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(54) **CONDUCTING A PAYMENT USING A SECURE ELEMENT AND SMS**

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(52) **U.S. Cl.** ..... **455/466**; 455/41.2; 455/566; 235/380; 340/10.5; 705/44

(58) **Field of Classification Search** ..... 455/552.1, 455/41.1-41.2, 466, 566; 340/10.1-10.5, 340/5.4-5.42, 572.1-572.8; 705/44; 235/380-382.5  
See application file for complete search history.

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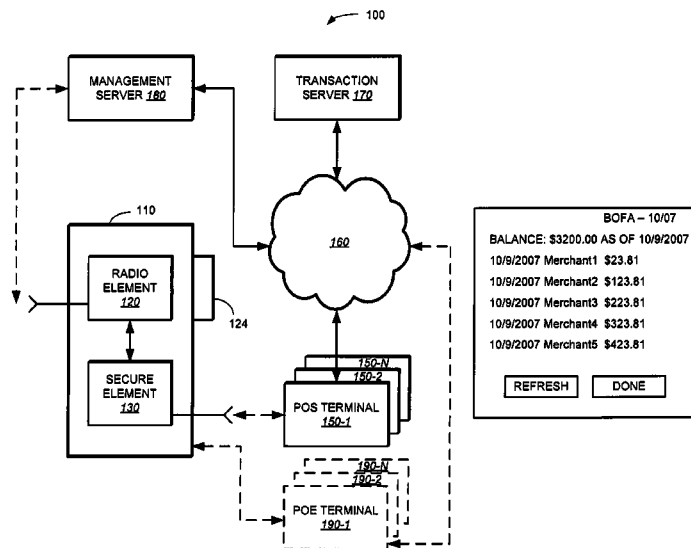
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(57) **ABSTRACT**

A method for transmitting data between a wireless communication and a remote server. The method includes running a mobile application on the wireless communication device, in which the mobile application is a rich client application. The method further includes transmitting data associated with the mobile application between the wireless communication device and the remote server using short message service (SMS). The mobile application links corresponding data transmitted through the short message service (SMS) for use by the mobile application.

**28 Claims, 10 Drawing Sheets**



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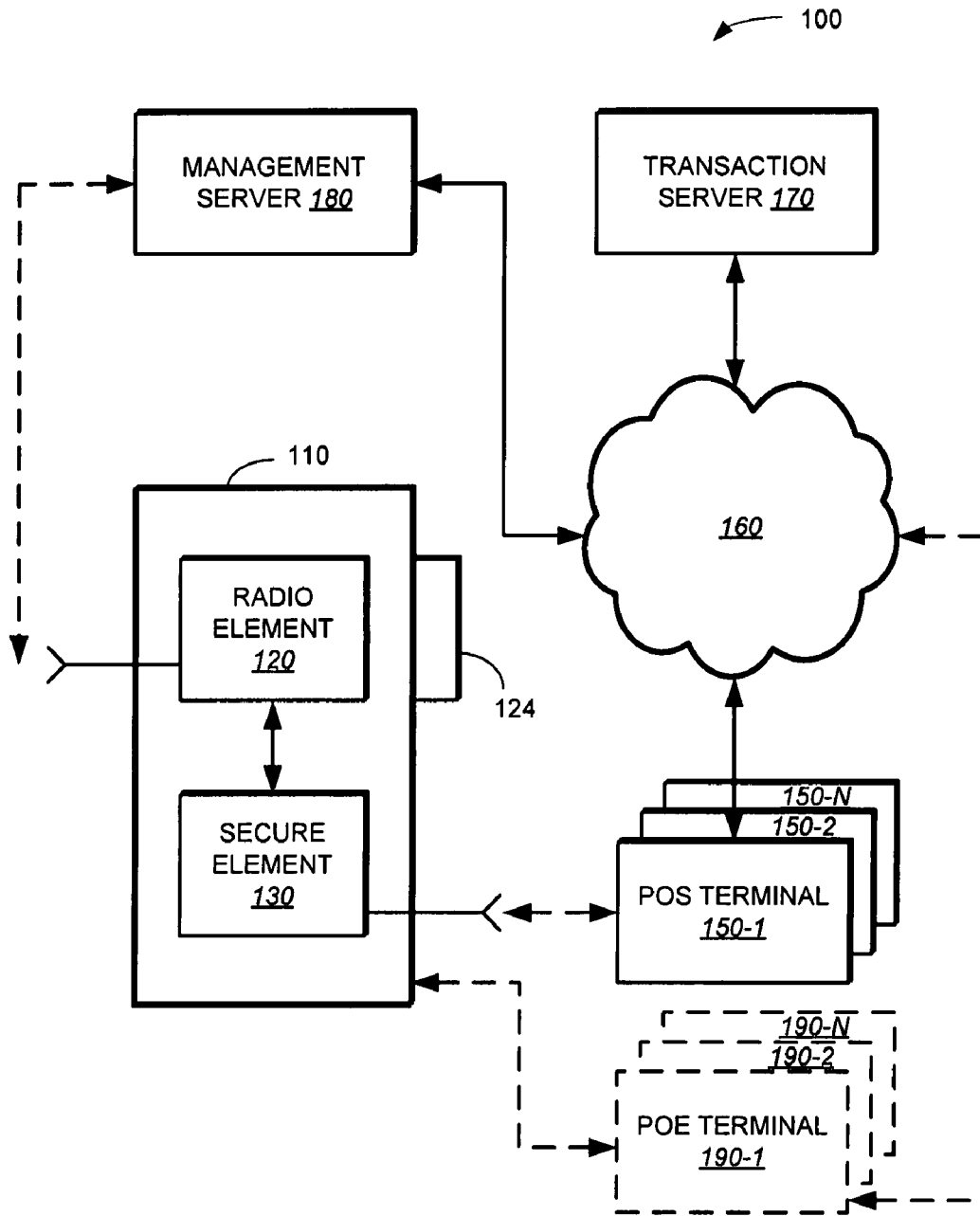


