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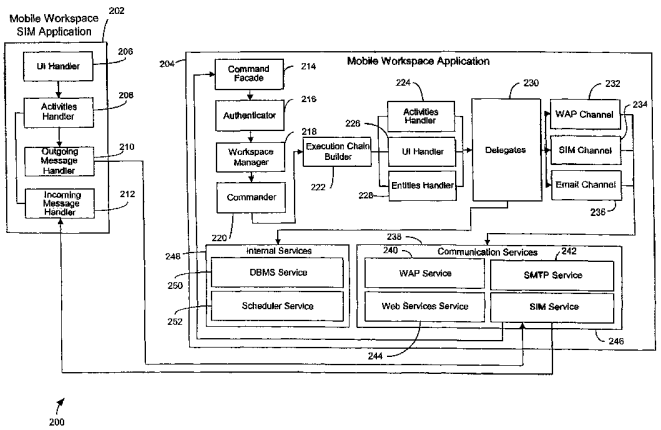

(57) Abstract: In a system for mobile collaboration, user sessions are managed in a shared workspace by providing a mobile workspace server coupled to a communications network, the mobile workspace server communicating with remote application servers. When a user command is received from one of the users, the user using a mobile device including a subscriber identity module (SIM), the user command is processed and a user session is conducted between the user and one of the remote application servers. SIM applications can be updated over the communications network by providing a management system server in communication with a SIM-containing mobile device over the communications network, receiving an update request from a framework application, and transmitting updates to the framework application over the communications network. Data can be transmitted over a communications network using a short message service (SMS) system and data concatenation by generating data for transmission, splitting the data into segmented data packets, each including header information, transmitting the segmented data packets, storing the segmented data packets in a temporary buffer, restoring the data by reordering the data packets using the header information, and providing the restored data to an output buffer.

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METHOD AND SYSTEM FOR DISTRIBUTED MOBILE COLLABORATION

FIELD OF THE INVENTION

The present invention relates generally to mobile computing devices, and more particularly, to a method and system of on-line collaboration and interconnection between computers, mobile phones, subscriber identity module (SIM) cards, mobile Internet phones, and other mobile devices over a telecommunication network.

BACKGROUND OF THE INVENTION

The Internet has grown rapidly in recent years. The World Wide Web (WWW) has been widely embraced as a standard infrastructure over which a variety of applications can be deployed. Businesses and individuals are increasing relying on the World Wide Web to perform critical activities. A similar revolution to that of the World Wide Web is taking place within the domain of mobile telecommunications where existing network infrastructures are being extended through wireless Internet access.

Wireless networks have lead to the development of the 'Mobile Internet'. On standard supporting these developments is the Wireless Application Protocol (WAP). WAP has emerged as a global standard for providing Internet communications and mobile telephony services on digital mobile phones, pagers, personal digital assistants (PDAs) and other wireless devices. Despite being designed for small devices with limited bandwidth and hardware capabilities, the application of WAP in wireless networks has fundamental technical properties that may have limited its suitability for providing collaborative services. Existing devices include shortcomings related to the reliance on a remote server for browsing creates a critical dependency on network and coverage quality, restricted network speed making applications slow, variability in maintaining network connections over prolonged periods, an inability to use application when outside network coverage areas, and compatibility issues regarding the implementation of WAP standards by various manufacturers.

Wireless devices have become increasingly ubiquitous and the use of mobile phones, pagers, and PDAs, as well as wireless services continues to expand. A large number of these devices are not mobile Internet enabled but have transcended the lack of browser based functionality through that provided by messaging protocols such as the short message service (SMS). SMS is a form of paging that was developed for these wireless devices. SMS enables two mobile devices to exchange text/binary messages. The ability to exchange SMS messages provides the convenience of non-voice based communication and enhanced network connectivity. SMS has a number of technical limitations that have, to date, limited the utilization of the technology in providing collaborative services.

Collaborative Internet applications such as chat rooms and instant messaging have proved to be enormously popular Internet-based services. The predecessor to these services was Internet Relay Chat (IRC), which is an Internet Protocol (IP) based service with support for distributed collaboration. Collaboration tools enable distributed users to work together and share information using a variety of approaches. IRC provides a variety of mechanisms for users to collaborate across the World Wide Web with friends, colleagues and others, by subscribing to various channels or chat rooms, to exchange text messages and transfer files.

While the Internet is dynamic and flexible in providing users with entertaining and useful ways of communicating, it does not meet the needs of all users. While users interact increasingly through the Internet, they continue to interact off the Internet in more conventional ways, such as multi-medium (phone, fax, whiteboard), multi-temporal (messaging, voice, mail) and other informal means of communication. This desire combined with the increased requirements of workplace mobility has seen a requirement to bridge the divide between the Internet and telecommunication networks.

While the increased utilization of browser based technologies on mobile devices is seeing the mobile Internet extend its reach, there is a large existing base of mobile phone handsets that do not include browsers and do not natively support browser based technologies. Bandwidth limitations also continue to inhibit the speed of using these browser based technologies over mobile networks.

The present invention provides a method and system for collaboration between mobile devices and the Internet that overcomes many of the problems related to existing systems.

SUMMARY OF THE INVENTION

According to one embodiment of the present invention, a method for managing user sessions in a shared workspace is disclosed. The method includes: providing a mobile workspace server coupled to a communications network, the mobile workspace server in operable communication with one or more users and a plurality of remote application servers; receiving a user command from one of the users over the communications network, the user using a mobile device including a subscriber identity module (SIM); processing the user command; and conducting a user session between the user and one of the plurality of remote application servers.

According to another embodiment of the present invention, a system for managing user sessions in a shared workspace is disclosed. The system includes: a mobile workspace server coupled to a communications network; a plurality of remote applications coupled to the mobile workspace server over the communications network; one or more users in communication with the mobile workspace server; and one or more sessions between the one or more users and the mobile workspace server, wherein each of the one or more users is configured to communicate with the plurality of remote applications using a user command, wherein the mobile workspace server receives the user command, processes the user command, and conducts the one or more sessions with one of the plurality of remote applications.

According to another embodiment of the present invention, a method for updating subscriber identity module (SIM) applications over a communications network is disclosed. The method includes: providing a management system server in communication with a mobile device over the communications network, the management system server configured to facilitate communication between the mobile device and the management system server, wherein a management system is operable on the management system server and a framework application is operable on the mobile device, wherein the mobile device includes a subscriber identity module (SIM); receiving an update request

from the framework application, wherein the framework application uses a framework engine, one or more component libraries, and application configuration data to generate and transmit the update request to the management system; and transmitting updates to the framework application over the communications network.

According to yet another embodiment of the present invention, a system for updating subscriber identity module (SIM) applications over a communications network is disclosed. The system includes: a mobile device including a subscriber identity module (SIM); a management system server in communication with the mobile device over the communications network; and an application framework for facilitating communication between the mobile device and the management system server, the application framework including: a management system operating on the management system server, wherein the management system receives update requests and transmits updates; and a framework application operationally stored on the mobile device, the framework application including a framework engine, one or more component libraries, and application configuration data, wherein the framework engine transmits the update requests to the management system and receives the updates from the management system.

According to yet another embodiment, a method for transmitting data over a communications network using a short message service (SMS) system and data concatenation is disclosed. The method includes: generating data for transmission; splitting the data into a plurality of segmented data packets, each of the data packets including header information; transmitting the plurality of segmented data packets over the communications network; storing the plurality of segmented data packets in a temporary buffer; restoring the data by reordering the plurality of data packets using the header information; and providing the restored data to an output buffer.

One desirable outcome of the present invention is a method and system for data concatenation in smart card applications, extending the message content length of SMS messages. A self-referential sequencing of a series of message segments are sent to a SIM application by a server. The message segments are then held by the SIM application and pieced together prior to notification of the message being received by the handset. In one embodiment,

the SIM application is compliant with GSM 11.14 standards from 1996 onwards, and the concatenation method will work on all handsets that comply with this standard.

Another desirable outcome of the present invention is a method and system for updating SIM applications and SIM browsing. One embodiment of the present invention is to provide a method and system for the creation of an application library, including menu types, commands, names and other items, and on-demand updating of the application library called by a generic application structure that resides on the SIM card. An update can be instigated by either the mobile device user or the system server with the commands encapsulated in one or more SMS messages. This system will provide a SIM application that is a smart client that enables the user to browse data on a remote server and also retains data in memory to aid offline utilisation. The system may also minimizes or reduce the constant interaction between client and server over the telecommunications network. In this regard, the application becomes a peer to the server and undertakes limited computation prior to initiating messaging interaction. It utilises a modular library of menus, commands and storage buffers for dynamic message content. A referenced pagination sequence may allow the user to have a back button function that retains links to previous interactions in memory.

Another desirable out of the present invention is a method and system for mobile collaboration in shared workspaces, including data storage and data synchronisation. In one embodiment, the invention uses a client-server architecture where the server holds the shared workspace and distributes workspace commands to the clients. For each member of the shared workspace, the number of connections that a client has to make may stay constant. By not using the notion of peers but instead a server the amount of connections and the amount of data needed to be synchronised is potentially greatly reduced and is much more suitable for a connection limited device. Also, in server-client model there may be only one source of synchronisation information. This reduces the number of connection sources that a client has to accept as for each connection source the client must apply processor resources plus handle the issues of security and connection reliability. However, multiple synchronisation sources may be used.

Remote data storage can minimise the amount of data that needs to be stored. In one embodiment, the invention provides a method for a shared workspace available to devices that don't have high resolution screens, applications to use third party files or an always available network connection. A disconnected mode may be used where the workspace data that is currently stored on the mobile equipment is available. The disconnected mode allows for viewing of the workspace without having to be connected to the server.

Any client can create a workspace for collaboration. The server provides the application to house the workspaces and administers the rules to share them between clients. Each collaborative workspace has an administrator that controls privileges for the clients of a workspace. The client who creates a workspace is the default administrator of that workspace. The method may further define privileges for a client, wherein the privilege defines access to document or message content, document or message type, function type, workspace name and type.

