for fusing the collected data based at least in part on the content description information.

In general, the various exemplary embodiments may be implemented in hardware or special purpose circuits, software, logic or any combination thereof. For example, some aspects may be implemented in hardware, while other aspects may be implemented in firmware or software which may be executed by a controller, microprocessor or other computing device, although the disclosure is not limited thereto. While various aspects of the exemplary embodiments of this disclosure may be illustrated and described as block diagrams, flow charts, or using some other

pictorial representation, it is well understood that these blocks, apparatus, systems, techniques or methods described herein may be implemented in, as non-limiting examples, hardware, software, firmware, special purpose circuits or logic, general purpose hardware or controller or other computing devices, or some combination thereof.

It will be appreciated that at least some aspects of the exemplary embodiments of the disclosures may be embodied in computer-executable instructions, such as in one or more program modules, executed by one or more computers or other devices. Generally, program modules include routines, programs, objects, components, data structures, etc. that perform particular tasks or implement particular abstract data types when executed by a processor in a computer or other device. The computer executable instructions may be stored on a computer readable medium such as a hard disk, optical disk, removable storage media, solid state memory, RAM, etc. As will be realized by one of skills in the art, the functionality of the program modules may be combined or distributed as desired in various embodiments. In addition, the functionality may be embodied in whole or in part in firmware or hardware equivalents such as integrated circuits, FPGA, and the like.

Although specific embodiments of the disclosure have been disclosed, those having ordinary skills in the art will understand that changes can be made to the specific embodiments without departing from the spirit and scope of the disclosure. The scope of the disclosure is not to be restricted therefore to the specific embodiments, and it is intended that the appended claims cover any and all such applications, modifications, and embodiments within the scope of the present disclosure.

CLAIMS

What is claimed is:

1. A method, comprising:

generating corresponding configuration information for one or more second devices connected to a first device, based at least in part on content description information;

configuring the one or more second devices according to the corresponding configuration information;

collecting data from at least one of the one or more second devices; and

fusing the collected data based at least in part on the content description information.

2. The method according to claim 1, wherein the content description information is associated with one or more content requirements from a service provider.

3. The method according to claim 1 or 2, wherein the configuration information indicates one or more data acquisition parameters for collecting the data from the at least one second device.

4. The method according to any one of claims 1 to 3, wherein said configuring the one or more second devices according to the corresponding configuration information comprises:

sending one or more configuration instructions generated from the corresponding configuration information to the respective second devices to configure behaviors of the respective second devices.

5. The method according to any one of claims 1 to 4, wherein said fusing the collected data based at least in part on the content description information comprises:
- processing one or more content items related to the content description information,
 - obtaining data corresponding to the one or more content items from the collected data, and
 - generating a report based at least in part on the obtained data, according to the content description information.
6. The method according to any one of claims 1 to 5, wherein the content description information is related to one or more of static content items, metadata content items and interactive content items.
7. The method according to any one of claims 1 to 6, wherein the data collected from the at least one second device comprise metadata corresponding to one or more metadata content items related to the content description information.
8. The method according to any one of claims 1 to 7, wherein a connection between the first device and the second device is established or removed in an installation mode, based at least in part on the content description information.
9. The method according to any one of claims 1 to 8, wherein one or more content requirements are input to the first device from a service provider in an editing mode to update the content description information.
10. The method according to any one of claims 1 to 9, wherein at least one of a configuration operation, an interaction operation, a data collection operation and a data fusion operation of the first device is performed in a normal mode.

11. The method according to claim 10, wherein the interaction operation comprises an information acquisition operation, an information rendering operation, a user notification operation or a login operation.

12. The method according to claim 11, wherein the information acquisition operation comprises:

presenting a questionnaire content of an interactive content item to a user,
receiving feedback information towards the questionnaire content from the user,
and
converting the feedback information into metadata of a metadata content item linked to the interactive content item.

13. The method according to any one of claims 1 to 12, wherein the second device is connected to the first device via a short-range communication link.

14. The method according to any one of claims 1 to 13, wherein the data collected from the at least one second device comprise at least one of personal data, environmental data, operational status data and auxiliary data.

15. An apparatus, comprising:

at least one processor; and
at least one memory comprising computer program code,
the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus to perform at least the following:
generating corresponding configuration information for one or more other apparatuses connected to the apparatus, based at least in part on content description information;

configuring the one or more other apparatuses according to the corresponding configuration information;

collecting data from at least one of the one or more other apparatuses; and

fusing the collected data based at least in part on the content description information.

16. The apparatus according to claim 15, wherein the content description information is associated with one or more content requirements from a service provider.

17. The apparatus according to claim 15 or 16, wherein the configuration information indicates one or more data acquisition parameters for collecting the data from the at least one other apparatus.