FIG. 1

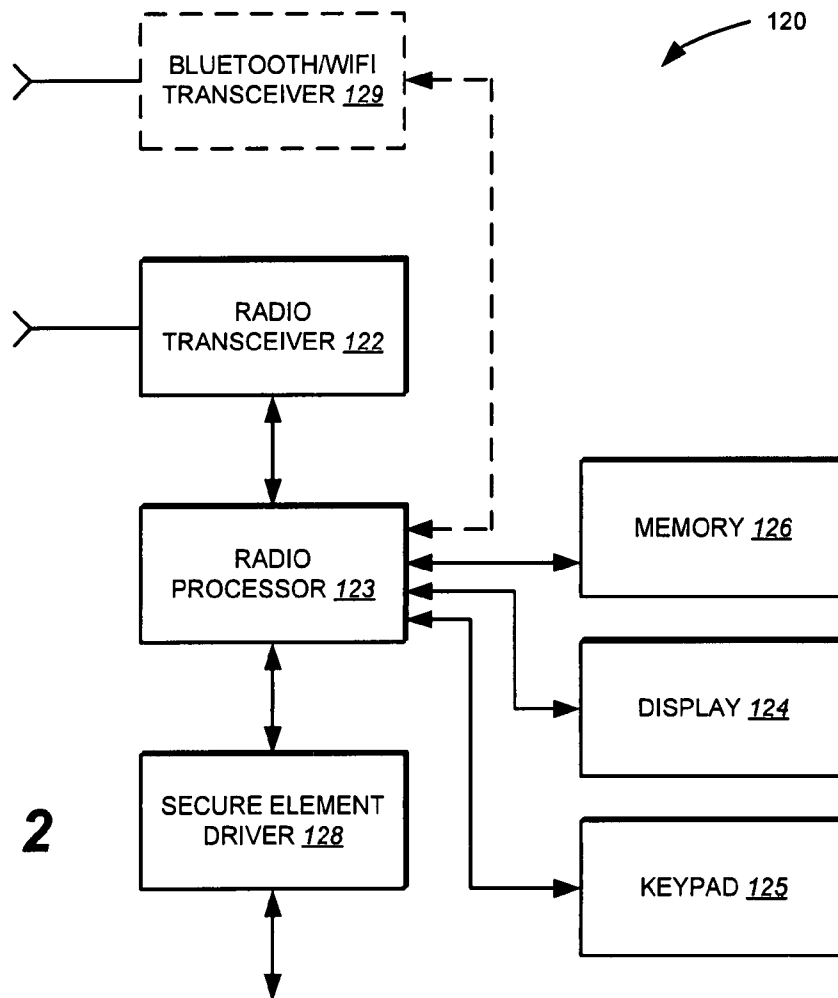


FIG. 2

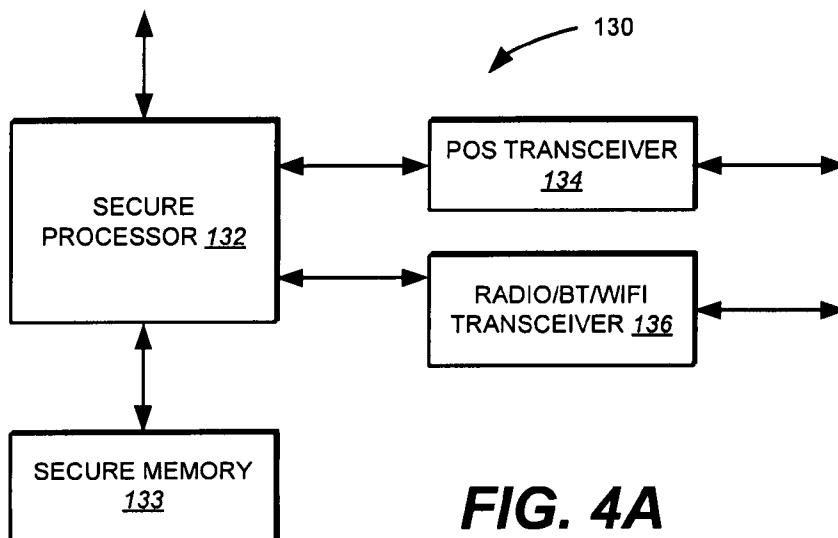
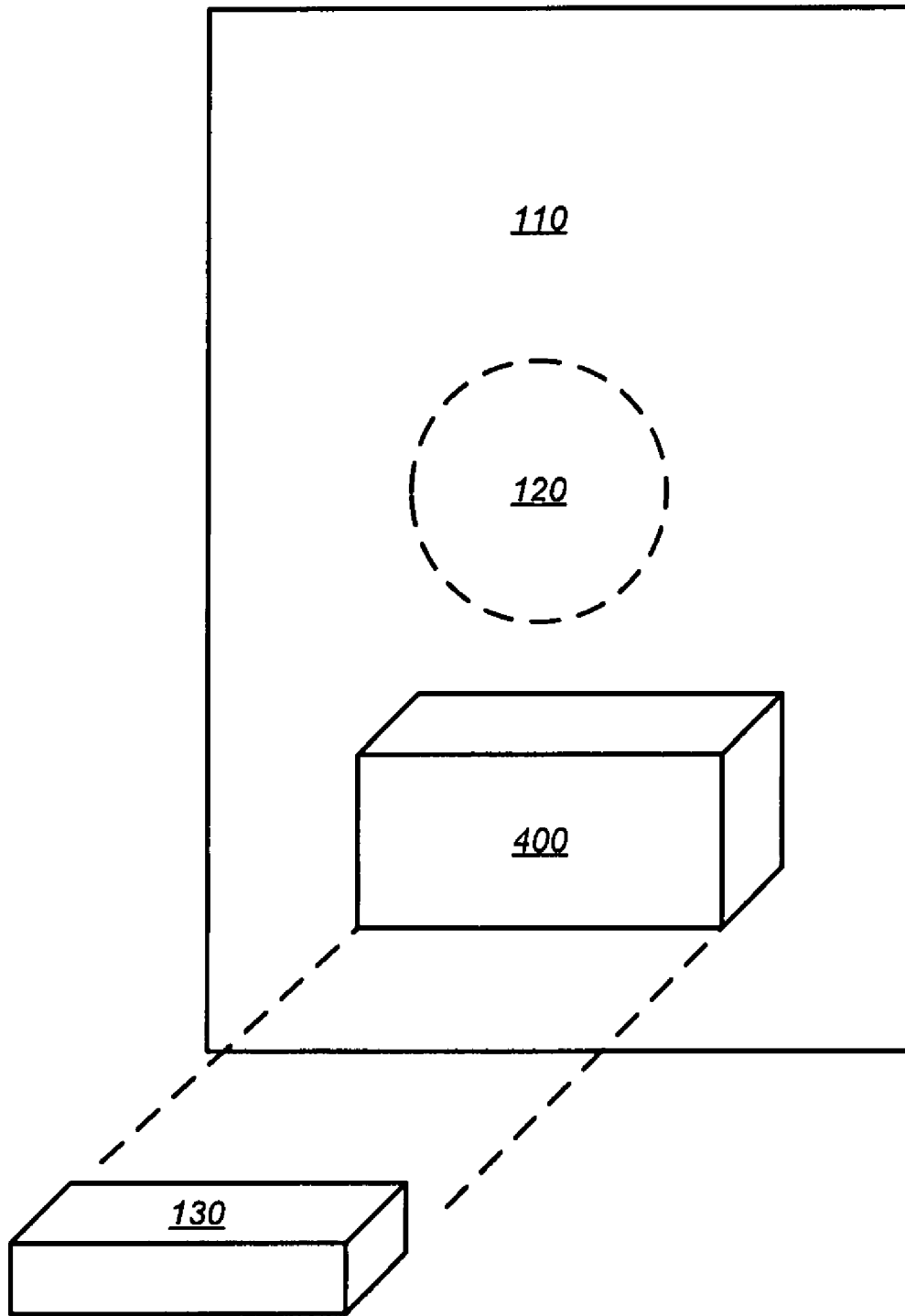
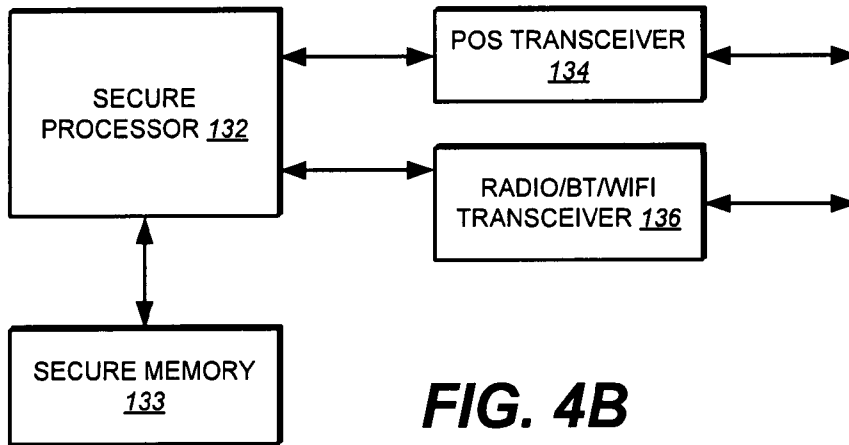


