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MANAGING SCHEDULED EVENTS IN NETWORK-HOSTED TIME MANAGEMENT SYSTEM

Technical Field

The present invention relates generally to electronic or computerised event management (scheduling) systems and in particular to such event management systems in a networked environment.

Background

Existing event management (scheduling) systems typically manage only simple static sequences of events for single or multiple users. However, such static sequences of events are not representative of real-life dynamic, recurring, and interrelated nature of events and event sequences.

While some future events and related event notifications can be predicted, existing event management systems are static and do not dynamically respond to changes to existing event schedules brought about by external influences or new event clashes when users commit to new event schedules. Furthermore, event notifications or alerts are usually unidirectional.

Existing event management systems require each user to redefine these events, schedules, and notifications each time a user uses the event, schedule, and notification. Disadvantageously, productivity losses and potential errors result because the events and the relationships between events in schedules must be redefined each time the events and the relationships between events are required.

Many events within schedules have temporal relationships with events in one or more of: other schedules of the same user, other user's schedules, and stored data records outside of schedules. These inter- and intra-schedule relationships often cause a scheduling conflict between events, resulting in some events being either delayed or ignored. Current event management systems do not cater for such more complex event relationships and resulting conflicts.

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Network-accessed electronic calendaring and scheduling applications do not allow for easy integration with third party schedules. Event data is usually stored locally and not readily accessible when the users are mobile or not connected to a network. Schedule synchronising mechanisms have been found to be difficult to manage and unreliable due to the time zone differences between users and between events within schedules.

Furthermore, the control and ownership of user events and data may change over time and current systems do not allow for easy transfer ownership or sharing of control.

Summary

In accordance with an aspect of the invention, there is provided a method for managing scheduled events in a network-hosted time management system implemented using a computer system. Reusable non-user-specific templates are constructed. Each template comprises an event, a notification, and an associated data record stored in a database repository accessible via an electronic network coupled to the time management system. Each template is a combination of records in a database repository with fields that relate one record type to another record type. At least one rule included in each template. Each rule creates a temporal relationship between at least two events, or an event and an associated data record, to form at least one dynamic interrelated event schedule. Templates are instantiated by populating the records of the templates with data to create at least one user-specific event schedule, or a multiple role roster, each having associated records. Each roster is a set of interrelated event schedules for multiple user roles. Event notification alert temporal data is monitored, and at least one user device is notified by initiating a smart-alert. The smart-alert comprises a notification regarding an event in at least one schedule that requires a reply from a user device connected to the electronic network with user information to satisfy the rule associated with the smart-alert. The requested information is stored in the associated data record. A reply to the smart-alert, comprising data to update the associated data record, is received from a user device. Based on a change to data in the associated data record, a rule, an event, a role, a data record, and/or a notification is changed.

The event may be in at least one schedule of events of at least one user.

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The temporal relationships defined in the templates each comprise a combination of absolute, relative, calculated, and user-defined temporal relationship.

The method may comprise recommending a template to a user based on a user attribute or activity.

The method may comprise: caching instantiated templates and associated data records in at least one local storage device of an electronic device that can access the electronic network for issuing a smart-alert when the electronic device is disconnected from the network-hosted time management system; storing a reply to the smart-alert on the local storage device until the electronic device is connected to the network-hosted time management system; and transferring the reply to the smart-alert to the network-hosted time management system.

The method may comprise modifying the timing of event notifications to cater for travel time based on a current location of a user, and time zone and location of events.

Templates and user records are adapted to be categorised, stored, searched, and viewed by system- or user-defined context specific categories and tags.

The method may comprise sharing a template and an associated data record between users using permission controls of the network-hosted time management system.

The method may comprise publishing a template by the network-hosted time management system for use by another user.

The method may comprise viewing a template and an instantiated template by the network-hosted time management system in a time-domain view or an event-relationship view.

The method may comprise displaying on a display device temporal events simultaneously as a wide time frame in summary and a shorter range of events in detail.

The method may comprise printing at least one of a template and an instantiated template.

The method may comprise allocating specific users to roster roles. The allocating may be performed automatically via predefined rules or manually.

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In accordance with another aspect of the invention, there is provided an apparatus for managing scheduled events in a network-hosted time management system implemented using a computer system. The computer system comprises a processing unit and a memory storing data and a computer program. The processing unit and memory are configured when executing the computer program to perform the foregoing method.

In accordance with yet another aspect of the invention, there is provided a non-transitory computer readable medium having recorded therein a computer program for managing scheduled events in a network-hosted time management system implemented using a computer system. The computer program comprising: code for constructing reusable non-user-specific templates each comprising an event, a notification, and an associated data record stored in a database repository accessible via an electronic network coupled to the time management system, each template being a combination of records in a database repository with fields that relate one record type to another record type; code for including, in each template, at least one rule, each rule creating a temporal relationship between at least two events, or an event and an associated data record, to form at least one dynamic interrelated event schedule; code for instantiating templates by populating the records of the templates with data to create at least one user-specific event schedule, or a multiple role roster, each having associated records, each roster being a set of interrelated event schedules for multiple user roles; code for monitoring event notification alert temporal data and notifying at least one user device by initiating a smart-alert, the smart-alert comprising a notification regarding an event in at least one schedule that requires a reply from a user device connected to the electronic network with user information to satisfy the rule associated with the smart-alert, the requested information being stored in the associated data record; code for receiving from a user device the reply to the smart-alert comprising data to update the associated data record; and code for, based on a change to data in the associated data record, changing at least one of: a rule, an event, a role, a data record, and a notification.

Brief Description of Drawings

Embodiments of the invention are described hereinafter with reference to the accompanying drawings, in which:

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FIG. 1 is a schematic diagram of a network and computing environment **100** with which various architectural components of the embodiments of the invention may be implemented;

FIG. 2 is a block diagram showing the relationships **200** between events, schedules, and rosters for single users and multiple user environments;

FIG. 3 is a simplified flowchart showing template creation **310**, template instantiation **320**, and smart-alerts **330**;

FIG. 4 is a flowchart illustrating the workflow of notifications, including alert notifications **413** and smart-alerts user responses **412**, to fixed or mobile device **410**;

FIG. 5 is a block diagram illustrating instantiation from published templates **510** to user templates **520** to user instantiated templates **530** and role participation **541** for both user subscribers **550** and contact pre-subscription **570**;

FIG. 6 is a flow diagram illustrating a method of managing scheduled events in a network-hosted time management system implemented using a computer system in accordance with embodiments of the invention; and

FIGS. 7A and 7B are a schematic block diagram of a general-purpose computer system with which embodiments of the invention may be practiced.

Detailed Description

Methods, apparatuses, and computer readable media for managing scheduled events in a network-hosted time management system implemented using a computer system are disclosed hereinafter. Embodiments of the invention are described with reference to the accompanying drawings, but modifications and substitutions may be made without departing from the scope of the invention. The embodiments of the invention relate to the management of user temporal events, event rules, event notifications, and associated event records and provide a means to define a schedule of events, event rules, and associated record structures so the schedule of events, event rules, and associated record structures can be replicated and reused many times by users.

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Where reference is made in any one or more of the accompanying drawings to steps and/or features, which have the same reference numerals, those steps and/or features have for the purposes of this description the same function(s) or operation(s), unless the contrary intention appears.

The embodiments of the invention enable users to manage a schedule of predefined time critical events and associated records by creating templates, which contain sequences of temporal events related by rules. These templates and rules can be used and reused multiple times. The rules create relationships between events within the same schedule, and/or between events within schedules that belong to the same user or multiple users. These templates allow users to instantiate their own independent copy of the schedule of events and if required customise the schedule of events to their requirements without changing the original schedule template.

Because rules can apply across multiple schedules for a single user, interdependent schedule templates can be created for management of complex temporal activities, such as but not limited to: medicine dispensing and education timetables, amongst others. Rules can also apply across multiple users and schedules, so that multi-user schedules templates can be created for managing complex collaboration activities, such as but not limited to: rostering, meetings, and projects.

The rules can contain any logical expression and can trigger events such as creating new records or smart-alerts. The rules can also refer to fields with stored records which enables the schedules to respond to and be modified by external input. Therefore making the schedules dynamic and changing automatically to external input.

Unlike existing systems, the embodiments of the invention advantageously, provide event notifications or alerts, which are not limited to being unidirectional, provide a feedback mechanism from the user back to the event management system to request, monitor, and receive external data from users that can be used to dynamically modify event relationships, scheduled events, or future notifications. Further, the embodiments of the invention take account of the fact that many user events and event schedules are recurring in nature and therefore are suitable for reuse by the same user or other users with little or no changes.

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Temporal data in schedules, rules and records can be absolute, relative to other events or stored data records via rules, or entered manually or automatically when the template is instantiated. Smart-alerts associated with the temporal events enables users to not only be notified of events but also allow users to manually or automatically enter data that is associated with the event alert that can be stored in records and used for temporal relationships or event triggers. One embodiment of smart-alerts enables feedback and control of wearable devices such as medical monitors and medication dispensers. Event Alerts can be pre-event, upon event, or post event. Multiple alerts within a defined timeframe can be aggregated into a single alert and can be acknowledged by a single acknowledgement to reduce user disruption.

Templates and instantiated schedules can be viewed in either the time domain or in a spatial relationship domain to facilitate, creation, editing, and viewing.

FIG. 6 illustrates at a high-level a method **600** of managing scheduled events in a network-hosted time management system implemented using a computer system in accordance with the embodiments of the invention. The method **600** commences processing at step **610** ("Start"). In step **620**, reusable non-user-specific templates are constructed, as described in greater detail hereinafter with reference to **FIGS. 1-5**. Each template comprises an event, a notification, and an associated data record stored in a database repository accessible via an electronic network coupled to the time management system. Each template is a combination of records in a database repository with fields that relate one record type to another record type. In step **630**, at least one rule is included (defined) in each template. Each rule creates a temporal relationship between (1) two or more events, or (2) an event and an associated data record, to form at least one dynamic interrelated event schedule. In step **640**, templates are instantiated by populating the records of the templates with data to create at least one user-specific event schedule, or a multiple role roster, each having associated records. Each roster is a set of interrelated event schedules for multiple user roles. In step **650**, event notification alert temporal data is monitored and at least one user device is notified in response to the monitoring by initiating a smart-alert. The smart-alert comprises a notification regarding an event in one or more schedules that require a reply from a user device connected to the electronic network with user information to satisfy the rule associated with the smart-alert. The requested information is stored in the associated data record. In

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step **660**, the reply to the smart-alert, comprising data to update the associated data record, is received from a user (mobile or fixed) device (e.g. a personal computer, a laptop computer, a tablet computer, a smartphone, a network accessible computer). In step **670**, based on a change to data in the associated data record, a rule, an event, a role, a data record, and/or a notification is changed. Processing then ends or returns in step **680**. The steps **620** to **670** may be repeatedly performed by use of an appropriate loop, or the method **600** may be repeatedly performed as required. The method **600** outlined in **FIG. 6** is described hereinafter in greater detail with reference to **FIGS. 1-5**.

The event may be in at least one schedule of events of at least one user. The temporal relationships defined in the templates may each comprise a combination of absolute, relative, calculated, and user-defined temporal relationship.

While not shown in **FIG. 6** to simplify the drawing, the method **600** may comprise recommending a template to a user based on a user attribute or activity. Furthermore, the method may comprise: caching instantiated templates and associated data records in at least one local storage device of an electronic device that can access the electronic network for issuing a smart-alert when the electronic device is disconnected from the network-hosted time management system; storing a reply to the smart-alert on the local storage device until the electronic device is connected to the network-hosted time management system; and transferring the reply to the smart-alert to the network-hosted time management system.

Optionally, the method **600** may comprise modifying the timing of event notifications to cater for travel time based on a current location of a user, and time zone and location of events.

Templates and user records may be adapted to be categorised, stored, searched, and viewed by system- or user-defined context specific categories and tags.

The method **600** may comprise sharing a template and an associated data record between users using permission controls of the network-hosted time management system. The method **600** may comprise publishing a template by the network-hosted time management system for use by another user. The method **600** may comprise viewing a template and an instantiated template by the network-hosted time management system in a time-domain view or an event-relationship view. The method **600** may comprise displaying,

on a display device, temporal events simultaneously as a wide time frame in summary and a shorter range of events in detail. The method **600** may comprise printing a template and/or an instantiated template.

The method **600** may also comprise allocating specific users to roster roles. The allocation may be done automatically via predefined rules. Alternatively, the allocation may be done manually.

The method **600** may also be implemented in an apparatus for managing scheduled events in a network-hosted time management system implemented using a computer system. The computer system comprises a processing unit and a memory storing data and a computer program. The processing unit and memory are configured, when executing the computer program, to perform the method **600**. A user device can communicate with the apparatus using the electronic or computer network.

The method **600** may also be implemented in a non-transitory computer readable storage medium having recorded therein a computer program for managing scheduled events in a network-hosted time management system implemented using a computer system, the computer program comprising code for implementing the steps of the method **600**. These and other aspects are described with reference to the drawings hereinafter.

FIG. 1 illustrates an example of a general network and computing environment **100** in which the architectural components of the embodiments of the invention may be implemented. The network and computing environment **100** is only one example of a suitable environment and implementation and is not intended to limit the scope nor application of the embodiments of the invention. Other electronic network and computing environments, such as: private networks, intranets, etc., are also suitable environments where the embodiments of the invention may be implemented. In **FIG. 1**, an illustrative system for implementing one or more architectural components includes a network accessed and hosted computer system and database managing N temporal-related schedules of events **110**, a rule engine **120** which manages the temporal event relationships and event triggers **125**, a process to generate smart-alerts **130**, a primary data storage **140** for storing records, system data and user data, a messaging server **150**, a rating engine **160**, a billing engine and payment gateway **165**, user fixed and mobile access devices **170**, mobile device specific applications (“apps”) **175**, an

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administration engine **180**, an advertising engine **181**, a template recommendation engine **182**, and templates **190**. All the components shown in **FIG. 1**, except for the fixed and mobile devices **170** with apps **175**, are shown within the cloud (encompassed by dashed line). The fixed and mobile devices **170** can receive messages from the messaging server **150** and can communicate with the administration engine **180**.

A schedule is defined as a collection of events, roles and the rules between them. A schedule may include records that are associated with the overall schedule or with each event. An event is defined as a temporal record, which has occurred in the past or will occur in the future. An event can be shared with another user, either nominated or defined by role tags. Event creation comprises adding records and defining rules, which may depend upon record types, role tags, or any other source of dynamic data. Rules are defined as logical expressions which can trigger events, allocate roles, or result in notifications. A smart-alert is defined as a type of notification in the system, which informs or reminds a user of something, a smart-alert includes user feedback, which is used to create records.

A record is defined as a data element owned by a user of the system and comprises fields, which may contain data and media. A record may include a layout format that is either fixed or dynamic, depending upon media or information used when creating the record.

A template is defined as a record that specifies the structure of fields and the rules operating on those fields, without necessarily including the field content. There are four template types: record template, event template, schedule template and roster template. Notifications are defined as outcomes of events which are defined by rules that send electronic alerts and smart-alerts to a user.

FIG. 2 illustrates the relationships amongst single temporal events **210**, a schedule or sequence of events **220**, repeating temporal events **230**, repeating schedules of events **240** for a single user, using rules. A schedule is a sequence of single temporal events related by rules. Single temporal events can be repeated resulting in a sequence of the recurring events related by rules. A schedule of individual events can be repeated resulting in a sequence of recurring schedules related by rules. Also shown are the relationships with single collaborative events **250**, a schedule of collaborative events **260**, repeating collaborative events **270**, and repeating schedules of collaborative events **280** using rules. Collaborative events involve multiple

users. A project is a sequence of collaborative events related by rules. Collaborative events can be repeated resulting in sequence of re-occurring collaborations related by rules. A sequence of collaborative events can be repeated to form a roster, each sequence related by rules. Different users may be allocated to various events in a roster. Therefore, a roster applies to a role, not a user. Users are allocated to a role.

FIG. 3 illustrates a three-tiered data schema for templates, with separate database entity structures for published templates **300**, user templates **310**, and user-instantiated templates **320**. For network-disconnected user devices **330**, the schema includes notifications **331**, smart-alerts **332** and user responses **333**, which are stored along with related records and processed on the local user device **330**, ready to upload to the user instantiated templates **320** upon re-establishing network connectivity to the user device **330**.

FIG. 4 illustrates the notifications received by fixed or mobile devices **410**. User records **424**, once instantiated, create instances of templates **420** that can be associated with user events **450**, user schedules **440** and user rosters **430**, as well as other records. For smart-alerts, user record templates **420** are also embedded, generating user responses **412** that are held on local storage media **411** of the device **410** or immediately uploaded **428** as a user record instance **424**. For mobile devices, iCalendar notifications **414** are also provided with links to create user session and provide user responses **412** via standard electronic calendar interfaces.

A user is defined as a person who has login and password credentials and can access to the system. A roster is defined as a type of schedule that has multiple people assigned to roles associated with its event/tasks. iCalendar is a type of notification interaction with internet accessed electronic calendars, which includes interoperability guidelines as described in publications by Calconnect, the Calendaring & Scheduling Consortium. For further information, refer to the following URL:

http://www.calconnect.org/CD1104_Calendaring_Standards.shtml.

Referring to Fig. 1, schedules **110** are created by linking more than one event **111** using rules and embedding data records **140** either associated with the whole schedule **110**, or linked to an individual event **111**. Schedules **110** once created as user instantiated templates (**320** in **FIG. 3**) are processed by the rule engine **120** and recommendation engine **182**. Event

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triggers **125** initiate smart-alerts **130**, which generate user notifications (**331** in **FIG. 3**). Smart-alerts **130** initiate user responses **333**, which are either stored in user records **324** or locally on the user device **330** if that device is not connected to the electronic network. Once an electronic network is re-established, user responses **333** are transferred to user records **324**.

FIG. 5 illustrates the flow of transaction and activities during the process of instantiation from published templates **510** to user templates **520**, and then to user instantiated templates **530** for user records templates **515**, user roster templates **514**, user schedule templates **513** and user event templates **512**. **FIG. 5** also illustrates the role, reserve, resource participation **541** interactions for user subscribers **550** and contacts if pre-subscription **570**. To identify a template, search tools allow the user to search public folder categories, which hold published templates **510**. User folders store both user templates **521** and user instantiated templates **531** and may be searched in the same way as categories by a user. The relationships between user record templates **515**, user roster templates **514**, user schedule templates **513** and user event templates **512** are also recorded. Interactions/functions are also indicated in **FIG. 5**, including: tag user **542**; verify interest **543** by sending notifications to user subscribers **550** and enrolment invitations to contacts pre-subscription **570**; role selection **544**; confirm availability **545**; confirmation **546**; resolve overlaps **547**; and reserve process **548**. The combination of these interactions/functions depends upon the type of published template selected **510** and the information required at the time of instantiation **520**, **530**.

Template instantiation is defined as a process of creating a new copy of a template with the same rules and structure, whose empty fields can then be filled with content. Resource is defined as a facility or asset that can be allocated to an event, subject to the availability of that facility or asset. A contact is defined as either a nominated registered user or a person who is to be invited to become a registered user. A folder is defined as a user instantiated category comprising a collection of records, events, schedules, templates, and folders which are grouped together for organisational and sharing purposes.

Smart-alert responses **333** can also generate event triggers **125** to initiate other user events **321**, user schedules or user rosters, either for that user or any other designated user by the rule engine **120**, which processes the user instantiated templates **320**.

The user device **330**, also caches both user notifications **331** and user records **324**, which are user generated or associated with user notifications **331** on the local storage device to allow for user notifications to be locally processed by fixed and mobile devices **170** without a connected electronic network. The embodiment involves either using existing electronic calendar interactions, or a reduced functionality version of the system **100**, capable of performing reliably on suitable fixed and mobile devices **330**.

Users are tracked via the administration engine **180** engine, using user information and contact lists for candidate users, which have not yet subscribed. Related information is stored in data records **140**.

An unregistered user may also be recommended to enrol in the system via embedded links across the electronic network or through notifications, supervised by the administration engine **180**.

Users and contacts are notified using each user's nominated messaging methods, being SMS, email, and/or direct application programming interface (API) **150**, and processed by the rule engine **120** and recommendation engine **182** in **FIG. 1** to generate user notifications **331** and smart-alerts **332** communicated to fixed and mobile devices **170**. User preferences are supervised by the administration engine **180** and stored in data records **140** during initial user registration or at the time of updates to user preferences.

Short Message Service (SMS) was defined in 1985 as part of the Global System for Mobile Communications (GSM) series of standards as a means of sending messages of up to 160 characters to and from GSM mobile handsets.

In an embodiment of the invention, templates **190** are based upon a three-tiered data schema per **FIG. 3**. An alternative embodiment of the invention may use a two-tiered schema if public distribution of the published templates **300** is not required.

The top-tier published templates **300** comprise user event templates **301**, user schedule templates **302**, user roster templates **303**, and user record templates **304**.

The user can create published templates **300** from a user template **310**, by identifying the fields in the template that are required to be populated with user or instantiation data at the time of instantiation. The instantiation relationship between published templates **300**,

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user templates **310**, and user instantiated template **320** is tracked so that subsequent updates of a published template **300** can flow through to user templates **310** and user instantiated templates **320** providing that related user responses **333** are authorised for updating by the user for each update.