18. The apparatus according to any one of claims 15 to 17, wherein said configuring the one or more other apparatuses according to the corresponding configuration information comprises:

sending one or more configuration instructions generated from the corresponding configuration information to the respective other apparatuses to configure behaviors of the respective other apparatuses.

19. The apparatus according to any one of claims 15 to 18, wherein said fusing the collected data based at least in part on the content description information comprises:

processing one or more content items related to the content description information,

obtaining data corresponding to the one or more content items from the collected data, and

generating a report based at least in part on the obtained data, according to the content description information.

20. The apparatus according to any one of claims 15 to 19, wherein the content description information is related to one or more of static content items, metadata content items and interactive content items.

21. The apparatus according to any one of claims 15 to 20, wherein the data collected from the at least one other apparatus comprise metadata corresponding to one or more metadata content items related to the content description information.

22. The apparatus according to any one of claims 15 to 21, wherein a connection between the apparatus and the other apparatus is established or removed in an installation mode, based at least in part on the content description information.

23. The apparatus according to any one of claims 15 to 22, wherein one or more content requirements are input to the apparatus from a service provider in an editing mode to update the content description information.

24. The apparatus according to any one of claims 15 to 23, wherein at least one of a configuration operation, an interaction operation, a data collection operation and a data fusion operation of the apparatus is performed in a normal mode.

25. The apparatus according to claim 24, wherein the interaction operation comprises an information acquisition operation, an information rendering operation, a user notification operation or a login operation.

26. The apparatus according to claim 25, wherein the information acquisition

operation comprises:

presenting a questionnaire content of an interactive content item to a user,
receiving feedback information towards the questionnaire content from the user,
and
converting the feedback information into metadata of a metadata content item
linked to the interactive content item.

27. The apparatus according to any one of claims 15 to 26, wherein the other apparatus is connected to the apparatus via a short-range communication link.

28. The apparatus according to any one of claims 15 to 27, wherein the data collected from the at least one other apparatus comprise at least one of personal data, environmental data, operational status data and auxiliary data.

29. A computer program product comprising a computer-readable medium bearing computer program codes embodied therein for use with a computer, the computer program codes comprising:

code for generating corresponding configuration information for one or more second devices connected to a first device, based at least in part on content description information;

code for configuring the one or more second devices according to the corresponding configuration information;

code for collecting data from at least one of the one or more second devices; and
code for fusing the collected data based at least in part on the content description information.

30. The computer program product according to claim 29, wherein the content description information is associated with one or more content requirements from a

service provider.

31. The computer program product according to claim 29 or 30, wherein the configuration information indicates one or more data acquisition parameters for collecting the data from the at least one second device.

32. The computer program product according to any one of claims 29 to 31, wherein said fusing the collected data based at least in part on the content description information comprises:

- processing one or more content items related to the content description information,

- obtaining data corresponding to the one or more content items from the collected data, and

- generating a report based at least in part on the obtained data, according to the content description information.

33. The computer program product according to any one of claims 29 to 32, wherein the content description information is related to one or more of static content items, metadata content items and interactive content items.

34. The computer program product according to any one of claims 29 to 33, wherein the data collected from the at least one second device comprise metadata corresponding to one or more metadata content items related to the content description information.

35. The computer program product according to any one of claims 29 to 34, wherein a connection between the first device and the second device is established or removed in an installation mode, based at least in part on the content description information.

36. The computer program product according to any one of claims 29 to 35, wherein one or more content requirements are input to the first device from a service provider in an editing mode to update the content description information.

37. The computer program product according to any one of claims 29 to 36, wherein at least one of a configuration operation, an interaction operation, a data collection operation and a data fusion operation of the first device is performed in a normal mode.