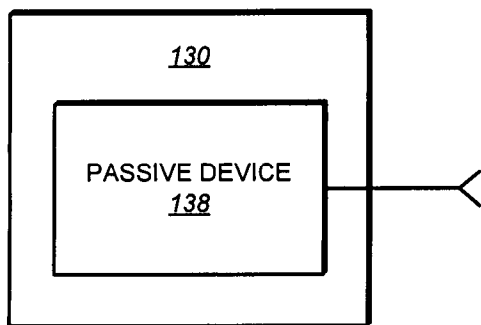
FIG. 4A



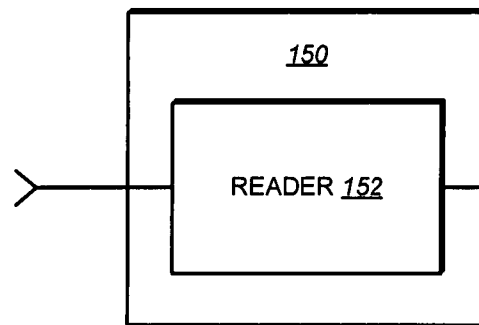
**FIG. 3**



**FIG. 4B**



**FIG. 4C**



**FIG. 5**

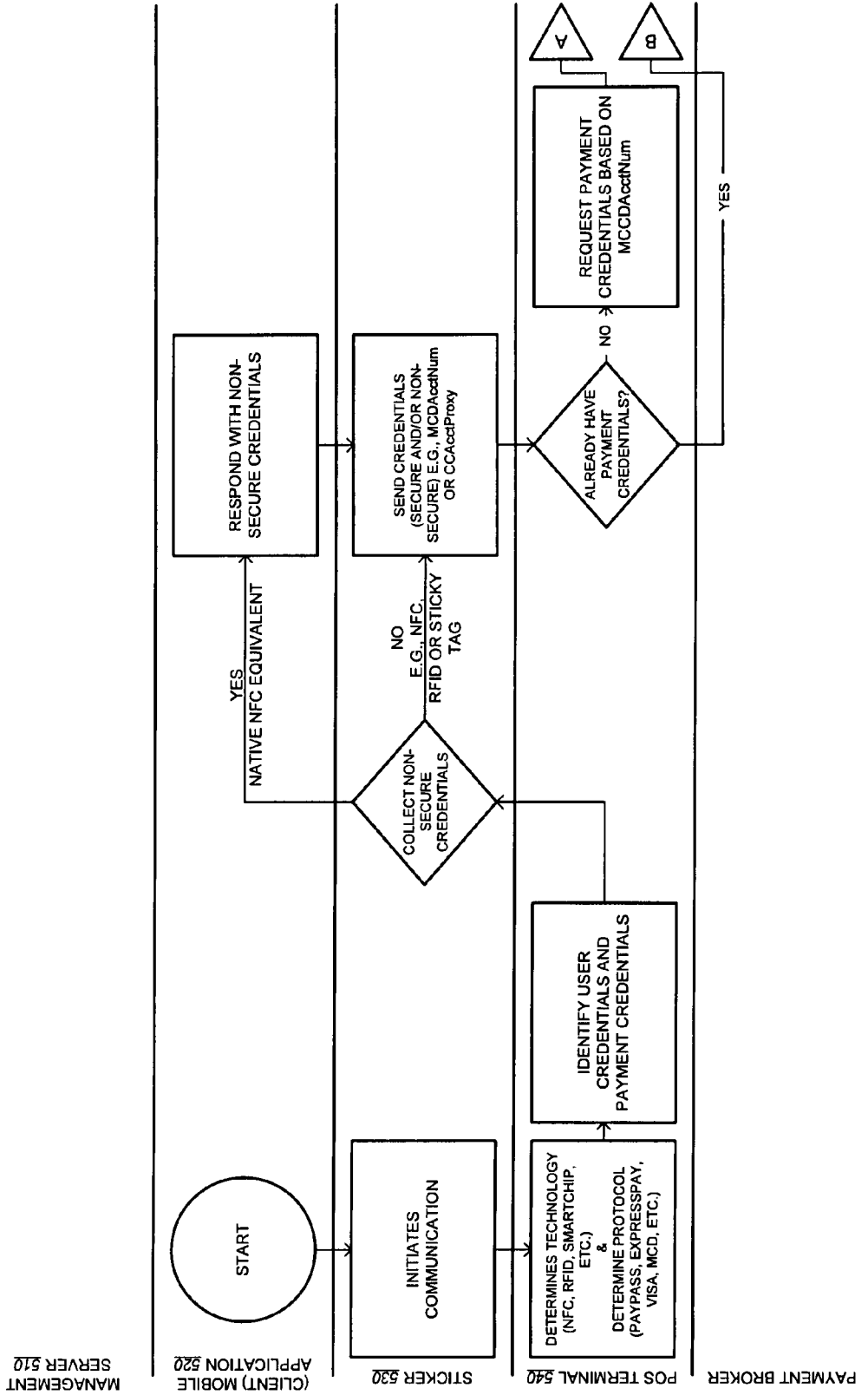


FIG. 6A

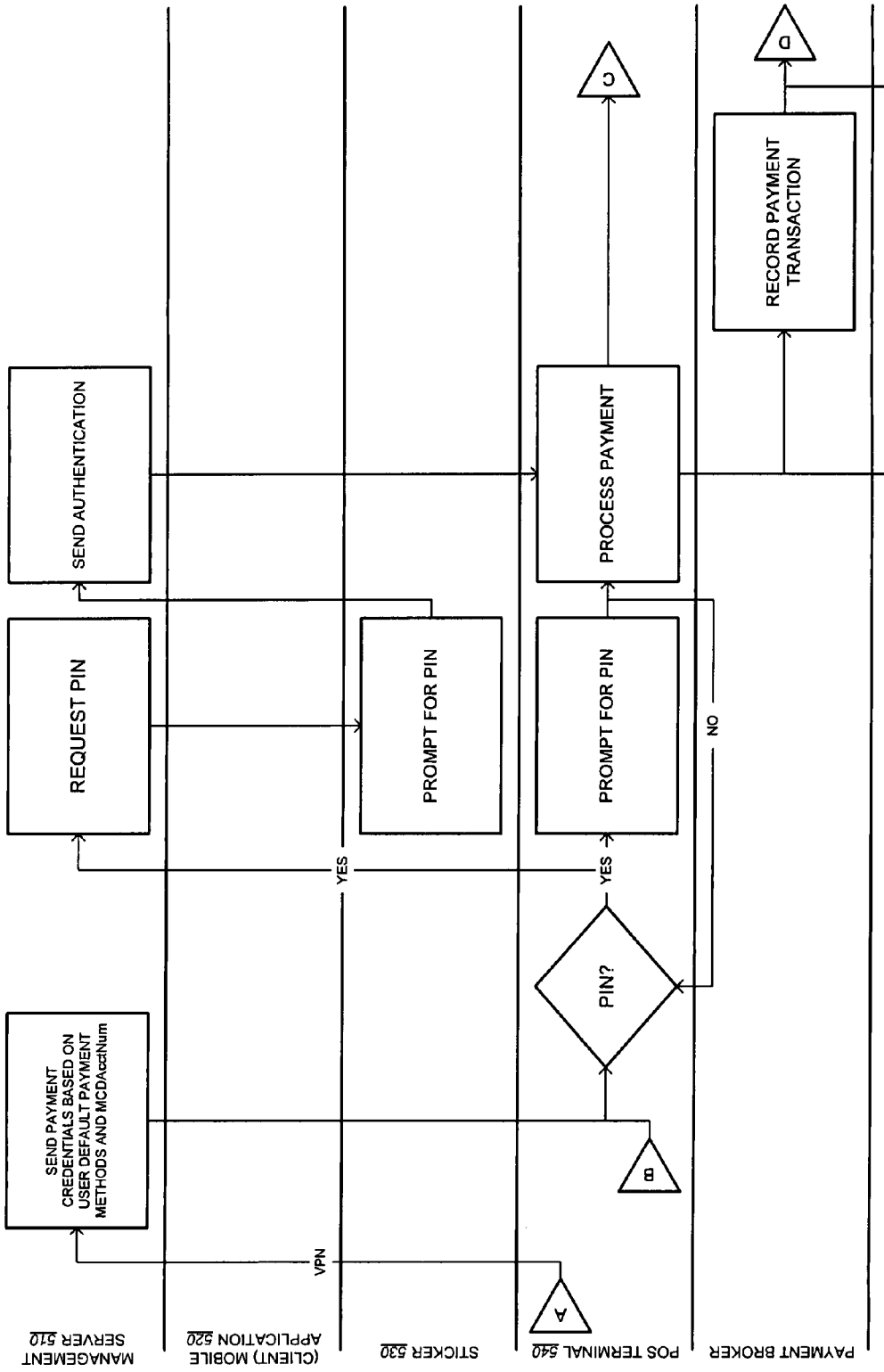


FIG. 6B



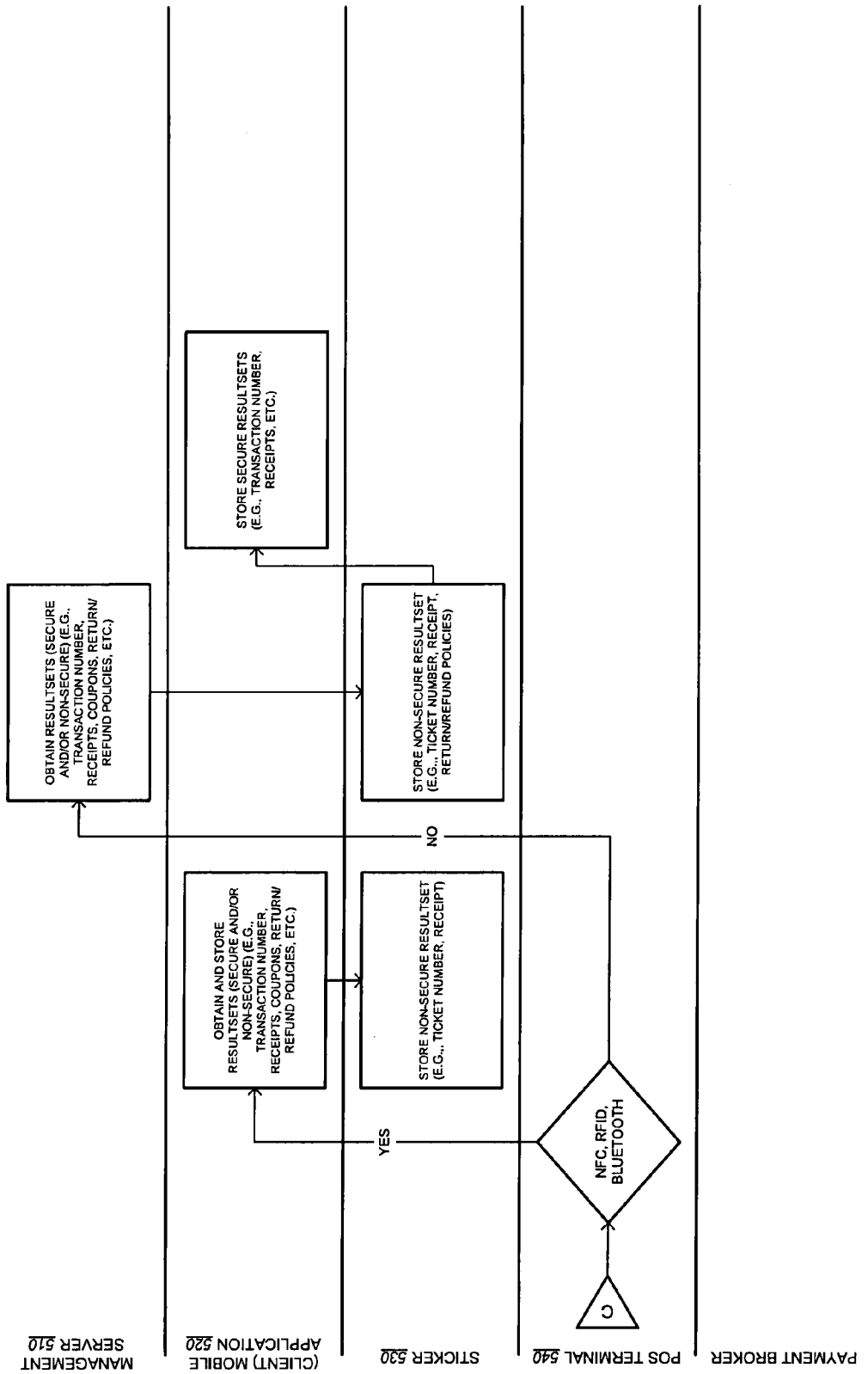


FIG. 6C

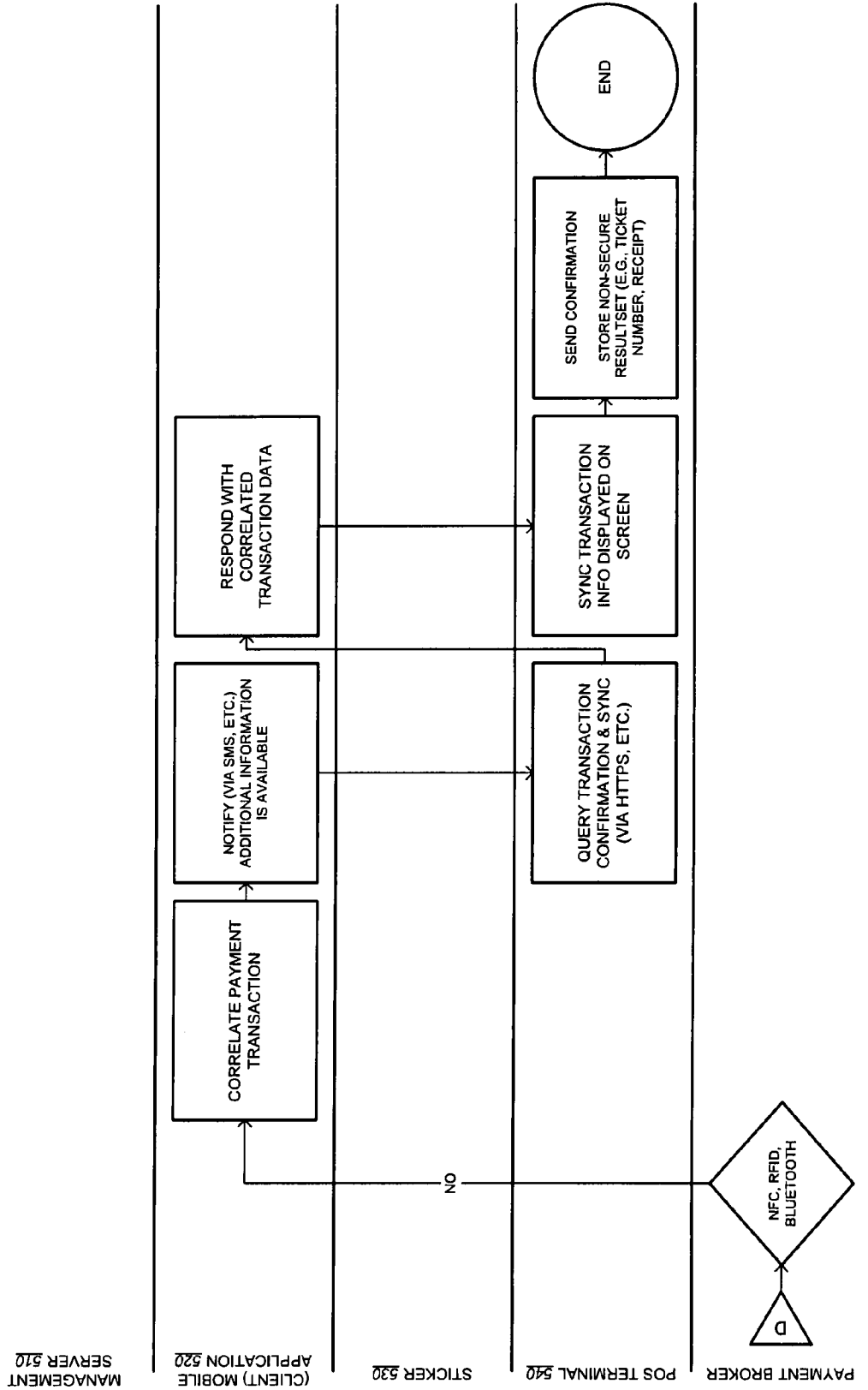
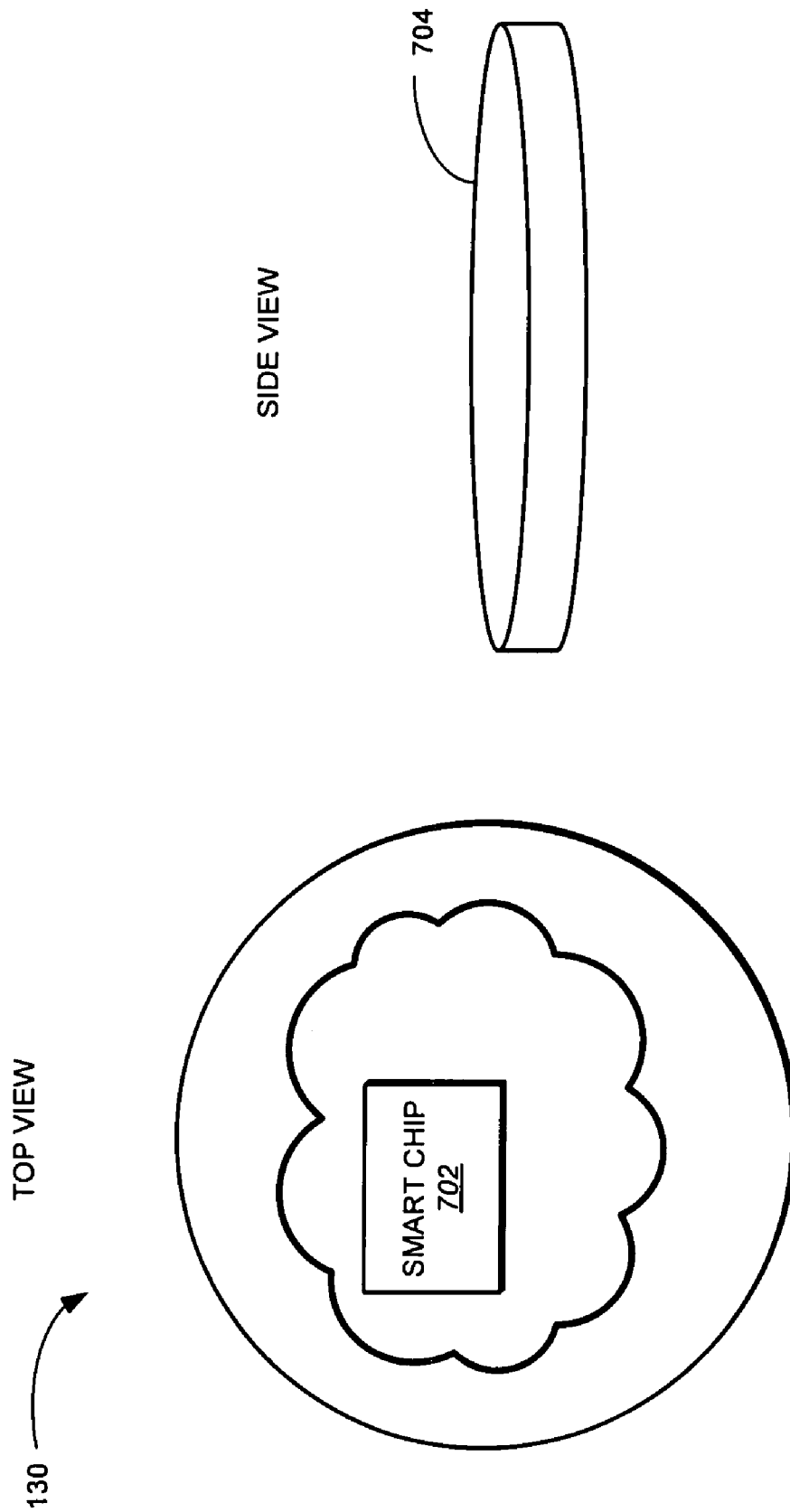


FIG. 6D



**FIG. 7**

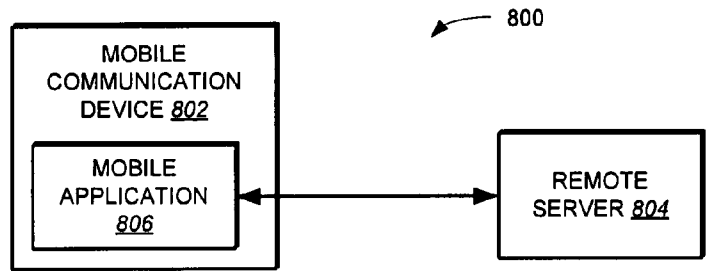


FIG. 8

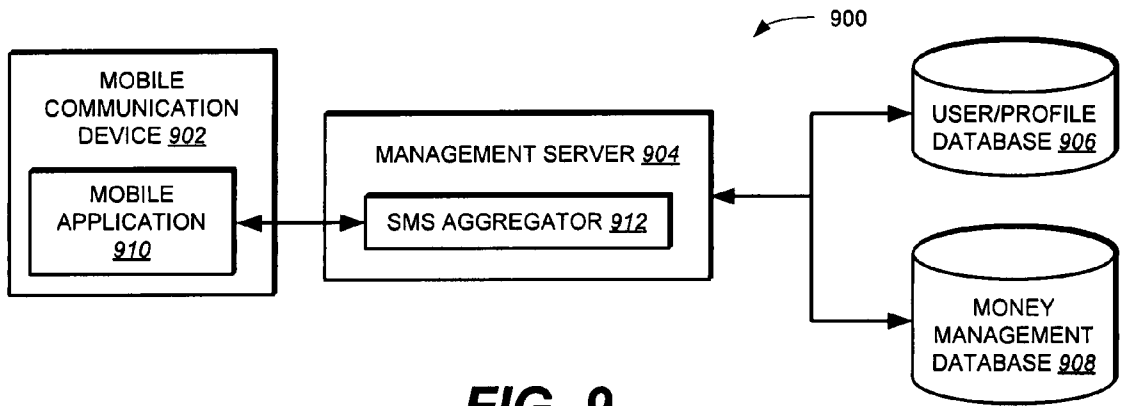


FIG. 9

BOFA - 10/07	
BALANCE: \$3200.00 AS OF 10/9/2007	
10/9/2007 Merchant1	\$23.81
10/9/2007 Merchant2	\$123.81
10/9/2007 Merchant3	\$223.81
10/9/2007 Merchant4	\$323.81
10/9/2007 Merchant5	\$423.81
<input type="button" value="REFRESH"/> <input type="button" value="DONE"/>	

FIG. 10A

BILL PAY	
PAY BILL	
PAYEE	<<PG&E...>>
FROM:	<<[MCC-2345]...>>
AMOUNT	\$ <input type="text" value="10"/> . <input type="text" value="00"/>
DATE	<input type="text" value="03"/> / <input type="text" value="28"/> / <input type="text" value="07"/>
	(MM / DD / YY)
<input type="button" value="ADVERTISEMENT"/>	
<input type="button" value="OPTIONS"/>	<input type="button" value="NEXT"/>

FIG. 10B

1

## CONDUCTING A PAYMENT USING A SECURE ELEMENT AND SMS

### CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of application Ser. No. 11/467,441, filed Aug. 25, 2006, which claims priority to U.S. Provisional Patent Application No. 60/766,171 and U.S. Provisional Patent Application No. 60/766,172, both filed on Dec. 31, 2005.

### FIELD OF INVENTION

The present invention relates to data communications and wireless devices.

### BACKGROUND OF THE INVENTION

Online transactions—e.g., for purchasing goods, receiving downloads, and so on—which involve personal computers and the Internet are well known. Further, wireless mobile communication devices, such as cell phones, blackberries or other personal digital assistants, are also being used for making transactions. For example, U.S. Patent Application No. US/2003/0172028 provides a description of a personal payment system that utilizes a wireless enabled device such as a cell phone. As described, the personal payment system interacts using a Bluetooth protocol with a terminal located nearby the wireless enabled device. In another example, U.S. Pat. No. 7,031,945 describes a system and method that provides an electronic ticket to a smart card or standard wireless device that is identified with a user's account.