For an existing published template **300**, a user selects published templates **300** and replicates those published templates **300** into user templates **310**. To prepare for processing of the template by the rule engine **120** and the recommendation engine **182**, the user data **324** is added either using available information in the user records **324** to automatically populate fields required for the instantiation, or the user is required to enter additional data which is not available in the user records **324**. Once all fields are entered, and other important data held by the system 100 is added, such as time zone and location, the middle-tier user templates **310** are instantiated to create lower-tier user instantiated templates **320**. The middle-tier user templates **310** include user event templates **311**, user schedule templates **312**, user roster templates **313**, and user record templates **314**.

User record templates **304**, **314** and user records **324** comprise graphical layouts, nominated media and field attributes, each stored as data records **140**. User records **324** and user records templates **314**, **304** may be stored with or without association with an event **210** or collaborative event **250**. The top-tier published user record templates **304** can be created from a user record template **314**, by identifying the fields in the template that are required to be populated with user or instantiation data at the time of instantiation, if any. Published user record templates **304** can be instantiated by a user into user template **301** versions creating user record templates **314**, which in turn can be instantiated into user templates **324**. To prepare for processing of templates, user data is added using available information in user records **324** to automatically populate fields required for the instantiation additional details entered by the user. Instantiation can only occur when dependent information as specified in the configuration of the template is provided by the user.

Record templates **420** and user records instances **424** are illustrated in **FIG. 4**, which shows the flowchart for notifications and smart-alerts in user events **450**, user schedules **440** and user rosters **430**. Notifications **413** of user record instances **429** are provided through transaction traffic from storage media **425**, **426**, **427** to the user instantiated templates of the

user roster **430**, user schedules **440** and user events **450** respectively. Template records comprise both public and user instantiated templates, with data that is not related to user records stored as user template data, or if not instantiated, stored in a data repository dedicated for public templates. At the time of instantiation, associated template data is transferred **421**, **422**, **423** to user rosters **430**, user schedules **440** and user events **450**. Notifications interact with the local apps **558** on fixed and mobile devices **410**, **560** as well as through standard iCalendar notifications **414**. Settings are available on the fixed or mobile device **410** to transfer user records instance **424** to local data storage cache **411**, so that this media is available when the electronic network is disconnected. If the device **410** is connected to an electronic network, user records instances **424** can be retrieved either by links embedded in standard iCalendar notification transactions or through system interactions with the app or processing instance that is processing on the fixed or mobile device **410**.

The flowchart depicted in **FIG. 4** illustrates the smart-alerts notification, which includes user responses **412**. Public and user records templates **420** are associated with the user instantiated templates of user rosters **430**, user schedules **440**, and user events **450**, including instantiation data required for user entry. Transactions are notified either by standard iCalendar electronic calendar notifications or to apps or clients, which operate independently on the fixed or mobile device **410**. Once the required information is entered by the user, the resulting user record instance is either locally stored **411**, or providing an electronic network is available, transferred to the system user records instance **424** data storage.

Refer to **FIG. 5** for details of the instantiation process for records. For published templates **510**, a search is completed by specifying categories **511** or descriptive tags, allowing the user to select the most appropriate template for their needs. A user record template may include fields that are configured comprising smart-alerts user responses **333**, fields which are based upon user data and filled at the time of instantiation or values that are set during processing. Public records may include information or media relevant to other records **515**, or associated with user roster templates **514**, user schedule templates **513** or user event templates **512**. A user record template based upon user templates **520** can be converted into a published template **510** by assigning unique global identifiers for fields that are required for instantiation and configuring the user record template **515** and any other record

media into the nominated category **511** for public searching. Tags and descriptive information are added to provide users with details suitable for unfamiliar users of the published-template user-record templates **515**. Folders, once instantiated, can be searched using folder tags in a similar way.

A category is defined as a pre-structured publicly searchable repository for collection of records, events, schedules, templates, and categories which are grouped together for organisational and sharing purposes. A category tag, is a type of tag which describes a category, and is defined as descriptive data records that allow users to search categories based upon common use names, simplifying the cross-referencing of categories, and preserving organisational structure of categories.

A folder tag is defined as descriptive data records that allows users to search folders based upon common use names, simplifying the cross-referencing of folders, and preserving organisational structure of folders.

Data in user record templates **515** can also be utilised in rules and as smart-alert responses allowing users to update data, resulting in dynamic sequencing that can be initiated by changes in user records **535**, once user instantiated templates have been created and linked to create rule field values. Role and resource tags **541** can be assigned to user subscriber records **550** to ensure that records are associated with appropriate users, with the same tags, at the time of instantiation, creating the user records **535**. User-templates user-record templates **525** inherit the association links from the published templates user record templates **515**. Additional user record templates **525** may be added at this time. The user record template **525** may also be associated with user roster templates **524**, user schedule templates **523**, and user event templates **522**. The next step in the instantiation process is to collect all of the fields required for instantiation from user data records **521** if available, or request the user to add missing fields, if required, resulting in the creation of the user records **535** for dynamic run-time processing. A user can include additional user records **531** at any time by selecting existing user records **525**, **535**, user rosters **524**, **534**, related user schedules **523**, **533**, or user events **522**, **532**, automatically resulting in the storage of the new user data record **531** with inherited folder categorisation and creating a data association for that selection, therefore simplifying the record inclusion process. The system records the

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association between published records **510** and every user subscriber **550** that selects that published template **510** for instantiation.

For rosters **280**, the top-tier published user-roster templates **303** can be created from a user roster template **313**, by identifying the fields in the template that are required to be populated with user or instantiation data at the time of instantiation, if any. Users can replicate published templates **300** versions of user roster templates **303** into user templates **310**. To prepare for processing of templates, user data is added using either available information in user records **324** to automatically populate fields required for the instantiation or the user is required to enter additional data that is not available in the user records **324**. Once all fields are entered, middle-tier user templates **310** versions of user roster templates **313** are instantiated to create lower-tier user-instantiated templates **320** versions of user rosters templates **323**, which are processed by the rule engine **120** and recommendation engine **182**.

Refer to **FIG. 5** for details of the instantiation process for rosters. For published templates **510**, a search is completed by specifying categories **511** or descriptive tags, allowing the user to select the most appropriate template for the user's needs. User roster templates **514** are defined as a type of schedule that includes the entire functionality comprising role, resource, reserve definition **541**, tag user **542**, verify interest **543**, role selection **544**, confirm availability **545**, confirmation **546**, resolve overlaps **547**, and reserve process **548**. Each user roster template **514** comprises user schedule templates **513**, user event templates **512**, and user record templates **515**. Data is configured and stored in associated user record templates **515**; relevant data includes user responses **333** to smart-alert, fields that are based upon user data and filled at the time of instantiation, and values that are set during processing. Rules are configured that define the interaction between user event templates **512**, user schedule templates **513**, and related notifications and smart-alert user responses **333**. A user-roster template, based upon user templates **520**, can be converted into a published template **510**, in a user-nominated publicly-searchable category. The conversion is done by assigning unique global identifiers for fields that are required for instantiation and configuring the user roster templates **514** and any other record media **525**, user schedule templates **523**, and user event templates **522**. Tags and descriptive information are added to

describe the template **510** during the creation process to provide users with details suitable for unfamiliar users of the published-template user-roster templates **514**.

Data in user record templates **515** can also be utilised in rules and as smart-alert responses, which allow users to update data resulting in dynamic sequencing that can be initiated by changes in user records **535** and in turn the user rosters **534** once user instantiated templates have been created and linked to create rule field values. Role and resource tags **541** can be assigned **551** to user subscriber records **550** to ensure that records are associated to appropriate users, with the same tags, at the time of instantiation, creating user records **535**. User templates user roster templates **524** inherit the association links from the published templates user roster templates **514**. Additional user record templates **525** may be added at this time. The next step in the instantiation process is to collect all of the fields required for instantiation from user data records **521**, if available, or request the user to add missing fields, if required, resulting in the creation of user records **535** for dynamic run-time processing. For user rosters **534**, the process includes verifying the interest **552** with user subscribers **550** and contacts pre-subscription **570** from contact lists, which can be entered by a user or imported as comma separated variable files, for example. Only a user subscriber **550** receives the full benefits of the system. In advance of subscription, contacts presubscription **570** may be contacted **571** by either SMS message or email to commence the invitation process to become a user subscriber **550**. Once the interest is confirmed, role selection **544** can be completed by the coordinator user or automatically via the system using the role tag matching or manually.

A role tag, is a type of tag which describes a role, and is defined as a predetermined data descriptor that sets the requirement for the automatic selection of a user for a particular event where the role capability definition of the user indicates the same data descriptor.

A confirmation of availability for the role is sent **553**, **572**. If the contact is pre-subscription **570**, an invitation is included to enrol as a user subscriber **550**. User subscribers **555** can consider and resolve their overlaps **547** or conflicts in calendar commitments. Once all allocations are finalised, a confirmation **546** is sent **554** to the user. If for any reason a confirmed user is no longer available for an assigned role, the reserve process **548** is initiated. If a reserve **541** has been pre-allocated, the system automatically resolves the assignment of a reserve **556**. If the assignment cannot be resolved, escalation notifications commence,

notifying the coordinator user of the role vacancy. A user can include additional user records **531** at any time by selecting existing user records **525**, **535** user rosters **524**, **534**, related user schedules **523**, **533**, or user events **522**, **532**, which automatically results in the storage of the new user data record **531** with inherited folder categorisation and creates a data association for that selection. This simplifies the record inclusion process. Published records maintain associations with the user subscriber **550** that created the template and all users that have selected the published template **510** for instantiation.

Referring to **FIG. 2**, for schedules **220** of events (E1, E2, ..., En), the top-tier published user schedule templates **302** can be created from user schedule templates **312**, by identifying the fields in the template that are required to be populated with user or instantiation data at the time of instantiation, if any. Users can replicate published templates **300** versions of user schedule templates **302** into user templates **310**. To prepare for processing of templates, user data is added using either available information in user records **324** to automatically populate fields required for the instantiation or the user is required to enter additional data which is not available in the user records **324**. Once all fields are entered, middle-tier user templates **310** versions of user schedule templates **312** are instantiated to create lower-tier user-instantiated templates **320** versions of user schedule templates **322**, which are processed by the rule engine **120** and recommendation engine **182**.

Refer to **FIG. 5** for details of the instantiation process for schedules. For published templates **510**, a search is completed by specifying categories **511** or descriptive tags, allowing the user to select the most appropriate template for the user's needs. User schedule templates **513** comprise role, resource **541**, resolve overlaps **547**, user event templates **512**, and user record templates **515**. Data is configured and stored in associated user record templates **515**; relevant data includes smart-alerts user responses **333**, fields which are based upon user data and filled at the time of instantiation, and values which are set during processing. Rules are configured for the interaction between user event templates **512**, user schedule templates **513**, and related notifications and smart-alert user responses **333**. User schedule templates **513** based upon user templates **520** can be converted into a published template **510** by assigning unique global identifiers for fields that are required for instantiation and configuring the user schedule templates **513**, any other record media **525**, and user event templates **522** into the nominated category **511** for public searching. Tags and

descriptive information are added to provide users with details suitable for unfamiliar users of the published template user schedule templates **513**. Data in user record templates **515** can also be utilised in rules and as smart-alert responses, which allow users to update data resulting in dynamic sequencing that can be initiated by changes in user records **535** and in turn user schedules **533**, once user instantiated templates have been created and linked to create rule field values. Role and resource tags **541** can be assigned to user subscriber records **550** to ensure that records are associated with appropriate users, with the same tags, at the time of instantiation, creating user records **535**. User-templates user-schedule templates **523** inherit the association links from the published templates user schedule templates **513**. Additional user record templates **525** may be added at this time. The next step in the instantiation process is to collect all of the fields required for instantiation from user data records **521**, if available, or request the user to add missing fields, if required, resulting in the creation of user records **535** for dynamic run-time processing.

For user schedules **533**, the process includes identifying user subscribers **550** that match tag criteria. Only a user subscriber **550** receives the full benefits of the system. In advance of subscription, contacts presubscription **570** may be contacted by either SMS message or email to commence the invitation process to become a user subscriber **550**. Once the interest is confirmed, role selection **544** can be completed by the coordinator user, automatically via the system using the role tag matching, or manually. A confirmation of availability for the role **545** is completed, allowing the user to consider overlaps **547** or conflicts in calendar commitments. A user can include additional user records **531** at any time by selecting existing user records **525**, **535**, user rosters **524**, **534**, related user schedules **523**, **533**, or user events **522**, **532**, which automatically results in the storage of the new user data record **531** with inherited folder categorisation and creating a data association for that selection. This simplifies the record inclusion process. Published records maintain associations with the user subscriber **550** that created the template and all users that have selected the published template **510** for instantiation.

For events **210**, the top-tier published user-schedule templates **302** can be created from a user events template **311** by identifying the fields in the template that are required to be populated with user or instantiation data at the time of instantiation, if any. Users can replicate published templates **300** versions of user event templates **301** into user templates

310. Users can replicate published templates **300** versions of user event templates **311** into user templates **310**. To prepare for processing of templates, user data is added using either available information in user records **324** to automatically populate fields required for the instantiation, or the user is required to enter additional data that is not available in the user records **324**. Once all fields are entered, middle-tier user templates **310** versions user event templates **311** are instantiated to create lower-tier user instantiated templates **320** version of user events templates **321**. Events **210** are also associated with user records **324**, which are added to published templates **300**, user templates **310**, or user instantiated templates **320** via a user device **300**. Records associated with events **210**, user notifications **331**, or user responses **333** are stored either in user records **324** or locally on the user device **330** if that device is not connected to the electronic network. Once an electronic network is re-established, records added by the user on the user device **320** are transferred to user records **324**, which are then processed by the rule engine **120** and recommendation engine **182**.

Refer to **FIG. 5** for details of the instantiation process for events. For published templates **510**, a search is completed by specifying categories **511** or descriptive tags, allowing the user to select the most appropriate template for their needs. User event templates **512** comprise role, resource **541**, resolve overlaps **547**, and user record templates **515**. Data is configured and stored in associated user record templates **515**; relevant data include smart-alerts user responses **333**, fields that are based upon user data and filled at the time of instantiation, and values that are set during processing. Rules are configured for the interaction between user event templates **512**, user schedule templates **513**, and related notifications and smart-alert user responses **333**. User event templates **512** based upon user templates **520** can be converted into a published template **510** by assigning unique global identifiers for fields that are required for instantiation and configuring the user event templates **512** and any other record media **525** into the nominated category **511** for public searching. Tags and descriptive information are added to provide users with details suitable for unfamiliar users of the published template user event templates **512**. Data in user record templates **515** can also be utilised in rules and as smart-alert responses, which allow users to update data resulting in dynamic sequencing that can be initiated by changes in user records **535** and in turn user events **532**, once user instantiated templates have been created and linked to create rule field values. Role and resource tags **541** can be assigned to user

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subscriber records **550** to ensure that records are associated with appropriate users, with the same tags, at the time of instantiation, creating the user records **535**. User-templates user event templates **522** inherit the association links from the published templates user event templates **512**. Additional user record templates **525** may be added at this time. The next step in the instantiation process is to collect all of the fields required for instantiation from user data records **521**, if available, or request the user to add missing fields, if required, resulting in the creation of user records **535** for dynamic run-time processing.

For user events **532**, the process includes identifying user subscribers **550** that match tag criteria. Only a user subscriber **550** receives the full benefits of the system. In advance of subscription, contacts presubscription **570** may be contacted by either SMS message or email to commence the invitation process to become a user subscriber **550**. Once the interest is confirmed, role selection **544** can be completed by the coordinator user, automatically via the system using the role tag matching, or manually. A confirmation of availability for the role **545** is completed, allowing the user to consider overlaps **547** or conflicts in calendar commitments. A user can include additional user records **531** at any time by selecting existing user records **525**, **535** user rosters **524**, **534**, related user schedules **523**, **533**, or user events **522**, **532**, automatically resulting in the storage of the new user data record **531** with inherited folder categorisation and creating a data association for that selection. This simplifies the record inclusion process. Published records maintain associations with the user subscriber **550** that created the template and all users that have selected the published template **510** for instantiation.

User instantiated templates **320**, which comprise user event **321**, user schedules **322**, user rosters **323**, and user records **324**, are processed by the rule engine **120** to initiate user notifications **331**, event triggers **125** and user smart-alerts **332**. User responses **333** may result in updating of user records **324**.

The rule engine **120** processes the configuration information stored as attributes of rules located in data records which define the various temporal relationships. The rule types define temporal relationships in templates which use smart-alert responses, other event **532** outcomes, scheduled times or machine states to dynamically create triggers that adjust event relationships.

The rating engine **160** processes user actions, the processing overhead, and the volume of stored user data records **140**. User subscription levels define entitlements, and if limits are exceeded, the rating engine **160** generates events, which propose subscription upgrades to users. Rating entitlements for groups of users are also tracked and managed by the rating engine **160**.

The billing & payment engine **165** shown in **FIG. 1** processes subscription events, which are managed by the rating engine **160** to collect user payments.

The advertising engine **181** of **FIG. 1** tracks metadata relating to users and completes analysis of user demographics to support targeted advertising. An advertising interface is also managed by the advertising engine **181** to utilise areas of the display on fixed and mobile user devices **170**.

The embodiments of the invention have application to, but are not limited to, medication management and academic schedules, for example. In both cases, important information and media is loaded into the data records **140** repository. If updates of this information are needed, user templates **310** and published templates **300** can be created. Events **210** are configured individually or as schedules **220**. Additional users, such as a carer for medications, or other student users in a student project can be established as a single collaboration **250**, repeated collaboration **270**, project **260** or roster **280**. For the medication administration (an example of a “medication event”) of a child, a parent can be provided with the full control of the user account for that child. The parent can also transfer the control of the account for a period of time or perpetually using the administration engine **180**.

Event templates can be instantiated in at least one schedule of events of at least one user.

Interactions between events **210** of one user or between events of different users **250** are cross referenced, and the attributes of rules are added to define those interactions. Data is stored as data records **140** for processing by the rule engine **120** and recommendation engine **182**.

A sequence of medications is established by using an event **111** for each medication, which may be repeated, or dynamically sequenced depending upon other events for the user

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or another user. A carer may be notified by the recommendation engine **182** if for any reason user responses **333** are not received in accordance with each rule **100**.

For a group of students, for example, all students can be provided with user notifications **331** to remind the students of their role, important actions, distribution and collection of records **324** and prompt the students for feedback on progress of tasks via the user responses **333**.

Calendars and schedules of events can be converted into user templates **310** and published templates **300**, which may be selected by different groups of users, and processed by the system according to user requirements and other instantiation data at the time or instantiation into the user instantiated templates **320**. In this manner, schedules that may be used in one period can be reapplied across future periods of time, thereby reducing the complexity of administration and increasing productivity of administrators and students.

For medication management, a protocol for one prescription medication created for one user can be used by many users across future periods of time. This ensures that patients are advised of user notification **331**. Using smart-alerts **332** and user responses **333** received by fixed and mobile devices **170**, patients are able to collect and log important information. Relevant examples of such information include test results, reports, dates of expiry of medications, symptoms, pain levels, date of next appointment, amount of stock of medication at hand, and dates that prescriptions are required to ensure that prescribed medications are not disrupted. An event **210** or schedule **220** can also be configured for interacting with medications, e.g. to track the maximum period that medication can be administered, and adjusting dosages depending on rule interactions. Schedules **220** and records **324** can be searched by the user and shared with health professionals or any other user, either on a temporary or perpetual basis.

For academic schedules, the system is able to track the location of the users fixed and mobile devices **170**. Based upon the location and time zone attributes of an event **210** along with other system and publicly available or licensed travel time data, the rule engine **120** and recommendation engine **182** can incorporate travel time and adjust user notifications to dynamically process user notifications **331**, to ensure that all participants are able to attend on time at an agreed location or at the same time. In a similar manner, a phone conference can

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be scheduled for participants in different time zones, ensuring that each participant's user notifications 331 are adjusted for time of day across the varying time zones.

Temporal relationships defined in the templates each comprises a combination of absolute, relative, calculated, and user-defined temporal relationship.

The rule engine **120** processes the configuration information stored as attributes of rules located in data records, where the rules define the various temporal and role allocation relationships. Further, the rule types define the following:

- rules between events **111**,
- rules between different sequences of events **110**,
- rules based upon data records **140**,
- rules based upon user data **324**,
- rules which manage role allocation,
- rules based upon user responses **333**,
- rules which rely upon the recommendation engine **182**,
- rules to define user notifications **331**,
- rules to define user smart-alerts **332**, and
- rules to respond to user responses **333**.

Rule attributes comprise input variables for simple processing algorithms that generate a Boolean outcome. Rules are configured whenever selecting an event **210** to create repeated events **230**, a single schedule **220**, or repeated schedules **240**. Rules also allow for the selection of user roles associated with a collaborative event **250**, a schedule of collaborations **260**, or repeated collaborations **270** or rosters **280**. Interactions with users are processed by the recommendation engine **182**.

Input variables comprise user records **324**, role allocation and contact tags, smart-alert user responses **333**, and/or outcomes generated by other event triggers **125** relating to events

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111, either triggered by users or any other source including machine status or time initiated events.