In another embodiment, the invention includes activities, which are collaboration components that are the tools that users can interact with and utilize inside a workspace. Each activity is a dynamic component for performing a certain job. For example, activities may include threaded messaging, real time chat, task dispatch, time logging, document editing, and the like. The activity components can be made available via access to server based software, over a network such as a telecommunication network or the Internet, and via installed components in a mobile phone, SIM card or other networked computing device. The activity components can operate through common application programming interfaces (API) provided by the framework. Accordingly the framework can be viewed and function as a platform for the applications in the form of activity components.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features, aspects, and advantages of the present invention will become better understood with regard to the following description and accompanying drawings where:

Figure 1 is a block diagram of a mobile workspace architecture in accordance with an embodiment of the present invention.

Figure 2 is a component view block diagram of the mobile workspace architecture in accordance with an embodiment of the present invention.

Figure 3 is a block diagram of a mobile workspace framework system for use with an SIM application update process in accordance with an embodiment of the present invention.

Figure 4 is a block diagram of network for use with the mobile collaboration system in accordance with am embodiment of the present invention.

Figure 5 is a process diagram of a data concatenation process in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION

The detailed description set forth below in connection with the appended drawings is intended as a description of example embodiments of the present invention and is not intended to represent the only embodiments in which the present invention can be practiced. The embodiments described throughout this description are intended to serve as an example or illustration of the present invention and should not necessarily be construed as preferred or advantageous over other embodiments. Any number of the described embodiments may be incorporated in any desired combination. The detailed description includes specific details for the purpose of providing a thorough understanding of the present invention. However, it will be apparent to those skilled in the art that the present invention may be practiced without these specific details.

In the following description, reference is made to the accompanying drawings, which form a part hereof, and through which is shown by way of illustration specific embodiments in which the invention may be practiced. It is to be understood that other embodiments may be used as structural and other changes may be made without departing from the scope of the present invention.

Mobile equipment and the subscriber identity module (SIM) card are the two components that provide the hardware for mobile communications at the user level. Mobile equipment may include any suitable mobile device capable of communication on a telecommunications network. There are a number of

mobile communication devices available for wireless or remote communications such as mobile telephones, pagers, personal digital assistants (PDAs), and laptop computers. Such mobile communications devices will be generally referred to herein as mobile equipment or mobile devices. Mobile equipment typically includes a rigid housing enclosing a printed circuit board, an associated microprocessor, electronic and electro acoustic components, and a portable power supply such as a battery. Mobile equipment may communicate through a variety of means, including antennas that transmit and receive radio frequency (RF) signals, infrared (IR) emitters and receivers, and cable connections to other input/output on computers or to other mobile equipment. The user interfaces with the circuitry and microprocessor of the mobile equipment through a keypad or touch pad located on the housing. Keys on the keypad are pressed by the user to temporarily close an internal switch and send a signal to the microprocessor of the mobile equipment where an appropriate routine processes the input and activates the mobile device. On mobile telephones, graphical elements, such as alphanumeric characters and icons, are located on or near the keys of the keypad to guide the user in interfacing with the mobile device. A display provides a read out of data input by the user, access to spatially navigated menu trees, graphical user interfaces (GUIs), windows and messaging.

A SIM is a microprocessor that was designed as a secure, tamper-resistant environment for the cryptographic engine and keys that mobile network operators use to authenticate individual subscribers to the network and to track those subscribers once they are 'on air'. The SIM has become a customisable, trusted, standardized and secure application platform. The current generation of SIM cards contain integrated silicon chips that extend the capability and capacity of the card, providing the user with access to card-enabled applications, as opposed to network-enabled applications.

On aspect of SIM card applications is a SIM Toolkit (STK), which is a standard set of program tools stored on the chip within a SIM card. These tools, combined with an application dependant code can be used to run applications remotely and on the phone.

The STK extends the role of the SIM card, making it a key interface between the mobile equipment and the network. Using the STK, the SIM card

can be programmed to carry out variety of functions. These functions include the ability to manipulate the menu structure of the mobile terminal to provide new applications and functionality. It is possible to load on a SIM card an application that defines a menu, a data-input interface and a data format for communicating with a service provider using SMS, USSD, GPRS, WCDMA, MMS, establish a voice call, and other telecommunications transport protocols. Using a SIM application and without typing in sophisticated data or commands, a customer may select a desired service through the menu and input data through the data input interface. The application organizes the data into a fixed format in order to send that data to a mobile network operator over a telecommunications network.

Referring now to figure 1, a block diagram of a mobile workspace architecture, in accordance with an embodiment of the present invention, is shown. One embodiment of the present invention provides a shared workspace for mobile collaboration using an n-tiered system architecture. A mobile SIM application 102 is coupled, via a short message service centre (SMSC) 104 and an SMS gateway 106 to a mobile workspace server 116 as specified by the user at the start of a session. The mobile workspace server 116 manages a user's collaborative sessions, which in turn can interact with multiple remote application servers over a plurality of gateways and servers, including a WEB gateway 110 coupled to a Web browser 111, a WAP gateway 112 coupled to a WAP browser 113, a SMTP server 108 corresponding with an email client 114 and a web services layer 117 coupled to a messenger client 118. This creates a system that can coordinate and manage the collaboration between the user and the various connected user communities.

While the illustrated embodiment includes a SIM client, embodiments of the present invention can be expanded to include clients using different technologies used in the implementation and different communication protocols.

The mobile workspace server 116 can also be the source of more than one workspace. In one embodiment, a workspace client only operates in one workspace at one time although a user can be a member of more than one workspace concurrently.

Each user's interaction with the system is managed through a session. Each user has a session with the mobile workspace server 116. Each session is

identified by the user's mobile number, or mobile station international subscriber digital number (MSISDN), and by other proprietary variables associated with the user. These variables can include, for example, the user's identification information such as a user name and/or password. When a user sends a request from the mobile device an automatic sender ID request is included, and before the request is actioned it must be authenticated by the mobile workspace server 116. Authentication may be done by matching the sender ID against the mobile workspace user's MSISDN. After successful authentication, the mobile workspace server 116 actions the request.

Figure 2 is a component view block diagram of the mobile workspace architecture in accordance with an embodiment of the present invention.

The mobile workspace 200 includes a detailed view of the SIM application 202 and the mobile workspace application 204. The SIM application 202 is a modular software system developed for the SIM application toolkit. The SIM application 202 may communicate with the application server using SMS messages. The SIM application 202 uses the STK to formulate a request depending upon the user interaction with the SIM application's user interface. According to one embodiment, an SMS message coming from the SIM application includes a four part structure including a command, a request, a sender ID and destination number.

The SIM application includes a plurality of functional components including a user interface (UI) handler 206, an activities handler 208, an outgoing message handler 210, and an incoming message handler 212. The mobile equipment triggers the UI handler when a user interface event, such as a button click, occurs in the SIM application. The UI handler 206 then passes this event onto the activities handler with details of the action that was requested and any information entered by the user into the UI.

The activities handler 208 forms the business processing element of the SIM application. For every UI event generated, a corresponding business process is triggered. The activities handler 208 formulates a command to be passed to the mobile workspace application containing the relevant parameters and information about the requesting user. In one embodiment, a command encapsulates a request as an object, thereby allowing the system to

parameterise the client with different requests, queue or log requests, and support undoable operations.

The outgoing message handler 210 performs the sending of messages from the SIM application to the application server. It takes the request and marshals it into the correct format to be sent to the application server.

The mobile equipment calls the incoming message handler 212 whenever a message is received for the SIM application 202 from the mobile workspace application.

The mobile workspace application is the repository of the workspace. The mobile workspace application is responsible for processing commands, affecting any changes to the workspace and then distributing those changes to any members of the workspace.

The application server can distribute changes to workspace members using any of the channels that the application server has available to it. To enable a new communication protocol all that is necessary is to activate a new channel component for the protocol and specify it as part of the application configuration. Then, information will be distributed using the new channel based on the workspace member's preferences.

On receipt of an SMS message, the application 204 will unpack the command and identify which activity should be used to process the request. The command will then be forwarded onto the correct activity. For example, if the command was to fetch active tasks then application server will send a request to the workspace application database and will get the result returned. This result in turn gets translated into the meaningful binary packet format and is returned to the SIM application client 202. The results of any request will be supplied as the return to the request, the results will then be returned to the SIM application, due to the nature of message, as soon as it arrives on the mobile equipment it will be passed transparently to the SIM application. Once the SIM application receives the message it will then unpack it, read its ID and direct it to the corresponding activity.

The mobile workspace service application 204 is made up of a number of different components, all performing specific tasks that enable the effective management of the mobile workspace. In one embodiment, the service application 204 includes a command façade 214, an authenticator 216, a

workspace manager 218, a commander 220, an execution chain builder 222, an activities handler 224, a UI handler 226, an entities handler 228, delegates 230, a WAP channel 232, a SIM channel 234, an email channel 236, communication services 238 including a WAP service 240, an SMTP service 242, a Web services service 244, and an SIM service 246.

In one embodiment, the command façade 214 is the entry point for all calls into the mobile workspace application 204. A façade pattern may provide a unified interface to a set of interfaces in a subsystem. The authenticator 216 is a component called after the command façade 214. The authenticator 206 performs the entire authentication needed for the command requested. It also asserts whether the provided security principal has the permission to execute the requested command. The workspace manager 218 is called after the authenticator 216. It is responsible for adding any pertinent workspace information into the command that is being created. This will add information about the workspace that client is part of. It will also ensure that any changes to the workspace state are identified to be distributed to the other members of the shared workspace. For example, a user can create a workspace or join an existing one. Also included is a protocol for inviting and being invited to existing workspaces. Depending on their membership of a given workspace, other 'activities' are common and shared by other sessions, for example, a project. The agent manages the collaboration by addressing and sharing variables with corresponding sessions, establishing the collaboration environment.

The commander 220 is responsible for coordinating all the business processing that is part of a request. The basic process of the commander is to invoke the execution chain builder 222 and then execute the resulting execution chain. An execution chain is a list of processes that have to be executed to satisfy a request. The execution chain builder 222 builds a chain made of handlers, delegates 230, and channels to be used in the execution of a task.