Further, wireless mobile devices that include a near field communication (NFC) device and a smart card (that uses an RFID for identification purposes) allow a person to securely make a simple transaction, such as for example, purchasing a bus ticket. In such an example, the person typically waves the wireless mobile device near a reader installed in a bus, and a price of the bus ticket is deducted from a total amount that is available and stored on the smart card of the wireless mobile device. Optionally, the amount of the bus ticket can be forwarded to a server that can identify the identification code of the particular RFID and then subsequently charge the person for the purchase of the bus ticket.

While the references discussed above illustrate that certain transactions are possible using wireless mobile devices, one problem associated with the references is that implementations described in the references are not useful in a wide variety of different platforms, but rather are typically tied to a specific platform. For example, NFC devices are only usable with NFC readers. Another problem is that conventional wireless mobile devices generally have a very limited ability to be used in transactions.

### BRIEF SUMMARY OF THE INVENTION

In general, in one aspect, this specification describes a method and system for transmitting data between a wireless communication and a remote server. The method includes running a mobile application on the wireless communication device, in which the mobile application is a rich client application. The method further includes transmitting data associated with the mobile application between the wireless communication device and the remote server using short message service (SMS). The mobile application links corresponding

2

data transmitted through the short message service (SMS) for use by the mobile application.

The details of one or more implementations are set forth in the accompanying drawings and the description below. Other features and advantages will be apparent from the description and drawings, and from the claims.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates one implementation of a block diagram of a communication system including a wireless mobile communication device.

FIG. 2 illustrates one implementation of radio element in the wireless mobile communication device of FIG. 1.

FIG. 3 illustrates one implementation of a wireless mobile communication device.

FIGS. 4A-4C respectively illustrate an implementation of a secure element in the wireless mobile communication device of FIG. 1.