The recommendation engine **182** can recommend templates **510** to users based upon criteria comprising:

selection of user attributes recorded in records **535**,

category and folder description or tags **544** identified based upon user search criteria,

invitations **543, 546** from co-ordinating users, or

other sources such as embedded URL links in social media or web advertising, which result in the pre-selection of application landing pages and pre-selection of templates **510** of interest to a user.

User devices **330** also cache both user notifications **331** and user records **324** on a local storage device to allow for user notifications to be locally processed without a connected electronic network. User records **324** may be user generated or associated with user notifications **331**, such as smart-alert responses. This embodiment involves either using existing electronic calendar functionality combined with system managed interactions via the connected electronic network, or a reduced functionality version of the system **100**, capable of performing reliably on suitable fixed and mobile devices **330** when an electronic network is not available.

Similarly, user responses to smart-alerts **333**, comprising the entry of data or acknowledgements as stored on user devices **330** that are not connected to an electronic network, are cached on that user device and then transferred to user data records **515** when a data connection via an electronic network to that device is next available.

A user device may connect automatically via fixed or local WLAN electronic networks, or can be manually connected using a wireless carrier's electronic network.

User instantiated templates including user events **532**, user schedules **533**, and user rosters **534** may include an event **532** that dynamically adjusts for travel time based on a current location of a user, time zone and location of events, and the intended time and location of a dependent event **532**. Third party travel time servers can be integrated via an

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electronic network to identify the transit time that applies depending upon the mode of transit, including: walking, pedal bicycle, motor vehicle, public transport, domestic or international air travel. Adjustments are also made if no transit time is required, as may be the case for a phone based teleconference.

Published templates **510**, user templates **520**, and user records in user instantiated templates **520** are categorised, stored, searched, and viewed by the system or user-defined context specific categories and tags. Published templates **510** have system defined categories and tags that can be replicated by users at the time of instantiation, converting from the published template **510** into the user template **520**. A user's folder structure can default to the same structure of the published template **510** category or may be user defined at the time of instantiation, or anytime thereafter.

A user may share a published template **510** or user template **520** and any user instantiated templates **530** and any associated user data record **531**. User data records comprise user events **532**, user schedule **533**, user rosters **534**, or user records **535**. Users may share user data records **521**, **531** with any other user subscriber, based upon a single selection of a record, or based upon a folder, which may include sub-folders depending upon the user selection. Sharing may be either perpetual, or for a defined period.

Another type of sharing occurs when a co-ordinating user includes an unsubscribed contact. This results in that unsubscribed contact being notified, by either SMS or email **150**, to become a subscriber of the system. A subscriber must enter required user data records **531** and thereafter receives system notifications to enrolled fixed and mobile devices **170**.

A user may request to create published templates **510**. The process of creating a published template comprises: selecting an existing user template **520**, defining the user records that must be defined at the time of instantiation of the published template **510** once created, and approving the template by a system administrator as being suitable for publication. The process also includes nominating a public category and defining descriptive information relating to that template and any tags that may be searched by users **511**. Once published, any system user may select that template and, providing the user has defined the user data records **511** required for instantiation, that user then creates their own unique version of a user template **520**. The relationship between the source published template **510**

and the user template **520** is traced by the system to allow for user notification of changes to published templates, if in the future those templates are adjusted.

Published templates **510**, user templates **520**, and user instantiated templates **530** may be viewed in either a time-domain view, or in a view based upon event-relationships. The published templates **510**, user templates **520**, and user instantiated templates **530** comprise user event templates **512**, **522** and user events **532**, user schedule templates **513**, **523** and user schedules **533**, user roster templates **514**, **524** and user roster **534**.

The time-domain views may comprise daily, weekly, monthly, six monthly, annual, and multi-year periods. Event relationships are illustrated by displaying configuration fields that define start time, end time, records, and rules that define interactions between events **305**, **315**, **325** and the types of alert and smart-alert notifications **513**.

A combined display of both time domain and event-relationship views may also be practiced.

The display on each user's fixed or mobile device **170** can illustrate the details of temporal events for defined shorter periods simultaneously as extended time frames are displayed in summary. Details may be displayed for daily-, weekly-, and monthly-scheduled events, along with monthly, six-monthly, annual, and multi-year periods. Each of the day, weekly, monthly and six-monthly views can be scrolled to increment or decrement each day, week, month, or six-month period respectively.

A user may output a printed document or file "output" suitable for electronic distribution of all of the information and details included in each user instantiated template **530**, user template **520**, and published template **510**. The output may include a summary section, as well as sections for each user data record **511**, **521**, **531** that include all definitions **541** rules **305**, fields and attributes stored in user records **324**, allocated categories and folders, tag **542**, contact **570**, user list **550**, availability **545**, confirmation **546**, verification of interest **543** (as applicable) for each record **511**, **521**, **531** along with printed copies of details of each user records **535** and user record templates **515**, **525**.

Thus, the embodiments of the invention provide network hosted service for managing temporal data such as: anniversaries, appointments, event schedules, rosters, meetings, and

associated record management driven by reusable and editable templates, rules, triggers, and smart-alerts.

The computer system implementing the time management system may be practiced using the computer system **700** depicted in **FIG. 7**. Similarly, the local devices, user devices, and the like electronic devices may be implemented using an architecture like that in **FIG. 7** with appropriate modifications (e.g., smart phones, electronic tablets, etc.) In particulars, **FIGS. 7A** and **7B** depict a general-purpose computer system **700**, upon which the various arrangements described can be practiced.

As seen in **FIG. 7A**, the computer system **700** includes: a computer module **701**; input devices such as a keyboard **702**, a mouse pointer device **703**, a scanner **726**, a camera **727**, and a microphone **780**; and output devices, including a printer **715**, a display device **714** and loudspeakers **717**. An external Modulator-Demodulator (Modem) transceiver device **716** may be used by the computer module **701** for communicating to and from a communications network **720** via a connection **721**. The communications network **720** may be a wide-area network (WAN), such as the Internet, a cellular telecommunications network, or a private WAN, for example. Where the connection **721** is a telephone line, the modem **716** may be a traditional “dial-up” modem. Alternatively, where the connection **721** is a high capacity (e.g., cable) connection, the modem **716** may be a broadband modem. A wireless modem may also be used for wireless connection to the communications network **720**.

The computer module **701** typically includes at least one processor unit **705**, and a memory unit **706**. For example, the memory unit **706** may have semiconductor random access memory (RAM) and semiconductor read only memory (ROM). The computer module **701** also includes a number of input/output (I/O) interfaces including: an audio-video interface **707** that couples to the video display **714**, loudspeakers **717** and microphone **780**; an I/O interface **713** that couples to the keyboard **702**, mouse **703**, scanner **726**, camera **727** and optionally a joystick or other human interface device (not illustrated); and an interface **708** for the external modem **716** and printer **715**. The modem **716** may be incorporated within the computer module **701**, for example within the interface **708**. The computer module **701** also has a local network interface **711**, which permits coupling of the computer system **700** via a

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connection **723** to a local-area communications network **722**, known as a Local Area Network (LAN). As illustrated in **FIG. 7A**, the local communications network **722** may also couple to the wide network **720** via a connection **724**, which would typically include a so-called “firewall” device or device of similar functionality. The local network interface **711** may comprise an Ethernet circuit card, a Bluetooth[®] wireless arrangement or an IEEE 802.11 wireless arrangement; however, numerous other types of interfaces may be practiced for the interface **711**.

The I/O interfaces **708** and **713** may afford either or both of serial and parallel connectivity, the former typically being implemented according to the Universal Serial Bus (USB) standards and having corresponding USB connectors (not illustrated). Storage devices **709** are provided and typically include a hard disk drive (HDD) **710**. Other storage devices such as a floppy disk drive and a magnetic tape drive (not illustrated) may also be used. An optical disk drive **712** is typically provided to act as a non-volatile source of data. Portable memory devices, such optical disks (e.g., CD-ROM, DVD, Blu-ray Disc[™]), USB-RAM, portable, external hard drives, and floppy disks, for example, may be used as appropriate sources of data to the system **700**.

The components **705** to **713** of the computer module **701** typically communicate via an interconnected bus **704** and in a manner that results in a conventional mode of operation of the computer system **700** known to those in the relevant art. For example, the processor **705** is coupled to the system bus **704** using a connection **718**. Likewise, the memory **706** and optical disk drive **712** are coupled to the system bus **704** by connections **719**. Examples of computers on which the described arrangements can be practised include IBM-PC's and compatibles, Sun Sparcstations, Apple Mac[™] or a like computer systems.

The method of managing scheduled events in a network-hosted time management system may be implemented using the computer system **700** where the processes of **FIGS. 1-6** may be implemented as one or more software application programs **733** executable within the computer system **700**. In particular, the steps of the method of managing scheduled events in a network-hosted time management system are effected by instructions **731** (see **FIG. 7B**) in the software **733** that are carried out within the computer system **700**. The

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software instructions **731** may be formed as one or more code modules, each for performing one or more particular tasks. The software may also be divided into two separate parts, in which a first part and the corresponding code modules performs the method of managing scheduled events in a network-hosted time management system and a second part and the corresponding code modules manage a user interface between the first part and the user.

The software may be stored in a computer readable medium, including the storage devices described below, for example. The software is loaded into the computer system **700** from the computer readable medium, and then executed by the computer system **700**. A computer readable medium having such software or computer program recorded on the computer readable medium is a computer program product. The use of the computer program product in the computer system **700** preferably effects an advantageous apparatus for managing scheduled events in a network-hosted time management system.

The software **733** is typically stored in the HDD **710** or the memory **706**. The software is loaded into the computer system **700** from a computer readable medium, and executed by the computer system **700**. Thus, for example, the software **733** may be stored on an optically readable disk storage medium (e.g., CD-ROM) **725** that is read by the optical disk drive **712**. A computer readable medium having such software or computer program recorded on it is a computer program product. The use of the computer program product in the computer system **700** preferably effects an apparatus for managing scheduled events in a network-hosted time management system.

In some instances, the application programs **733** may be supplied to the user encoded on one or more CD-ROMs **725** and read via the corresponding drive **712**, or alternatively may be read by the user from the networks **720** or **722**. Still further, the software can also be loaded into the computer system **700** from other computer readable media. Computer readable storage media refers to any non-transitory tangible storage medium that provides recorded instructions and/or data to the computer system **700** for execution and/or processing. Examples of such storage media include floppy disks, magnetic tape, CD-ROM, DVD, Blu-rayTM Disc, a hard disk drive, a ROM or integrated circuit, USB memory, a magneto-optical disk, or a computer readable card such as a PCMCIA card and the like, whether or not such

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devices are internal or external of the computer module **701**. Examples of transitory or non-tangible computer readable transmission media that may also participate in the provision of software, application programs, instructions and/or data to the computer module **701** include radio or infra-red transmission channels as well as a network connection to another computer or networked device, and the Internet or intranets including e-mail transmissions and information recorded on Websites and the like.

The second part of the application programs **733** and the corresponding code modules mentioned above may be executed to implement one or more graphical user interfaces (GUIs) to be rendered or otherwise represented upon the display **714**. Through manipulation of typically the keyboard **702** and the mouse **703**, a user of the computer system **700** and the application may manipulate the interface in a functionally adaptable manner to provide controlling commands and/or input to the applications associated with the GUI(s). Other forms of functionally adaptable user interfaces may also be implemented, such as an audio interface utilizing speech prompts output via the loudspeakers **717** and user voice commands input via the microphone **780**.

FIG. 7B is a detailed schematic block diagram of the processor **705** and a “memory” **734**. The memory **734** represents a logical aggregation of all the memory modules (including the HDD **709** and semiconductor memory **706**) that can be accessed by the computer module **701** in **FIG. 7A**.

When the computer module **701** is initially powered up, a power-on self-test (POST) program **750** executes. The POST program **750** is typically stored in a ROM **749** of the semiconductor memory **706** of **FIG. 7A**. A hardware device such as the ROM **749** storing software is sometimes referred to as firmware. The POST program **750** examines hardware within the computer module **701** to ensure proper functioning and typically checks the processor **705**, the memory **734** (**709**, **706**), and a basic input-output systems software (BIOS) module **751**, also typically stored in the ROM **749**, for correct operation. Once the POST program **750** has run successfully, the BIOS **751** activates the hard disk drive **710** of **FIG. 7A**. Activation of the hard disk drive **710** causes a bootstrap loader program **752** that is resident on the hard disk drive **710** to execute via the processor **705**. This loads an operating

system **753** into the RAM memory **706**, upon which the operating system **753** commences operation. The operating system **753** is a system level application, executable by the processor **705**, to fulfil various high level functions, including processor management, memory management, device management, storage management, software application interface, and generic user interface.

The operating system **753** manages the memory **734** (**709**, **706**) to ensure that each process or application running on the computer module **701** has sufficient memory in which to execute without colliding with memory allocated to another process. Furthermore, the different types of memory available in the system **700** of **FIG. 7A** must be used properly so that each process can run effectively. Accordingly, the aggregated memory **734** is not intended to illustrate how particular segments of memory are allocated (unless otherwise stated), but rather to provide a general view of the memory accessible by the computer system **700** and how such is used.

As shown in **FIG. 7B**, the processor **705** includes a number of functional modules including a control unit **739**, an arithmetic logic unit (ALU) **740**, and a local or internal memory **748**, sometimes called a cache memory. The cache memory **748** typically includes a number of storage registers **744** - **746** in a register section. One or more internal busses **741** functionally interconnect these functional modules. The processor **705** typically also has one or more interfaces **742** for communicating with external devices via the system bus **704**, using a connection **718**. The memory **734** is coupled to the bus **704** using a connection **719**.

The application program **733** includes a sequence of instructions **731** that may include conditional branch and loop instructions. The program **733** may also include data **732** which is used in execution of the program **733**. The instructions **731** and the data **732** are stored in memory locations **728**, **729**, **730** and **735**, **736**, **737**, respectively. Depending upon the relative size of the instructions **731** and the memory locations **728-730**, a particular instruction may be stored in a single memory location as depicted by the instruction shown in the memory location **730**. Alternately, an instruction may be segmented into a number of parts each of which is stored in a separate memory location, as depicted by the instruction segments shown in the memory locations **728** and **729**.

In general, the processor **705** is given a set of instructions which are executed therein. The processor **705** waits for a subsequent input, to which the processor **705** reacts to by executing another set of instructions. Each input may be provided from one or more of a number of sources, including data generated by one or more of the input devices **702**, **703**, data received from an external source across one of the networks **720**, **702**, data retrieved from one of the storage devices **706**, **709** or data retrieved from a storage medium **725** inserted into the corresponding reader **712**, all depicted in **FIG. 7A**. The execution of a set of the instructions may in some cases result in output of data. Execution may also involve storing data or variables to the memory **734**.

The disclosed arrangements use input variables **754**, which are stored in the memory **734** in corresponding memory locations **755**, **756**, **757**. The arrangements produce output variables **761**, which are stored in the memory **734** in corresponding memory locations **762**, **763**, **764**. Intermediate variables **758** may be stored in memory locations **759**, **760**, **766** and **767**.

Referring to the processor **705** of **FIG. 7B**, the registers **744**, **745**, **746**, the arithmetic logic unit (ALU) **740**, and the control unit **739** work together to perform sequences of micro-operations needed to perform “fetch, decode, and execute” cycles for every instruction in the instruction set making up the program **733**. Each fetch, decode, and execute cycle comprises: a fetch operation, which fetches or reads an instruction **731** from a memory location **728**, **729**, **730**; a decode operation in which the control unit **739** determines which instruction has been fetched; and an execute operation in which the control unit **739** and/or the ALU **740** execute the instruction.

Thereafter, a further fetch, decode, and execute cycle for the next instruction may be executed. Similarly, a store cycle may be performed by which the control unit **739** stores or writes a value to a memory location **732**.

Each step or sub-process in the processes of **FIGS. 1-6** is associated with one or more segments of the program **733** and is performed by the register section **744**, **745**, **747**, the ALU **740**, and the control unit **739** in the processor **705** working together to perform the

fetch, decode, and execute cycles for every instruction in the instruction set for the noted segments of the program **733**.

The method of managing scheduled events in a network-hosted time management system may alternatively be implemented in dedicated hardware such as one or more integrated circuits performing the functions or sub functions of managing scheduled events in a network-hosted time management system. Such dedicated hardware may include graphic processors, digital signal processors, or one or more microprocessors and associated memories.

Methods, apparatuses, and computer readable media for managing scheduled events in a network-hosted time management system implemented using a computer system have been disclosed. The foregoing discloses several embodiments of the invention, but modifications and/or changes can be made thereto without departing from the scope of the invention. The embodiments of the embodiment are illustrative and not restrictive.

Embodiments of the service comprise a method of creating templates by a user, then using that template by either that user, or another user. This example illustrates the method of embodiment for the following: immunisations applicable from birth. Recommendations for this example are based on at least one of, national, state and local jurisdiction health-related requirement and a health advisory body recommendation.

Examples of a health advisory body include medical specialists, health insurance providers, health care centres and organisations such as the World Health Organization (WHO), a specialist agency of the United Nations Development Group, which provides guidance to governments on setting policy for immunisation schedules which then apply to each government's jurisdiction.

This example includes user profile and other information and circumstances related to the specific aspects of sub-groups in the community of users, including the geographic location of the user community and may relate to the specific requirements related to national, state or local jurisdiction. This embodiment also encapsulates related embodiments

including templates for community health care, and may also combine the health checks schedule example in a single embodiment.

Referring to **FIG. 6** for immunisations, the method **600** uses events and timing information which is advised by health administrators and health advisors as applicable to each user's location. The method **600** commences processing at step **610** ("Start"). In step **620**, reusable non-user-specific templates are constructed by users, including health administrators and health advisors, as described in greater detail hereinafter with reference to **FIGS. 1-5**. Each template comprises for each immunisation an event, a notification, and an associated data record stored in a database repository accessible via an electronic network coupled to the time management system. Examples of records include date of birth, gender, demographic information, content of questions and responses to answers, addresses, maps, url links, media relating to events, advisory text as well as user created records which can be added for storage of information. Each template is a combination of records in a database repository with fields that relate one record type to another record type. In step **630**, at least one rule is included (defined) in each template. Each rule creates a temporal relationship between (1) two or more events, or (2) an event and an associated data record, to form at least one dynamic interrelated event schedule. Examples of rules may relate to the timing between immunisations, particularly when events are missed, and there is a pre-determined constraint on administering further immunisations or any sequence of events that requires definition such as repeats or any other specific periods between those events. In step **640**, templates are instantiated by populating the records of the templates with data to create at least one user-specific event schedule, or a multiple role roster, each having associated records. For immunisations, rosters may be used to manage the health pathway interaction between healthcare professionals as well as the involvement of the patient's nurse, family, friend, advocate or carer. Each roster is a set of interrelated event schedules for multiple user roles. In step **650**, event notification alert temporal data is monitored and at least one user device is notified in response to the monitoring by initiating a smart-alert. The smart-alert comprises a notification regarding an event in one or more schedules that require a reply from a user device connected to the electronic network with user information to satisfy the rule associated with the smart-alert. The requested information is stored in the associated data record. In step **660**, the reply to the smart-alert, comprising data to update the associated data record, is

received from a user (mobile or fixed) device (e.g. a personal computer, a laptop computer, a tablet computer, a smartphone, a network accessible computer). For the immunisation embodiment, records include date of birth, gender, demographic information, content of questions and responses to answers, addresses, maps, url links, media relating to events, advisory text as well as user created records which can be added for storage of information. In step **670**, based on a change to or adding of user data in the associated data record, a rule, an event, a role, a data record, and/or a notification is changed. Processing then ends or returns in step **680**. This results in the smart-alert notifications being delivered, and personalised for each user's immunisation requirement. The steps **620** to **670** may be repeatedly performed by use of an appropriate loop, or the method **600** may be repeatedly performed as required. The embodiments of the invention enable users to manage a schedule of predefined time critical events and associated records by creating templates, which contain sequences of temporal events related by rules. These templates and rules can be used and reused multiple times. The rules create relationships between events within the same schedule, and/or between events within schedules that belong to the same user or multiple users. These templates allow users to instantiate their own independent copy of the schedule of events and if required customise the schedule of events to their requirements without changing the original schedule template.

Because rules can apply across multiple schedules for a single user, interdependent schedule templates can be created for management of complex temporal activities, such as but not limited to: vaccinations, immunisations, health checks to determine requirements, family nurse evaluations, briefings on symptoms, advise of media and related information, request for user details, request for records relating to each of those events in the schedule or roster which defines the specific details of this embodiment.

The rules can contain any logical expression and can trigger events such as creating new records or smart-alerts. The rules can also refer to fields with stored records which enables the schedules to respond to and be modified by external input. Therefore making the schedules dynamic and changing automatically to external input.

Temporal data in schedules, rules and records can be absolute, relative to other events or stored data records via rules, or entered manually or automatically when the template is

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instantiated. Smart-alerts associated with the temporal events enables users to not only be notified of events but also allow users to manually or automatically enter data that is associated with the event alert that can be stored in records and used for temporal relationships or event triggers. A related embodiment of smart-alerts enables notifications to users via wearable devices such blue tooth connected devices providing text messages, vibrations, enrolment of photos or voice notes and user responses at the time of notification.