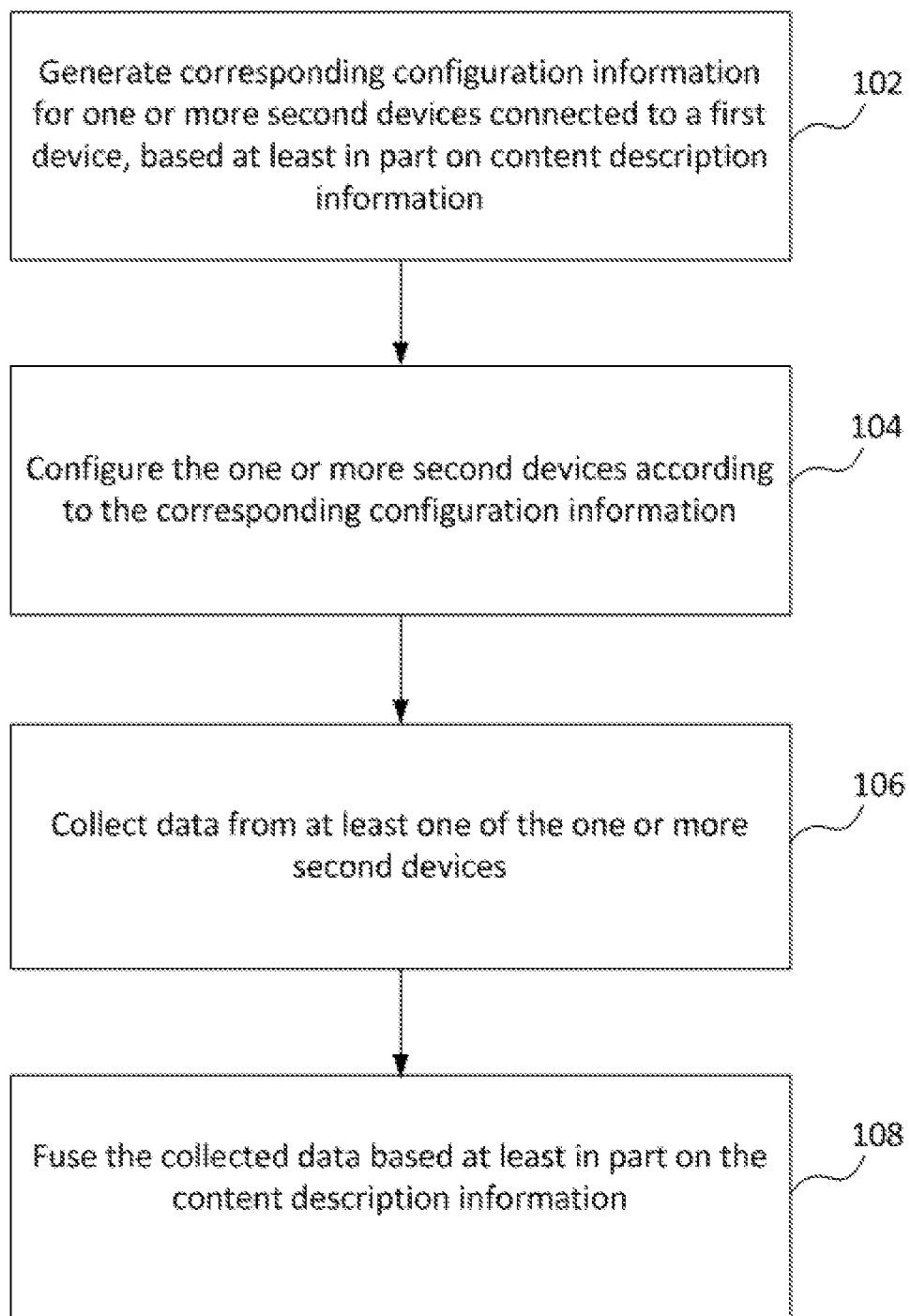
38. An apparatus, comprising:

generating means for generating corresponding configuration information for one or more other apparatuses connected to the apparatus, based at least in part on content description information;

configuring means for configuring the one or more other apparatuses according to the corresponding configuration information;

collecting means for collecting data from at least one of the one or more other apparatuses; and

fusing means for fusing the collected data based at least in part on the content description information.