FIG. 5 illustrates one implementation of a point of sale terminal.

FIGS. 6A-6D illustrate a flowchart for conducting a transaction according to one implementation.

FIG. 7 illustrates one implementation of a secure element that is attachable to a wireless communication device.

FIG. 8 illustrates a communication system in accordance with one implementation.

FIG. 9 illustrates a communication system in accordance with one implementation.

FIGS. 10A-10B illustrate example client user interfaces that are displayable on a display of the mobile communication device of FIG. 9.

Like reference symbols in the various drawings indicate like elements.

### DETAILED DESCRIPTION OF THE INVENTION

This disclosure describes a communication system and method for assisting a user to complete a transaction. FIG. 1 illustrates one implementation of a communication system 100. The communication system 100 includes a hand-held, wireless mobile communication device 110 that (in one implementation) includes a radio element 120 and a secure element 130. A display 124 is shown associated with the radio element 120, and antennas (not labeled) are shown as associated with each of the radio element 120 and the secure element 130. Each antenna can physically be implemented in a manner that is different from the wireless antennas shown in FIG. 1. For example, an antenna can comprise a stripe that is passed along a reader, or comprise some suitable transmission mechanism. Although elements 120 and 130 are shown as distinct and separate, and display 124 is shown as connected to the radio element 120, other configurations are possible. In particular, a combination in which a single processor is used to execute the functions that are currently performed and described herein as being provided by both the radio element 120 and the secure element 130. Further as illustrated in FIG. 1, both the radio element 120 and the secure element 130 are internal to the mobile communication device 110, although in other implementations the secure element 130 can be external to the mobile communication device 110, as described below. Also, various different functionalities can be included within the radio element 120 and the secure element 130.

In one implementation, the mobile communication device 110 has the functionality to communicate with one of many different a point of sale (POS) terminals 150-1 to 150-n—

e.g., in a contactless manner using a wireless protocol. The mobile communication device **110** can also similarly communicate with one or more point of entry (POE) terminals **190-1** to **190-n**. The point-of-sale terminal **150** receives one of the transaction request signals from the mobile communication device **110** and transmits the one transaction request signal to a transaction server **170**, typically using a communication channel **160** such as the Internet. The transaction server **170** verifies the transaction, and forwards a transaction verification signal to the management server **180**. The management server **180** identifies the user corresponding to the transaction verification signal, and provides a first transaction response signal back to the mobile communication device **110** as one of the transaction signals.

In one implementation, the first transaction response signal is communicated back to the mobile communication device **110** using a communication channel that is different from the communication channel used to initiate the transaction. In one implementation, different transaction response signals can be communicated back to the mobile communication device **110** using communication channels from the management server **180** to the radio element **120** associated with the device **110**, as well as from the management server **180** to the secure element **130** through the POS terminal **150** or the POE terminal **190**. Further detailed descriptions of these implementations are discussed in greater detail below.

FIG. 2 illustrates one implementation of the radio element **120** associated with the mobile communication device **110**, and illustrates the radio element **120** connected to the display **124** of the mobile communication device **110**. In one implementation, the radio element **120** includes a radio transceiver **122** that is adapted to send outgoing voice and data signals and receive incoming voice and data signals over a radio communication channel. The radio communication channel can be a digital radio communication channel, such as CDMA or GSM. Such a radio communication channel has the capacity to communicate both voice and data messages using conventional techniques. The radio transceiver **122** communicates with a radio processor **123**, which processor has the capability to perform not only the radio communication services necessary to allow for phone and data communications, but can also execute various programs that are stored in the memory **126**, which programs can receive inputs from the user via the display **124** and/or a keypad **125** associated with the mobile communication device **110**.

In one implementation, application programs running on the radio processor **123** are, e.g., BREW or J2ME applications and can encompass a broad array of application types. For example, current applications include games, enterprise applications, and multimedia applications. In one implementation, the radio processor **123** runs an application that provides movie and event information. Such an application can comprise ticketing applications, content, item and service purchase applications, and/or payment management applications (referred to herein also as "wallet applications"). In one implementation, the radio processor **123** also has the capability of recognizing secure communications, and transmits data which must be stored in a secure environment to the secure element driver **128** for transmission to the secure element **130**. In one implementation, in which both the radio element **120** and the secure element **130** are internal to the mobile communication device **110**, transmissions to the secure element **130** can take place using an internal wired communication channel. In one implementation, the radio processor **123** also has the capability of receiving data from the secure element **130**, e.g., using the internal wired communication channel. In one implementation, the secure element **130** and

the radio element **120** communicate using signals described in the Java Card 2.1 Platform API Specification.

In one implementation, both the radio element **120** and the secure element **130** are disposed internally within a body of the mobile communication device **110**. For example, referring to FIG. 3, the mobile communication device **110** is shown including a slot **400**, which allows for the insertion of a secure element **130** into the slot **400**. In this configuration, the secure element **130** can be purchased independently of the mobile communication device **110**. The secure element **130** can also be disposed into a slot that only provides for physical insertion and mechanical connection to the body of the mobile communication device **110**. In such an implementation, the secure element can include a transceiver that allows for the communication with the radio element **130** through a wireless local communication channel. The radio element **120** also is illustrated as optionally including another transceiver **129**, such as a Bluetooth or WIFI transceiver, which can transmit and receive signals with an external device and then communicate signals to and from the radio processor **123**. This additional communication channel allows for communications between other external devices, such as an external Bluetooth enabled smartcard, and provides an additional communication channel that is useful for certain transactions, as described further herein.

FIG. 4A illustrates one implementation of the secure element **130** associated with the mobile communication device **110**. The secure element **130** can be a smart card. In one implementation, the secure element **130** includes a secure processor **132**, a secure memory **133**, and a POS transceiver **134** adapted to send transaction request signals and receive transaction response signals over a first communication channel. In one implementation, the secure processor **132** communicates via the secure element driver **128** with the radio processor **123** using signals as described in the Java Card 2.1 Platform API Specification. The transaction request signals and the transaction response signals associated with the transaction can include an identification code associated with the user, as well as information relative to the transaction, such as item, quantity, vendor, and so on. In one implementation, the POS transceiver **134** is an NFC device, which uses an NFC modem. The POS transceiver **134** can also be a Bluetooth, WIFI or other transceiver. In an implementation in which the POS transceiver is an NFC modem, such an NFC modem will typically have a set of registers that can be read/written by the secure processor **132**. These registers are in turn available for reading and writing over the RFID communications channel and serve as a shared memory between the secure processor **123** within the secure element **130** and the RFID reader that is associated with the POS terminal **150**. This communication is specified, for example, in the ISO 14443A/B standard. The secure element can optionally include a radio/Bluetooth/WIFI transceiver **136**, which can communicate with other devices, such as a transceiver associated with the radio processor **120** or for other external devices having those communication capabilities, thus allowing for more flexibility.

FIG. 4B shows another implementation of a secure element **130**, in which the radio element **120** does not communicate with the secure element **130** through a secure element driver **128**. In this case, for example, the secure element **130** may be external to the mobile communication device **110** and as such is not connected to the radio element through the secure element driver **128**. In such an implementation, however, if the transceiver **136** as described above is included, and a similar transceiver **129** associated with the radio element **130** as described previously with respect to FIG. 2 is included, then this communication channel can be used to wirelessly

obtain direct communications between the radio element **120** and the secure element **130**. This implementation allows for certain bidirectional communications with other devices, as well as with the radio element **120**, and as such more functionality and flexibility is achieved. This implementation is particularly useful since it establishes a direct local communication path with the radio element **120**, since there is not communications with the radio element **120** via the path of driver **128**.

This implementation allows for certain bidirectional communications with other devices, as well as with the radio element **120**, and as such more functionality and flexibility is achieved. This implementation is particularly useful for establishing a direct local communication path with the radio element **120**, since there are no communications with the radio element **120** via the path of driver **128**. If either of the transceivers **129** or **136** are not associated with the respective radio element **120** or secure element **130**, and there is no direct connection between the radio element **120** and the secure element **130**, then a direct communication link between the radio element **120** and the secure element **130** will not exist. As such, while ticketing and many transactions can still exist, data from a real-time transaction performed using the secure element **130** cannot be made directly available to the radio processor and the applications stored thereon. In such an implementation, certain redundancy checks may not occur. For example, a ticketing application can be programmed to provide an alert if a ticket receipt has not been received within a certain period of time. Such an alert would not be possible to program directly (although it could be programmed indirectly via the button panel on the phone).

FIG. 7 illustrates one implementation of a secure element **130** that can be attached (or affixed) externally to a wireless communication device (e.g., mobile communication device **110**). In one implementation, the secure element **130** has circular shape. The secure element **130** can have other suitable shapes—e.g., rectangular, triangular, and so on. In one implementation, the secure element **130** includes an embedded smart chip **702** that is capable of executing proximity services (e.g., services related to payments, ticketing, identification, sending coupons, etc.). In one implementation, the smart chip **702** is capable of 2-way wireless communication (e.g., RFID, NFC, Bluetooth, etc.) with a supporting 3rdParty terminal. In one implementation, the 2-way communication is performed using a communication protocol that is different from a communication protocol through which the mobile communication device sends or receives voice and/or data signals. Multiple application protocols (NFC, MiFare, etc.) can be supported. In one implementation, the smart chip **702** is programmable. Accordingly, different application (for payments, ticketing, identification, coupons, etc.) can be developed, downloaded to the smart chip, and commissioned. Thus in operation, in response to the secure element **130** being placed in close proximity with a suitable terminal, the terminal will trigger (via application protocol) an appropriate application stored in the smart chip, and the smart chip will respond appropriately with the terminal.

In one implementation, the smart chip uses a low-power RF transmitter/receiver to communicate with a terminal. The low-power output of the smart chip makes it susceptible to RF interference from neighboring devices. Specifically problematic are components associated with the mobile communication device, e.g., battery, antennae (internal or external), to which the secure element **130** is affixed. Thus, in one implementation, the secure element **130** includes an RF shield to insulate the smart chip from external interference. In one implementation, a lining of the secure element **130** is com-

posed of an RF absorbent material/lining. In general, each phone has different levels of interference, and a material, size and thickness of the RF lining can determine an effectiveness of the RF shield. In one implementation, an RF shield can be placed between the secure element **130** and the mobile communication device **110**.

Given the abuse a mobile communication device can take, components that are affixed externally to a mobile communication device need to be able to withstand some abuse. Thus, in one implementation, the secure element includes a ruggedized shell **704** that encases a smart chip (with antennae). In one implementation, the shell **704** is formed from a composite plastic or polymer. The shell **704** can be hard (and substantially inflexible) or be soft (and pliable). In one implementation, the shell **704** provides a protective membrane for the smart chip which prevents damage to internal circuitry, a surface to adhere to an RF lining and/or a mobile communication device with appropriate adhesive, and a surface to print branding and advertising. Types of adhesives that can be used to affix the secure element **130** to a mobile communication device include, for example, paper glue, super glue, polymers, and the like. In one implementation, the shell **704** has a maximum width (or diameter) of 25 mm, and has a maximum thickness (or depth) of 5 mm.

FIG. 4C shows another implementation of a secure element **130**, in which the secure element **130** does not include a processor that is capable of bidirectional communications, but instead includes a passive device **138**. The passive device **138** can be an RFID sticker or suitable tag that allows for uniquely identifying a user, such that a transaction that is initiated with the passive device **138** will cause the management server **180** to perform transaction details. In this implementation, the code received from the POS terminal **150** (or the POE terminal **190**) is transmitted from the POS terminal **150** (or the POE terminal **190**) to the management server **190**, which then takes over the transaction. This passive device **138**, with the identification code stored thereon, can thus be associated with a mobile communication device **110** not otherwise equipped for such communications, and the management server **190** can provide transactional information to the mobile communication device **110** using available channels on the mobile communication device (such as audio, SMS, or other known data transmission methods). While bidirectional communications do not occur with other devices, transactions are possible, because the management server **190** is involved. SMS (Short Messaging Service) As A Data Transmission Method

As discussed above SMS (Short Message Service) can be used as a data transmission method between the management server **190** and the mobile communication device **110**. SMS is generally unstructured. Thus, when messages arrive in an inbox of a user inbox, the user cannot easily search, retrieve, or organize the messages. In addition, due to SMS's send-and-forget characteristics, it cannot be assumed that messages are received by the terminating point, or if received, received in a particular sequence. FIG. 8 illustrates a communication system **800** in accordance with one implementation. The communication system **800** includes a mobile communication device **802** that communicates with a remote server **804** (e.g., a transaction server) via SMS. The mobile communication device **802** includes a mobile application **806** that receives SMS messages from the remote server **804** and organizes the SMS messages (including linking corresponding messages into a pre-determined order) so that data can be stored and displayed to a user in an organized and easily retrievable fashion, unlike a conventional application that implements SMS as a data transmission method in which

SMS messages remain in an unstructured format and are unlinked. Such an unstructured format does not allow the user to retrieve, organize, or manage the display of messages. The mobile application **806** can be, for example, a J2ME, BREW, Windows Mobile, or other type of application.

In one implementation, the mobile application **806** is a rich client application (also commonly referred to as a fat client application or thick client application). A rich client application is a client application that performs the bulk of any data processing operations itself, and does not necessarily rely on a server (e.g., remote server **804**). The mobile application **806** can also be a thin client application or hybrid client application. In one implementation, the mobile application **806** is the Blaze Mobile Wallet Lite application available from Mobile Candy Dish Inc. or Berkeley, Calif. In one implementation, the mobile application **806** provides banking and money management transaction services, and transmits data from the wireless communication device **802** via SMS in accordance with a connectionless protocol.

FIG. 9 illustrates a communication system **900** in accordance with one implementation. The communication system **900** includes a mobile communication device **902**, a management server **904**, a user/profile database **906**, and a money management database **908**. In one implementation, the management server **904** is a Blaze server. In one implementation, the mobile communication device **902** stores a mobile application **910** that uses short message service (SMS) over a connectionless protocol to transmit data to the management server **904**. SMS permits the mobile application **910** to send messages of a fixed size, for example, up to 160 characters, to and from the wireless mobile communication device **902**. In one implementation, the management server **904** includes an SMS aggregator **912** to aggregate each message received from the wireless mobile communication device **902** and keep track of the ordering of each message, and (in one implementation) also groups each message into a corresponding group. In one implementation, the mobile application **910** also includes an SMS aggregator (not shown).

Thus, in one implementation, the mobile application **910** is not browser HTTP based, and delivers banking and money management services. The mobile application **910** also leverages a low-end communication infrastructure (also referred to herein as a “bearer service”). A bearer service that is universal on all mobile devices is the Short Message Service (SMS). SMS is a means of sending short messages to and from mobile phones to the Application Service Provider (ASP) Server “Server”. It is inherently a connectionless communication protocol, i.e., send and forget. There is no acknowledgement to the Mobile Originating (MO) sender that the message sent was successfully received by the Mobile Terminating (MT) recipient. There is no concept of timeouts, message lost, message not received, etc. Leveraging SMS as a bearer service to support a ‘rich’ client application. The Client will listen to a specific incoming SMS port to be defined based on Network Operator/Carrier, Phone Vendor, etc.

In one implementation, the mobile application **910** provides banking and money management service, which includes (but is not limited to):

Registration: User creates new MW Lite account with PIN (PIN and user info can be stored in user/profile database **306**)

Security & Encryption: Sensitive information may optionally be encrypted using 3rdParty or native phone tools (Bouncy Castle, etc.). Encryption (Public/Private) keys

may be managed or proxy’d by Server which may additionally be out-sourced to 3rdparty Key Management vendor.

Install & Configuration (I&C): Refers to setting up proxies to

payment accounts (virtual, credit, debit & banking) Payees (BillPay, PayAnyone, etc.) and associated rules Specify default payment account to debit fund transfers/unloading

Specify default payment account to credit fund transfers/loading

Activation of 3rdParty Services (Account Balance, Bill Pay, Fund Transfer, Funds Loading, Funds Unloading)

It is assumed Client application is pre-installed or downloaded to mobile device.

I&C to be performed via Kiosk, ATM, 3rdParty/Carrier Web Portal, MCD Web Portal, on mobile device, or other suitable device.

Loading Funds

Banking or financial data

Account balance

Transaction history

Bill Pay—Biller Direct

Fund Transfer—Intra Bank; Me-2-Me

Fund Transfer—Inter Bank; Me-2-Me

Fund Transfer—Inter Bank; Me-2-You (based on Bank Routing/Account#)

Fund Transfer—Inter Bank; Me-2-You (based on WalletID)

Fund Transfer—Inter Bank; Me-2-You (based on ACH Check). A.k.a. Bill Pay Anyone

Load Fund

Unload Funds (ATM Withdrawal, etc.)

Sync: Ensures server-side objects are downloaded to client and locally cached. This includes payment accounts, payees, payment rules, server-side cached account info (account balance, Last-N transaction history), etc.

This info will be cached on Client.

Users can create transaction either in ONLINE or OFFLINE (no network connectivity) mode

Initiating/Triggering Banking Services:

Storage: Storage of Users MWLite info, User’s payment account info (credentials, account balance, history, etc.); Banking Payment History (BillPay, Fund Transfer, Fund Loads, Fund Unloads, etc.)

Scenarios/Features

1. Overlaying connection protocol properties over SMS. This includes: segmenting complex command and control (C&C) messages into 1 or more SMS messages, and reconstructing one or more SMS messages into complex C&C resultset messages. Re-constructing the one or more messages into complex C&C resultset messages can include one or more of the following providing acknowledgement, handling out-of-sequence incoming messages, handling unexpected messages or messages considered lost (due to timeout, etc.), Managing encryption as needed, and so on.

2. User uses the mobile application **910** to initiate/trigger appropriate banking service. For example, referring to FIG. **10A** a user can initiate a bill paying service through which a payee (e.g., PG&E) can be paid. In one implementation, the display of the bill pay screen can include an advertisement as shown in FIG. **10A**.

3. The mobile application **910** formulates appropriate banking services commands, for example:



“<command> <PaymentAccount> <Payee> <\$amt>  
<transferDate> <PIN> <sequenceID> <message>  
<messages>”  
billpay MCC-2345 PG&E110.23 20070328 1234 36 1 1  
transfer bofa-1007 jdoe 25.00 20070328 1234 36 1 5  
1#where jdoe is a walletID  
transfer bofa-1007 8005550001 25.00 20070328 1234  
36 1 1#where 8005550001 is the phoneNumber of  
unloading station.

fundstransfer bofa-1007 gw bush 30.00 20070328 1234 10  
36 1 1#gwbush is a payee  
“<command> <PaymentAccount> <PIN> <sequenceID>  
<message> <messages>”  
Balance bofa-1007 1234 36 1 1  
4. A Loading Station (Kiosk, etc.) can load funds by send- 15  
ing command to MCD’s Loading Shortcode.

“<command> <PaymentAccount> <Payee> <\$amt>  
<transferDate> <PIN> <sequenceID> <message>  
<messages>”  
load CorpBankPayrollAccount-2007 8005550001 20  
4000.00 20070328 0987 43 1 1 (#Debit account Corp  
BankPayrollAccount-2007 by \$4000 and credit  
account held by user with phone Number  
8005550001)

5. Receive multiple (in/out sequence, missing, lost, etc.) 25  
messages to reconstruct a complex messages.

<sequenceID>:<message>;<messages>; <body>  
“36:1:6; acct:Bofa-1007 bal:40123.32 date:20071009”  
“36:3:6; date:20071009 name:Merchant2 amt:123.81”  
“36:6:6; date:20071009 name:Merchant5 amt:423.81” 30  
“36:4:6; date:20071009 name:Merchant3 amt:223.81”  
“36:2:6; date:20071009 name:Merchant1 amt:23.81”  
“36:5:6; date:20071009 name:Merchant4 amt:323.81”

In one implementation, post processing of these multiple 35  
messages results in the screen shown in FIG. 10B which  
displays the account balance and the last five transactions in  
a transaction history list. The list can be cached on the mobile  
communication device 902 for later use.