Event Alerts can be pre-event, upon event, or post event. Multiple alerts within a defined timeframe can be aggregated into a single alert and can be acknowledged by a single acknowledgement to reduce user disruption.

Templates and instantiated schedules can be viewed in either the time domain or in a spatial relationship domain to facilitate, creation, editing, and viewing.

The event may be in at least one schedule of events of at least one user. The temporal relationships defined in the templates may each comprise a combination of absolute, relative, calculated, and user-defined temporal relationship.

For this embodiment example, schedules are created for each specific intended purpose, and may include: vaccinations, inoculations, immunisations, health checks to determine requirements, family nurse evaluations, briefings on symptoms, advise of media and related information, request for user details, request for records relating to each of those events in the schedule

Examples of records include birth date, gender, address, location of the mobiles device, health status, immunisation certificates, prescriptions, medical reports, health insurance claims, receipts, photos, voicemail, video, calculated travel time, or any other record type which is referenced in the specific schedule example of this embodiment.

By way of example of the method used in the embodiment of embodiments, and relating back to the description previously recorded, schedules **110** are created by linking more than one event **111** using rules and embedding data records **140** either associated with the whole schedule **110**, or linked to an individual event **111**. Schedules **110** once created as user instantiated templates (**320** in **FIG. 3**) are processed by the rule engine **120** and recommendation engine **182**. Event triggers **125** initiate smart-alerts **130**, which generate

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user notifications (**331** in **FIG. 3**). Smart-alerts **130** initiate user responses **333**, which are either stored in user records **324** or locally on the user device **330** if that device is not connected to the electronic network. Once an electronic network is re-established, user responses **333** are transferred to user records **324**.

Smart-alert responses **333** can also generate event triggers **125** to initiate other user events **321**, user schedules or user rosters, either for that user or any other designated user by the rule engine **120**, which processes the user instantiated templates **320**.

Users are tracked via the administration engine **180** engine, using user information and contact lists for candidate users, which have not yet subscribed. Related information is stored in data records **140**.

The user can create published templates **300** from a user template **310**, by identifying the fields in the template that are required to be populated with user or instantiation data at the time of instantiation. The instantiation relationship between published templates **300**, user templates **310**, and user instantiated template **320** is tracked so that subsequent updates of a published template **300** can flow through to user templates **310** and user instantiated templates **320** providing that related user responses **333** are authorised for updating by the user for each update.

For an existing published template **300**, a user selects published templates **300** and replicates those published templates **300** into user templates **310**. To prepare for processing of the template by the rule engine **120** and the recommendation engine **182**, the user data **324** is added either using available information in the user records **324** to automatically populate fields required for the instantiation, or the user is required to enter additional data which is not available in the user records **324**. Once all fields are entered, and other important data held by the system **100** is added, such as time zone and location, the middle-tier user templates **310** are instantiated to create lower-tier user instantiated templates **320**. The middle-tier user templates **310** include user event templates **311**, user schedule templates **312**, user roster templates **313**, and user record templates **314**.

At the time of instantiation, associated template data is transferred **421**, **422**, **423** to user rosters **430**, user schedules **440** and user events **450**. Notifications interact with the local apps **558** on fixed and mobile devices **410**, **560** as well as through standard iCalendar

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notifications **414**. Settings are available on the fixed or mobile device **410** to transfer user records instance **424** to local data storage cache **411**, so that this media is available when the electronic network is disconnected. If the device **410** is connected to an electronic network, user records instances **424** can be retrieved either by links embedded in standard iCalendar notification transactions or through system interactions with the app or processing instance that is processing on the fixed or mobile device **410**.

Data in user record templates **515** can also be utilised in rules and as smart-alert responses allowing users to update data, resulting in dynamic sequencing that can be initiated by changes in user records **535**, once user instantiated templates have been created and linked to create rule field values.

As a further example of the embodiments of the embodiment, the following text is repeated:

For rosters **280**, the top-tier published user-roster templates **303** can be created from a user roster template **313**, by identifying the fields in the template that are required to be populated with user or instantiation data at the time of instantiation, if any. Users can replicate published templates **300** versions of user roster templates **303** into user templates **310**. To prepare for processing of templates, user data is added using either available information in user records **324** to automatically populate fields required for the instantiation or the user is required to enter additional data that is not available in the user records **324**. Once all fields are entered, middle-tier user templates **310** versions of user roster templates **313** are instantiated to create lower-tier user-instantiated templates **320** versions of user rosters templates **323**, which are processed by the rule engine **120** and recommendation engine **182**.

For this embodiment example, rosters are created for each specific intended purpose along with the nominated role allocations and the selection of resources. Examples may include : vaccinations, inoculations, immunisations, health checks to determine requirements, family nurse evaluations, briefings on symptoms, advise of media and related information, request for user details, request for records relating to each of those events in the roster

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User instantiated templates **320**, which comprise user event **321**, user schedules **322**, user rosters **323**, and user records **324**, are processed by the rule engine **120** to initiate user notifications **331**, event triggers **125** and user smart-alerts **332**. User responses **333** may result in updating of user records **324**.

The embodiments of the invention have application to, but are not limited to, immunisations, community health care, personal development monitoring, health checks and any other related event which is added to the specific schedule or roster.

In these cases, important information and media is loaded into the data records **140** repository. If updates of this information are needed, user templates **310** and published templates **300** can be created. Events **210** are configured individually or as schedules **220**.

Event templates can be instantiated in at least one schedule of events of at least one user.

Interactions between events **210** of one user or between events of different users **250** are cross referenced, and the attributes of rules are added to define those interactions. Data is stored as data records **140** for processing by the rule engine **120** and recommendation engine **182**.

A sequence for immunisations is established by using an event **111** for each scheduled activity, which may be repeated, or dynamically sequenced depending upon other events for the user or another user. A carer, guardian, schedule creator or other user may be notified by the recommendation engine **182** if for any reason user responses **333** are not received in accordance with each rule **100**.

For a health administrator, for example, a schedule can be created so that all participants are provided with user notifications **331** to remind them of their important actions, preparations, distribution and collection of records **324** and prompt each role for feedback on progress of tasks via the user responses **333**.

Calendars and schedules of events can be converted into user templates **310** and published templates **300**, which may be selected by different groups of users, and processed by the system according to user requirements and other instantiation data at the time or instantiation into the user instantiated templates **320**. In this manner, schedules that may be

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used in one period can be reapplied across future periods of time, thereby reducing the complexity of administration and increasing productivity of administrators and students.

For immunisations, a health plan created by health administrators for typical users based upon standard advice published by the peak industry body applicable to that location or jurisdiction. This can be used by many parents for children, each with their own profile. The schedule is then available for future users over future periods of time. This ensures that each user, or their parent or guardian if applicable, is advised of user notifications **331**. Using smart-alerts **332** and user responses **333** received by fixed and mobile devices **170**, users are able to adjust the standard schedule to match their profile, as well as collect and log important information. Relevant examples of such information include information on the immunisation as scheduled, preparation, confirmation of appointments, related health checks such as baby health care review, adding of reports, details required for health care claims, and dates that other related tasks need to be conducted, such as confirmation of available times. An event **210** or schedule **220** can also be configured for interacting with each planned immunisation e.g. for where there are follow-on procedures relating to test results, changes in health care advice specific to each user, allergy treatment, alternative inoculation, and other specific treatments which may depend upon health care policies, user responses and the user's profile. Schedules **220** and records **324** can be searched by the user and shared with between parents, guardian or other users and health professionals or any other user, either on a temporary or perpetual basis.

Based upon the location and time zone attributes of an event **210** along with other system and publicly available or licensed travel time data, the rule engine **120** and recommendation engine **182** can incorporate travel time and adjust user notifications to dynamically process user notifications **331**, to ensure that all participants are able to attend on time at an agreed location or at the same time. In a similar manner, for immunisations planning or any of the related examples, a phone conference can be scheduled for participants in different time zones, ensuring that each participant's user notifications **331** are adjusted for time of day across the varying time zones.

The method of managing scheduled events in a network-hosted time management system may alternatively be implemented in dedicated hardware such as one or more

integrated circuits performing the functions or sub functions of managing scheduled events in a network-hosted time management system. Such dedicated hardware may include graphic processors, digital signal processors, or one or more microprocessors and associated memories.

Methods, apparatuses, and computer readable media for managing scheduled events in a network-hosted time management system implemented using a computer system have been disclosed. The foregoing relates to the embodiment of the patent in immunisations planning and related applications, but modifications and/or changes can be made thereto without departing from the scope of the invention. The embodiments of the embodiment are illustrative and not restrictive.

Embodiments of the service comprise a method of creating templates by a user, then using that template by either that user, or another user. This example illustrates the method of embodiment for the following: health checks planning relating to the date of birth, gender and other user profile information. This embodiment may also combine the immunisations schedule example in a single embodiment.

Recommendations for health checks planning may be based on at least one of, national, state and local jurisdiction health-related requirement and a health advisory body recommendation.

Examples of a health advisory body include medical specialists, health insurance providers, health care centres, any other source of health and well-being advice, and organisations such as the World Health Organization (WHO), a specialist agency of the United Nations Development Group, which provides guidance to governments on setting policy for immunisation schedules which then apply to each government's jurisdiction.

Referring to **FIG. 6** for health checks plans, the method **600** uses events and timing information which is advised by health administrators and health advisors as applicable to each user's location. The method **600** commences processing at step **610** ("Start"). In step **620**, reusable non-user-specific templates are constructed by users, including health administrators and health advisors, as described in greater detail hereinafter with reference to **FIGS. 1-5**. Each template comprises for each health check an event, a notification, and an

associated data record stored in a database repository accessible via an electronic network coupled to the time management system. Examples of records include date of birth, gender, demographic information, content of questions and responses to answers, addresses, maps, url links, media relating to events, advisory text as well as user created records which can be added for storage of information. Each template is a combination of records in a database repository with fields that relate one record type to another record type. In step **630**, at least one rule is included (defined) in each template. Each rule creates a temporal relationship between (1) two or more events, or (2) an event and an associated data record, to form at least one dynamic interrelated event schedule. Examples of rules may relate to the timing between health checks, particularly when events are missed, and there is a pre-determined constraint on when the next related health check is recommended or any sequence of events that requires definition such as repeats or any other specific periods between those events. In step **640**, templates are instantiated by populating the records of the templates with data to create at least one user-specific event schedule, or a multiple role roster, each having associated records. For health checks, rosters may be used to manage the health pathway interaction between healthcare professionals as well as the involvement of the patient's nurse, family, friend, advocate or carer. Each roster is a set of interrelated event schedules for multiple user roles. In step **650**, event notification alert temporal data is monitored and at least one user device is notified in response to the monitoring by initiating a smart-alert. The smart-alert comprises a notification regarding an event in one or more schedules that require a reply from a user device connected to the electronic network with user information to satisfy the rule associated with the smart-alert. The requested information is stored in the associated data record. In step **660**, the reply to the smart-alert, comprising data to update the associated data record, is received from a user (mobile or fixed) device (e.g. a personal computer, a laptop computer, a tablet computer, a smartphone, a network accessible computer). For the health check embodiment, records include date of birth, gender, demographic information, content of questions and responses to answers, addresses, maps, url links, media relating to events, advisory text as well as user created records which can be added for storage of information. In step **670**, based on a change to or adding of user data in the associated data record, a rule, an event, a role, a data record, and/or a notification is changed. Processing then ends or returns in step **680**. This results in the smart-alert notifications being delivered, and

personalised for each user's health care plan. The steps **620** to **670** may be repeatedly performed by use of an appropriate loop, or the method **600** may be repeatedly performed as required.

The embodiments of the invention enable users to manage a schedule of predefined time critical events and associated records by creating templates, which contain sequences of temporal events related by rules. These templates and rules can be used and reused multiple times. The rules create relationships between events within the same schedule, and/or between events within schedules that belong to the same user or multiple users. These templates allow users to instantiate their own independent copy of the schedule of events and if required customise the schedule of events to their requirements without changing the original schedule template.

Because rules can apply across multiple schedules for a single user, interdependent schedule templates can be created for management of complex temporal activities, such as but not limited to: the standard recommended health checks, courses of actions relating to the preparation of health checks, briefings on symptoms, advise of media and related information, request for user details, request for records relating to each of those events in the schedule or roster which defines the specific details of this embodiment.

The rules can contain any logical expression and can trigger events such as creating new records or smart-alerts. The rules can also refer to fields with stored records which enables the schedules to respond to and be modified by external input. Therefore making the schedules dynamic and changing automatically to external input.

Temporal data in schedules, rules and records can be absolute, relative to other events or stored data records via rules, or entered manually or automatically when the template is instantiated. Smart-alerts associated with the temporal events enables users to not only be notified of events but also allow users to manually or automatically enter data that is associated with the event alert that can be stored in records and used for temporal relationships or event triggers. A related embodiment of smart-alerts enables notifications to users via wearable devices such blue tooth connected devices providing text messages, vibrations, enrolment of photos or voice notes and user responses at the time of notification.

Event Alerts can be pre-event, upon event, or post event. Multiple alerts within a defined timeframe can be aggregated into a single alert and can be acknowledged by a single acknowledgement to reduce user disruption.

Templates and instantiated schedules can be viewed in either the time domain or in a spatial relationship domain to facilitate, creation, editing, and viewing.

The event may be in at least one schedule of events of at least one user. The temporal relationships defined in the templates may each comprise a combination of absolute, relative, calculated, and user-defined temporal relationship.

For this embodiment example, schedules are created for each specific intended purpose, and may include: standard recommended health checks, courses of actions relating to the preparation of health checks, briefings on symptoms, advise of media and related information, request for user details, request for records relating to each of those events in the schedule

Examples of records include birth date, gender, address, location of the user's mobile device, health status, immunisation certificates, doctor's reports, prescriptions, medical reports, health insurance claims, receipts, photos, voicemail, video, calculated travel time, or any other record type which is referenced in the specific schedule example of this embodiment.

By way of example of the method used in the embodiment of embodiments, and relating back to the description previously recorded, schedules **110** are created by linking more than one event **111** using rules and embedding data records **140** either associated with the whole schedule **110**, or linked to an individual event **111**. Schedules **110** once created as user instantiated templates (**320** in **FIG. 3**) are processed by the rule engine **120** and recommendation engine **182**. Event triggers **125** initiate smart-alerts **130**, which generate user notifications (**331** in **FIG. 3**). Smart-alerts **130** initiate user responses **333**, which are either stored in user records **324** or locally on the user device **330** if that device is not connected to the electronic network. Once an electronic network is re-established, user responses **333** are transferred to user records **324**.

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Smart-alert responses **333** can also generate event triggers **125** to initiate other user events **321**, user schedules or user rosters, either for that user or any other designated user by the rule engine **120**, which processes the user instantiated templates **320**.

Users are tracked via the administration engine **180** engine, using user information and contact lists for candidate users, which have not yet subscribed. Related information is stored in data records **140**.

The user can create published templates **300** from a user template **310**, by identifying the fields in the template that are required to be populated with user or instantiation data at the time of instantiation. The instantiation relationship between published templates **300**, user templates **310**, and user instantiated template **320** is tracked so that subsequent updates of a published template **300** can flow through to user templates **310** and user instantiated templates **320** providing that related user responses **333** are authorised for updating by the user for each update.

For an existing published template **300**, a user selects published templates **300** and replicates those published templates **300** into user templates **310**. To prepare for processing of the template by the rule engine **120** and the recommendation engine **182**, the user data **324** is added either using available information in the user records **324** to automatically populate fields required for the instantiation, or the user is required to enter additional data which is not available in the user records **324**. Once all fields are entered, and other important data held by the system **100** is added, such as time zone and location, the middle-tier user templates **310** are instantiated to create lower-tier user instantiated templates **320**. The middle-tier user templates **310** include user event templates **311**, user schedule templates **312**, user roster templates **313**, and user record templates **314**.

At the time of instantiation, associated template data is transferred **421**, **422**, **423** to user rosters **430**, user schedules **440** and user events **450**. Notifications interact with the local apps **558** on fixed and mobile devices **410**, **560** as well as through standard iCalendar notifications **414**. Settings are available on the fixed or mobile device **410** to transfer user records instance **424** to local data storage cache **411**, so that this media is available when the electronic network is disconnected. If the device **410** is connected to an electronic network, user records instances **424** can be retrieved either by links embedded in standard iCalendar

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notification transactions or through system interactions with the app or processing instance that is processing on the fixed or mobile device **410**.

Data in user record templates **515** can also be utilised in rules and as smart-alert responses allowing users to update data, resulting in dynamic sequencing that can be initiated by changes in user records **535**, once user instantiated templates have been created and linked to create rule field values.

As a further example of the embodiments of the embodiment, the following text is repeated:

For rosters **280**, the top-tier published user-roster templates **303** can be created from a user roster template **313**, by identifying the fields in the template that are required to be populated with user or instantiation data at the time of instantiation, if any. Users can replicate published templates **300** versions of user roster templates **303** into user templates **310**. To prepare for processing of templates, user data is added using either available information in user records **324** to automatically populate fields required for the instantiation or the user is required to enter additional data that is not available in the user records **324**. Once all fields are entered, middle-tier user templates **310** versions of user roster templates **313** are instantiated to create lower-tier user-instantiated templates **320** versions of user rosters templates **323**, which are processed by the rule engine **120** and recommendation engine **182**.

For this embodiment example, rosters are created for each specific intended purpose along with the nominated role allocations and the selection of resources. Examples may include : standard recommended health checks, courses of actions relating to the preparation of health checks, briefings on symptoms, advise of media and related information, request for user details, request for records relating to each of those events in the roster

User instantiated templates **320**, which comprise user event **321**, user schedules **322**, user rosters **323**, and user records **324**, are processed by the rule engine **120** to initiate user notifications **331**, event triggers **125** and user smart-alerts **332**. User responses **333** may result in updating of user records **324**.

The embodiments of the invention have application to, but are not limited to, immunisations, community health care, personal development monitoring, health checks and any other related event which is added to the specific schedule or roster.

In these cases, important information and media is loaded into the data records **140** repository. If updates of this information are needed, user templates **310** and published templates **300** can be created. Events **210** are configured individually or as schedules **220**.

Event templates can be instantiated in at least one schedule of events of at least one user.

Interactions between events **210** of one user or between events of different users **250** are cross referenced, and the attributes of rules are added to define those interactions. Data is stored as data records **140** for processing by the rule engine **120** and recommendation engine **182**.

A sequence for health checks is established by using an event **111** for each scheduled activity, which may be repeated, or dynamically sequenced depending upon other events for the user or another user. A carer, guardian, schedule creator or other user may be notified by the recommendation engine **182** if for any reason user responses **333** are not received in accordance with each rule **100**.

For a health administrator, for example, a schedule can be created so that all participants are provided with user notifications **331** to remind them of their important actions, preparations, distribution and collection of records **324** and prompt each role for feedback on progress of tasks via the user responses **333**.

Calendars and schedules of events can be converted into user templates **310** and published templates **300**, which may be selected by different groups of users, and processed by the system according to user requirements and other instantiation data at the time or instantiation into the user instantiated templates **320**. In this manner, schedules that may be used in one period can be reapplied across future periods of time, thereby reducing the complexity of administration and increasing productivity of administrators and students.

For health checks, a health plan created for typical users based upon standard advice published by the health care industry. This can then be used by many users across future

periods of time. This ensures that each user is advised of user notifications **331**. Using smart-alerts **332** and user responses **333** received by fixed and mobile devices **170**, users are able to adjust the standard schedule to match their profile, as well as collect and log important information. Relevant examples of such information include information on the health check as scheduled, preparation, confirmation of meetings, adding of reports, details required for health care claims, and dates that other related tasks need to be conducted, such as confirmation of available times, and completion of related health care activities such as pathology and radiology. An event **210** or schedule **220** can also be configured for interacting with each planned health check e.g. for where there are follow-on procedures relating to test results, changes in health care advice specific to each user, and other health prevention schedules. Schedules **220** and records **324** can be searched by the user and shared with other users and health professionals or any other user, either on a temporary or perpetual basis.

Based upon the location and time zone attributes of an event **210** along with other system and publicly available or licensed travel time data, the rule engine **120** and recommendation engine **182** can incorporate travel time and adjust user notifications to dynamically process user notifications **331**, to ensure that all participants are able to attend on time at an agreed location or at the same time. In a similar manner, for health checks planning or any of the related examples, a phone conference can be scheduled for participants in different time zones, ensuring that each participant's user notifications **331** are adjusted for time of day across the varying time zones.

The method of managing scheduled events in a network-hosted time management system may alternatively be implemented in dedicated hardware such as one or more integrated circuits performing the functions or sub functions of managing scheduled events in a network-hosted time management system. Such dedicated hardware may include graphic processors, digital signal processors, or one or more microprocessors and associated memories.

Methods, apparatuses, and computer readable media for managing scheduled events in a network-hosted time management system implemented using a computer system have been disclosed. The foregoing relates to the embodiment of the patent in health checks planning and related applications, but modifications and/or changes can be made thereto

without departing from the scope of the invention. The embodiments of the embodiment are illustrative and not restrictive.