**Fig.1**

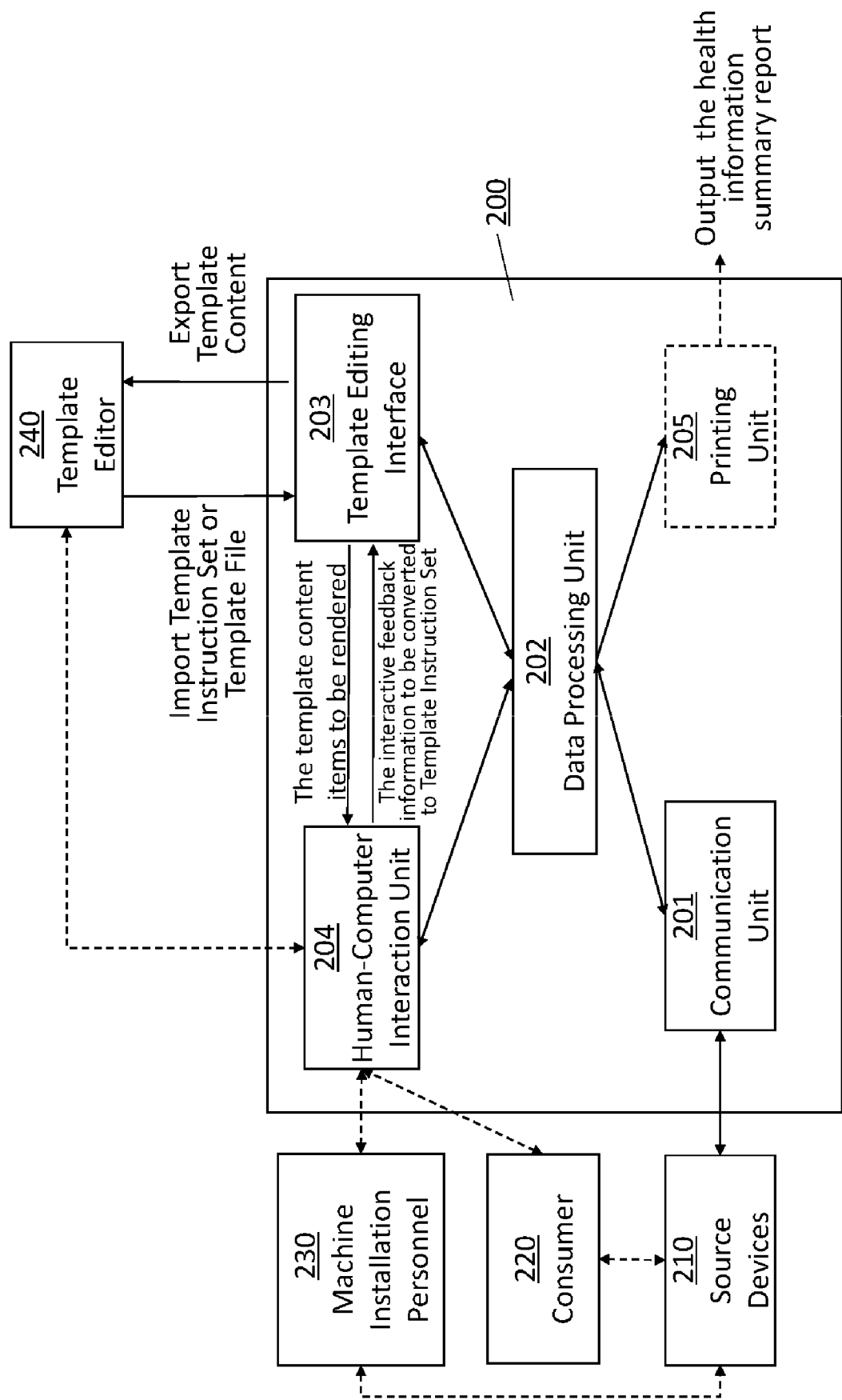


Fig.2