The activities handler 224 is responsible for handling all the processing related to a workspace, including changes to workspaces and information from the workspace. The UI handler 226 is responsible for creating meta-information to describe dynamic UIs that are used by the mobile workspace clients. The UI handler 226 is responsible for dynamically generating an SMPP packet that controls the user interface on the SIM application. The entities handler 228 is

responsible for providing a mechanism of taking all the information about a workspace and placing that information into a persistent data store such as a relational database system.

Delegates 230 is a collective term for components that contain specific logic about executing a task on the system such as, for example, sending a message. They are not specifically tied to a channel. Channels may be dynamically configured by the execution chain builder

The channels, including the WAP channel 232, STK channel 234, and email channel 236, represent how the application server communicates with its client applications. The illustrated embodiment includes channels for WAP, SIM and email. Channels provide a layer of abstraction between the application processes and the actual communication protocols. Any information that is tagged to be distributed to the workspace is sent out through the workspace client's communication channel.

The communication services 238 are the actual communication services. When a message is received by one of the communication services, the message is forwarded to the command façade 214 to be processed. The SIM service 246 handles the communication between the SIM application and the application server. This service creates a message from data stored on the server. the method then maps the message and associated delivery instructions onto a transfer protocol data unit (TPDU) at the transport layer of the message and pushes the message to the SIM application.

Internal services 248 provide service type functionality to the delegates without delegates making direct calls to these services. The services provide a layer of abstraction between the implementation of the service such as a specific database vendor by providing a generic and extensible interface to the services. The internal services 248 specifically provide access to the application database 250 and scheduling services 252. The application database is a persistent store for all application information. The scheduling service 252 provides a timer service which is used as the basis of all asynchronous events generated by the application.

Figure 3 is a block diagram of a mobile workspace framework system for use with an SIM application update process in accordance with an embodiment of the present invention. The framework system includes a network 302, an

application framework 304, a framework operator 306, and a business application layer 310. A framework application 312 resides in the SIM smart card and a framework management system 314 running on a server. In one embodiment, communication between the management system 314 and the framework application 312 is conducted via over the air (OTA) messaging to and from the mobile equipment or SIM Reader/Writer device connected directly to the workstation. The framework application 312 is loaded to the SIM card at the issuing of the card or using suitable OTA technology.

The behaviour and structure of the framework application 312 is to be configured and changed by the management system 314 via the communication channel to meet any specific business requirements. The framework application 312 makes configuration and changes possible by having an engine 316, which makes use of framework component libraries 318 based on the application configuration data 320. This allows the user interaction with the framework application 312 to be flexible and configurable. The component libraries 318 may include input dialog, menus, display message dialogs, sending OTA requests (SMS, multimedia message service (MMS), establishing a voice call, and unstructured service data (USSD)) and any other desired components. In one embodiment, the application configuration data 320 may reside in the EEPROM area of the SIM. The application configuration data 320 may include enable/disable application data, component configuration data, data on the sequencing of components, application specific data, and any other desired data.

The framework provides the ability to browse the application in both an on-line and off-line mode. In the on-line mode, changes to workspace that are made on other nodes are reflected in near real-time with all the other members of that workspace. In the off-line mode, a snapshot of the last known state of the workspace is provided, with the workspace repository holding the master copy of the workspace.

Once the framework application 312 is configured, the application 312 can communicate with a business application layer 310 via network interaction library components (such as sending SMS, USSD, MMS, or establishing a voice call) to deliver information and communication services. The application 312 is not required to communicate with the management system 314 during

operation. When there is any requirement for application updates from the business application layer 310, the framework application 312 can be reconfigured via push messaging without the need to reload the whole application to the SIM card.

The framework application 312 may be pre-loaded to the SIM smart card before the card is issued to the mobile user. The application 312 runs on the microprocessor of the SIM smart card and communicates with the host mobile equipment, the mobile network or SIM terminal via the APDU protocol. Three main components of the application are the engine 316, the component libraries 318 and the configuration data 320.

The framework engine 316 is the active part of the application 312, which reads/writes the configuration data and calls component libraries to interact with the mobile user and the mobile network. When the mobile user starts interacting with framework application 312 via the mobile equipment interface, the engine 316 reads the configuration data and initialises the application accordingly. For example, it can start with displaying a menu of a list of items to the user for selection or asking the user for input data. The engine 316 also manages the sequence of interactions with the mobile user based on the configuration data, including network interactions, sending wireless messages, initialising phone calls (parts of component libraries), and other interactions.

The framework engine 316 updates or changes the configuration data when there is a configuration message received from the management system 314 or SIM reader/writer 336. As part of managing configuration data, the engine 316 provides an interface to allow the mobile user to initialise a network request for updating the configuration data. When this happens, a wireless message with special formatted content is sent to the framework management system containing a request for configuration data updates.

The component libraries 318 include sets of routines, classes and methods that can be run on the SIM card's microprocessor to communicate and interact with the mobile network or mobile equipment and carry out a specific task. These component libraries 318 define the possible generic interactions by which any application implemented by the framework system can behave. The engine 318 is able to call any component of the libraries with arguments loaded from configuration data. The component interacts with mobile network or mobile

equipment based on the argument data. Interactions provided by the component libraries 318 include reading input data from mobile user (including text, number and Boolean (yes/no) types of input), displaying a menu (a list of items) for user selection, displaying sub menus and sub-sub menus, etc., attached to a menu for user selection, displaying an information message text, sending wireless SMS message or USSD request, initialising network calls, and any other desired interactions.

In one embodiment, the configuration data 320 is binary data stored in the static memory (for example EEPROM) of the SIM card. Based on file structure and memory availability, this data can be stored in special SIM files, elementary file (EF) format, or application memory so that it can be read/written and not be lost or reset when the SIM card is not powered or detached from the mobile equipment. The configuration data 320 may be uniquely structured to contain information about the sequence of the framework application 312 and an argument to be loaded when each of the components involved in the sequence is called.

The illustrated network 302 includes a short message service centre (SMSC) 322 coupled to a network 324 and a wireless network 326. In the illustrated embodiment, the wireless network is used for communication with mobile telephones using a radio tower 328, or cell tower, and over the air (OTA) transmissions with a mobile device 330. Other mobile telephone network structures and protocols may be used with embodiments of the present invention. The network 324 is coupled to a mobile workspace management server 332 over a network connection 334. A SIM reader/writer 336 may also be coupled to the mobile workspace management server 332 over a peripheral connection 338, such as a serial, USB, or other suitable connection. The mobile device 330 includes the SIM smart card 340, which includes the framework application 342.

The frame work operator 306 transmits application requirements 344 and management instructions 346 to the management system 314. The management instructions 346 are used to manage the framework application.

The management system 314 includes process steps for the construction of configuration data 348. For the construction of the configuration data 348, input is received from an update request 350, design of the framework

application 352, an external management interface 354, and a configuration database 356. Updates of the configuration database 356 from the external management interface 354 may be made on a periodic basis. A deployment of the configuration data 358 is made to transmit the configuration data, or update, to the framework application 312.

Referring now to figure 4, a block diagram of a network for use with the mobile collaboration system, in accordance with an embodiment of the present invention, is shown. The illustrated network 400 includes a SIM smart card 402 in operable communication with a remote application 410 over a wireless network 404 or a card terminal 406 and one or more data interfaces 408. An embedded application 412 is included in the smart card 402. The embedded application is a program installed in the smart card memory and runs on the smart card's microcomputer. The embedded application 412 talks with the external host via the smart card's electrical interface over the application protocol data unit (APDU) protocol packets. The external host may be either the mobile equipment that the smart card resides in or the card terminal 406.

The remote application 410 is a computer program that runs on any remote computing device and communicates with the embedded application 412 via the wireless network interface 404 with the mobile equipment or a peripheral connection with the card terminal 406. The remote application 410 may be used to send a large amount of data to the embedded application 412 over a communication channel. However, any amount of data may be sent. The nature of the communication channel of the wireless network 404 or card terminal 406 allows the data received from the embedded application 412 to be in packets. The amount of data that can be encapsulated in each packet may be limited. For example, in the case of a wireless channel, the data encapsulated in a packet is limited by the size of the wireless message transmitted to the mobile equipment. For the card terminal interface, the data packet size is limited by the APDU protocol packet size.

Figure 5 is a process diagram of a data concatenation process in accordance with an embodiment of the present invention. Data concatenation for smart card applications provides a method for smart card applications to receive a large quantity of byte data, which is larger than the data that can be

encapsulated in a single packet, via the smart card interface with the host. The host may be the mobile equipment or the card terminal.

Data 500 is of a certain size is transmitted over a data transportation layer 503, such as the wireless network, the card terminal, or other data communications medium, from the remote application 410. If the data 500 is larger than the size limit of the communications channel, before the data 500 is transmitted, it is split in to a plurality of segmented packets 504 to be sent to the embedded application 412. Each segmented packet 504 contains header bytes 506, which determine a concatenation identifier 508 of the segment packet 504, a sequence 510 of the packet and a total number 512 of segment packets as part of the original data 500.

When one of the segmented packets 504 is received by the embedded application 412 over the communication channel, the concatenation header 506 of the packet triggers the embedded application 412 to read the data bytes encapsulated in the packet 504. The packet 504 is then manipulated and stored in a temporary buffer 514 of the embedded application 412 so that it contains the size of the data encapsulated. The embedded application 412 keeps on appending the segment packets as they arrive. The segment packets 504 are not required to arrive at the embedded application 412 in any specific order or sequence. The temporary buffer 514 may also store additional information such as the header 504 and a length 522 of the data segment.

In the above method, the embedded application 412 stores a current count variable 516 and a total count variable 518 to keep track of the number of packets received and number of packets expected. When the current count reaches the number of packets expected, the embedded application 412 starts to reconstruct the temporary buffer 514 to reconstruct the original data 500.

The reconstruction of the data 500 is undertaken by reading through the temporary buffer to retrieve the segment data in order from 1 to n, where n is the total number of data packets, according to the packet order when the original data 500 is split at the remote application 410. Read data bytes are copied to an output buffer 520 in the original order. Accordingly, the original data 500 may be read by the embedded application 412.