Embodiments of the service comprise a method of creating templates by a user, then using that template by either that user, or another user. This example illustrates the method of embodiment for the following: therapy management for the various related roles including patient, dependent, carer, nurse, clinician, clinical facility, This embodiment also encapsulates related embodiments including events for medication, therapy preparation, therapy execution, post-operative therapy, inpatient or outpatient services.

Referring to **FIG. 6** for therapy management, the method **600** uses events and timing information which is advised by healthcare providers and related health and well being advisors as applicable to each user's specific need. The method **600** commences processing at step **610** ("Start"). In step **620**, reusable non-user-specific templates are constructed by users, including administrators, advisors, carer or user, as described in greater detail hereinafter with reference to **FIGS. 1-5**. Each template comprises for each health therapy an event, a notification, and an associated data record stored in a database repository accessible via an electronic network coupled to the time management system. Examples of records include date of preparation for that therapy, date of consultation, information related to the progression of events for that therapy, content of questions and responses to answers, addresses, maps, url links, media relating to events, advisory text as well as user created records which can be added for storage of information. Each template is a combination of records in a database repository with fields that relate one record type to another record type. In step **630**, at least one rule is included (defined) in each template. Each rule creates a temporal relationship between (1) two or more events, or (2) an event and an associated data record, to form at least one dynamic interrelated event schedule. Examples of rules may relate to the timing between the progressions of events for that therapy, particularly when events are missed, and there is a pre-determined constraint on when the next related event in the sequence or any sequence of events that requires definition such as repeats or any other specific periods between those events. In step **640**, templates are instantiated by populating the records of the templates with data to create at least one user-specific event schedule, or a multiple role roster, each having associated records. For therapies, rosters may be used to manage the health pathway interaction between healthcare and wellness professionals as well

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as the involvement of the patient's nurse, family, friend, advocate, therapy or wellness community or carer. Each roster is a set of interrelated event schedules for multiple user roles. In step **650**, event notification alert temporal data is monitored and at least one user device is notified in response to the monitoring by initiating a smart-alert. The smart-alert comprises a notification regarding an event in one or more schedules that require a reply from a user device connected to the electronic network with user information to satisfy the rule associated with the smart-alert. The requested information is stored in the associated data record. In step **660**, the reply to the smart-alert, comprising data to update the associated data record, is received from a user (mobile or fixed) device (e.g. a personal computer, a laptop computer, a tablet computer, a smartphone, a network accessible computer). For the therapy and wellness embodiment, records include date of consultation, information related to the progression of events for that therapy, content of questions and responses to answers, addresses, maps, url links, media relating to events, advisory text as well as user created records which can be added for storage of information. In step **670**, based on a change to or adding of user data in the associated data record, a rule, an event, a role, a data record, and/or a notification is changed. Processing then ends or returns in step **680**. This results in the smart-alert notifications being delivered, and personalised for each user's care plan. The steps **620** to **670** may be repeatedly performed by use of an appropriate loop, or the method **600** may be repeatedly performed as required.

The embodiments of the invention enable users to manage a schedule of predefined time critical events and associated records by creating templates, which contain sequences of temporal events related by rules. These templates and rules can be used and reused multiple times. The rules create relationships between events within the same schedule, and/or between events within schedules that belong to the same user or multiple users. These templates allow users to instantiate their own independent copy of the schedule of events and if required customise the schedule of events to their requirements without changing the original schedule template.

Because rules can apply across multiple schedules for a single user, interdependent schedule templates can be created for management of complex temporal activities, such as but not limited to: management of medication, preparation for a therapy, the execution of a therapy, inpatient process, outpatient process, fitness and other health prevention programs,

surgical dressings, pain management, recovery procedures, meeting schedules relating to a therapy, dietary advice. Specific therapy management examples include pre-operative management, post-operative management, admission preparation, discharge preparation, carer management, nursing procedures, patient review processes, holistic medicine planning, consumer self-care, remote care management, collaborations of health care participants and managing life transitions as may be appropriate when a person requires a carer to take over in-home care, or when a patient is admitted to a facility for their future healthcare requirements, as per those events in the schedule or roster which defines the specific details of this embodiment.

The rules can contain any logical expression and can trigger events such as creating new records or smart-alerts. The rules can also refer to fields with stored records which enables the schedules to respond to and be modified by external input. Therefore making the schedules dynamic and changing automatically to external input.

Temporal data in schedules, rules and records can be absolute, relative to other events or stored data records via rules, or entered manually or automatically when the template is instantiated. Smart-alerts associated with the temporal events enables users to not only be notified of events but also allow users to manually or automatically enter data that is associated with the event alert that can be stored in records and used for temporal relationships or event triggers. A related embodiment of smart-alerts enables notifications to users via wearable devices such blue tooth connected devices providing text messages, vibrations, enrolment of photos or voice notes and user responses at the time of notification. As well, smart-alerts enable feedback and control of wearable devices such as medical monitors and medication dispensers.

Event Alerts can be pre-event, upon event, or post event. Multiple alerts within a defined timeframe can be aggregated into a single alert and can be acknowledged by a single acknowledgement to reduce user disruption.

Templates and instantiated schedules can be viewed in either the time domain or in a spatial relationship domain to facilitate, creation, editing, and viewing.

The event may be in at least one schedule of events of at least one user. The temporal relationships defined in the templates may each comprise a combination of absolute, relative, calculated, and user-defined temporal relationship.

For this embodiment example, schedules are created for each specific intended purpose, and may include: management of medication, preparation for a therapy, the execution of a therapy, inpatient process, outpatient process, fitness, health prevention programs, changing of surgical dressings, pain management, recovery procedures, meeting schedules relating to a therapy, dietary advice, pre-operative management, post-operative management, admission preparation, discharge preparation, carer management, nursing procedures, patient review processes, holistic medicine planning, consumer self-care, remote care management, collaborations of health care participants as per those events in the schedule

Examples of records include birth date, gender, address, location of the user's mobile device, health care identifier, insurance provider, health status, immunisation certificates, doctor's reports, prescriptions, medical reports, health insurance claims, receipts, photos, voicemail, video, calculated travel time, or any other record type which is referenced in the specific schedule example of this embodiment.

By way of example of the method used in the embodiment of embodiments, and relating back to the description previously recorded, schedules **110** are created by linking more than one event **111** using rules and embedding data records **140** either associated with the whole schedule **110**, or linked to an individual event **111**. Schedules **110** once created as user instantiated templates (**320** in **FIG. 3**) are processed by the rule engine **120** and recommendation engine **182**. Event triggers **125** initiate smart-alerts **130**, which generate user notifications (**331** in **FIG. 3**). Smart-alerts **130** initiate user responses **333**, which are either stored in user records **324** or locally on the user device **330** if that device is not connected to the electronic network. Once an electronic network is re-established, user responses **333** are transferred to user records **324**.

Smart-alert responses **333** can also generate event triggers **125** to initiate other user events **321**, user schedules or user rosters, either for that user or any other designated user by the rule engine **120**, which processes the user instantiated templates **320**.

Users are tracked via the administration engine **180** engine, using user information and contact lists for candidate users, which have not yet subscribed. Related information is stored in data records **140**.

The user can create published templates **300** from a user template **310**, by identifying the fields in the template that are required to be populated with user or instantiation data at the time of instantiation. The instantiation relationship between published templates **300**, user templates **310**, and user instantiated template **320** is tracked so that subsequent updates of a published template **300** can flow through to user templates **310** and user instantiated templates **320** providing that related user responses **333** are authorised for updating by the user for each update.

For an existing published template **300**, a user selects published templates **300** and replicates those published templates **300** into user templates **310**. To prepare for processing of the template by the rule engine **120** and the recommendation engine **182**, the user data **324** is added either using available information in the user records **324** to automatically populate fields required for the instantiation, or the user is required to enter additional data which is not available in the user records **324**. Once all fields are entered, and other important data held by the system **100** is added, such as time zone and location, the middle-tier user templates **310** are instantiated to create lower-tier user instantiated templates **320**. The middle-tier user templates **310** include user event templates **311**, user schedule templates **312**, user roster templates **313**, and user record templates **314**.

At the time of instantiation, associated template data is transferred **421**, **422**, **423** to user rosters **430**, user schedules **440** and user events **450**. Notifications interact with the local apps **558** on fixed and mobile devices **410**, **560** as well as through standard iCalendar notifications **414**. Settings are available on the fixed or mobile device **410** to transfer user records instance **424** to local data storage cache **411**, so that this media is available when the electronic network is disconnected. If the device **410** is connected to an electronic network, user records instances **424** can be retrieved either by links embedded in standard iCalendar notification transactions or through system interactions with the app or processing instance that is processing on the fixed or mobile device **410**.

Data in user record templates **515** can also be utilised in rules and as smart-alert responses allowing users to update data, resulting in dynamic sequencing that can be initiated by changes in user records **535**, once user instantiated templates have been created and linked to create rule field values.

As a further example of the embodiments of the embodiment, the following text is repeated:

For rosters **280**, the top-tier published user-roster templates **303** can be created from a user roster template **313**, by identifying the fields in the template that are required to be populated with user or instantiation data at the time of instantiation, if any. Users can replicate published templates **300** versions of user roster templates **303** into user templates **310**. To prepare for processing of templates, user data is added using either available information in user records **324** to automatically populate fields required for the instantiation or the user is required to enter additional data that is not available in the user records **324**. Once all fields are entered, middle-tier user templates **310** versions of user roster templates **313** are instantiated to create lower-tier user-instantiated templates **320** versions of user rosters templates **323**, which are processed by the rule engine **120** and recommendation engine **182**.

For this embodiment example, rosters are created for each specific intended purpose along with the nominated role allocations and the selection of resources. Examples may include : management of medication (for example, medication events including the administration or/or taking of a medication), preparation for a therapy, the execution of a therapy, inpatient process, outpatient process, fitness, health prevention programs, changing of surgical dressings, pain management, recovery procedures, meeting rosters relating to a therapy, dietary advice, pre-operative management, post-operative management, admission preparation, discharge preparation, carer management, nursing procedures, patient review processes, holistic medicine planning, consumer self-care, remote care management, collaborations of health care participants as per those events in the roster

User instantiated templates **320**, which comprise user event **321**, user schedules **322**, user rosters **323**, and user records **324**, are processed by the rule engine **120** to initiate user

notifications **331**, event triggers **125** and user smart-alerts **332**. User responses **333** may result in updating of user records **324**.

The embodiments of the invention have application to, but are not limited to, management of medication, preparation for a therapy (an example of a “therapy event”), the execution of a therapy (an example of a “therapy event”), inpatient process, outpatient process, fitness, health prevention programs, changing of surgical dressings, pain management, recovery procedures, meeting rosters relating to a therapy, dietary advice, pre-operative management, post-operative management, admission preparation, discharge preparation, carer management, nursing procedures, patient review processes, holistic medicine planning, consumer self-care, remote care management, collaborations of health care participant and any other related event which is added to the specific schedule or roster.

In these cases, important information and media is loaded into the data records **140** repository. If updates of this information are needed, user templates **310** and published templates **300** can be created. Events **210** are configured individually or as schedules **220**.

Event templates can be instantiated in at least one schedule of events of at least one user.

Interactions between events **210** of one user or between events of different users **250** are cross referenced, and the attributes of rules are added to define those interactions. Data is stored as data records **140** for processing by the rule engine **120** and recommendation engine **182**.

A sequence for therapy management is established by using an event **111** for each scheduled activity (that is, each of a plurality of therapy events), which may be repeated, or dynamically sequenced depending upon other events for the user or another user. A carer, guardian, nurse or medical professional may be notified by the recommendation engine **182** if for any reason user responses **333** are not received in accordance with each rule **100**.

For a health care team, for example, all participants can be provided with user notifications **331** to remind them of their roles, important actions, distribution and collection of records **324** and prompt each role for feedback on progress of tasks via the user responses **333**.

Calendars and schedules of events can be converted into user templates **310** and published templates **300**, which may be selected by different groups of users, and processed by the system according to user requirements and other instantiation data at the time or instantiation into the user instantiated templates **320**. In this manner, schedules that may be used in one period can be reapplied across future periods of time, thereby reducing the complexity of administration and increasing productivity of administrators and students.

For medication management, a protocol for one specific therapy example created for one user can be used by many users across future periods of time. This ensures that patients are advised of user notification **331**. Using smart-alerts **332** and user responses **333** received by fixed and mobile devices **170**, patients are able to collect and log important information. Relevant examples of such information include test results, reports, dates of expiry of medications, symptoms, pain levels, date of next appointment or treatment, amount of stock of medication at hand by the user, and dates that other related tasks need to be conducted, such as the need for prescriptions to ensure that prescribed medications are not disrupted. An event **210** or schedule **220** can also be configured for interacting with each therapy, e.g. for medications, to track the maximum period that medication can be administered, and adjusting dosages depending on rule interactions. Schedules **220** and records **324** can be searched by the user and shared with health professionals or any other user, either on a temporary or perpetual basis.

Based upon the location and time zone attributes of an event **210** along with other system and publicly available or licensed travel time data, the rule engine **120** and recommendation engine **182** can incorporate travel time and adjust user notifications to dynamically process user notifications **331**, to ensure that all participants are able to attend on time at an agreed location or at the same time. In a similar manner, for therapy management or any of the related examples, a phone conference can be scheduled for participants in different time zones, ensuring that each participant's user notifications **331** are adjusted for time of day across the varying time zones.

The method of managing scheduled events in a network-hosted time management system may alternatively be implemented in dedicated hardware such as one or more integrated circuits performing the functions or sub functions of managing scheduled events in

a network-hosted time management system. Such dedicated hardware may include graphic processors, digital signal processors, or one or more microprocessors and associated memories.

Methods, apparatuses, and computer readable media for managing scheduled events in a network-hosted time management system implemented using a computer system have been disclosed. The foregoing relates to the embodiment of the patent in therapy management and related applications, but modifications and/or changes can be made thereto without departing from the scope of the invention. The embodiments of the embodiment are illustrative and not restrictive.

Embodiments of the service comprise a method of creating templates by a user, then using that template by either that user, or another user. This example illustrates the method of embodiment for the following: education community. This example may apply to user profile details such year of study, age, interest, optional study, tutorials, project allocation, common purpose or specific participation requirement. This embodiment also encapsulates related embodiments including templates for the entire academic community, either applying to all of the community or a subset of that community, such as student body, parents, guardians, teacher, administration, support staff and volunteer.

Referring to **FIG. 6** for the education community embodiment, the method **600** uses events and timing information which administrators, coordinators, users or any another advisor as applicable to each user's specific need. The method **600** commences processing at step **610** ("Start"). In step **620**, reusable non-user-specific templates are constructed by users, including administrators, co-ordinators, advisors, or users, as described in greater detail hereinafter with reference to **FIGS. 1-5**. Each template comprises for each education community sequence an event, a notification, and an associated data record stored in a database repository accessible via an electronic network coupled to the time management system. Examples of records include date of events, dates for preparation and follow-up, information related to the progressions of events for that sequence, content of questions and responses to answers, addresses, maps, url links, media relating to events, advisory text as well as user created records which can be added for storage of information. Each template is a combination of records in a database repository with fields that relate one record type to

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another record type. In step **630**, at least one rule is included (defined) in each template. Each rule creates a temporal relationship between (1) two or more events, or (2) an event and an associated data record, to form at least one dynamic interrelated event schedule. Examples of rules may relate to the timing between the progression of events for that education community, particularly when events are missed, and there is a pre-determined constraint on when the next related event in the sequence or any sequence of events that requires definition such as repeats or any other specific periods between those events. In step **640**, templates are instantiated by populating the records of the templates with data to create at least one user-specific event schedule, or a multiple role roster, each having associated records. For education communities, rosters may be used to manage the various roles between the coordinator and other users in the community with examples including student, teacher, tutor, volunteer, attendee, guest, delegate, lecturer, facility manager, caterer, examiner, umpire, marshall, administrator, secretary or any other user activity in that community. Each roster is a set of interrelated event schedules for multiple user roles. In step **650**, event notification alert temporal data is monitored and at least one user device is notified in response to the monitoring by initiating a smart-alert. The smart-alert comprises a notification regarding an event in one or more schedules that require a reply from a user device connected to the electronic network with user information to satisfy the rule associated with the smart-alert. The requested information is stored in the associated data record. In step **660**, the reply to the smart-alert, comprising data to update the associated data record, is received from a user (mobile or fixed) device (e.g. a personal computer, a laptop computer, a tablet computer, a smartphone, a network accessible computer). For the education community embodiment, records include date of events, dates for preparation and follow-up, information related to the progression of events for that sequence, content of questions and responses to answers, addresses, maps, url links, media relating to events, advisory text as well as user created records which can be added for storage of information. In step **670**, based on a change to or adding of user data in the associated data record, a rule, an event, a role, a data record, and/or a notification is changed. Processing then ends or returns in step **680**. This results in the smart-alert notifications being delivered, and personalised for each user's role in the education community. The steps **620** to **670** may be repeatedly performed by use of an appropriate loop, or the method **600** may be repeatedly performed as required.

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The embodiments of the invention enable users to manage a schedule of predefined time critical events and associated records by creating templates, which contain sequences of temporal events related by rules. These templates and rules can be used and reused multiple times. The rules create relationships between events within the same schedule, and/or between events within schedules that belong to the same user or multiple users. These templates allow users to instantiate their own independent copy of the schedule of events and if required customise the schedule of events to their requirements without changing the original schedule template.

Because rules can apply across multiple schedules for a single user, interdependent schedule templates can be created for management of complex temporal activities, such as but not limited to: academic, governance, sports, volunteer, curriculum, tutorials, exam, project, group work or any other situation associated with the education community as per those events in the schedule or roster which defines the specific details of this embodiment.

The rules can contain any logical expression and can trigger events such as creating new records or smart-alerts. The rules can also refer to fields with stored records which enables the schedules to respond to and be modified by external input. Therefore making the schedules dynamic and changing automatically to external input.

Temporal data in schedules, rules and records can be absolute, relative to other events or stored data records via rules, or entered manually or automatically when the template is instantiated. Smart-alerts associated with the temporal events enables users to not only be notified of events but also allow users to manually or automatically enter data that is associated with the event alert that can be stored in records and used for temporal relationships or event triggers. One embodiment of smart-alerts enable feedback and control of wearable devices which deliver notification text, provide vibration, and allow for user responses.

Event Alerts can be pre-event, upon event, or post event. Multiple alerts within a defined timeframe can be aggregated into a single alert and can be acknowledged by a single acknowledgement to reduce user disruption.

Templates and instantiated schedules can be viewed in either the time domain or in a spatial relationship domain to facilitate, creation, editing, and viewing.

The event may be in at least one schedule of events of at least one user. The temporal relationships defined in the templates may each comprise a combination of absolute, relative, calculated, and user-defined temporal relationship.

For this embodiment example, schedules are created for each specific intended purpose, and may include: academic, governance, sports, volunteer, curriculum, tutorials, exam, project, group work or any other situation associated with the education community as per those events in the schedule.

Examples of records include birth date, gender, address, location of the user's mobile device, current year of study, examination results/certificates, sports results, reports, receipts, photos, voicemail, video, calculated travel time, or any other record type which is referenced in the specific schedule example of this embodiment.

By way of example of the method used in the embodiment of embodiments, and relating back to the description previously recorded, schedules **110** are created by linking more than one event **111** using rules and embedding data records **140** either associated with the whole schedule **110**, or linked to an individual event **111**. Schedules **110** once created as user instantiated templates (**320** in **FIG. 3**) are processed by the rule engine **120** and recommendation engine **182**. Event triggers **125** initiate smart-alerts **130**, which generate user notifications (**331** in **FIG. 3**). Smart-alerts **130** initiate user responses **333**, which are either stored in user records **324** or locally on the user device **330** if that device is not connected to the electronic network. Once an electronic network is re-established, user responses **333** are transferred to user records **324**.

Smart-alert responses **333** can also generate event triggers **125** to initiate other user events **321**, user schedules or user rosters, either for that user or any other designated user by the rule engine **120**, which processes the user instantiated templates **320**.

Users are tracked via the administration engine **180** engine, using user information and contact lists for candidate users, which have not yet subscribed. Related information is stored in data records **140**.

The user can create published templates **300** from a user template **310**, by identifying the fields in the template that are required to be populated with user or instantiation data at

the time of instantiation. The instantiation relationship between published templates **300**, user templates **310**, and user instantiated template **320** is tracked so that subsequent updates of a published template **300** can flow through to user templates **310** and user instantiated templates **320** providing that related user responses **333** are authorised for updating by the user for each update.

For an existing published template **300**, a user selects published templates **300** and replicates those published templates **300** into user templates **310**. To prepare for processing of the template by the rule engine **120** and the recommendation engine **182**, the user data **324** is added either using available information in the user records **324** to automatically populate fields required for the instantiation, or the user is required to enter additional data which is not available in the user records **324**. Once all fields are entered, and other important data held by the system **100** is added, such as time zone and location, the middle-tier user templates **310** are instantiated to create lower-tier user instantiated templates **320**. The middle-tier user templates **310** include user event templates **311**, user schedule templates **312**, user roster templates **313**, and user record templates **314**.