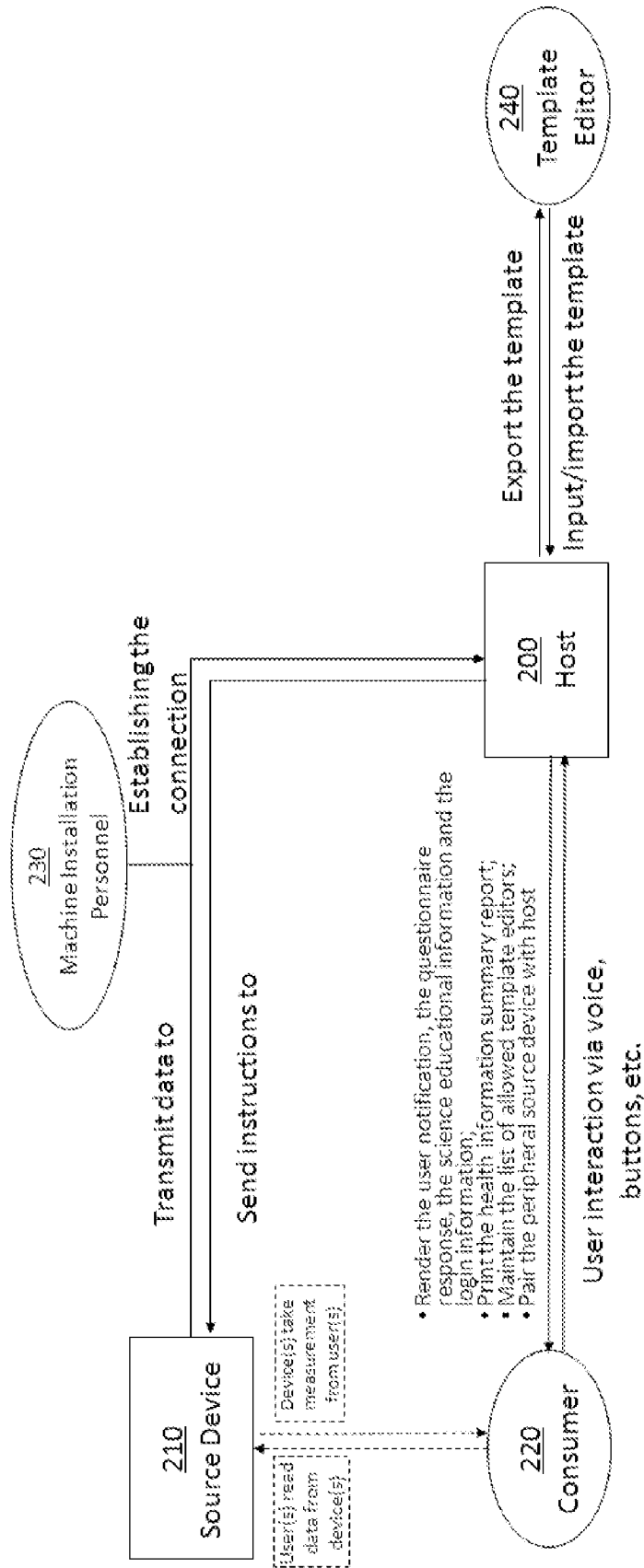


Fig.3