The described embodiments of the present invention can be implemented as a series of commercial products and services including, for

example, the individual activity components, the software for enabling use of the system by individual mobile clients, the servers that synchronize and administer the system, as well as the communication services for effecting interactions between devices forming the system. It is to be understood that, because some of the constituent components and method steps depicted in the accompanying figures may be implemented in software, the actual connections between the system components (or the process steps) may differ depending on the manner in which the present invention is developed. Given the teachings of the present invention provided herein, one of ordinary skill in the art will readily be able to contemplate these and similar implementations and configurations of the present invention.

For clarity, certain words used in the description of the present invention are further explained in addition to the meanings regularly attached to the words. 'Activity' refers to what a user does with the system to interact with other users. An activity may be a task shared with other, remotely located users, such as, for example 'chat', 'messages', 'tasks', 'calendars' or other business applications. A 'workspace' may be a virtual space where people gather to participate in one or more activities, and where people share communications, documents or other things using tools. The workspace is persistently stored on a remote server with portions stored on mobile phones and other mobile computing devices. A workspace represents the logical unit of "membership" and access to activities. A workspace is an instantiation of one of more activities. A 'tool' may be a graphical user interface that implements the activities user interfaces. Tools are components utilized by workspace members.

Those skilled in the art will appreciate that the above-described system may be implemented in a variety of configurations. For example, specific communication protocols have been identified with reference to the illustrated telecommunications network. Other suitable communications lines and communication protocols may be used.

The previous description of the exemplary embodiments is provided to enable any person skilled in the art to make or use the present invention. While the invention has been described with respect to particular illustrated embodiments, various modifications to these embodiments will readily be

apparent to those skilled in the art, and the generic principles defined herein may be applied to other embodiments without departing from the spirit or scope of the invention. It is therefore desired that the present embodiments be considered in all respects as illustrative and not restrictive. Accordingly, the present invention is not intended to be limited to the embodiments described above but is to be accorded the widest scope consistent with the principles and novel features disclosed herein.

Claims:

1. A method for managing user sessions in a shared workspace, the method including:

providing a mobile workspace server coupled to a communications network, the mobile workspace server in operable communication with one or more users and a plurality of remote application servers;

receiving a user command from one of the users over the communications network, the user using a mobile device including a subscriber identity module (SIM);

processing the user command; and

conducting a user session between the user and one of the plurality of remote application servers.

2. A method according to claim 1, wherein the communications network includes a plurality of gateways, wherein each of the plurality of remote application servers is in communication with the mobile workspace server over one of the plurality of gateways.

3. A method according claim 1 or claim 2, wherein the user command includes a request to establish a session with the remote application server.

4. A method according to any one of claims 1 to 3, further including processing the user command using a command façade.

5. A method according to any one of claims 1 to 4, further including constructing a chain including at least one of handlers, delegates, and channels, wherein the chain is used in execution the user command.

6. A method according to any one of claims 1 to 5, wherein the mobile workspace server includes one or more data storage devices for storing mobile workspace data.

7. A method according to any one of claims 1 to 6, wherein the mobile workspace server includes a plurality of mobile workspaces.

8. A method according to any one of claims 1 to 7, wherein each of the one or more users includes access privileges, and wherein the mobile workspace server is configured to control user access to the mobile workspace server.

9. A mobile collaboration system for managing user sessions in a shared workspace, the system including:

a mobile workspace server coupled to a communications network;

a plurality of remote applications coupled to the mobile workspace server over the communications network;

one or more users in communication with the mobile workspace server; and

one or more sessions between the one or more users and the mobile workspace server, wherein each of the one or more users is configured to communicate with the plurality of remote applications using a user command, wherein the mobile workspace server receives the user command, processes the user command, and conducts the one or more sessions with one of the plurality of remote applications.

10. A system according to claim 9, wherein each of the one or more users is in communication with the mobile workspace server using a mobile device including a subscriber identity module (SIM).

11. A system according to claim 9 or claim 10, wherein each of the mobile device is in communication with the mobile workspace server over a mobile telecommunications network.

12. A system according to any one of claims 9 to 11, further including a plurality of gateways, wherein a remote application server is coupled to the mobile workspace server over one of the plurality of gateways.

13. A system according to any one of claims 9 to 12, wherein the user command includes a request to establish the session with the one of a plurality of remote application servers.

14. A system according to any one of claims 9 to 13, wherein the mobile workspace server includes a command façade for processing the user command.

15. A system according to any one of claims 9 to 14, wherein the mobile workspace server further includes an execution chain builder for constructing a chain including at least one of handlers, delegates, and channels, wherein the chain is used in execution the user command.

16. A system according to any one of claims 9 to 15, wherein the number of mobile workspace connections for each of the users remains constant.

17. A system according to any one of claims 9 to 16, wherein mobile workspace server includes one or more data storage devices for storing mobile workspace data.

18. A system according to any one of claims 9 to 17, wherein the mobile workspace server further includes a plurality of mobile workspaces.

19. A system according to any one of claims 9 to 18, wherein each of the one or more users includes access privileges, the mobile workspace server configured to control user access to the mobile workspace server.

20. A method for updating subscriber identity module (SIM) applications over a communications network, the method including:

providing a management system server in communication with a mobile device over the communications network, the management system server configured to facilitate communication between the mobile device and the management system server, wherein a management system is operable on the management system server and a framework application is operable on the mobile device, wherein the mobile device includes a subscriber identity module (SIM);

receiving an update request from the framework application, wherein the framework application uses a framework engine, one or more component libraries, and application configuration data to generate and transmit the update request to the management system; and

transmitting updates to the framework application over the communications network.

21. A method according to claim 20, wherein the framework application includes an on-line mode and an off-line mode, wherein in the on-line mode changes are reflected in real-time.

22. A method according to either claim 20 or claim 21, further including receiving management instructions or application requirements from a framework operator.

23. A application framework system for updating subscriber identity module (SIM) applications over a communications network, the system including:

a mobile device including a subscriber identity module (SIM);

a management system server in communication with the mobile device over the communications network; and

an application framework for facilitating communication between the mobile device and the management system server, the application framework including:

a management system operating on the management system server, wherein the management system receives update requests and transmits updates; and

a framework application operationally stored on the mobile device, the framework application including a framework engine, one or more component libraries, and application configuration data, wherein the framework engine transmits the update requests to the management system and receives the updates from the management system.

24. A system according to claim 23, wherein the framework application includes an on-line mode and an off-line mode, wherein in the on-line mode changes are reflected in real-time.

25. A system according to either claim 23 or claim 24, wherein the management system receives management instructions or application requirements from a framework operator.

26. A system according to any one of claims 23 to 25, further including a business application layer, the business application layer in communication with the framework application.

27. A method for transmitting data over a communications network using a short message service (SMS) system and data concatenation, the method including:

generating data for transmission;

splitting the data into a plurality of segmented data packets, each of the data packets including header information;

transmitting the plurality of segmented data packets over the communications network;

storing the plurality of segmented data packets in a temporary buffer;

restoring the data by reordering the plurality of data packets using the header information; and

providing the restored data to an output buffer.

28. A method according to claim 27, wherein the header information includes a packet identifier, a packet sequence identifier, a total packet count, and a length of the data packet.

29. A method according to either claim 27 or claim 28, further including:

monitoring a current count of data packets received over the communications network; and

restoring the data when the current count equals the total packet count.

30. A method according to any one of claims 27 to 29, wherein communications network includes a mobile telephone network.

31. A method according to any one of claims 27 to 30, wherein the data is transmitted from a remote application to a mobile telephone, and wherein the data is split at the remote application and the plurality of data packets are transmitted over the mobile telephone network and restored at the mobile telephone application.

32. A method according to any one of claims 27 to 31, wherein the data has a size that exceeds the size capacity of a single packet of a communications network channel.

33. A method of managing user sessions in a shared workspace substantially as herein described with reference to the accompanying drawings.

34. A mobile collaboration system for managing user sessions in a shared workspace substantially as herein described with reference to the accompanying drawings.

35. A method for updating subscriber identity module (SIM) applications over a communications network substantially as herein described with reference to the accompanying drawings.

36. A application framework system for updating subscriber identity module (SIM) applications over a communications network substantially as herein described with reference to the accompanying drawings.

37. A method for transmitting data over a communications network using a short message service (SMS) system and data concatenation substantially as herein described with reference to the accompanying drawings.