6. Cashed data is refreshed upon user request. This in turn 40  
invokes a command similar to the following:

<command> <account> <PIN> <sequenceID> <mes-  
sage> <messages>  
Balance Bofa-1007 1234 37 1 1 (# Where 37 is the next  
<sequenceID>)

#### Connection Protocol Properties

The above description introduced the concept on <sequen- 45  
ceID> <message> <messages>. The sequenceID is a rotating  
pool per Client, issued by the Client, used as a callback  
mechanism, i.e., match outgoing command messages and  
incoming resultset messages. Since resultsets can be long and 50  
complex, the resultset is broken into pages, where each page  
can fit with the allowed payload size of an SMS message.  
Hence, “<message> <messages>” implies “Page 1 of 5”. The  
Client (or mobile application) then has to wait for all <mes- 55  
sages> to arrive before re-constructing the original resultset.  
Due to characteristics of SMS, the client has to handle sce-  
narios when a message with an un-expected sequenceID  
arrives. In addition, if a missing page within the expected  
sequenceID fails to arrive within a specified time interval, the  
client needs to request retransmission, e.g., “retransmit 60  
36:4:6 1234” which will instruct server to retransmit resultset  
36, part 4 of 6.

The pool size (or range of valid sequenceID’s) controls the 65  
asynchronous aspect of the application. The sequenceID is  
mapped to the command (at least until the sequenceID is  
re-used). Hence, the client will use the sequenceID to deter-  
mine to command and associate the appropriate display style

sheet to best display the resultset to the user. For example, if  
sequenceID=36 was issued by the command ‘balance’ which  
determines account balance, it makes sense to leverage the  
‘Account Balance & History’ style sheet to present this infor-  
mation.

SMS messages to and from the mobile communication  
device has to be acknowledged. A simple protocol is neces-  
sary, for example, as follows:

1. # Mobile Originated (MO) command  
<command> <body> <sequenceID> <message> <mes-  
sages>

balance Bofa-1007 1234 37 1 1

2. # Server, a.k.a., Mobile Terminating (MT) receives and  
acknowledges receipt of message ‘37 part 1 of 1.’

ack 37 1 1

3. # MT responds with resultset

36:1:2; acct:Bofa-1007 bal:40123.32 date:20071009

4. # MO receives and acknowledges receipt of message ‘36  
part 1 of 2.’

ack 37 1 2

5. # MT responds with resultset (part 2 of 2)

“36:2:2; date:20071009 name:Merchant1 amt:23.81”

6. # MO receives and acknowledges receipt of message ‘36  
part 2 of 2.’

ack 37 2 2

7. # MO has received all messages. Reconstruct & store  
message

8. # Next time user view account balance, display cached  
(local store) information:

Bank Account: Bofa-1007

Balance: \$40,123.32 as of Oct. 9, 2007

Oct. 9, 2007 Merchant1 \$23.81

#### Online/Offline Access

In one implementation, a mobile communication device  
creates task/objects either while connected with a Server  
(online-mode) or when no connection is available (offline-  
mode). Tasks/objects are specific to mobile banking service  
and include for example: schedule (or cancel) a fund transfer  
transaction, schedule (or cancel) a bill pay transaction, and  
manage other banking transactions. In addition, digital arti-  
facts (coupons, tickets, etc.) that possess a state (or status)  
(e.g., Assigned, Saves, Redeemed, Deleted, etc.) can undergo  
changes on the mobile communication device. Given these  
tasks/objects associated to Banking Services and Digital Arti-  
facts has ‘states’ that can be changed in either an online-mode  
or offline-mode, the Server has to be refreshed/updated either  
in real-time (online-mode) or in batch (offline-mode).

For example, given a situation in which a user is travelling  
in a region in which the user’s mobile communication device  
does not have network access and the user needs to transfer  
funds into a checking account, the user can use the mobile  
communication device (with the Mobile Wallet Client applica-  
tion) to schedules a fund transfer in offline mode. Since the  
mobile communication device has no network connectivity,  
the Client (in OFFLINE mode) creates a ‘task’ to represent  
the fund transfer (or any other banking service) using banking  
information (Banks accounts, etc.) previously cached on  
mobile device. The task can have an initial state (e.g., “pend-  
ing”). While the Client is enabled the Client will actively  
monitor network access. When the user travels into a region  
where network access is available, the client will identify the  
network and automatically re-connect to the network. The  
client will then negotiate with a server and any tasks having a  
“pending” state on the client are then uploaded to server  
(either in batch mode or one task at a time). The client (in  
ONLINE mode) will refresh states of all task from the server  
(including the recently added tasks) to present to the user the

updated status of all tasks managed by the server. Other services possible include, for example: request schedule (or cancellation) of Bill Pay transaction, request schedule (or cancellation) of Fund Transfer transaction, request schedule (or cancellation) of Pay Anyone transaction, any other state-based banking transaction service.

Using the client (or mobile application), a user can store digital artifacts (e.g., coupons, tickets, etc.) on a mobile communication device. These digital artifacts are objects that are consumed by a 3rdParty, e.g., a ticket can be redeemed at a theater, and a coupon can be redeemed at the Point-Of-Sale of a retail merchant. Hence, this is a 3-way sync: 1) mobile communication device with server, 2) mobile communication device with 3rdParty Merchant, and 3) server with 3rdParty Merchant. For user's convenience, redemption of digital artifacts by a 3rdParty must be enabled in an environment with or without network access. For example, a user with an electronic ticket on a mobile communication device may wish to redeem an eTicket at a theater. However, if there is no network access inside the theater, the user will still need access the eTicket on the client. In ONLINE mode, the client will cache (local store) the eTicket (and any other digital artifact.) In the theater, the client (in OFFLINE mode) will be able to redeem the eTicket and update the state of the eTicket on the mobile communication device (e.g., change state from 'valid' to 'redeemed'). This prevents the user from re-using the eTicket. At some point when the mobile communication device re-acquires network connectivity, the client will then negotiate with the server and any artifacts with a state change (e.g., 'valid' to 'redeemed', etc.) on the client are then uploaded to the server (e.g., either in batch mode or one task at a time).

The client (in ONLINE mode) will manage and refresh states of all artifacts from the server (including the recently added tasks) to present to the user. In one implementation, the server is the master repository. In the process of redeeming the eTicket, the eTicket is uploaded to the merchant (via secondary out-of-band communication link, e.g., RFID/NFC, Bluetooth, etc.). This is necessary for theater to update their inventory systems. The 3rdParty may liaise (via an internet connection) with the server to validate eTicket and authenticate the user.

POS (Point of Sale) Terminal

The point of sale terminal **150** illustrated in FIG. **5** is conventional, in that it has the capability of electronically reading information from a device equipped to transmit information in a format that it reads. Thus, the reader **152** within the point of sale terminal **150** can be of one or many types. If the point of sale terminal reader **152** includes the provision for NFC communications, then simply bringing the secure element **130** with the NFC transceiver will cause initiation of a transaction and the transmission of the identification code associated with the secure element **130** and thus the user.

In one implementation, various software that is downloaded into the memory **126** of the radio element **120** and the secure memory **132** of the secure element **130**, along with software resident on the management server **180**, cooperate at a layer that is above the physical layer of the communications, in order for the desired transaction to occur. This software is implemented using based upon known knowledge of mobile communication device **110** internals and application platforms, NFC, smartcard internals and application platforms, payment protocols (e.g. PayPass), and the working/workflow associated with POS and POE terminals, and the transaction and management servers. In addition, the present invention provides for piggybacking a tunneling protocol on top of the payment protocol, so that the secure elements **130** can communicate with the transaction server **170** and/or the manage-

ment server **180**, without modification to the POS terminal **150** or the POE terminal **190**. As such, this includes software within the secure element **130** that embeds the required information in fields which will not adversely affect the performance of the POS terminal **150** and/or the POE terminal **190**, and also software in transaction server **170** that will extract the piggybacked payload, associate the payload with the management server **180** if needed, and then authenticate, authorize, and execute transfers of transaction information to the management server **180**. In one implementation, the piggybacked payload is sent, instead of to the transaction server **170**, to the management server **180**, which can then associate the transaction and notify the transaction server **170**, the POS terminal **150** and/or the POE terminal as needed.

In one implementation, the management server **180** has the capability of storing codes that are from a variety of different mobile communication devices. Thus, codes that are associated with a smart card having an RFID can be stored, as can be codes stored from an RFID sticker, as well as codes that are associated with a smart card that communicates using a slide reader, Bluetooth, or an NFC channel, for example. As such, the management server **180** can store user personal and credit and transactional information and history, including a code associated with the user, for a variety of different mobile communication devices, thereby allowing a system which can scale.

FIGS. **6A-6D** illustrate a flowchart of a transaction in accordance with one implementation, and the various steps that are included in the transaction, with reference to which of the various devices are implementing this step. Referring to FIG. **6A**, a user first waves a mobile communication device **530** (e.g., a NFC device or device having an attached sticker) across (or near) a POS terminal **540**. The POS terminal **540** identifies the technology associated with the mobile communication device, a payment method, user credentials, and payment credentials. Irrespective if t mobile communication device is a NFC-Phone or includes an attached sticker, the mobile communication device sends to the POS Terminal **540** payment credentials including optional credentials (e.g., WalletID). As shown in FIG. **6B**, using optional credentials (e.g., WalletID), contact is made with a transaction server **510** to request payment credentials. The POS terminal **540** determines if a security code prompt (e.g., a PIN) is needed? If yes, a prompt is made for the security code (PIN) on the POS terminal **540** and the process continues with processing of the payment. Otherwise, the POS terminal **540** simply proceeds with processing of the payment. As an alternative, the POS terminal **540** can integrate via the back office to a management server **510** and trigger a PIN prompt on the mobile communication device. In such a case, the user can enter the PIN on the mobile communication device (instead of through the POS terminal **540**). The POS terminal **540** hands processing to a payment broker.

Referring to FIG. **6C**, assuming the POS terminal **540** was capable of 2-way communication, if the POS terminal **540** determines that the mobile communication device is a NFC Phone, the POS terminal **540** can write digital artifacts (e.g, eReceipts, eTickets, eCoupons, etc.) to the mobile communication device. Non-secure data is stored in the mobile communication device. Otherwise, the POS terminal **540** sends optional digital artifacts to the management server **510**. As part of an out-of-band sync between the management server **510** and the mobile communication device, the non-secure digital artifacts are downloaded and stored in the mobile communication device. Secure digital artifacts are down-

loaded to the mobile communication device and stored on a secure element of the mobile communication device (if possible).

In FIG. 6D, upon successful payment processing and assuming the POS terminal 540 was capable of 2-way communication, if the POS terminal 540 determines that the mobile communication device is not an NFC Phone, the POS terminal 540 triggers the management server 510 of payment processing completion. Note, this can be time delayed due to a difference when a payment is posted and cleared. The management server 510 can send a notification to the mobile communication device (via SMS, etc.). Since the mobile communication device could be shutdown, the notification will wake-up the mobile application running on the mobile communication device, and initiate SYNC operations between the management server 510 and the mobile application (or client). Any pending digital artifacts (including notifications, etc.) are displayed on the mobile communication device.