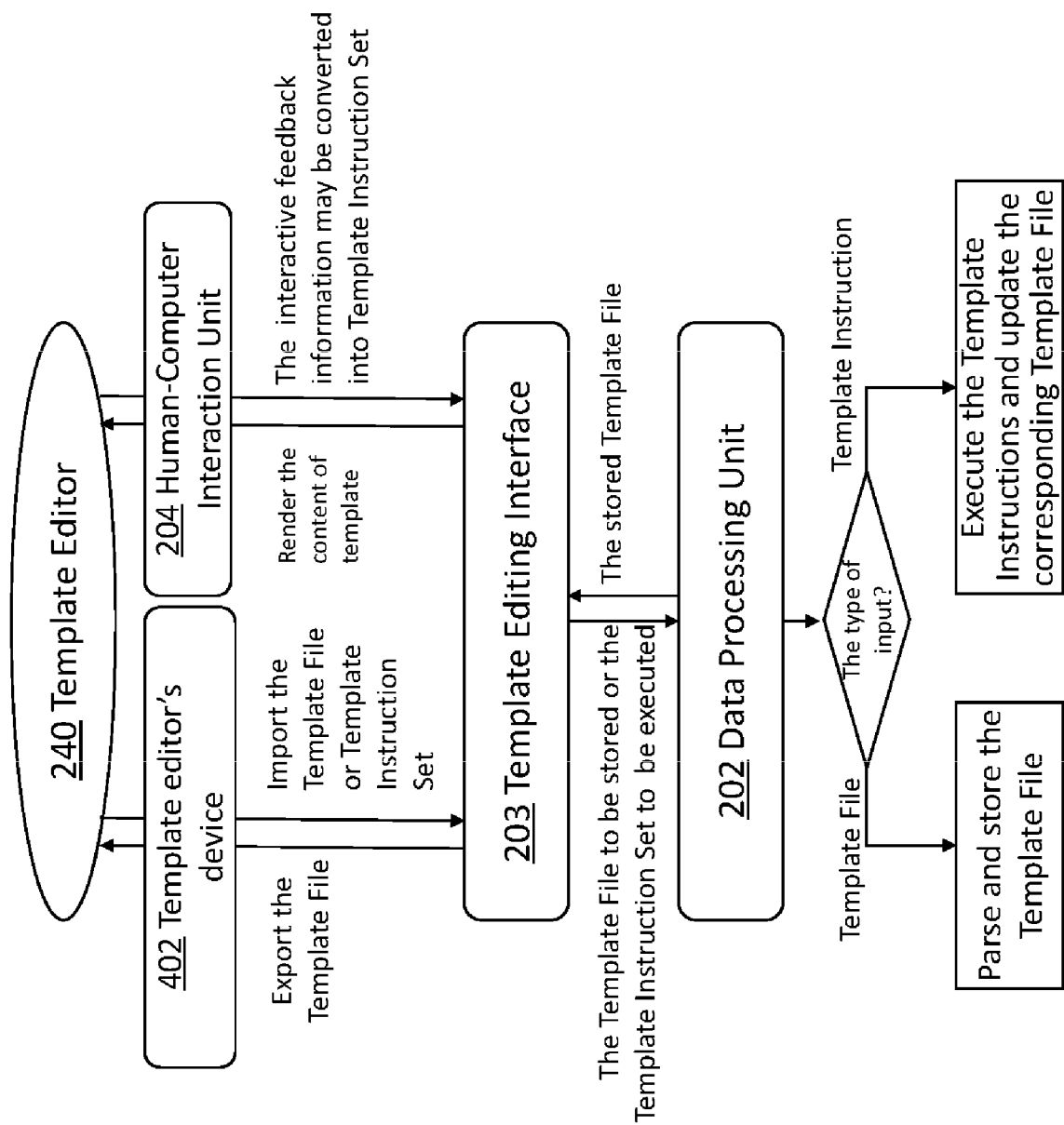
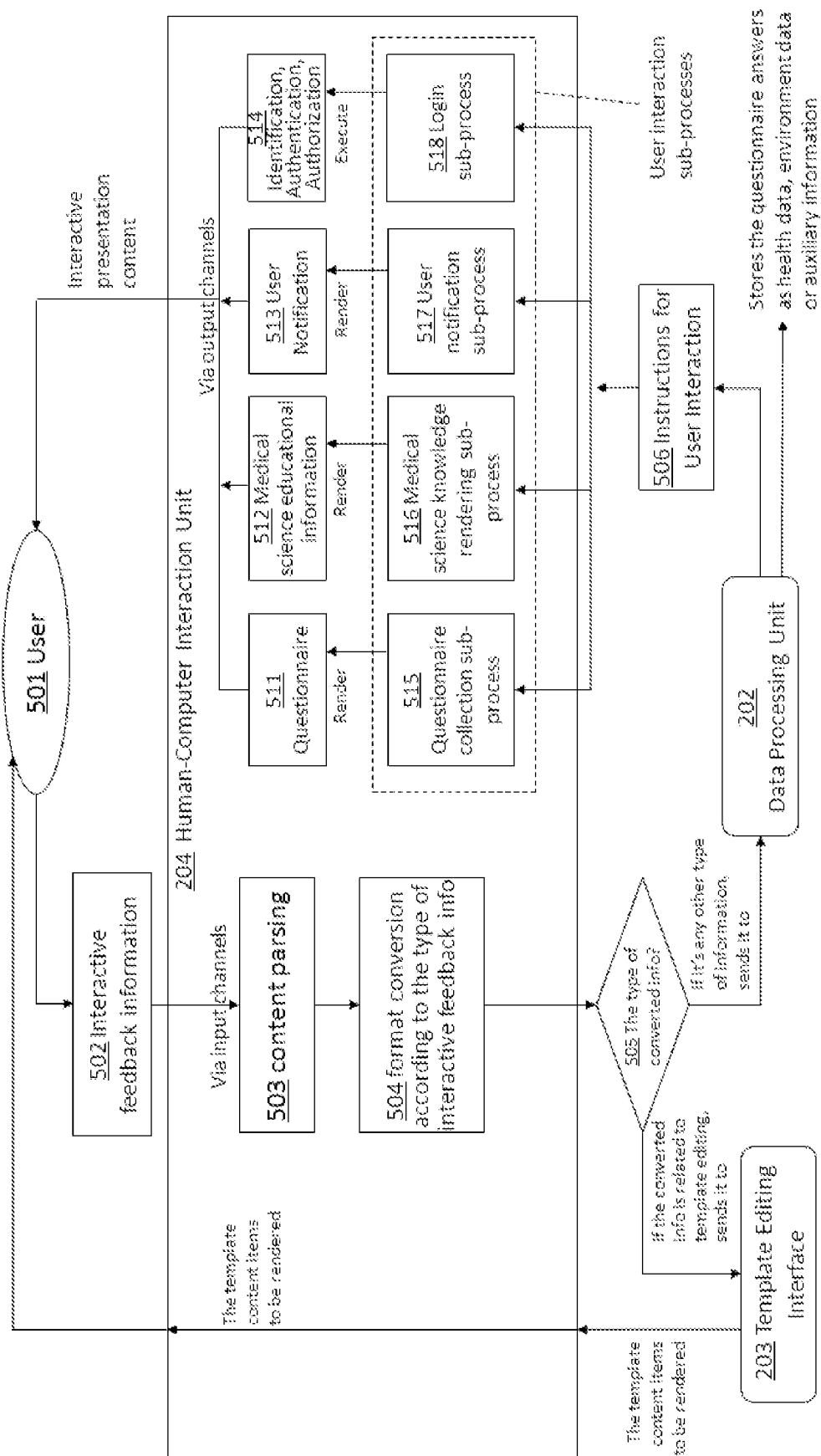