At the time of instantiation, associated template data is transferred **421**, **422**, **423** to user rosters **430**, user schedules **440** and user events **450**. Notifications interact with the local apps **558** on fixed and mobile devices **410**, **560** as well as through standard iCalendar notifications **414**. Settings are available on the fixed or mobile device **410** to transfer user records instance **424** to local data storage cache **411**, so that this media is available when the electronic network is disconnected. If the device **410** is connected to an electronic network, user records instances **424** can be retrieved either by links embedded in standard iCalendar notification transactions or through system interactions with the app or processing instance that is processing on the fixed or mobile device **410**.

Data in user record templates **515** can also be utilised in rules and as smart-alert responses allowing users to update data, resulting in dynamic sequencing that can be initiated by changes in user records **535**, once user instantiated templates have been created and linked to create rule field values.

As a further example of the embodiments of the embodiment, the following text is repeated:

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For rosters **280**, the top-tier published user-roster templates **303** can be created from a user roster template **313**, by identifying the fields in the template that are required to be populated with user or instantiation data at the time of instantiation, if any. Users can replicate published templates **300** versions of user roster templates **303** into user templates **310**. To prepare for processing of templates, user data is added using either available information in user records **324** to automatically populate fields required for the instantiation or the user is required to enter additional data that is not available in the user records **324**. Once all fields are entered, middle-tier user templates **310** versions of user roster templates **313** are instantiated to create lower-tier user-instantiated templates **320** versions of user rosters templates **323**, which are processed by the rule engine **120** and recommendation engine **182**.

For this embodiment example, rosters are created for each specific intended purpose, and may include: academic, governance, sports, volunteer, curriculum, tutorials, exam, project, group work or any other situation associated with the education community as per those events in the roster.

User instantiated templates **320**, which comprise user event **321**, user schedules **322**, user rosters **323**, and user records **324**, are processed by the rule engine **120** to initiate user notifications **331**, event triggers **125** and user smart-alerts **332**. User responses **333** may result in updating of user records **324**.

The embodiments of the invention have application to, but are not limited to, academic, governance, sports, volunteer, curriculum, tutorials, exam, project, group work or any other situation associated with the education community and any other related event which is added to the specific schedule or roster.

In these cases, important information and media is loaded into the data records **140** repository. If updates of this information are needed, user templates **310** and published templates **300** can be created. Events **210** are configured individually or as schedules **220**.

Event templates can be instantiated in at least one schedule of events of at least one user.

Interactions between events **210** of one user or between events of different users **250** are cross referenced, and the attributes of rules are added to define those interactions. Data is stored as data records **140** for processing by the rule engine **120** and recommendation engine **182**.

A sequence for an education community is established by using an event **111** for each scheduled activity, which may be repeated, or dynamically sequenced depending upon other events for the user or another user. Each role within the education community may be notified by the recommendation engine **182** relating to user responses **333** in accordance with each rule **100**.

For each role in the education community, for example, all participants can be provided with user notifications **331** to remind each role of important actions, distribution and collection of records **324** and prompt each participant for feedback on progress of tasks via the user responses **333**.

Calendars and schedules of events can be converted into user templates **310** and published templates **300**, which may be selected by different groups of users, and processed by the system according to user requirements and other instantiation data at the time or instantiation into the user instantiated templates **320**. In this manner, schedules that may be used in one period can be reapplied across future periods of time, thereby reducing the complexity of administration and increasing productivity of administrators and students.

For the education community, a protocol for one subject curriculum created by a co-ordinator or user for one user can be used by many users across future periods of time. This ensures that participants are advised of user notifications **331**. Using smart-alerts **332** and user responses **333** received by fixed and mobile devices **170**, participants are able to collect and log important information. Relevant examples of such information include assignments, test results, reports, important dates, tutorials, project meetings, collaboration interaction and dates that other related tasks that need to be conducted.

An event **210** or schedule **220** can also be configured for interacting with group within the education community, e.g. group assignments, collaborations, social interactions, etc., each schedule or roster adjusting depending on rule interactions. Schedules **220** and records **324** can be searched by the user and shared with other members in the education community.

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Based upon the location and time zone attributes of an event **210** along with other system and publicly available or licensed travel time data, the rule engine **120** and recommendation engine **182** can incorporate travel time and adjust user notifications to dynamically process user notifications **331**, to ensure that all participants are able to attend on time at an agreed location or at the same time. In a similar manner, for the education community or any of the related examples, a phone conference can be scheduled for participants in different time zones, ensuring that each participant's user notifications **331** are adjusted for time of day across the varying time zones.

The method of managing scheduled events in a network-hosted time management system may alternatively be implemented in dedicated hardware such as one or more integrated circuits performing the functions or sub functions of managing scheduled events in a network-hosted time management system. Such dedicated hardware may include graphic processors, digital signal processors, or one or more microprocessors and associated memories.

Methods, apparatuses, and computer readable media for managing scheduled events in a network-hosted time management system implemented using a computer system have been disclosed. The foregoing relates to the embodiment in education communities and related applications, but modifications and/or changes can be made thereto without departing from the scope of the invention. The embodiments of the embodiment are illustrative and not restrictive.

Embodiments of the service comprise a method of creating templates by a user, then using that template by either that user, or another user. This example illustrates the method of embodiment for the following: sports community. This example may apply to users who are spectators, participants, umpires, game official, trainers, support staff, volunteers, catering staff, transport providers, dignitaries and those who are responsible for managing the facilities and resources required for that sport. This embodiment also encapsulates related embodiments including templates for competition games, training, multi-sports events, touring, social occasions, and administration planning.

Referring to **FIG. 6** for the sports community embodiment, the method **600** uses events and timing information which spectators, participants, umpires, game official, trainers, support staff, volunteers, catering staff, transport providers, dignitaries and those who are responsible for managing the facilities and resources required for that sport as applicable to each user's specific need. The method **600** commences processing at step **610** ("Start"). In step **620**, reusable non-user-specific templates are constructed by users, including administrators, co-ordinators, advisors, or users, as described in greater detail hereinafter with reference to **FIGS. 1-5**. Each template comprises for each sports community sequence an event, a notification, and an associated data record stored in a database repository accessible via an electronic network coupled to the time management system. Examples of records include date of events, dates for preparation and follow-up, information related to the progression of events for that sequence, content of questions and responses to answers, addresses, maps, url links, media relating to events, advisory text as well as user created records which can be added for storage of information. Each template is a combination of records in a database repository with fields that relate one record type to another record type. In step **630**, at least one rule is included (defined) in each template. Each rule creates a temporal relationship between (1) two or more events, or (2) an event and an associated data record, to form at least one dynamic interrelated event schedule. Examples of rules may relate to the timing between the progressions of events for that sports community, particularly when events are missed, and there is a pre-determined constraint on when the next related event in the sequence or any sequence of events that requires definition such as repeats or any other specific periods between those events. In step **640**, templates are instantiated by populating the records of the templates with data to create at least one user-specific event schedule, or a multiple role roster, each having associated records. For sports communities, rosters may be used to manage the various roles between the co-ordinator and other users in the community with examples including spectators, participants, umpires, game official, trainers, support staff, volunteers, catering staff, transport providers, dignitaries and those who are responsible for managing the facilities and resources required for that sport. Each roster is a set of interrelated event schedules for multiple user roles. In step **650**, event notification alert temporal data is monitored and at least one user device is notified in response to the monitoring by initiating a smart-alert. The smart-alert comprises a

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notification regarding an event in one or more schedules that require a reply from a user device connected to the electronic network with user information to satisfy the rule associated with the smart-alert. The requested information is stored in the associated data record. In step **660**, the reply to the smart-alert, comprising data to update the associated data record, is received from a user (mobile or fixed) device (e.g. a personal computer, a laptop computer, a tablet computer, a smartphone, a network accessible computer). For the sports community embodiment, records include date of events, dates for preparation and follow-up, information related to the progression of events for that sequence, content of questions and responses to answers, addresses, maps, url links, media relating to events, advisory text as well as user created records which can be added for storage of information. In step **670**, based on a change to or adding of user data in the associated data record, a rule, an event, a role, a data record, and/or a notification is changed. Processing then ends or returns in step **680**. This results in the smart-alert notifications being delivered, and personalised for each user's role in the sports community. The steps **620** to **670** may be repeatedly performed by use of an appropriate loop, or the method **600** may be repeatedly performed as required.

The embodiments of the invention enable users to manage a schedule of predefined time critical events and associated records by creating templates, which contain sequences of temporal events related by rules. These templates and rules can be used and reused multiple times. The rules create relationships between events within the same schedule, and/or between events within schedules that belong to the same user or multiple users. These templates allow users to instantiate their own independent copy of the schedule of events and if required customise the schedule of events to their requirements without changing the original schedule template.

Because rules can apply across multiple schedules for a single user, interdependent schedule templates can be created for management of complex temporal activities, such as but not limited to: competition games, training, multi-sports events, touring, social occasions, administration or any other situation associated with the sports community as per those events in the schedule or roster which defines the specific details of this embodiment.

The rules can contain any logical expression and can trigger events such as creating new records or smart-alerts. The rules can also refer to fields with stored records which

enables the schedules to respond to and be modified by external input. Therefore making the schedules dynamic and changing automatically to external input.

Temporal data in schedules, rules and records can be absolute, relative to other events or stored data records via rules, or entered manually or automatically when the template is instantiated. Smart-alerts associated with the temporal events enables users to not only be notified of events but also allow users to manually or automatically enter data that is associated with the event alert that can be stored in records and used for temporal relationships or event triggers. A related embodiment of smart-alerts enables notifications to users via wearable devices such blue tooth connected devices providing text messages, vibrations, enrolment of photos or voice notes, and user responses such as adjusting for scores, or other statistical details, at the time of notification.

Event Alerts can be pre-event, upon event, or post event. Multiple alerts within a defined timeframe can be aggregated into a single alert and can be acknowledged by a single acknowledgement to reduce user disruption.

Templates and instantiated schedules can be viewed in either the time domain or in a spatial relationship domain to facilitate, creation, editing, and viewing.

The event may be in at least one schedule of events of at least one user. The temporal relationships defined in the templates may each comprise a combination of absolute, relative, calculated, and user-defined temporal relationship.

For this embodiment example, schedules are created for each specific intended purpose, and may include: competition games, training, multi-sports events, touring, social occasions, administration or any other situation associated with the sports community as per those events in the schedule

Examples of records include birth date, gender, address, location of the user's mobile device, current team and grade classification, competition results, sports results, reports, receipts, photos, voicemail, video, calculated travel time, or any other record type which is referenced in the specific schedule example of this embodiment.

By way of example of the method used in the embodiment of embodiments, and relating back to the description previously recorded, schedules **110** are created by linking

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more than one event **111** using rules and embedding data records **140** either associated with the whole schedule **110**, or linked to an individual event **111**. Schedules **110** once created as user instantiated templates (**320** in **FIG. 3**) are processed by the rule engine **120** and recommendation engine **182**. Event triggers **125** initiate smart-alerts **130**, which generate user notifications (**331** in **FIG. 3**). Smart-alerts **130** initiate user responses **333**, which are either stored in user records **324** or locally on the user device **330** if that device is not connected to the electronic network. Once an electronic network is re-established, user responses **333** are transferred to user records **324**.

Smart-alert responses **333** can also generate event triggers **125** to initiate other user events **321**, user schedules or user rosters, either for that user or any other designated user by the rule engine **120**, which processes the user instantiated templates **320**.

Users are tracked via the administration engine **180** engine, using user information and contact lists for candidate users, which have not yet subscribed. Related information is stored in data records **140**.

The user can create published templates **300** from a user template **310**, by identifying the fields in the template that are required to be populated with user or instantiation data at the time of instantiation. The instantiation relationship between published templates **300**, user templates **310**, and user instantiated template **320** is tracked so that subsequent updates of a published template **300** can flow through to user templates **310** and user instantiated templates **320** providing that related user responses **333** are authorised for updating by the user for each update.

For an existing published template **300**, a user selects published templates **300** and replicates those published templates **300** into user templates **310**. To prepare for processing of the template by the rule engine **120** and the recommendation engine **182**, the user data **324** is added either using available information in the user records **324** to automatically populate fields required for the instantiation, or the user is required to enter additional data which is not available in the user records **324**. Once all fields are entered, and other important data held by the system **100** is added, such as time zone and location, the middle-tier user templates **310** are instantiated to create lower-tier user instantiated templates **320**. The

middle-tier user templates **310** include user event templates **311**, user schedule templates **312**, user roster templates **313**, and user record templates **314**.

At the time of instantiation, associated template data is transferred **421**, **422**, **423** to user rosters **430**, user schedules **440** and user events **450**. Notifications interact with the local apps **558** on fixed and mobile devices **410**, **560** as well as through standard iCalendar notifications **414**. Settings are available on the fixed or mobile device **410** to transfer user records instance **424** to local data storage cache **411**, so that this media is available when the electronic network is disconnected. If the device **410** is connected to an electronic network, user records instances **424** can be retrieved either by links embedded in standard iCalendar notification transactions or through system interactions with the app or processing instance that is processing on the fixed or mobile device **410**.

Data in user record templates **515** can also be utilised in rules and as smart-alert responses allowing users to update data, resulting in dynamic sequencing that can be initiated by changes in user records **535**, once user instantiated templates have been created and linked to create rule field values.

As a further example of the embodiments of the embodiment, the following text is repeated:

For rosters **280**, the top-tier published user-roster templates **303** can be created from a user roster template **313**, by identifying the fields in the template that are required to be populated with user or instantiation data at the time of instantiation, if any. Users can replicate published templates **300** versions of user roster templates **303** into user templates **310**. To prepare for processing of templates, user data is added using either available information in user records **324** to automatically populate fields required for the instantiation or the user is required to enter additional data that is not available in the user records **324**. Once all fields are entered, middle-tier user templates **310** versions of user roster templates **313** are instantiated to create lower-tier user-instantiated templates **320** versions of user rosters templates **323**, which are processed by the rule engine **120** and recommendation engine **182**.

For this embodiment example, rosters are created for each specific intended purpose along with the nominated role allocations and the selection of resources. Examples may

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include : competition games, training, multi-sports events, touring, social occasions, administration or any other situation associated with the sports community as per those events in the roster

User instantiated templates **320**, which comprise user event **321**, user schedules **322**, user rosters **323**, and user records **324**, are processed by the rule engine **120** to initiate user notifications **331**, event triggers **125** and user smart-alerts **332**. User responses **333** may result in updating of user records **324**.

The embodiments of the invention have application to, but are not limited to, competition games, training, multi-sports events, touring, social occasions, administration or any other situation associated with the sports community as per those events in the roster and any other related event which is added to the specific schedule or roster.

In these cases, important information and media is loaded into the data records **140** repository. If updates of this information are needed, user templates **310** and published templates **300** can be created. Events **210** are configured individually or as schedules **220**.

Event templates can be instantiated in at least one schedule of events of at least one user.

Interactions between events **210** of one user or between events of different users **250** are cross referenced, and the attributes of rules are added to define those interactions. Data is stored as data records **140** for processing by the rule engine **120** and recommendation engine **182**.

A sequence for a sports community is established by using an event **111** for each scheduled activity, which may be repeated, or dynamically sequenced depending upon other events for the user or another user. Each role within the sports community may be notified by the recommendation engine **182** relating to user responses **333** in accordance with each rule **100**.

For each role in the sports community, for example, all participants can be provided with user notifications **331** to remind each role of important actions, distribution and collection of records **324** and prompt each participant for feedback on progress of tasks via the user responses **333**.

Calendars and schedules of events can be converted into user templates **310** and published templates **300**, which may be selected by different groups of users, and processed by the system according to user requirements and other instantiation data at the time or instantiation into the user instantiated templates **320**. In this manner, schedules that may be used in one period can be reapplied across future periods of time, thereby reducing the complexity of administration and increasing productivity of administrators and students.

For a sports community a season of events for one team created by a coach, trainer, manager or user can be used on many occasions by many other team across future periods of time. This ensures that participants are advised of user notifications **331**. Using smart-alerts **332** and user responses **333** received by fixed and mobile devices **170**, participants are able to collect and log important information. Relevant examples of such information include player positions, confirmation, reserves for games, official roles, catering and support staff.

An event **210** or schedule **220** can also be configured for interacting with other teams within the sports community as may be the case for finals series e.g. allocation of position, official roles, financial statements, social interactions, etc., each schedule or roster adjusting depending on rule interactions. Schedules **220** and records **324** can be searched by the user and shared with other members in the community involved with that team.

Based upon the location and time zone attributes of an event **210** along with other system and publicly available or licensed travel time data, the rule engine **120** and recommendation engine **182** can incorporate travel time and adjust user notifications to dynamically process user notifications **331**, to ensure that all participants are able to attend on time at an agreed location or at the same time. In a similar manner, for the sports community or any of the related examples, a phone conference can be scheduled for participants in different time zones, ensuring that each participant's user notifications **331** are adjusted for time of day across the varying time zones.

The method of managing scheduled events in a network-hosted time management system may alternatively be implemented in dedicated hardware such as one or more integrated circuits performing the functions or sub functions of managing scheduled events in a network-hosted time management system. Such dedicated hardware may include graphic

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processors, digital signal processors, or one or more microprocessors and associated memories.

Methods, apparatuses, and computer readable media for managing scheduled events in a network-hosted time management system implemented using a computer system have been disclosed. The foregoing relates to the embodiment in sports communities and related applications, but modifications and/or changes can be made thereto without departing from the scope of the invention. The embodiments of the embodiment are illustrative and not restrictive.

Embodiments of the service comprise a method of creating templates by a user, then using that template by either that user, or another user. This example illustrates the method of embodiment for the following: meeting management. This example may apply to meeting participants, official meeting roles, use of facilities and resources required for that particular meeting. This embodiment also encapsulates related embodiments including templates for formal meetings, social events, project management, not-for-profit administration, general administration in any field, work programs, or any other application where roles, resources and outcomes may be factors in a successful outcome for a meeting.

Referring to **FIG. 6** for meeting management embodiments, the method **600** uses events and timing information which meeting participants, official meeting roles, use of facilities and resources required for that particular meeting. as applicable to each user's specific need. The method **600** commences processing at step **610** ("Start"). In step **620**, reusable non-user-specific templates are constructed by users, including administrators, co-ordinators, advisors, or users, as described in greater detail hereinafter with reference to **FIGS. 1-5**. Each template comprises for each meeting management sequence an event, a notification, and an associated data record stored in a database repository accessible via an electronic network coupled to the time management system. Examples of records include date of events, dates for preparation and follow-up, information related to the progression of events for that sequence, content of questions and responses to answers, agenda for meetings, minutes of meetings, reports, action plans, addresses, maps, url links, media relating to events, advisory text as well as user created records which can be added for storage of information. Each template is a combination of records in a database repository with fields

that relate one record type to another record type. In step **630**, at least one rule is included (defined) in each template. Each rule creates a temporal relationship between (1) two or more events, or (2) an event and an associated data record, to form at least one dynamic interrelated event schedule. Examples of rules may relate to the timing between the progression of event for the community involved with a specific meeting, particularly when events are missed, and there is a pre-determined constraint on when the next related event in the sequence or any sequence of events that requires definition such as repeats or any other specific periods between those events. In step **640**, templates are instantiated by populating the records of the templates with data to create at least one user-specific event schedule, or a multiple role roster, each having associated records. For communities involved with meetings, rosters may be used to manage the various roles between the co-ordinator and other users in the meeting community with examples including meeting participants, official meeting roles, use of facilities and resources required for that particular meeting. Each roster is a set of interrelated event schedules for multiple user roles. In step **650**, event notification alert temporal data is monitored and at least one user device is notified in response to the monitoring by initiating a smart-alert. The smart-alert comprises a notification regarding an event in one or more schedules that require a reply from a user device connected to the electronic network with user information to satisfy the rule associated with the smart-alert. The requested information is stored in the associated data record. In step **660**, the reply to the smart-alert, comprising data to update the associated data record, is received from a user (mobile or fixed) device (e.g. a personal computer, a laptop computer, a tablet computer, a smartphone, a network accessible computer). For the meeting management embodiment, records include date of events, dates for preparation and follow-up, information related to the progression of events for that sequence, content of questions and responses to answers, agenda for meetings, minutes of meetings, reports, action plans, addresses, maps, url links, media relating to events, advisory text as well as user created records which can be added for storage of information. In step **670**, based on a change to or adding of user data in the associated data record, a rule, an event, a role, a data record, and/or a notification is changed. Processing then ends or returns in step **680**. This results in the smart-alert notifications being delivered, and personalised for each user's role in the community of users involved in that

meeting. The steps **620** to **670** may be repeatedly performed by use of an appropriate loop, or the method **600** may be repeatedly performed as required.

The embodiments of the invention enable users to manage a schedule of predefined time critical events and associated records by creating templates, which contain sequences of temporal events related by rules. These templates and rules can be used and reused multiple times. The rules create relationships between events within the same schedule, and/or between events within schedules that belong to the same user or multiple users. These templates allow users to instantiate their own independent copy of the schedule of events and if required customise the schedule of events to their requirements without changing the original schedule template.

Because rules can apply across multiple schedules for a single user, interdependent schedule templates can be created for management of complex temporal activities, such as but not limited to: formal meetings, social events, project management, not-for-profit administration, governance, routine meetings, general administration in any field, work programs, meetings of officials and participant, symposium or any other situation associated with meeting management as per those events in the schedule or roster which defines the specific details of this embodiment.

The rules can contain any logical expression and can trigger events such as creating new records or smart-alerts. The rules can also refer to fields with stored records which enables the schedules to respond to and be modified by external input. Therefore making the schedules dynamic and changing automatically to external input.

Temporal data in schedules, rules and records can be absolute, relative to other events or stored data records via rules, or entered manually or automatically when the template is instantiated. Smart-alerts associated with the temporal events enables users to not only be notified of events but also allow users to manually or automatically enter data that is associated with the event alert that can be stored in records and used for temporal relationships or event triggers. A related embodiment of smart-alerts enables notifications to users via wearable devices such blue tooth connected devices providing text messages,

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vibrations, enrolment of photos or voice notes and user responses such as voting at the time of notification.

Event Alerts can be pre-event, upon event, or post event. Multiple alerts within a defined timeframe can be aggregated into a single alert and can be acknowledged by a single acknowledgement to reduce user disruption.

Templates and instantiated schedules can be viewed in either the time domain or in a spatial relationship domain to facilitate, creation, editing, and viewing.

The event may be in at least one schedule of events of at least one user. The temporal relationships defined in the templates may each comprise a combination of absolute, relative, calculated, and user-defined temporal relationship.

For this embodiment example, schedules are created for each specific intended purpose, and may include: formal meetings, social events, project management, not-for-profit administration, governance, routine meetings, general administration in any field, work programs, meetings of officials and participant, symposium or any other situation associated with meeting management as per those events in the schedule

Examples of records include minutes of meeting, agenda, outcomes, project milestones, reports, certificates, official documentation, correspondence, receipts, photos, voicemail, video, calculated travel time, or any other record type which is referenced in the specific schedule example of this embodiment.

By way of example of the method used in the embodiment of embodiments, and relating back to the description previously recorded, schedules **110** are created by linking more than one event **111** using rules and embedding data records **140** either associated with the whole schedule **110**, or linked to an individual event **111**. Schedules **110** once created as user instantiated templates (**320** in **FIG. 3**) are processed by the rule engine **120** and recommendation engine **182**. Event triggers **125** initiate smart-alerts **130**, which generate user notifications (**331** in **FIG. 3**). Smart-alerts **130** initiate user responses **333**, which are either stored in user records **324** or locally on the user device **330** if that device is not connected to the electronic network. Once an electronic network is re-established, user responses **333** are transferred to user records **324**.

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Smart-alert responses **333** can also generate event triggers **125** to initiate other user events **321**, user schedules or user rosters, either for that user or any other designated user by the rule engine **120**, which processes the user instantiated templates **320**.

Users are tracked via the administration engine **180** engine, using user information and contact lists for candidate users, which have not yet subscribed. Related information is stored in data records **140**.

The user can create published templates **300** from a user template **310**, by identifying the fields in the template that are required to be populated with user or instantiation data at the time of instantiation. The instantiation relationship between published templates **300**, user templates **310**, and user instantiated template **320** is tracked so that subsequent updates of a published template **300** can flow through to user templates **310** and user instantiated templates **320** providing that related user responses **333** are authorised for updating by the user for each update.

For an existing published template **300**, a user selects published templates **300** and replicates those published templates **300** into user templates **310**. To prepare for processing of the template by the rule engine **120** and the recommendation engine **182**, the user data **324** is added either using available information in the user records **324** to automatically populate fields required for the instantiation, or the user is required to enter additional data which is not available in the user records **324**. Once all fields are entered, and other important data held by the system **100** is added, such as time zone and location, the middle-tier user templates **310** are instantiated to create lower-tier user instantiated templates **320**. The middle-tier user templates **310** include user event templates **311**, user schedule templates **312**, user roster templates **313**, and user record templates **314**.

At the time of instantiation, associated template data is transferred **421**, **422**, **423** to user rosters **430**, user schedules **440** and user events **450**. Notifications interact with the local apps **558** on fixed and mobile devices **410**, **560** as well as through standard iCalendar notifications **414**. Settings are available on the fixed or mobile device **410** to transfer user records instance **424** to local data storage cache **411**, so that this media is available when the electronic network is disconnected. If the device **410** is connected to an electronic network, user records instances **424** can be retrieved either by links embedded in standard iCalendar

notification transactions or through system interactions with the app or processing instance that is processing on the fixed or mobile device **410**.

Data in user record templates **515** can also be utilised in rules and as smart-alert responses allowing users to update data, resulting in dynamic sequencing that can be initiated by changes in user records **535**, once user instantiated templates have been created and linked to create rule field values.

As a further example of the embodiments of the embodiment, the following text is repeated:

For rosters **280**, the top-tier published user-roster templates **303** can be created from a user roster template **313**, by identifying the fields in the template that are required to be populated with user or instantiation data at the time of instantiation, if any. Users can replicate published templates **300** versions of user roster templates **303** into user templates **310**. To prepare for processing of templates, user data is added using either available information in user records **324** to automatically populate fields required for the instantiation or the user is required to enter additional data that is not available in the user records **324**. Once all fields are entered, middle-tier user templates **310** versions of user roster templates **313** are instantiated to create lower-tier user-instantiated templates **320** versions of user rosters templates **323**, which are processed by the rule engine **120** and recommendation engine **182**.

For this embodiment example, rosters are created for each specific intended purpose along with the nominated role allocations and the selection of resources. Examples may include : formal meetings, social events, project management, not-for-profit administration, governance, routine meetings, general administration in any field, work programs, meetings of officials and participant, symposium or any other situation associated with meeting management as per those events in the roster

User instantiated templates **320**, which comprise user event **321**, user schedules **322**, user rosters **323**, and user records **324**, are processed by the rule engine **120** to initiate user notifications **331**, event triggers **125** and user smart-alerts **332**. User responses **333** may result in updating of user records **324**.

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The embodiments of the invention have application to, but are not limited to, immunisations, community health care, personal development monitoring, health checks and any other related event which is added to the specific schedule or roster.

In these cases, important information and media is loaded into the data records **140** repository. If updates of this information are needed, user templates **310** and published templates **300** can be created. Events **210** are configured individually or as schedules **220**.

Event templates can be instantiated in at least one schedule of events of at least one user.

Interactions between events **210** of one user or between events of different users **250** are cross referenced, and the attributes of rules are added to define those interactions. Data is stored as data records **140** for processing by the rule engine **120** and recommendation engine **182**.

A sequence for meeting management is established by using an event **111** for each scheduled activity, which may be repeated, or dynamically sequenced depending upon other events for the user or another user. Each role for the specific meeting community may be notified by the recommendation engine **182** relating to user responses **333** in accordance with each rule **100**.

For each role in the meeting community, for example, all participants can be provided with user notifications **331** to remind each role of important actions, distribution and collection of records **324** and prompt each participant for feedback on progress of tasks via the user responses **333**.

Calendars and schedules of events can be converted into user templates **310** and published templates **300**, which may be selected by different groups of users, and processed by the system according to user requirements and other instantiation data at the time or instantiation into the user instantiated templates **320**. In this manner, schedules that may be used in one period can be reapplied across future periods of time, thereby reducing the complexity of administration and increasing productivity of administrators and students.

For meeting management, a protocol for one group of participants created by a co-ordinator or user can be used on many occasions by many other user groups across future

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periods of time. This ensures that participants are advised of user notifications **331**. Using smart-alerts **332** and user responses **333** received by fixed and mobile devices **170**, participants are able to collect and log important information. Relevant examples of such information include agenda, meeting minutes, progress reports, correspondence, collaboration interactions and dates that other related tasks that need to be conducted.

An event **210** or schedule **220** can also be configured for interacting with group within the community applicable to that meeting, e.g. allocation of roles and actions, progress in the completion of actions, reports, financial statements, governance processes, group work collaborations, social interactions, etc., each schedule or roster adjusting depending on rule interactions. Schedules **220** and records **324** can be searched by the user and shared with other members in the community involved with each meeting.

Based upon the location and time zone attributes of an event **210** along with other system and publicly available or licensed travel time data, the rule engine **120** and recommendation engine **182** can incorporate travel time and adjust user notifications to dynamically process user notifications **331**, to ensure that all participants are able to attend on time at an agreed location or at the same time. In a similar manner, for meeting management or any of the related examples, a phone conference can be scheduled for participants in different time zones, ensuring that each participant's user notifications **331** are adjusted for time of day across the varying time zones.

The method of managing scheduled events in a network-hosted time management system may alternatively be implemented in dedicated hardware such as one or more integrated circuits performing the functions or sub functions of managing scheduled events in a network-hosted time management system. Such dedicated hardware may include graphic processors, digital signal processors, or one or more microprocessors and associated memories.

Methods, apparatuses, and computer readable media for managing scheduled events in a network-hosted time management system implemented using a computer system have been disclosed. The foregoing relates to the embodiment in meeting management and related applications, but modifications and/or changes can be made thereto without departing from

the scope of the invention. The embodiments of the embodiment are illustrative and not restrictive.

Embodiments of the service comprise a method of creating templates by a user, then using that template by either that user, or another user. This example illustrates the method of embodiment for the following: travel or group travel. This example may apply to travel participants including the tourist, tour organiser, tour guide, transport operators, caterers, hoteliers and any combination of air, bus, train, taxi or private operator. This embodiment also encapsulates related embodiments including tour options, management of symposium travel and events, preparatory schedules, timetables and other temporal related plan.

Referring to **FIG. 6** for travel embodiments, the method **600** uses events and timing information for a tourist, tour organiser, tour guide, transport operators, caterers, hoteliers and any combination of air, bus, train, taxi or private operator as applicable to each user's specific need. The method **600** commences processing at step **610** ("Start"). In step **620**, reusable non-user-specific templates are constructed by users, including administrators, co-ordinators, advisors, or users, as described in greater detail hereinafter with reference to **FIGS. 1-5**. Each template comprises for each travel sequence an event, a notification, and an associated data record stored in a database repository accessible via an electronic network coupled to the time management system. Examples of records include itineraries, directions, payment dates, date of events, dates for preparation and follow-up, information related to the progression of events for that sequence, content of questions and responses to answers, addresses, maps, url links, media relating to events, advisory text as well as user created records which can be added for storage of information. Each template is a combination of records in a database repository with fields that relate one record type to another record type. In step **630**, at least one rule is included (defined) in each template. Each rule creates a temporal relationship between (1) two or more events, or (2) an event and an associated data record, to form at least one dynamic interrelated event schedule. Examples of rules may relate to the timing between the progressions of events for travel arrangements, particularly when events are missed, and there is a pre-determined constraint on when the next related event in the sequence or any sequence of events that requires definition such as repeats or any other specific periods between those events. In step **640**, templates are instantiated by populating the records of the templates with data to create at least one user-specific event schedule, or a multiple role

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roster, each having associated records. For travel embodiments, rosters may be used to manage the various roles between the co-ordinator and other users in the community with examples including tourist, tour organiser, tour guide, transport operators, caterers, hoteliers and any combination of air, bus, train, taxi or private operator as applicable to each user's specific need. Each roster is a set of interrelated event schedules for multiple user roles. In step **650**, event notification alert temporal data is monitored and at least one user device is notified in response to the monitoring by initiating a smart-alert. The smart-alert comprises a notification regarding an event in one or more schedules that require a reply from a user device connected to the electronic network with user information to satisfy the rule associated with the smart-alert. The requested information is stored in the associated data record. In step **660**, the reply to the smart-alert, comprising data to update the associated data record, is received from a user (mobile or fixed) device (e.g. a personal computer, a laptop computer, a tablet computer, a smartphone, a network accessible computer). For travel embodiments, records include itineraries, directions, payment dates, date of events, dates for preparation and follow-up, information related to the progression of events for that sequence, content of questions and responses to answers, addresses, maps, url links, media relating to events, advisory text as well as user created records which can be added for storage of information. In step **670**, based on a change to or adding of user data in the associated data record, a rule, an event, a role, a data record, and/or a notification is changed. Processing then ends or returns in step **680**. This results in the smart-alert notifications being delivered, and personalised for each user's role in the travel community. The steps **620** to **670** may be repeatedly performed by use of an appropriate loop, or the method **600** may be repeatedly performed as required.

The embodiments of the invention enable users to manage a schedule of predefined time critical events and associated records by creating templates, which contain sequences of temporal events related by rules. These templates and rules can be used and reused multiple times. The rules create relationships between events within the same schedule, and/or between events within schedules that belong to the same user or multiple users. These templates allow users to instantiate their own independent copy of the schedule of events and

if required customise the schedule of events to their requirements without changing the original schedule template.

Because rules can apply across multiple schedules for a single user, interdependent schedule templates can be created for management of complex temporal activities, such as but not limited to: tour itinerary, group itinerary, optional tourist activities, optional catering options, optional transport alternatives, administration of tourists, financial interactions, as per those events in the schedule or roster which defines the specific details of this embodiment.

The rules can contain any logical expression and can trigger events such as creating new records or smart-alerts. The rules can also refer to fields with stored records which enables the schedules to respond to and be modified by external input. Therefore making the schedules dynamic and changing automatically to external input.

Temporal data in schedules, rules and records can be absolute, relative to other events or stored data records via rules, or entered manually or automatically when the template is instantiated. Smart-alerts associated with the temporal events enables users to not only be notified of events but also allow users to manually or automatically enter data that is associated with the event alert that can be stored in records and used for temporal relationships or event triggers. A related embodiment of smart-alerts enables notifications to users via wearable devices such blue tooth connected devices providing text messages, vibrations, enrolment of photos or voice notes and user responses such as advising choices at the time of notification.

Event Alerts can be pre-event, upon event, or post event. Multiple alerts within a defined timeframe can be aggregated into a single alert and can be acknowledged by a single acknowledgement to reduce user disruption.

Templates and instantiated schedules can be viewed in either the time domain or in a spatial relationship domain to facilitate, creation, editing, and viewing.

The event may be in at least one schedule of events of at least one user. The temporal relationships defined in the templates may each comprise a combination of absolute, relative, calculated, and user-defined temporal relationship.

For this embodiment example, schedules are created for each specific intended purpose, and may include: tour itinerary, group itinerary, optional tourist activities, optional catering options, optional transport alternatives, administration of tourists, financial interactions, as per those events in the schedule

Examples of records include birth date, gender, address, location of the user's mobile device, identification records, passport details, driver's license, visas, itinerary, catering plans, documentation, correspondence, receipts, photos, voicemail, video, calculated travel time, or any other record type which is referenced in the specific schedule example of this embodiment.

By way of example of the method used in the embodiment of embodiments, and relating back to the description previously recorded, schedules **110** are created by linking more than one event **111** using rules and embedding data records **140** either associated with the whole schedule **110**, or linked to an individual event **111**. Schedules **110** once created as user instantiated templates (**320** in **FIG. 3**) are processed by the rule engine **120** and recommendation engine **182**. Event triggers **125** initiate smart-alerts **130**, which generate user notifications (**331** in **FIG. 3**). Smart-alerts **130** initiate user responses **333**, which are either stored in user records **324** or locally on the user device **330** if that device is not connected to the electronic network. Once an electronic network is re-established, user responses **333** are transferred to user records **324**.

Smart-alert responses **333** can also generate event triggers **125** to initiate other user events **321**, user schedules or user rosters, either for that user or any other designated user by the rule engine **120**, which processes the user instantiated templates **320**.

Users are tracked via the administration engine **180** engine, using user information and contact lists for candidate users, which have not yet subscribed. Related information is stored in data records **140**.

The user can create published templates **300** from a user template **310**, by identifying the fields in the template that are required to be populated with user or instantiation data at the time of instantiation. The instantiation relationship between published templates **300**, user templates **310**, and user instantiated template **320** is tracked so that subsequent updates of a published template **300** can flow through to user templates **310** and user instantiated

templates **320** providing that related user responses **333** are authorised for updating by the user for each update.

For an existing published template **300**, a user selects published templates **300** and replicates those published templates **300** into user templates **310**. To prepare for processing of the template by the rule engine **120** and the recommendation engine **182**, the user data **324** is added either using available information in the user records **324** to automatically populate fields required for the instantiation, or the user is required to enter additional data which is not available in the user records **324**. Once all fields are entered, and other important data held by the system **100** is added, such as time zone and location, the middle-tier user templates **310** are instantiated to create lower-tier user instantiated templates **320**. The middle-tier user templates **310** include user event templates **311**, user schedule templates **312**, user roster templates **313**, and user record templates **314**.

At the time of instantiation, associated template data is transferred **421**, **422**, **423** to user rosters **430**, user schedules **440** and user events **450**. Notifications interact with the local apps **558** on fixed and mobile devices **410**, **560** as well as through standard iCalendar notifications **414**. Settings are available on the fixed or mobile device **410** to transfer user records instance **424** to local data storage cache **411**, so that this media is available when the electronic network is disconnected. If the device **410** is connected to an electronic network, user records instances **424** can be retrieved either by links embedded in standard iCalendar notification transactions or through system interactions with the app or processing instance that is processing on the fixed or mobile device **410**.

Data in user record templates **515** can also be utilised in rules and as smart-alert responses allowing users to update data, resulting in dynamic sequencing that can be initiated by changes in user records **535**, once user instantiated templates have been created and linked to create rule field values.

As a further example of the embodiments of the embodiment, the following text is repeated:

For rosters **280**, the top-tier published user-roster templates **303** can be created from a user roster template **313**, by identifying the fields in the template that are required to be populated with user or instantiation data at the time of instantiation, if any. Users can

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replicate published templates **300** versions of user roster templates **303** into user templates **310**. To prepare for processing of templates, user data is added using either available information in user records **324** to automatically populate fields required for the instantiation or the user is required to enter additional data that is not available in the user records **324**. Once all fields are entered, middle-tier user templates **310** versions of user roster templates **313** are instantiated to create lower-tier user-instantiated templates **320** versions of user rosters templates **323**, which are processed by the rule engine **120** and recommendation engine **182**.

For this embodiment example, rosters are created for each specific intended purpose along with the nominated role allocations and the selection of resources. Examples may include: tour itinerary, group itinerary, optional tourist activities, optional catering options, optional transport alternatives, administration of tourists, financial interactions, as per those events in the schedule

User instantiated templates **320**, which comprise user event **321**, user schedules **322**, user rosters **323**, and user records **324**, are processed by the rule engine **120** to initiate user notifications **331**, event triggers **125** and user smart-alerts **332**. User responses **333** may result in updating of user records **324**.

The embodiments of the invention have application to, but are not limited to, tour itinerary, group itinerary, optional tourist activities, optional catering options, optional transport alternatives, administration of tourists, financial interactions and any other related event which is added to the specific schedule or roster.

In these cases, important information and media is loaded into the data records **140** repository. If updates of this information are needed, user templates **310** and published templates **300** can be created. Events **210** are configured individually or as schedules **220**.

Event templates can be instantiated in at least one schedule of events of at least one user.

Interactions between events **210** of one user or between events of different users **250** are cross referenced, and the attributes of rules are added to define those interactions. Data is

stored as data records **140** for processing by the rule engine **120** and recommendation engine **182**.

A sequence for travel is established by using an event **111** for each scheduled activity, which may be repeated, or dynamically sequenced depending upon other events for the user or another user. Each role for the specific travel community may be notified by the recommendation engine **182** relating to user responses **333** in accordance with each rule **100**.

For each role in the travel community, for example, all participants can be provided with user notifications **331** to remind each role of important actions, distribution and collection of records **324** and prompt each participant for feedback on progress of tasks via the user responses **333**.

Calendars and schedules of events can be converted into user templates **310** and published templates **300**, which may be selected by different groups of users, and processed by the system according to user requirements and other instantiation data at the time or instantiation into the user instantiated templates **320**. In this manner, schedules that may be used in one period can be reapplied across future periods of time, thereby reducing the complexity of administration and increasing productivity of administrators and students.

For travel, an itinerary for one group of tourists created by a co-ordinator such as a travel agent, tour guide or user can be used on many occasions by many other tours across future periods of time. This ensures that participants are advised of user notifications **331**. Using smart-alerts **332** and user responses **333** received by fixed and mobile devices **170**, participants are able to collect and log important information. Relevant examples of such information include itineraries, details of travel bookings, confirmations, transport instructions, travel time, interactions and dates that other related tasks that need to be conducted.

An event **210** or schedule **220** can also be configured for interacting with group within the community applicable to each tour e.g. allocation of roles and provision of travel services, financial statements, social interactions, restaurant booking, etc., each schedule or roster adjusting depending on rule interactions. Schedules **220** and records **324** can be searched by the user and shared with other members in the community involved with that tour.

Based upon the location and time zone attributes of an event **210** along with other system and publicly available or licensed travel time data, the rule engine **120** and recommendation engine **182** can incorporate travel time and adjust user notifications to dynamically process user notifications **331**, to ensure that all participants are able to attend on time at an agreed location or at the same time. In a similar manner, for travel or any of the related examples, a phone conference can be scheduled for participants in different time zones, ensuring that each participant's user notifications **331** are adjusted for time of day across the varying time zones.

The method of managing scheduled events in a network-hosted time management system may alternatively be implemented in dedicated hardware such as one or more integrated circuits performing the functions or sub functions of managing scheduled events in a network-hosted time management system. Such dedicated hardware may include graphic processors, digital signal processors, or one or more microprocessors and associated memories.

Methods, apparatuses, and computer readable media for managing scheduled events in a network-hosted time management system implemented using a computer system have been disclosed. The foregoing relates to the embodiment in travel and related applications, but modifications and/or changes can be made thereto without departing from the scope of the invention. The embodiments of the embodiment are illustrative and not restrictive.

Embodiments of the service comprise a method of creating templates by a user, then using that template by either that user, or another user. This example illustrates the method of embodiment for the following: church community. This example may apply to users who are members of the congregation, religious leaders, support staff, volunteers, catering staff, transport providers, musicians, dignitaries and those who are responsible for managing the facilities and resources required for that church or any activity that the church community is involved in. This embodiment also encapsulates related embodiments including templates for church services, marriage, baptism, social event, youth group, fund raiser, mission or any other activity that the church community is involved in.

Referring to **FIG. 6** for church community embodiments, the method **600** uses events and timing information which members of the congregation, religious leaders, support staff, volunteers, catering staff, transport providers, musicians, dignitaries and those who are responsible for managing the facilities and resources required for that church or any activity that the church community is involved in as applicable to each user's specific need. The method **600** commences processing at step **610** ("Start"). In step **620**, reusable non-user-specific templates are constructed by users, including administrators, co-ordinators, advisors, or users, as described in greater detail hereinafter with reference to **FIGS. 1-5**. Each template comprises for each church community sequence an event, a notification, and an associated data record stored in a database repository accessible via an electronic network coupled to the time management system. Examples of records include date of events, dates for preparation and follow-up, information related to the progression of events for that sequence, content of questions and responses to answers, addresses, maps, url links, media relating to events, advisory text as well as user created records which can be added for storage of information. Each template is a combination of records in a database repository with fields that relate one record type to another record type. In step **630**, at least one rule is included (defined) in each template. Each rule creates a temporal relationship between (1) two or more events, or (2) an event and an associated data record, to form at least one dynamic interrelated event schedule. Examples of rules may relate to the timing between the progressions of events for that church community, particularly when events are missed, and there is a pre-determined constraint on when the next related event in the sequence or any sequence of events that requires definition such as repeats or any other specific periods between those events. In step **640**, templates are instantiated by populating the records of the templates with data to create at least one user-specific event schedule, or a multiple role roster, each having associated records. For church communities, rosters may be used to manage the various roles between the co-ordinator and other users in the community with examples including members of the congregation, religious leaders, support staff, volunteers, catering staff, transport providers, musicians, dignitaries and those who are responsible for managing the facilities and resources required for that church or any activity that the church community. Each roster is a set of interrelated event schedules for multiple user roles. In step **650**, event notification alert temporal data is monitored and at least one user device is notified in response to the monitoring by initiating a

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smart-alert. The smart-alert comprises a notification regarding an event in one or more schedules that require a reply from a user device connected to the electronic network with user information to satisfy the rule associated with the smart-alert. The requested information is stored in the associated data record. In step **660**, the reply to the smart-alert, comprising data to update the associated data record, is received from a user (mobile or fixed) device (e.g. a personal computer, a laptop computer, a tablet computer, a smartphone, a network accessible computer). For church community embodiments, records include date of events, dates for preparation and follow-up, information related to the progression of events for that sequence, content of questions and responses to answers, addresses, maps, url links, media relating to events, advisory text as well as user created records which can be added for storage of information. In step **670**, based on a change to or adding of user data in the associated data record, a rule, an event, a role, a data record, and/or a notification is changed. Processing then ends or returns in step **680**. This results in the smart-alert notifications being delivered, and personalised for each user's role in the church community. The steps **620** to **670** may be repeatedly performed by use of an appropriate loop, or the method **600** may be repeatedly performed as required.

The embodiments of the invention enable users to manage a schedule of predefined time critical events and associated records by creating templates, which contain sequences of temporal events related by rules. These templates and rules can be used and reused multiple times. The rules create relationships between events within the same schedule, and/or between events within schedules that belong to the same user or multiple users. These templates allow users to instantiate their own independent copy of the schedule of events and if required customise the schedule of events to their requirements without changing the original schedule template.

Because rules can apply across multiple schedules for a single user, interdependent schedule templates can be created for management of complex temporal activities, such as but not limited to: church services, marriage, baptism, social event, youth group, fund raiser, mission or any other activity that the church community is involved in as per those events in the schedule or roster which defines the specific details of this embodiment.

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The rules can contain any logical expression and can trigger events such as creating new records or smart-alerts. The rules can also refer to fields with stored records which enables the schedules to respond to and be modified by external input. Therefore making the schedules dynamic and changing automatically to external input.

Temporal data in schedules, rules and records can be absolute, relative to other events or stored data records via rules, or entered manually or automatically when the template is instantiated. Smart-alerts associated with the temporal events enables users to not only be notified of events but also allow users to manually or automatically enter data that is associated with the event alert that can be stored in records and used for temporal relationships or event triggers. A related embodiment of smart-alerts enables notifications to users via wearable devices such blue tooth connected devices providing text messages, vibrations, enrolment of photos or voice notes and user responses at the time of notification.

Event Alerts can be pre-event, upon event, or post event. Multiple alerts within a defined timeframe can be aggregated into a single alert and can be acknowledged by a single acknowledgement to reduce user disruption.

Templates and instantiated schedules can be viewed in either the time domain or in a spatial relationship domain to facilitate, creation, editing, and viewing.

The event may be in at least one schedule of events of at least one user. The temporal relationships defined in the templates may each comprise a combination of absolute, relative, calculated, and user-defined temporal relationship.

For this embodiment example, schedules are created for each specific intended purpose, and may include: church services, marriage, baptism, social event, youth group, fund raiser, mission or any other activity that the church community is involved in as per those events in the schedule.

Examples of records include scripture references, run sheet for each service, location of the user's mobile device, certificates of baptism, marriage, records of donations, other receipts, catering plans, documentation, correspondence, photos, voicemail, video, calculated travel time, or any other record type which is referenced in the specific schedule example of this embodiment.

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By way of example of the method used in the embodiment of embodiments, and relating back to the description previously recorded, schedules **110** are created by linking more than one event **111** using rules and embedding data records **140** either associated with the whole schedule **110**, or linked to an individual event **111**. Schedules **110** once created as user instantiated templates (**320** in **FIG. 3**) are processed by the rule engine **120** and recommendation engine **182**. Event triggers **125** initiate smart-alerts **130**, which generate user notifications (**331** in **FIG. 3**). Smart-alerts **130** initiate user responses **333**, which are either stored in user records **324** or locally on the user device **330** if that device is not connected to the electronic network. Once an electronic network is re-established, user responses **333** are transferred to user records **324**.

Smart-alert responses **333** can also generate event triggers **125** to initiate other user events **321**, user schedules or user rosters, either for that user or any other designated user by the rule engine **120**, which processes the user instantiated templates **320**.

Users are tracked via the administration engine **180** engine, using user information and contact lists for candidate users, which have not yet subscribed. Related information is stored in data records **140**.

The user can create published templates **300** from a user template **310**, by identifying the fields in the template that are required to be populated with user or instantiation data at the time of instantiation. The instantiation relationship between published templates **300**, user templates **310**, and user instantiated template **320** is tracked so that subsequent updates of a published template **300** can flow through to user templates **310** and user instantiated templates **320** providing that related user responses **333** are authorised for updating by the user for each update.

For an existing published template **300**, a user selects published templates **300** and replicates those published templates **300** into user templates **310**. To prepare for processing of the template by the rule engine **120** and the recommendation engine **182**, the user data **324** is added either using available information in the user records **324** to automatically populate fields required for the instantiation, or the user is required to enter additional data which is not available in the user records **324**. Once all fields are entered, and other important data held by the system **100** is added, such as time zone and location, the middle-tier user

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templates **310** are instantiated to create lower-tier user instantiated templates **320**. The middle-tier user templates **310** include user event templates **311**, user schedule templates **312**, user roster templates **313**, and user record templates **314**.

At the time of instantiation, associated template data is transferred **421**, **422**, **423** to user rosters **430**, user schedules **440** and user events **450**. Notifications interact with the local apps **558** on fixed and mobile devices **410**, **560** as well as through standard iCalendar notifications **414**. Settings are available on the fixed or mobile device **410** to transfer user records instance **424** to local data storage cache **411**, so that this media is available when the electronic network is disconnected. If the device **410** is connected to an electronic network, user records instances **424** can be retrieved either by links embedded in standard iCalendar notification transactions or through system interactions with the app or processing instance that is processing on the fixed or mobile device **410**.

Data in user record templates **515** can also be utilised in rules and as smart-alert responses allowing users to update data, resulting in dynamic sequencing that can be initiated by changes in user records **535**, once user instantiated templates have been created and linked to create rule field values.

As a further example of the embodiments of the embodiment, the following text is repeated:

For rosters **280**, the top-tier published user-roster templates **303** can be created from a user roster template **313**, by identifying the fields in the template that are required to be populated with user or instantiation data at the time of instantiation, if any. Users can replicate published templates **300** versions of user roster templates **303** into user templates **310**. To prepare for processing of templates, user data is added using either available information in user records **324** to automatically populate fields required for the instantiation or the user is required to enter additional data that is not available in the user records **324**. Once all fields are entered, middle-tier user templates **310** versions of user roster templates **313** are instantiated to create lower-tier user-instantiated templates **320** versions of user rosters templates **323**, which are processed by the rule engine **120** and recommendation engine **182**.

For this embodiment example, rosters are created for each specific intended purpose along with the nominated role allocations and the selection of resources. Examples may include : church services, marriage, baptism, social event, youth group, fund raiser, mission or any other activity that the church community is involved in as per those events in the roster.

User instantiated templates **320**, which comprise user event **321**, user schedules **322**, user rosters **323**, and user records **324**, are processed by the rule engine **120** to initiate user notifications **331**, event triggers **125** and user smart-alerts **332**. User responses **333** may result in updating of user records **324**.

The embodiments of the invention have application to, but are not limited to, church services, marriage, baptism, social event, youth group, fund raiser, mission and any other related event which is added to the specific schedule or roster.

In these cases, important information and media is loaded into the data records **140** repository. If updates of this information are needed, user templates **310** and published templates **300** can be created. Events **210** are configured individually or as schedules **220**.

Event templates can be instantiated in at least one schedule of events of at least one user.

Interactions between events **210** of one user or between events of different users **250** are cross referenced, and the attributes of rules are added to define those interactions. Data is stored as data records **140** for processing by the rule engine **120** and recommendation engine **182**.

A sequence for the church community is established by using an event **111** for each scheduled activity, which may be repeated, or dynamically sequenced depending upon other events for the user or another user. Each role for the specific church community may be notified by the recommendation engine **182** relating to user responses **333** in accordance with each rule **100**.

For each role in the church community, for example, all participants can be provided with user notifications **331** to remind each role of important actions, distribution and

collection of records **324** and prompt each participant for feedback on progress of tasks via the user responses **333**.

Calendars and schedules of events can be converted into user templates **310** and published templates **300**, which may be selected by different groups of users, and processed by the system according to user requirements and other instantiation data at the time or instantiation into the user instantiated templates **320**. In this manner, schedules that may be used in one period can be reapplied across future periods of time, thereby reducing the complexity of administration and increasing productivity of administrators and students.

For a church community, a set of events for one type of church service for one group of parishioners created by a co-ordinator in the church, or any other user in the church community can be used on many occasions for other church services across future periods of time, and with different church goers. This ensures that parishioners are advised of user notifications **331**. Using smart-alerts **332** and user responses **333** received by fixed and mobile devices **170**, participants are able to collect and log important information. Relevant examples of such information include the sequence of church services, confirmations, preparation, transport instructions, travel time, interactions and dates that other related tasks that need to be conducted.

An event **210** or schedule **220** can also be configured for interacting with group within the community applicable to each tour e.g. allocation of roles and provision of travel services, financial statements, social interactions, restaurant booking, etc., each schedule or roster adjusting depending on rule interactions. Schedules **220** and records **324** can be searched by the user and shared with other members in the community involved with that tour.

Based upon the location and time zone attributes of an event **210** along with other system and publicly available or licensed travel time data, the rule engine **120** and recommendation engine **182** can incorporate travel time and adjust user notifications to dynamically process user notifications **331**, to ensure that all participants are able to attend on time at an agreed location or at the same time. In a similar manner, for the church embodiment or any of the related examples, a phone conference can be scheduled for participants in different time zones, ensuring that each participant's user notifications **331** are adjusted for time of day across the varying time zones.

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The method of managing scheduled events in a network-hosted time management system may alternatively be implemented in dedicated hardware such as one or more integrated circuits performing the functions or sub functions of managing scheduled events in a network-hosted time management system. Such dedicated hardware may include graphic processors, digital signal processors, or one or more microprocessors and associated memories.

Methods, apparatuses, and computer readable media for managing scheduled events in a network-hosted time management system implemented using a computer system have been disclosed. The foregoing relates to the embodiment in church community and related applications, but modifications and/or changes can be made thereto without departing from the scope of the invention. The embodiments of the embodiment are illustrative and not restrictive.

CLAIMS:

The claims defining the invention are as follows:

1. A method for managing scheduled events in a network-hosted time management system implemented using a computer system, the method comprising:
 - constructing reusable non-user-specific schedule templates each comprising an event, a notification, and an associated data record stored in a database repository accessible via an electronic network coupled to said time management system, each template being a combination of records in a database repository with fields that relate one record type to another record type;
 - including, in each template, at least one rule, each rule creating a temporal relationship between at least two events, or an event and an associated data record, to form at least one dynamic interrelated event schedule;
 - instantiating templates by populating said records of said templates with data to create at least one user-specific event schedule, or a multiple role roster, each having associated records, each roster being a set of interrelated event schedules for multiple user roles;
 - monitoring event notification alert temporal data and notifying at least one user device by initiating a smart-alert, said smart-alert comprising a notification regarding an event in at least one schedule that requires a reply from a user device connected to the electronic network with user information to satisfy the rule associated with the smart-alert, said requested information being stored in the associated data record;
 - receiving from a user device a reply to the smart-alert comprising data to update the associated data record; and
 - based on a change to data in said associated data record, changing at least one of:
 - a schedule,
 - a rule,
 - an event,
 - a role,
 - a data record, and

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a notification.

2. The method as claimed in claim 1, wherein said event is in at least one schedule of events of at least one user.

3. The method as claimed in claim 1, wherein the temporal relationships defined in said templates each comprises a combination of absolute, relative, calculated, and user-defined temporal relationship.

4. The method as claimed in claim 1, comprising recommending a template to a user based on a user attribute, activity, or current location of the user device..

5. The method as claimed in claim 1, comprising:

 caching instantiated templates and associated data records in at least one local storage device of an electronic device that can access the electronic network for issuing a smart-alert when said electronic device is disconnected from the network-hosted time management system;

 storing a reply to said smart-alert on said local storage device until said electronic device is connected to the network-hosted time management system; and

 transferring said reply to said smart-alert to the network-hosted time management system.

6. The method as claimed in claim 1, comprising receiving from a user device the current geographic location of the user device and based on that location information creating or modifying at least one of:

 a schedule,

 a rule,

 an event,

 a role,

 a data record, and

 a notification.

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7. The method defined by claim 6 wherein based on that location information the at least one of the schedule, the rule, the event, the role, the data record and the notification is modified in accordance with at least one of a , national, state and local jurisdiction health-related requirement and a health advisory body recommendation.

8. The method defined by any one of the preceding claims wherein the reusable non-user specific schedule templates are constructed by at least one of health administrators, health advisers and user.

9. A method defined by any one of the preceding claims wherein at least one of the non-user specific schedule templates comprises a health related event.

10. A method defined by any one of the preceding claims wherein the at least one rule relates the timing between two health related events.

11. A method defined by any one of the preceding claims comprising the step of instantiating at least one of the reusable non-user specific schedule template by populating the records of the templates with data to create at least one user-specific event schedule, or a multiple role roster.

12. A method defined by claim 11 comprising the step of using the user-specified event schedule, or the multiple role roster, to manage the health pathway interaction between at least one of health care professionals, nurses, family, friends, advocates and carers.

13. A method defined by either one of claim 11 and claim 12 wherein the user-specified event schedule, or the multiple role roster, comprises a set of interrelated event schedules for multiple user roles.

14. A method defined by any one of the claims 11 to 13 comprising the step of monitoring event notification alert temporal data and notifying at least one user device in response to the monitoring by initiating a smart alert.

15. A method defined by any one of the claims 11 to 14 comprising the step of changing at least one of a rule, an event, a role, a data record, and/or a notification in response to at least one of a change to and an addition to user data in the associated data record.

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16. A method defined by any one of the claims 7 to 15 wherein the health related event comprises at least one of a vaccination, an immunisation, a health check, a family nurse evaluation, a symptom briefing, media and related information advice, a medication event, a therapy event, and a request for user details.

17. A method defined by any one of the claims 7 to 16 wherein the instantiated data records comprise at least one of health status information, immunisation certification information, prescription information, medical report information, and health insurance claim information.

18. The method as claimed in claim 1, wherein templates and user records are adapted to be categorised, stored, searched, and viewed by system- or user-defined context specific categories and tags.

19. The method as claimed in claim 1, comprising sharing in part or whole a user's account including any event schedules, templates, and an associated data records between users using permission controls of the network-hosted time management system.

20. The method as claimed in claim 1, comprising identifying and notifying the user of any conflicts between events in a user's schedules or events in shared schedules from other users and recommending possible changes to those events to avoid or minimise conflict.

21. The method as claimed in claim 1, comprising publishing a template by the network-hosted time management system for use by another user.

22. The method as claimed in of claim 1, comprising viewing a template and an instantiated template by the network-hosted time management system in a time-domain view or an event-relationship view.

23. The method as claimed in claim 1, comprising displaying on a display device temporal events simultaneously as a wide time frame in summary and a shorter range of events in detail.

24. The method as claimed in claim 1, comprising printing at least one of a template and an instantiated template.

25. The method as claimed in claim 1, comprising allocating specific users to roster roles.

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26. The method as claimed in claim 25, wherein the allocating is performed either automatically via predefined rules or manually.

27. An apparatus for managing scheduled events in a network-hosted time management system implemented using a computer system, the computer system comprising a processing unit and a memory storing data and a computer program, the processing unit and memory configured when executing the computer program to perform a method comprising:

constructing reusable non-user-specific templates each comprising an event, a notification, and an associated data record stored in a database repository accessible via an electronic network coupled to said time management system, each template being a combination of records in a database repository with fields that relate one record type to another record type;

including, in each template, at least one rule, each rule creating a temporal relationship between at least two events, or an event and an associated data record, to form at least one dynamic interrelated event schedule;

instantiating templates by populating said records of said templates with data to create at least one user-specific event schedule, or a multiple role roster, each having associated records, each roster being a set of interrelated event schedules for multiple user roles;

monitoring event notification alert temporal data and notifying at least one user device by initiating a smart-alert, said smart-alert comprising a notification regarding an event in at least one schedule that requires a reply from a user device connected to the electronic network with user information to satisfy the rule associated with the smart-alert, said requested information being stored in the associated data record;

receiving from a user device the reply to the smart-alert comprising data to update the associated data record; and

based on a change to data in said associated data record, changing at least one of:

a schedule,

a rule,

an event,

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a role,
a data record, and
a notification.

28. The apparatus as claimed in claim 27, wherein the method, performed by the processing unit and memory executing the computer program, comprises allocating specific users to roster roles.

29. The apparatus as claimed in claim 28, wherein the allocating is performed either automatically via predefined rules or manually.

30. The apparatus as claimed in any one of the claims 27 to 29 wherein the processing unit and memory are configured when executing the computer program to perform the steps of the method defined in any one of the claims 1 to 26.

30. A non-transitory computer readable medium having recorded therein a computer program for managing scheduled events in a network-hosted time management system implemented using a computer system, the computer program comprising:

code for constructing reusable non-user-specific templates each comprising an event, a notification, and an associated data record stored in a database repository accessible via an electronic network coupled to said time management system, each template being a combination of records in a database repository with fields that relate one record type to another record type;

code for including, in each template, at least one rule, each rule creating a temporal relationship between at least two events, or an event and an associated data record, to form at least one dynamic interrelated event schedule;

code for instantiating templates by populating said records of said templates with data to create at least one user-specific event schedule, or a multiple role roster, each having associated records, each roster being a set of interrelated event schedules for multiple user roles;

code for monitoring event notification alert temporal data and notifying at least one user device by initiating a smart-alert, said smart-alert comprising a notification regarding an event in at least one schedule that requires a reply from a user device connected to the

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electronic network with user information to satisfy the rule associated with the smart-alert, said requested information being stored in the associated data record;

code for receiving from a user device the reply to the smart-alert comprising data to update the associated data record; and

code for, based on a change to data in said associated data record, changing at least one of:

- a schedule,
- a rule,
- an event,
- a role,
- a data record, and
- a notification.

31. The computer readable medium as claimed in claim 30, wherein the computer program comprises code for allocating specific users to roster roles.

32. The computer readable medium as claimed in claim 31, wherein the allocating is performed either automatically via predefined rules or manually.

33. The computer readable medium as claimed in any one of the claims wherein the computer program comprises code for the steps of the method defined by any one of the claims 1 to 26.