The present invention, as described previously, allows for various different programs to exist within the memory 126 of the radio element 120, as well as in the secure memory 132 of the secure element 130.

#### Mobile Tickets (eTickets)

In one implementation, a mobile ticket (also referred to herein as “electronic ticket” or “eTicket”) includes both a unique code that is sent to the consumer’s cell phone and a database that allows for the validation of the consumer using their cell phone number and the unique code. The mobile ticket can be used at kiosks in addition to interfacing with a ticket agent. The mobile ticket may be used with or without cell phones equipped with radio technology (i.e., RFID or NFC). In operation, a mobile ticket works when the user is sent a unique code (alpha-numeric, numeric, etc.) to their cell phone. The user is validated as a customer by their cell phone number and their code. If these match the information stored in a central database, the user is allowed admission into a venue by either manual validation by a ticket agent or automatically using RFID or NFC technology.

In general, an electronic ticket can be delivered to a mobile device and allow a consumer admission into a sports venue, entertainment venue (e.g. concert or movies), or other point of sale location either manually if the consumer displays the electronic ticket to an agent who may issue a paper ticket to the consumer or automatically if the consumer waves their cell phone (if equipped with a radio transmitter) over a POS device which contains a radio receiver. In one implementation, an electronic ticket (or tickets) is selected by viewing an image of the venue seating map. The seating map can be rendered on the mobile device. Users can zoom in/out of the seating map. As User zooms in, additional layers (details, info, etc.) is presented. For example, a user can view Venue->Quadrant->Level->Section->Row. The ability to zoom in/out and present additional levels of details can be processed either on the mobile device (Client) or on the Content Server, the end result is an updated image rendered on the mobile device. In one implementation, seats are color coded to represent availability and price. In this manner, seat inventory (what’s available and at what price) can be illustrated graphically. Once user has navigated to lowest level, the image is granular enough to select individual seats. In one implementation, a seat selection will automatically cause a price to be calculated. Any service fee can be included in the ticket price. Once user confirms purchase, reservation request is sent to ticket inventory system. If reservation is successful, a valid electronic ticket is returned to the mobile device.

The present invention can also be interfaced with certain known and implanted payment protocols, such as Paypass. For implementing these additional payment protocols, implementation of streaming communication protocols (in the full NFC case), protocols for session setup, and configuration of communications modules and secure data areas as needed is necessary, taking into account the communication protocol used (e.g. NFC, Bluetooth, WIFI, CDMA, 3.sup.rd Generation CDMA for example) as well as file transfer protocols and facilities access protocols. In particular, in implementing such protocols, the ability to extract transaction information from the POS terminal 150 to the secure element 130 can be provided during the course of the local interaction between the POS terminal 150 and the secure element 130. For instance, the implementation of PayPass within the invention will take note, and alert the application running on the radio processor 123 that a purchase or purchase attempt has occurred, as noted above in the context of the alert discussion. In one implementation, a feature is provided that permits information passed via the PayPass protocol to the POS terminal 150 (and thence to the transaction server 170) to be augmented with additional fields containing the elements of the tunneling protocol, for subsequent processing by the transaction server 170, either directly, or through the management server 180.

The two transaction workflows that have been specifically discussed above are the credit card and ticketing workflows. Other transaction flows can also be implemented. Debit card and cash card transactions are similar to credit card transactions, with variations being implemented to account for the differences that exist in those types of transactions, which types of transactions are well understood. Coupons can be implemented with the invention, in much the same manner as tickets, though coupons can be transmitted without there being payment. Many of the transaction types noted herein will, as is apparent, require communication between the secure element 130 and the radio element 120. As such, due to that requirement, a significant part of the preceding discussion has been directed to how to implement that communication, particularly for mobile communication devices 110 that are not manufactured to allow for such communications.

An example of a typical transaction requiring such communication between the secure element 130 and the radio element 120 is one in which the POS terminal 150 allows for the transfer of detailed purchase information from the POS terminal 150 to the secure element 130, as well as transactional information from the POS terminal 150 and/or the transaction server 170 to the management server 180. The management server 180 can then also communicate with the radio element 120 via the radio channel. This allows for the matching and reconciliation of detailed purchase information and, if the transaction fails, failure details can be matched to the purchase information, and forwarded in real-time to the user via the radio element 120. In one implementation, there is included the provision for different phones to communicate the results of a transaction, particularly using the POS transceiver or one of the Bluetooth/Wifi transceivers. In this implementation, after a transaction has been completed with one of the mobile communication devices 110a, another mobile communication device 110b can receive information regarding the transaction completed. Thus, for instance, if mobile communication device 110a purchases two tickets, one of the tickets can be transmitted to the mobile communication device 110b by each using a POS transceiver or one of the Bluetooth/Wifi transceivers.

Although the present invention has been particularly described with reference to implementations discussed

15

above, various changes, modifications and substitutes are can be made. Accordingly, it will be appreciated that in numerous instances some features of the invention can be employed without a corresponding use of other features. Further, variations can be made in the number and arrangement of components illustrated in the figures discussed above.

What is claimed is:

1. A method for transmitting data between a mobile communication device and a remote server, the method comprising:

attaching, by a user, a secure element to an exterior of the mobile communication device, wherein the secure element is not electrically connected to the components in the mobile communication device, wherein the secure element includes:

a memory for storing a payment application and payment credentials associated with a payment account, the execution of the payment application facilitating the transfer of the payment credentials to a Point-of-Sale (POS) terminal; and

a wireless transceiver that sends transaction data including the payment credentials associated with the executed payment application through a second communication channel to the POS terminal, the second communication channel being different from a first communication channel through which the mobile communication device communicates voice data, the payment application executed in response to an induction-based trigger from the POS terminal;

wirelessly transmitting the transaction data associated with the executed payment application through the second communication channel to the POS terminal using the wireless transceiver to perform a POS transaction;

receiving manual user authentication information at the POS terminal entered by the user through the mobile communication device, wherein the payment account is authenticated, wherein the authentication is performed by a remote server after the payment application has been triggered by the POS terminal and after payment credentials have been transferred to the POS terminal but prior to the payment being processed and completed; receiving a short message service (SMS) response from the remote server associated with the payment at the mobile communication device wherein the SMS response is stored in memory of the mobile communication device; generating a command for a particular mobile financial transaction function using the client application in the mobile communication, wherein the command is associated with the POS transaction;

transmitting the command as one or more SMS messages to the remote server;

identifying a series of SMS messages associated with a mobile financial transaction at a pre-defined port for the mobile communication device, the identified SMS messages each having a number and an identifier embedded in a header and originating from the remote server, the series of SMS messages identified by the client application executing at the mobile communication device;

assembling the series of SMS messages identified at the pre-defined port into a predetermined order based on the number embedded in the header and as specified by the remote server, assembly of the series of SMS messages occurring as a result of the execution of the client application;

formatting the assembled SMS messages in accordance with a selected style sheet for a particular mobile financial transaction function at the mobile communication

16

device, wherein the style sheet is selected based on the identifier embedded in the header, wherein each different type of mobile financial transaction function and associated type of style sheet is associated with a different identifier, formatting of the messages occurring in response to execution of the client application at the mobile communication device; and

displaying the formatted SMS messages on a display of the mobile communication device as a part of the mobile financial transaction, the display of the formatted SMS messages resulting from the selected style sheet.

2. The method of claim 1, wherein the mobile financial transaction is for banking services or money management services.

3. The method of claim 1, wherein the client application executing at the mobile communication device is a rich client application.

4. The method of claim 1, further comprising transmitting a command from the mobile communication device to the remote server to request for a payment history for a user of the mobile communication device, and wherein the formatted SMS messages displayed at the mobile communication device are part of the series of SMS messages received at the mobile communication device and responsive to the transmitted command.

5. The method of claim 4, wherein the command is in SMS message format.

6. The method of claim 5, wherein the command involves a plurality of SMS messages transmitted to the remote server.

7. The method of claim 1, further comprising receiving an acknowledgment of the command from the remote server.

8. The method of claim 1, wherein the number includes an indicator of a total number of messages in a series of SMS messages related to the mobile financial transaction.

9. The method of claim 1, further comprising: determining that a respective SMS message of the series of SMS messages related to the mobile financial transaction has not arrived at the wireless communication device within a specified time interval; and transmitting a request to the remote server to retransmit the respective SMS message.

10. The method of claim 1, further comprising transmitting an acknowledgement of an SMS message from a series of SMS messages to the remote server.

11. The method of claim 1, wherein the series of SMS messages received at the mobile communication device are in response to one or more commands generated by the client application at the mobile communication device, the one or more commands converted into one or more SMS messages and transmitted to the remote server through a predefined logical port at the mobile communication device.

12. The method of claim 11, wherein the command is a request for an account balance.

13. The method of claim 11, wherein the command is a request for a bill payment transaction.

14. The method of claim 11, wherein the command is for a transfer of funds.

15. The method of claim 14, wherein the transfer of funds is based on an account number.

16. The method of claim 14, wherein the transfer of funds is based on a mobile wallet identification number associated with a user of the mobile communication device.

17. The method of claim 14, wherein the transfer of funds is based on an ACH transaction code.

18. The method of claim 1, wherein the command is to load funds into a mobile payment account.

17

19. The method of claim 1, wherein the command is to unload funds from a mobile payment account.

20. The method of claim 1, wherein the command is to synchronized financial data between the remote server and the mobile communication device.

21. The method of claim 1, wherein the command is to create a later executed financial transaction in an online or an offline mode.

22. The method of claim 1, wherein the command is to store transaction data.

23. The method of claim 1, wherein the series of SMS messages are associated with a receipt for a previous NFC based transaction device.

24. The method of claim 23, wherein the remote server is communicatively coupled to an POS terminal.

18

25. The method of claim 23, where the remote server is communicatively coupled to a POE terminal.

26. The method of claim 1, wherein the number embedded in the header and as specified by the remote server is different from an order of the series of SMS messages as determined by a network operator, and wherein the remote server order overrides that of the network operator.

27. The method of claim 1, wherein one or more of the series of SMS messages are encrypted by the client application for storage at the mobile communication device.

28. The method of claim 1, wherein the client application executing at the mobile communication device is a thin client application.

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