Fig.4



501

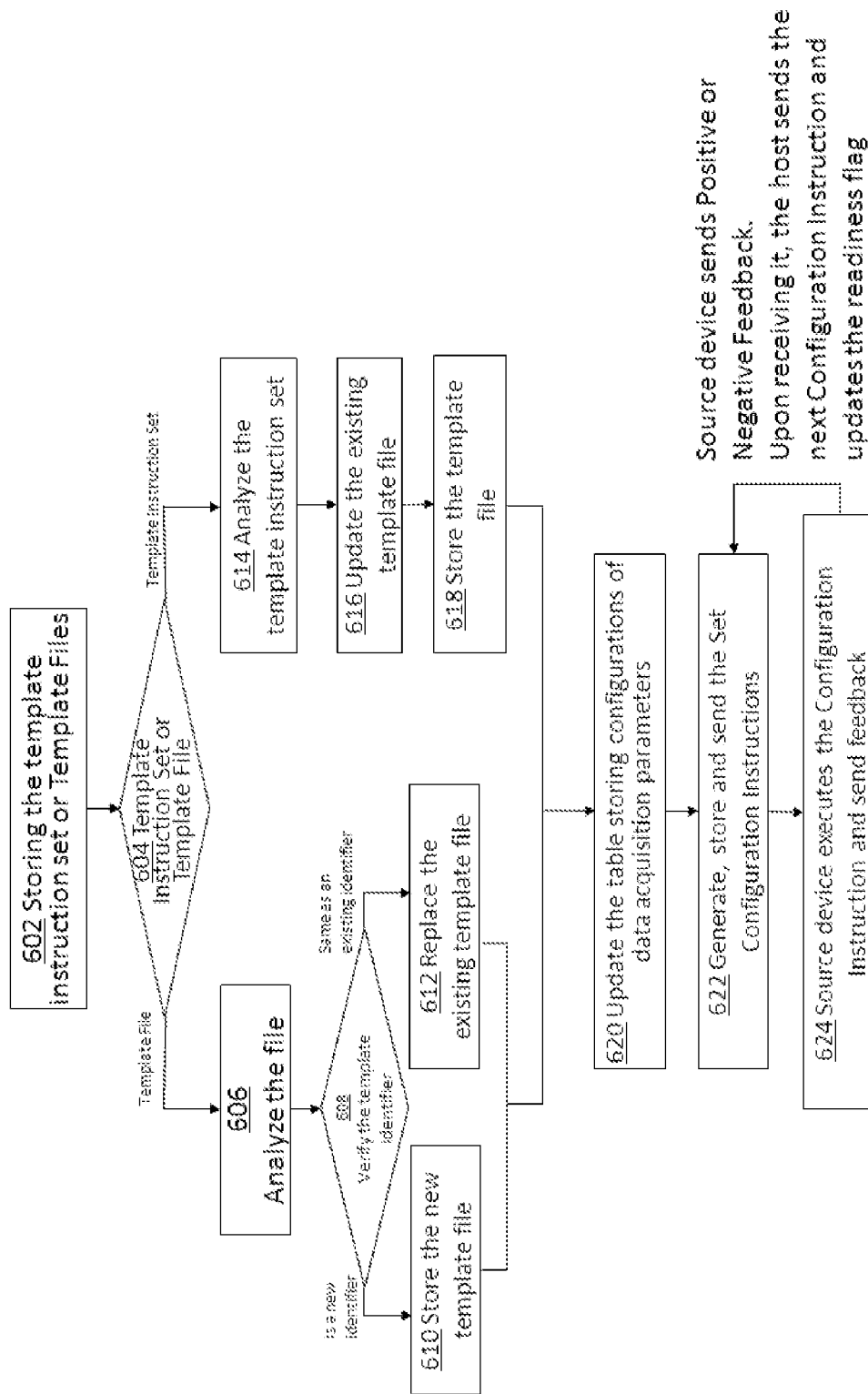
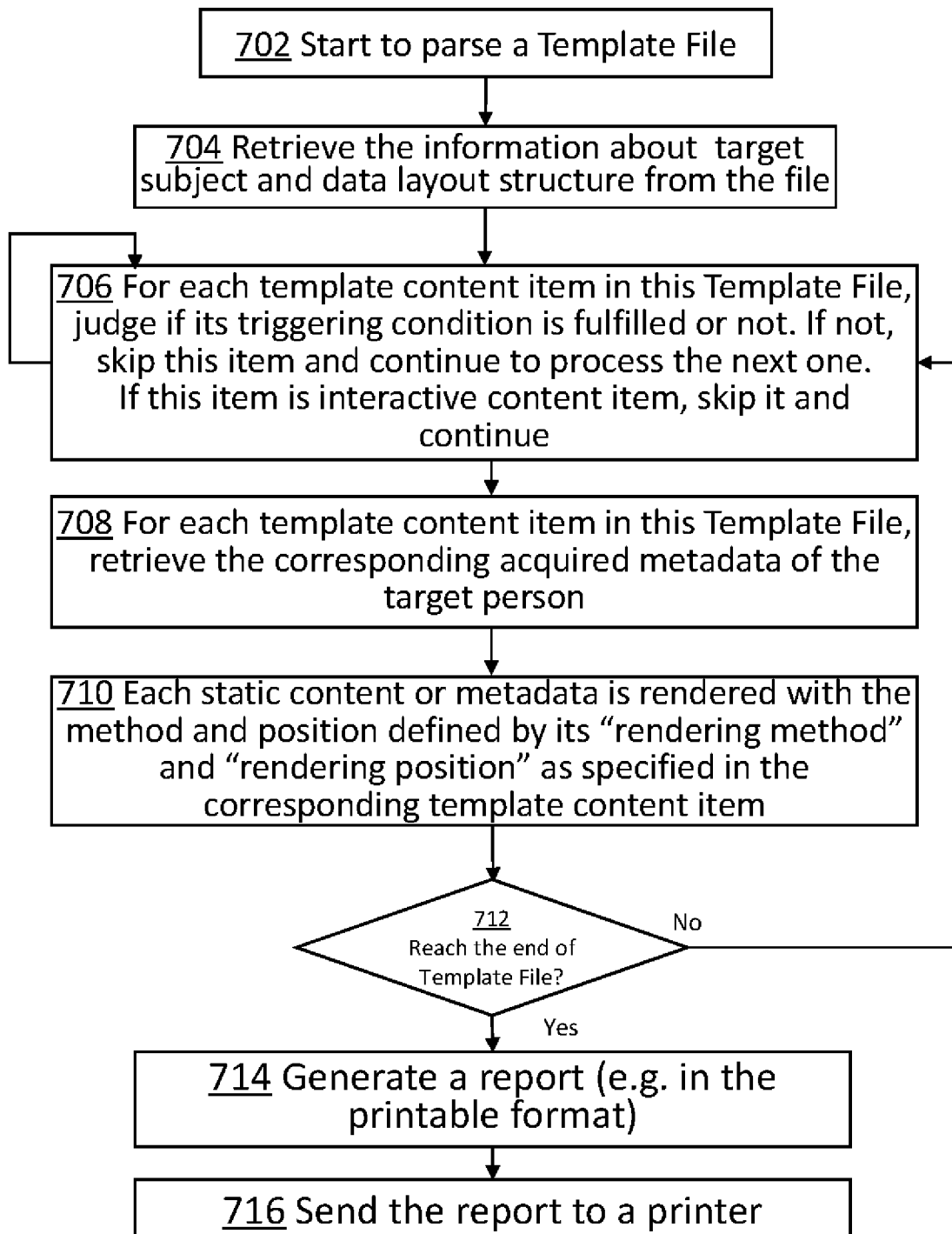


Fig.6

**Fig.7**

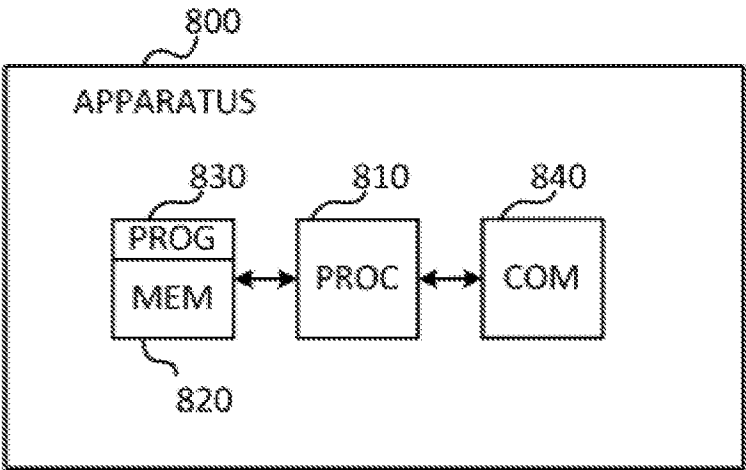


Fig.8

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2016/084273

A. CLASSIFICATION OF SUBJECT MATTER

G06F 15/177(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G06F

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

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

WPI,EPODOC,IEEE,CNPAT,CNKI:connect,configure,collect,fuse,health,one,second

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2013102963 A1 (QUALCOMM INC.) 25 April 2013 (2013-04-25) description, paragraphs [0037]-[0042] and figures 1-2	1-38
A	US 2006199610 A1 (FUJITSU LTD.) 07 September 2006 (2006-09-07) the whole document	1-38
A	US 2006229911 A1 (MEDCOMMONS, INC.) 12 October 2006 (2006-10-12) the whole document	1-38
A	WO 2008048662 A2 (HEALTHCALL LLC) 24 April 2008 (2008-04-24) the whole document	1-38



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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

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

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

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

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

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

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

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

“&” document member of the same patent family

Date of the actual completion of the international search

21 February 2017

Date of mailing of the international search report

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Name and mailing address of the ISA/CN

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2016/084273

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				CN	103890725	A	25 June 2014
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				EP	2769298	A1	27 August 2014
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				JP	2006209771	A	10 August 2006
US	2006229911	A1	12 October 2006	WO	2006118628	A2	09 November 2006
WO	2008048662	A2	24 April 2008	US	2008140449	A1	12 June 2008
				US	2014324467	A1	30 October 2014