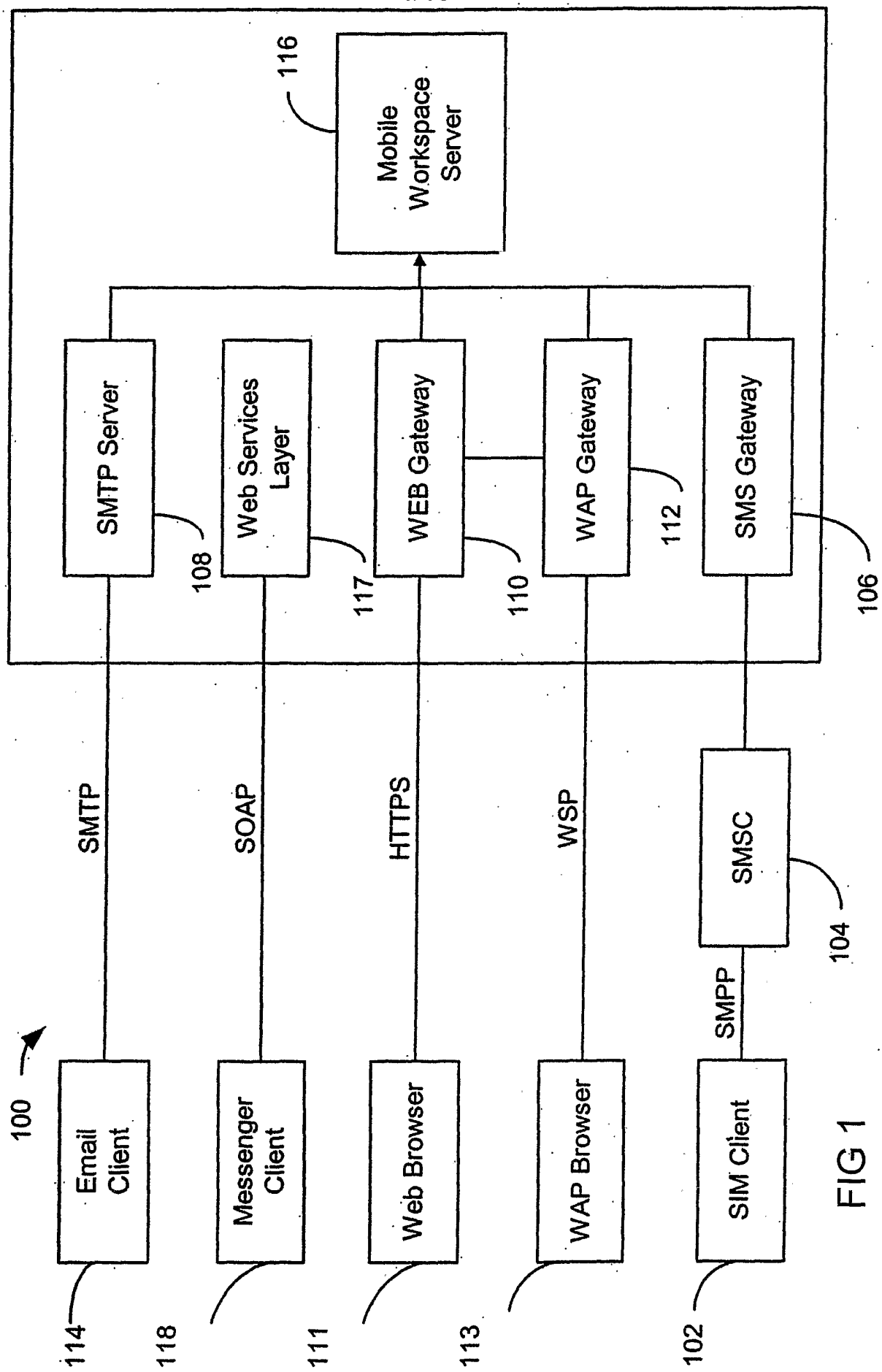
Mobile Workspace Server
116
SMTP Server
Web Services Layer
WEB Gateway
WAP Gateway
SMS Gateway
108
117
110
112
106
SMTP
SOAP
HTTPS
WSP
SMSC
104
SMPP
100
Email Client
Messenger Client
Web Browser
WAP Browser
SIM Client
114
118
111
113
102

FIG 1

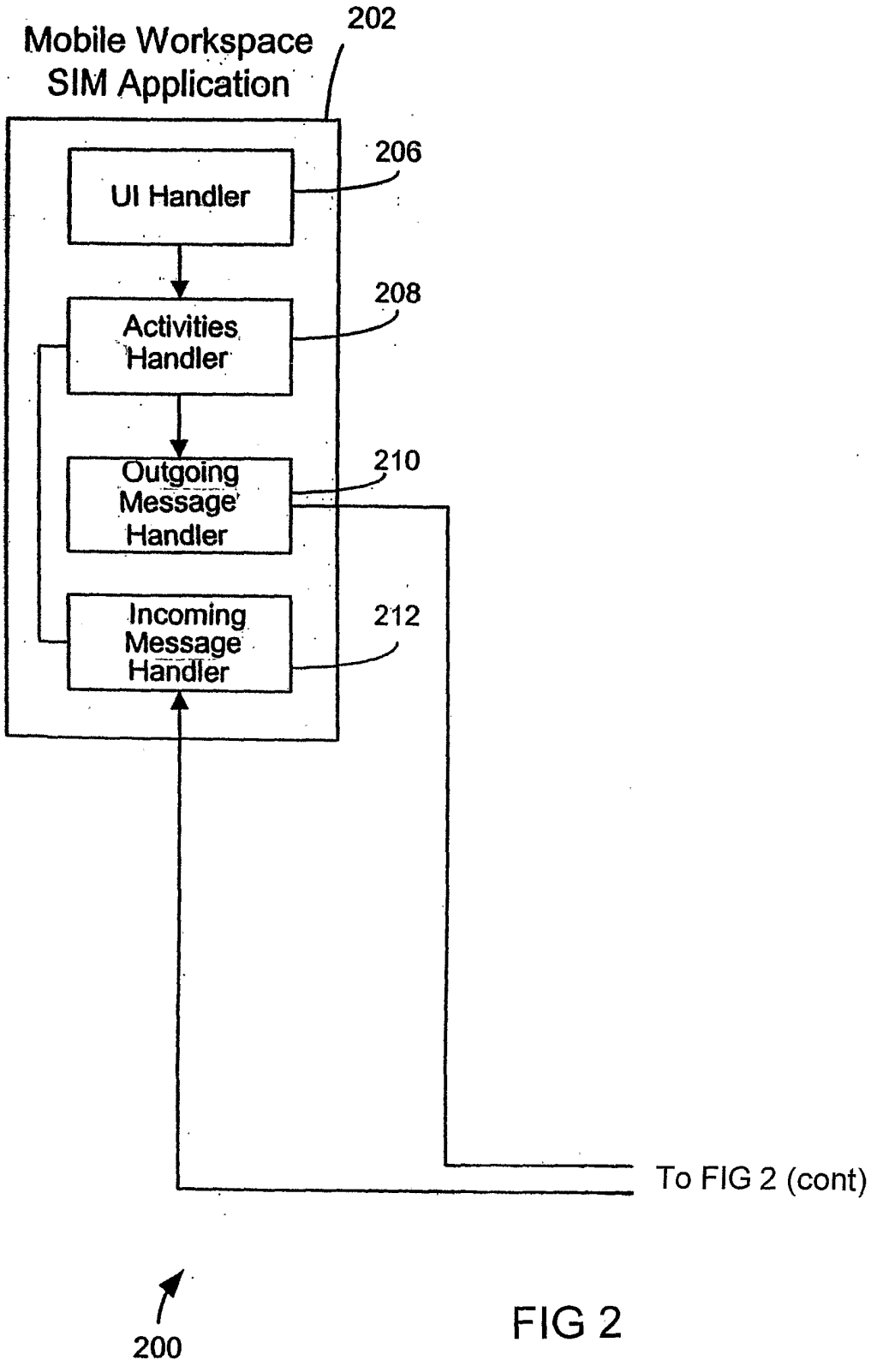
Mobile Workspace
SIM Application
202
206
UI Handler
208
Activities
Handler
210
Outgoing
Message
Handler
212
Incoming
Message
Handler
To FIG 2 (cont)
200

FIG 2

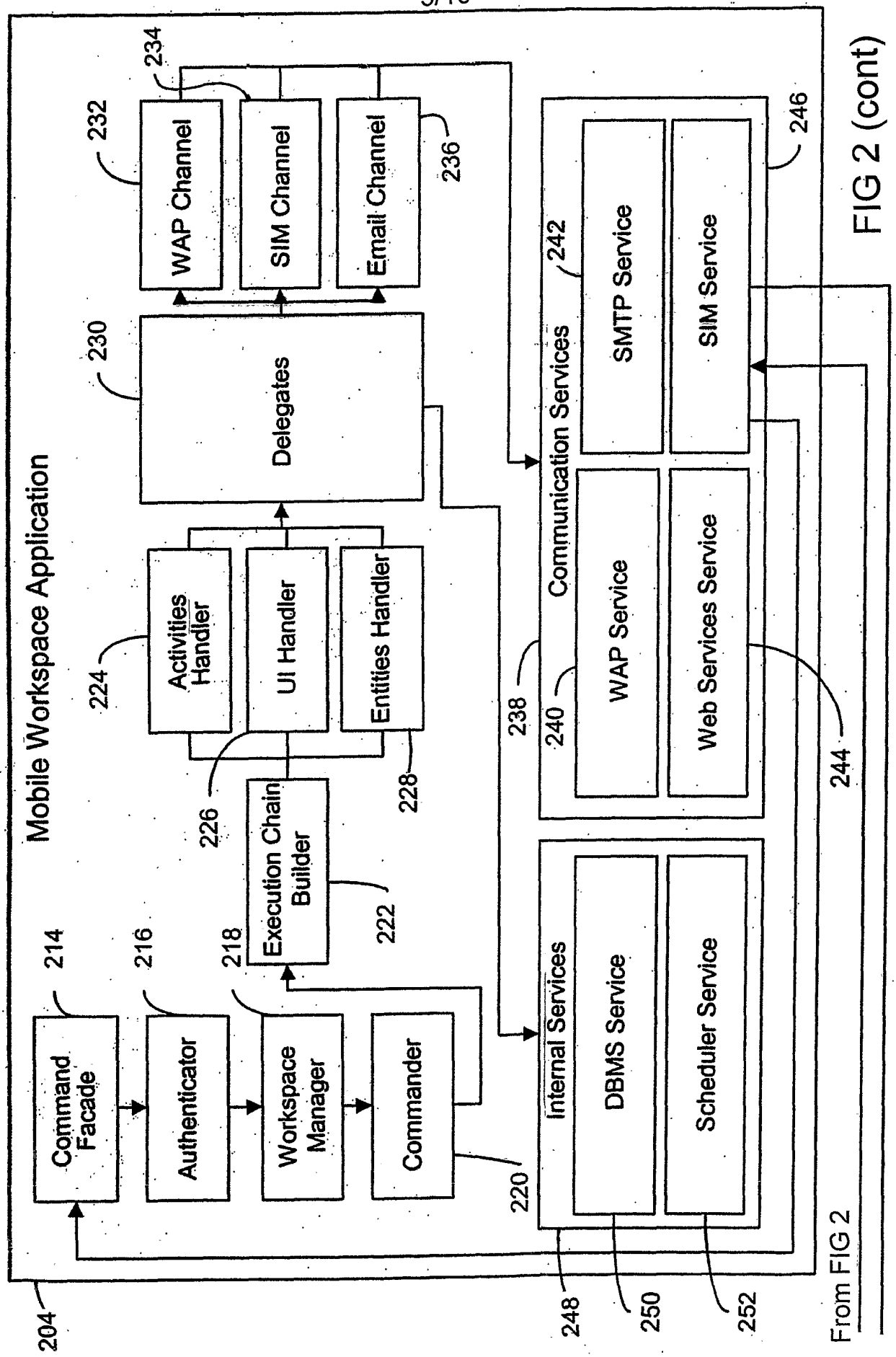
Mobile Workspace Application
204
Command Facade
214
Authenticator
216
Workspace Manager
218
Commander
220
Execution Chain Builder
222
Activities Handler
224
UI Handler
226
Entities Handler
228
Delegates
230
WAP Channel
232
SIM Channel
234
Email Channel
236
Communication Services
238
WAP Service
240
SMTP Service
242
SIM Service
244
Web Services Service
246
Internal Services
248
DBMS Service
250
Scheduler Service
252
From FIG 2

FIG 2 (cont)

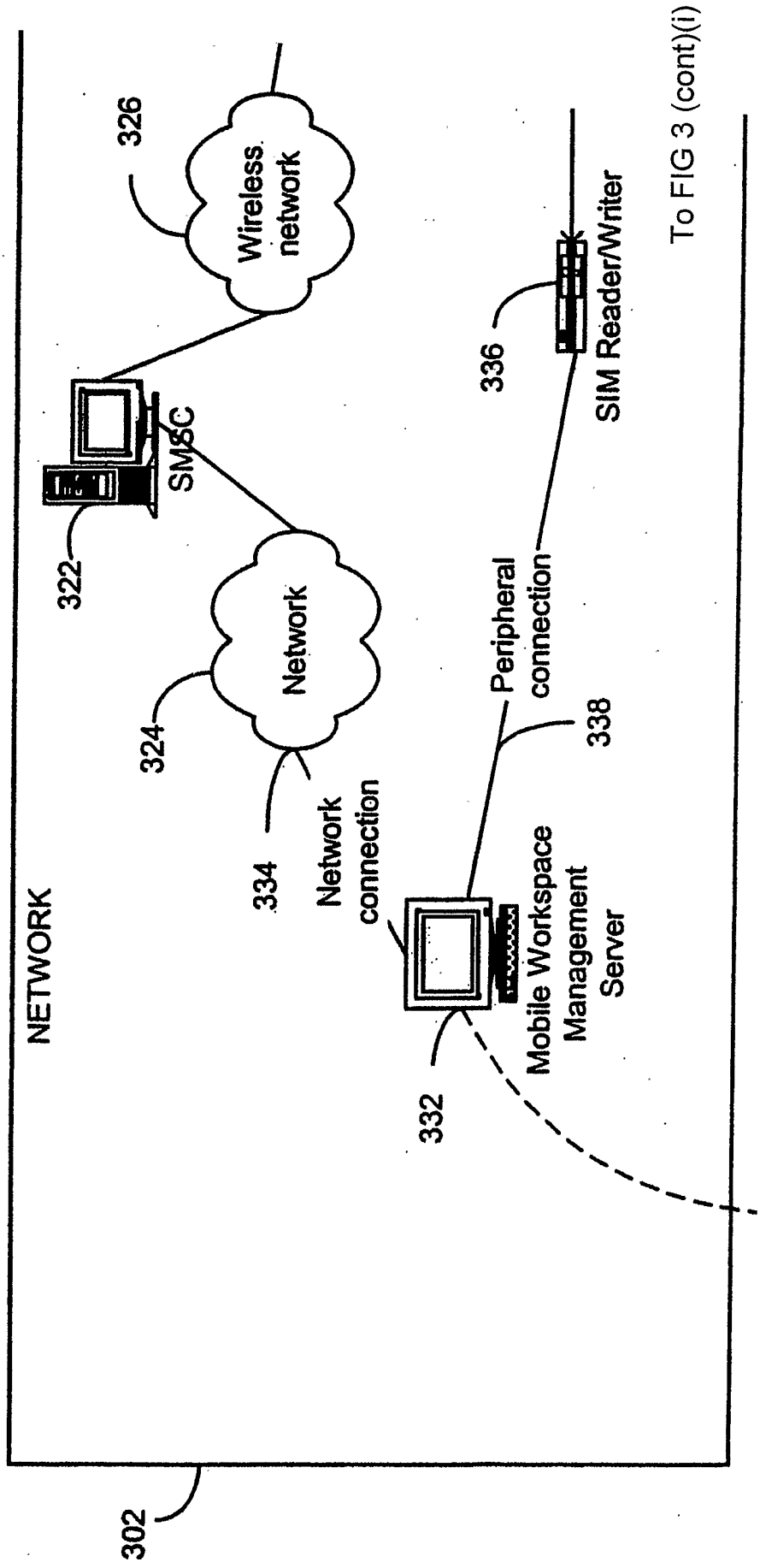
NETWORK
302
326
Wireless network
322
SMSC
324
Network
334
Network connection
332
Mobile Workspace Management Server
Peripheral connection
338
336
SIM Reader/Writer
To FIG 3 (cont)(i)
To FIG 3 (cont)(ii)

FIG 3

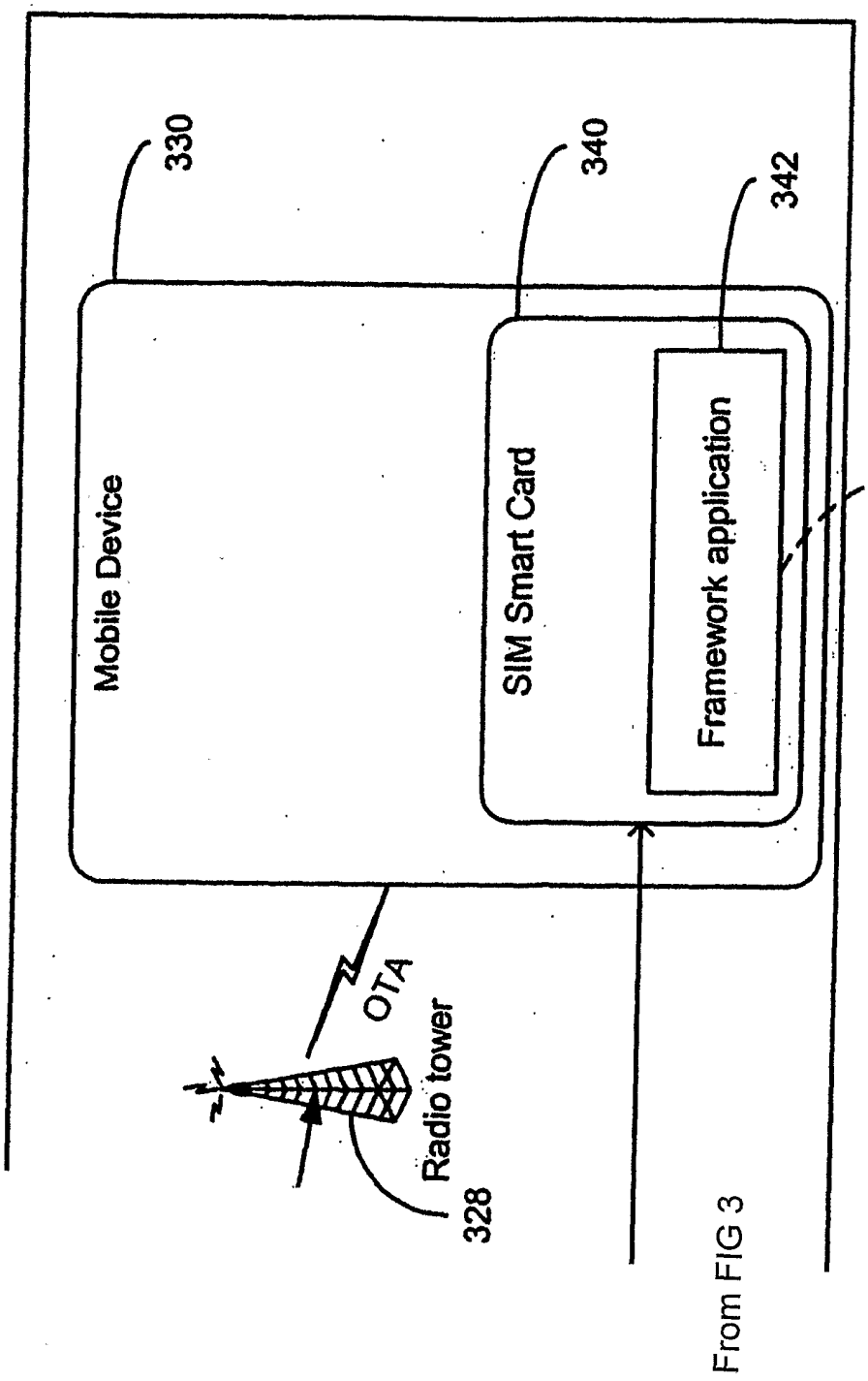
330
340
342
Mobile Device
SIM Smart Card
Framework application
To FIG 3 (cont)(iii)
OTA
Radio tower
328
From FIG 3

FIG 3 (cont)(i)

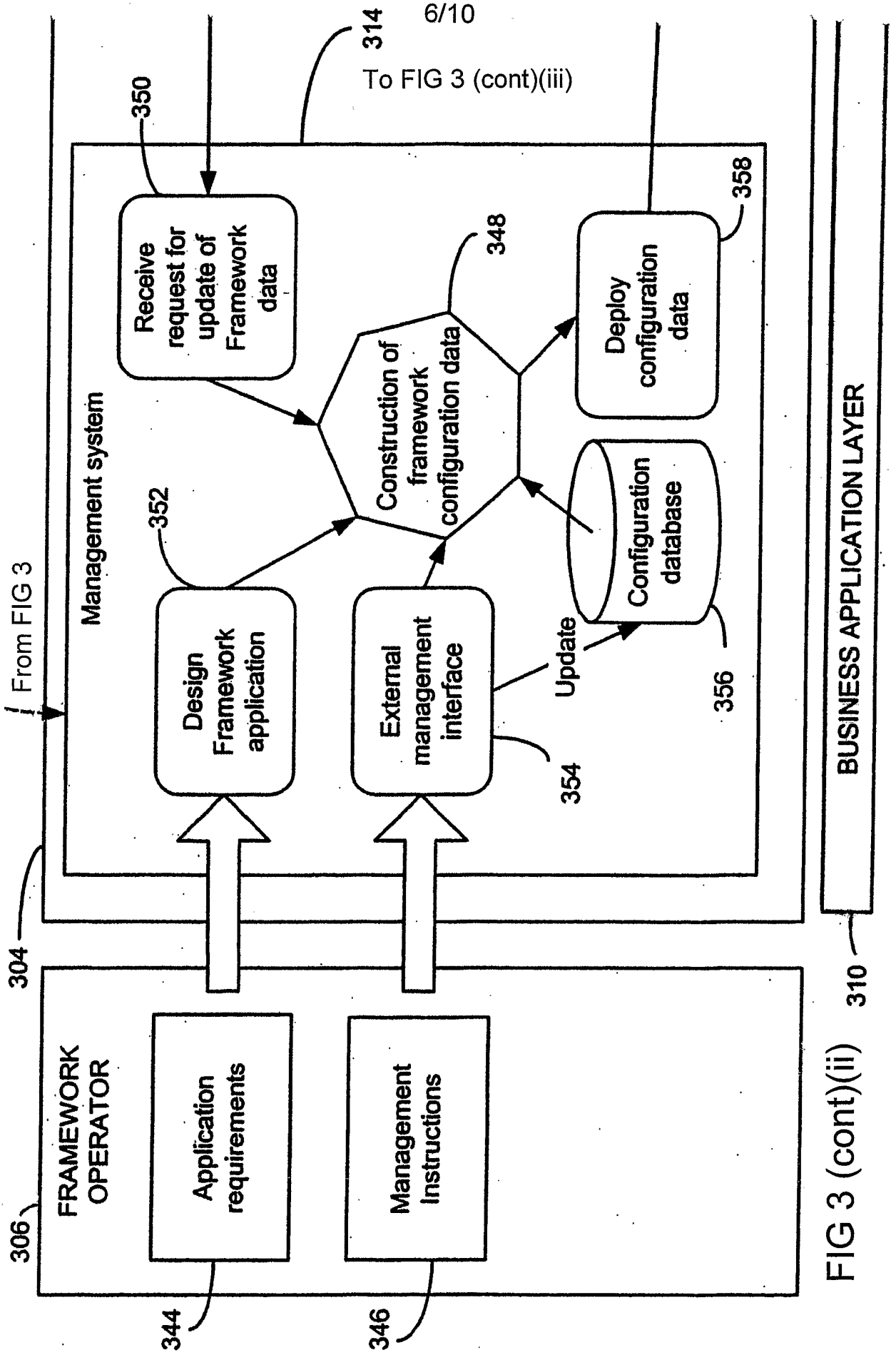
314
To FIG 3 (cont)(iii)
350
Receive request for update of Framework data
348
Construction of framework configuration data
358
Deploy configuration data
Management system
352
Design Framework application
External management interface
Update
Configuration database
356
354
From FIG 3
304
306
FRAMEWORK OPERATOR
Application requirements
Management Instructions
344
346
BUSINESS APPLICATION LAYER
310

FIG 3 (cont)(ii)

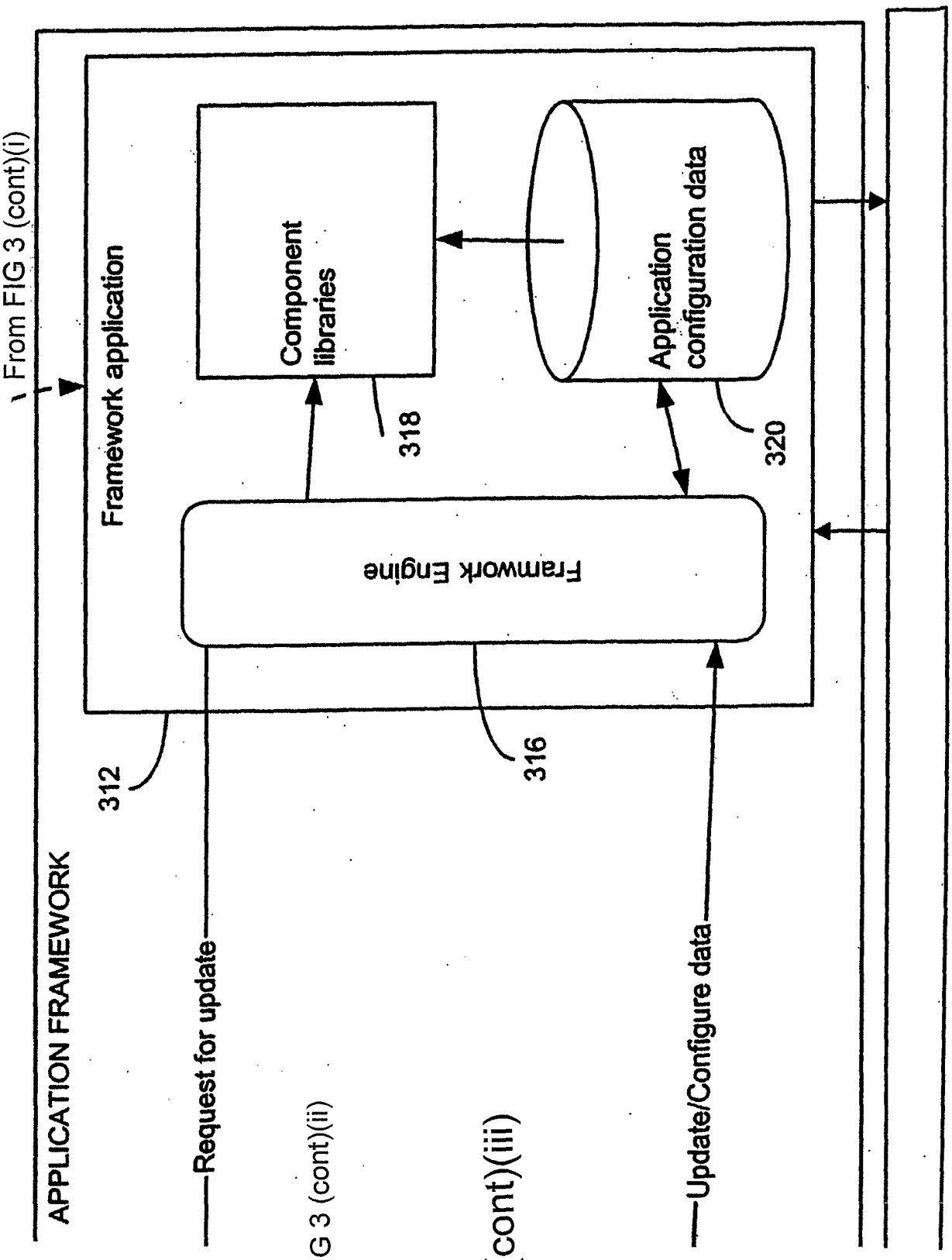

FIG 3 (cont)(iii)

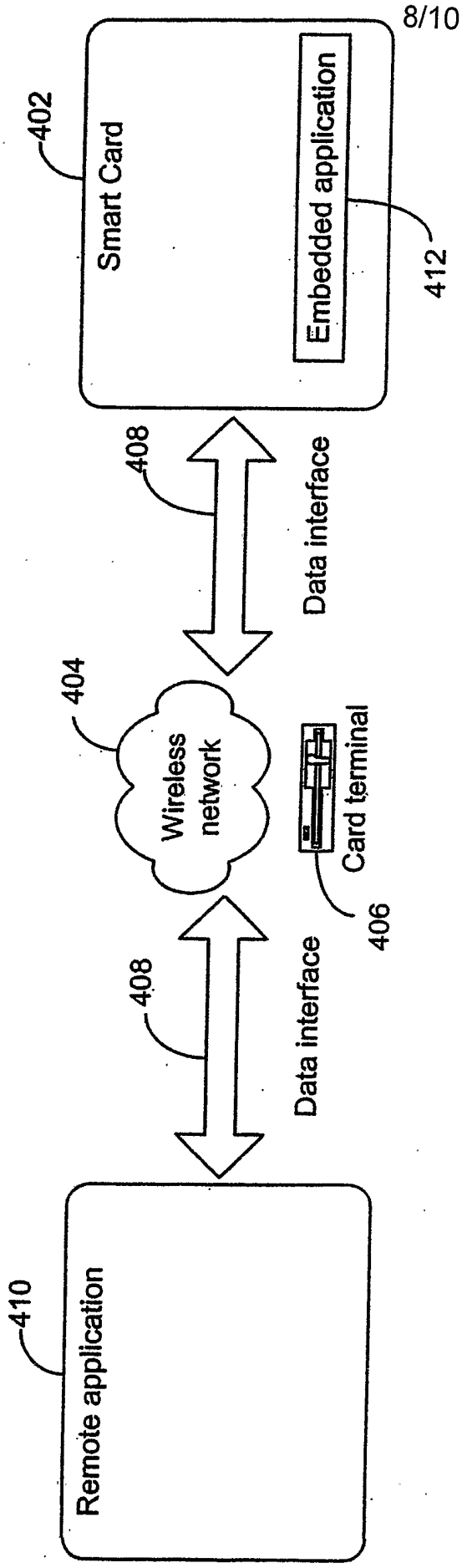
Smart Card
402
Embedded application
412
408
Data interface
404
Wireless network
Card terminal
406
408
Data interface
Remote application
410
400

FIG 4

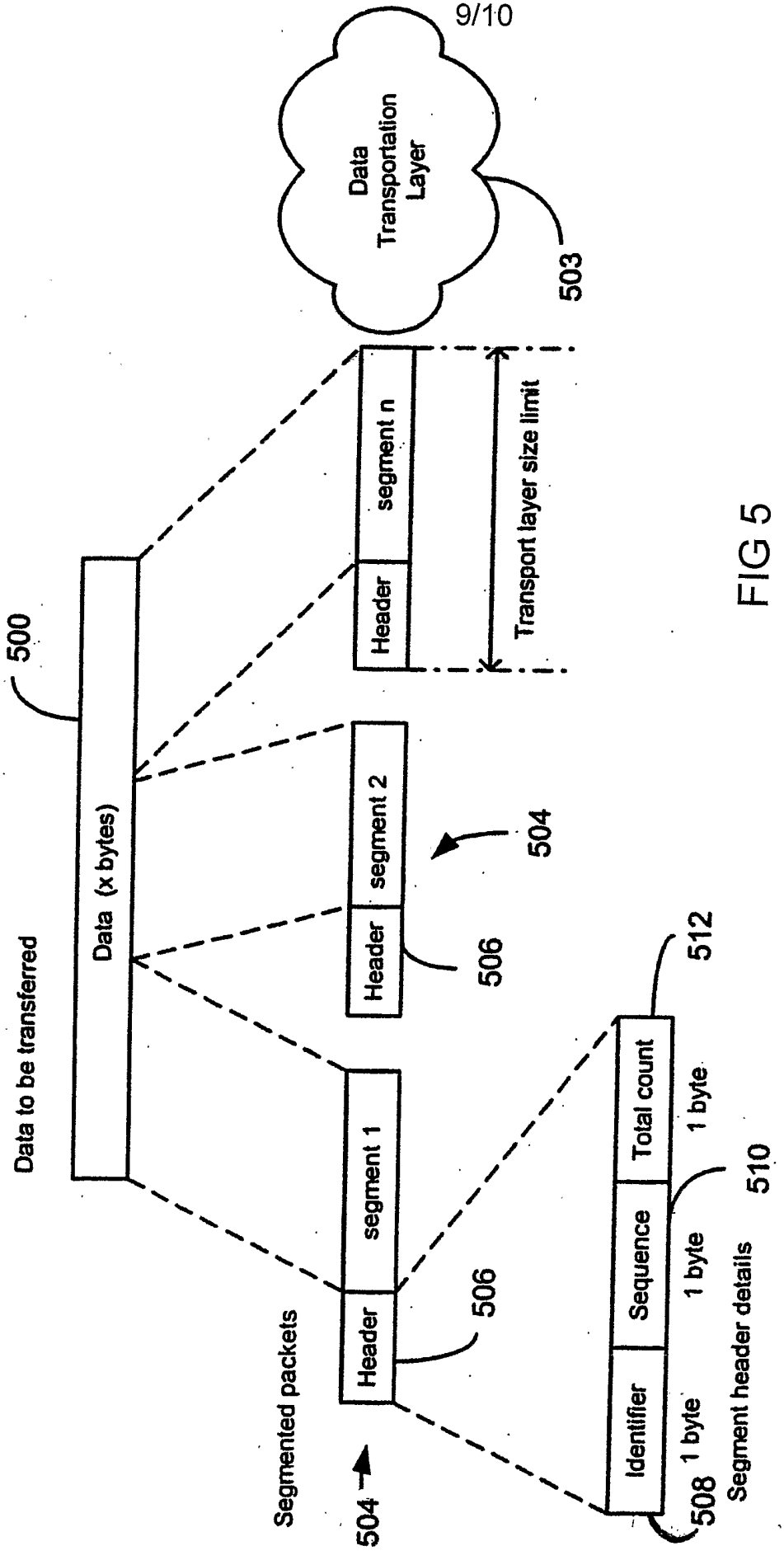
Data Transportation Layer
503
Transport layer size limit
Header
segment n
500
Data (x bytes)
Data to be transferred
Header
segment 2
504
506
512
Total count
1 byte
Sequence
1 byte
510
Segment header details
Identifier
1 byte
508
Header
segment 1
506
Segmented packets
504

FIG 5

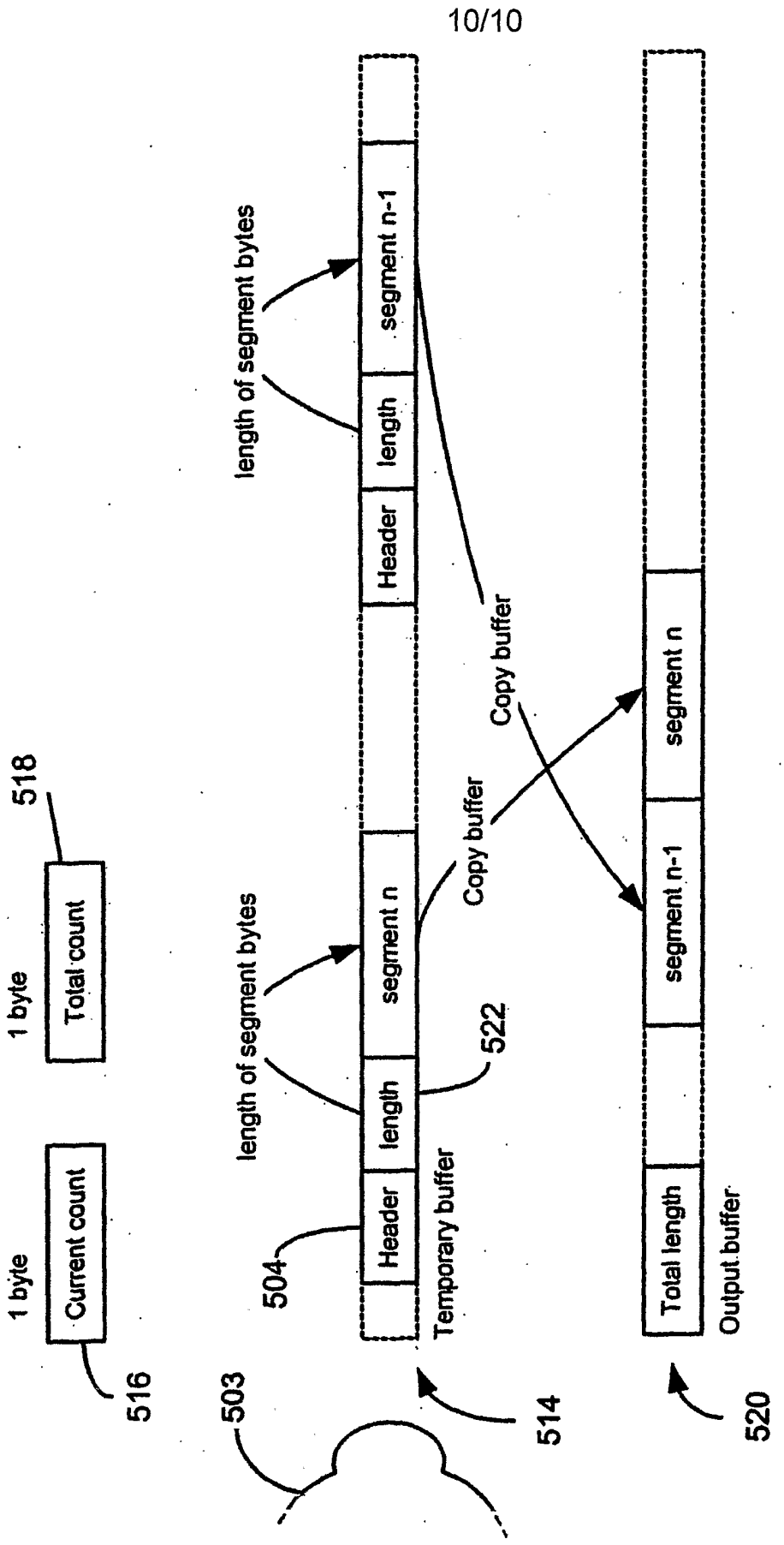
1 byte
Current count
516
1 byte
Total count
518
503
length of segment bytes
Header
length
segment n
504
length of segment bytes
Header
length
segment n-1
Temporary buffer
514
522
Copy buffer
Copy buffer
Total length
segment n-1
segment n
Output buffer
520

FIG 5 (cont)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2004/001455

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. [7]: H04Q 7/32, H04L 29/06

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Espacenet, WPAT: mobile, wireless, cellular, server, gateway, command, SIM, data, packet, buffer, and similar terms

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2001/063375 A2 (ADAMTECH LTD) 30 August 2001 whole document	1-26, 33-36
Y	WO 2003/046719 A2 (SCHLUMBERGER SYSTEMES) 5 June 2003 whole document	1-26, 33-36
Y	WO 2002/019664 A2 (MOTOROLA, INC) 7 March 2002 whole document	1-26, 33-36
Y	WO 2002/059752 A1 (COETZEE PIETER C) 1 August 2002 whole document	1-26, 33-36

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:

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

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 December 2004	7 JAN 2005
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized officer **Mani Ramachandran** Telephone No : (02) 6283 2233

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2004/001455

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 1331559 A2 (VODAFONE GROUP PLC) 30 July 2003 whole document	1-26, 33-36
Y	US 20030039250 A1 (NICHOLS et al) 27 February 2003 whole document	27-32, 37
Y	WO 2001/041391 A2 (KONINKLIJKE PHILIPS ELECTRONICS N.V.) 7 June 2001 whole document	27-32, 37
A	FR 2819131 A1 (BULL CP8 S. A.) 5 July 2002 whole document	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2004/001455

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. Claims 1-26, 33-36 relate to a method and system of managing user sessions in a shared workspace comprising a mobile workspace server coupled to a communications network and to other remote servers, receiving a user command from a mobile device including a SIM, processing the user command and conducting a user session between the user and the plurality of servers , comprise a first "special technical feature"..

2. Claim 27-32, 37 relate to a method of transmitting data over a communications network using SMS and data concatenation, wherein the data is split into segmented packets, stored in a temporary buffer and restored by reordering the packets using information contained in the header of the packets, and providing the restored data to an output buffer, and comprise a second "special technical feature".

Since the abovementioned groups of claims do not share either of the technical features identified, a "technical relationship" between the inventions, as defined in PCT rule 13.2 does not exist. Accordingly the international application does not relate to one invention or to a single inventive concept.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/AU2004/001455

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
WO	2001/063375	AU	32189/01	EP	1221081	IL	134741
		US	2002181710				
WO	2003/046719	CN	1348298	EP	1449392		
WO	2002/019664	AU	88348/01	US	6466804		
WO	2002/059752	NONE					
EP	1331559	EP	2198198				
US	20030039250	NONE					
WO	2001/041391	EP	1180291				
FR	2819131	WO	2002/054804				

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX