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[54] **ELECTRONIC TRANSFER SYSTEM AND METHOD**

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[21] Appl. No.: **572,425**

[22] Filed: **Dec. 14, 1995**

[51] **Int. Cl.**[6] **H04K 1/00**

[52] **U.S. Cl.** **580/21**; 380/25; 380/29

[58] **Field of Search** 380/21, 25, 23, 380/30, 29

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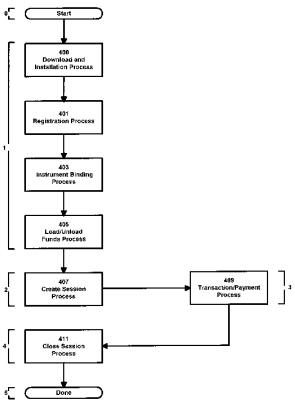
[57] **ABSTRACT**

A system and method relating to secure communications in a communication network is disclosed. The invention uses sessions having limited duration to enable parties to communicate securely in the communication network. The session of one party is independent from the session of another party. The sessions are linked at a server which confirms that the sessions are valid.

In a preferred embodiment, the secure communications occur in an electronic transfer system. In the electronic transfer system, a customer and a merchant can conduct a transaction wherein the customer can purchase a product from the merchant and pay for the product using electronic funds.

25 Claims, 73 Drawing Sheets



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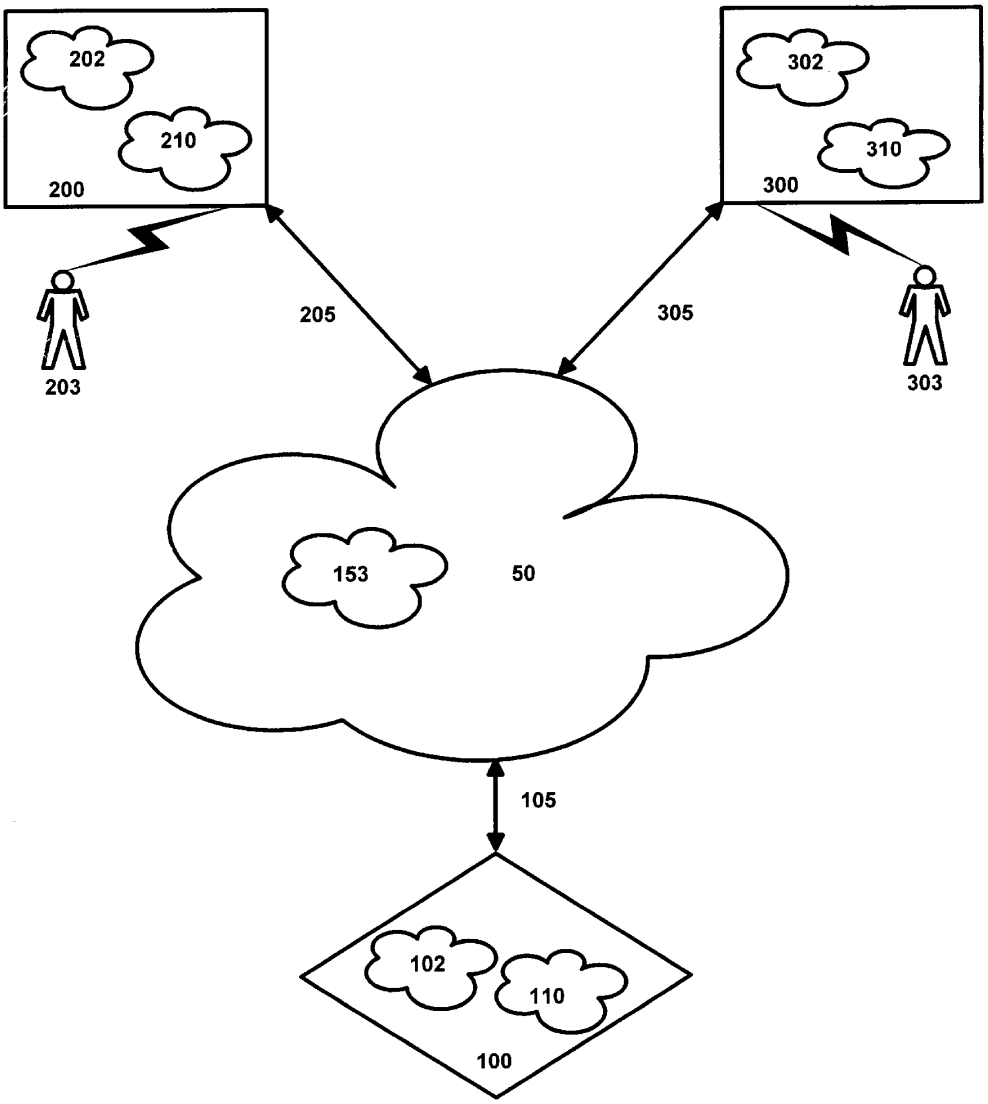


Figure 1

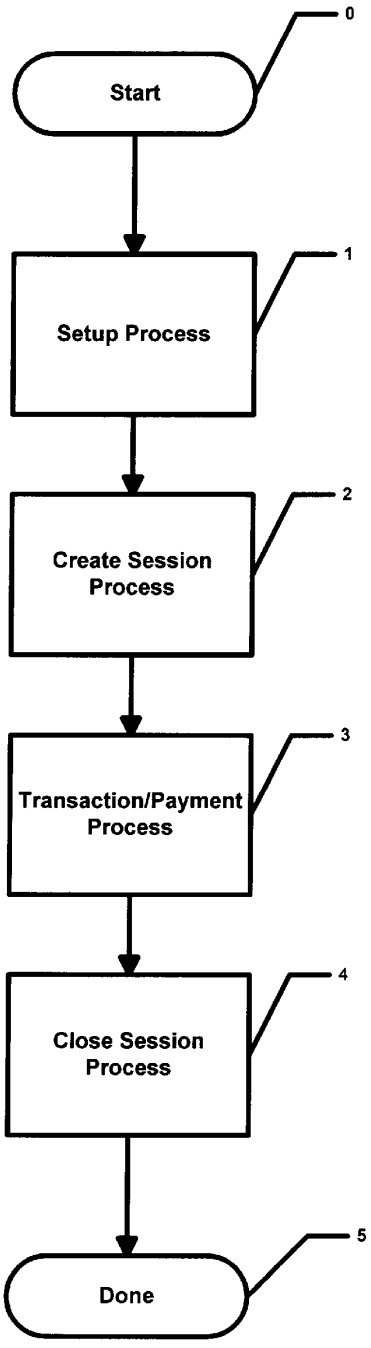
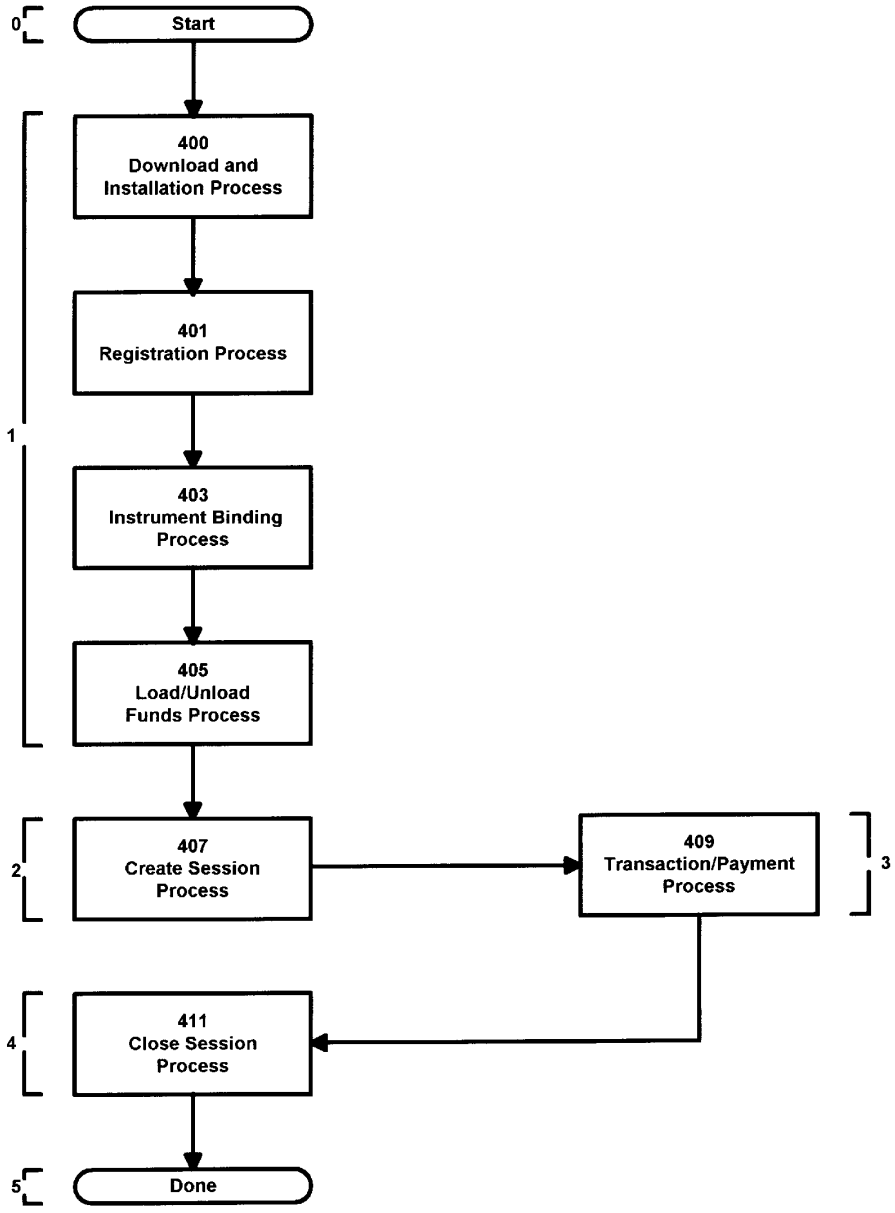

0
Start
1
Setup Process
2
Create Session Process
3
Transaction/Payment Process
4
Close Session Process
5
Done

Figure 2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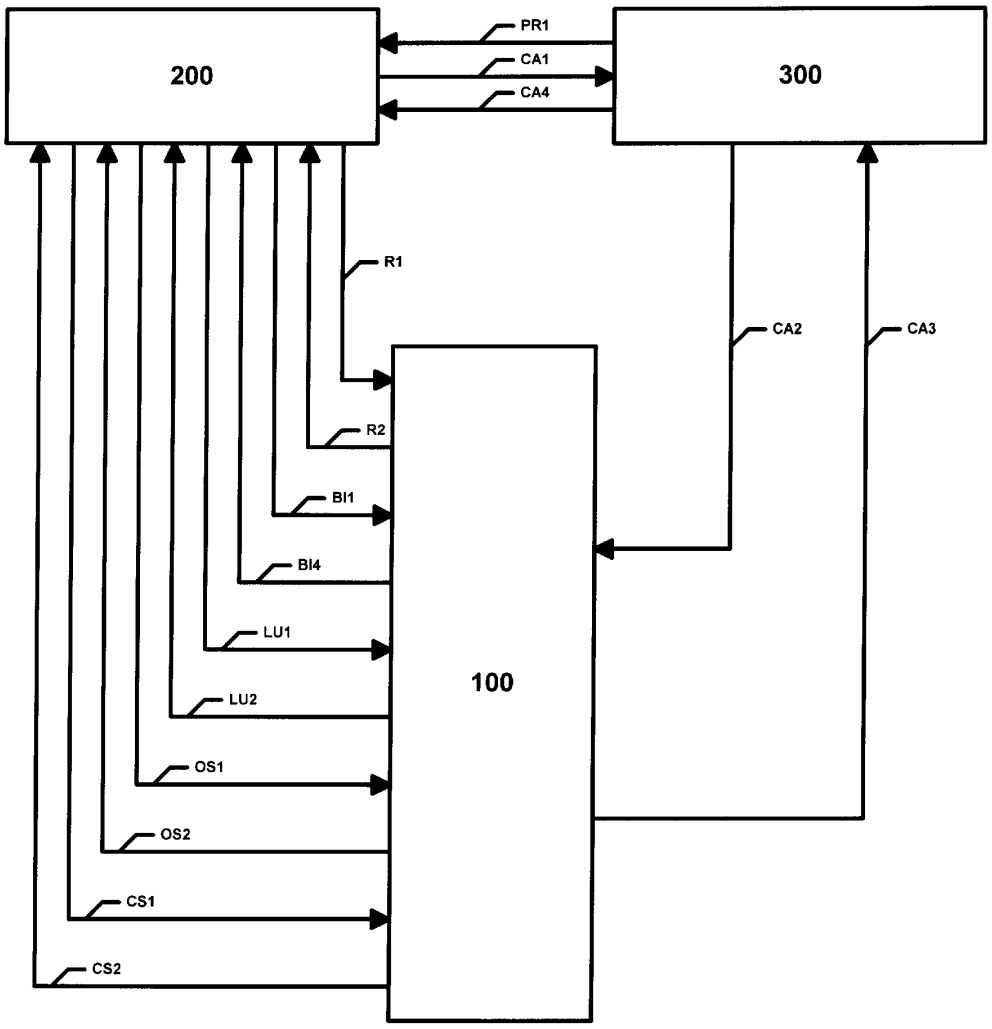
Start
400
Download and
Installation Process
401
Registration Process
1
403
Instrument Binding
Process
405
Load/Unload
Funds Process
2
407
Create Session
Process
409
Transaction/Payment
Process
3
4
411
Close Session
Process
5
Done

Figure 3A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300
100
PR1
CA1
CA4
R1
R2
BI1
BI4
LU1
LU2
OS1
OS2
CS1
CS2
CA2
CA3

Figure 3B

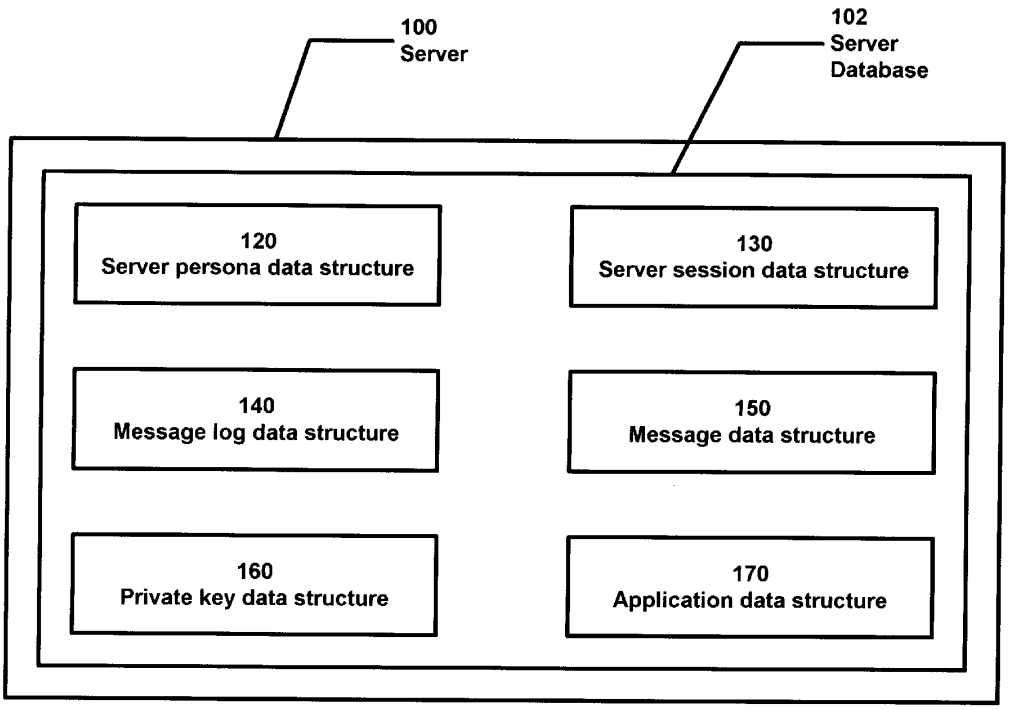

100
Server
102
Server
Database
120
Server persona data structure
130
Server session data structure
140
Message log data structure
150
Message data structure
160
Private key data structure
170
Application data structure

Figure 4A

Figure 4B

Table Illustrating Server Persona Data Structure 120

120.1

120A	persona-id
120B	email
120C	public-key
120D	date-registered
120E	language
120F	autoclose-passphrase
120G	cash-container
120H	instrument-binding-data
120I	agreements

Figure 4C

Table Illustrating Fields of Cash-Container-Data 120G

120G.1	Currency
120G.2	Available-balance
120G.3	On-hold-balance
120G.4	Agency-account-number

Figure 4D

Table Illustrating Fields of Instrument Binding Data 120H

120H.1	Persona-ID
120H.2	Instrument-Type
120H.3	Instrument-Sub-Type
120H.4	Instrument-Number
120H.5	Instrument-SubNumbers
120H.6	Instrument-Native-Currency
120H.7	Legal-Agreements
120H.8	Instrument-Prefix
120H.9	Instrument-Hash
120H.10	Issuer-Identification-Number
120H.11	Instrument-Holder-Name
120H.12	Instrument-Holder-Address
120H.13	Instrument-Bind-Date
120H.14	Instrument-First-Used-Date
120H.15	Binding-Status
120H.16	Sale-Transaction-Enabled
120H.17	Sale-Transaction-Limit
120H.18	Credit-Transaction-Enabled
120H.19	Credit-Transaction-Limit
120H.20	Load-Cash-Enabled
120H.21	Load-Cash-Transaction-Limit
120H.22	Unload-Cash-Enabled
120H.23	Unload-Cash-Transaction-Limit
120H.24	AutoClose-Binding
120H.25	Sale-Transaction-Limit-Time
120H.26	Credit-Transaction-Limit-Time
120H.27	Load-Transaction-Limit-Time
120H.28	Unload-Transaction-Limit-Time

Figure 4E

Table Illustrating Server Persona Data Structure 120

120.2

120AA	persona-id
120BB	email
120CC	public-key
120DD	date-registered
120EE	content-language
120FF	autoclose-passphrase
120GG	cash-container
120HH	instrument-binding-data
120II	agreements

Figure 4F

Table Illustrating Fields of Cash-Container-Data 120GG

120GG.1	Currency
120GG.2	Available-balance
120GG.3	On-hold-balance
120GG.4	Agency-account-number

Figure 4G

Table Illustrating Fields of Instrument Binding Data 120HH

120HH.1	Persona-ID
120HH.2	Instrument-Type
120HH-3	Instrument-Sub-Type
120HH.4	Instrument-Number
120HH.5	Instrument-SubNumbers
120HH.6	Instrument-Native-Currency
120HH.7	Legal-Agreements
120HH.8	Instruments-Prefix
120HH.9	Instrument-Hash
120HH.10	Issuer-Identification-Number
120HH.11	Instrument-Holder-Name
120HH.12	Instrument-Holder-Address
120HH.13	Instrument-Bind-Date
120HH.14	Instrument-First-Used-Date
120HH.15	Binding-Status
120HH.16	Sale-Transaction-Enabled
120HH.17	Sale-Transaction-Limit
120HH.18	Credit-Transaction-Enabled
120HH.19	Credit-Transaction-Limit
120HH.20	Load-Cash-Enabled
120HH.21	Load-Cash-Transaction-Limit
120HH.22	Unload-Cash-Enabled
120HH.23	Unload-Cash-Transaction-Limit
120HH.24	AutoClose-Binding
120HH.25	Sale-Transaction-Limit-Time
120HH.26	Credit-Transaction-Limit-Time
120HH.27	Load-Transaction-Limit-Time
120HH.28	Unload-Transaction-Limit-Time

Figure 4H

Table Illustrating Customer Session Record of Server Session Data Structure 130

130.1

130A	Session-ID
130B	Session-Key
130C	Session-Salt
130D	Currency
130E	Opening-Amount
130F	Current-Amount
130G	Opening-Date
130H	Closing-Date
130I	Key-Use-Limit
130J	Key-Lifetime
130K	Persona-ID
130L	Status
130M	Memo
130N	Transaction-Data

Figure 4I

Table Illustrating Fields of Transaction Data 130N

130N.1	amount
130N.2	payer-session-id
130N.3	payee-order-id
130N.4	payee-session-id
130N.5	payer-index

Figure 4J

Table Illustrating Session Record of Server
Session Data Structure 130

130.2

130AA	Session-ID
130BB	Session-Key
130CC	Session-Salt
130DD	Currency
130EE	Opening-Amount
130FF	Current-Amount
130GG	Opening-Date
130HH	Closing-Date
130II	Key-Use-Limit
130JJ	Key-Lifetime
130KK	Persona-ID
130LL	Status
130MM	Memo
130NN	Transaction-Data

Figure 4K

Table Illustrating Field of Transaction Data 130NN

130NN.1	amount
130NN.2	payer-session-id
130NN.3	payee-order-id
130NN.4	payee-session-id
130NN.5	payee-index

Figure 4L

Table Illustrating Record 140.1 of Message Log Data Structure 140

140A	persona-id
140B	session-id
140C	transaction-number
140D	index
140E	incoming-message
140F	response-message

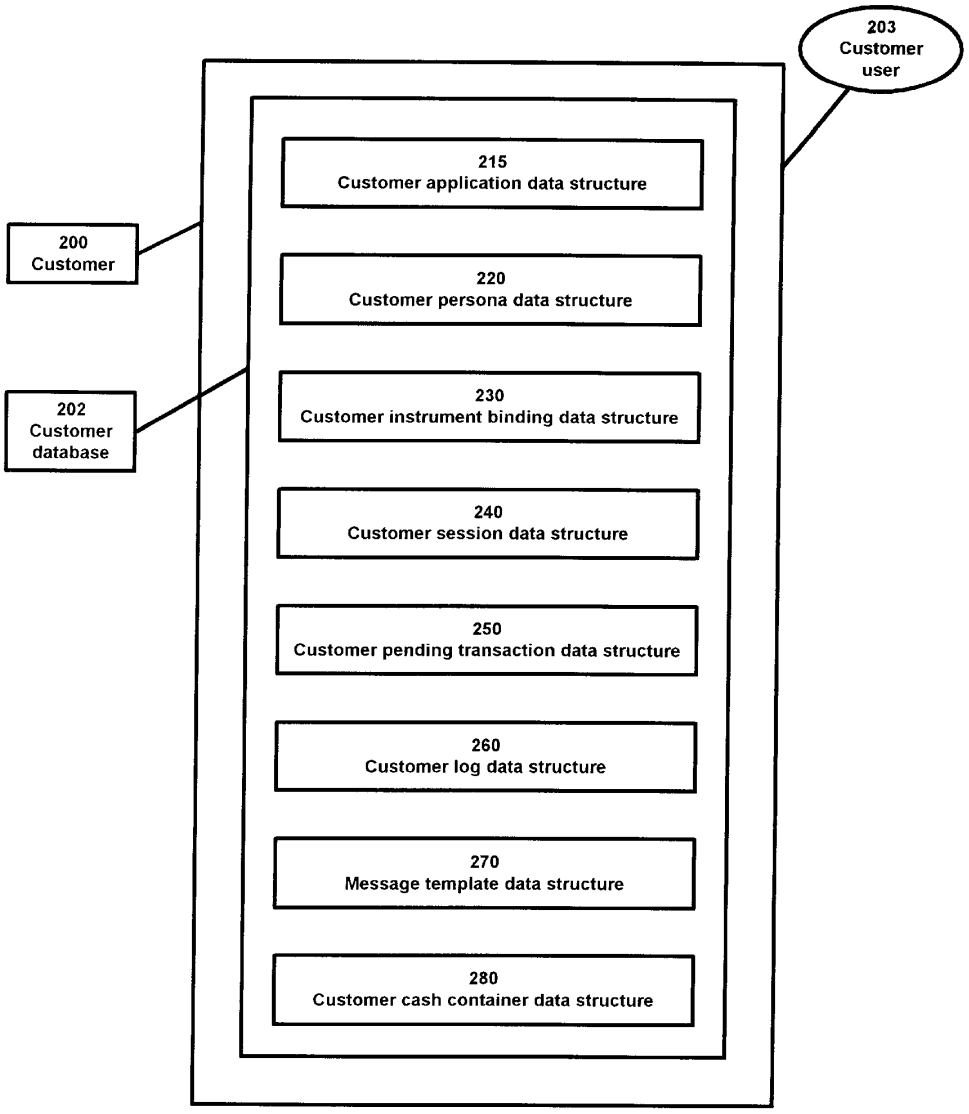

203
Customer
user
215
Customer application data structure
200
Customer
220
Customer persona data structure
230
Customer instrument binding data structure
202
Customer
database
240
Customer session data structure
250
Customer pending transaction data structure
260
Customer log data structure
270
Message template data structure
280
Customer cash container data structure

Figure 5A

Figure 5B

Table Illustrating Record of Customer Application Data Structure 215

215.1

215A	Server-100-public-key
215B	URL-of-server-100

Figure 5C

Table Illustrating Record of Customer Persona Data Structure 220

220.1

220A	persona-id
220B	email
220C	public-key
220D	autoclose-passphrase
220E	language
220F	default-name-and-address
220G	software-options
220H	private-key
220I	cash-container-data
220J	instrument-binding-data
220K	autoclose-account
220L	agreements
220M	active-sessions-data
220N	pending-log-data
220O	transaction-log-data

Figure 5D

Table Illustrating Record of Customer Instrument Binding Data Structure 230

230.1

230A	instrument-number
230B	instrument-description
230C	holder-name
230D	holder-address
230E	holder-city
230F	holder-country
230G	holder-zip-code
230H	holder-country-code
230I	holder-area-code
230J	holder-telephone
230K	currency
230L	transaction-sale-flag
230M	transaction-credit-flag
230N	unload-funds-flag
230O	load-funds-flag
230P	status
230Q	instrument-salt
230R	instrument-recurring-data
230S	agreements

Figure 5E

Table Illustrating Record of Customer Active Session Data Structure 240

240.1

240A	Session-ID
240B	Session-Key
240C	Session-Salt
240D	Currency
240E	Opening-Amount
240F	Current-Amount
240G	Index
240H	Memo
240J	Key-Use-Limit
240K	Key-Lifetime

Figure 5F

Table Illustrating Customer Pending Log
Data Structure 250

Record	Description
251	Pending Persona Registration/Update Persona Information
252	Pending Link/Update Financial Instrument Binding
253	Pending Cash Payment
254	Pending Load/Unload Funds
255	Pending Open Session
256	Pending Close Session

Figure 5G

Table Illustrating Record of Pending Registration/
Update Persona Information Record 251

251A	Transaction-Type
251B	Transaction-Number
251C	Transaction-Date/Time
251D	Software-Version
251E	Language
251F	Currency
251G	Requested-Persona-ID
251H	Email
251I	Autoclose-Passphrase
251J	Original-Transaction-String

Figure 5H

Table Illustrating Pending Link/Update Instrument Binding Record 252

252A	Transaction-Type
252B	Transaction-Number
252C	Transaction-Date/Time
252D	Software-Version
252E	Persona-ID
252F	Instrument-Number
252G	Customer-ID
252H	Name-On-Instrument
252I	Instrument-Expiration-Date
252J	Holder-Address
252K	Holder-City
252L	Holder-State
252M	Holder-Zip-Code
252N	Holder-Country
252O	Holder-Country-Code
252P	Holder-Area-Code
252Q	Holder-Telephone
252R	Description-Of-Instrument
252S	Instrument-Recurring-Data
252T	Instrument-Type
252U	Salt
252V	Autoclose-Account-Flag
252W	Original-Transaction-String

Figure 5I

Table Illustrating Pending Cash Payment Record 253

253A	Transaction-Type
253B	Transaction-Number
253C	Transaction-Date/Time
253D	Software-Version
253E	Persona-ID
253F	Order-ID
253G	Merchant-ID
253H	Amount
253I	Memo
253J	Pay-To-URL
253K	Session-ID
253L	Index
253M	Original-Transaction-String
253N	URL-cancel
253O	URL-success
253P	URL-failure

Figure 5J

Table Illustrating Pending Load/Unload Funds Record 254

254A	Transaction-Type
254B	Transaction-Number
254C	Transaction-Date/Time
254D	Software-Version
254E	Persona-ID
254F	Instrument-Account-Number
254G	Amount
254H	Account-Type
254I	Original-Transaction-String

Figure 5K

Table Illustrating Pending Open Session Record 255

255A	Transaction-Type
255B	Transaction-Number
255C	Transaction-Date/Time
255D	Software-Version
255E	Persona-ID
255F	Amount
255G	Key-Use-Limit-Requested
255H	Key-Lifetime-Requested
255I	Session-User-Description
255J	Currency
255K	Original-Transaction-String

Figure 5L

Table Illustrating Pending Close Session Record 256

256A	Transaction-Type
256B	Transaction-Number
256C	Transaction-Date/Time
256D	Software-Version
256E	Persona-ID
256F	Transaction-Log
256G	Session-ID
256H	Session-User-Description
256I	Original-Transaction-String

Figure 5M

Table Illustrating Customer Log Data Structure 260

Record	Description
261	Persona Registration/Update-Persona-Information Response
262	Link/Update Instrument Binding Response
263	Cash Payment Response
264	Load/Unload Funds Response
265	Open Session Response
266	Payment Request
267	Close Session Response

Figure 5N

Table Illustrating Persona Registration/Update Response Record 261

261A	Transaction-Type
261B	Transaction-Number
261C	Transaction-Date/Time
261D	Software-Severity-Code
261E	Software-Message
261F	Response-Code
261G	Response-Message
261H	Requested-Persona-ID
261I	Suggested-Persona-ID
261J	Email
261K	Language
261L	Currency

Figure 5O

Table Illustrating Link/Update Instrument Response Record 262

262A	Transaction-Type
262B	Transaction-Number
262C	Transaction-Date/Time
262D	Software-Severity-Code
262E	Software-Message
262F	Response-Code
262G	Response-Message
262H	Persona-ID
262I	Instrument-Number
262J	Instrument-Type
262K	Customer-ID
262L	Name-On-Instrument
262M	Instrument-Expiration-Date
262N	Holder-Address
262O	Holder-City
262P	Holder-State
262Q	Holder-Zip-Code
262R	Holder-Country
262S	Holder-Country-Code
262T	Holder-Area-Code
262U	Holder-Telephone
262V	Description-of-instrument
262W	Currency
262X	Issuer
262Y	Issuer-country
262Z	Autoclose-flag

Figure 5P

Table Illustrating Cash Payment Response Record 263

263A	Transaction-Type
263B	Transaction-Number
263C	Transaction-Date/Time
263D	Response-Code
263E	Response-Message
263F	Persona-ID
263G	Order-ID
263H	Merchant-ID
263I	Merchant-Message
263J	Amount
263K	User-Memo
263L	Session-Id
263M	Index

Figure 5Q

Table Illustrating Load/Unload Response 264

264A	Transaction-Type
264B	Transaction-Number
264C	Transaction-Date/Time
264D	Software-Severity-Code
264E	Software-Message
264F	Response-Code
264G	Response-Message
264H	Persona-ID
264I	Instrument-Account-Number
264J	Amount
264K	Fee
264L	Balance
264M	On-hold-balance

Figure 5R

Table Illustrating Open Session Response Record 265

265A	Transaction-Type
265B	Transaction-Number
265C	Transaction-Date/Time
265D	Software-Severity-Code
265E	Software-Message
265F	Response-Code
265G	Response-Message
265H	Persona-ID
265I	Amount
265J	Key-Use-Limit
265K	Key-Lifetime
265L	Session-ID
265M	Session-user-description
265N	Fee
265O	Balance

Figure 5S

Table Illustrating Payment Request Record 266

266A	Merchant-ID
266B	Order-ID
266C	Amount(s)
266D	Credit-Cards-Accepted
266E	Merchant-Note
266F	Pay-to-URL

Figure 5T

Table Illustrating Close Session Response Record 267

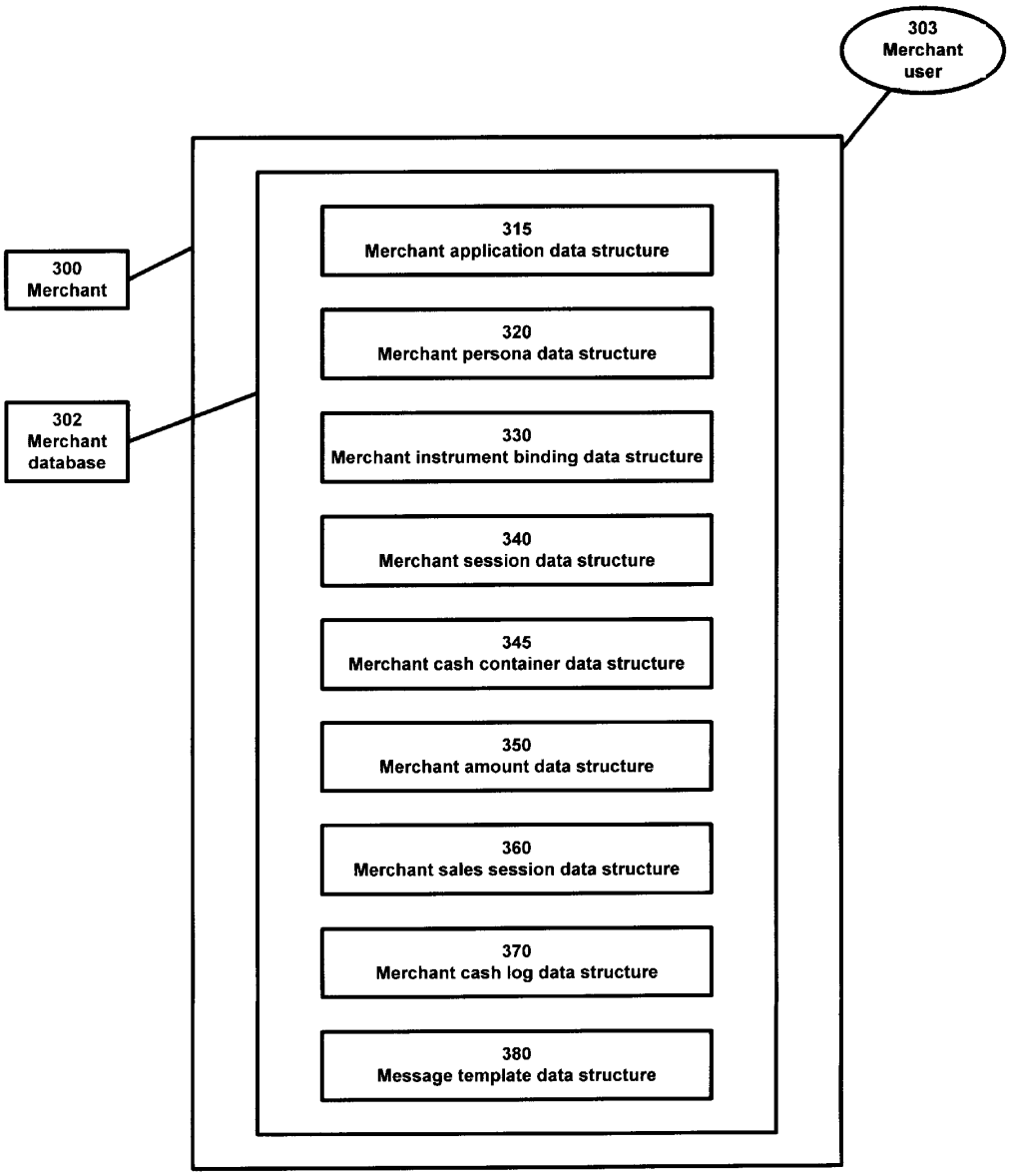
267A	Transaction-Type
267B	Transaction-Number
267C	Transction-Date/Time
267D	Software-Severity-Code
267E	Software-Message
267F	Response-Code
267G	Response-Message
267H	Persona-ID
267I	Amount
267J	Transaction-Log
267K	Fee

Figure 5U

Table Illustrating Record of Customer Cash Container Data Structure 280

280.1

280A	Currency
280B	Available-balance
280C	On-hold-balance


303
Merchant
user
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Merchant
302
Merchant
database
315
Merchant application data structure
320
Merchant persona data structure
330
Merchant instrument binding data structure
340
Merchant session data structure
345
Merchant cash container data structure
350
Merchant amount data structure
360
Merchant sales session data structure
370
Merchant cash log data structure
380
Message template data structure

Figure 6A

Figure 6B

Table Illustrating Record of Merchant Appliation
Data Structure 315

315A	Server-100-public-key
315B	URL-of-server-100

Figure 6C

Table Illustrating Record of Customer Persona Data Structure 320

320.1

320A	persona-id
320B	email
320C	public-key
320D	autoclose-passphrase
320E	language
320F	default-name-and-address
320G	software-options
320H	private-key
320I	cash-container-data
320J	instrument-binding-data
320K	autoclose-account
320L	agreements
320M	active-sessions-data
320N	pending-log-data
320O	transaction-log-data

Figure 6D

Table Illustrating Record of Merchant Instrument Binding Data Structure 330

330A	instrument-number
330B	instrument-description
330C	holder-name
330D	holder-address
330E	holder-city
330F	holder-country
330G	holder-zip-code
330H	holder-country-code
330I	holder-area-code
330J	holder-telephone
330K	currency
330L	transact-sale-flag
330M	transact-credit-flag
330N	unload-funds-flag
330O	load-funds-flag
330P	status
330Q	instrument-salt
330R	instrument-recurring-data
330S	agreements

Figure 6E

Table Illustrating Record of Merchant Session Data Structure 340

340.1

340A	Session-ID
340B	Session-Key
340C	Session-Salt
340D	Currency
340E	Opening-Amount
340F	Current-Amount
340G	Opening-Date
340H	Closing-Date
340J	Key-Use-limit
340K	Key-lifetime

Figure 6F

Table Illustrating Record of Merchant Cash-Container-Data Data Structure 345

345.1

345A	Currency
345B	Available-balance
345C	On-hold-balance

Figure 7A

Table Illustrating Record of Merchant Amount Data Structure 350

350A	Order-ID
350B	Amount-of-Transaction
350C	Flag

Figure 7B

Table Illustrating Record of Merchant Sales Session Data Structure 360

360A	Session-ID
360B	Session-Key
360C	Session-Salt
360D	Currency
360E	Opening-Amount
360F	Current-Amount
360G	Opening-Data
360H	Closing-Date
360I	Status
360J	Key-Use-limit
360K	Key-lifetime
360L	Persona-ID

Figure 7C

Table Illustrating Record of Merchant Cash Log
Data Structure 370

370A	Type
370B	Status
370C	Order-Id
370D	Customer-Session-ID
370E	Customer-Index
370F	Customer-Currency
370G	Merchant-Session-ID
370H	Merchant-Index
370I	Merchant-Currency
370J	Merchant-Amount-Requested
370K	Amount-Credited
370L	Fees-Paid
370M	Result-Code
370N	Type
370O	Status
370P	Transaction-Number
370Q	Requested-Session-Duration
370R	Requested-Session-Count
370S	Session-ID
370T	Result-Code

FIGURE 7D

Table Illustrating The Format of Sample Message 4000

4005	[header]
4013A	label1: value1
4013B	label2: value2
4017	opaque:
4050	[trailer]

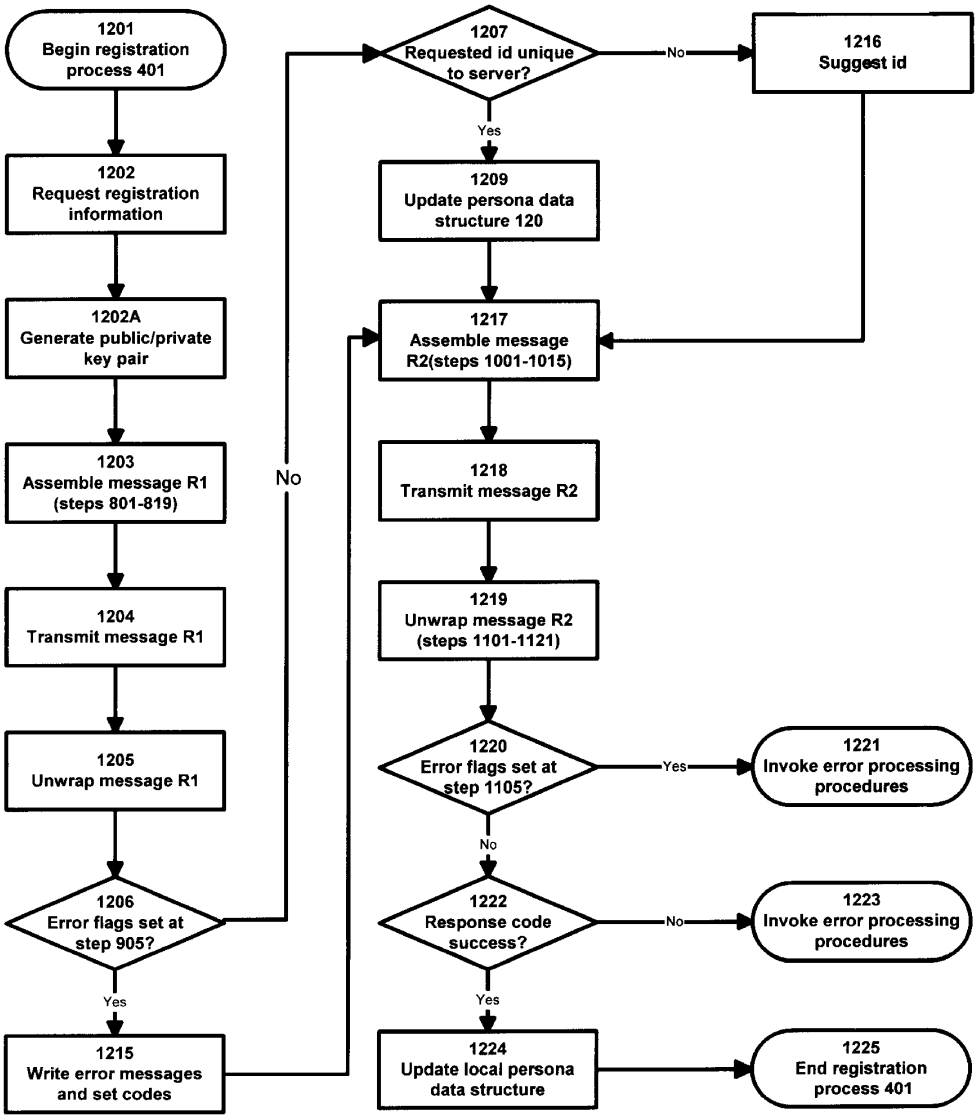
1201
Begin registration process 401
1202
Request registration information
1202A
Generate public/private key pair
1203
Assemble message R1 (steps 801-819)
1204
Transmit message R1
1205
Unwrap message R1
1206
Error flags set at step 905?
Yes
No
1215
Write error messages and set codes
1207
Requested id unique to server?
No
1216
Suggest id
Yes
1209
Update persona data structure 120
1217
Assemble message R2(steps 1001-1015)
1218
Transmit message R2
1219
Unwrap message R2 (steps 1101-1121)
1220
Error flags set at step 1105?
Yes
1221
Invoke error processing procedures
No
1222
Response code success?
No
1223
Invoke error processing procedures
Yes
1224
Update local persona data structure
1225
End registration process 401

Figure 8

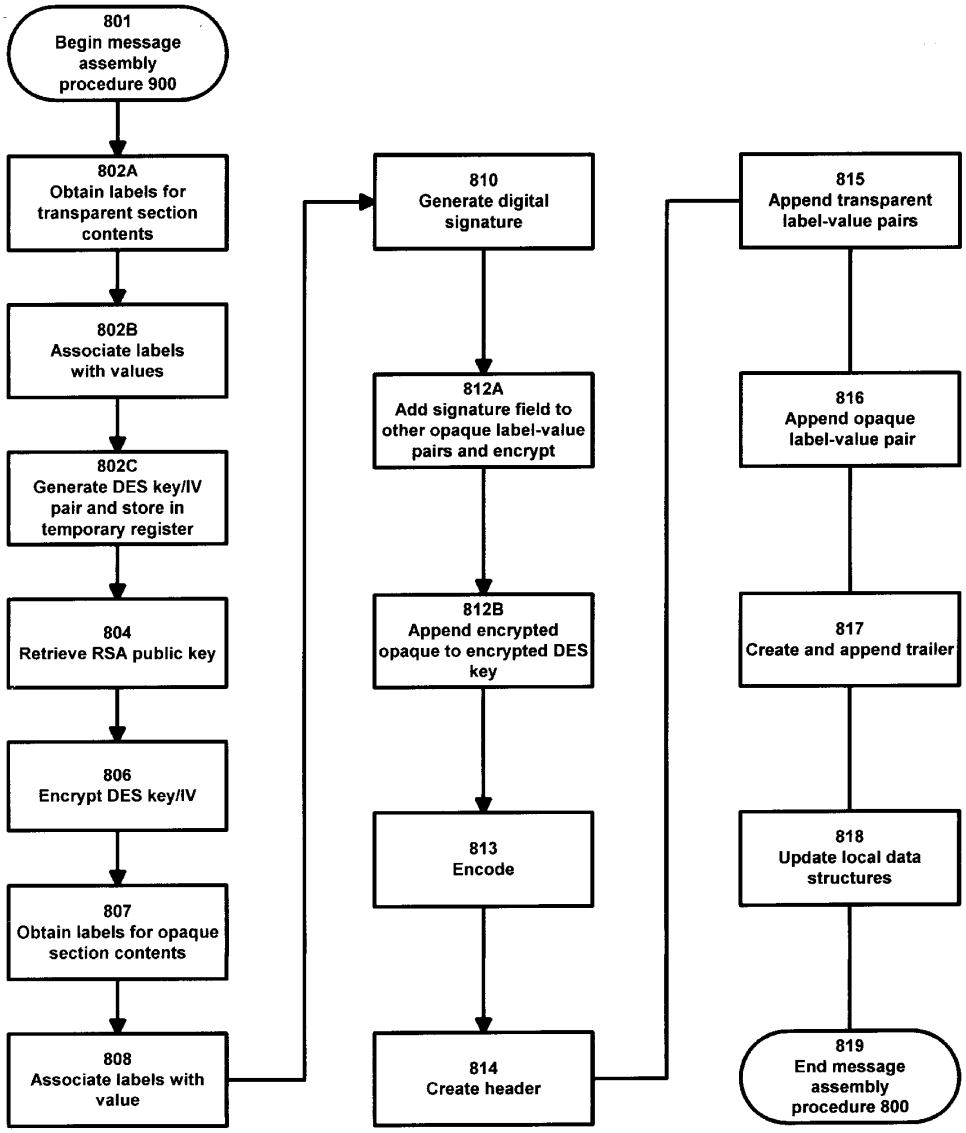
801
Begin message assembly procedure 900
802A
Obtain labels for transparent section contents
802B
Associate labels with values
802C
Generate DES key/IV pair and store in temporary register
804
Retrieve RSA public key
806
Encrypt DES key/IV
807
Obtain labels for opaque section contents
808
Associate labels with value
810
Generate digital signature
812A
Add signature field to other opaque label-value pairs and encrypt
812B
Append encrypted opaque to encrypted DES key
813
Encode
814
Create header
815
Append transparent label-value pairs
816
Append opaque label-value pair
817
Create and append trailer
818
Update local data structures
819
End message assembly procedure 800

Figure 9

Figure 10A

Table Illustrating The Format of Message R1

4205	[header]
4213A	transaction:
4213B	date:
4213C	serverkey:
4213D	service-category:
4217	opaque:
4250	[trailer]

Figure 10B

Table Illustrating The Opaque Section Contents of Message R1

4217A	type:
4217B	server-date:
4217C	swversion:
4217D	content-language:
4217E	default-currency:
4217F	requested-id:
4217G	email:
4217H	agreements:
4217I	autoclose-passphrase:
4217J	pubkey:
4217K	signature:

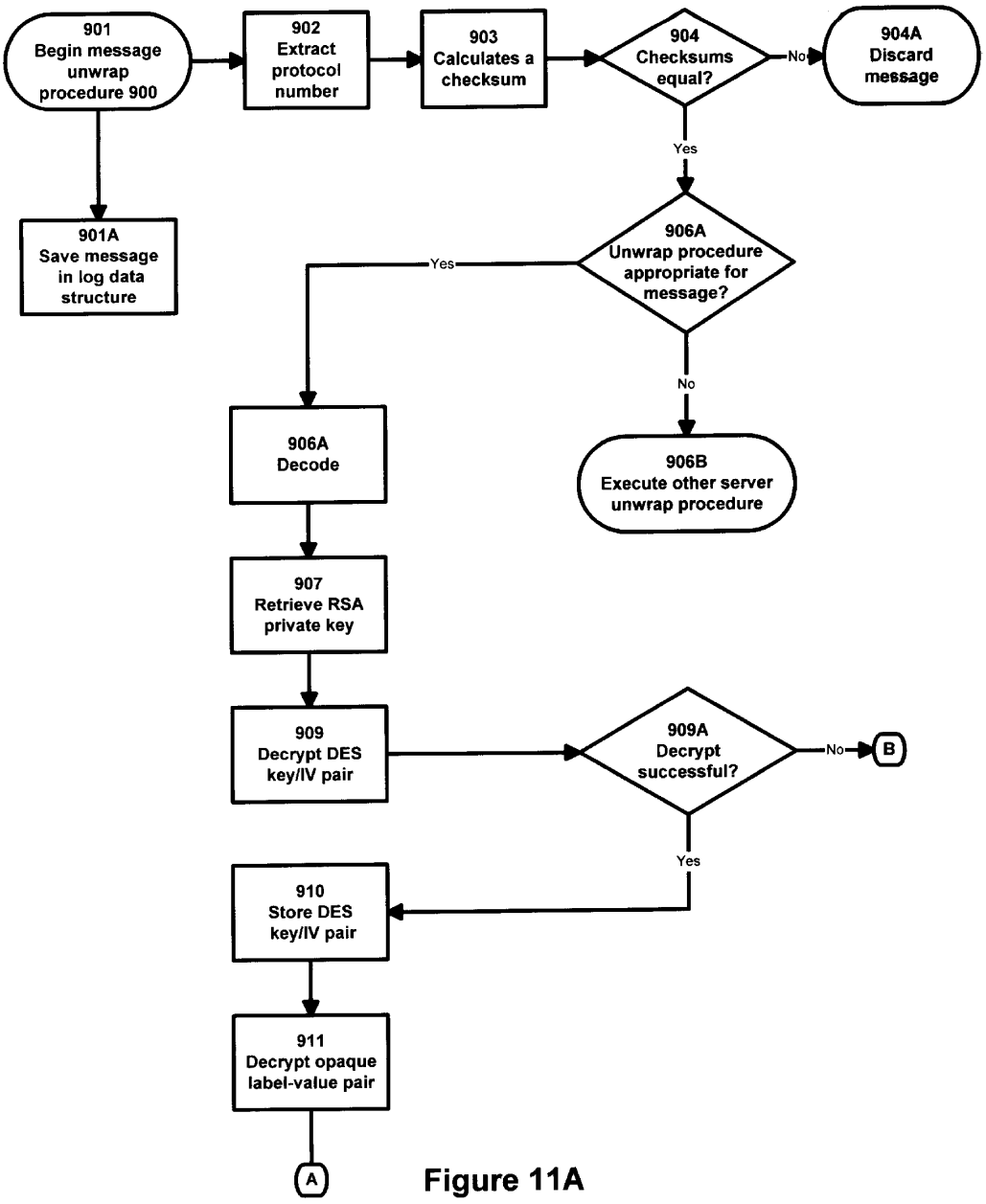
901
Begin message unwrap procedure 900
902
Extract protocol number
903
Calculates a checksum
904
Checksums equal?
No
904A
Discard message
Yes
901A
Save message in log data structure
906A
Unwrap procedure appropriate for message?
Yes
No
906A
Decode
906B
Execute other server unwrap procedure
907
Retrieve RSA private key
909
Decrypt DES key/IV pair
909A
Decrypt successful?
No
B
Yes
910
Store DES key/IV pair
911
Decrypt opaque label-value pair
A

Figure 11A

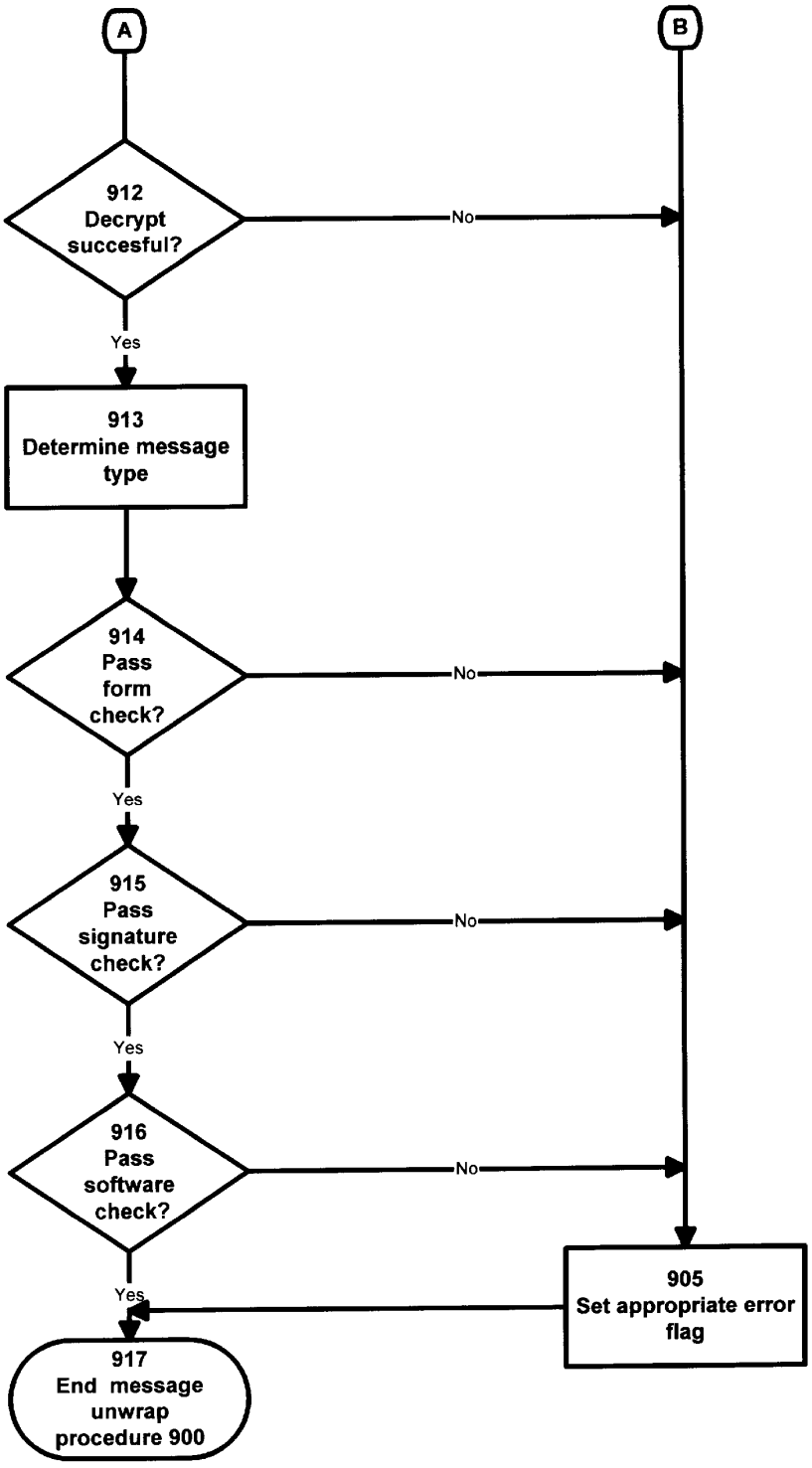
A
B
912
Decrypt
succesful?
No
Yes
913
Determine message
type
914
Pass
form
check?
No
Yes
915
Pass
signature
check?
No
Yes
916
Pass
software
check?
No
Yes
905
Set appropriate error
flag
917
End message
unwrap
procedure 900

Figure 11B

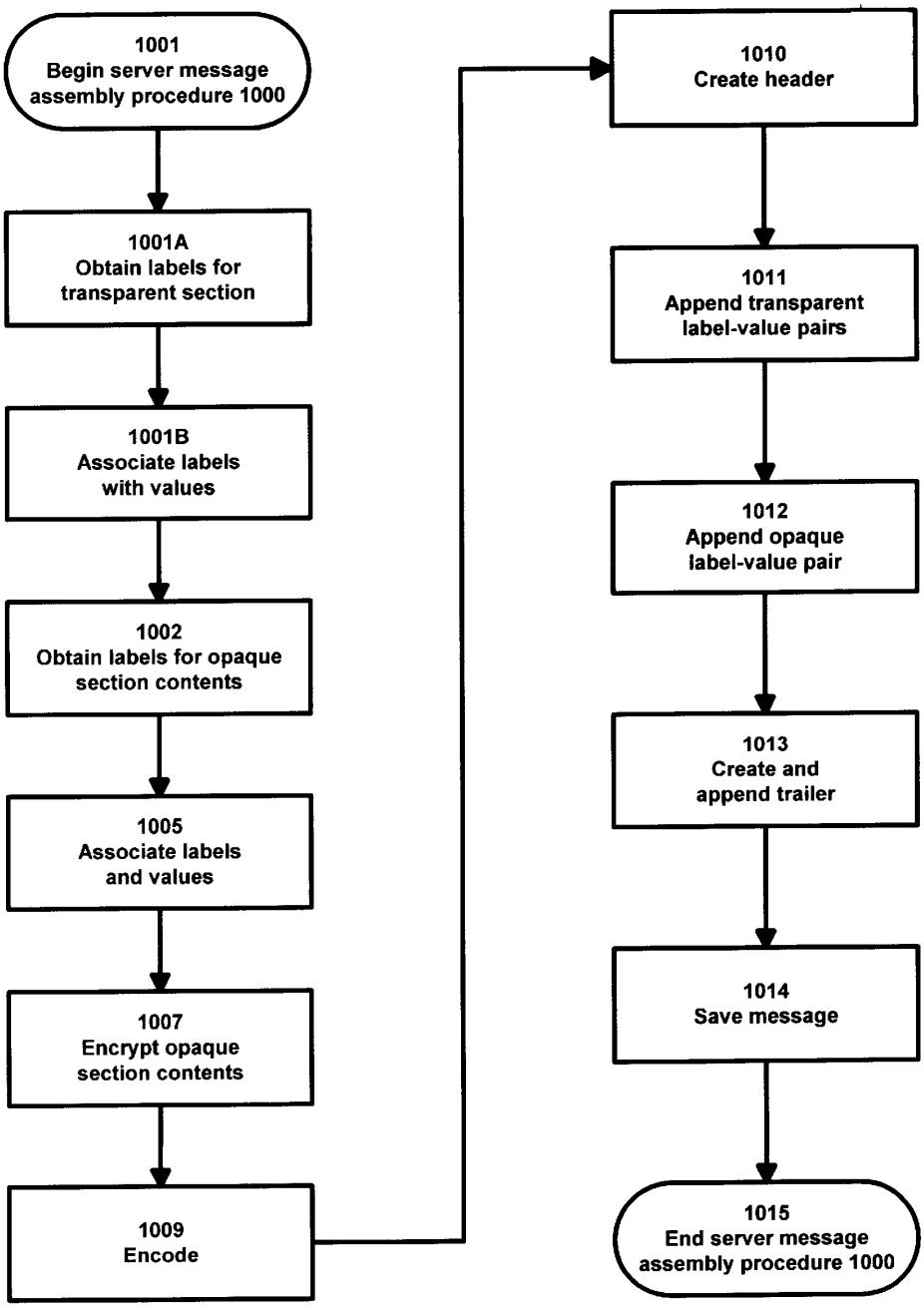
1001
Begin server message assembly procedure 1000
1001A
Obtain labels for transparent section
1001B
Associate labels with values
1002
Obtain labels for opaque section contents
1005
Associate labels and values
1007
Encrypt opaque section contents
1009
Encode
1010
Create header
1011
Append transparent label-value pairs
1012
Append opaque label-value pair
1013
Create and append trailer
1014
Save message
1015
End server message assembly procedure 1000

Figure 12

FIGURE 13A

Table Illustrating the Format of Message R2

4305	[header]
4313A	transaction:
4313B	date:
4313C	service-category:
4317	opaque:
4350	[trailer]

FIGURE 13B

Table Illustrating The Opaque Section Contents Of Message R2

4317A	type:
4317B	server-date:
4317C	requested-id:
4317D	response-id:
4317E	email:
4317F	response-code:
4317G	funds-waiting:
4317H	autoclose-passphrase:
4317I	pubkey:
4317J	swseverity:
4317K	swmessage:
4317L	message:

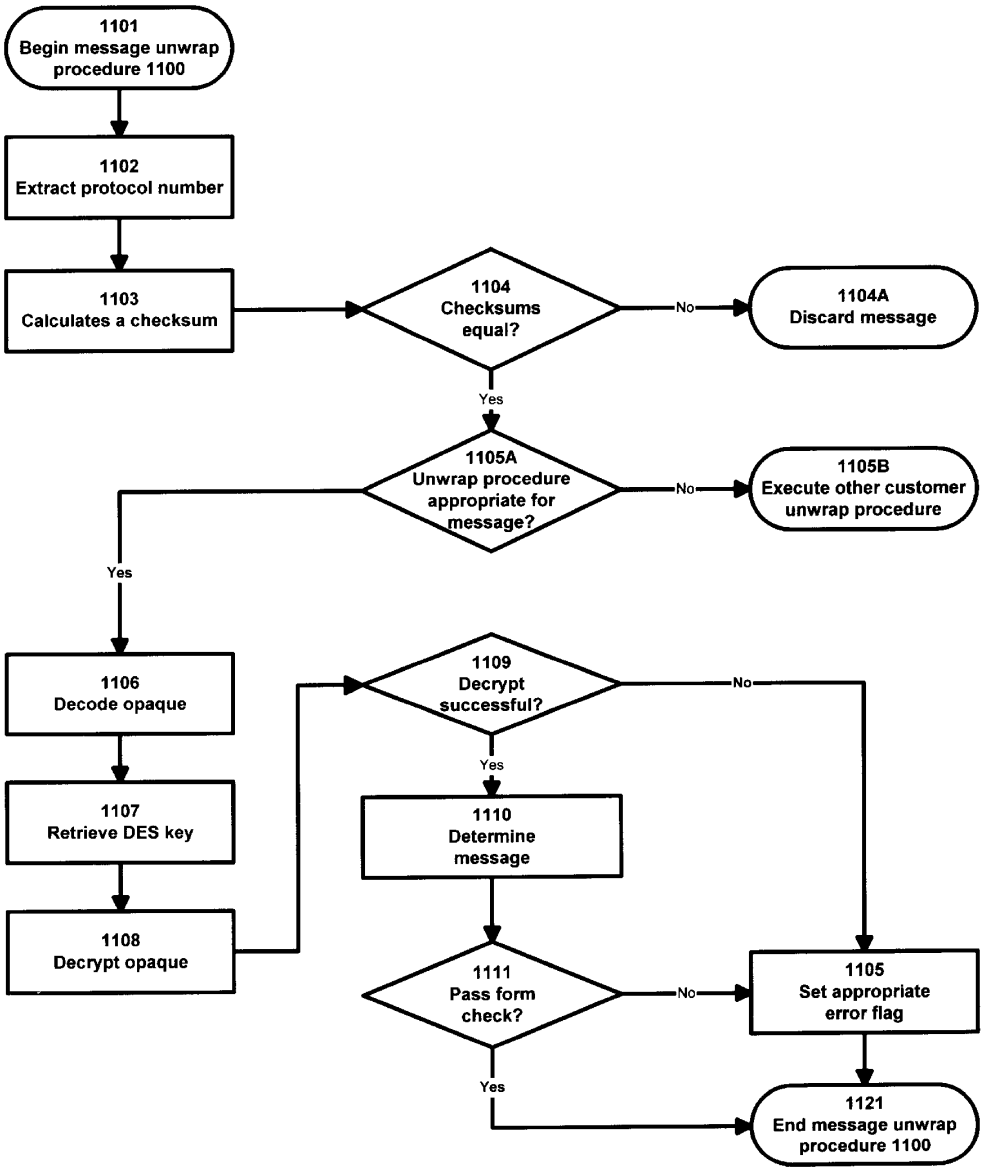
1101
Begin message unwrap procedure 1100
1102
Extract protocol number
1103
Calculates a checksum
1104
Checksums equal?
No
1104A
Discard message
Yes
1105A
Unwrap procedure appropriate for message?
No
1105B
Execute other customer unwrap procedure
Yes
1106
Decode opaque
1107
Retrieve DES key
1108
Decrypt opaque
1109
Decrypt successful?
No
Yes
1110
Determine message
1111
Pass form check?
No
1105
Set appropriate error flag
Yes
1121
End message unwrap procedure 1100

Figure 14

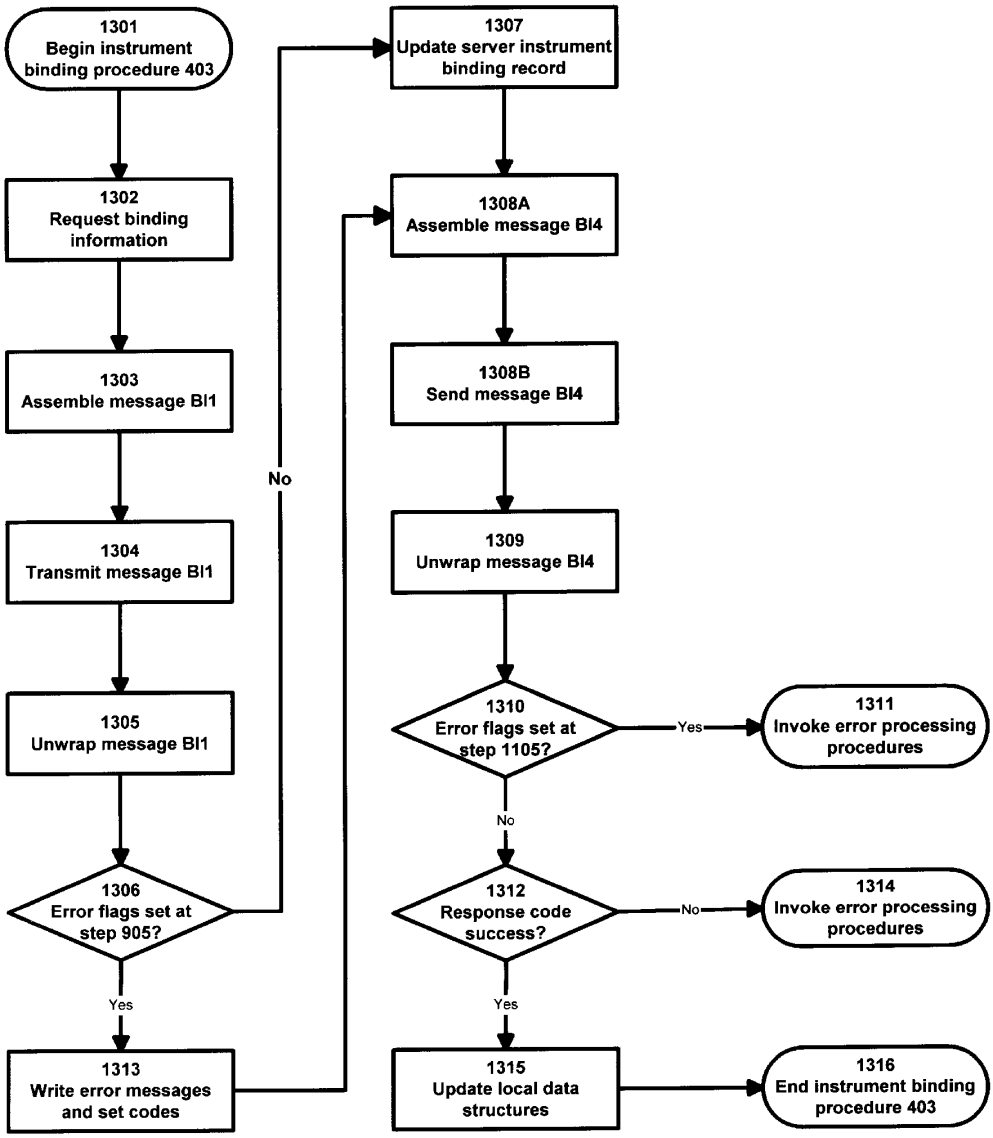
1301
Begin instrument binding procedure 403
1302
Request binding information
1303
Assemble message BI1
1304
Transmit message BI1
1305
Unwrap message BI1
1306
Error flags set at step 905?
No
Yes
1313
Write error messages and set codes
1307
Update server instrument binding record
1308A
Assemble message BI4
1308B
Send message BI4
1309
Unwrap message BI4
1310
Error flags set at step 1105?
Yes
1311
Invoke error processing procedures
No
1312
Response code success?
No
1314
Invoke error processing procedures
Yes
1315
Update local data structures
1316
End instrument binding procedure 403

Figure 15

FIGURE 16A

Table Illustrating The Format of Message BI1

4405	[header]
4413A	persona id:
4413B	transaction:
4413C	date:
4413D	serverkey:
4413E	service-category:
4417	opaque:
4450	[trailer]

FIGURE 16B

Table Illustrating The Opaque Section Contents Of Message BI1

4417A	type:
4417B	server-date:
4417C	swversion:
4417D	instrument-number:
4417E	instrument-type:
4417F	instrument-category:
4417I	instrument-functions:
4417J	instrument-salt:
4417K	instrument-expiration-date:
4417L	instrument-name:
4417M	instrument-address:
4417N	instrument-city:
4417O	instrument-state:
4417P	instrument-postal-code:
4417Q	instrument-country:
4417R	agreements:
4417S	autoclose:
4417T	autoclose-passphrase:
4417U	key:
4417V	signature:

FIGURE 17A

Table Illustrating The Format of Message BI4

44.105	[header]
44.113A	id:
44.113B	transaction:
44.113C	date:
44.113D	service-category:
44.117	opaque:
44.150	[trailer]

FIGURE 17B

Table Illustrating The Opaque Section Contents of Message BI4

44.117A	type:
44.117B	server-date:
44.117C	response-code:
44.117D	swseverity:
44.117E	swmessage:
44.117F	instrument-number:
44.117G	instrument-type:
44.117H	instrument-salt:
44.117J	instrument-functions:
44.117K	instrument*:
44.117L	message:

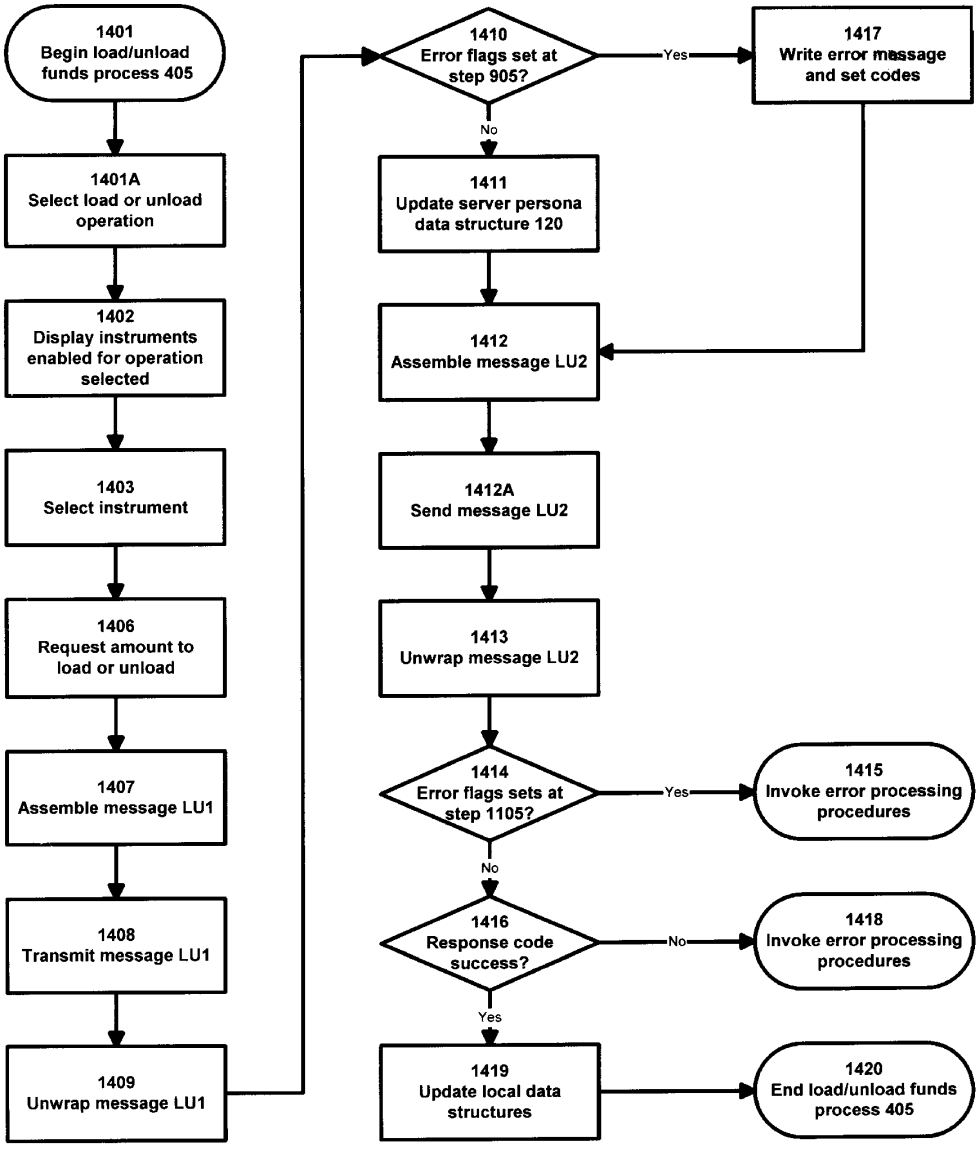
1401
Begin load/unload funds process 405
1401A
Select load or unload operation
1402
Display instruments enabled for operation selected
1403
Select instrument
1406
Request amount to load or unload
1407
Assemble message LU1
1408
Transmit message LU1
1409
Unwrap message LU1
1410
Error flags set at step 905?
Yes
1417
Write error message and set codes
No
1411
Update server persona data structure 120
1412
Assemble message LU2
1412A
Send message LU2
1413
Unwrap message LU2
1414
Error flags sets at step 1105?
Yes
1415
Invoke error processing procedures
No
1416
Response code success?
No
1418
Invoke error processing procedures
Yes
1419
Update local data structures
1420
End load/unload funds process 405

Figure 18

FIGURE 19A

Table Illustrating The Format of Message LU1

4505	[header]
4513A	id:
4513B	transaction:
4513C	date:
4513D	serverkey:
4513E	service-category:
4517	opaque:
4550	[trailer]

FIGURE 19B

Table Illustrating The Opaque Section Contents Of Message LU1

4517A	type:
4517B	server-date:
4517C	swversion:
4517D	amount:
4517E	instrument*:
4517F	key:
4517G	signature:

FIGURE 20A

Table Illustrating The Format of Message LU2

45.105	[header]
45.113A	id:
45.113B	transaction:
45.113C	date:
45.113D	service-category:
45.117	opaque:
45.150	[trailer]

FIGURE 20B

Table Illustrating The Opaque Section Contents of Message LU2

45.117A	type:
45.117B	server-date:
45.117C	amount:
45.117D	response-code:
45.117E	message:
45.117F	swseverity:
45.117G	swmessage:
45.117H	fee:
45.117I	balance:
45.117J	session-funds:
45.117K	on-hold:

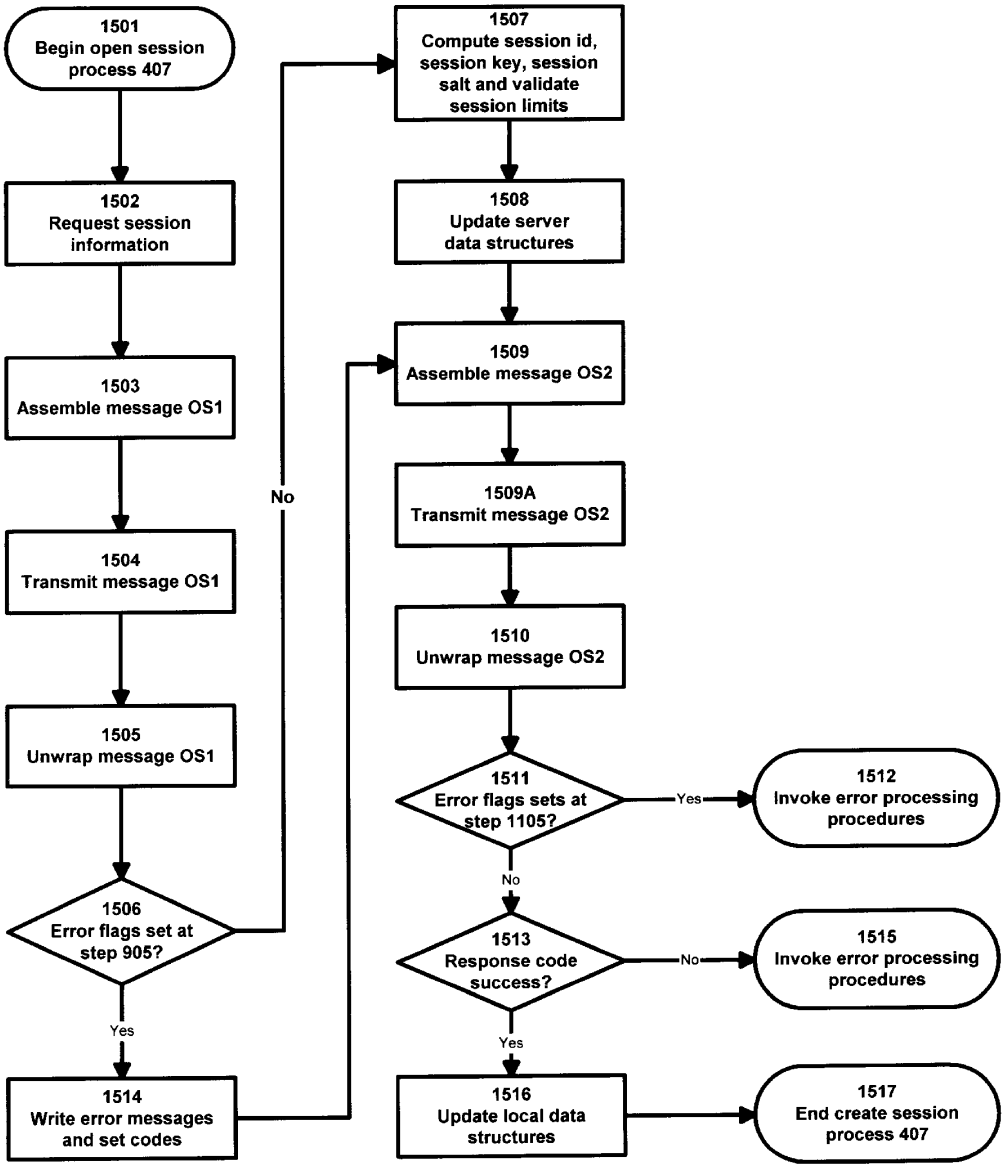
1501
Begin open session process 407
1502
Request session information
1503
Assemble message OS1
1504
Transmit message OS1
1505
Unwrap message OS1
1506
Error flags set at step 905?
No
Yes
1514
Write error messages and set codes
1507
Compute session id, session key, session salt and validate session limits
1508
Update server data structures
1509
Assemble message OS2
1509A
Transmit message OS2
1510
Unwrap message OS2
1511
Error flags sets at step 1105?
Yes
1512
Invoke error processing procedures
No
1513
Response code success?
No
1515
Invoke error processing procedures
Yes
1516
Update local data structures
1517
End create session process 407

Figure 21

FIGURE 22A

Table Illustrating The Format of Message OS1

4605	[header]
4613A	id:
4613B	transaction:
4613C	date:
4613D	serverkey:
4613E	service-category:
4617	opaque:
4650	[trailer]

FIGURE 22B

Table Illustrating The Opaque Section Contents of Message OS1

4617A	type:
4617B	server-date:
4617C	swversion:
4617D	record-note:
4617E	amount:
4617F	key-lifetime:
4617G	key-use-limit:
4617H	key:
4617I	signature:

FIGURE 23A

Table Illustrating The Format of Message OS2

4705	[header]
4713A	id:
4713B	transaction:
4713C	date:
4713D	service-category:
4717	opaque:
4750	[trailer]

FIGURE 23B

Table Illustrating The Opaque Section Contents of Message OS2

4717A	type:
4717B	server-date:
4717C	response-code:
4717d	swseverity:
4717E	swmessage:
4717F	message:
4717G	key-lifetime:
4717H	key-use-limit:
4717I	amount:
4717J	foreign-exchange:
4717K	session-funds:
4717L	balance:
4717M	on-hold:
4717N	fee:
4717O	session-id:
4717P	session-key:
4717Q	session-salt:

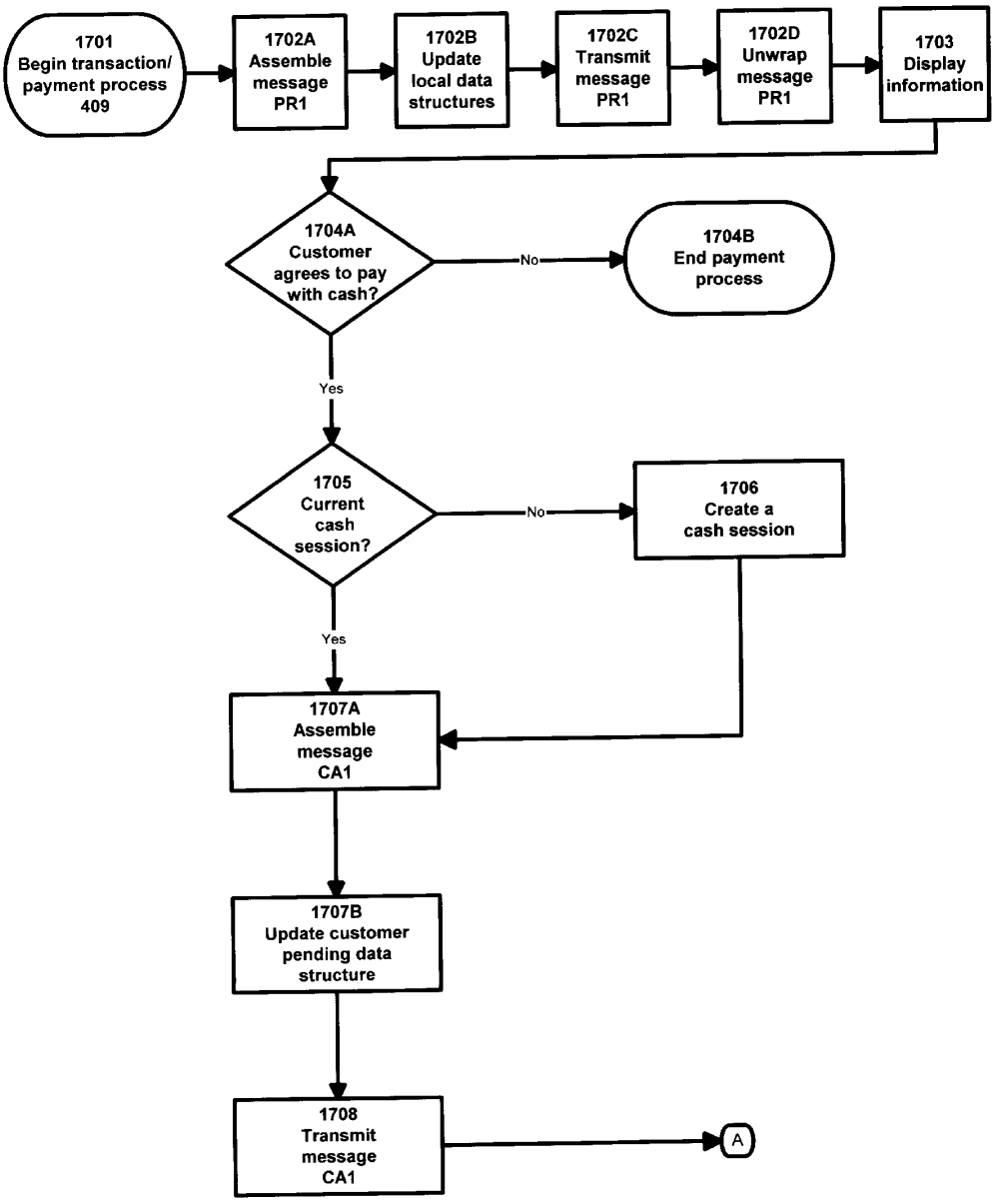
1701
Begin transaction/ payment process 409
1702A
Assemble message PR1
1702B
Update local data structures
1702C
Transmit message PR1
1702D
Unwrap message PR1
1703
Display information
1704A
Customer agrees to pay with cash?
No
1704B
End payment process
Yes
1705
Current cash session?
No
1706
Create a cash session
Yes
1707A
Assemble message CA1
1707B
Update customer pending data structure
1708
Transmit message CA1
A

Figure 24A

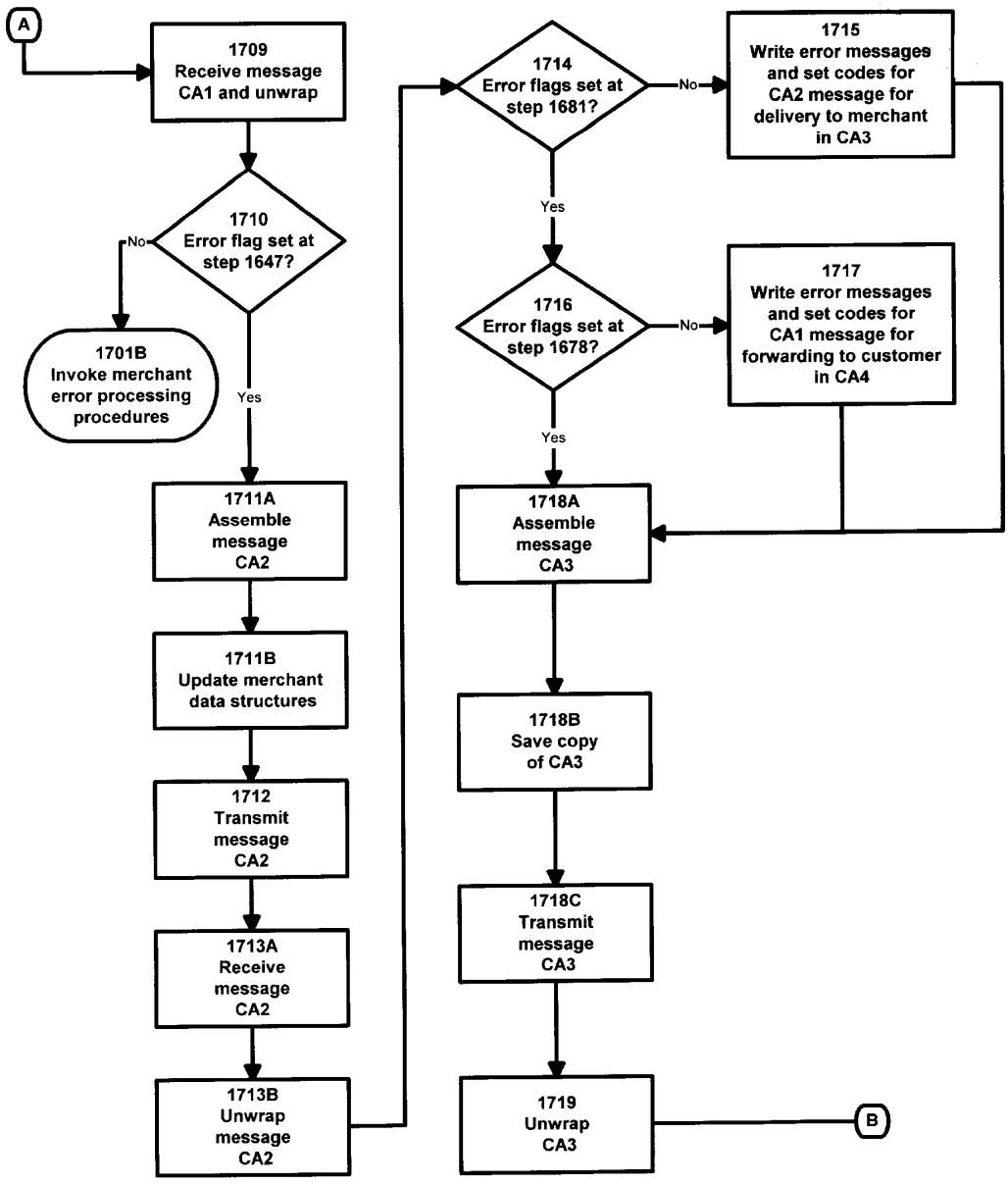
A
1709
Receive message CA1 and unwrap
1710
Error flag set at step 1647?
No
Yes
1701B
Invoke merchant error processing procedures
1711A
Assemble message CA2
1711B
Update merchant data structures
1712
Transmit message CA2
1713A
Receive message CA2
1713B
Unwrap message CA2
1714
Error flags set at step 1681?
No
Yes
1715
Write error messages and set codes for CA2 message for delivery to merchant in CA3
1716
Error flags set at step 1678?
No
Yes
1717
Write error messages and set codes for CA1 message for forwarding to customer in CA4
1718A
Assemble message CA3
1718B
Save copy of CA3
1718C
Transmit message CA3
1719
Unwrap CA3
B

Figure 24B

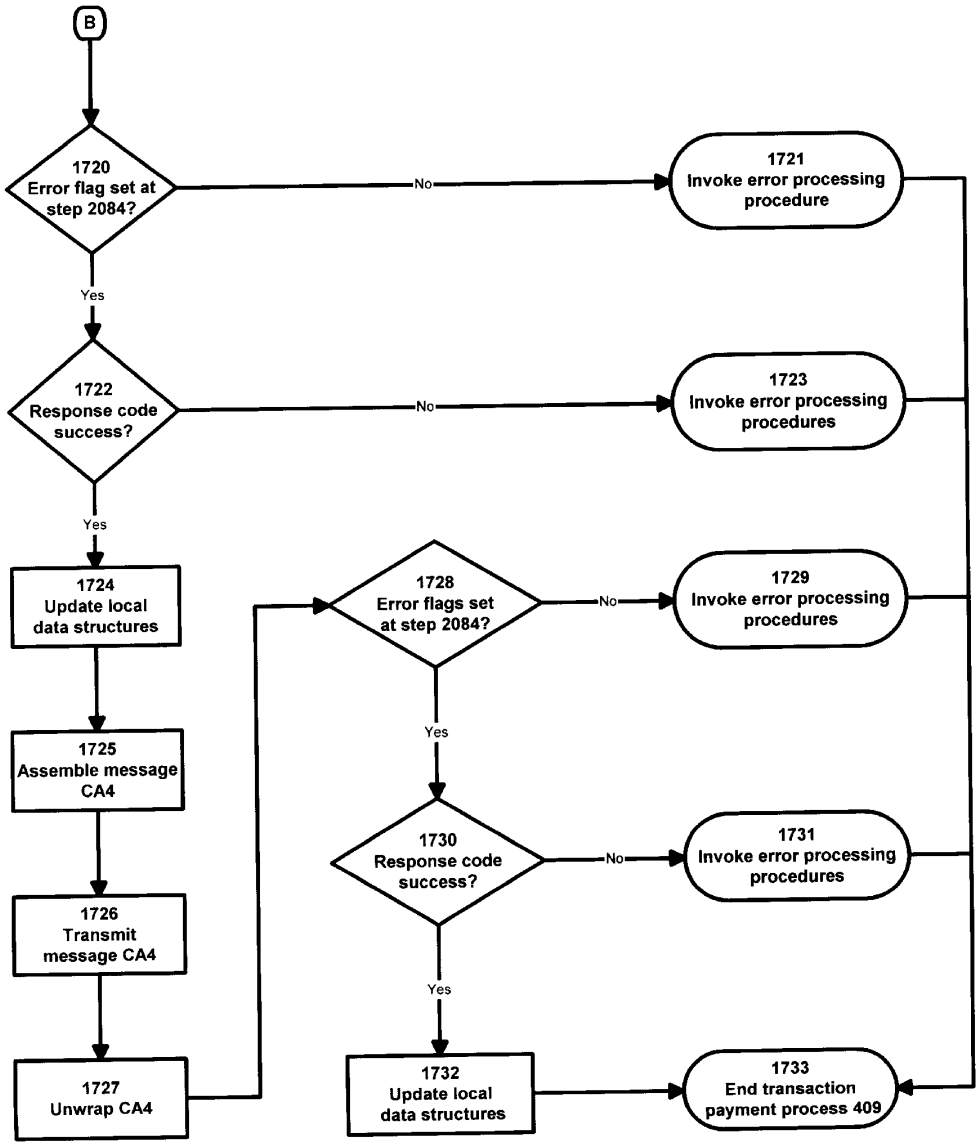
B
1720
Error flag set at step 2084?
No
1721
Invoke error processing procedure
Yes
1722
Response code success?
No
1723
Invoke error processing procedures
Yes
1724
Update local data structures
1725
Assemble message CA4
1726
Transmit message CA4
1727
Unwrap CA4
1728
Error flags set at step 2084?
No
1729
Invoke error processing procedures
Yes
1730
Response code success?
No
1731
Invoke error processing procedures
Yes
1732
Update local data structures
1733
End transaction payment process 409

Figure 24C

FIGURE 25

Table Illustrating The Format of Message PR1

5005	[header]
5013A	type:
5013B	merchant-id:
5013C	merchant-order-id:
5013D	merchant-date:
5013E	merchant-swversion:
5013F	note:
5013G	merchant-amount:
5013H	accepts:
5013I	url-pay-to:
5013J	url-cancel:
5013K	url-success:
5013L	url-failure:
5013M	merchant-signed-hash-key:
5013N	merchant-signed-hash:
5013O	merchant-amount2:
5050	[trailer]

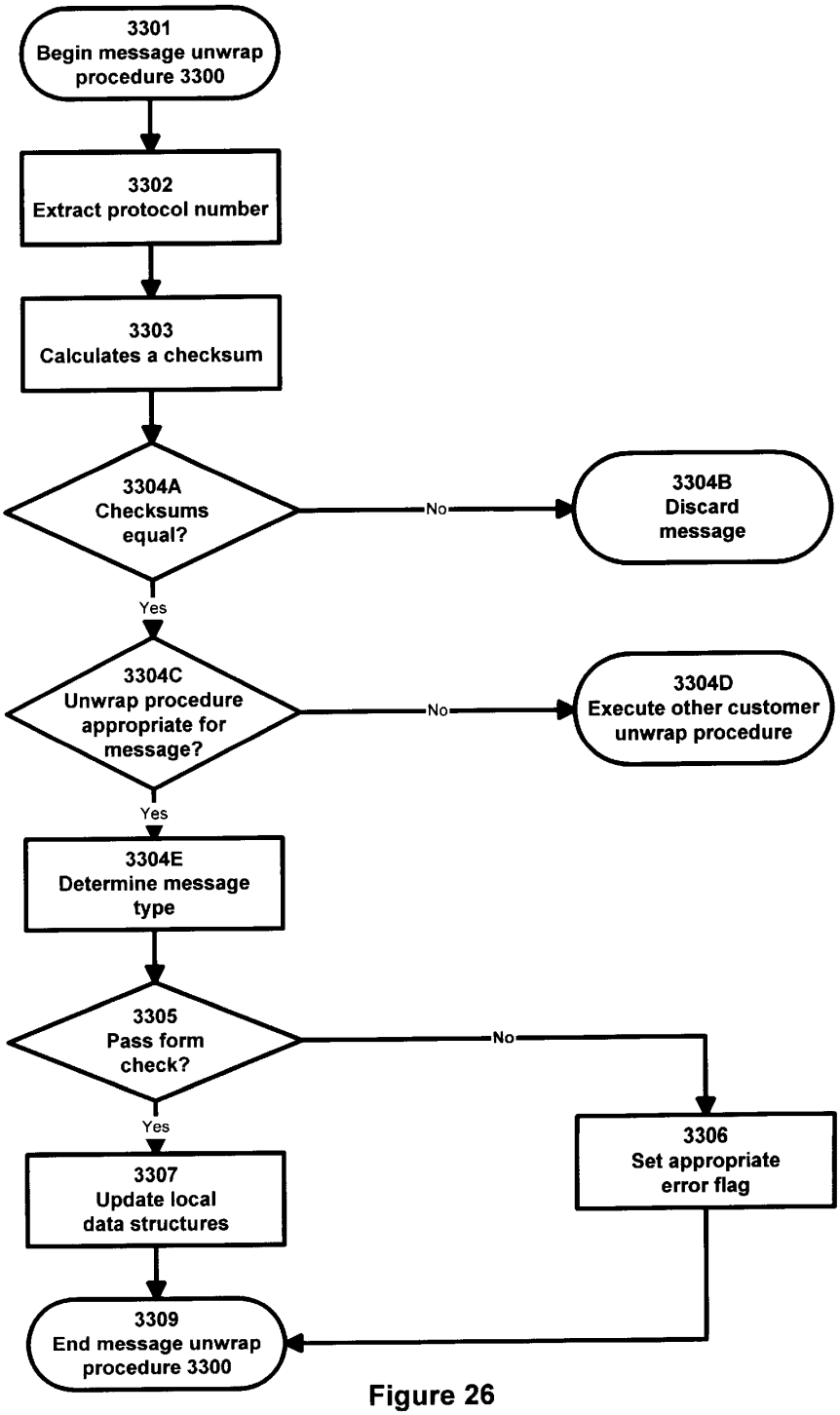
3301
Begin message unwrap procedure 3300
3302
Extract protocol number
3303
Calculates a checksum
3304A
Checksums equal?
No
3304B
Discard message
Yes
3304C
Unwrap procedure appropriate for message?
No
3304D
Execute other customer unwrap procedure
Yes
3304E
Determine message type
3305
Pass form check?
No
3306
Set appropriate error flag
Yes
3307
Update local data structures
3309
End message unwrap procedure 3300

Figure 26

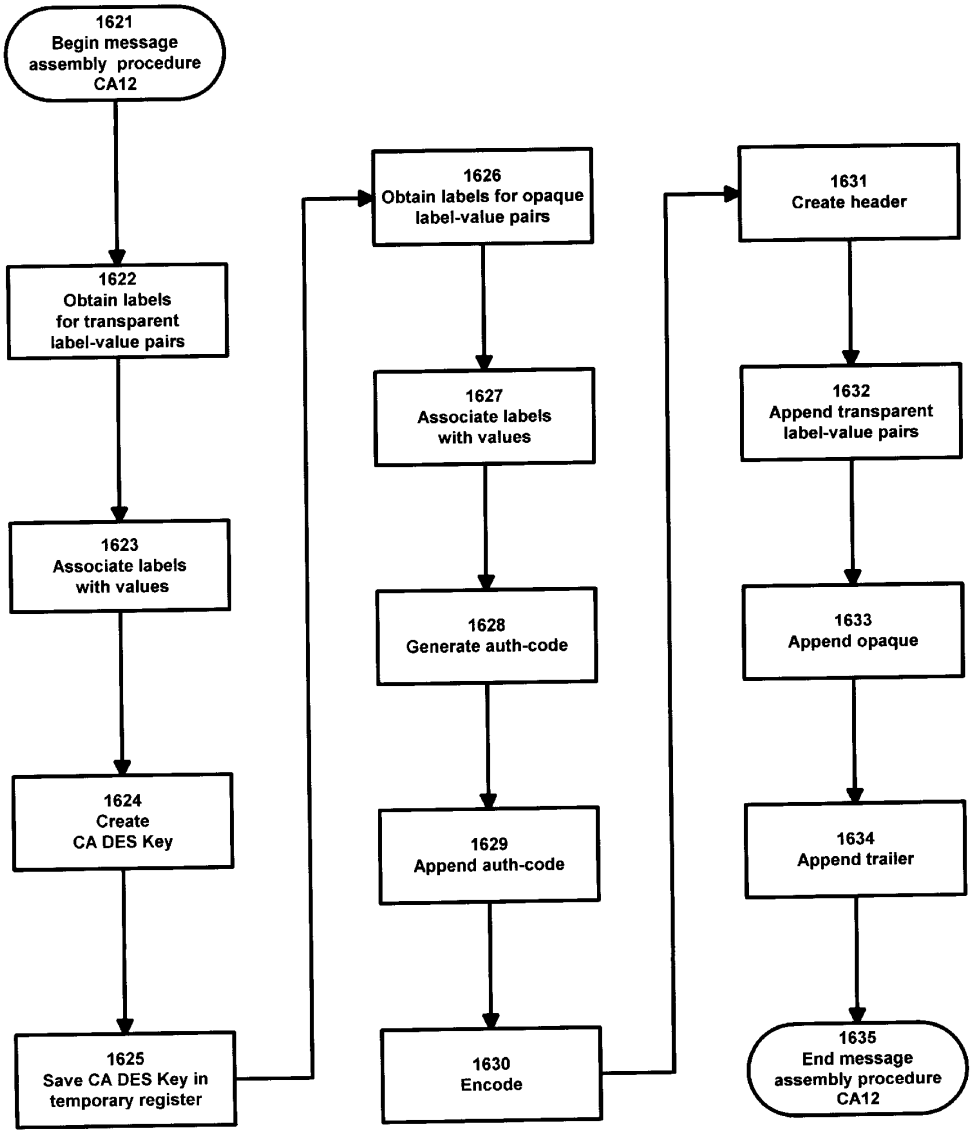
1621
Begin message assembly procedure CA12
1622
Obtain labels for transparent label-value pairs
1623
Associate labels with values
1624
Create CA DES Key
1625
Save CA DES Key in temporary register
1626
Obtain labels for opaque label-value pairs
1627
Associate labels with values
1628
Generate auth-code
1629
Append auth-code
1630
Encode
1631
Create header
1632
Append transparent label-value pairs
1633
Append opaque
1634
Append trailer
1635
End message assembly procedure CA12

Figure 27

FIGURE 28A

Table Illustrating The Format of Message CA1

5105	[header]
5113A	type:
5113B	version:
5113C	session-id:
5113D	index:
5113E	payee-currency:
5113F	note-hash:
5113G	payee-id:
5113H	order-id:
5113I	service-category:
5117	opaque:
5150	[trailer]

FIGURE 28B

Table Illustrating the Opaque Section Contents of Message CA1

5117A	amount:
5117B	auth-code:

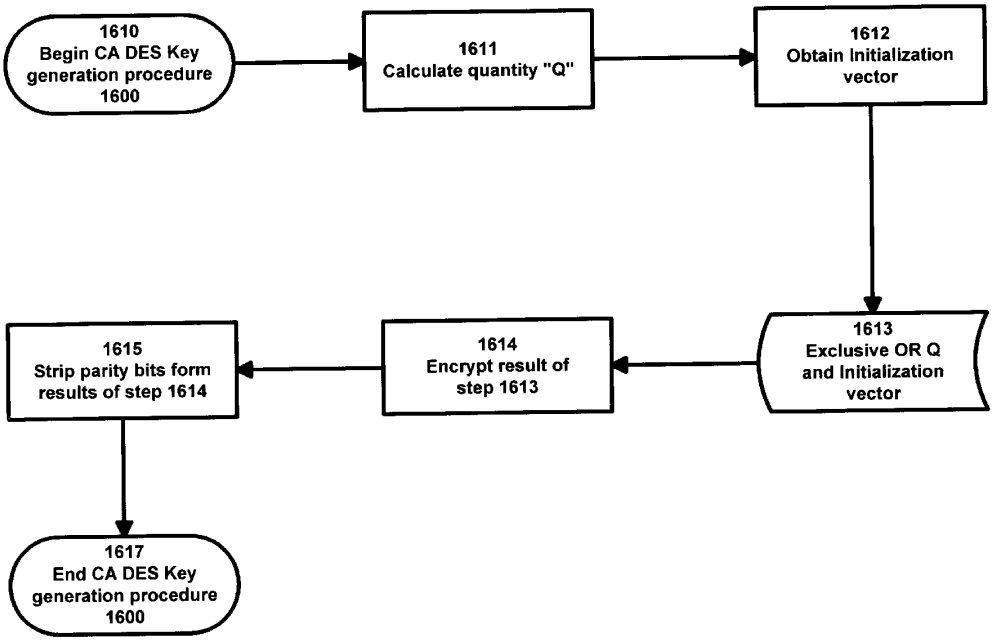
1610
Begin CA DES Key generation procedure 1600
1611
Calculate quantity "Q"
1612
Obtain Initialization vector
1613
Exclusive OR Q and Initialization vector
1614
Encrypt result of step 1613
1615
Strip parity bits form results of step 1614
1617
End CA DES Key generation procedure 1600

Figure 29

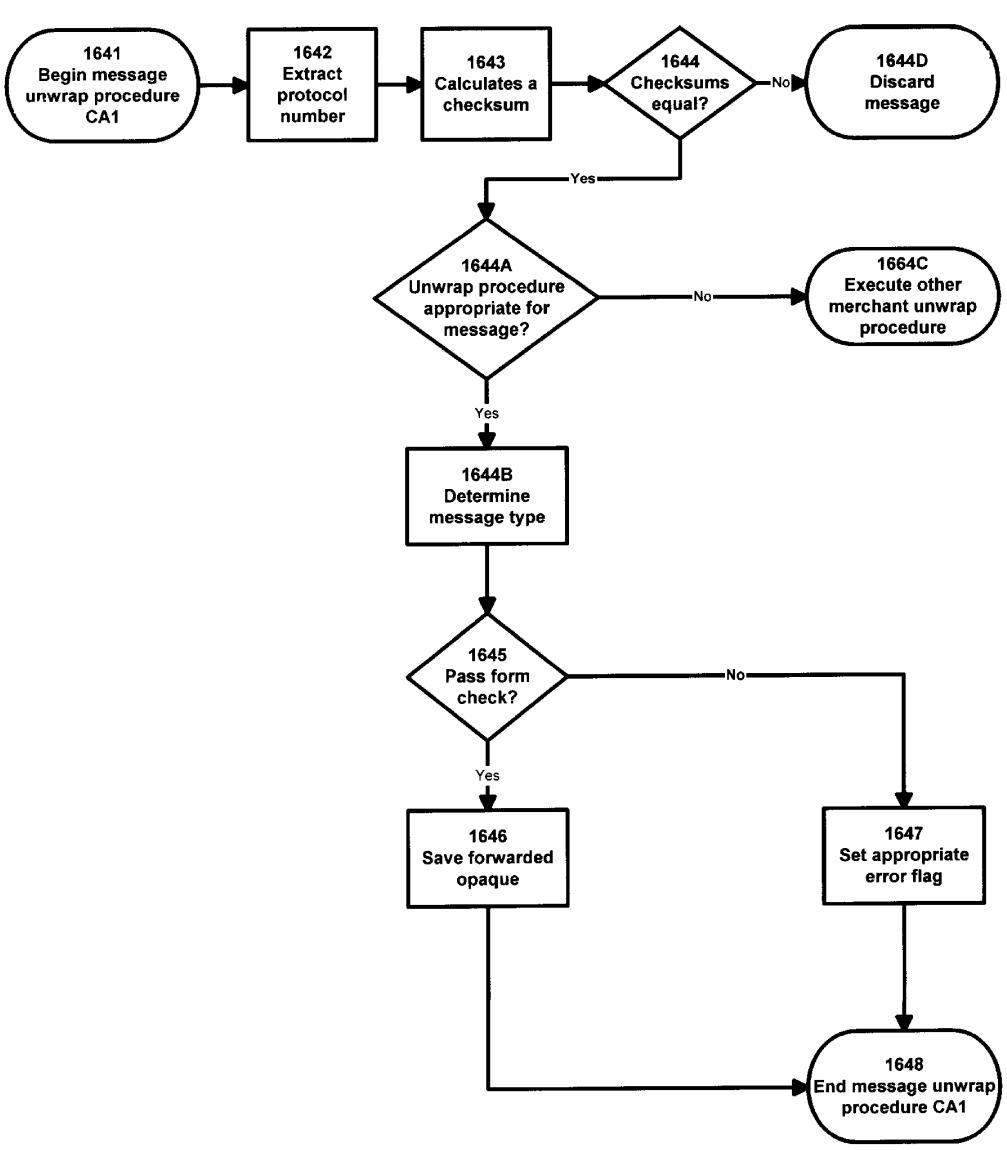
1641
Begin message unwrap procedure CA1
1642
Extract protocol number
1643
Calculates a checksum
1644
Checksums equal?
No
1644D
Discard message
Yes
1644A
Unwrap procedure appropriate for message?
No
1664C
Execute other merchant unwrap procedure
Yes
1644B
Determine message type
1645
Pass form check?
No
Yes
1646
Save forwarded opaque
1647
Set appropriate error flag
1648
End message unwrap procedure CA1

Figure 30

FIGURE 31A

Table Illustrating The Format of Message CA2

5205	[header]
5213A	type:
5213B	version:
5213C	session-id:
4213D	index:
5213E	service-category:
5217.1	merchant-opaque:
5217.2	customer-opaque:
5250	[trailer]

FIGURE 31B

Table Illustrating The Opaque Section Contents of Message CA2

5217.1A	type:
5217.1B	version:
5217.1C	type-$_n$:
5217.1D	subversion$_n$:
5217.1E	payer-session-id$_n$:
5217.1F	payer-index$_n$:
5217.1G	note-hash$_n$:
5217.1H	payee-id$_n$:
5217.1I	order-id$_n$:
5217.1J	merchant-amount$_n$:
5217.1K	auth-code:

FIGURE 31C

Table Illustrating The Contents of Label-Value Pair 5217.2

5217.2A	amount:
5217.2B	auth-code:

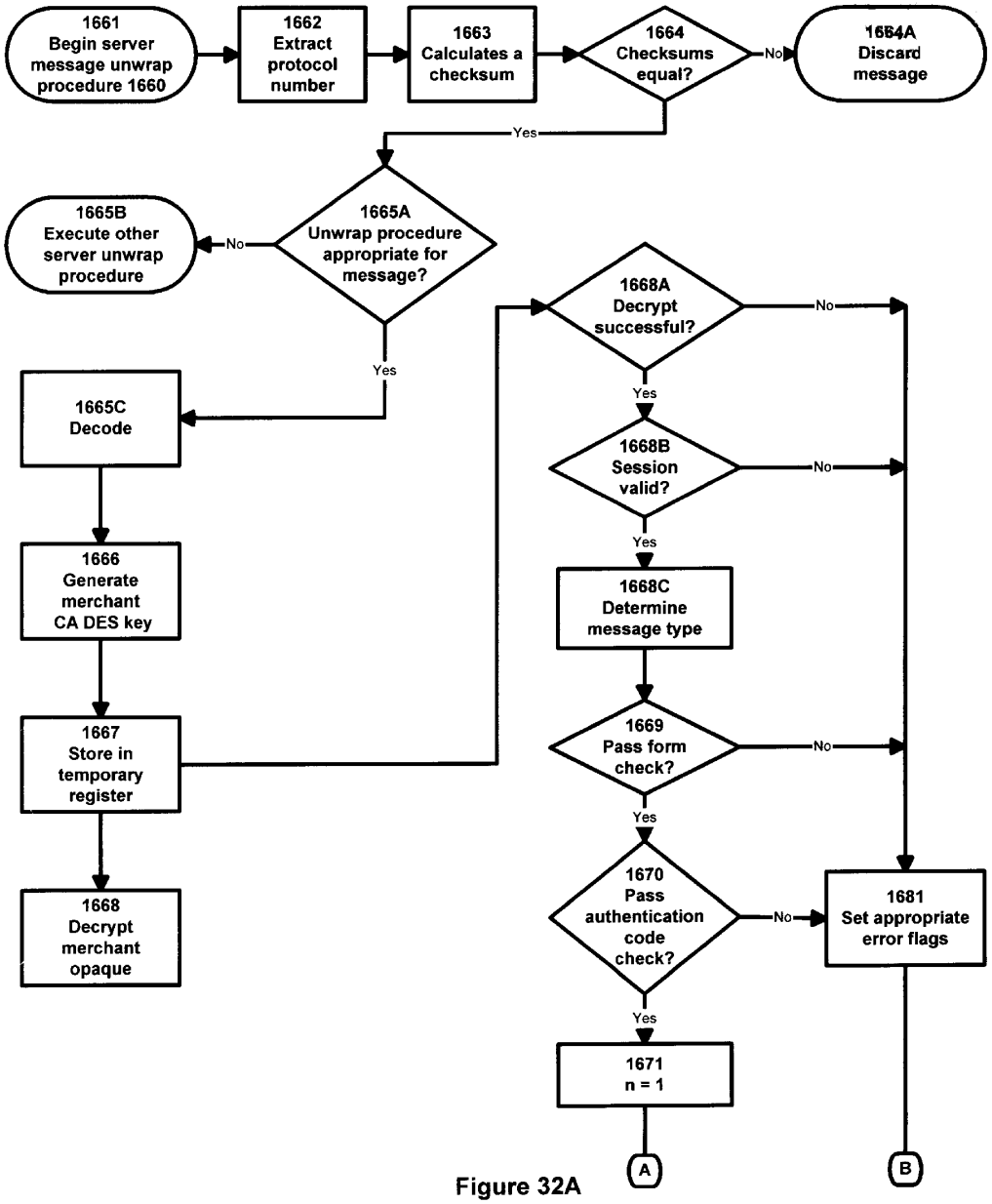
1661
Begin server message unwrap procedure 1660
1662
Extract protocol number
1663
Calculates a checksum
1664
Checksums equal?
No
1664A
Discard message
Yes
1665A
Unwrap procedure appropriate for message?
No
1665B
Execute other server unwrap procedure
Yes
1665C
Decode
1666
Generate merchant CA DES key
1667
Store in temporary register
1668
Decrypt merchant opaque
1668A
Decrypt successful?
No
Yes
1668B
Session valid?
No
Yes
1668C
Determine message type
1669
Pass form check?
No
Yes
1670
Pass authentication code check?
No
Yes
1681
Set appropriate error flags
1671
n = 1
A
B

Figure 32A

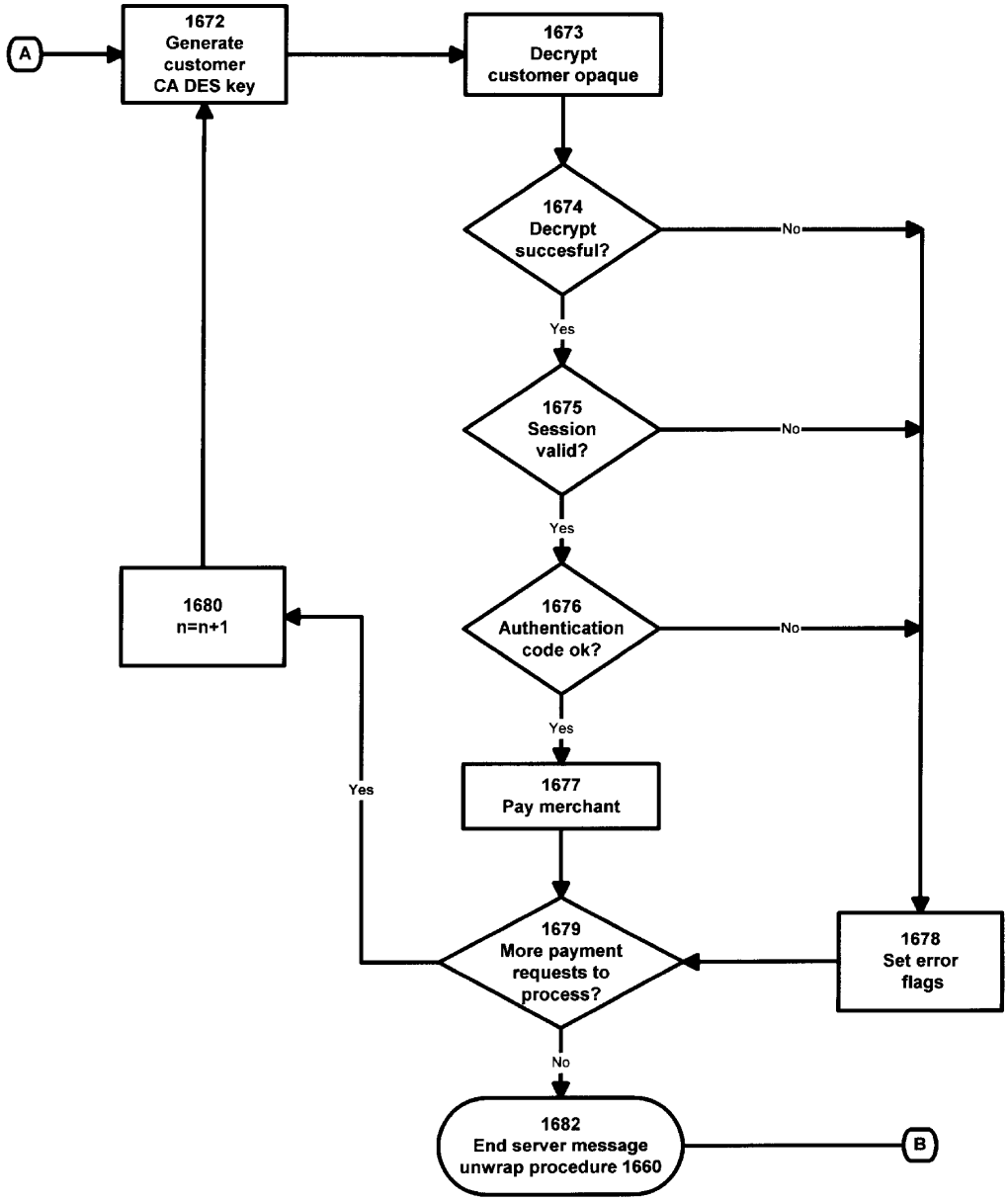
A
1672
Generate
customer
CA DES key
1673
Decrypt
customer opaque
1674
Decrypt
succesful?
No
Yes
1675
Session
valid?
No
Yes
1676
Authentication
code ok?
No
Yes
1677
Pay merchant
1678
Set error
flags
1679
More payment
requests to
process?
Yes
No
1680
n=n+1
1682
End server message
unwrap procedure 1660
B

Figure 32B

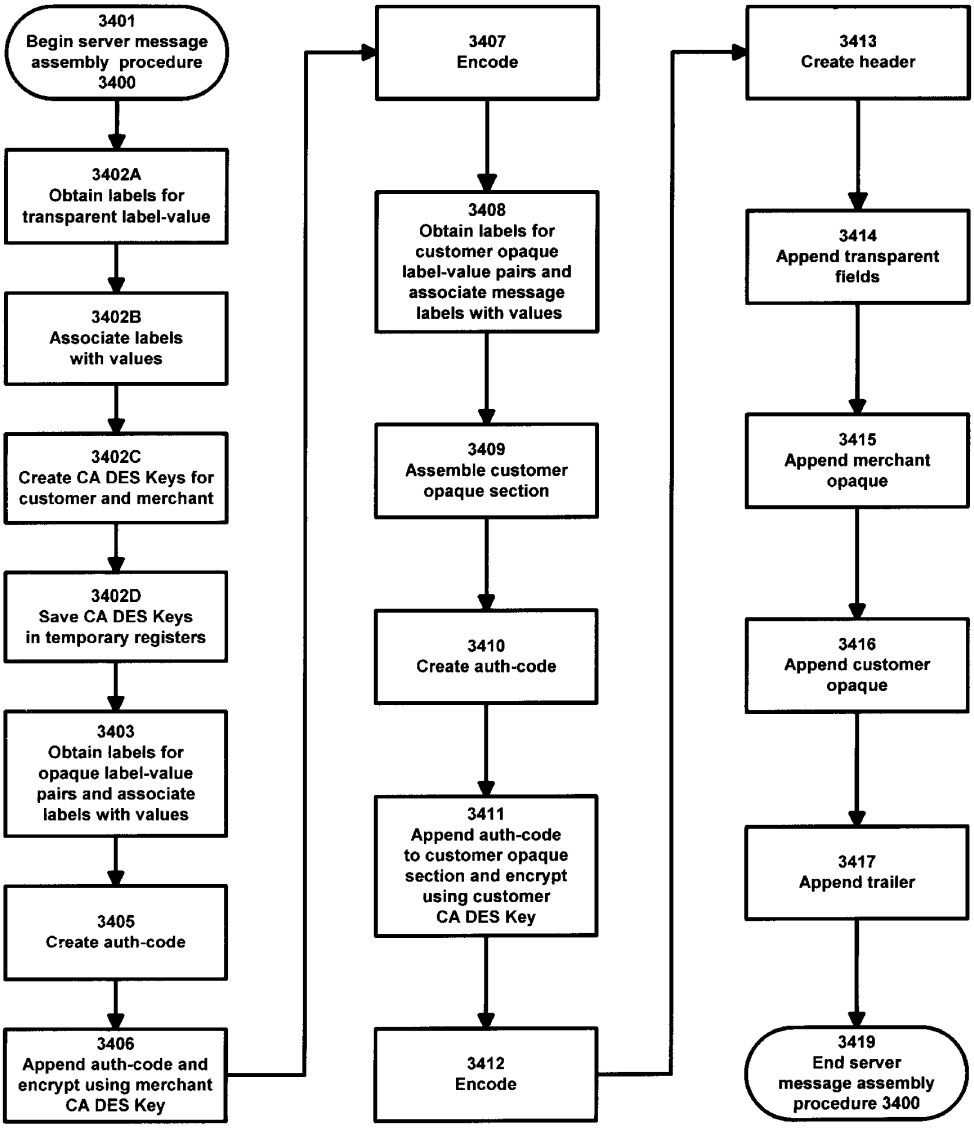
3401
Begin server message assembly procedure 3400
3402A
Obtain labels for transparent label-value
3402B
Associate labels with values
3402C
Create CA DES Keys for customer and merchant
3402D
Save CA DES Keys in temporary registers
3403
Obtain labels for opaque label-value pairs and associate labels with values
3405
Create auth-code
3406
Append auth-code and encrypt using merchant CA DES Key
3407
Encode
3408
Obtain labels for customer opaque label-value pairs and associate message labels with values
3409
Assemble customer opaque section
3410
Create auth-code
3411
Append auth-code to customer opaque section and encrypt using customer CA DES Key
3412
Encode
3413
Create header
3414
Append transparent fields
3415
Append merchant opaque
3416
Append customer opaque
3417
Append trailer
3419
End server message assembly procedure 3400

Figure 33

FIGURE 34A

Table Illustrating The Format of Message CA3

5305	[header]
5313A	type:
5313B	version:
5313C	session-id:
5313D	index:
5313E	service-category:
5317.1	merchant-opaque:
5317.2	customer-opaque:
5350	[trailer]

FIGURE 34B

Table Illustrating The Opaque Section Contents of Message CA3

5317.1A	subtype:
5317.1B	subversion:
5317.1C	response-code:
5317.1D	fee:
5317.1E	problem:
5317.1F	remark:
5317.1G	$subtype_n$:
5317.1H	$subversion_n$:
5317.1I	$payer\text{-}session\text{-}id_n$:
5317.1J	$payer\text{-}index_n$:
5317.1K	$response\text{-}code_n$:
5317.1L	$remark_n$:
5317.1M	$collected\text{-}amount_n$:
5317.1N	$problem_n$:
5317.1O	$order\text{-}id_n$:
5317.1P	request-version:
5317.1Q	auth-code:

FIGURE 34C

Table Illustrating The Contents of Label-Value Pair 5317.2(Message CA3)

5317.2A	response-code:
5317.2B	remark:
5317.2C	foreign exchange:
5317.2D	amount:
5317.2E	problem:
5317.2F	order-id:
5317.2G	request-version:
5317.2H	auth-code:

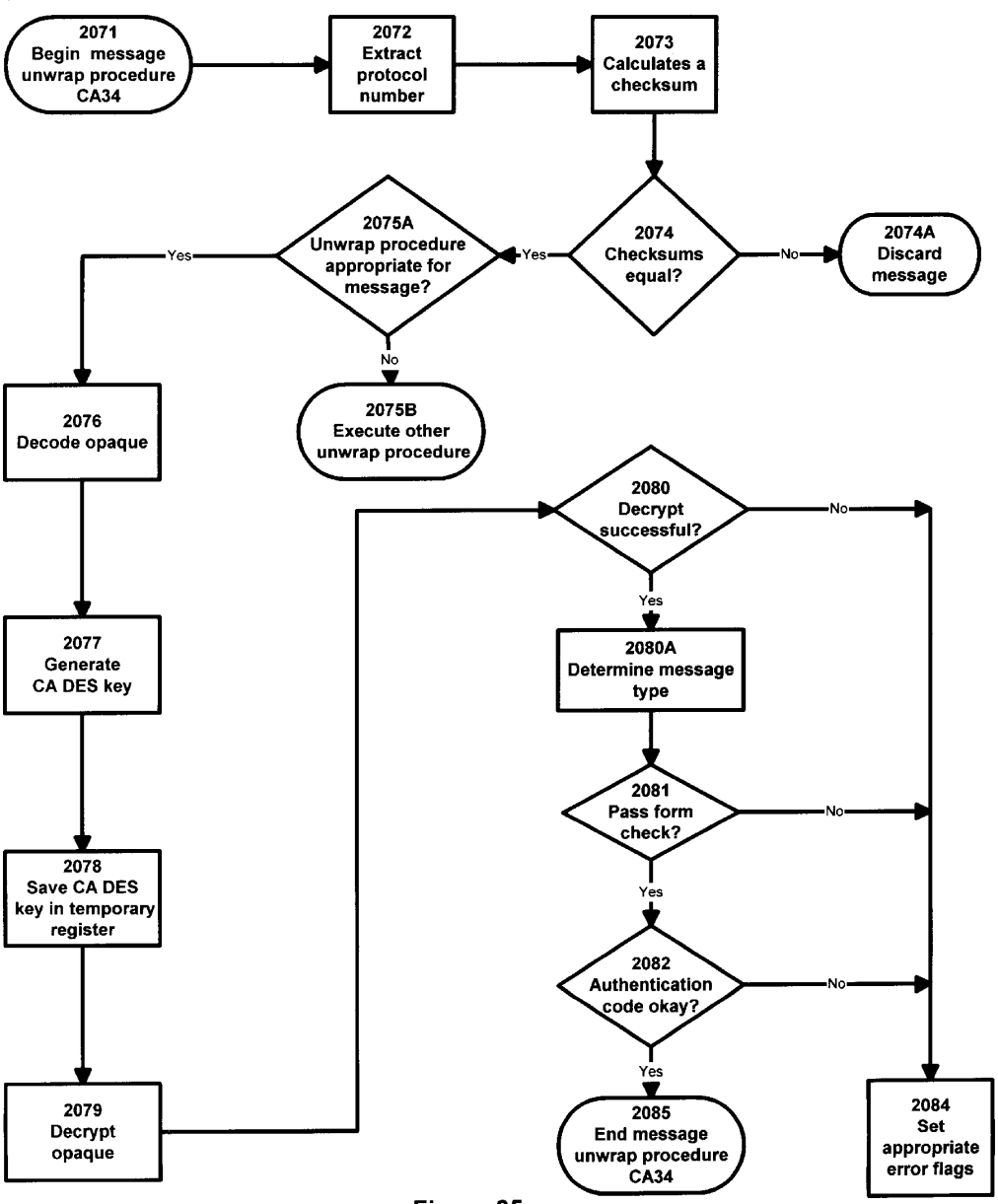
2071
Begin message unwrap procedure CA34
2072
Extract protocol number
2073
Calculates a checksum
2074
Checksums equal?
Yes
No
2074A
Discard message
2075A
Unwrap procedure appropriate for message?
Yes
No
2075B
Execute other unwrap procedure
2076
Decode opaque
2077
Generate CA DES key
2078
Save CA DES key in temporary register
2079
Decrypt opaque
2080
Decrypt successful?
No
Yes
2080A
Determine message type
2081
Pass form check?
No
Yes
2082
Authentication code okay?
No
Yes
2084
Set appropriate error flags
2085
End message unwrap procedure CA34

Figure 35

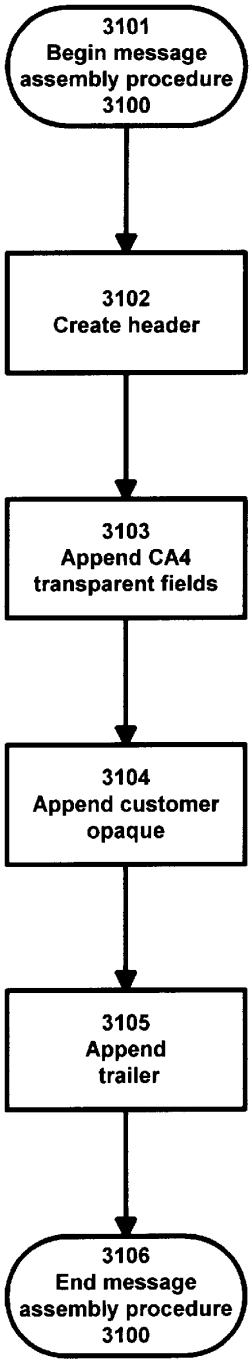
3101
Begin message assembly procedure 3100
3102
Create header
3103
Append CA4 transparent fields
3104
Append customer opaque
3105
Append trailer
3106
End message assembly procedure 3100

Figure 36

FIGURE 37A

Table Illustrating The Format of Message CA4

5405	[header]
5413A	type:
5413B	version:
5413C	session-id:
5413D	index:
5413F	order-id:
5413G	service-category:
5417	opaque:
5450	[trailer]

FIGURE 37B

Table Illustrating The Opaque Section Contents of Message CA4

5417A	response-code:
5417B	remark:
5417C	foreign exchange:
5417D	amount:
5417E	problem:
5417F	order-id:
5417G	service-category:
5417H	auth-code:

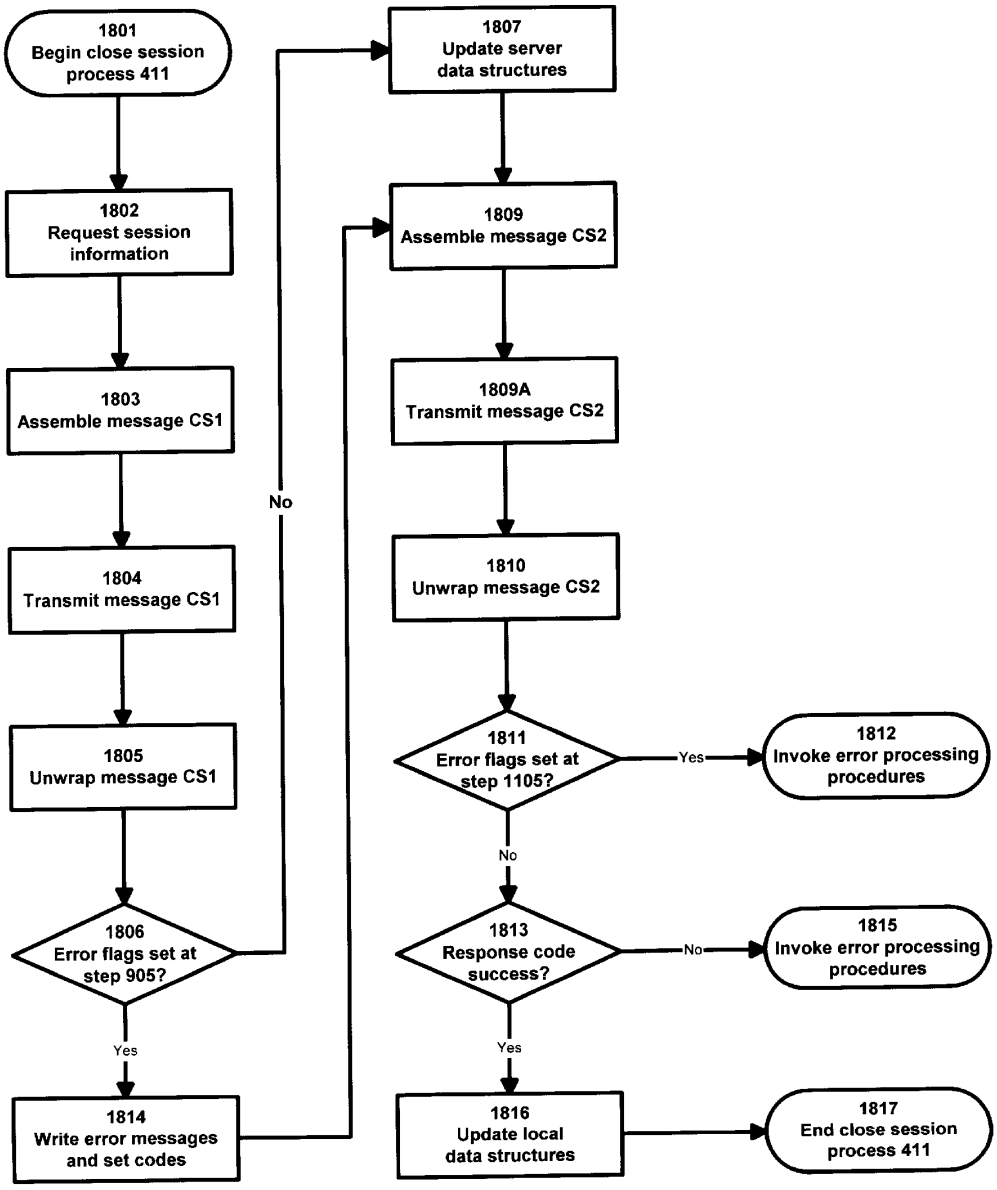
1801
Begin close session process 411
1802
Request session information
1803
Assemble message CS1
1804
Transmit message CS1
1805
Unwrap message CS1
1806
Error flags set at step 905?
No
Yes
1814
Write error messages and set codes
1807
Update server data structures
1809
Assemble message CS2
1809A
Transmit message CS2
1810
Unwrap message CS2
1811
Error flags set at step 1105?
Yes
1812
Invoke error processing procedures
No
1813
Response code success?
No
1815
Invoke error processing procedures
Yes
1816
Update local data structures
1817
End close session process 411

Figure 38

FIGURE 39A

Table Illustrating The Format of Message CS1

4805	[header]
4813A	id:
4813B	transaction:
4813C	date:
4813D	serverkey:
4813E	service-category:
4817	opaque:
4850	[trailer]

FIGURE 39B

Table Illustrating The Opaque Section Contents of Message CS1

4817A	type:
4817B	server-date:
4817C	swversion:
4817D	record-note:
4817E	session-id:
4817F	request-log:
4817G	key:
4817H	signature:

FIGURE 40A

Table Illustrating The Format of Message CS2

4905	[header]
4913A	id:
4913B	transaction:
4913C	date:
4913D	service-category:
4917	opaque:
4950	[trailer]

FIGURE 40B

Table Illustrating The Opaque Section Contents of Message CS2

4917A	type:
4917B	server-date:
4917C	response-code:
4917D	swseverity:
4917E	swmessage:
4917F	message:
4917G	fee:
4917H	amount:

ELECTRONIC TRANSFER SYSTEM AND METHOD

BACKGROUND OF THE INVENTION

1. Field of Invention

Public key encryption with large key sizes (e.g., RSA) is usually required for creating acceptable levels of security for message processing over an insecure network, such as the Internet. The present invention relates to a system and method for increasing the efficiency of secure message processing over such insecure networks. More specifically, the present invention relates to a system and method for reducing the level of encryption required in a network for message exchanges. Even more specifically, the present invention relates to processing electronic cash transactions in a secure manner while substantially reducing the computational requirements for encryption.

2. Description of the Prior Art

Various methods for increasing the security of communications over insecure networks, such as the Internet, have been disclosed. An insecure network does not protect messages from observation, interception, and manipulation. On the other hand, secure networks offer various means to reduce the opportunity for observation, interception, and/or manipulation of messages.

For example, channel message security schemes (such as secure HTTP ("S-HTTP") and Secure Socket Layer (SSL) protocol) are intended to create confidence in two communicating parties that they are who they say they are and that their communications are private. SSL utilizes digitally signed certificates to provide authentication and security by heavily encrypting each message. S-HTTP relies on digitally signed messages using a heavy encryption key to ensure security and authentication.

A number of multi-party protocols have been proposed for credit transactions, most notably Secure Transport Technology (STT), Internet Keyed Payments (IKP), and Secure Electronic Payment Protocol (SEPP). All of these approaches are built around a credential issuing authority and require that both merchants and customers be authenticated by the credential issuing authority which in turn has been authenticated by a higher authority. In STT, merchants and customers each have two sets of RSA of keys, one to be used to sign messages and one used to encrypt and decrypt symmetrical keys. Thus, in this system, each party needs two certificates (one for each key). A merchant will have a pair of credentials for each credit card it accepts. SEPP and IKP use RSA encryption differently; but, like STT, utilize multiple public key signatures and encryptions per transaction.

Another system has been described under the name "NetBill." While the NetBill approach is less reliant on public key encryption than others, it still requires public key signatures throughout a transaction.

Another approach is that of DigiCash. In the DigiCash model, the user creates a random number, which acts like a serial number for a digital coin. Like the other proposed systems, DigiCash achieves its primary objective of a secure, anonymous cash payment system by requiring heavy reliance on modular exponentiation (which is the basis for other public key techniques such as RSA encryption). It also requires a bank or third party to create tokens that have intrinsic value. It is uncertain how such a system will be treated under banking, tax, and currency laws in the United States and other jurisdictions.

Other systems, such as Mondex, implement security through the use of hardware connected to the user's computer. For Internet transactions, a proprietary card reader must be added to the computers of all customers and merchants who will use a particular card.

The reliance on encryption, especially public key encryption, whether based in software or hardware comes at a price: the greater the use of encryption, the greater the processing effort required to decrypt messages. Where message processing costs are important, such as in commercial network payment transaction, processor and hardware costs can become a significant deterrent to using networks such as the Internet for secure communications.

The current art can only achieve acceptable security with the concomitant high cost of processor time, additional hardware, or both. What is needed to encourage the development of insecure networks such as the Internet for commercial use is a software-based system that offers reduced processing costs of encrypted messages while maintaining an acceptable level of security for the communications being transmitted.

SUMMARY OF INVENTION

Therefore, the present invention aims to provide a system and method for very efficient, economic and secure transactions over the Internet, or other insecure networks. This provides the basis for implementing relatively small value, secure payment (including small cash payments) for products over the Internet or other insecure networks.

In accordance therewith, we herein disclose a method for securely communicating in a communication system. The communication system comprises a first device at a first party's location, a second device at a second party's location, and a server in communication therewith. The method comprises creating a first session associated with the first party, wherein the first session has first use parameters for limiting the duration that said first session can be used and a first set of data. The first use parameters and said first set of data are identifiable by the server. The method also comprises creating a second session associated with the second party. The second session has second use parameters for limiting the duration that the second session can be used and a second set of data. The second use parameters and said second set of data are identifiable by the server. The method further comprises linking a portion of the first session with a portion of the second session in the communication system. The portion of the first session includes said first set of data and said first use parameters and the portion of the second session includes the second set of data and the second use parameters. The method still further comprises verifying the first and second parties based upon at least portions of the first and second sets of data by the server, and determining whether the first and second sessions can be used based upon the first and second use parameters by the server. When the server verifies the first and second parties and determines that the first and second sessions can be used, the first and second parties are assured of communicating securely in the communication system.

Another aspect of the present invention is directed to a method for securely communicating in a communication system. The communication system has a device at a user's location and a server in communication therewith, and the method comprises transmitting a request from the device to the server for creating a session having use parameters associated therewith, encrypting a first key with a second key by the server, and transmitting the encrypted first key and the use parameters associated with the session from the server to the device. The method also comprises receiving

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the encrypted first key and the use parameters by the device and decrypting the encrypted first key so that the device can communicate securely in the communication system by using the decrypted first key according to the use parameters.

BRIEF DESCRIPTION OF DRAWINGS

Representative embodiments of the present invention will be described with reference to the following drawings:

FIG. **1** depicts the general architecture of the present invention.

FIG. **2** depicts the general processes of the present invention.

FIG. **3**A more particularly depicts the processes shown in FIG. **2**.

FIG. **3**B depicts the flow of messages in the present invention.

FIG. **4**A depicts the structure of the database of the server computer **100**.

FIG. **4**B depicts a customer persona **120**.**1** of server persona data structure **120**.

FIG. **4**C depicts the fields of cash container data **120**G of FIG. **4**B.

FIG. **4**D depicts the fields of instrument binding data **120**H of FIG. **4**B.

FIG. **4**E depicts a merchant persona **120**.**2** of server persona data structure **120**.

FIG. **4**F depicts the fields of cash container data **120**GG of FIG. **4**E.

FIG. **4**G depicts the fields of instrument binding data **120**HH of FIG. **4**E.

FIG. **4**H depicts customer session record **130**.**1** of server session data structure **130**.

FIG. **4**I depicts the fields of transaction data **130**N of FIG. **4**H.

FIG. **4**J depicts merchant session record **130**.**2** of server session data structure **130**.

FIG. **4**K depicts the fields of transaction data **130**NN of FIG. **4**J.

FIG. **4**L depicts a record **140**.**1** of message log data structure **140**.

FIG. **5**A depicts the structure of the database of the customer computer **200**.

FIG. **5**B depicts record **215**.**1** of customer application data structure **215**.

FIG. **5**C depicts record **220**.**1** of customer persona data structure **220**.

FIG. **5**D depicts record **230**.**1** of customer instrument binding data structure **230**.

FIG. **5**E depicts record **240**.**1** of customer active session data structure **240**.

FIG. **5**F depicts customer pending log data structure **250**.

FIG. **5**G depicts pending registration/update persona information record **251** of customer pending transaction data structure **250**.

FIG. **5**H depicts pending link/update instrument binding record **252** of customer pending transaction data structure **250**.

FIG. **5**I depicts pending cash payment record **253** of customer pending transaction data structure **250**.

FIG. **5**J depicts pending load/unload funds record **254** of customer pending transaction data structure **250**.

FIG. **5**K depicts pending open session record **255** of customer pending transaction data structure **250**.

FIG. **5**L depicts pending close session record **256** of customer pending transaction data structure **250**.

FIG. **5**M depicts customer log data structure **260**.

FIG. **5**N depicts persona registration/update response record **261** of customer log data structure **260**.

FIG. **5**O depicts link/update instrument response record **262** of customer log data structure **260**.

FIG. **5**P depicts cash payment response record **263** of customer log data structure **260**.

FIG. **5**Q depicts load/unload funds response record **264** of customer log data structure **260**.

FIG. **5**R depicts open session response record **265** of customer log data structure **260**.

FIG. **5**S depicts payment request record **266** of customer log data structure **260**.

FIG. **5**T depicts close session response record **267** of customer log data structure **260**.

FIG. **5**U depicts a record **280**.**1** of Customer cash container data structure **280**.

FIG. **6**A depicts the structure of the database of the merchant computer.

FIG. **6**B depicts a record of the merchant application data structure of the database of the merchant computer.

FIG. **6**C depicts a record of the merchant persona data structure of the database of the merchant computer.

FIG. **6**D depicts a record of the merchant instrument binding data structure of the database of the merchant computer.

FIG. **6**E depicts a record of the merchant session data structure of the database of the merchant computer.

FIG. **6**F depicts a record of the merchant cash container data structure of the database of the merchant computer.

FIG. **7**A depicts a record of the merchant amount data structure of the database of the merchant computer.

FIG. **7**B depicts a record of the merchant sales session data structure of the database of the merchant computer.

FIG. **7**C depicts a record of the merchant cash log data structure of the database of the merchant computer.

FIG. **7**D depicts the format of a sample message.

FIG. **8** is a flow diagram illustrating registration process **401**.

FIG. **9** is a flow diagram illustrating message assembly procedure **800**.

FIGS. **10**A and **10**B depict the format of registration message R**1**.

FIGS. **11**A and **11**B is a flow diagram illustrating server message unwrap procedure **900**.

FIG. **12** is a flow diagram illustrating server message assembly procedure **1000**.

FIGS. **13**A and **13**B depict the format of registration message R**2**.

FIG. **14** is a flow diagram illustrating client message unwrap procedure **1100**.

FIG. **15** is a flow diagram illustrating instrument binding process **403**.

FIGS. **16**A and **16**B depict the format of binding message BI**1**.

FIGS. **17**A and **17**B depict the format of binding message BI**4**.

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FIG. **18** is a flow diagram illustrating the load/unload funds process **405**.

FIGS. **19**A and **19**B depict the format of load/unload message LU**1**.

FIGS. **20**A and **20**B depict the format of load/unload message LU**2**.

FIG. **21** is a flow diagram illustrating open session process **407**.

FIGS. **22**A and **22**B depict the format of open session message OS**1**.

FIGS. **23**A and **23**B depict the format of open session message OS**2**.

FIGS. **24**A, **24**B and **24**C depict a flow diagram illustrating transaction/payment process **409**.

FIG. **25** depicts the format of payment request message PR**1**.

FIG. **26** depicts a flow diagram illustrating message unwrap procedure **3300**.

FIG. **27** depicts a flow diagram illustrating message assembly procedure CA**12**.

FIG. **28** depicts FIGS **28**A and B depict the format of cash payment message CA**1**.

FIG. **29** depicts a flow diagram illustrating CA-DES-key generation process **1600**.

FIG. **30** depicts a flow diagram illustrating message unwrap procedure CA**1**.

FIGS. **31**A, **31**B and **31**C depict the format of message CA**2**.

FIGS. **32**A and **32**B depict a flow diagram illustrating server message unwrap procedure **1660**.

FIG. **33** depicts a flow diagram illustrating server message assembly procedure **3400**.

FIGS. **34**A, **34**B and **34**C depict the format of message CA**3**.

FIG. **35** depicts a flow diagram illustrating message unwrap procedure CA**34**.

FIG. **36** depicts a flow diagram illustrating message assembly procedure **3100**.

FIGS. **37**A and **37**B depict the format of message CA**4**.

FIG. **38** depicts a flow diagram illustrating close session process **411**.

FIGS. **39**A and **39**B depict the format of message CS**1**.

FIGS. **40**A and **40**B depict the format of message CS**2**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference is now made to FIGS. **1**–**40** for the purpose of describing, in detail, the preferred embodiments of the present invention. The Figures and accompanying detailed description are not intended to limit the scope of the present invention.

I. Information And Information Flow

The present invention is generally depicted in FIG. **1**. FIG. **1** shows three entities: server computer **100**, customer computer **200** and merchant computer **300**, connected to each other via the Internet 50. The connections are identified by lines **105**, **205** and **305**, respectively.

Customer computer **200** represents the computer of an individual, customer user **203**, who wants to buy a product over the Internet 50. (A "product" includes goods, services, information, data, and the like.) Customer computer **200** includes customer database **202** and customer application software **210**. Merchant computer **300** represents the computer of an individual, merchant user **303**, who provides the product to customer user **203** over the Internet **50**. Merchant computer **300** includes merchant database **302** and merchant application software **310**. Information relating to merchant user **303** is stored within merchant database **302**. Merchant application software **310** executes the processes of the present invention.

While the following detailed description is provided for a single customer user **203** and a single merchant user **303**, it is noted that the present invention contemplates communication and transactions between both single and multiple customer users **203** and single and multiple merchant users **303**.

Server computer **100** communicates securely—as will be described in detail later—with customer computer **200** and merchant computer **300** over the Internet 50 to effect transactions between customer user **203** and merchant user **303**. Server computer **100** includes server database **102** and server software **110**. Information relating to server computer **100**, customer user **203** and merchant user **303** is stored within server database **102**. Server software **110** executes the processes of the present invention.

Communication between server computer **100**, customer computer **200** and merchant computer **300** is preferably carried out by hypertext transport protocol ("HTTP") over the World Wide Web ("WWW") services provided on the Internet 50. Of course, other protocols and networks may be used or desired.

FIG. **2** depicts the general processes performed by the present invention. The processes start at step **0**.

Preliminarily, setup processes are performed at step **1**. In the setup processes, customer user **203** and merchant user **303** (collectively "clients") are configured within database **102** of server computer **100**. In this manner, clients can be recognized by and communicate with server computer **100**. Customer database **202** and merchant database **302** are also configured at step **1**.

An open session process is performed at step **2**. Generally, a session is an opportunity (or window) in which customer user **203** may purchase a product from merchant user **303** over the Internet 50 or in which merchant user **303** may provide a product to customer user **203** over the Internet 50. Customer user **203** and merchant user **303** have their own independent sessions. Sessions are of limited duration. This duration is governed by parameters. These parameters are preferably set by customer user **203** and merchant user **303**. Alternatively, server computer **100** may set such parameters.

A transaction/payment process is performed at step **3**. In this step, customer user **203** and merchant user **303** agree upon a product to be provided at an agreed upon price. Customer user **203** pays for the product with electronic cash. Electronic cash is a representation of funds (real cash, credit, etc.) used in the present invention. The electronic cash is received by merchant user **303** who can provide the purchased product to customer user **203**. Customer user **203** may conduct business with multiple merchant users **303** during a session. Customer user **203** and merchant user **303** are only able to transact business for the duration of sessions such as those created at step **2**.

A close session process may be included in the present invention at step **4**. This step ends the session created at step **2**.

The processes performed by the present invention end at step **5**.

Referring to FIG. **3**A, the processes described above in steps **1** through **4** of FIG. **2** are now more particularly described. Initially, the setup processes performed at step **1**

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include download and installation process **400**, registration process **401**, instrument binding process **403** and load/unload funds process **405**.

During the download and installation process **400**, customer user **203** and merchant user **303** each download and install a copy of client application software **153** (FIG. **1**) which preferably resides on the Internet 50. Within customer computer **200** and merchant computer **300**, the copy of client application software **153** resides as customer application software **210** and merchant application software **310**, respectively. (Merchant application software **310** includes other software to enable merchant computer **300** to perform the functions described below.) Using well known techniques, customer application software **210** and merchant application software **310** are linked to the web browser of customer computer **200** and merchant computer **300**, respectively, and are accessed through the browser as necessary.

Next, at registration process **401**, customer user **203** and merchant user **303** register with server computer **100**. That is, "persona" for customer user **203** and merchant users **303** is created within database **102** of server computer **100**. A "persona" is herein defined as a collection of data relating to a specific client. Therefore, by this registration process, each customer user **203** and merchant user **303** who has registered with server computer **100** has their own persona in server computer **100**. (The details of personas will be described later.) The right of a persona to preform certain operations (e.g., load funds, unload funds, submit certain messages to server computer **100**) may be enabled or disabled on a message or service basis.

During the instrument binding process **403** of FIG. **3**A, a client (a customer user **203** or a merchant user **303**) communicates information to server computer **100** which it uses to establish that the client may use a financial instrument. Financial instruments may include credit cards, debit cards, demand deposit accounts ("DDAs") or other financial instruments. The issuer of the instrument being bound or a third party guarantor sets whatever criteria are deemed necessary by it to determine if the client may use the instrument. For example, a bank issuing a credit card may find sufficient that the client provide a five digit postal code and his mother's maiden name in order to use the credit card. A list of these criteria may, for example, be provided to server computer **100** in which case server computer **100** can communicate with the client to establish whether the client meets these criteria so that the client can use the financial instrument.

Once the client establishes that the client may use the instrument by this process, the instrument is "bound" to or associated with the client's persona created during registration process **401**. Once the instrument is bound, the client can use the instrument for transactions as will be described later.

Load/unload funds process **405** is discussed next. For customer user **203**, a "load" is the process by which funds associated with a bound instrument are "loaded" (or transferred) to the persona of customer user **203**. In the persona of customer user **203**, the funds are represented as electronic cash. For customer user **203**, an "unload" is the process by which electronic cash is "unloaded" (or transferred) from the persona of customer user **203** to a bound instrument. For merchant user **303**, an "unload" is the process by which electronic cash is "unloaded" from the persona of merchant user **303** to a bound instrument. For merchant user **303**, a "load" is the process by which funds associated with a bound instrument are "loaded" to the persona of merchant user **303**. In the persona of merchant user **303**, the funds are represented as electronic cash.

The open session process described for step **2** in FIG. **2** is further explained with regard to the open session process **407** of FIG. **3**A. When customer user **203** creates a session, customer user **203** is enabled to transact business over the Internet 50 with one or more merchant users **303** who have each created their own independent sessions. (Of course, merchant users **303** may also act as customer users **203** if they so desire.) The transaction/payment process **409** is performed next. During this process, customer user **203** and merchant user **303** may negotiate and agree upon the elements of a transaction (e.g., a particular product and price). Then, merchant user **303** may request that customer user **203** pay the agreed upon price for the product. In response to the request of merchant user **303**, customer user **203** may communicate to merchant user **303** that customer user **203** accepts the agreed upon price for the product. It is preferred that merchant user **303** cause information regarding the transaction to be submitted to server computer **100** for validation. If server computer **100** validates the transaction, electronic cash is transferred from the persona of customer user **203** to the persona of merchant user **303**. Once notified of validation, merchant user **303** can provide the product to customer user **203**.

At close session process **411**, the session created during open session process **407** may be terminated. When customer user **203** (or merchant user **303**) closes the session, server computer **100** disables customer user **203** (or merchant user **303**) from transacting business over the Internet 50 with another merchant user **303** (or customer user **203**) who has an open session unless customer user **203** has other open sessions.

Referring to FIG. **3**B which depicts the flow of messages of the present invention, registration process **401** is carried out by customer computer **200** sending message R**1** ("Registration **1**") to server computer **100**. In response to message R**1**, server computer **100** sends message R**2** ("Registration **2**") back to customer computer **200**. The information included in these registration messages will be described later.

During instrument binding process **403**, customer computer **200** sends message BI**1** ("Bind Instrument **1**") to server computer **100**. The information in message BI**1** is used by server computer **100** to confirm the authority of the binder of the instrument with the issuer of that instrument or a third party guarantor. The confirmation process could augmented by the exchange of messages (herein, messages BI**2** and BI**3**) between server computer **100** and customer computer **200**. Messages BI**2** and BI**3** would have a format similar to that of the other messages described herein. The content of message BI**2** may include requests for additional information (prompted by the issuer of the instrument) or clarification of information as required by the issuer of the instrument or the third party guarantor. For example, message BI**2** may cause customer user **203** to be prompted for customer user **203**'s mother's maiden name. Message BI**3** may contain the response of customer user **203**.

In response to message BI**1**, server computer **100** sends message BI**4** ("Bind Instrument **4**") back to customer computer **200**. The information included in these binding messages will be described later. In the description which follows, messages BI**1** and BI**4** are the operative messages for instrument binding.

During load/unload funds process **405**, customer computer **200** sends message LUI ("Load/Unload **1**") to server computer **100**. In response to message LU**1**, server computer **100** sends message LU**2** ("Load/Unload **2**") back to customer computer **200**. The information included in these load/unload funds messages will be described later.

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During open session process **407** customer computer **200** sends message OS**1** ("Open Session **1**") to server computer **100**. In response to message OS**1**, server computer **100** sends message OS**2** ("Open Session **2**") back to customer computer **200**. The information included in these open session messages will be described later.

During transaction/payment process **409**, merchant computer **300** sends message PR**1** ("Payment Request **1**") to customer computer **200**. In response to message PR**1**, customer computer sends back message CA**1** ("CAsh payment **1**") to merchant computer **300**. After receiving message CA**1**, merchant computer sends message CA**2** ("CAsh payment **2**") server computer **100**. In response to message CA**2**, server computer **100** sends back message CA**3** ("CAsh payment **3**") to merchant computer **300**. In response to message CA**3**, merchant computer **200** sends message CA**4** ("CAsh payment **4**") to customer computer **200**. The information included in these transaction/payment messages will be described later.

During optional close session process **411**, customer computer **200** sends message CS**1** ("Close Session **1**") to server computer **100**. In response to message CS**1**, server computer **100** sends message CS**2** ("Close Session **2**") to customer computer **200**. The information included in these close session messages will be described later.**2**

It is noted that FIG. **3**B depicts messages R**1**/R**2**, BI**1**/BI**4**, LU**1**/LU**2**, OS**1**/OS**2** and CS**1**/CS**2** passing between customer computer **200** and server computer **100**. Merchant user **303** causes these same messages to flow between merchant computer **300** and server computer **100**. It follows that merchant user **303** executes registration process **401**, instrument binding process **403**, load/unload funds process **405**, open session process **407** and close session process **411** in the same way as customer user **203**, unless otherwise noted. In the case of merchant user **303**, data associated with these processes is manipulated with regard to the merchant database and merchant data structures included in server computer **100**.

The databases and data structures used in the preferred embodiments of the present invention are described next.

II. Databases

Referring to FIG. **1**, server computer **100**, customer computer **200**, and merchant computer **300** include databases **102**, **202** and **302**, respectively. While the following description of databases **102**, **202** and **302** refer to specific data structures and formats, those skilled in the art will readily appreciate that such specific data structures and formats are not critical to and are not considered part of the present invention. Therefore, any modifications to the data structures and formats would be within the scope of the appended claims.

It is preferred that values be stored in databases **202** and **302** when a response message is received by customer computer **200** and merchant computer **300**, respectively. However, where it enhances clarity, values are described as being stored prior to the receipt of such a response message.

A. Server Database **102**

Server database **102** stores data enabling server computer **100** to communicate with and process transactions between customer computer **200** and merchant computer **300**. FIG. **4**A depicts the general structure of server database **102**.

As shown in FIG. **4**A, server database **102** includes server persona data structure **120**, server session data structure **130**, message log data structure **140**, message data structure **150** and public key data structure **160** and application data structure **170**. Each of these data structures is now described in detail.

1. Server Persona Data Structure **120**

Server persona data structure **120** stores data relating to the universe of customer users **203** and merchant users **303** who have registered with server computer **100**. Referring to FIG. **4**B, persona data structure **120** includes one or more customer personas **120.1**. It is preferred that customer persona **120.1** be recorded having fields **120**A–**120**H. Server persona data structure **120** contains a customer persona **120.1** for each registered customer user **203**. The fields of customer persona **120.1** are now described.

Field **120**A stores a persona id for customer user **203**. The persona id identifies particular customer user **203**. In order to increase system security, server database **102** does not store recognizable information for customer user **203**. For example, the actual name and address of customer user **203** is not stored within server database **102**. Rather, the persona id is used for identification. The persona id field is optional in that the information stored in public key field **120**C (described below) may also be used to locate records associated with customer user **203**. Because a persona id is shorter than a public key it is more efficient, and thus preferred, to use the persona id for this purpose.

Field **120**B contains an email address for customer user **203**. Using the email address of field **120**B, server computer **100** is able to send email to customer user **203** over the Internet 50.

Field **120**C stores an RSA public key for customer persona **120.1**. As is more fully described below, the RSA public key of field **120**C is generated by customer application software **210**. The RSA public key of field **120**C is the public component of an RSA public/private key pair. Both the RSA public and private key for a customer computer **200** are stored in customer computer **200**, as described later. In the preferred embodiment, RSA keys are 768 bits in length. This length reflects a balance between increasing security (achieved using longer keys) and decreasing processing costs (achieved using shorter keys). As processor power increases in the future, longer RSA keys may be used to increase security without compromising system performance.

If the customer RSA public key is encapsulated in a certificate by appropriate certification authority, the key from the certificate is used in place of the public key and the persona id field **120**A is no longer optional as previously described. Certificate based systems are well known in the art and are not described.

The date that customer user **203** registered with server computer **100** is stored in field **120**D. The date of field **120**D permits the running of promotions (e.g., if you register before this date, then this will happen) and assists in the resolution of disputes.

Field **120**E contains a preferred language of communication for customer user **203**.

Field **120**F stores an autoclose passphrase for customer user **203**. The autoclose passphrase is a passphrase which allows customer user **203** to close customer persona **120.1** in certain circumstances as described later.

Data **120**G represents a data structure containing fields **120**G.**1**–**120**G.**4**, shown in FIG. **4**C. Fields **120**G.**1**–**120**G.**4** store data for each cash container established by customer user **203**. Server persona data structure **120** contains a set of fields **120**G.**1**–**120**G.**4** for each cash container established by customer user **203**. The cash container stores electronic cash. It is contemplated that multiple cash containers can be used, e.g., one for each currency that customer user **203** intends to transact business in.

Fields **120**G.**1**–**120**G.**4** are now described in detail with reference to FIG. **4**C.

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Field **120**G.**1** stores the currency associated with the amount of electronic funds stored in fields **120**G.**2** and/or **120**G.**3**.

Field **120**G.**2** stores the available-balance of the cash container.

Field **120**G.**3** stores the on-hold-balance of the cash container.

Electronic cash stored in fields **120**G.**2** and/or **120**G.**3** is preferably deposited into an agency account (a form of banking instrument in which funds are held by one party for the benefit of the other). The account number of this agency account is stored in field **120**G.**4**.

Data **120**H represents a data structure containing fields **120**H.**1**–**120**H.**28**, shown in FIG. **4**D. Fields **120**H.**1**–**120**H.**28** store data for instruments bound to customer persona **120**.**1**. Server persona data structure **120** contains a set of fields **120**H.**1**–**120**H.**28** for each instrument bound to a customer persona **120**.**1**. Fields **120**H.**1**–**120**H.**28** are now described in detail with reference to FIG. **4**D.

Field **120**H.**1** stores the persona id of field **120**A (FIG. **4**B). The persona id of field **120**H.**1** indicates the persona **120**.**1** to which the instrument having data stored in fields **120**H.**1**–**120**H.**28** is bound.

Field **120**H.**2** contains an instrument type for the bound instrument. Instrument types preferably include bank accounts, debit cards and credit cards.

Field **120**H.**3** stores an instrument subtype for the bound instrument. The instrument subtype is a sub-classification of an instrument type (e.g., "VISA" for the instrument type credit card").

Customer user **203** may elect to activate an "autoclose" feature when registering its persona **120**.**1**. The autoclose feature permits customer user **203** to provide a passphrase (described later) to close customer persona **120**.**1** and to unload all electronic cash associated with that persona to an autoclose instrument. If the instrument being bound is the autoclose instrument, field **120**H.**4** contains an instrument number for the bound instrument. The instrument number identifies the instrument. It is preferred that the instrument number be encrypted before it is stored. Alternatively, the instrument number could be saved in a separate store device not connected to server computer **100**. If the instrument being bound is not the autoclose instrument, the instrument number is used to compute field **120**H.**9** (as described later) and the instrument number is not stored in field **120**H.**4**.

Bound instruments may have a secondary number further identifying the bound instrument, for example, an American Express CID or a US-DDA account R/T number. Such secondary numbers, referred herein to as instrument sub-numbers, are stored in field **120**H.**5**.

Bank accounts are created in a single currency. The native currency of a bank account instrument is stored in field **120**H.**6**.

Field **120**H.**7** stores one or more integers representing legal agreements. In the preferred embodiment, the operator of server computer **100** determines what legal agreements must be agreed to by customer user **203** in order for customer user **203** to use the bound instrument to perform certain operations.

Field **120**H.**8** contains an instrument prefix. The instrument prefix of **120**H.**8** is subset of the instrument number described in reference to field **120**H.**4**. In the preferred embodiment, the instrument prefix of field **120**H.**8** (for credit cards, debit cards, and bank accounts) is the first two and the last four digits of the instrument number of field **120**H.**4**.

Field **120**H.**9** stores an instrument hash value, preferably an MD5 hash of the instrument number described with reference to field **120**H.**4**. (The term "hash" as used in this application refers to cryptographic hashes, as opposed to other mathematical hashing functions such as algebraic hashes.) The instrument number represented by the hash is preferably made more difficult to guess by concatenating the instrument number with a random number generated and provided to server computer **100** by customer computer **200** (such number commonly referred to as a "salt") before hashing. The instrument salt is stored in field **230**Q of customer instrument binding data structure **230** as discussed below. The instrument hash of field **120**H.**9** is used to verify the instrument number without requiring the instrument number to be stored at server computer **100**. This reduces the attractiveness of server computer **100** as a target for thieves and scoundrels.

Field **120**H.**10** contains an identification number of the issuer of the bound instrument, also known as a "BIN", or bank id number.

If the instrument being bound is to be used as autoclose instrument, fields **120**H.**11** and **120**H.**12** contain the name and address of a holder of the bound instrument. It is preferred that this information be encrypted before being stored. Alternatively, the instrument number could be saved in a separate store device not connected to server computer **100**.

Fields **120**H.**13** and **120**H.**14** store dates that the bound instrument was bound and was first used, respectively.

Field **120**H.**15** contains a status of a bound instrument. The content of binding status field **120**H.**15** is dependent upon the instrument being bound. For example, to bind a DDA, customer user **203** may be required to sign a form and authorize the operator of server computer **100** to initiate a pre-notification ("pre-note") process with an automated clearing house ("ACH"). Before receiving the signed form or the response to the pre-note, server computer **100** may show that the binding was "created". Upon receiving the signed form, status field **120**H.**15** may contain "pending pre-note". If the pre-note is sent before the signed form, field **120**H.**15** may contain "pending-signature". If both have been received and are acceptable, field **120**H.**15** may contain "enabled". If there were a problem with either, or if a specified time period for receiving either requirement expires, field **120**H.**15** may contain "disabled". Field **120**H.**15** may also contain "disabled" if the instrument is subsequently determined not to be usable (e.g., an account is frozen by a bank). The status of other bound instruments will depend on the instrument type and the steps necessary to bind a particular type of instrument. Of course, the prenote process may be performed on-line.

Field **120**H.**16** is a flag indicating whether the bound instrument is enabled for sale transactions. A sale transaction is where customer persona **120**.**1** is used to pay for something using a bound instrument directly, as in the use of a debit card.

If field **120**H.**16** indicates that the bound instrument is enabled for sale transactions, a limit in customer user **203**'s chosen (native) currency is stored in field **120**H.**17**. If a native currency does not exist, the sale transaction limit of **120**H.**17** is U.S. dollars. A special value may be used to indicate that there is no sale transaction limit for the bound instrument. This special value may be any value that is not within the set of acceptable values of the field. For example, if the limit of field **120**H.**17** is expressed as a positive number, the special value could be negative one.

Field **120**H.**18** is a flag indicating whether the bound instrument is enabled for credit/return transactions. A credit/return transaction is an operation where a merchant credits

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customer persona **120.1** in lieu of providing the product originally agreed to.

If field **120**H.**18** indicates that the bound instrument is enabled for credit/return transactions, a limit in customer user **203**'s chosen native currency, per credit/return transaction is stored in field **120**H.**19**. If a native currency does not exist, the credit/return transaction limit of field **120**H.**19** is U.S. dollars. A special value, may be used to indicate that there is no credit/return transaction limit for the bound instrument, as previously described.

Field **120**H.**20** is a flag indicating whether a bound instrument is enabled for load operations, as previously described.

If field **120**H.**20** indicates that the bound instrument is enabled for load operations, a limit is stored in field **120**H.**21**. The load cash transaction limit of field **120**H.**21** represents a limit, in native currency. If a native currency does not exist, the load cash transaction limit of field **120**H.**21** may default to U.S. dollars. A special value may be used to indicate that there is no load cash transaction limit for the bound instrument as previously described.

Field **120**H.**22** is a flag indicating whether the bound instrument is enabled for unload operations, as previously described.

If field **120**H.**22** indicates that the bound instrument is enabled for unload cash transactions, a limit for cash transactions is stored in field **120**H.**23**. The unload cash transaction limit of field **120**H.**23** represents a limit, in native currency. If a native currency does not exist, the unload cash transaction limit of field **120**H.**23** may preferably default to U.S. dollars. A special value may be used to indicate that there is no unload cash transaction limit for the bound instrument, as previously described.

Field **120**H.**24** is a flag indicating whether the bound instrument is designated as the autoclose binding for customer persona **120.1**. An autoclose binding must have its unload cash transaction flag (field **120**H.**22**) enabled.

Field **120**H.**25** stores a number of hours over which the sales transaction limit stored in field **120**H.**17** applies.

Field **120**H.**26** stores a number of hours over which the credit transaction limit stored in field **120**H.**19** applies.

Field **120**H.**27** stores a number of hours over which the load cash transaction limit stored in field **120**H.**21** applies.

Field **120**H.**28** stores a number of hours over which the unload cash transaction limit stored in field **120**H.**23** applies.

Field **120**I stores legal agreements as previously described.

While the foregoing description of customer persona **120.1** was set forth with respect to data relating to customer user **203**, it is noted that a merchant user **303** has merchant persona **120.2** stored in server persona data structure **120**. Merchant persona **120.2** is shown in FIGS. **4**E, **4**F, and **4**G where fields **120**AA–**120**HH, **120**GG.**1**–**120**GG.**4**, and **120**HH.**1**–**120**HH.**28** correspond to fields **120**A–**120**H, **120**G.**1**–**120**G.**4**, and **120**H.**1**–**120**H.**28** of FIGS. **4**B, **4**C and **4**D.

2. Server Session Data Structure **130**

Server session data structure **130**, shown generally in FIG. **4**A, stores data associated with a session. Server session data structure **130** is now described for customer user **203**.

Referring to FIG. **4**H, server session data structure **130** includes one or more customer session records **130.1**. Server session data structure **130** contains one record **130.1** for each active session of customer user **203**.

Server computer **100** identifies a session by a unique session identification number ("session id"). The session id is stored in field **130**A.

Messages exchanged between server computer **100** and customer computer **200** during a session includes encrypted data. Field **130**B contains an encryption key (known as a "session key"). The session key of field **130**B is used by server computer **100** to calculate a key to decrypt encrypted messages received from customer computer **200**.

Field **130**C stores a session salt, preferably 8-bytes in length. As will be described below, messages exchanged inside a session between server computer **100**, customer computer **200** and merchant computer **300** are not authenticated using digital signatures. Instead, messages exchanged inside a session are authenticated by knowledge of the session key and session salt described above. To ensure that the unencrypted part of a message is not altered, it is hashed and the hash value is included in the encrypted part of the message. Use of the session salt of field **130**C ensures that the hash values are more secure.

In the present invention, customer user **203** may transact business in one or more currencies. Field **130**D indicates a denomination of currency (for example, U.S. dollars) that customer user **203** will use during the session.

Field **130**E represents a maximum amount of electronic cash (in the currency of field **130**D) available to customer user **203** at the start of the session.

Field **130**F represents an amount of electronic cash (in the currency of field **130**D) available to user **203** at a particular instant during the session. The initial value of field **130**F is the value stored in opening amount field **130**E. Thereafter, the value of current amount of field **130**F is determined by subtracting each amount spent for products during the session from the previous value of **130**F.

Field **130**G indicates a date and time that the session was created. Field **130**H indicates the date and time that the session actually closed.

Field **130**I represents the maximum number of times (key use limit) that server computer **100** will recognize customer computer **200**'s use of the session key of field **130**B.

Field **130**J represents a length of time (key lifetime) that the session key of field **130**B is valid.

Field **130**K stores the persona id of customer user **203**. It is through the persona id of field **130**K that a session is associated with a persona **120.1**.

Field **130**L stores the status of a session associated with the session id in field **130**A. The status is either "open" or "closed".

Field **130**M stores an optional string (memo) provided by customer user **203** describing the session associated with the session id in field **130**A. Field **130**M may contain a string provided by customer user **203** at the opening of a session and a string provided at the close of a session.

Transaction data **130**N comprises fields **130**N.**1**–**130**N.**5**. Fields **130**N.**1**–**130**N.**5**, shown in FIG. **4**I, are maintained for each transaction initiated by customer user **203** during the session identified by the session id in field **130**A. The maximum number of such transactions is equal to the key-use limit stored in field **1301**. Fields **130**N.**1**—**130**N.**5** are now described in detail with reference to FIG. **4**I.

Field **130**N.**1** contains the amount charged to customer user **203** for a particular transaction.

Field **130**N.**2** stores the session id stored in field **130**A.

Field **130**N.**3** stores an order identification number ("order id") generated by merchant computer **300** to identify a particular order.

Field **130**N.**4** stores the session id of merchant **303** from which the product associated with a particular transaction as purchased.

Field **130**N.**5** contains the index value assigned by customer computer **200** to a particular transaction. The index

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value must be within the key use-limit established as set forth in field **130**I. Because the transactions executed by customer persona **120**.**1** may not be received by server computer **100** in the order that they are executed, the index value is stored in a manner, such as bit map of permitted index values, which allows server computer **100** to determine if a permitted index has been used and to take appropriate action should that occur.

While the foregoing description of server session data structure **130**, customer session record **130**.**1** was set forth with respect to data relating to customer user **203**, it is noted that a merchant **303** user has corresponding data stored in server session data structure **130**. Such a merchant session record **130**.**2** is shown in FIGS. **4**J and **4**K where fields **130**AA–**130**NN correspond to fields **130**A–**130**N, and fields **130**NN.**1**–**130**NN.**5** correspond to fields **130**N.**1**–**130**N.**5**.

3. Message Log Data Structure **140**

Message log data structure **140** (FIG. **4**A) tracks messages received and sent by server computer **100**. This permits server computer **100** to identify duplicate messages and respond accordingly. Duplicate messages are used to ensure consistent state between a client and server computer **100** in the face of unpredictable communications over the Internet 50. For example, a duplicate of a valid message could be responded to with the original response. Server computer **100** might not, however, duplicate the processing of the duplicate message. A record **140**.**1** of message log data structure **140** is now described with reference to FIG. **4**L.

Field **140**A contains the persona id included in the message received by server computer **100**.

Field **140**B contains the session number included in a message CA**2** (described later) received by server computer **100**. For all other messages received by server computer **100**, this field is preferably null.

Field **140**C contains the transaction number included in a message R**1**, BI**1**, LU**1**, OS**1**, or CS**1** (described later) received by server computer **100**. For any message CA**2** received by server computer **100**, this field is preferably null.

Field **140**D contains the index included in message CA**2** received by server computer **100**. For all other messages received by server computer **100**, this field is preferably null.

Field **140**E contains a hash of, or copy of, the message received (incoming) by server computer **100** associated with fields **140**A–**140**D.

Field **140**F contains a copy of a message sent by server computer **100** in response to the message saved in field **140**E.

4. Message Data Structure **150**

Message data structure **150** (FIG. **4**A) includes templates indicative of the format and contents of messages used in the present invention by type and version. For example, a particular message may differ between one or more supported versions of customer application software **210** or merchant application software **310**. When a message is received by server computer **100**, it is compared to a template for that message. As described later, if the message does not conform to the template, an error message is returned to the sender of the message.

5. Private Key Data Structure **160**

Private key data structure **160** maintains a list of the RSA public/private key pairs of server computer **100** that are used in supported versions of customer application software **210** or merchant application software **310**. As will be described later, encrypted messages sent to server computer **100** include a pointer which informs server computer **100** which RSA public key of server computer **100** was used by customer application software **210** or merchant application software **310** to encrypt the message. In this manner, server computer **100** can find the corresponding RSA private key to decrypt the encrypted message.

6. Application Data Structure **170**

Application data structure **170** tracks existing version(s) of customer application software **210** and merchant application software **310**. Application data structure **170** is also used to determined whether an update to customer application software **210** or merchant application software **310** is available or necessary. For example, server computer **100** may advise a customer computer **200** that customer application software **210** is non-current yet usable, or that the software is no longer usable and must be replaced.

B. Customer Database **202**

FIG. **5**A depicts the general structure of customer database **202**. Customer database **202** includes customer application data structure **215**, customer persona data structure **220**, customer instrument binding data structure **230**, customer session data structure **240**, customer pending transaction data structure **250**, customer log data structure **260**, message template data structure **270** and customer cash data structure **280**. Each of these data structures is now described in detail.

1. Customer Application Data Structure **215**

Customer application data structure **215** stores data relating to server computer **100**. Referring to FIG. **5**B, customer application data structure **215** includes record **215**.**1**, shown there in detail.

Field **215**A contains an RSA public key for server computer **100**. The RSA public key of field **215**A is used by customer computer **200** to encrypt data in messages sent by customer computer **200** to server computer **100**.

Field **215**B stores a uniform resource locator for ("URL") for server computer **100**. The URL of field **215**B is the address of server computer **100** on the world wide web of the Internet 50.

While the foregoing description of customer application data structure **215** and record **215**.**1** was set forth with respect to data relating to customer user **203**, it is noted that a merchant user **303** has corresponding data stored in merchant application data structure **315**, shown in FIG. **6**B. A merchant record **315**.**1** is shown in FIG. **6**B where fields **315**A–**315**B correspond to fields **215**A–**215**B.

2. Customer Persona Data Structure **220**

Customer persona data structure **220** stores data relating to customer user **203**. Referring to FIG. **5**C, customer persona data structure **220** includes record **220**.**1**, shown there in detail.

Fields **220**A–**220**C correspond to and contain the same information as fields **120**A–**120**C (FIG. **4**B).

Field **220**D stores an autoclose passphrase for customer user **203**. The autoclose passphrase is a passphrase which allows customer user **203** to close customer persona **120**.**1** in certain circumstances as described later.

Field **220**E contains a preferred language of communication for customer user **203**.

A default name and address of customer user **203** is stored in field **220**F. The default name and address of field **220**F is the name and address of the individual whose customer persona **120**.**1** is indicated by the persona id of field **220**A. The default name and address of field **220**F facilitates providing such information when it is requested.

Field **220**G retains preferred customer application software **210** settings (options), for example, the communication preferences (e.g., time-out range in seconds), alert preferences (e.g., show alerts before submitting transactions offline and/or when logging on), and security preferences (e.g., ask for passphrase before a payment operation).

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Field **220**H stores the RSA private key for a customer persona **120**.**1**. The RSA private key of field **220**H is the complement to RSA public key of field **120**C, stored in server database **102**.

Cash container data **220**I represents fields **280**A–**280**C shown in FIG. **5**U.

Instrument binding **220**J represents fields **230**A–**230**S shown in FIG. **5**D.

Field **220**K retains the autoclose account number associated with the autoclose password stored in field **220**D.

Field **220**L stores one or more integers representing legal agreements. In the preferred embodiment, the operator of server computer **100** determines what legal agreements must be agreed to by customer user **203** in order for customer user **203** to create a persona.

Active sessions data **220**M represents fields **240**A–**240**K.

Pending log data **220**N represents records **251**–**256** of pending log data structure **250**.

Transaction log data **2200** repressents records **261**–**267** of transaction log data structure **260**.

While the foregoing description of customer persona data structure **220** and record **220**.**1** was set forth with respect to data relating to customer user **203**, it is noted that merchant user **303** has corresponding data stored in merchant persona data structure **320**, shown in FIG. **6**C. A merchant record **320**.**1** is shown in FIG. **6**C where fields **320**A–**3200** correspond to fields **220**A–**220**O.

3. Customer Instrument Binding Data Structure **230**

Customer instrument binding data structure **230** retains information at customer computer **200** regarding bound instruments. Referring to FIG. **5**D, customer instrument binding data structure **230** includes one or more records **230**.**1**. Customer database **202** contains one record **230**.**1** for each instrument bound to customer persona **120**.**1**. A detailed record **230**.**1** of customer instrument binding data structure **230** is shown in FIG. **5**D where:

Field **230**A stores the instrument number.

Field **230**B contains a description of the bound instrument.

Fields **230**C–**230**J respectively represent the name, address, city, country, postal code, country code, area code and telephone number of the holder of the bound instrument.

Field **230**K stores a default currency associated with the bound instrument.

Fields **230**L–**230**O are flags indicating whether the bound instrument is enabled for sale transactions, credit return transactions, unload and load operations. Fields **230**L–**230**O correspond to fields **120**H.**16**, **120**H.**18**, **120**H.**22** and **120**H.**20**, respectively (FIG. **4**D).

Field **230**P contains a status of the bound instrument. The binding status of field **230**P corresponds to the binding status of field **120**H.**15** of FIG. **4**D.

Field **230**Q stores a salt for the bound instrument. The salt of field **230**Q represents a random number generated by customer application software **210**. As previously described, is used by server to strengthen the result of the instrument hash value stored in field **120**H.**9**.

Field **230**R stores certain information associated with a bound instrument and is referred to as "instrument recurring data". The recurring data is a data string which is used by customer application software **210** to reconstruct a set of label-value pairs identified by server computer **100** at the time an instrument is bound. The fields are returned to server computer **100** by customer computer **200** during operations that require use of the instrument associated with the recurring data. In this way, server computer **100** may receive information regarding the instrument when necessary without storing that information in its data structures. The particular label-value pairs that are contained within recurring data depend on the type of the bound instrument and the requirements of the issuer of the instrument. For example, a credit card might require the card number, the card expiration date, and the name and address of the card holder to be returned to the server each time the card is used to load funds into persona **120**.**1**. The recurring data would contain data which would allow customer application software **210** to return this information in the proper label-value pair format.

Field **230**S corresponds to and stores the same information as field **120**H.**7** (FIG. **4**D) relating to legal agreements.

While the foregoing description of customer instrument binding data structure **230** and record **230**.**1** was set forth with respect to data relating customer user **203**, it is noted that a merchant user **303** has corresponding data stored in merchant persona data structure **330**, shown in FIG. **6**D. A merchant record **330**.**1** is shown in FIG. **6**D where fields **330**A–**330**S correspond to fields **230**A–**230**S.

4. Customer Session Data Structure **240**

Customer session data structure **240** maintains information at customer computer **200** relating to a session. Referring to FIG. **5**E, customer session data structure **240** includes one or more records **240**.**1**. Customer session data structure **240** contains one record **240**.**1** for each active session of customer user **203**. A detailed record **240**.**1** of customer session data structure **240** is shown in FIG. **5**E.

Fields **240**A–**240**F correspond to and contain the same information relating to a session as fields **130**A–**130**F (FIG. **4**H). Field **240**G contains the last index used by customer computer **200** during the session. Field **240**H contains the same information as field **130**M. Fields **240**J–**240**K contain the same data as fields **1301**–**130**J, respectively.

While the foregoing description of customer session data structure **240** and record **240**.**1** was set forth with respect to data relating a customer user **203**, it is noted that a merchant user **303** has corresponding data stored in merchant persona data structure **340**, shown in FIG. **6**E. A merchant record **340**.**1** is shown in FIG. **6**E where fields **340**A–**340**K correspond to fields **240**A–**240**K (FIG. **5**E).

5. Customer Pending Transaction Data Structure **250**

Customer pending transaction data structure **250** stores (1) data necessary to create messages sent by customer computer **200** and (2) a copy of each message sent by customer computer **200**. Referring to FIG. **5**F, customer pending transaction data structure **250** includes the following records: pending persona registration/update persona information **251**, pending link/update financial instrument binding **252**, pending cash payment **253**, pending load/unload funds **254**, pending open session record **255**, and pending close session record **256**. Each record **251**–**256** is now described in detail with reference to FIGS. **5**G–**5**L. It is preferred that a pending record **251**–**256** be deleted upon receipt by customer computer **200** of a response message unless customer user **203** has indicated otherwise.

a. Pending Persona Registration/Update Persona Information Record **251**

Pending persona registration/update persona information record **251** stores data relating to processes by which customer user **203** creates customer persona **120**.**1**. Referring to FIG. **5**G, record **251** is shown in detail.

Field **251**A indicates a code which represents a type (transaction type) of action being performed. For example, field **251**A may contain "creation" which would indicate that user **203** is creating persona **120**.**1**. If a persona **120**.**1** already exits and the action being performed is to change

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something associated with that persona, field **251**A may contain "modification".

Field **251**B stores a transaction number, that is, a unique number indicative of a particular action. The transaction number of field **251**B is generated by client application software **210**. The transaction number of field **250**B allows server computer **100** to send an associated reply message. Because transaction numbers are unique, the transaction number of field **251**B also permits server computer **100** to determine whether a message R**1** is a duplicate message.

Field **251**C represents the date and time that message R**1** was assembled and sent to server computer **100**.

Field **251**D stores the version of the application software **210** used to assemble message R**1**. As further described later, the software version number of field **251**D is used to determine whether customer application software **210** is outdated.

Field **251**E contains a preferred language for customer user **203**, corresponding to field **220**E (FIG. **5**B).

Field **251**F contains a preferred currency for customer user **203**, corresponding to field **240**D (FIG. **5**E).

Field **251**G stores a persona id requested by customer user **203**. It should be noted that the requested persona id of field **251**G may not be the same as the persona id of field **120**A finally assigned to customer user **203**. For example, server computer **100** may reject the requested persona id of field **251**G if it is already in use by another customer user **203**.

Field **251**H contains the email address for customer user **203**, corresponding to field **220**B (FIG. **5**C).

Field **251**I contains an autoclose passphrase, corresponding to field **120**F (FIG. **4**B).

Field **251**J stores an original transaction string which is a copy of original message R**1** sent from customer computer **200** to server computer **100**.

b. Pending Link/Update Instrument Record **252**

Pending link/update record **252** stores data relating to processes by which customer user **203** binds an instrument to customer persona **120.1** or updates an existing bound instrument. Referring to FIG. **5**H, a record **252** is shown in detail.

Field **252**A indicates a code which represents a type of action (transaction type) being performed. For example, field **252**A may contain "link" which would indicate that user **203** is linking an instrument to customer persona **120.1**. If the action being performed is to change something associated with an instrument already linked with that persona, field **252**A may contain "update".

Fields **252**B–**252**D correspond to and store the same information as field **251**B–**251**D of FIG. **5**G. These fields relate to the transaction number, transaction date and time, and software version, respectively.

Field **252**E contains the persona id of customer user **203**, corresponding to field **220**A (FIG. **5**B).

Field **252**F stores the number of the instrument being bound to persona **120.1**.

Field **252**G stores additional customer identification information needed to use the instrument being bound, for example, American Express card customer identification number.

Field **252**H stores the name of the person to whom the instrument being bound was issued.

Field **252**I stores the expiration date of the instrument being bound.

Fields **252**J–**252**Q respectively store the street address, city, state, postal code, country, country code, area code and telephone number of the person to whom the instrument being bound was issued.

Field **252**R contains customer user **203**'s selected description of the instrument being bound.

Instrument recurring data field **252**S stores information stored in field **230**R as relates to bound instruments.

Field **252**T stores the type of instrument being bound, for example, VISA, American Express, etc.

Field **252**U contains a random number salt, generated by customer computer **200**. The salt of field **252**U is used to strengthen the instrument number hash mainatined at server **100**.

Field **252**V stores a flag which if set indicates that the instrument is the autoclose account instrument.

Field **252**W stores an original transaction string which is a copy of the original message BI**1** sent by customer computer **200** to server computer **100**.

c. Pending Cash Payment Record **253**

Pending cash payment record **253** stores data relating to transactions involving cash payments. Referring to FIG. **51**, a record **253** is shown in detail.

Field **253**A indicates a code which represents a type of action (transaction type) being performed. For example, if a session is open, then field **254**A may indicate "cash payment" indicating that customer user **203** is sending a message CA**1** (described later).

Fields **253**B–**253**D correspond to and store the same information as fields **251**B–**251**D (FIG. **5**G). These fields relate to the transaction number, transaction date and time, and software version, respectively.

Field **253**E contains the persona id of customer user **203**, corresponding to field **220**A (FIG. **5**C).

Field **253**F stores an order identification number ("order id"). The order id of field **254**F is generated by merchant computer **300** to identify a particular order.

Field **253**G contains merchant user **303**'s persona id **120**AA (FIG. **4**E).

Field **253**H stores an amount of electronic cash that a customer user **203** is paying for a product which is the subject of the current transaction.

Field **253**I provides a location for an optional customer user **203** generated memo that describes this particular transaction.

Field **253**J contains the URL of a merchant computer **300** to which customer user **203** wishes to direct a cash payment. Customer application software **210** uses the URL field **253**J to direct pay cash requests in the form of message CA**1** to merchant computer **300** for forwarding to server computer **100**.

Field **253**K stores the session-id of the session during which the current transaction was initiated.

Field **253**L stores the index associated with current transaction.

Field **253**M stores an original transaction string which is a copy of message CA**1** sent by customer computer **200**, through merchant computer **300**, to server computer **100**. <cr> Field **253**N contains the URL of merchant computer **300** on which customer user **203** wishes to cancel a transaction. Customer application software **210** uses the URL field **253**N to cancel transaction requests in the form of message CA**1**.

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Field **253**O contains the URL of merchant computer **300** to indicate a successful cancellation of a transaction by customer user **203**. Customer application software **210** uses the URL field **253**O to indicate a successful cancellation in the form of message CA**4**.

Field **253**P stores the URL of merchant computer **300** to indicate a failure of a transaction. Customer application software **210** uses the URL field **253**P to indicate a failure of a transaction in the form of message CA**4**.

d. Pending Load/Unload Funds Record **254**

Pending load/unload funds record **254** stores data relating to transactions involving loading and unloading of electronic cash. Referring to FIG. **5**J, a record **254** is shown in detail.

Field **254**A indicates a code which represents a type of action (transaction type) being performed. For example, field **254**A may contain "load" which would indicate that user customer **203** is "transferring" funds into the cash container field **280**B of record **280.1** from the instrument identified in field **254**F. Alternatively, field **254**A may contain "unload" which would indicate that customer user **203** is "transferring" electronic cash funds from cash container field **280**B to the instrument identified in field **254**F.

Fields **254**B–**254**D correspond to and store the same information as fields **251**B–**251**D (FIG. **5**G). These fields relate to the transaction number, transaction date and time, and software version, respectively.

Field **254**E contains the persona id of customer user **203**, corresponding to field **220**A (FIG. **5**C).

Field **254**F stores an account number identifying a bound instrument from which funds are to be loaded or to which funds are to be unloaded.

Field **254**G stores an amount of funds to be loaded from or unloaded to a bound instrument.

Field **254**H stores the type of account from which funds are being load or to which funds are being loaded.

Field **254**I stores an original transaction string which is a copy of message LU**1** sent by customer computer **200** to server computer **100**.

e. Pending Open Session Record **255**

Pending session record **255** stores data relating to processes by which customer user **203** creates a session. Referring to FIG. **5**K, a record **255** is shown in detail.

Field **255**A indicates a code which represents a type of action (transaction type) being performed. For example, field **255**A may contain "open-session" which would indicate that user customer **203** is creating a session.

Fields **255**B–**255**D correspond to and store the same information as fields **251**B–**251**D (FIG. **5**G). These fields relate to the transaction number, transaction date and time, and software version, respectively.

Field **255**E contains the persona id of customer user **203**, corresponding to field **220**A (FIG. **5**C).

Field **255**F stores an amount of electronic cash to be made available during a session.

Field **255**G stores a value representing the maximum number of transactions (key use limit) that customer user **203** may request during a session.

Field **255**H stores a value representing the maximum amount of time (key lifetime) the session will remain open.

Field **255**I stores the text of an optional description of a session as entered by customer user **203**.

Field **255**J stores the currency associated with the amount value stored in field **255**F.

Field **255**K stores an original transaction string which is a copy of message OS**1** sent by customer computer **200** to server computer **100**.

f. Pending Close Session Record **256**

Pending close-session record **256** stores data relating to processes by which customer user **203** closes a session. Referring to FIG. **5**L, a record **256** is shown in detail.

Field **256**A indicates a code which represents a type of action being performed. For example, field **256**A may contain "close-session" which would indicate that user customer **203** is closing a session.

Fields **256**B–**256**D correspond to and store the same information as fields **251**B–**251**D (FIG. **5**G). These fields relate to the transaction number, transaction date and time, and software version, respectively.

Field **256**E contains the persona id of customer user **203**, corresponding to field **220**A (FIG. **5**C).

Field **256**F contains either "yes" or "no". The value of field **257** determines whether customer user **203** has elected to receive a log of the transactions initiated by customer user **203** during the session to be closed.

Field **256**G stores the session-id of the open session to be closed. Alternatively, if all open sessions are to be closed, field **256**G will be null.

Field **256**H stores the text of an optional description related to the session closing as entered by customer user **203**.

Field **256**I stores an original transaction string which is a copy of message CS**1** sent by customer computer **200** to server computer **100**.

6. Customer Log Data Structure **260**

Referring to FIG. **5**A, customer log data structure **260** maintains a copy of each message received by customer computer **200**. Customer log data structure **260** stores data received by customer computer **200** from server computer **100**. Referring to FIG. **5**M, customer log data structure **260** includes the following records: persona registration/update persona information response **261**, link/update financial instrument binding response **262**, cash payment response **263**, load/unload funds response **264**, open session response **265**, payment request **266**, and close session response **267**. Each record **261**–**267** is now described in detail with reference to FIGS. **5**N–**5**U.

a. Persona Registration/Update Response Persona Information Record **261**

Persona registration/update persona information record **261** stores data relating to the response of server computer **100** to a request to create a customer persona **120.1** by customer user **203**. Referring to FIG. **5**N, a record **261** is shown in detail.

Field **261**A indicates a type of action that was requested and is the same as the value of field **251**A of record **251**. Field **261**B stores a transaction number that is the same as the value stored in **251**B.

Field **261**C represents the date and time that message R**1** was assembled and sent to server computer **100**.

As will be discussed later, messages from customer computer **200** to server computer **100** convey a code containing the version number of the customer application software **210** used to create the message. At server computer

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100, each software version is associated with one of three "status" labels: current, warning, or fatal. Server computer 100 checks the software version reported in customer's messages and includes in its reply message one of the three possible status labels. The status label returned in message R2 is stored in software severity field 261D. A text message regarding the content of software severity field 261D may also be returned by server computer 100 and, if so, is stored in field 261E.

A code representing the success or failure of message R1 is returned by server computer 100 and is stored in response code field 261F. A text message regarding the content of the response code field 261F, if sent by server computer 100, is stored in field 261G.

Field 261H stores a persona id requested by customer user 203. As described below, if the requested persona id is in use, server computer 100 will suggest a persona id to customer user 203. The persona id suggested by server computer 100 is stored in field 261I.

Field 261J contains the email address for customer user 203 corresponding to field 220B (FIG. 5C).

Field 261K contains a preferred language for customer user 203, corresponding to field 220E (FIG. 5C).

Field 261L contains a preferred currency for customer user 203, corresponding to field 240D (FIG. 5E).

b. Link/Update Response Instrument Record 262

Link/update instrument record 262 stores data relating to the response by server computer 100 to a request by customer user 203 to bind an instrument to customer persona 120.1. Referring to FIG. 5O, a record 262 is shown in detail.

Field 262A indicates a type of action (transaction) that was requested and is the same as the value of field 252A of record 252.

Fields 262B–262G correspond to and store the same information as field 261B–261G of FIG. 5N. These fields relate to the transaction date and time, software severity code, software message, response code, and response message respectively.

Field 262H contains the persona id of customer user 203, corresponding to field 220A (FIG. 5C).

Field 262I stores the number of the instrument being bound to customer persona 120.1. Field 262J stores the type of instrument being bound, for example, VISA, American Express, etc. to customer persona 120.1.

Field 262K stores customer identification information needed to use the instrument being bound, for example, American Express card customer identification number <cr>.

Field 262L stores the name of the customer to whom the instrument being bound was issued.

Field 262M stores the expiration date of the instrument being bound.

Fields 262N–262U respectively store the street address, city, state, postal code, country, country code, area code and telephone number of the person to whom the instrument being bound was issued.

Field 262V stores the text of a description of the instrument being bound as entered by customer user 203.

Field 262W stores the native currency, if any associated with an instrument which is returned by server computer 100.

Field 262X stores the name of the issuer of the instrument which is returned by server computer 100.

Field 262Y stores the country of issuance of the instrument.

Field 262Z stores a flag which if set indicates that the instrument is the autoclose account instrument.

c. Cash Payment Response Record 263

Cash payment response record 263 stores data relating transactions involving cash payments and sessions. Referring to FIG. 5P, a record 263 is shown in detail.

Field 263A indicates a type of action (transaction type) that was requested and is the same as the value of field 253A of record 253.

Fields 263B–263E correspond to and store the same information as field 261B–261C and 261F–261G of FIG. 5N. These fields relate to the transaction number, date and time, response code, and response message respectively.

Field 263F contains the persona id of customer user 203, corresponding to field 220A (FIG. 5C).

Field 263G stores an order identification number ("order id"). The order id of field 263I is generated by merchant computer 300 to identify a particular order.

Field 263H contains a merchant user 303 persona id 120AA.

Field 263I provides a location to store a message from merchant user 303.

Field 263J stores an amount of electronic cash that a customer user 203 is paying for a product which is the subject of the current transaction.

Field 263K provides a location for an optional customer user 203 generated memo.

Field 263L stores the session-id of the session during which the current transaction was initiated.

Field 263M stores the index associated with the current transaction.

d. Load/Unload Funds Response Record 264

Load/unload funds response record 264 stores data relating to the response of server computer 100 to a request to load or unload funds by customer user 203. Referring to FIG. 5Q, a record 264 is shown in detail.

Field 264A indicates a type of action (transaction type) that was requested and is the same as the value of field 254A of record 254.

Fields 264B–264G correspond to and store the same information as field 261B–261G of FIG. 5N. These fields relate to the transaction date and time, software severity code, software message, response code, and response message respectively.

Field 264H contains the persona id of customer user 203, corresponding to field 220A (FIG. 5C).

Field 264I stores an account number identifying a bound instrument from which electronic cash is to be loaded or to which electronic cash is to be unloaded.

Field 264J stores an amount of electronic cash to be loaded from or unloaded to a bound instrument.

Field 264K stores an amount of any fee charged by the operation of server computer 100 to load or unload funds from customer persona 120.1.

Field 264L stores an amount equal to the available balance of the funds held by customer persona 120.1 as determined by server computer 100, corresponding to the value stored in field 120G.2 (FIG. 4C).

Field 264M stores an amount of funds which have been loaded (or unloaded) but are not available to customer user

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203. These funds are awaiting processing, corresponding to the value stored in field 120G.3 (FIG. 4C).

e. Open Session Response Record 265

Create session response record 265 stores data relating to the response of server computer 100 to a request to create a session by customer user 203. Referring to FIG. 5R, a record 265 is shown in detail.

Field 265A indicates a type of action that (transaction type) was requested and is the same as the value of field 255A of record 255.

Fields 265B–265G correspond to and store the same information as field 261B–261G of FIG. 5N. These fields relate to the transaction date and time, software severity code, software message, response code, and response message respectively.

Field 265H contains the persona id of customer user 203, corresponding to field 220A of FIG. 5C.

Field 265I stores an amount of electronic cash made available during a session.

Field 265J stores a value representing the maximum number of transactions (key use limit) that customer user 203 may request during a session.

Field 265K stores a value representing the maximum amount of time (key lifetime) the session will remain open.

Field 265L stores a session id number.

Field 265M stores the text of an optional description of the session to be opened as entered by customer user 203.

Field 265N stores an amount of any fee charged by the operation of server computer 100 to create a session.

Field 265O stores the available balance remaining in the cash container (field 120G.2) after the value in amount field 265I is subtracted.

f. Payment Request Record 266

Payment request record 266 stores data relating to a request from merchant user 303 for payment for the product. The request is in the form of a message PR1 (described later) which is sent by merchant computer 300 to customer computer 200. Referring to FIG. 5S, a record 266 is shown in detail.

Field 266A contains a merchant user 303 persona id 120AA.

Field 266B stores an order identification number ("order id"). The order id of field 266B is generated by merchant computer 300 to identify a particular order.

Field 266C stores an amount of electronic funds that a customer user 203 is paying for the product which is the subject of the current transaction.

Field 266D stores a list of credit cards accepted by merchant 203 for payment.

Field 266E provides a location to store a message (note) from merchant user 303.

Field 266F stores the pay-to-URL. The value of label-value pair 5013I is an Internet 50 uniform resource locator. The Internet 50 uniform resource locator of label-value pair 5013I is the address on the Internet 50 to which customer computer 200 is to sends message CA1, described later.

g. Close Session Response Record 267

Close session response record 267 stores data relating to the response of server computer 100 to a request to close a session by customer user 203. Referring to FIG. 5T, a record 267 is shown in detail.

Field 267A indicates a type of action (transaction type) that was requested and is the same as the value of field 256A of record 256.

Fields 267B–267G correspond to and store the same information as field 261B–261G of FIG. 5N. These fields relate to the transaction date and time, software severity code, software message, response code, and response message respectively.

Field 267H contains the persona id of customer user 203, corresponding to field 220A (FIG. 5C).

Field 267I stores an amount of electronic cash remaining in the session after the close of a session after all payments and fees have been deducted.

Field 267J stores the transaction log returned by server computer 100 if requested by customer user 203 in message CS1. This would also indicate whether or not a transaction log was returned.

Field 267K stores an amount of any fee charged by the operation of server computer 100 to close the session.

7. Message Template Data Structure 270

Referring to FIG. 5A, message template data structure 270 tracks the format and contents of messages that customer user 203 sends and receives. A message which contains all the required labels with valid values (e.g., syntax, etc.) as determined by reference to message template data structure 270 will be processed even if there are extraneous label-value pairs. A message which does not contain all the required label-value pairs, or which includes labels associated with invalid values as determined by reference to message template data structure 270 will fail as to form.

While the foregoing description of message templates 270 was set forth with respect to data relating a customer user 203, it is noted that a merchant user 303 has corresponding data stored in message templates 380, shown in FIG. 6A.

8. Cash Container Data Structure 280

Customer cash container data structure 280 maintains information at customer computer 200 relating to cash containers. Referring to FIG. 5U, cash container data structure 280 includes one record 280.1 for each cash container established by customer user 203. A detailed record 280.1 of customer cash container data structure 280 is shown in FIG. 5U.

Fields 280A–280C correspond to and contain the same information relating to a cash container as fields 120G.1–120G.3 (FIG. 4C).

While the foregoing description of customer cash container data structure 280 and record 280.1 was set forth with respect to data relating a customer user 203, it is noted that a merchant user 303 has corresponding data stored in merchant cash container data structure 345, shown in FIG. 6F. A merchant record 345.1 is shown in FIG. 6F where fields 345A–345C correspond to fields 280A–280C (FIG. 5U).

C. Merchant Database 305

The database 305 of merchant computer 300 is described next.

FIG. 6A depicts the general structure of the merchant database 302 of merchant computer 300. FIG. 6A, depicts merchant application data structure 315 (previously described), merchant persona data structure 320 (previously described), merchant instrument binding data structure 330 (previously described), merchant session data structure 340 (previously described), merchant amount data structure 350, merchant sales session data structure 360, merchant cash log 370, message template data structure 380 (previously

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described), and merchant cash container data structure **345** (previously described). Data structures **350**, **360** and **370** are now described.

1. Merchant Amount Data Structure **350**

Merchant amount data structure **350** tracks the amount of electronic cash merchant user **303** expects to receive from customer user **203** for an order. Referring to FIG. **7**A, record **350** is shown in detail.

Field **350**A stores an order id, corresponding to field **253**F of FIG. **5**I.

Field **350**B stores an amount of electronic cash (amount of transaction) corresponding to field **253**H of FIG. **5**I.

Field **350**C is a flag indicating whether an order has been paid for by customer user **203**.

2. Merchant Sales Session Data Structure **360**

Merchant sales session data structure **360** tracks the sessions of merchant user **303**. Referring to FIG. **7**B, record **360** is shown in detail.

Fields **360**A–**360**D correspond to fields **340**A–**340**D (FIG. **6**E). Field **360**E corresponds to field **340**H (FIG. **6**E). Fields **360**F corresponds to field **340**F (FIG. **6**E). Fields **360**J–**360**K correspond to fields **340**J–**340**K (FIG. **6**E). Field **360**G stores the date that the merchant sales session identified by session id field **360**A was opened. Field **360**H stores the date that such session was closed.

3. Merchant Cash Log Data Structure **370**

Merchant cash log **370** tracks electronic cash transactions and session data not retained in merchant sales session data structure **360**. More specifically, merchant cash log data structure **370** stores data relating to collections and sessions initiated by a merchant user **303**. Referring to FIG. **7**C, a record **370** is shown in detail.

Fields **370**A–**370**M store data relating to collection messages CA**2** submitted by merchant computer **300** to server computer **100**. Those fields are now described in detail.

Field **370**A indicates a type of action being performed. In this case, the type stored in field **370**A is "collection".

Field **370**B stores a status of the current collection request. The status of field **370**B may include "attempt", "success" or "failure". The label "attempt" will be returned when the request has been sent to server computer **100** but no response has been received. If the request is processed by server computer **100** and the collection request is honored, field **370**B will contain the label "success". If server computer **100** denies the request, field **370**B will contain the label "failure" and field **370**M will include a code identifying the reason for such failure.

Field **370**C stores an order identification number ("order id"). The order id of field **370**A is generated by merchant computer **300** to identify a particular order.

Field **370**D stores the session id of field **240**A used by customer computer **200** in the current collection request.

Field **370**E stores the index of field **240**G used by customer computer **200** in the current collection request.

Field **370**F stores the currency of field **240**D used by customer computer **200** in the current collection request.

Field **370**G stores the session id of field **340**A used by merchant computer **300** in the current collection request.

Field **370**H stores the index of label-value pair **5213**D used by merchant computer **300** in the current collection request.

Field **370**I stores the currency of field **340**D used by merchant computer **300** in the current collection request.

Field **370**J stores an amount of electronic cash funds requested to be paid to merchant user **303** in the current collection request.

Field **370**K stores an amount of electronic cash credited to merchant cash container field **345**B for the current collection. The amount of electronic cash credited is null if the status of field **370**B is null.

Field **370**L stores an amount of electronic cash funds paid to the operator of server computer **100** for processing the current collection request (i.e., a fee).

If the content of status field **370**B is "failure", field **370**M stores a result code. The result code is used by merchant application software **310** to associate a message with the failure reported in status field **370**B. Thus, the code returned in field **370**M could prompt merchant application software to display a message such as "collection failed due to inadequate funds."

Fields **370**N–**370**T store data relating to sessions initiated by merchant computer **300** (message OS**1**). Those fields are now described in detail.

Field **370**N indicates a type of action being performed. In this case, the type stored in field **370**N is "OS".

Field **370**O stores a status of the current collection request. The status of field **370**O may include "attempt", "success" or "failure". The label "attempt" will be returned when the request has been sent to server computer **100** but no response has been received. If the request is processed by server computer **100** and the collection request is honored, field **370**O will contain the label "success". If server computer **100** denies the request, field **370**O will contain the label "failure" and field **370**T will include a code identifying the reason for such failure.

Field **370**P stores a transaction number, that is, a unique number indicative of a particular session initiated by merchant computer **300**.

Field **370**Q stores a merchant user **303**'s requested amount of time that the current session should last (i.e., requested session duration).

Field **370**R stores a merchant user **303**'s requested number of times that the session key of field **340**J can be used (i.e., requested session court).

If the status of field **370**O is "success", field **370**S stores a session id for merchant computer **300** for the current session.

If the content of status field **370**O is "failure", field **370**T stores a result code. The result code is used by merchant application software **310** to associate a message with the failure reported in status field **370**T.

III. General Information

The preferred format of messages used in the present invention is now described.

Due to the nature of the Internet 50, the present invention uses a message transmission independent mechanism so that messages can be transmitted using several different protocols. These protocols may include e-mail (simple mail transport protocol) and world wide web (hyper text transport protocol or other protocols, such as remote procedure protocol (RPC)). Therefore, messages used in the present invention have a particular and preferred format that is not specific to the transport protocol. The particular and preferred format is based on RFC 822, which is well known in the art and therefore, only briefly described.

FIG. **7**D depicts the format of a sample message **4000**. Sample message **4000** includes header **4005**, body **4010** and trailer **4050**. Body **4010** includes transparent (unencrypted) label-value pairs **4013**A, **4013**B, etc. and may include opaque (encrypted) label-value pair **4017**. (Label-value pairs consist of a label and data relating to the label, separated by a label terminator, for example, "name: Brian".)

Header **4005** defines the start of sample message **4000**. Header **4005** may include a system identifier, for example, "CyberCash" (the assignee of the present invention) and a

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number of the message protocol ("protocol number") in which sample message **4000** was assembled.

Transparent label-value pairs **4013**A, **4013**B, etc. include any clear (non-encrypted) text associated with sample message **4000**. Encryption and decryption are described below.

Opaque label-value pair **4017** includes the label "opaque". The value of opaque label-value pair **4017** is a block of encrypted data. The value of opaque label-value pair **4017** includes a predetermined set of label-value pairs encrypted with a DES key. After encryption, the value is preferably base-**64** encoded. The predetermined set of label-value pairs is referred to herein as the "opaque section contents" of sample message **4000**. For request messages sent outside of a session (R**1**, BI**1**, LU**1** and CS**1**), the value of opaque label-value pair **4017** begins with that DES key, RSA encrypted under a public RSA key of server computer **100**. RSA encryption is computationally expensive. For reply messages (R**2**, BI**4**, LU**2**, OS**2** and CS**2**) and messages inside a session (CA**1**, CA**2**, CA**3** and CA**4**), no additional information, beyond the opaque section contents, is required in the value of opaque label-value pair **4017**, thus avoiding the expense of RSA encryption. The opaque section contents varies in length and represents data encrypted with the DES key used.

Trailer **4050** closes sample message **4000**. Trailer **4050** preferably includes a transmission checksum. It is preferred that the transmission checksum of field **4050**D be an MD5 hash performed on all printable characters in header **4005** and those appearing in body **4010**. Thus, all white space, including new-lines, spaces, tabs, carriage returns, etc. are omitted from the checksum hash. In this manner, the correctness of the message transmission can be checked while avoiding sensitivity to gateways or processing that might, for example, change the line terminator sequence or convert tabs to spaces.

Encryption and decryption techniques used in the present invention are now described.

The present invention preferably uses both RSA and DES methods for data encryption and decryption. Such methods are well known in the art. RSA is fully described in U.S. Pat. No. 4,405,829. The present invention preferably relies on 768-bit RSA keys reflecting a balance between concerns relating to security, execution time, and export control. The size of the RSA key may change as high-end computers with fast processing speeds become more prevalent in customer installations and the export requirements are relaxed. As is known to those skilled in the art, other public/private asymmetric key systems (such as Rabin, and ElGamal) could be used in the current invention for authentication purposes.

In the present invention, digital signatures are used to authenticate information. The details of digital signatures are widely discussed in computer security literature. The present invention utilizes two methods for authentication: RSA/MD5 digital signatures and knowledge of shared information (e.g., a salt value and/or a key value).

As mentioned above, the present invention also depends on hashing hashing of data. A has preferably is calculated using the well-known MD5 algorithm which is described in Internet publication RFC 1321, applied to a "synthetic message".

If a label-value pair is specified in a hash input, but is not present in a message, the label and label terminator are preferably omitted from the hash.

IV. Processes of the Present Invention

A. Download And Installation Process **400**

During the download and installation process **400** as previously described with respect to FIG. **3**A, an RSA public key of server computer **100** is stored in field **215**A of customer application data structure **215**. Merchant computer **300** obtains a copy of user application software **153** in the same manner as customer user **203** using download and installation process **400**. In such case, user application software **153** resides on merchant computer **300** as a component of merchant application software **310** and an RSA public key of server computer **100** is stored in field **315**A of merchant application data structure **315**.

B. Registration Process **401**

FIG. **8** depicts a flow diagram illustrating registration process **401** which begins at step **1201**.

At step **1202**, customer application software **210** prompts or requests customer user **203** to enter information relating to customer user **203**. This information will be included in message R**1** sent to server computer **100** and will become part of customer persona **120**.**1**. In the preferred embodiment, customer user **203** enters a preferred language of communication, a currency in which transactions will be processed, a requested persona id, an email address and an autoclose passphrase.

At step **1202**A, customer application software **210** generates an RSA public/private key pair for customer computer **200**. The RSA public key is stored in field **220**C of customer persona data structure **220** (FIG. **5**C). The RSA private key is stored in field **220**H of customer persona data structure **220** (FIG. **5**C).

At step **1203**, message R**1** is assembled in accordance with message assembly procedure **800**, depicted in FIG. **9**. Message R**1** will be sent from customer computer **200** to server computer **100** and will include the information entered by customer user **203** at step **1202**. Message assembly procedure **800** is now described with reference to FIG. **9**.

Message assembly procedure **800** begins a step **801**. Steps **802**A–**802**B create transparent label-value pairs **4213**A–**4213**D of message R**1**, shown in FIG. **10**A. Steps **802**C–**813** create opaque label-value pair **4217** of message R**1**, based upon the opaque section contents of message R**1**, shown in FIG. **10**B. Steps **814**–**817** assemble header **4205**, transparent label-value pairs **4213**A–**4213**D, opaque label-value pair **4217** and trailer **4250** of message R**1**.

At step **802**A, customer application software **210** accesses message template data structure **270** (FIG. **5**A) to obtain a list of labels, which, when matched up with associated values, make up transparent label-value pairs **4213**A–**4213**C of message R**1**. At step **802**B, values are associated with each label as follows:

Label-value pair **4213**A has the label "transaction". The value of field **4213**A is a transaction number, generated by client software **210**, which uniquely identifies message R**1**. The value of label-value pair **4213**A allows server computer **100**, upon receipt of message R**1**, (1) to send an associated reply message R**2**, described later, and (2) to determine if message R**1** is a duplicate message (i.e., already received by server computer **100**). The value associated with label-value pair **4213**A is stored in field **251**B of pending persona registration/update persona information record **251** (FIG. **5**G).

Label-value pair **4213**B has the label "date". The value of label-value pair **4213**B indicates the date and time that message R**1** was assembled and sent to server computer **100**, according to the clock of customer computer **200**. The value associated with label-value pair **4213**B is stored in field **251**C.

Label-value pair **4213**C has the label "serverkey". As described below, a DES key/IV pair used by customer

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computer **200** to encrypt the opaque label-value pair **4217** of message R**1** is encrypted using an RSA public key of server computer **100**. The value of label-value pair **4213**C points to the corresponding RSA private key stored in server private key data structure **160** (FIG. **4**A).

Label-value pair **4213**D has the label "service-category". The value of label-value pair **4213**D is a label which may be used to route message R**1** to a processor within server computer **100** that handles messages of a particular service category. This option permits the functions of server computer **100** to be distributed among multiple processors thereby improving capacity of the system.

At step **802**C, customer application software **210** uses well known techniques to generate a random 128-bit quantity. It is preferred that the first 64-bits of the quantity so generated be treated as a 56-bit DES key and the second 64-bits be treated as a 64-bit initialization vector ("IV"). The 56-bit DES key is represented as a 64-bit quantity having the least significant bit of each eight bit byte ignored. This 128-bit quantity may be viewed as a DES key/IV pair. The DES key/IV pair is stored in a temporary register.

Next, at step **804**, customer application software **210** retrieves the RSA public key for server computer **100** from field **215**A of client application data structure **215** (FIG. **5**B). As stated previously, the RSA public key for server computer **100** is preferably 768-bits in length. Of course, other length RSA keys may be used. At step **806**, the RSA public key retrieved at step **804** is used to encrypt the DES key/IV pair created at step **802**.

At step **807**, customer application software **210** accesses message template data structure **270** (FIG. **2**B) to obtain a list of labels, which, when matched up with associated values, make up the opaque section contents of message R**1**, shown in FIG. **10**B. At step **808**, values are associated with each label as follows:

Label-value pair **4217**A has the label "type". The value of label-value pair **4217**A references a record in message data structure **270** (FIG. **2**B) which sets forth the labels of message R**1**. The value of label-value pair **4217**A is obtained from customer application software **210** which generates the label when customer user **203** initiates the registration process.

Label-value pair **4217**B has the label "server-date". The value of label-value pair **4217**B indicates the date and time message R**1** was assembled as measured by customer computer **200**'s perception of the date of server computer **100**'s clock.

Label-value pair **4217**C has the label "swversion" (software version). The value of label-value pair **4217**C indicates the version of customer application software **210** communicating with server computer **100**. The value of label-value pair **4217**C is obtained from data embedded in customer application software **210**. The value associated with label-value pair **4217**C is stored in field **25** ID.

Label-value pair **4217**D has the label "content-language". The value of label-value pair **4217**D indicates a preferred language of communication for customer user **203**. The value of label-value pair **4217**D is obtained from customer user **203** during registration process **401** at step **1202**. The value associated with label-value pair **4217**D is stored in field **251**E.

Label-value pair **4217**E has the label "default-currency". The value of label-value pair **4217**E indicates a default currency in which transactions of customer user **203** will be processed, unless changed by customer user **203**. The value of label-value pair **4217**E is obtained from customer user **203** during registration process **401** at step **1202** of FIG. **8**. The value associated with label-value pair **4217**E is stored in field **251**F.

Label-value pair **4217**F has the label "requested-id". The value of label-value pair **4217**F indicates the persona id requested by customer user **203**. The value of label-value pair **4217**E is obtained from customer user **203** during registration process **401** at step **1202** of FIG. **8**. The value associated with label-value pair **4217**F is stored in field **251**G.

Label-value pair **4217**G has the label "email". The value of label-value pair **4217**G indicates an email address for customer user **203**. The value of label-value pair **4217**G is obtained from customer user **203** during registration process **401** at step **1202** of FIG. **8**. The value associated with label-value pair **4217**G is stored in field **251**H.

Label-value pair **4217**H has the label "agreements". The value of label-value pair **4217**H indicates legal agreements which customer user **203** has accepted in order to use the present invention. Legal agreements are presented to customer user **203** at step **1202** of FIG. **8**. The value of label-value pair **4217**H is generated when an agreement is accepted by customer user **203** and stored in field **220**L of customer instrument persona data structure **220** (FIG. **5**C).

Label-value pair **4217**I has the label "autoclose-passphrase". The value of label-value pair **4217**I indicates an autoclose passphrase for customer user **203**. The value of label-value pair **4217**I is provided by customer user **203** during registration process **401** at step **1202** of FIG. **8**. The value associated with label-value pair **4217**I is stored in field **220**D of customer persona data structure **220** and field **251**I of customer pending data structure **250**.

Label-value pair **4217**J has the label "pubkey". The value of label-value pair **4217**J represents the RSA public key for customer persona **120.1** generated by customer application software **210** during registration process **401** at step **1202**A of FIG. **8**.

Referring again to FIG. **9**, at step **810**, the digital signature for message R**1**, represented by label-value pair **4217**K of FIG. **10**B, is created. Label-value pair **4217**K has the label "signature". The value of label-value pair **4217**K represents the digital signature of customer persona **120.1**. For message R**1**, the value of label-value pair **4217**K is a hash of the printable U.S. ASCII characters in the the label-value pairs **4213**A-**4213**C, and label-value pairs **4217**A-**4217**J in alphabetical order, encrypted with the RSA private key of customer persona **120.1**. The RSA private key of customer persona **120.1** is obtained from field **220**H (FIG. **5**C.)

At step **812**A, label-value pair **4217**K, created in step **810**, is appended to label-value pairs **4217**A–**4217**J. Label-value pairs **4217**A–**4217**K are encrypted with DES key/IV pair stored in the temporary register at step **802**C. At step **812**B, the result of step **812**A is appended to the RSA-encrypted DES key/IV pair created in step **806**.

At step **813**, data assembled at step **812**B is encoded using well known techniques (preferably base-64), completing assembly of the opaque section contents of message R**1**.

Message R**1** is assembled at steps **814**–**818**. At step **814**, header **4205** is created using the message template found at customer message template data structure **270** (FIG. **5**A) and a protocol number embedded in customer application software **210**.

Next, at step **815**, transparent label-value pairs **4213**A–**4213**C as described above are appended.

At step **816**, opaque label-value pair **4217** is appended. Label-value pair **4217** has the label "opaque" signifying that the value which follows is encrypted data. The value of label-value pair **4217**, shown in FIG. **10**A, represents the data which was encoded at step **813**.

Trailer **4250** is assembled at step **817**. The checksum of trailer **4250** is calculated as described above with respect to

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sample message **4000**. Trailer **4250** is added to message R1. At step **818**, a copy of message R1 is saved in field **251**J.

The assembly of message R1 is now complete. Message assembly process **800** ends at step **819**.

Referring again to FIG. **8**, registration process **401** continues at step **1204**. There, customer computer **200** transmits message R1 to server computer **100**. Customer computer **200** waits for a reply message R2 from server computer **100**.

At step **1205**, server computer **100** receives message R1 from customer computer **200** and unwraps message R1 by executing server message unwrap procedure **900**. Server message unwrap procedure **900** is now described with reference to FIGS. **11**A and **11**B, where it begins at step **901**.

At step **901** A, a copy of message R1 is stored in field **140**E (FIG. **4**L).

At step **902**, server software **110** extracts the protocol number from field **4205**C of header **4205** of message R1. Next, based upon the protocol number extracted at step **902**, server message data structure **150** (FIG. **4**A) is accessed to determine the expected format of message R1. The expected format may include message syntax (e.g., permitted end-of-line characters) and message coding (e.g., ASCII or hex). Message R1 is parsed in accordance with the expected format as follows.

At step **903** server computer **100** calculates a checksum using the same data used by customer computer **200** at step **817** of message assembly procedure **800**. At step **904**, the checksum calculated at step **903** is compared to the checksum **4250**D of trailer **4250** of message R1. If the checksums are not equal, message R1 is discarded at step **904**A where server message unwrap procedure **900** also terminates.

If the checksums are equal at step **904**, processing continues at step **906**A where the message is checked to determine if it is appropriate for message unwrap procedure **900**. If a message includes a label "serverkey", message unwrap procedure **900** is appropriate. Messages received by server computer **100** for which unwrap procedure **900** is inappropriate will not contain the "serverkey" label but will instead include a label "type" in the transparent part of the message. Such messages will be unwrapped using other procedures as described later. If a message is inappropriate, processing continues at step **906**B where the message is diverted to another unwrap procedure. Message R1 is appropriate; therefore, processing continues at step **906**C where the value of opaque label-value pair **4217** is decoded.

At step **907**, the RSA public key used by customer computer **200** to encrypt the DES key/IV pair at step **806** of message assembly procedure **800** is determined. To do this, server software **110** obtains the value of label-value pair **4213**C associated with the label "serverkey". The value of label-value pair **4213**C is a pointer to a field in private key data structure **160** which stores the RSA private key component corresponding to the RSA public key used by customer computer **200** at step **806**.

At step **909**, the RSA private key determined at step **907** is used to decrypt that portion of opaque label-value pair **4217** corresponding to the RSA-encrypted DES key/IV pair. In this manner, the DES key/IV pair used to encrypt the remainder of opaque label-value pair **4217** is obtained. At step **909**A, it is determined whether the decryption of the DES key/IV succeeded or failed. Should the decryption fail for any reason, processing continues at step **905** where we have found it preferable to set an appropriate error flag and server unwrap procedure **900** terminates at step **917**. If the decryption of the DES key/IV pair is successful, processing continues at step **910**.

At step **910**, the DES key/IV pair obtained at step **909** is stored in a temporary register.

At step **911**, the DES key/IV pair obtained at step **909** is used to decrypt that portion of opaque label-value pair **4217** revealing to label-value pairs **4217**A–**4217**K of FIG. **10**B. At step **912**, the decryption of the opaque-value pair **4217** is determined to either succeed or fail. Should the decryption fail for any reason, processing continues at step **905** where we have found it preferable to set an appropriate error flag and server unwrap procedure **900** terminates at step **917**. If the decryption of opaque-value pair **4217** is successful, processing continues at step **913**.

At step **913**, the message type is determined by reference to label-value pair **4217**A. For example, the value of label-value pair **4217**A for message R1 may be "registration."

We have found it preferable to have three checks of message R1 performed at steps **914**, **915** and **916** as follows.

Server form check of step **914** is message type and software version dependent. That is, the expected form of the message, and the criteria that determine whether it is acceptable, depend on the message and any variations of the message that are valid at a given time as determined by reference to message type and version data structure **150** as previously described. At a minimum, the form check procedure will ascertain whether an incoming message contains all the labels that are prescribed for that message, whether there are values for each label that requires a value, and whether the values are of the type, syntax, and value range as required. If a message can be parsed but does not meet a form criteria, server computer **100** will set an error flag at step **905** and return an error code in message R2 (described later). A message which is so malformed that it cannot be parsed by server computer **100** will be discarded. If the form check at step **914** is successful, processing continues at step **915**.

At step **915**, the digital signature represented by the value of label-value pair **4217**K is verified (Pass signature test!). First, server software **110** obtains the RSA public key for customer persona **120**.**1** from the value of label-value pair **4217**J. The RSA public key obtained from label-value pair **4217**J is used to decrypt label-value pair **4217**K. Next, server software **1** 10 accesses message data structure **150** to determine which label-value pairs were hashed at step **810** of message assembly procedure **800** to compute the value of label-value pair **4217**K. Server software **110** then hashes the same label-value pairs which were hashed at step **810**. The two hash values are compared. If the hash values differ, an appropriate error flag is set at step **905**. In this case, server message unwrap procedure **900** terminates at step **917**. If the hash values match, processing continues at step **916**.

At step **916**, a check as to whether customer application software **210** is current is performed as follows. Server software **110** obtains the version number of customer application software **210** used to assemble message R1 from the value of label-value pair **4217**C. The obtained value is compared to the latest supported version number of customer application software **210**.

Each version has associated with it one of three "status" labels. If the software check returns "current", then the customer application software **210** that constructed message R1 is the latest version of that software available. No flags are set and message unwrap procedure **900** ends at step **917**. If the software check returns "warning", the version of customer application software **210** is not the latest but is still deemed usable. A flag is set at step **905** which will cause a warning message to be sent to customer user **203** in message R2 (described below) and message unwrap procedure **900** ends at step **917**. If the label associated with customer application software **210** is "fatal", the application software

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is not usable and an error flag is set at step **905** which will cause an error message to be sent to customer user **203** in message R**2** (described below). Message unwrap procedure **900** ends at step **917**.

Referring again to FIG. **8**, processing continues at step **1206**. If any of the tests of steps **909**A, **912**, **914**, **915** or **916** caused an error flag to be set at step **905**, error processing procedures are executed by server computer **100** at step **1215**. While the level of error processing at step **1215** is largely an administrative decision, it is preferred that a minimum, failures of the checksum, signature, and form, and a "fatal" return on the software check procedure result in a return message containing a code that can be processed by customer application software **210** and a message that can be read by customer user **203**. The error processing procedure in step **1215** entails associating a flag with a specific error code (described later in the context of the return message R**2**) and creating a text message (either from a data structure of messages or a message sent by the system administrator). Server computer **100** then generates a message R**2** similar to that described later to customer computer **200** conveying the error code and any related message.

If the tests of steps **909**A, **912**, **914**, **915** and **916** did not cause an error flag to be set at step **905**, processing continues at step **1207** where the value of label-value pair **4217**F, is compared to the persona id of field **120**A for all customer personas **120**.**1** and field **120**AA for all merchant personas **120**.**2** contained in server persona data structure **120**.

At step **1209**, if unique, server software **110** creates a new persona **120**.**1** in server persona data structure **120**. Information contained in message R**1** is then transferred into the new persona **120**.**1** as follows: The value of label-value **4217**F, and the two-digit check code, is assigned to the persona id of field **120**A. The value of label-value pair **4217**G, is stored in email address field **120**B. The RSA public key of field **120**C receives the value of label-value pair **4217**J. The value of label-value pair **4217**B is assigned to field **120**D. The value of label-value pair **4217**D is stored in field **120**E. The value of label-value pair **4217**H is stored in field **120**I. The value of label-value pair **4217**I is stored in field **120**F. In this case, processing continues at step **1217**.

If the value of label-value pair **4217**F is not unique to server persona data structure **120** at step **1207**, processing continues at step **1216**.

At step **1216**, a suggested persona id is determined by computing a random number and appending it to the requested id without hyphenation. Thus, "Brian" becomes "Brian**15**". In this case, processing continues at step **1217**.

At step **1217**, server software **110** assembles reply message R**2**, shown in FIG. **13**, according to the flow diagram of FIG. **12**. FIG. **12** depicts server message assembly procedure **1000**.

Server message assembly procedure **1000** begins at step **1001**. Steps **1001**A–**1001**B create transparent label-value pair **4313** of message R2. Steps **1002**–**1009** create opaque label-value pair **4317** of message R2. Steps **1010**–**1014** assemble header **4305**, transparent label-value pairs **4313**A–**4313**C, opaque label-value pair **4317** and trailer **4350** of message R**2**.

At step **1002**, server software **110** accesses message data structure **150** (FIG. **4**A) to obtain a list of labels, which, when matched up with associated values, make up the transparent label-value pairs **4313**A–**4313**B of message R**2**. At step **1002**B, values are associated with each label as follows:

Label-value pair **4313**A has the label "transaction". The value of label-value pair **4313**A is a transaction number. The value of label-value pair **4313**A is the same as that received in message R**1** in label-value pair **4213**A.

Field **4313**B has the label "date". The value of label-value pair **4313**B is the same as that received in message R**1** in label-value pair **4213**B.

Label-value pair **4313**C has the label "service-category". The value of label-value pair **4313**C is the same as that received in message R**1** in label-value pair **4213**D.

At step **1002**, server software **110** accesses message template data structure **150** to obtain a list of labels which, when matched up with associated values, make up the opaque section contents of message R**2**, shown in FIG. **13**B.

Processing continues at step **1005**. There, values are matched up with labels to form label-value pairs **4317**A–**4317**K, of FIG. **13**B.

The opaque section contents of message R**2** are shown in FIG. **13**B where label-value pair **4317**A has the label "type". Label-value pair **4317**A references a record in message data structure **150** which sets forth the labels of the opaque section contents of message R**2**. The value of label-value pair **4317**A is obtained from server software **110**.

Label-value pair **4317**B has the label "server-date". The value of label-value pair **4317**B indicates the date and time message R**2** was assembled according to the clock of server computer **100**.

Label-value pair **4317**C has the label "requested-id". The value of label-value pair **4317**C indicates the persona id requested by customer user **203**. The value of label-value pair **4317**C was received in label-value pair **4217**F in message R**1**.

Label-value pair **4317**D has the label response-id'The value of label-value pair **4317**D indicates the persona id of customer user **203**, or, if the requested-id in label-value pair **4317**C was a duplicate, indicates a suggested persona id.

Label-value pair **4317**E has the label "email". The value of label-value pair **4317**E indicates an email address for customer user **203**. The value of label-value pair **4317**E was received in label-value pair **4217**G of message R**1**.

Label-value pair **4317**F has the label "response-code". The value of label-value pair **4317**F indicates whether registration process **401** was a success or failure.

Label-value pair **4317**G has the label "funds-waiting". The value of label-value pair **4317**G indicates if there are any messages holding funds waiting for the holder of the email address in label-value pair **4317**E. Alternatively, label-value pair could indicate the number of such email messages. Either approach provides a means by which the registrant obtains any such funds preferably requires the registrant to send server computer **100** a message containing a password provided by the sender of the funds.

Label-value pair **4317**H has the label "autoclose-passphrase". The value label-value pair **4217**H indicates an autoclose passphrase for customer user **203**. The value of label-value pair **4317**H was received in label-value pair **4217**I of message R**1**.

Label-value pair **4317**I has the label "pubkey". The value of label-value pair **4317**I shown in FIG. **13**B represents the RSA public key of customer persona **120**.**1** received in label-value pair **4217**J of message R**1**.

Label-value pair **4317**J has the label "swseverity" (software severity). The value of label-value pair **4317**J indicates whether customer application software **210** needs to be updated, but is still usable ("warning") or is no longer usable ("fatal"). The value of label-value pair **4317**J is null if customer application software **210** is current.

Label-value pair **4317**K has the label "swmessage" (software message). The value of label-value pair **4317**K

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indicates instructions as to what customer user **203** should do in the case of a "fatal" or "warning" software severity. The value of label-value pair **4317**K is only present if the value of label-value pair **4317**J is not null.

Label-value pair **4317**L has the label "message". The value of label-value pair **4317**L is a free text message associated with an error or success condition returned in label-value pair **4317**F and displayed to customer user **203**.

Referring again to FIG. **12**, processing continues at step **1007**. There, label-value pairs **4317**A–**4317**L of FIG. **13**B are assembled and encrypted with the DES key/IV pair decrypted at step **910**.

At step **1009**, label-value pairs **4317**A–**4317**L encrypted at step **1007** are encoded using well known techniques (preferably base-64).

Message R**2** is assembled at steps **1010**–**1014**. At step **1010**, header **4305** is assembled using the message and type data structure **150** and the protocol number from the incoming message R**1**.

Next, at step **1011**, transparent label-value pairs **4313**A and **4313**B previously described are appended.

At step **1012**, opaque label-value pair **4317** is appended. Label-value pair **4317** has the label "opaque" signifying that the value which follows is encrypted data. The value of label-value pair **4317** represents the data encoded at step **1009**.

Trailer **4350** is assembled (created) at step **1013**. The checksum of trailer **4350** is calculated as described above with respect to sample message **4000**. Trailer **4350** is appended to message R**2**. At step **1014**, a copy of the complete message R**2** is saved at field **140**F of server message log data structure **140**.

The assembly of message R**2** has now been completed. Message assembly procedure **1000** ends at step **1015**.

Referring again to FIG. **8**, at step **1218**, message R**2** is sent (transmitted) from server computer **100** to customer computer **200**.

At step **1219**, customer computer **200** receives message R**2** from server computer **100** and unwraps message R**2** by executing message unwrap procedure **1100**. Message unwrap procedure **1100** is now described with reference to FIG. **14**, where it begins at step **1101**.

At step **1102**, customer computer software **210** extracts the protocol number from header **4305** of message R**2**. Next, based upon the extracted protocol number at step **1102**, message template data structure **270** (FIG. **5**A) is accessed to determine the expected format of message R**2**. The expected format may include message syntax (e.g., permitted end-of-line characters) and message coding (e.g., ASCII or hex). Message R**2** is parsed in accordance with the expected format as follows.

At step **1103**, customer computer **200** calculates a checksum using the same data used by server computer **100** at step **1013** of server message assembly procedure **1000**. At step **1104**, the checksum calculated at step **1103** is compared to the checksum of trailer **4350** of message R**2**. If the checksums are not equal, message R**2** is discarded at step **1104**A where message unwrap procedure **1100** terminates.

If the checksums are equal at step **1104**, processing continues at step **1105**A where the message is checked to determine if it is appropriate for message unwrap procedure **1100**. If a message does not include the label "type" in the transparent part of the message, message unwrap procedure **1100** is appropriate. Messages received by customer computer **200** containing the label "type" in the transparent part of the message will be unwrapped using other procedures (described elsewhere) at step **1105**B. Here, message R**2** is appropriate; therefore, processing continues at step **1106** where the value of opaque label-value pair **4317** is decoded.

At step **1107**, the DES key/IV pair stored in temporary register at step **802** of message assembly procedure **800** is retrieved.

At step **1108**, the DES key/IV pair retrieved at step **1107** is used to decrypt the value of opaque label-value pair **4317**. If for any reason the decryption of opaque label-value pair **4317** is not successful, step **1109** directs the processing of message R**2** to step **1105** where an error flag is set. In this case processing of message unwrap procedure **1100** stops at step **1121**. If the decryption of label-value pair **4317** is successful, processing continues at step **1110**.

At step **1110**, the message type is determined by reference to label-value pair **4317**A. For example, value of label-value pair **4317**A for message R**2** may be "registration-response."

A check of message R**2** is then performed at step **1111** as follows. Message data structure **270** (FIG. **5**A) contains data regarding the form of incoming messages. At a minimum, the form check procedure will ascertain whether an incoming message contains all the labels that are prescribed for that message, whether there are values for each label that requires a value, and whether the values are of the type (e.g.,, text, signed numbers,), syntax (e.g., in the form of a valid e-mail address) and within any specified limits as required. If there are additional labels, customer computer **200** will ignore them. If a message cannot be parsed, or if it can be parsed but does not meet a form criteria, an error flag will be set at step **1105**.

If the message passes the form check at step **1111**, message unwrap procedure **1100** terminates at step **1121**.

Referring again to FIG. **8**, processing continues at step **1220**. There, we have found it preferable to handle error messages as follows:

(1) if an error flag was set at step **1105**, the flag will be detected at step **1220** and processing of message R**2** will terminate at step **1221**. From the perspective of customer user **203**, no further action is taken with respect to message R**2**. In the preferred embodiment of the present invention, we prefer to include a mechanism within customer application software **210** to create and send to server computer **100** a message. This message includes the R**2** message as received by customer computer **200** and any diagnosis of what caused the message to fail. No response to this message is sent by server computer **100** to customer computer **200**. Rather, the information is used to ascertain whether a problem exists within the system and if appropriate corrective measures need to be taken.

(2) if no error flag was set at step **1105** but an error in message R**1** was detected at step **905** or step **1216**, processing will continue at step **1222** where the content of label-value **4317**F is checked. If the value of label-value **4317**F is other than "success", error processing routines are performed at step **1223** causing customer application software **210** to display the message contained in label-value **4317**K associated with the content of label-value **4317**F and to interpret the value of label-value **4317**F and take whatever action may be associated with that value. In particular, if the only error flag set was detected at step **1216** indicating that the requested id was not unique, the id suggested by server computer **100** and returned in label-value pair **4317**D is displayed and the registration process is restarted at step **1201**; or

(3) if message R**1** passed the check at step **905** and no flags were set at step **1105** and the id requested by

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customer user **203** was accepted by server computer **100**, processing continues at step **1224** where customer application software **210** updates customer database **202** as follows: The value of label-value **4317**D and the two-digit check code is assigned to the customer persona id of field **220**A. The value of label-value pair **4317**E is stored in the email address of field **220**B. The RSA public key of field **220**C receives the value created by customer application software **210** and echoed in label-value pair **4317**I. In addition, record **261** of customer log data structure **260** is created as follows: The transaction number from label-value pair **4313**A is stored in field **261**B. The date from label-value pair **4317**B is stored in field **261**C. The requested id from label-value pair **4317**C is stored in field **261**H. The response id from label-value pair **4317**D is store in field **261**I. The email address from label-value pair **4317**E is stored in field **261**J. The response-code from label-value pair **4317**F is stored in field **261**F. The software severity code from label-value pair **4317**J is stored in field **261**D. The software-message from label-value pair **4317**K is stored in field **261**E. The response message associated with the response code from field **4317**L is stored in field **261**G.

Processing continues at step **1225** where registration process **401** ends.

C. Instrument Binding Process **403**

Instrument binding process **403** is a process by which a customer user **203** binds an instrument to customer persona **120.1**. FIG. **15** depicts a flow diagram illustrating instrument binding process **403** which begins at step **1301**.

At step **1302**, customer application software **210** prompts (request) customer user **203** to enter information relating to an instrument to be bound to customer persona **120.1**. This information will be included in message BI**1** sent to server computer **100** and will become part of instrument binding data **120**H (fields **120**H.**1**–**120**H.**28**) for the instrument being bound. In the preferred embodiment, customer user **203** enters the instrument number, the instrument expiration date, the instrument customer identification number, and the name, street address, city, state, postal code, country, country code, and the telephone number (including area code) of the instrument holder. Customer user **203** will also be asked to indicate whether the instrument being bound is the autoclose instrument as previously described. In addition, customer application software **210** will create a random number (referred to as "instrument salt"). Customer user **203** will also be asked for a description of the instrument being bound. This description might be in the form of "Company Credit Card" or "John's Bank Account." For bindings of credit cards, this information is stored in field **252**R in customer pending transaction data structure **250**. Instrument type, instrument category, and instrument functions are derived by customer application software **210** from the data entered by customer user **203**.

While the data acquired at step **1302** is described with reference to a credit card instrument, it is within the knowledge of one skilled in the art to modify the credit card data to accommodate debit cards, DDAs, and other financial instruments.

Message BI**1** will be assembled by and transmitted from customer computer **200** server computer **100** to effect instrument binding process **403**. The contents of the message BI**1** is now described with reference to FIGS. **16**A and **16**B.

Label-value pair **4413**A has the label "id". The value of label-value pair **4413**A indicates the persona id for customer user **203**. The value of label-value pair **4413**A is obtained from field **220**A of customer persona data structure **220** (FIG. **5**B).

Label-value pair **4413**B has the label "transaction". The value of label-value pair **4413**B is a transaction number, generated by customer application software **210**, which uniquely identifies message BI**1**. The value associated with label-value pair **4413**B is stored in field **252**B (FIG. **5**H).

Label-value pair **4413**C has the label "date". The value of label-value pair **4413**B indicates the date and time that message BI**1** was assembled and sent to server computer **100**, according to the clock of customer computer **200**. The value associated with label-value pair **4413**C is stored in field **252**C of customer pending data structure **250**.

Label-value pair **4413**D has the label "serverkey". As described later, the DES key/IV pair used by customer computer **200** to encrypt opaque label-value pair **4417** of message BI**1** is encrypted using an RSA public key of server computer **100**. The value of label-value pair **4413**D points to the corresponding RSA private key stored in server private key data structure **160**.

Label-value pair **4413**E has the label "service-category". The value of label-value pair **4413**E is a label which may be used to route message BI**1** to a processor within server computer **100** that handles messages of a particular service category.

Label-value pair **4417** has the label "opaque" signifying that the date which follows includes the encrypted opaque section contents of message BI**1**.

The opaque section contents of message BI**1**, shown in FIG. **16**B, is now described.

Label-value pair **4417**A has the label "type". The value of label-value pair **4417**A references a record in message data structure **270** (FIG. **5**A) which sets forth the labels of the opaque section contents of message BI**1**. The value of label-value pair **4417**A is obtained from customer application software **210** which generates the value when customer user **203** initiates the instrument binding process **403**.

Label-value pair **4417**B has the label "server-date". Label-value pair **4417**B indicates the date and time message BI**1** was assembled as measured by customer computer **200**'s perception of server computer **100**'s clock.

Label-value pair **4417**C has the label "swversion" (software version). The value of label-value pair **4417**C indicates the version of customer application software **210** communicating with server computer **100**. The value of label-value pair **4417**C is obtained from data embedded in customer application software **210**. The value associated with label-value pair **4417**C is stored in field **252**D (FIG. **5**H).

Label-value pair **4417**D has the label "instrument-number". For security reasons, the actual instrument number is not stored in database **102** of server computer **100**. Rather, the instrument number is stored in database **102** as a hash value The hash of the value associated with label-value pair **4417**D is stored in field **252**F.

Label-value pair **4417**E has the label "instrument-type". Label-value pair **4417**E indicates a type of instrument, for example, VISA, MasterCard, American Express, etc. The value of label-value pair **4417**E is obtained from customer user **203** during instrument binding process **403** at step **1302** or may be derived by customer application software **210** from the instrument number. The value associated with label-value pair **4417**E is stored in field **252**T.

Label-value pair **4417**F has the label "instrument-category". The value of label-value pair **4417**F indicates a category of the instrument being bound. Categories may include, for example, credit cards, debit card, DDAs, etc. The value of label-value pair **4417**F is derived by customer application software during instrument binding process **403** at step **1302**.

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Label-value pair **4417**I has the label "instrument-functions" and preferably may have any combination of the following values: "charge", "credit", "load" or "unload". The value of label-value pair **4417**I indicates one or more functions that may be performed by customer user **203** with the instrument being bound. A charge transaction occurs when a persona **120.1** uses a bound instrument as a credit card to pay for a product. A credit transaction is an operation where a merchant credits customer persona **120.1** in lieu of providing the product originally agreed upon. The load and unload transaction are the same as those described previously. The function(s) of label-value pair **4417**I are derived by customer application software **210** during instrument binding process **403** at step **1302**.

Label-value pair **4417**J has the label "instrument-salt". The value of label-value pair **4417**J indicates a cryptographic salt used to reduce the ease by which the value of label-value pair **4417**D (relating to the instrument number) can be determined. The value of label-value pair **4417**J is generated by customer application software **210** during instrument binding process **403** at step **1302**. The value associated with label-value pair **4417**J is stored in field **252**U (FIG. **5**H).

Label-value pair **4417**K has the label "instrument-expiration-date". The value of label-value pair **4417**H indicates the expiration date of the instrument being bound. The value of label-value pair **4417**K is obtained from customer user **203** during instrument binding process **403** at step **1302**. The value associated with label-value pair **4417**K is stored in field **252**I.

Label-value pair **4417**L has the label "instrument-name". The value of label-value pair **4417**L indicates the name of the holder of the instrument being bound. The value of label-value pair **4417**L is obtained from customer user **203** during instrument binding process **403** at step **1302**. The value associated with label-value pair **4417**L is stored in field **252**H.

Label-value pair **4417**M has the label "instrument-address". The value of label-value pair **4417**K indicates the street address of the holder of the instrument being bound. The value of label-value pair **4417**M is obtained from customer user **203** during instrument binding process **403** at step **1302**.

Label-value pair **4417**N has the label "instrument-city". The value of label-value pair **4417**N indicates the city of the holder of the instrument being bound. The value of label-value pair **4417**N is obtained from customer user **203** during instrument binding process **403** at step **1302**.

Label-value pair **4417**O has the label "instrument-state". The value of label-value pair **4417**O indicates the state of the holder of the instrument being bound. The value of label-value pair **4417**O is obtained from customer user **203** during instrument binding process **403** at step **1302**.

Label-value pair **4417**P has the label "instrument-postal-code". Label-value pair **4417**P indicates the postal code of the holder of the instrument being bound. The value of label-value pair **4417**P is obtained from customer user **203** during instrument binding process **403** at step **1302**.

Label-value pair **4417**Q has the label "instrument-country". The value of label-value pair **4417**Q indicates the country of the holder of the instrument being bound. The value of label-value pair **4417**Q is obtained from customer user **203** during instrument binding process **403** at step **1302**.

The value associated with label-value pairs **4417**K–**4417**Q are stored in fields **252**H–**252**N (FIG. **5**H).

Label-value pair **4417**R has the label "agreements". Label-value pair **4417**R indicates which legal agreements customer user **203** has accepted in order to use the present invention. The value of label-value pair **4417**R is generated from agreement accepted by customer user **203** and stored in field **230**S (FIG. **5**D).

Label-value pair **4417**S has the label "autoclose" and may have the value "yes" or "no". The value of label-value pair **4417**S indicates whether the instrument being bound will be the autoclose instrument for customer user **203**. The value of label-value pair **4417**S is obtained from customer user **203** during instrument binding process **403** at step **1302**.

Label-value pair **4417**T has the label "autoclose-passphrase". The value of label-value pair **4417**T indicates the passphrase (preferably six to fifty characters) which, when used, will close customer persona **120.1**. Label-value pair **4417**T is present only if the value of label-value pair **4417**T is "yes". The value of label-value pair **4417**T is provided by customer user **203** during registration process **401**.

Label-value pair **4417**U has the label "key". The value of label-value pair **4417**U represents a hash of the modulus part of the RSA public/private key pair for customer persona **120.1**. The value of label-value pair **4417**U permits server computer **100** to confirm that the RSA public key maintained in field **120**B (FIG. **4**B) is the same key used to sign message BI**1** (label-value pair **4417**V).

The digital signature of message BI**1**, represented by label-value pair **4417**V, has the label "signature". The value of label-value pair **4417**V represents the digital signature of customer persona **120.1**. For message BI**1**, the value of label-value pair **4417**V is preferably a hash of label-value pairs **4413**A–**4413**D, and label-value pairs **4417**A–**4417**U in alphabetical order, encrypted with the RSA private key of customer persona **120.1**. The RSA private key of customer persona **120.1** is obtained from field **220**H (FIG. **5**C).

Referring again to FIG. **15**, at step **1303**, message BI**1** is assembled in accordance with message assembly procedure **800**, depicted in FIG. **9**. Message assembly procedure **800** was described previously for the assembly of registration message R**1**, with the following modification noted for message BI**1**: A copy of message BI**1** is preferably saved in field **252**W (FIG. **5**H) instrument binding process **403** continues at step **1304**. There, customer computer **200** transmits message BI**1** to server computer **100**. Customer computer **200** waits for reply message BI**4** from server computer **100**.

At step **1305**, server computer **100** receives message BI**1** from customer computer **200** and unwraps message BI**1** by executing server message unwrap procedure **900** (steps **901**–**917**). Server message unwrap procedure **900** (steps **901**–**917**) was previously described with reference to FIG. **11** for message R1.

At step **1306**, if any of the tests of steps **909**A, **912**, **914**, **915** or **916** caused an error flag to be set at step **905**, error processing procedures are executed by server computer **100** at step **1313**.

While the level of error processing at step **1313** is largely an administrative decision, it is preferred that a minimum, failures of the checksum, signature, and form, and a "fatal" return on the software check procedure result in a return message containing a code that can be processed by customer application software **210** and a message that can be read by customer user **203**. The error processing procedure in step **1313** entails associating a flag with a specific error code (described in the context of the return message BI**4** below) and creating a text message (either from a data structure of messages or a message sent by the system administrator). Server computer **100** then sends a message BI**4** similar to that described later to customer computer **200** conveying the error code and any related message.

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If the tests of steps **909**A, **912**, **914**, **915** and **916** did not cause an error flag to be set at step **905**, processing continues at step **1307**. There, information contained in message BI**1** is transferred into the instrument binding data **120**H (fields **120**H.**1**–**120**H.**28**) (FIG. **4**D) as follows: The value of label-value pair **4413**A is stored in the persona id of field **120**H.**1**. The value of label-value pair **4417**A is stored in the instrument type of field **120**H.**2**. The value of label-value pair **4417**B is stored in the instrument bind date of field **120**H.**13**. If the instrument being bound is selected by customer user **203** as the autoclose instrument, the value of label-value pair **4417**D is stored in the instrument number of field **120**H.**4**. It is preferred that this value be encrypted using an RSA key known only to the system operator. If the instrument being bound is not the autoclose instrument of the persona, the value of label-value pair **4417**D is not stored at server data structure **102** but is hashed along with the value in label-value pair **4417**J and stored in the instrument hash of field **120**H.**9** The value of label-value pair **4417**E is stored in the instrument sub type of field **120**H.**3**. The value of label-value pair **4417**F is stored in the instrument type of field **120**H.**2**. The value of label-value pair **4417**R is stored in the legal agreements of field **120**H.**7**. The value of label-value pair **4417**S is stored in the autoclose binding of field **120**F.

After step **1307**, message BI**4** will be assembled by and transmitted from server computer **100** to customer computer **200** to complete instrument binding process **403**. The contents of the message BI**4** is now described with reference to FIGS. **17**A and **17**B.

Label-value pair **44**.**113**A has the label "id". The value of label-value pair **44**.**113**A indicates the persona id for customer user **203**. The value of label-value pair **44**.**113**A is the same as that received in message BI**1** in label-value pair **4413**A.

Label-value pair **44**.**113**B has the label "transaction". The value of label-value pair **44**.**113**B is a transaction number. The value of label-value pair **44**.**113**B is the same as that received in message BI**1** in label-value pair **4413**B.

Field **44**.**113**C has the label "date". The value of label-value pair **44**.**113**C is the same as that received in message BI**1** in label-value pair **4413**C.

Label-value pair **44**.**113**D has the label "service-category". The value of label-value pair **44**.**113**D is the same as that received in message BI**1** in label-value pair **4413**E.

The opaque section contents of message BI**4**, shown in FIG. **17**B, is now described.

Label-value pair **44**.**117**A has the label "type". The value of label-value pair **44**.**117**A references a record in message data structure **270** (FIG. **5**A) which sets forth labels of the opaque section contents of message BI**4**. The value of label-value pair **44**.**117**A is obtained from server software **110**.

Label-value pair **44**.**117**B has the label "server-date". The value of label-value pair **44**.**117**B indicates the date and time message BI**4** was assembled according to the clock of server computer **100**.

Label-value pair **44**.**117**C has the label "response-code" and preferably the value "success" or "failure". The value of label-value pair **44**.**117**C indicates whether instrument binding process **403** was a success or failure.

Label-value pair **44**.**117**D has the label "swseverity" (software severity) and preferably the value "fatal" or "warning". The value of label-value pair **44**.**117**D indicates whether customer application software **210** needs to be updated, but is still usable ("warning") or is no longer usable ("fatal"). The value of label-value pair **44**.**117**D is null if customer application software **210** is current.

Label-value pair **44**.**117**E has the label "swmessage" (software message). The value of label-value pair **44**.**117**E provides instructions as to what customer user **203** should do in the case of a "fatal" or "warning" software severity. The value of label-value pair **44**.**117**E is only present if the value of label-value pair **44**.**117**D is not null.

Label-value pair **44**.**117**F has the label "instrument-number". The value of label-value pair **44**.**117**F indicates the number of the instrument being bound as described above. The value of label-value pair **44**.**117**F is obtained from label-value pair **4417**D of message BI**1**.

Label-value pair **44**.**117**G has the label "instrument-type". The value of label-value pair **44**.**117**G indicates a type of instrument. The value of label-value pair **44**.**117**G is obtained from label-value pair **4417**E of message BI**1**.

Label-value pair **44**.**117**H has the label "instrument-salt". The value of label-value pair **44**.**117**H from label-value pair **4417**J of message BI**1**.

Label-value pair **44**.**117**J has the label "instrument-functions" and may have any combination of the following values: "sale", "credit", "load" or "unload" as previously described. Label-value pair **44**.**117**J indicates one or more functions that may be performed by customer user **203** with the instrument being bound. The value of label-value pair **44**.**117**J is obtained from label-value pair **4417**I of message BI**1**.

Label-value pair **44**.**117**K has the label "instrument*" and represents any number of label-value pairs whose labels start with "instrument" that are provided to customer user **203** in message BI**4** (as previously described) and returned to server computer **100** in message LU**1** when the instrument is used to load or unload funds. In this way, server computer **100** may receive information regarding the instrument when necessary without storing that information in its data structures. The particular data-value pairs that are contained in label-value pair **44**.**117**K depend on the type of the bound instrument and the requirements of the issuer of the instrument. For example, a credit card might require the card number, the card expiration date, and the name and address of the card holder to be returned to the server each time the card is used to load funds into person **120**.**1**.

Label-value pair **44**.**117**L has the label "message". The value of label-value pair **44**.**117**L is a free text message associated with an error or success condition returned in label-value pair **44**.**117**C and displayed to customer user **203**. The value of label-value pair **44**.**117**L may include a message indicating a bad digital signature or an ill formed registration message BI**1**I and instructions as to how customer user **203** should proceed (e.g., "call system administrator").

Referring again to FIG. **15**, at step **1308**A, message BI**4** is assembled in accordance with server message assembly procedure **1000**, depicted in FIG. **12**. Server message assembly procedure **1000** was described previously for the assembly of registration message R**2**. At step **1308**B, message BI**4** is sent to sever computer **100**.

At step **1309**, customer computer **200** receives message BI**4** from server computer **100** and unwraps message BI**4** by executing message unwrap procedure **1100** (step **1101**–**1121**). Message unwrap procedure **1100** was previously described with reference to FIG. **14** for message R**2**.

At step **1310**,

(1) if an error flag was set at step **1105**, the flag will be detected at step **1310** and processing of message BI**4** will terminate at step **1311**. From the perspective of customer user **203**, no further action is taken with respect to message BI**4**. In the present invention, a

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mechanism is provided within customer application software **210** to create and send to server computer **100** a message. This message includes the BI**4** message as received by customer computer **200** and any diagnosis of what caused the message to fail. No response to this message is sent by server computer **100** to customer computer **200**. Rather, the information is used to ascertain whether a problem exists within the system and if appropriate corrective measures need to be taken.

(2) if no error flag was set at step **1105** but an error in message BI**1** was detected at step **905**, processing will continue at step **1312** where the content of label-value **44**.**117**C is checked. If the value of label-value **44**.**117**C is other than "success", error processing routines are performed at step **1314** causing customer application software **210** to display the message contained in label-value **44**.**117**L associated with the content of label-value **44**.**117**C and the interpret the value of label-value **44**.**117**C and take whatever action may be associated with that value; or

(3) if message BI**1** passed the check at step **905** and no error flags were set at step **1105**, processing continues at step **1315** where customer application software **210** updates customer database **202** as follows: The instrument number from label-value pair **44**.**117**F is stored in field **230**A (FIG. **5**D). The content of label-value pair **44**.**117**J is used to set flags in fields **230**L–**230**O. The result code contained in label-value pair **44**.**117**C is saved in field **230**P. The content of label-value pair **44**.**117**K is stored in field **230**R. In addition, a new record **262** (FIG. **5**O) of customer log data structure **260** is created as follows: The transaction number from label-value pair **44**.**113**B is stored in field **262**B. The date from label-value pair **44**.**117**B is stored in field **262**C. The response-code from label-value pair **44**.**117**C is stored in field **262**F. The software severity code from label-value pair **44**.**117**D is stored in field **262**D. The software-message from label-value pair **44**.**117**E is stored in field **262**E. The instrument-number from label-value pair **44**.**117**F is stored in field **262**I. The instrument-type from label-value pair **44**.**117**G is stored in field **262**J. The response message associated with the response code from field **44**.**117**L is stored in field **262**G.

Processing continues at step **1316** where instrument binding process **403** ends.

D. Load/Unload Funds Process **405**

FIG. **18** depicts a flow diagram illustrating load/unload process **405** which begins at step **1401**.

At step **1401**A, customer user **203** selects whether customer user **203** desires to load or unload (operation) funds. For the purposes of this description, it is assumed that customer user **203** selects to load funds. Unloading funds follows the same process with the exception that funds to be unloaded are specified as a negative quantity.

At step **1402**, customer application software **210** accesses field **230**O of record **230**.**1** for all instruments bound to persona **120**.**1** and displays a list of all instruments enabled for load operations. At step **1403**, customer user **203** is prompted select an instrument from the displayed list from which to load funds into cash container represented by cash container data field **120**G and **220**I.

At step **1406**, customer user **203** is prompted (requested) to enter an amount of funds in a specified currency to load from the instrument selected at step **1402** into cash container **120**G.

Message LU**1** will be assembled by and transmitted from customer computer **200** to server computer **100** to effect load/unload funds process **405**. The contents of the message LU**1** is now described with reference to FIGS. **19**A and **19**B.

Label-value pair **4513**A has the label "id". Label-value pair **4513**A indicates the persona id for customer user **203**. The value of label-value pair **4513**A is obtained from field **220**A (FIG. **5**C). The value associated with label-value pair **4513**A is stored in field **255**E (FIG. **5**K).

Label-value pair **4513**B has the label "transaction". The value of label-value pair **4513**B is a transaction number, generated by customer application software **210**, which uniquely identifies message LU**1**. The value of label-value pair **4513**B allows server computer **100**, upon receipt of message LU**1**, (1) to send an associated reply message LU**2**, described later, and (2) to determine if message LU**1** is a duplicate message (i.e., already received by server computer **100**). The value associated with label-value pair **4513**B is stored in field **255**B.

Label-value pair **4513**C has the label "date". The value of label-value pair **4513**C indicates the date and time that message LU**1** was assembled and sent to server computer **100**, according to the clock of customer computer **200**. The value associated with label-value pair **4513**C is stored in field **255**E.

Label-value pair **4513**D has the label "serverkey". As described below, the DES key/IV pair used by customer computer **200** to encrypt the opaque label-value pair **4517** of message LU**1** is encrypted using an RSA public key of server computer **100**. The value of label-value pair **4513**D points to the corresponding RSA private key stored in server private key data structure **160**.

Label-value pair **4513**E has the label "service-category". The value of label-value pair **4513**E is a label which may be used to route message LU**1** to a processor within server computer **100** that handles messages of a particular service category.

Label-value pair **4517** has the label "opaque" signifying that the data which follows includes the encrypted opaque section contents of message LU**1**. The opaque section contents of message LU**1**, shown in FIG. **19**B, is now described.

Label-value pair **4517**A has the label "type". The value of label-value pair **4517**A references a record in message data structure **150** (FIG. **4**A) which sets forth the labels of the opaque section contents of message LU**1**. The value of label-value pair **4517**A is obtained from customer application software **210** which generates the label when customer user **203** initiates the load/unload process **405**.

Label-value pair **4517**B has the label "server-date". The value of label-value pair **4517**B indicates the date and time message LU**1** was assembled as measured by customer computer **200**'s perception of server computer **100**'s clock.

Label-value pair **4517**C has the label "swversion" (software version). The value of label-value pair **4517**C indicates the version of customer application software **210** communicating with server computer **100**. The value of label-value pair **4517**C is obtained from data embedded in customer application software **210**. The value associated with label-value pair **4517**C is stored in field **255**D (FIG. **5**K).

Label-value pair **4517**D has the label "amount". The value of label-value pair **4517**D represents the currency type and the amount of funds to be transferred from the bound instrument selected at step **1402** to the cash container **120**G for customer user **203**. For unload operations, the amount of funds is a negative quantity. Thus, for unloads, the value of label-value pair **4517**D represents the currency type and the amount of funds to be transferred from cash container **120**G to the bound instrument selected at step **1402**. The value associated with label-value pair **4517**D is stored in field **255**G.

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Label-value pair **4517**E has the label "instrument" and represents all of the label-value pairs returned by server computer **100** in message BI**4** in label-value pair **44**.**117**K (FIG. **17**A) whose labels start with "instrument". The value of label-value pair **4517**E is unique to the instrument from which the load operation is to be performed and identifies that instrument to server computer **100**.

Label-value pair **4517**F has the label "key". The value of label-value pair **4517**K represents a hash of the modulus part of the RSA public/private key pair used by customer persona **120**.**1**. The value of label-value pair **4517**F permits server computer **100** to confirm that the RSA public key maintained in field **120**B (FIG. **4**B) is the same key used to sign message LU**1** (label-value pair **4517**F).

Referring again to FIG. **18**, at step **1407**, message LU**1** is assembled in accordance with message assembly procedure **800** (FIG. **9**). Message assembly procedure **800** was described previously for the assembly of registration message R**1**, with the following modification noted for message LU**1**. A copy of message LU**1** is preferably saved in field **140**E (FIG. **4**L).

Load/unload process **405** continues at step **1408**. There, customer computer **200** transmits message LU**1** to server computer **100**. Customer computer **200** waits for a reply message LU**2** from server computer **100**.

At step **1409**, server computer **100** receives message LU**1** from customer computer **200** and unwraps message LU**1** by executing server message unwrap procedure **900** (steps **901**–**917**). Server message unwrap procedure **900** was previously described with reference to FIG. **11** for message R**1**.

Referring again to FIGS. **11**A and **11**B, processing continues at step **1410**, if any of the tests of steps **909**A, **912**, **914**, **915** or **916** caused an error flag to be set at step **905**, error processing procedures are executed by server computer **100** at step **1417**. While the level of error processing at step **1417** is largely an administrative decision, it is preferred that a minimum, failures of the checksum, signature, and form, and a "fatal" return on the software check procedure result in a return message containing a code that can be processed by customer application software **210** and a message that can be read by customer user **203**. The error processing procedure in step **1417** entails associating a flag with a specific error code (described in the context of the return message LU**2** below) and creating a text message (either from a data structure of messages or a message sent by the system administrator). Server computer **100** then generates a message LU**2** similar to that described below to customer computer **200** conveying the error code and any related message.

If the tests of steps **909**A, **912**, **914**, **915** and **916** did not cause an error flag to be set at step **905**, processing continues at step **1411**. There, information contained in message LU**1**, that is, the amount represented by label-value pair **4517**D, is updated to the amount in the cash container of field **120**G.**2** of persona **120**.**1** for customer user **203** in server persona data structure **120**. At this point, server computer **100** will cause funds from the instrument referenced in the message LU**1** to be transferred the agency account identified in cash container field **120**G.**4**. Funds requested in message LU**1** may be placed "on-hold" in such a way that they are not available until some additional conditions have been met, such as twenty-four hours having elapsed.

After step **1411**, message LU**2** will be assembled by and transmitted from server computer **100** to customer computer **200** to complete load/unload funds process **405**. The contents of the message LU**2** is now described with reference to FIGS. **20**A and **20**B.

Label-value pair **45**.**113**A has the label "id". The value of label-value pair **45**.**113**A indicates the persona id for customer user **203**. The value of label-value pair **45**.**113**A is the same as that received in message LU**1** in label-value pair **4513**A.

Label-value pair **45**.**113**B has the label "transaction". The value of label-value pair **45**.**113**B is a transaction number. The value of label-value pair **45**.**113**B is the same as that received in message LU**1** in label-value pair **4513**B.

Label-value pair **45**.**113**C has the label "date". The value of label-value pair **45**.**113**C is the same as that received in message LU**1** in label-value pair **4513**C.

Label-value pair **45**.**113**D has the label "service-category". The value of label-value pair **45**.**113**D is the same as that received in message LU**1** in label-value pair **4513**E.

The opaque section contents of the reply message LU**2**, shown in FIG. **20**B, is as follows:

Label-value pair **45**.**117**A has the label "type". Label-value of label-value pair **45**.**117**A references a record in message data structure **270** (FIG. **5**A) which sets forth the labels of the opaque section contents of message LU**2**. The value of label-value pair **45**.**117**A is obtained from server software **110**.

Label-value pair **45**.**117**B has the label "server-date". Label-value pair **45**.**117**B indicates the date and time message LU**2** was assembled according to the clock of server computer **100**.

Label-value pair **45**.**117**C has the label "amount". The value of label-value pair **45**.**117**C is the amount transferred from the bound instrument identified by label-value pair **4517**E to cash container field **120**G.**2** for customer user **203**.

Label-value pair **45**.**117**D has the label "response-code" and the value "success" or "failure" as previously described. Label-value pair **45**.**117**D indicates whether load/unload process **405** was a success or failure.

Label-value pair **45**.**117**E has the label "message". The value of label-value pair **45**.**117**E is a free text message explaining the "response-code" value of label-value pair **45**.**117**D.

Label-value pair **45**.**117**F has the label "swseverity" (software severity) and the value "fatal" or "warning". The value of label-value pair **45**.**117**F indicates whether customer application software **210** needs to be updated, but is still usable ("warning") or is no longer usable ("fatal"). The value of label-value pair **45**.**117**F is null if customer application software **210** is current.

Label-value pair **45**.**117**G has the label "swmessage" (software message). The value of label-value pair **45**.**117**G indicates instructions as to what customer user **203** should do in the case of a "fatal" or "warning" software severity. The value of label-value pair **45**.**117**G is only present if the value of label-value pair **45**.**117**D is not null.

Label-value pair **45**.**117**H has the label "fee". The value of label-value pair **45**.**117**H indicates a fee charged to customer user **203**, if any, associated with server computer **100** processing message LU**1**. The fee, if any, will be deducted from cash container field **120**G.**2**.

Label-value pair **45**.**117**I has the label "balance". The value of label-value pair **45**.**117**I indicates the available balance in cash container field **120**G.**2** for customer user **203**. This balance reflects the previous balance of the cash container adjusted by the amount value of label-value pair **45**.**117**C loaded via message LU**1** and the fee value of label-value pair **45**.**117**H.

Label-value pair **45**.**117**J has the label "session-funds". The value of label-value pair **45**.**117**J indicates the amount transferred from cash container field **120**G.**2** to the opening amount field **130**E of server session data structure **130** for all open sessions.

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Label-value pair **45**.**117**K has the label "on-hold". The value of label-value pair **45**.**117**K is obtained from cash container field **120**G.**3** and indicates the amount of funds pending transfer from the bound instrument identified by label-value pair **4517**E of message LU**1** to cash container field **120**G.**2** for customer user **203**. This value represents funds which are awaiting approval or processing by the issuer of the instrument from which funds are being loaded or to which funds are being unloaded.

At step **1412** of FIG. **18**, server software **110** assembles reply message LU**2** according to the flow diagram of FIG. **12**. Server message assembly procedure **1000** was described previously for the assembly of registration message R**2**.

Referring again to FIG. **14** message LU**2** is sent from server computer **100** to customer computer **200** at step **1412**A.

At step **1413**, customer computer **200** receives message LU**2** from server computer **100** and unwraps message LU**2** by executing message unwrap procedure **1100** (steps **1101**–**1121**). Message unwrap procedure **1100** was described previously with reference to FIG. **14** for message R**2**.

At step **1414**,

(1) if an error flag was set at step **1105**, the flag will be detected at step **1414** and processing of message LU**2** will terminate at step **1415**. From the perspective of customer user **203**, no further action is taken with respect to message LU**2**. In the present invention, a mechanism is provided within customer application software **210** to create and send to server computer **100** a message. This message includes the LU**2** message as received by customer computer **200** and any diagnosis of what caused the message to fail. No response to this message is sent by server computer **100** to customer computer **200**. Rather, the information is used to ascertain whether a problem exists within the system and if appropriate corrective measures need to be taken.

(2) if no error flag was set at step **1105** but an error in message LU**1** was detected at step **905**, processing will continue at step **1416** where the content of label-value **45**.**117**D is checked. If the value of label-value **45**.**117**D is other than "success", error processing routines are performed at step **1418** causing customer application software **210** to display the message contained in label-value **45**.**117**E associated with the content of label-value **45**.**117**D and to interpret the value of label-value **45**.**117**D and take whatever action may be associated with that value; or

(3) if message LU**1** passed the check at step **905** and no flags were set at step **1105**, processing continues at step **1419** where customer application software **210** updates customer database **202** by storing the content of cash container field **220**J of customer persona data structure **220**.

In addition, a new record **264** of customer log data structure **260** is created as follows: The persona id from label-value pair **45**.**113**A is stored in field **264**H. The transaction number from label-value pair **45**.**113**B is stored in field **264**B. The date from label-value pair **45**.**117**B is stored in field **264**C. The amount from label-value pair **45**.**117**C is stored in field **264**J. The response-code from label-value pair **45**.**117**D is stored in field **264**F. The response message associated with the response code from field **45**.**117**E is stored in field **264**G. The software severity code from label-value pair **45**.**117**F is stored in field **264**D. The software-message from label-value pair **45**.**117**G is stored in field **264**E. The fee from label-value pair **45**.**117**H is stored in field **264**K. The balance from label-value pair **45**.**117**I is stored in field **264**L.

Processing continues at step **1420** where load/unload process **405** ends.

E. Open Session Process **407**

FIG. **21** depicts a flow diagram illustrating open session process **407** which begins at step **1501**.

At step **1502**, customer application software **210** prompts (requests) customer user **203** to enter information relating to the session to be created. This information will be included in message OS**1** sent to server computer **100** and will become part of session data structure **130** (FIG. **4**H). In the preferred embodiment, customer user **203** enters the maximum length of time the session will last, the maximum number of transactions which may occur during the session and the amount and currency of electronic cash available to customer user **203** during the session. Customer user **203** may also enter an optional description of the session.

Message OS**1** will be assembled by and transmitted from customer computer **200** to server computer **100** to effect open session process **407**. The content of message OS**1** is now described with reference to FIGS. **22**A and **22**B.

Label-value pair **4613**A has the label "id". The value of label-value pair **4613**A indicates the persona id for customer user **203**. The value of label-value pair **4613**A is obtained from field **220**A (FIG. **5**C).

Label-value pair **4613**B has the label "transaction". The value of label-value pair **4613**B is a transaction number, generated by customer application software **210**, which uniquely identifies message OS**1**. The value of label-value pair **4613**B allows server computer **100**, upon receipt of message OS**1**, (1) to send an associated reply message OS**2**, described below, and (2) to determine if message OS**1** is a duplicate message (i.e., already received by server computer **100**). The value associated with label-value pair **4613**B is stored in field **256**B (FIG. **5**L).

Label-value pair **4613**C has the label "date". The value of label-value pair **4613**B indicates the date and time that message OS**1** was assembled and sent to server computer **100**, according to the clock of customer computer **200**. The value associated with label-value pair **4613**C is stored in field **256**C.

Label-value pair **4613**D has the label "serverkey". As described below, the DES key/IV pair used by customer computer **200** to encrypt the opaque label-value pair **4617** of message OS**1** is encrypted using an RSA public key of server computer **100**. Label-value pair **4613**D points the corresponding RSA private key stored in server private key data structure **160**.

Label-value pair **4613**E has the label "service-category". The value of label-value pair **4613**E is a label which may be used to route message OS**1** to a processor within server computer **100** that handles messages of a particular service category.

Label-value pair **4617** has the label "opaque". The value of label-value pair **4617** includes the opaque section contents (in encrypted form) of message OS**1**. We now describe the opaque section contents of message OS**1**, shown in FIG. **22**B.

Label-value pair **4617**A has the label "type". The value of label-value pair **4617**A references a record in message data structure **150** which sets forth the labels of the opaque section contents message OS**1**. The value of label-value pair **4617**A is obtained from customer application software **210** which generates the label when customer user **203** initiates the open session process **407**.

Label-value pair **4617**B has the label "server-date". The value of label-value pair **4617**B indicates the date and time message OS**1** was assembled as measured by customer computer **200**'s perception of server computer **100**'s clock.

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Label-value pair **4617**C has the label "swversion" (software version). The value of label-value pair **4617**C indicates the version of customer application software **210** communicating with server computer **100**. The value of label-value pair **4617**C is obtained from data embedded in customer application software **210**. The value associated with label-value pair **4617**C is stored in field **256**D.

Label-value pair **4617**D has the label "record-note". The value of label-value pair **4617**D is an optional short text note to be stored in field **130**M (FIG. **4**H). For example, the note may state "Christmas Shopping" or "ski equipment". The value of label-value pair **4617**D is obtained from customer user **203**'s response to a prompt from customer application software **210** and is preferably limited to sixty characters to simplify the display produced by customer application software **210**.

Label-value pair **4617**E has the label "amount" and the value entered at step **1502** indicating the maximum amount of electronic cash available to customer user **203** during the session. The value associated with label-value pair **4617**E is stored in field **256**F.

Label-value pair **4617**F has the label "key-lifetime" and the value entered at step **502** indicating the maximum length of time the session will last as requested by customer user **203**. The value associated with label-value pair **4617**F is stored in field **256**H.

Label-value pair **4617**G has the label "key-use-limit" and the value entered at step **1502** indicating the maximum number of transactions which may occur during the session as requested by customer user **203**. The value associated with label-value pair **4617**G is stored in field **256**G.

Label-value pair **4617**H has the label "key". The value of label-value pair **4617**H represents a hash of the modulus of the RSA public/private key pair of customer persona **120.1**. The value of label-value pair **4617**H permits server computer **100** to confirm that the RSA public key maintained in field **120**B (FIG. **4**B) is the same key used to sign message OS**1** (label-value pair **4617**I).

Label-value pair **4617**I has the label "signature". The value of label-value pair **4617**I represents the digital signature for customer persona **120.1**. For message OS**1**, the value of label-value pair **4617**I is a hash of label-value pairs **4613**A–**4613**D and label-value pairs **4617**A–**4617**H in alphabetical order, encrypted with the RSA private key for customer persona **120.1**. The RSA private key for customer persona **120.1** is obtained from field **220**H (FIG. **5**C).

Message OS**1** is assembled using message assembly procedure **800** (FIG. **9**) described previously for the assembly of registration message R**1**. The following modification is noted for message OS**1**: A copy of message OS**1** is preferably saved in field **256**I.

In the case of assembly of message OS**1** by merchant computer **300**, a new record **370.1** (FIG. **7**C) is created as follows:

The value of label-value pair **4613**B is stored in field **370**P. The value of label-value pair **4617**F is stored in field **370**Q. The value of label-value pair **4617**G is stored in field **370**R. The value of status field **370**O is set to "attempt" by merchant application software **310**.

Referring again to FIG. **15**, open session process **407** continues at step **1504**. There, customer computer **200** transmits message OS**1** to server computer **100**. Customer computer **200** waits for a reply message OS**2** from server computer **100**.

At step **1505**, server computer **100** receives message OS**1** from customer computer **200** and unwraps message OS**1** by executing server message unwrap procedure **900**. Server message unwrap procedure **900** (steps **901**–**917**) was described previously for message R**1** with reference to FIG. **11**. The following modification is noted: A copy of message OS**1** is stored in field **140**E (FIG. **4**L).

At step **1506**, if any of the tests of steps **909**A, **912**, **914**, **915** or **916** caused an error flag to be set at step **905**, error processing procedures are executed by server computer **100** at step **1514**. While the level of error processing at step **1514** is largely an administrative decision, it is preferred that a minimum, failures of the checksum, signature, and form, and a "fatal" return on the software check procedure result in a return message containing a code that can be processed by customer application software **210** and a message that can be read by customer user **203**. The error processing procedure in step **1514** entails associating a flag with a specific error code (described in the context of the return message OS**2** below) and creating a text message (either from a data structure of messages or a message sent by the system administrator). Server computer **100** then generates a message OS**2** similar to that described below to customer computer **200** conveying the error code and any related message.

If the tests of steps **909**A, **912**, **914**, **915** and **916** did not cause an error flag to be set at step **905**, processing continues at step **1507**. There, server computer **100** calculates (computes) a session identification number ("session id"), a session encryption/decryption key ("session key") and a session salt and validates the session limits requested by customer user **203** as reflected in message OS**1**.

The session id is a 64-bit quantity that uniquely identifies the session being created. Uniqueness is ensured because the session ids are sequentially generated by server computer **100**.

The session-key is a 128-bit quantity containing a 56 bit DES key (64-bits with the least significant bit of each eight bit byte ignored) and a 64-bit initialization vector.

The session-salt is an 8-byte cryptographic salt used to strengthen the authentication of messages CA**1**–CA**4** which are exchanged during a session. Messages CA**1**–CA**4** are described later.

The session limits requested by customer user **203** are the amount value of label-value pair **4617**E, the key-lifetime value of label-value pair **4617**F, and the key-uselimit value of label-value pair **4617**G. With respect to the key-lifetime and key-uselimit, it is preferred that these values be subject to a fixed range established by server computer **100** to improve system efficiency and maximize the security of transactions performed during a session. Server computer **100** verifies that the requested values are within any such limits. Any requested limit that exceeds a permitted value are ignored and the maximum permitted value imposed by server computer **100**.

The value of Label-value pair **4617**E represents the amount of electronic funds that customer user **203** desires to spend during the session. The actual amount of such funds made available to customer user **203** during a session may be less than or equal to the amount requested by customer user **203** at step **1502**. For example, customer user may request more electronic cash than is available in cash container field **120**G.**2** for customer user **203**. In this case, the amount granted, as indicated by label-value pair **4717**I described below, is limited to the amount stored in cash container field **120**G.**2** for customer user **203**.

At step **1508**, server session data structure **130** (FIG. **4**H) is updated. The session id is stored in the session id field **130**A. The session key is stored in the session key field **130**B. The session salt is stored in the session salt field

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130C. The amount of electronic cash made available to customer user 203 during the session is stored in opening amount field 130E and the currency designator associated with the value stored in field 130E is stored in field 130D. Initially, field 130F reflects the value of the opening amount in field 130E. As electronic cash is spent, the value in field 130F reflects the difference between the opening amount and the amount spent. The key-lifetime actually granted by server computer 100 is stored in key-lifetime field 130J. The key-uselimit actually granted by server computer 100 is stored in key-use-limit field 1301. The value of label-value pair 4613A is stored in persona id field 130K. The date that the session was created is obtained from server application software 110 and stored in opening date field 130G. The value of label-pair 4617D is saved in the record note field 130M. The remaining fields of server session data structure 130 are discussed in the context of the CA-type messages below.

After step 1509, message OS2 is assembled by and transmitted from server computer 100 to customer computer 200 to complete credit session process 407. The contents of message OS2 is now described with reference to FIGS. 23A and 23B.

Label-value pair 4713A has the label "id". The value of label-value pair 4713A indicates the persona id for customer user 203. The value of label-value pair 4713A is the same as that received in message OS1 in label-value pair 4613A.

Label-value pair 4713B has the label "transaction". The value of label-value pair 4713B is a transaction number. The value of label-value pair 4713B is the same as that received in message OS1 in label-value pair 4613B.

Label-value pair 4713C has the label "date". The value of label-value pair 4713C is the same as that received in message OS1 in label-value pair 4613C.

Label-value pair 4713D has the label "service-category". The value of label-value pair 4713D is the same as that received in label-value pair 4613E of message OS1.

Label-value pair 4717 has the label "opaque". The value of label-value pair 4717 includes the opaque section contents (in encrypted form) of message OS2. We now describe the opaque section contents of message OS2, shown in FIG. 23B.

Label-value pair 4717A has the label "type". The value of label-value pair 4717A references a record in message data structure 270 (FIG. 5A) which sets forth the labels of the opaque section content of message 0S2. The value of label-value pair 4717A is obtained from server software 110.

Label-value pair 4717B has the label "server-date". The value of label-value pair 4717B indicates the date and time message OS2 was assembled according to the clock of server computer 100.

Label-value pair 4717C has the label "response-code" and the value "success" or "failure" as previously described. Label-value pair 4717C indicates whether open session process 407 was a success or failure.

Label-value pair 4717D has the label "swseverity" (software severity) and the value "fatal" or "warning". The value of label-value pair 4717D indicates whether customer application software 210 needs to be updated, but is still usable ("warning") or is no longer usable ("fatal"). The value of label-value pair 4717D is null if customer application software 210 is current.

Label-value pair 4717E has the label "swmessage" (software message). The label-value pair 4717E indicates instructions as to what customer user 203 should do in the case of a "fatal" or "warning" software severity. The value of label-value pair 4717E is only present if the value of label-value pair 4717D is not null.

Label-value pair 4717F has the label "message". The value of label-value pair 4717F is a free text message associated with an error or success condition returned in label-value pair 4717C and displayed to customer user 203. The value of label-value pair 4317F may include a message indicating a duplicate requested persona id, a bad digital signature or an ill formed message OS1 and instructions as to how customer user 203 should proceed (e.g., "call system administrator").

Label-value pair 4717G has the label "key-lifetime" and the value obtained from the key-lifetime of field 130J (FIG. 4L) indicating the maximum length of time the session will last.

Label-value pair 4717H has the label "key-use-limit" and the value obtained from the key-use-limit of field 130I indicating the maximum number of transactions which may occur during the session.

Label-value pair 4717I has the label "amount" and indicated the maximum amount of electronic cash available to customer user 203 during the session. The amount value of label-value pair 4717I may be less than or equal to the amount requested by customer user 203 at step 1502.

Label-value pair 4717J has the label "foreign-exchange" and a value indicating a conversion rate from the currency denomination included in the value of label-value pair 4217I into other currencies, for example, U.S. dollars into Canadian dollars. Preferably, the indicated conversion rate is in the number of minor units (or major units if there is no minor unit) of the destination currency for hundred major units of source currency.

Label-value pair 4717K has the label "session-funds". The value of label-value pair 4717K indicates an amount of electronic cash sent to all open sessions including the amount value of label-value pair 4417I. A customer persona 120.1 may have any number of sessions open. Label-value pair 4717K provides customer user 203 information regarding the amount of funds initially allocated to all open sessions, including the session just opened.

Label-value pair 4717L has the label "balance". The value of label-value pair 4717L indicates the amount of electronic cash stored in cash container field 120G.2 of server persona data structure 120 for customer user 203 after the transfer of electronic cash funds to opening amount field 130E of server session data structure 130.

Label-value pair 4717M has the label "on-hold". The value of label-value pair 4717M is obtained from cash container field 120G.3 and indicates the amount of uncollected electronic cash still being cleared in persona 120.1 for customer user 203. This value represents electronic cash which are awaiting approval or processing by the issuer of the instrument from which funds are being load or to which funds are being unloaded.

Label-value pair 4717N has the label "fee". The value of label-value pair 4717N indicates a fee charged to customer user 203, if any, associated with processing message OS1.

Label-value pair 4717O has the label "session-id". The value of label-value pair 4717O is obtained from the session id of field 130A.

Label-value pair 4717P has the label "session-key". The value of label-value pair 4717P is obtained from the session key of field 130B.

Label-value pair 4717Q has the label "session-salt". The value of label-value pair 4717Q is obtained from the session salt of field 130C.

At step 1509 of FIG. 21, server software 100 assembles message OS2 according to the flow diagram of FIG. 12. Server message assembly procedure 1000 was described previously for the assembly of message R2.

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At step **1509**A, message OS**2** is sent (transmitted) from server computer **100** to customer computer **200**.

At step **1510**, customer computer **200** receives message OS**2** from server computer **100** and unwraps message OS**2** by executing message unwrap procedure **1100** for message OS**2**. Message unwrap procedure **1100** (steps **1101**–**1121**) was previously described for message R**2** with reference to FIG. **14**.

At step **1511**,

(1) if an error flag was set at step **1105**, the flag will be detected at step **1511** and processing of message OS**2** terminates at step **1512**. From the perspective of customer user **203**, no further action is taken with respect to message OS**2**. In the present invention, a mechanism is provided within customer application software **210** to create and send to server computer **100** a message. This message includes the OS**2** message as received by customer computer **200** and any diagnosis of what caused the message to fail. No response to this message is sent by server computer **100** to customer computer **200**. Rather, the information is used to ascertain whether a problem exists within the system and if appropriate corrective measures need to be taken.

(2) if no error flag was set at step **1105** but an error in message OS**1** was detected at step **905**, processing continues at step **1513** where the content of label-value **4717**C is checked. If the value of label-value **4717**C is other than "success", error processing routines are performed at step **1515** causing customer application software **210** to display the message contained in label-value **4717**F associated with the content of label-value **4717**C and to interpret the value of label-value **4717**C and take whatever action may be associated with that value; or

(3) if message OS**1** passed the check at step **905** and no flags were set at step **1105**, processing continues at step **1516** where customer application software **210** updates customer database **202**.

Customer session data structure **240** is updated as follows: The session id is stored in the session id field **240**A. The session key is stored in the session key field **240**B. The session salt is stored in the session salt field **240**C. The value of label-value pair **4717**I includes a currency designator and a quantity. The quantity value is stored in opening amount field **130**E and the currency designator associated with the value stored in field **130**E is stored in field **130**D. The value of label-value pair **4717**G is stored in key-lifetime field **240**K. The value of label-value pair **4717**G is stored in key-use-limit field **240**J.

It is noted that field **240**F initially will reflect the value of the opening amount in field **240**E. As electronic cash is spent, the value in field **240**F will reflect the difference between the opening amount and the amount spent. The remaining fields of customer session data structure **240** are discussed in the context of the CA-type messages below.

In addition to the values recorded in customer session data structure **240**, record **265** of customer log data structure **260** is updated as follows: The persona id from label-value pair **4713**A is stored in field **265**H. The transaction number from label-value pair **4713**B is stored in field **265**B. The date from label-value pair **4717**B is stored in field **265**C. The response-code from label-value pair **4717**C is stored in field **265**F. The software severity code from label-value pair **4717**D is stored in field **265**D. The software-message from label-value pair **4717**E is stored in field **265**E. The response message associated with the response code from field **4717**F is stored in field **265**G. The key-lifetime from label-value pair **4717**G is stored in field **265**K. The key-use limit from label-value pair **4717**H is store in field **265**J. The amount from label-value pair **4717**I is stored in filed **265**I. The balance from label-value pair **4717**L is stored in field **265**P. The fee from label-value pair **4717**N is stored in field **265**O. The session-id from label-value pair **4717**O is stored in field **265**L.

If the open session process is initiated by merchant user **303**, record **370**.**1** of merchant cash log data structure **370** is updated as follows:

The response code from label-value pair **4717**C is stored in field **370**O. The message from label-value pair **4717**F associated with the response code from label-value pair **4717**C is saved in field **370**T. The session-id from label-value pair **4717**O is stored in field **370**S.

Processing continues at step **1517** where open session process **407** ends.

F. Transaction/Payment Process **409**

When customer user **203** and merchant user **303** have open sessions, secure cash transactions can occur over the Internet 50. Security in this context means that customer user **203** and merchant user **303** can each be confident that its electronic funds are not at risk of being accessed by an unauthorized third party and that no electronic cash will be transferred until both parties have assented to a transaction which has been validated by server computer **100**.

A transaction includes a customer user **203** shopping among Internet 50 merchant users **303** who have merchant personas **120**.**2**. Using well known techniques, customer user **203** and a merchant user **303** agree on a price that customer user **203** is willing to pay for a product to be provided by merchant user **303**. When merchant user **303** requests payment, customer user **203** elects to pay with electronic cash. This election drives an exchange of messages resulting in the ultimate payment to merchant user **303** for the product purchased by customer user **203**.

FIGS. **24**A–**24**C is a flow diagram depicting transaction/payment process **409** which begins at step **1701**.

At step **1702**A merchant computer **300** assembles message PR**1**. Message PR**1** preferably does not include encrypted data. Thus, only steps **814**–**817** of message assembly procedure **800** (FIG. **9**) are needed to assemble message PR**1**. The content of message PR**1** is now described with reference to FIG. **25**.

Label-value pair **5013**A has the label "type". The value of label-value pair **5013**A references a record in message data structure **270** (FIG. **5**A) which sets forth labels comprising PR**1**. The value of label-value pair **5013**A is obtained from merchant application software **310**.

Label-value pair **5013**B has the label "merchant-id". The value of label-value pair **5013**B indicates the persona id for merchant user **303**. The value of label-value pair **5013**B is obtained from field **320**A (FIG. **6**C).

Label-value pair **5013**C has the label "merchant-order-id". The value of label-value pair **5013**C indicates an order identification number ("order id") generated by merchant computer **300** to identify a particular order. The value of label-value pair **5013**C is stored in field **370**C (FIG. **7**C).

Label-value pair **5013**D has the label "merchant-date". The value of label-value pair **5013**D indicates the date and time message PR**1** was assembled according to the clock of merchant computer **300**.

Label-value pair **5013**E has the label "merchant-swversion" (merchant software version). The value of label-value pair **5013**E indicates the version of merchant application software **310** communicating with customer computer **200**. The value of label-value pair **5013**E is obtained from merchant application software **310**.

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Label-value pair **5013**F has the label "note". The value of label-value pair **5013**F describes the product being provided by merchant user **303** to customer user **203**. The value of label-value pair **5013**F is obtained by merchant application software **310** from software provided by merchant **303** or a third-party.

Label-value pair **5013**G has the label "merchant-amount". The value of label-value pair **5013**G describes the currency and the price for the product described in label-value pair **5013**F.

Label-value pair **5013**H has the label "accepts". The value of label-value pair **5013**H identifies credit cards accepted by merchant user **303** (if any). The values of label-value pair **5013**H are obtained from merchant user **303**.

Label-value pair **5913**I has the label "url-pay-to". The value of label-value pair **5913**I is an Internet 50 uniform resource locator. The Internet 50 uniform resource locator of label-value pair **5913**I is the address on the Internet 50 to which customer computer **200** is to sends message CA**4**, described later.

Label-value pair **5013**J has the label "url-cancel". The value of label-value pair **5013**J is an Internet 50 uniform resource locator. The Internet 50 uniform resource locator of label-value pair **5013**J is used by customer computer **200** should customer user **203** decide to cancel a transaction.

Label-value pair **5013**K has the label "url-success". The value of label-value pair **5013**K is an Internet 50 uniform resource locator which directs customer computer **200** to an address on the world wide web if a transaction is successful. The success of a transaction is reported in message CA**4**, described later. For example, if the transaction is validated by server computer **100**, the value of label-value pair **5013**K may direct customer computer **200** to a web page that congratulates customer user **203** for his or her purchase.

Label-value pair **5013**L has the label "url-failure". The value of label-value pair **5013**L is an Internet 50 uniform resource locator which directs customer computer **200** to an address on the world wide web if a transaction is unsuccessful. The failure of a transaction is reported in message CA**4**, described later. For example, if the transaction is not validated by server computer **100**, the value of label-value pair **5013**L may direct customer computer **200** to a web page which requests customer user **203** to try his or her purchase again.

Label-value pair **5013**M has the label "merchant-signed-hash-key". The value of label-value pair **5013**M represents a hash of the modulus part of the RSA public/private key pair used by merchant computer **300** to sign the hash of merchant-signed hash label-value pair **5013**N described below. The value of label-value pair **5013**M permits server computer **100** to confirm that the RSA public key maintained in field **120**CC (FIG. **4**E) for merchant persona **120.2** is the same key used to sign "merchant-signed-hash" label-value pair **5013**N, or if the decryption of label-value pair **5013**N fails, the reason for such failure.

Label-value pair **5013**N has the label "merchant-signed-hash". For message PR**1**, the value of label-value pair **5013**N is a hash of label-value pairs **5013**A–**5013**M in that order. This hash is signed, meaning that the hash is hashed again, then encrypted with the RSA private key for merchant persona **120.2**. The RSA private key merchant persona **120.2** is obtained from field **320**H (FIG. **6**C).

Label-value pair **50130** has the label "merchant-amount**2**". The value of label-value pair **50130** describes the price in currencies other than that associated with the price specified in label-value pair **5013**G.

Customer user **203** cannot authenticate the signature of label-value pair **5013**N because it does not have the public key for merchant persona **120.2**. The value of label-value pair **5013**N may be stored by customer application software in the event that a dispute arises over the transaction. In such event, server computer **100** can use the value of label-value pair **5013**N to determine if message PR**1** was actually sent by merchant computer **300**.

Referring again to FIG. **24**A, step **1702**A, a new record **350.1** (FIG. **7**A) is added (assembled) as follows:

The value of label-value pair **5013**C (relating to the merchant-order-id) is stored in order-id field **350**A.

The value of label-value pair **5013**G (relating to the amount that merchant user **303** intends to receive in exchange for products) is stored in amount field **350**B.

Transaction/payment process **409** continues at step **1702**C. There, merchant computer **300** transmits message PR**1** to customer computer **200**. Merchant computer **300** waits for message CA**1** from customer computer **200**.

At step **1702**D, customer computer **200** receives message PR**1** from merchant computer **300** and unwraps message PR**1** by executing message unwrap procedure **3300**. Message unwrap procedure **3300** is now described with reference to FIG. **26**, where it begins at step **3301**.

At step **3302**, customer application software **210** extracts the protocol (version) number of header **5005** of message PR**1**. Next, based upon the extracted protocol number, message template data structure **270** (FIG. **5**A) is accessed to determine the expected format of message PR**1**. The expected format may include message syntax (e.g., permitted end-of-line characters) and message coding (e.g., ASCII or hex). Message PR**1** is parsed in accordance with the expected format as follows.

At step **3303**, customer computer **200** calculates a checksum using the same data used by merchant computer **300**. At step **3304**A, the checksum calculated at step **3303** is compared to the checksum of trailer **5050** of message PR**1**. If the checksums are not equal, message PR**1** is discarded at step **3304**B where message unwrap procedure **3300** also terminates.

If the checksums are equal at step **3304**A, processing continues at step **3304**C where the message is checked to determine if it is appropriate for message unwrap procedure **3300**. If a message includes the label "type" in the transparent part of the message and the value PR**1**, it is appropriate. If a message does not have this label-value pair, it is not appropriate for a message unwrap procedure **3300** in which case processing continues at step **3304**D where the message is diverted to another unwrap procedure, described elsewhere. Message PR**1** is appropriate; therefore, processing continues at stby refer where the message type is determined by reference to the value of label-value pair **5013**A. In this case, the value of label-value pair is "payment-request."

At step **3305** a form check of message PR**1** is performed. The form check procedure of step **3305** is software version dependent. That is, the expected form of the message, and the criteria that determine whether it is acceptable, depend on the message and any variations of the message that are valid at a given time. At a minimum, the form check procedure will ascertain whether an incoming message contains all the labels that are prescribed for that message, whether there are values for each label that requires a value, and whether the values are of the type (e.g., text, signed numbers), syntax and within any specified limits as required. If there are additional labels, customer computer **200** will ignore them. If a message cannot be parsed, or if it can be parsed but does not meet a form criteria, an error flag will be set at step **3306**. In this case, message unwrap procedure **3300** ends at step **3309**.

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If message PR1 has proper form, processing continues at step 3307. There, customer application software 210 adds (updates) a new record 266 as follows:

The merchant-id value of label-value pair 5013B is stored in field 266A. The merchant-order-id value of label-value pair 5013C is stored in field 266B. The amount value of label-value pair 5013G is stored in field 266C. The merchant-note value of label-value pair 5013F is stored in field 266D. The pay-to-value of 50131 is stored in field 266F.

Message unwrap procedure 3300 ends at step 3309.

Referring again to FIG. 24, at step 1703 customer computer 200 displays the offer of merchant user 303 to customer user 203. The values of label-value pair 5013F and 5013G (describing the product being sold to customer user 203 and the offer price) are displayed.

At step 1704A, customer user 203 accepts the offer of merchant user 303. It is foreseeable that at this juncture, customer user 203 will also be given a variety of payment options (e.g., credit card or electronic cash). If customer user 203 selects credit, other processes will take place which are not described herein. If customer user 203 indicates a desire to pay for the product with electronic cash, processing continues at step 1705.

At step 1705, customer application software 210 determines whether customer user 203 has an open session by searching records 240 (FIG. 5E).

If customer user 203 does not have an open session, processing proceeds to step 1706. There, a session is created using open session process 405 as described above.

If customer user 203 has an open session, or after open session process 405 has been executed, processing continues at step 1707A. There, customer computer 200 assembles message CA1 as follows.

Referring to FIG. 27, message assembly procedure CA12 is depicted. ("CA12" references that this message assembly procedure is executed to assemble messages CA1 and CA2.)

Message assembly procedure CA12 for message CA1 begins at step 1621. Message CA1 is shown in FIGS. 28A and 28B.

At step 1622, customer application software 210 accesses message template data structure 270 (FIG. 5A) to obtain a list of labels, which, when matched up with associated values, make up the transparent label-value pairs 5113A–5113I of message CA1. At step 1623, values are associated with each label. These label-value pairs are now described.

Label-value pair 5113A has the label "type". The value of label-value pair 5113A references a record in message data structure 150 (FIG. 4A) which sets forth the labels comprising message CA1. The value of label-value pair 5113A is obtained from customer application software 210.

Label-value pair 5113B has the label "version". The value of label-value pair 5113B is a code maintained in message data structure 270 (FIG. 5A) which references a record within the type record indicated by label-value pair 5113A. The value of label-value pair 5113B is retrieved by customer application software 210 from message data structure 270.

Label-value pair 5113C has the label "session-id". The value of label-value pair 5113C is obtained from the session-id of field 240A (FIG. 5E).

Label-value pair 5113D has the label "index". The value of label-value pair 5113D is an integer assigned by customer application software 210 to a transaction within a session and represents a use of the session key stored in field 240B. The range of values is bounded by 1 and the key-use-limit stored in field 240J. Label-value pair 5113E has the label "payee-currency" and the value indicated by the currency portion of label-value pair 5013G of message PR1. The value of label-value pair 5113E describes the currency in which merchant user 303 intends to be paid for the transaction.

Label-value pair 5113F has the label "note-hash". The value of label-value pair 5113F is a hash of label-value pair 5013F of message PR1.

Label-value pair 5113G has the label "payee-id". The value of label-value pair 5113G is the merchant persona id obtained from the value of label-value pair 5113B of message PR1.

Label-value pair 5113H has the label "order-id". The value of label-value pair 5113H is the order id obtained from the value of label-value pair 5113C of message PR1.

Label-value pair 51131 has the label "service-category". The value of label-value pair 5113I is a label which may be used by merchant computer 300 to route message CA1 to a processor within merchant computer 300 that handles messages of a particular service category.

At step 1624, customer application software 210 generates a 56-bit DES key DES-CA1 according to CA-DES-key generation process 1600, shown in the flow chart of FIG. 29.

Generation of DES key DES-CA1 begins at step 1610.

At step 1611, customer application software 210 constructs (calculates) a quantity Q, an eight byte quantity. Quantity Q is a concatenation of the values of label-value pairs 5113A, 5113B and 5113D of message CA1. It is preferred that the resulting DES Key change with each message so as to increase the likelihood that each DES key generated by CA-DES-key generation process 1600 will be unique. In the present invention, the value of session key field 240B and label-value pair 5113D ("index"), when taken together, will normally be different for every request message (that is, message CA1 and message CA2) and every response message (that is, message CA3 and message CA4). In addition, the value of label-value pair 5113A ("type") will differentiate the request from the response, resulting a low probability that any two messages will be encrypted with the same DES key. Additional variability is obtained by using label-value pair 5113B ("version").

In the present invention, the concatenation of the value of label-value pairs 5113A, 5113B and 5113D of message CA1 results in a four-byte quantity. To reach the desired value of eight-bytes, the resulting concatenation is padded on the left side with four bytes of zeros.

At step 1612, a 64-bit initialization vector is obtained. The initialization vector is the lower 64-bits of the session-key of field 240B (FIG. 5E). This initialization vector was generated during open session process 407.

At step 1613, a logical "exclusive or" (XOR) operation is performed on quantity Q calculated at step 1611 and the initialization vector obtained at step 1612.

At step 1614, the result of the XOR operation at step 1613 (a 64-bit value) is encrypted using the 56-bit DES key stored in the upper 64-bits of the session-key of field 240B. The 56-bit DES key was generated during open session process 407.

At step 1615, the parity bits of the encrypted XOR result of step 1614 are stripped. In this manner, the 56-bit DES key DES-CA1 is created.

CA-DES-key generation process 1600 for message CA1 ends at step 1617.

Referring again to FIG. 27, message assembly procedure CA12 for message CA1 continues at step 1625. There, the DES key DES-CA1 is stored (saved) in a temporary register.

At step 1626, customer application software 210 accesses message template data structure 270 (FIG. 5A) to obtain a

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list of labels, which, when matched up with associated values, make up the opaque section contents of message CA1.

The opaque section contents of message CA1 are shown in FIG. 28B where label-value pair 5117A has the label "amount". The value of label-value pair 5117A describes the currency and the amount that customer user 203 intends to pay for the product.

Label-value pair 5117B has the label "auth-code" and is created at step 1628. For message CA1, the value of label-value pair 5117B is a hash of the concatenation of the following: 8-byte salt of field 240C, the values of label-value pairs 5113A, 5113C–5113H, and 5117A and the 8-byte salt of field 240C. Prior to hashing, all white space embedded in the values of label-value pairs 5113A, 5113C–5113H, and 5117A is removed and a vertical bar separator character inserted between each adjacent pair of values.

This authentication code is not a digital signature. While a digital signature could be used instead of the auth-code reflected in label-value pair 5117B, the cost of such use in terms of processing time is substantial when compared to processing a hash. Given the safeguards provided by the use of independent sessions having limited duration for customer user 203 and a merchant user 303, the benefit of encryption-based non-repudiation is not sufficient to outweigh the cost in processor time.

At step 1629, label-value pair 5117B, created at step 1628, is appended to label-value pair 5117A. Label-value pairs 5117A and 5117B are encrypted using DES-key DES-CA1 stored in the temporary register at step 1625.

At step 1630, the data encrypted at step 1629 is encoded using well known techniques.

Message CA1 is assembled at steps 1631–1634. At step 1631, header 5105 is created using the message template found at customer message template data structure 270 (FIG. 5A) and the protocol number as embedded in customer application software 210.

At step 1632, the transparent label-value pairs 5113A–5113H are appended.

At step 1633, opaque label-value pair 5117 is appended. Label-value pair 5117 has the label "opaque" signifying that the value which follows is encrypted data. The value of label-value pair 5117 represents the data which was encoded at step 1630.

Trailer 5150 is assembled at step 1634. The checksum of trailer 5150 is calculated as described above with respect to sample message 4000. Trailer 5150 is added to the remainder of message CA1.

The assembly of message CA1 is now complete. Message assembly procedure CA12 for message CA1 ends at step 1635.

Referring again to FIG. 24, processing continues at step 1707A. There, customer computer 200 adds a new record 253 (FIG. 5I) as follows.

Customer application software 210 creates a value, preferably, "cash-payment", and saves it at type field 253A.

Customer application software also creates a transaction number and date and stores them in transaction number field 253B and date/time field 253C.

The software version of the customer application software 210 used to create message CA1 is obtained from customer application software 210 and saved in software version field 253D.

The persona id for customer persona 120.1 is obtained from field 220A and stored in field 253E.

The value of label-value pair 5013C from message PR1 is saved in order id field 253F.

The value of label-value pair 5013B is saved in merchant id field 253G.

The value associated with label-value pair 5117A is saved in amount field 253H and deducted from current value field 240F of customer session data structure 240.

User memo field 253I stores an optional note (memo) from customer describing the transaction. The value of field 253I is obtained from customer user 203 in response to a prompt from customer application software 210 at the time customer user 203 agrees to make payment.

The value of label-value pair 5013I from message PR1 is saved in field 253J.

A copy of message CA1 is preferably saved in field 253K.

Referring again to FIG. 24A, processing continues at step 1708. There, customer computer 200 transmits message CA1 to merchant computer 300. Customer computer 200 waits for a reply message CA4 from merchant computer 300.

At step 1709, merchant computer 300 receives message CA1 from customer computer 200 and unwraps message CA1 by executing message unwrap procedure CA1. Message unwrap procedure CA1 for message CA1 is now described with reference to FIG. 30 where it begins at step 1641.

At step 1642, merchant software 310 extracts the protocol number of header 5105 of message CA1. Next, based on the extracted protocol number of field 5105C, message data structure 380 is accessed to determine the expected format of message CA1. The expected format may include message syntax (e.g., permitted end-of-line characters) and message coding (e.g., ASCII or hex). Message CA1 is parsed in accordance with the expected format as follows.

At step 1643, merchant computer 300 calculates a checksum using the same data used by customer computer 200 at step 1633 of message assembly procedure CA12 (FIG. 27) for message CA1. At step 1644, the checksum calculated at step 1643 is compared to the checksum of trailer 5150 of message CA1. If the checksums are not equal, message CA1 is discarded at step 1644D where CA1 message unwrap procedure terminates.

If the checksums are equal at step 1644, processing continues at step 1644B where the message is checked to determine if it is appropriate for message unwrap procedure CA1. A message is appropriate if it includes the label "type" in the transparent part of the message and the value indicating a message CA1. If a message does not include that label-value pair, it is not appropriate. If a message is inappropriate, processing continues at step 1664C where the message is diverted to another merchant unwrap procedure. Message CA1 is appropriate; therefore processing continues at step 1644B where the message type is determined by reference to label-value pair 5113A.

At step 1645, a form check of message CA1 is performed. The form check procedure of step 1645 is software version dependent. That is, the expected form of the message, and the criteria that determine whether it is acceptable, depend on the message and any variations of the message that are valid at a given time as determined by reference to message type and version information provided in message CA1 and message data structure 380 as previously described. At a minimum, the form check procedure will ascertain whether an incoming message contains all the labels that are prescribed for that message, whether there are values for each label that requires a value, and whether the values are of the type (e.g., text, signed numbers), syntax and within any specified limits as required. If a message cannot be parsed, or if it can be parsed but does not meet a form criteria, an

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error flag will be set at step **1647**. In this case, message unwrap procedure CA**1** ends at step **1648**. If message CA**1** passes the form check at step **1645**, processing continues at step **1646** where the value of label-value pair **5117** is saved in a temporary register. Message unwrap procedure CA**1** is complete at step **1648**.

Referring again to FIG. **24**, processing resumes at step **1710**A. If error flags were set at step **1647**, processing continues at step **1710**B where merchant error processing procedures are invoked.

If no flags were set at step **1647**, processing continues at step **1711**A. There, merchant computer **300** assembles message CA**2** (FIG. **31**A) according to message assembly procedure CA**12**, shown in FIG. **27**. Message assembly procedure CA**12** was previously described for message CA**1** with the following noted exception: DES-key DES-CA**2** is generated (rather than DES key DES-CA**1**) using CA-DES-key procedure **1600**. The content of message CA**2**, as shown in FIG. **31**A is as follows:

Label-value pair **5213**A has the label "type". The value of label-value pair **5213**A references a record in server message data structure **150** which sets forth the labels comprising message CA**2**. The value of label-value pair **5213**A is obtained from merchant application software **310**.

Label-value pair **5213**B has the label "version" and references a record relating to the type record as described above. The value of label-value pair **5213**B contains information regarding the form and content of label-value pairs **5213**A, **5213**C, **5213**D, and **5213**E and information to decrypt and parse label-value pairs **5217.1** and **5217.2**. As will be discussed later, additional information regarding the form and content of label-value pairs **5217.1** and **5217.2** is provided in label-value pair **5217.1**B. The value of label-value pair **5213**B is retrieved by merchant application software **310** from message data structure **380** (FIG. **6**A).

Label-value pair **5213**C has the label "session-id". The value of label-value pair **5213**C is obtained from the session-id of field **340**A (FIG. **6**E).

Label-value pair **5213**D has the label "index". The value of label-value pair **5213**D is an integer assigned by merchant application software **310** to a transaction within a session and represents a use of the session key stored in field **240**B.

Label-value pair **5213**E has the label "service-category". The value of label-value pair **5213**E is a label which may be used to route message CA**2** to a processor within server computer **100** that handles messages of a particular service category.

Message CA**2** includes merchant-opaque label-value pair **5217.1** and customer-opaque label-value pair **5217.2**. Label-value pairs **5217.1** and **5217.2** have the labels "merchant-opaque" and "customer-opaque", respectively, signifying that the values which follow are encrypted data. The value of label-value pair **5217.1** represents the data which was base-64 encoded at step **1630**. The value of label-value pair **5217.2** is the value of label-value pair **5117** (forwarded by customer computer **200** in message CA**1**) and saved in the temporary register at step **1646**.

The opaque section contents of message CA**2** are shown in FIG. **31**B where label-value pair **5217.1**A has the label "type". The value of label-value pair **5217.1**A references a record in message data structure **150** which sets forth the labels of the opaque section contents of message CA**2**. The value of label-value pair **5217.1**A is obtained from merchant application software **310**.

Label-value pair **5217.1**B has the label "version" and references a record within the type record referenced by label-value pair **5217.1**A. As previously discussed, label-value pair **5217.1**B permits the sender of a message to advise the recipient of the message what version of that message was sent and to instruct the recipient how to parse and process that version. Label-value pair **5217.1**B advises server computer **100** of the form and content of the opaque label-value pair **5217.1**. The value of label-value pair **5217.1**B is obtained from merchant application software **310**.

The present invention preferably allows merchant computer **300** to submit "n" CA**1** messages received from one or more customer computers **200** to server computer **100** in a single message CA**2**. In the current invention, the variable "n" is an integer ranging from 1 through 255. A different range could be established depending on system capacity and other factors. Message CA**2** is structured such that transparent label-value pairs **5113**A–**5113**D and **5113**F–**5113**H of a received message CA**1** are included in opaque label-value pair **5217.1**. For each message CA**2** submitted by merchant computer **300** to server computer **100**, message CA**2** includes label-value pairs **5217.1**C–**5217.1**I (corresponding to label-value pairs **5113**A–**5113**D and **5113**F–**5113**H) and **5217.1**J. More specifically:

Label-value pair **5217.1**C has the label "type$_n$" and the value of label-value pair **5117**A.

Label-value pair **5217.1**D has the label "subversion$_n$" and the value of label-value pair **5117**B.

Label-value pair **5217.1**E has the label "payer-session-id$_n$" and the value of label-value pair **5117**C.

Label-value pair **5217.1**F has the label "payer-index$_n$" and the value of label-value pair **5117**D.

Label-value pair **5217.1**G has the label "note-hash$_n$" and the value of label-value pair **5117**F.

Label-value pair **5217.1**H has the label "payee-id$_n$" and the value of label-value pair **5117**G.

Label-value pair **5217.1**I has the label "order-id$_n$" and the value of label-value pair **5117**H.

Label-value pair **5217.1**J has the label "merchant-amount$_n$". The value of label-value pair **5217.1**J is provided by merchant application software **310** and describes the currency and the amount that merchant user **303** intends to receive for the product.

Referring again to FIG. **24**, processing continues at step **1711**B where merchant computer **330** updates its local data structures as follows.

A new record **350.1** is created in merchant amount data structure **350** for the "n" CA**1** messages included in message CA**2**. The order id from label-value pair order-id-n is stored in field **350**A. The merchant-amount from label-value pair merchant-amount-n is stored in field **350**B.

Record **370.1** (FIG. **7**C) is updated as follows.

Status field **370**B is set to "attempt" by merchant application software **310**. Merchant user **303**'s session-id from label-value pair **5213**C is stored in field **370**G. The merchant user **303**'s index from label-value pair **5213**D is stored in field **370**H. The session-id of customer user **203** from label-value pair **5217.1**E is stored in field **370**D. The index of customer user **203** from label-value pair **5217.1**F is stored in field **370**E. The merchant currency is taken from the currency symbol value in label-value pair **5217.1**J and saved in field **370**I. The amount merchant expects to be paid is taken from the amount value in label-value pair **5217.1**K and stored in field **370**J.

Referring again to FIG. **24**, processing continues at step **1712**. There, merchant computer **300** transmits message CA**2** to server computer **100**. Merchant computer **300** waits for a reply message CA**3** from server computer **100**.

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At step **1713**A, server computer **100** receives message CA**2** from merchant computer **300** and saves a copy of the value of label-value pair **5213**D of message CA**2** in index field **130**LL.**1** (FIG. **4**J) and a copy of message CA**2** in field **130**LL.**2**. At step **1713**B, server unwraps message CA**2** by executing server message unwrap procedure **1660**. Server message unwrap procedure **1660** for message CA**2** is now described with reference to FIGS. **32**A and **32**B, where it begins at step **1661**.

At step **1662**, server software **110** extracts the protocol number from field **5205**C of header **5205** of message CA**2**. Next, based upon the extracted protocol number, message data structure **150** is accessed to determine the expected format of message CA**2**. The expected format may include message syntax (e.g.,, permitted end-of-line characters) and message coding (e.g., ASCII or hex). Message CA**2** is parsed in accordance with the expected format as follows.

At step **1663**, server computer **100** calculates a checksum using the same data used by merchant computer **300** at step **1633** of message assembly procedure CA**12** for message CA**2**. At step **1664**, the checksum calculated at step **1663** is compared to the checksum of trailer **5250** of message CA**2**. If the checksums are not equal, message CA**2** is discarded at step **1664**A where server message unwrap procedure **1660** terminates.

If the checksums are equal at step **1664**, processing continues at step **1665**A where the message is checked to determine if it is appropriate for message unwrap procedure **1600**. A message is appropriate if it includes the label "type" in the transparent part of the message and the value indicating a message CA**2**. If the message does not include this label-value pair, it is not appropriate and processing continues at step **1665**B where the message is diverted to another unwrap procedure described elsewhere. Message CA**2** is appropriate; therefore, processing continues at step **1665**C. There, the value of merchant-opaque label-value pair **5217.1** is decoded.

At step **1666**, server software **110** independently generates DES key DES-CA**2** independently from merchant computer **300**, according to CA-DES-key generation process **1600**, described previously.

At step **1667**, the 56-bit DES key DES-CA**2** generated by server computer **100** is stored in a temporary register.

Processing continues at step **1668**. There, merchant-opaque label-value pair **5217.1** is decrypted using DES key DES-CA**2**.

At step **1668**A, the success or failure of the decryption of label-value pair **5217.1** is determined. If the decryption fails for any reason, an error flag is set at step **1681** and server message unwrap procedure **1660** terminates at step **1682**.

If the decryption is successful, processing continues at step **1668**B. There, server computer **100** determines whether merchant user **303** has a valid session open. Server computer **100** obtains the session id number of merchant from label-value pair **5213**C. The session id is used to obtain merchant record **130.2** for the session identified in label-value pair **5213**C. The opening date stored in field **130**GG is then compared with the date as determined by reference to server computer **100**'s clock and the time that has elapsed since the creation of the session calculated. If the amount of time that has elapsed since the creation of the session exceeds the value in key-lifetime field **130**JJ, the session is invalid. In addition, if the value in index label-value pair **5213**D exceeds the value of the key-use limit stored in field **130**II, the session use is invalid. If the session is invalid, a session-closed flag is set at step **1681** and CA**2** unwrap procedure terminates at step **1682** and payment process **1700** continues at step **1714**.

If the session is valid, at step **1668**C, the message type is determined by reference to label-value pair **5217.1**A. For example, value of label-value pair **5217.1**A for message CA**2** may be "cash-collection."

Processing continues at step **1669**. There, server computer **100** performs a check of the form of message CA**2**. The form check procedure of step **1669** is software version dependent. That is, the expected form of the message, and the criteria that determine whether it is acceptable, depend on the message and any variations of the message that are valid at a given time as determined by reference to message type and version data structure **150** as previously described. At a minimum, the form check procedure will ascertain whether an incoming message contains all the labels that are prescribed for that message, whether there are values for each label that requires a value, and whether the values are of the type (e.g., text, signed numbers), syntax and within any specified limits as required. If a message can be parsed but does not meet a form criteria, server computer **100** will set an error flag at step **1681** and return an error code in message CA**3** (described below). In this case, server message unwrap procedure **1660** for message CA**2** terminates at step **1682**.

If message CA**2** passes the form check at step **1669**, processing continues at step **1670**.

At step **1670**, the authentication code of merchant user **303** represented by label-value pair **5217.1**K is verified (check) as follows. Server software **110** obtains the 8-byte salt of field **130**CC. Server software **110** then accesses message data structure **150** to determine which label-value pairs were hashed at step **1627** of message assembly procedure CA**12** for message CA**2** to compute the value of label-value pair **5217.1**K. Server software **110** then hashes those same label-value pairs. The 8-byte salt of field **130**CC is added as both a prefix of and a suffix to the label-value pairs before the hash is computed. This hash value is compared to the value of label-value pair **5217.1**K. If the values differ, an appropriate error flag is set at step **1681**. In this case, server message unwrap procedure **1660** for message CA**2** terminates at step **1682**. If the values match, processing continues at step **1671**.

At step **1671**, variable "n" is initialized to one. The value of variable "n", as described above, represents the n^{th} CA**1** message included in message CA**2**.

At step **1672**, server software **110** generates DES key DES-CA**1**, according to CA-DES-key generation process **1600**. DES key DES-CA**1** generated by server computer **100** is stored in a temporary register.

At step **1673**, customer-opaque label-value pair **5217.2** is decrypted using DES key DES-CA**1**.

At step **1674**, the success or failure of the decryption of label-value pair **5217.2** is determined. If the decryption fails for any reason, an error flag is set at step **1678** and processing continues at step **1679**. There, it is determined if there are more CA**1** messages to process. If so, processing continues at step **1680**. If not, server message unwrap procedure **1660** terminates at step **1682**.

If the decryption of label-value pair **5217.2** is successful, processing continues at step **1675**. <cr> At step **1675**, if the merchant **303** has a valid open session, server computer **100** determines whether the customer user **203** associated with the nth payment request included in message CA**2** has a valid session open. Server computer **100** obtains the session id number of customer user **203** from label-value pair **5217.1** E. The session is used to obtain customer session record **130.1** for the session identified in label-value pair **5217.1** E. The opening date stored in field **130**G is then compared with the date as determined by reference to server computer 100's

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clock and the time that has elapsed since the creation of the session calculated. The session is invalid if the amount of time that has elapsed since the creation of the session exceeds the value in key-lifetime field **130**J. The transaction is invalid if the value in index label-value pair **5217**. IF exceeds the value of the key-use limit stored in field **130**I. If the session is invalid, a session-closed flag is set at step **1678** and processing continues at step **1679**. There, it is determined whether there are more CA**1** messages to process. If so, processing continues at step **1680**. If not, server message unwrap procedure **1660** terminates at step **1682**.

At step **1676**, the authentication code of customer user **203** represented by label-value pair **5117**B of message CA**1** is verified as follows. Server software **110** obtains the 8-byte salt of field **130**C. Server software **110** then accesses message data structure **150** to determine which label-value pairs were hashed at step **1627** of message assembly procedure CA**12** for message CA**1** to compute the value of label-value pair **5117**B. Server software **110** then hashes those same label-value pairs. The 8-byte salt of field **130**C is added as both a prefix of and a suffix to the label-value pairs before the hash is computed. This hash value is compared to the value of label-value pair **5117**B. If the values differ, an appropriate error flag is set at step **1678** and processing continues at step **1679**. There, it is determined if there are more CA**1** messages to process. If not, server message unwrap procedure **1660** terminates at step **1682**. If so, processing continues at step **1680**. If the values match at step **1675**, processing continues at step **1676**.

If customer user $_2$**03**'s session is valid, processing continues at step **1667**.

At step **1677**, payment to merchant user **303** is effected. For customer user **203**, this means deducting the amount reflected in amount label-value pair **5217.2**A from the current amount of field **130**F and capturing transaction data **130**N of record **130.1**. Transaction data **130**N is shown in FIG. **4**I where the following data is captured: The amount in label-value pair **5217.2**A is stored in field **130**N.**1**; the customer session-id from label-value pair **5217.1**E is stored in field **130**N.**2**; the order-id from label-value pair **5217.1**I is stored in field **130**N.**3**; the merchant session-id from label-value pair **5213**C is stored in filed **130**N.**4**; and the customer index from label-value pair **5217.1**F is stored in field **130**N.**5**.

For merchant user **303**, this payment means adding the amount reflected in amount field **5117**A to the current amount of field **130**FF and capturing transaction data **1 30**NN of record **130.2.130.1**. Transaction data **130**NN is shown in FIG. **4**K where the following data is captured: The amount in label-value pair **5217.2**A is stored in field **130**NN.**1**; the customer session-id from label-value pair **5217.1**E is stored in field **130**NN.**2**; the order-id from label-value pair **5217.1**I is stored in field **130**NN.**3**; the merchant session-id from label-value pair **5213**C is stored in filed **130**NN.**4**; and the merchant index from label-value pair **5213**D is stored in field **130**NN.**5**.

At step **1679**, server software **110** determines whether message CA**2** includes additional messages CA**1** to be processed. If there are additional CA**1** messages to be processed, variable "n" is incremented at step **1680** and processing continues at step **1672** as previously described. If there are no additional CA**1** messages to process, server message unwrap procedure **1660** for message CA**2** terminates at step **1682**.

Processing continues at step **1714** of FIG. **24**. There, if error flags were set at step **1681** as a result of the checks of steps **1664**, **1668**A, **1668**B, **1669**, or **1670**, processing continues at step **1681**. There, the type of error will cause an appropriate code to be associated with response-code label-value pair **5317.1**C and a message to be associated with label-value pair **5317.1**E. The level of detail detected by error flags and reported in the response-code label-value pair is a decision for the system administrator. For example, a "failure" may be a "hard failure", that is, a failure of a subset of failures for which resubmission of the message would not result in processing of the message (e.g., invalid format or session closed). "Failure" could also encompass a failure which can be cured (a time-out because of a temporary outage of server computer **100**). In the discussion which follows, the term failure will be used in its broad context.

If no flags were set at step **1681**, processing proceeds to step **1716** where server computer **100** determines whether the checks at steps **1674**, **1675**, and **1676** of the payment request messages caused an error flag to be set at step **1678**. If the nth CA**1** message caused a flag to be set, at step **1717** the value of label-value pair **5317.1**K (response-code-n)and label-value pair **5317.2**A (response code) will be set to failure; and label-value pair **5317.1**N (problem-n) and label-value pair **5317.2**E (problem) will assigned a value of a code associated with the value of label-value pair **5317.1**K. If the operator of server computer **100** deems it desirable, a free form message regarding the failure can be included in label-value pair **5317.1**L (remark-n) and label-value pair **5317.5**A (remark).

At step **1718**A, server computer **100** assembles message CA**3** according to server message assembly procedure **3400**, shown in FIG. **33**.

Server message assembly procedure **3400** for message CA**3** begins at step **3401**.

At step **3402**A, server software **110** accesses message type and version data structure **150** to obtain a list of labels, which, when matched up with associated values, make up the transparent label-value pairs **5313**A–**5313**E for message CA**3**, shown in FIGS. **34**A and **34**B. At step **3402**B, values are associated with each label as follows.

Label-value pair **5313**A has the label "type". The value of label-value pair **5313**A references a record in message data structure **380** which sets forth the labels of message CA**3**. The value of label-value pair **5313**A is obtained from server software **110**.

Label-value pair **5313**B has the label "version" and references a record relating to the record referenced by label-value pair **5313**A. As previously discussed, label-value pair **5313**B permits the sender of a message to advise the recipient as to the version of that message and how to parse and process that version. Because message CA**3** is in response to message CA**2** sent by merchant computer **300**, the version of message CA**3** will be selected by server software **110** to assure that it can be processed by merchant application software **310**. Label-value pair **5313**B advises merchant application software **310** of the form and content of the transparent label-value pairs **5313**A, **5313**C, **5313**D, and **5313**E. The value of label-value pair **5313**B is obtained from merchant application software **310**.

Label-value pair **5313**C has the label "session-id". The value of label-value pair **5313**C is obtained from the session-id of field **130**AA of merchant session data structure **130**.

Label-value pair **5313**D has the label "index". The value of label-value pair **5313**D is obtained from the index of field **130**LL of merchant session data structure **130.2**.

Label-value pair **5313**E has the label "service-category". The value of label-value pair **5313**E is a label which may be used by merchant computer **300** to route message CA**3** to a processor within merchant computer **300** that handles messages of a particular service category.

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At step **3402**C, server software **10** generates 56-bit DES keys DES-CA**3**-C-n and DES-CA**3**-M. DES keys DES-CA**3**-C-n and DES-CA**3**-M will be used to encrypt data to be received by customer computer **200** and merchant computer **300**, respectively. DES keys DES-CA**3**-C and DES-CA**3**-M are generated according to CA-DES-key generation process **1600**, previously described.

Referring again to FIG. **33**, message assembly procedure CA**3** continues at step **3402**D. There, DES keys DES-CA**3**-C-n and DES-CA**3**-M are stored in temporary registers.

At step **3403**, server software **10** accesses message template data structure **150** to obtain a list of labels, which, when matched up with associated values, make up the merchant-opaque section contents of message CA**3** (FIG. **34**B). Values are associated with each label as follows.

The merchant-opaque section contents of message CA**3** are shown in FIG. **34**B where label-value pair **5317**.1A has the label "subtype". The value of label-value pair **5317**.1A is a label referencing a record in message data structure **380** which includes the labels of the merchant-opaque section contents for message CA**3**. The value of label-value pair **5317**.1A is obtained from server software **110**.

Label-value pair **5317**.1B has the label "subversion". The value of label-value pair **5317**.1B is a code maintained in message data structure **150** which permits processing variations of a message type as are valid at a given time.

Label-value pair **5317**.1C has the label "response-code" and the value "success" or "failure" as previously described. Label-value pair **5317**.1C indicates whether the transaction presented to server computer **100** by message CA**2** was a success, failure, etc. The value of label-value pair **5317**.1C is obtained at step **1715** described above from server software **110**.

Label-value pair **5317**.1D has the label "fee". The value of label-value pair **5317**.1 D indicates a fee charged to merchant user **303**, if any, associated with processing message CA**2**. The value of label-value pair **5317**. ID is obtained from server software **110**.

Label-value pair **5317**.1E has the label "problem". If the response-code value of label-value pair **5317**.1C has other than a "success" value, the value of label-value pair **5317**.1E is a code advising merchant user **303** as to the cause for the non-success. The value of label-value pair **5317**.1E is obtained at step **1715** described above from server software **110**.

Label-value pair **5317**.1F has the label "remark". If the response-code value of label-value pair **5317**.1C has other than a "success" value, the value of label-value pair **5317**.1F is a free form text message providing a detailed explanation of the reason for the non-success. The value of label-value pair **5317**.1F is obtained at step **1715** described above from server software **110**.

Message CA**3** includes the following label-value pairs **5317**.1G–**5317**.1P for each of the "n" CA**1** messages submitted with message CA**2**:

Label-value pair **5317**.1G has the label "subtype$_n$" and the value of label-value pair **5217**.1C of message CA**2**.

Label-value pair **5317**.1H has the label "subversion$_n$" and the value of label-value pair **5217**.1D of message CA**2**.

Label-value pair **5317**.1I has the label "payer-session$_n$" and the value of label-value pair **5217**.1E of message CA**2**.

Label-value pair **5317**.1J has the label "payer-index$_n$" and the value of label-value pair **5217**.1F of message CA**2**.

Label-value pair **5317**.1K has the label "response-code$_n$" and the value "success" or "failure" as previously described. The value of label-value pair **5317**.1K is obtained at step **1717** described above from server software **110**.

Label-value pair **5317**.1L has the label "remark$_n$". If the response-code value of label-value pair **5317**.1K has other than a "success" value, the value of label-value pair **5317**.1L is a free form text message providing a detailed explanation of the reason for the non-success. The value of label-value pair **5317**.1L is obtained at step **1717** described above from server software **110**. Label-value pair **5317**.1M has the label "collected-amount$_n$" and the value indicating the amount of electronic cash collected by merchant user **303** for the transaction (at step **1677** of server message unwrap procedure **1660** for message CA**2**).

Label-value pair **5317**.1N has the label "problem$_n$". If value of label-value pair **5317**.1K has other than a "success" value, the value of label-value pair **5317**.1N is a code advising customer user **203** as to the cause for the non-success. The value of label-value pair **5317**.1N is obtained at step **1717** described above from server software **110**.

Label-value pair **5317**.1O has the label "order-id$_n$". The value of label-value pair **5317**.1O is obtained from label-value pair **5217**.1I of message CA**2**.

Label-value pair **5317**.1P has the label "request-version". The value of label-value pair **5317**.1P represents the version of message CA**2** actually processed by server computer **100**. <cr> Referring again to FIG. **33**, at step **3405**, an authentication code for the merchant-opaque section of message CA**3**, represented by label-value pair **5317**.1Q of FIG. **34**B, is created. Label-value pair **5317**.1Q has the label "auth-code". The value of label-value pair **5317**.1Q represents the authentication code of server computer **100**. For the merchant-opaque section of message CA**3**, the value of label-value pair **5317**.1Q is an MD5 hash of the concatenation of the following: 8-byte salt of field **130**CC, label-value pairs **5313**A–**5313**E and **5317**.1A–**5317**.1P, and the 8-byte salt of field **130**CC. Prior to hashing, all white space embedded in label-value pairs **5313**A–**5313**E and **5317**.1A–**5317**.1P is removed.

At step **3406**, label-value pair **5317**.1Q, created at step **3405**, is appended to label-value pairs **5317**.1A–**5317**.1P. Label-value pairs **5317**.1A–**5317**.1Q are encrypted using the 56-bit DES key DES-CA**3**-M.

At step **3407**, data encrypted at step **3406** is encoded using well known techniques.

At step **3408**, server software **110** accesses message template data structure **150** to obtain a list of labels, which, when matched up with associated values, make up the customer-opaque section contents of message CA**3**. At step **3409**, the customer opaque section is assembled. Values are associated with each label as follows.

The customer-opaque section contents of message CA**3** are shown in FIG. **34** where label-value pair **5317**.2A has the label "response-code" and the value "success" or "failure". Label-value pair **5317**.2A indicates whether the transaction presented to server computer **100** by message CA**2** was a success, failure, etc. The value of label-value pair **5317**.2A is obtained in step **1717** described above from server software **110**.

Label-value pair **5317**.2B has the label "remark". If the response-code value of label-value pair **5317**.2A has other than a "success" value, the value of label-value pair **5317**.2B is a free form text message providing a detailed explanation of the reason for the non-success. The value of label-value pair **5317**.2B is obtained at step **1717** described above from server software **110**.

Label-value pair **5317**.2C has the label "foreign-exchange". The value of label-value pair **5317**.2C provides updated information regarding a conversion rate from the currency denomination included in the value of label-value

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pair **5117**A into other currencies. The value of label-value pair **5317.2**C is obtained from server software **110**.

Label-value pair **5317.2**D has the label "amount" and a value indicating the amount of funds charged to customer user **203** for the transaction. The value of label-value pair **5317.2**D is obtained from server software **110**.

Label-value pair **5317.2**E has the label "problem". If the response-code value of label-value pair **5317.2**A has other than a "success" value, the value of label-value pair **5317.2**E is a code advising customer user **203** as to the cause for the non-success. The value of label-value pair **5317.2**E is obtained at step **1717** described above from server software **110**.

Label-value pair **5317.2**F has the label "order-id". The value of label-value pair **5317.2**F is obtained from label-value pair **5217.1**I of message CA**2**.

Label-value pair **5317.2**G has the label "request-version". The value of label-value pair **5317.2**G represents the version of message CA**1** actually processed by server computer **110**. <cr> Referring again to FIG. **33**, at step **3410**, an authentication code for the customer-opaque section of message CA**3**, represented by label-value pair **5317.2**H of FIG. **34**C, is created. Label-value pair **5317.2**H has the label "auth-code". The value of label-value pair **5317.2**H shown in FIG. **34**C represents the authentication code of server computer **100**. For the customer-opaque section of message CA**3**, the value of label-value pair **5317.2**H is a hash of a concatenation of the following: 8-byte salt of field **130**C, the values of label-value pairs **5313**A–**5313**D and **5317.2**A–**5317.2**G, and the 8-byte salt of field **130**C. Prior to hashing, all white space embedded in the values of label-value pairs **5313**A–**5313**D and **5317.2**A–**5317.2**G is removed and a vertical bar separator character inserted between each adjacent pair of values.

At step **3411**, label-value pair **5317.2**H, created at step **3410**, is appended to label-value pairs **5317.2**A–**5317.2**G. Label-value pairs **5317.2**A–**5317.2**H are encrypted using DES key DES-CA**3**-C-n.

At step **3412**, data encrypted at step **3411** is encoded using well known techniques (preferably base **64**).

Message CA**3** is assembled at steps **3413**–**3417**. At step **3413**, header **5305** is created using the message template found at type and version data structure **150** and the protocol number as embedded in server software **110**.

Next, at step **3414**, transparent label-value pairs **5313**A–**5313**D are added (appended). Label-value pairs **5213**A–**5213**D were described previously.

At steps **3415** and **3416**, merchant-opaque label-value pair **5317.1** and customer-opaque label-value pair **5317.2** are appended. Label-value pairs **5317.1** and **5317.2** have the labels "merchant-opaque" and "customer-opaque", respectively, signifying that the values which follow are encrypted data. The value of label-value pair **5317.1**, represents the data which was encoded at step **3407**. The value of label-value pair **5317.2** represents the data which was encoded at step **3412** (which will be forwarded to customer computer **200** in message CA**4**).

Trailer **5350** is assembled at step **3417**. The checksum of trailer **5350** is calculated as described above with respect to sample message **4000**. Trailer **5350** is added (appended) to the remainder of message CA**3**.

The assembly of message CA**3** is complete. Message assembly procedure **3400** for message CA**3** ends at step **3419**.

At step **1719**, merchant computer **300** receives message CA**3** from server computer **100** and unwraps message CA**3** by executing message unwrap procedure CA**34**. Message unwrap procedure CA**34** for message CA**3** is now described with reference to FIG. **35**, where it begins at step **2072**.

At step **2072**, merchant software **310** extracts the protocol number from header **5305** of message CA**3**. Next, based upon the extracted protocol number, message data structure **380** is accessed to determine the expected format of message CA**3**. The expected format may include message syntax (e.g., permitted end-of-line characters) and message coding (e.g., ASCII or hex). Message CA**3** is parsed in accordance with the expected format as follows.

At step **2073**, merchant computer **300** calculates a checksum using the same data used by server computer **100** at step **3417** of message assembly procedure **3400** for message CA**3**. At step **2074**, the checksum calculated at step **2073** is compared to the checksum of trailer **5350** of message CA**3**. If the checksums are not equal, message CA**3** is discarded at step **2074**A where message unwrap procedure CA**34** terminates.

If the checksums are equal at step **2074**, processing continues at step **2075**A where the message is checked to determine if it is appropriate for message unwrap procedure CA**34**. A message is appropriate if it includes the label "type" in the transparent part of the message and the value indicating a message CA**3** or CA**4**. If a message does not include this label-value pair, it is inappropriate. Processing of inappropriate message occurs at step **2075**B where the message is diverted to another unwrap procedure described elsewhere. Message CA**3** is appropriate; therefore, processing continues at step **2076** where the value of merchant-opaque label-value pair **5317.1** is decoded.

At step **2077**, merchant application software **310** generates the same DES key DES-CA**3**-M generated by server software **10** according to CA–DES-key generation process **1600**.

At step **2078**, DES key DES-CA**3**-M is stored in a temporary register.

At step **2079**, DES key DES-CA**3**-M is used to decrypt the value of merchant-opaque label-value pair **5317.1**.

A check of message CA**3** is then performed at step **2080** as follows.

At step **2080**, the success or failure of the decryption of label-value pair **5317.1** is determined. If the decryption fails for any reason, an error flag is set at step **2084** and message unwrap procedure CA**34** terminates at step **2085**.

If the decryption is successful, at step **2080**A, the message type is determined by reference to label-value pair **5317.1**A. For example, value of label-value pair **5317.1**A for message CA**3** may be "cash-batch-receipt."

Processing continues at step **2081**. There, merchant computer **300** performs a check of the form of message CA**3**. The form check procedure of step **2081** is software version dependent. That is, the expected form of the message, and the criteria that determine whether it is acceptable, depend on the message and any variations of the message that are valid at a given time as determined by reference to message type and version information provided in message CA**3** and message template structure **380** as previously described. At a minimum, the form check procedure will ascertain whether an incoming message contains all the labels that are prescribed for that message, whether there are values for each labels that requires a value, and whether the values are of the type (e.g., text, signed numbers), syntax and within any specified limits as required. If a message cannot be parsed, or can be parsed but does not meet a form criteria, merchant computer **300** will set an error flag at step **2084** and message unwrap procedure CA**34** terminates at step **2085**.

If message CA**3** passes the form check at step **2081**, processing continues at step **2082**. There, the authentication code represented by label-value pair **5317.1**P is verified as

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follows. Merchant software **310** obtains the 8-byte salt of field **340**C (FIG. **6**E). Based on the value of subtype label-value pair **5317**.1A and subversion label-value pair **5317**.1B, merchant application software **310** accesses message template data structure **380** to determine which label-value pairs were hashed at step **3405** of message assembly procedure CA**3** to compute the value of label-value pair **5317**. IP. Merchant application software **310** then adds the 8-byte salt of field **340**C as both a prefix of and a suffix to the values of those same label-value pairs and computes the hash of the result. This hash value is compared to the value of label-value pair **5317**.1Q. If the values differ, an appropriate error flag is set at step **2084**. Message unwrap procedure CA**34** terminates at step **2085**.

Referring again to FIG. **24**, processing continues at step **1720**. There,

(1) if an error flag was set at step **2084**, the flag will be detected at step **1720** and processing of message CA**3** will terminate at step **1721**.

(2) if no error flag was set at step **2084** but an error in message CA**2** was detected at step **1681**, processing will continue at step **1722** where the content of label-value pair **5317**.1C is checked. If the value of label-value **5317**.1C is other than "success", error processing routines are performed at step **1723** causing merchant application software **310** to display the message contained in label-value **5317**.1F associated with the content of label-value **5317**.1C. Merchant application software **310** will also interpret the value of label-value **5317**.1E and take whatever action may be associated with that value and CA**3** message processing ends at step **1733**; or

(3) if message CA**3** passed the check at step **1720** and step **1722**, processing continues at step **1724** where merchant computer **300** updates local data structure as follows.

Record **350**.1 (FIG. 7A) is updated to reflect whether a payment request was paid. Field **350**C contains a flag which is set to either "paid" or "not-paid", depending on whether the response-code from label-value pair **5317**.1C is "success" or "failure". Similarly, record **370**.1 (FIG. 7C) is updated to reflect the status of a particular payment request. Field **370**B, which is set to "attempt" at the time a particular payment request is sent to server computer **100** in message CA**2**, is set to "success" or "failure" depending on whether the response-code from label-value pair **5317**.1C is "success" or "failure". The result code from label-value pair **5317**.1E is stored in field **370**M. The fee paid by merchant user **303** for processing of the payment request from label-value pair **5317**.1D is stored in field **370**L. The amount collected by merchant user **303** for a particular payment request from label-value pair **5317**.1M is stored in field **370**K and is added to field **360**F of record **360**.1 of sales session data structure **360**.

At step **1725**, merchant computer **300** assembles message CA**4** according to message assembly procedure **3100**, shown in FIG. **36**. Message CA**4** is shown in FIGS. **37**A and **37**B.

Message assembly procedure **3100** for message CA**4** begins at step **3101**. At step **3102**, header **5405** is created using the message template found at message data structure **380** and the protocol number protocol as embedded in merchant application software **310**.

Next, at step **3103**, transparent label-value pairs **5413**A–**5413**G are added (appended).

Label-value pair **5413**A has the label "type". The value of label-value pair **5413**A references a record in message data structure **270** (FIG. **5**A) which sets forth the labels of message CA**4**. The value of label-value pair **5413**A is obtained from merchant application software **310**.

Label-value pair **5413**B has the label "version" and references a record relating to the record referenced by label-value pair **5413**A. As previously discussed, label-value pair **5413**B permits the sender of a message to advise the recipient as to the version of that message how to parse and process that version. Because message CA**4** is in response to message CA**1** from customer user **203**, the version used by merchant application software **310** to construct message CA**4** will be selected by merchant application software **310** to assure that it can be processed by customer application software **210**. Label-value pair **5313**B advises customer application software **210** of the form and content of both the transparent label-value pairs **5413**A, **5413**C and **5413**D and the opaque label-value pair **5417**. The value of label-value pair **5413**B is obtained from merchant application software **310**.

Label-value pair **5413**C has the label "session-id" and a value indicating the current session id for customer user **203**. Merchant computer **300** obtains the value of label-value pair **5413**C from the session-id value of label-value pair **5113**C of message CA**1**.

Label-value pair **5413**D has the label "index". The value of label-value pair **5413**D is an integer selected from a range of unused values indicating each time different transactions with a session is attempted. Merchant user **303** obtains the value of label-value pair **5413**D from the index value of label-value pair **5113**D of message CA**1**.

Label-value pair **5413**F has the label "order-id". The value of label-value pair **5413**F indicates the order identification number generated by merchant computer **300** to identify the order. The value of label-value pair **5413**F is the same as that provided in label-value pair **5013**C of message PR**1**.

Label-value pair **5413**G has the label "service-category". The value of label-value pair **5413**G is a label which may be used by customer computer **100** to route message CA**4** to a processor within customer computer **200** that handles messages of a particular service category.

At step **3104**, opaque label-value pair **5417** is appended. Label-value pair **5417** has the label "opaque" signifying that the value which follows is encrypted data. The value of label-value pair **5417** represents the value of label-value pair **5317**.2, forwarded from server computer **100** to merchant computer **300**.

Trailer **5450** is assembled at step **3105**. The checksum of trailer **5450** is calculated as described above with respect to sample message **4000**. Trailer **5450** is added (appended) to the remainder of message CA**4**.

The assembly of message CA**4** is now complete. Message assembly procedure **3100** ends at step **3106**.

Referring again to FIG. **24**, processing continues at step **1726**. There, merchant computer **300** transmits message CA**4** to customer computer **200**.

At step **1727**, customer computer **200** receives message CA**4** from merchant computer **300** and unwraps message CA**4** by executing message unwrap procedure CA**34**. Message unwrap procedure CA**34** for message CA**4** was previously described for message CA**3** with reference to FIG. **35**.

Referring again to FIG. **24**, processing continues at step **1728**. There,

(1) if an error flag was set at step **2084**, the flag will be detected at step **1728** and processing of message CA**4** will terminate at step **1729**; or

(2) if no error flag was set at step **2084** but an error in message CA**1** was detected at step **1678**, processing

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will continue at step **1730** where the content of label-value pair **5417**A is checked. If the value of label-value **5317**A is other than "success", error processing routines are performed at step **1731** causing customer application software **210** to display the message contained in label-value **5417**B associated with the content of label-value **5317.1**C. Customer application software **210** will also interpret the value of label-value **5417**E and take whatever action may be associated with that value and processing message CA**4** will terminate at step **1733**; or

(3) if message CA**4** passed the check at step **1728** and step **1730**, processing continues at step **1732** where customer computer **200** updates its data structures as follows.

Customer computer **200** compares the value contained in label-value pair **5417**D with the value of label-value pair **5117**A. If the values are different, customer computer **200** adjusts the current amount field **240**D to reflect the amount actually deducted from current amount field **130**F as maintained by server computer **100**. In addition to the values recorded in customer session data structure **240**, a new record **263** of customer log data structure **260** is created as follows: The date from label-value pair **5413**E is stored in field **263**C. The response-code from label-value pair **5417**A is stored in field **263**D. The remark from label-value pair **5417**B associated with the response code from label-value pair **5417**A is stored in field **263**E. The amount from label-value pair **5417**D is stored in filed **263**J. The order-id from label-value pair **5417**F is stored in field **263**G. The session-id from label-value pair **5413**C is stored in field **263**L. The index from label-value pair **5413**D is stored in field **263**M.

G. Close Session Process **411**

Close session process **411** may be used by customer user **203** to close a session.

FIG. **38** depicts a flow diagram illustrating close session process **411** which begins at step **1801**.

At step **1802**, customer application software **210** prompts (requests) customer user **203** to enter the identification number of the session to be closed, any record-note to be attached to a session, and whether customer user **203** desires a log of transactions submitted to server computer **100** by merchant **303** for customer user **203** during the session that is being closed. If customer user **203** has more than one session open, the prompt will include a list of all open sessions and request customer user **203** to select the session to close.

The content of message CS**1** is now described with reference to FIGS. **39**A and **39**B.

Label-value pair **4813**A has the label "id". The value of label-value pair **4813**A indicates the persona id for customer user **203**. The value of label-value pair **4813**A is obtained from field **220**A (FIG. **5**C).

Label-value pair **4813**B has the label "transaction". The value of label-value pair **4813**B is a transaction number, generated by customer application software **210**, which uniquely identifies message CS**1**. The value of label-value pair **4813**B allows server computer **100**, upon receipt of message CS**1**, (1) to send an associated reply message CS**2**, described below, and (2) to determine if message CS**1** is a duplicate message (i.e., already received by server computer **100**). The value associated with label-value pair **4813**B is stored in field **256**B.

Label-value pair **4813**C has the label "date". The value of label-value pair **4813**C indicates the date and time that message CS**1** was assembled and sent to server computer **100**, according to the clock of customer computer **200**. The value associated with label-value pair **4813**C is stored in field **256**C.

Label-value pair **4813**D has the label "serverkey". As previously described, the DES key/IV pair used by customer computer **200** to encrypt the opaque label-value pair **4817** of message CS**1** is encrypted using an RSA public key of server computer **100**. Label-value pair **4813**D points to the corresponding RSA private key as stored in server private key data structure **160**.

Label-value pair **4813**E has the label "service-category". The value of label-value pair **4813**E is a label which may be used by server computer **100** to route message CS**1** to a processor within server computer **100** that handles messages of a particular service category.

Label-value pair **4817** is described next. Label-value pair **4817** has the label "opaque" signifying that the value which follows is encrypted data. The value of label-value pair **4817** represents the data which was encoded at step **813**. The opaque section contents of message CS**1** (FIG. **39**B) is as follows:

Label-value pair **4817**A has the label "type". Label-value pair **4817**A references a record in message data structure **150** which sets forth the labels of the opaque section contents message CS**1**. The value of label-value pair **4817**A is obtained from customer application software **210** which generates the label when customer user **203** initiates close session process **411**.

Label-value pair **4817**B has the label "server-date". The value of label-value pair **4817**B indicates the date and time message CS**1** was assembled. This date and time is customer computer **200**'s perception of server computer **100**'s clock.

Label-value pair **4817**C has the label "swversion" (software version). The value of label-value pair **4817**C indicates the version of customer application software **210** communicating with server computer **100** and is obtained from data embedded in customer application software **210**. The value associated with label-value pair **4817**C is also in field **256**D.

Label-value pair **4817**D has the label "record-note". The value of label-value pair **4817**D is an optional short text note to be stored in field **130**M of server session data structure **130** relating to the current close session process **411**. The value of label-value pair **4817**D is obtained from customer user **203**'s response to a prompt from customer application software **210** and is preferably limited to sixty characters to for convenience in display. If a record-note was created by customer user **203** during open session process **407**, the value of label-value pair **4817**D is added to the value previously stored in field **130**M.

Label-value pair **4817**E has the label "session-id". The value associated with label-value pair **4817**E is obtained from field **240**A of customer session data structure **240** and is stored in field **256**F.

Label-value pair **4817**F has the label "request-log". The value associated with label-value pair **4817**F is either "yes" or "no". The value of label-value pair **4817**F reflects whether customer user **203** has elected to receive a log of the transactions at step **1802**. The value of label-value pair **4817**F is stored in field **256**G of customer pending data structure **250**.

Label-value pair **4817**G has the label "key". The value of label-value pair **4817**H represents a hash of the modulus part of the RSA public/private key pair of customer persona **120.1**. The value of label-value pair **4817**G permits server computer **100** to confirm that the RSA public key maintained in field **120**B (FIG. **4**B) is the same key used to sign message CS**1** (label-value pair **4817**H).

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Label-value pair **4817**H has the label "signature". The value of label-value pair **4817**I represents the digital signature of customer persona **120.1**. For message CS**1**, the value of label-value pair **4817**H is a hash of label-value pairs **4813**A–**4813**E and label-value pairs **4817**A–**4817**G in alphabetical order, encrypted with the RSA private key of customer persona **120.1**. The RSA private key of customer persona **120.1** is obtained from field **220**H.

At step **1803**, message CS**1** is assembled in accordance with message assembly procedure **800**. Message assembly procedure **800** was previously described for message R**1** with reference to FIG. **9**. One noted exception: A copy of message CS**1** is saved in field **256**H.

Referring again to FIG. **38**, close session process **411** continues at step **1804**. There, customer computer **200** transmits message CS**1** to server computer **100**. Customer computer **200** waits for a reply message CS**2** from server computer **100**.

At step **1805**, server computer **100** receives message CS**1** from customer computer **200** and unwraps message CS**1** by executing server message unwrap procedure **900** for message CS**1**. Server message unwrap procedure **900** was previously described for message R**1** with reference to FIG. **11**. A noted exception: a copy of message CS**1** is stored in field **140**E.

At step **1806**, if any of the tests of steps **904**, **909**A, **912**, **914**, **915** or **916** caused an error flag to be set at step **905**, error processing procedures are executed by server computer **100** at step **1814**. While the level of error processing at step **1814** is largely an administrative decision, it is preferred that a minimum, failures of the signature, and form, and a "fatal" return on the software check procedure result in a return message containing a code that can be processed by customer application software **210** and a message that can be read by customer user **203**. The error processing procedure in step **1814** entails associating a flag with a specific error code (described in the context of the return message CS**2** below) and creating a text message (either from a data structure of messages or a message sent by the system administrator). Server computer **100** then generates a message CS**2** similar to that described below to customer computer **200** conveying the error code and any related message.

If the tests of steps **904**, **909**A, **912**, **914**, **915** and **916** did not cause an error flag to be set at step **905**, processing continues at step **1807**. There, server computer **100** invalidates (updates server data structures) the session identified in label-value pair **4817**E by setting the status flag in field **130**L to "closed".

At step **1809**, server software **110** assembles reply message CS**2**, according to server message assembly procedure **1000**. Server message assembly procedure **1000** was previously described for message R**2**, with reference to FIG. **12**. The content of message CS**2** (FIGS. **40**A and **40**B) is now described.

Label-value pair **4913**A has the label "id". The value of label-value pair **4913**A indicates the persona id for customer user **203**. The value of label-value pair **4913**A is obtained from the value of label-value pair **4813**A of message CS**1**.

Label-value pair **4913**B has the label "transaction". The value of label-value pair **4913**B is a transaction number. The value of label-value pair **4913**B is the same as that received in message CS**1** in label-value pair **4813**B.

Label-value pair **4913**C has the label "date". Label-value pair **4913**C has the same value as label-value pair **4813**C of message CS**1**.

Label-value pair **4913**D has the label "service-category". Label-value pair **4913**D has the same value as label-value pair **4813**E of message CS**1**.

The opaque section contents of message CS**2** are shown in FIG. **40**B where label-value pair **4917**A has the label "type". The value of label-value pair **4917**A references a record in message data structure **270** (FIG. **5**A) which sets forth the labels of the opaque section contents of message CS**2**. The value of label-value pair **4917**A is obtained from server software **110**.

Label-value pair **4917**B has the label "server-date". The value of label-value pair **4917**B indicates the date and time message CS**2** was assembled according to the clock of server computer **100**.

Label-value pair **4917**C has the label "response-code". The value of label-value pair **4917**C indicates whether close session process **411** was a success or failure.

Label-value pair **4917**D has the label "swseverity" (software severity). The value of label-value pair **4917**D indicates whether customer application software **210** needs to be updated, but is still usable ("warning") or is no longer usable ("fatal"). The value of label-value pair **4917**D is null if customer application software **210** is current.

Label-value pair **4917**E has the label "swmessage" (software message). The value of label-value pair **4917**E indicates instructions as to what customer user **203** should do in the case of a "fatal" or "warning" software severity. The value of label-value pair **4917**E is only present if the value of label-value pair **4917**D is not null.

Label-value pair **4917**F has the label "message". The value of label-value pair **4917**F is a free text message associated with an error or success condition returned in label-value pair **4917**C and is displayed to customer user **203**.

Label-value pair **4917**G has the label "fee". The value of label-value pair **4917**G indicates a fee, if any, charged to customer user **203** for processing message CS**1**.

Label-value pair **4917**H has the label "amount" and indicates the amount of electronic funds remaining from the amount allocated to the session during open session process **407** after all payments and fees are deducted. If the process of message CS**1** is successful, the amount represented by label-value pair **4917**H will be added to cash container field **120**G.**2** (FIG. **4**C).

The assembly of message CS**2** is now complete.

Referring again to FIG. **38**, at step **1809**A, message CS**2** is sent (transmitted) from server computer **100** to customer computer **200**.

At step **1810**, customer computer **200** receives message CS**2** from server computer **100** and unwraps message CS**2** by executing message unwrap procedure **1100**. Message unwrap procedure **1100** for message CS**2** was previously described for message R**2** with reference to FIG. **14**.

At step **1811**,

(1) if an error flag was set at step **1105**, the flag will be detected at step **1811** and processing of message CS**2** will terminate at step **1812**. From the perspective of customer user **203**, no further action is taken with respect to message CS**2**. In the present invention, a mechanism is provided within customer application software **210** to create and send to server computer **100** a message. This message includes the CS**2** message as received by customer computer **200** and any diagnosis of what caused the message to fail. No response to this message is sent by server computer **100** to customer computer **200**. Rather, the information is used to ascertain whether a problem exists within the system and if appropriate corrective measures need to be taken.

(2) if no error flag was set at step **1105** but an error in message CS**1** was detected at step **905**, processing will

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continue at step **1813** where the content of label-value pair **4717**C is checked. If the value of label-value pair **4917**C is other than "success", error processing routines are performed at step **1815** causing customer application software **210** to display the message contained in label-value pair **4917**F associated with the content of label-value pair **4917**C and to interpret the value of label-value pair **4917**C and take whatever action may be associated with that value; or

(3) if message CS**1** passed the check at step **905** and no flags were set at step **1105**, processing continues at step **1816** where customer application software **210** updates customer data structure **202** as follows:

The amount from label-value pair **4917**H is added to field **220**J.

Record **267** of customer log data structure **260** is updated as follows: the persona id from label-value pair **4913**A is stored in field **267**H. The transaction number from label-value pair **4913**B is stored in field **267**B. The date from label-value pair **4917**B is stored in field **267**C. The response-code from label-value pair **4917**C is stored in field **267**F. The software severity code from label-value pair **4917**D is stored in field **267**D. The software-message from label-value pair **4917**E is stored in field **267**E. The response message associated with the response code from label-value pair **4917**F is stored in field **267**G. The fee from label-value pair **4917**G is stored in field **267**K. The amount from label-value pair **4917**H is stored in field **267**I.

If the value of request-log label-value pair **4817**F in message CS**1** was set to "yes", a report will be delivered to customer computer **200** of all transactions initiated by customer user **203** during the session just closed.

Processing continues at step **1817** where close session process **411** ends.

A. Registration process **401**

Registration process **401** is identical for a customer and a merchant. Only the registration of customer user **203** is described below.

Customer user **203** runs customer application software **210** which prompts customer user **203** for its assent to one or more legal agreements. In response to a request for customer user **203**'s assent to a legal agreement, customer user **203** selects "agreed". Customer application software **210** then prompts customer user **203** for the following information: a desired persona id, the email address of customer user **203**, the desired language in which any error messages will be displayed, the autoclose passphrase to be associated with the persona, and the default currency of the persona.

In response to a prompt for a desired persona id, customer user **203** selects "brianb". In response to a prompt for an the email address, customer user **203** enters "brianb@reality.com". In response to a prompt for the desired language for error messages, customer user **203** selects "English". In response to a prompt for the autoclose passphrase associated with the persona, customer user **203** enters "badnews". In response to a prompt for the default currency of the persona, customer selects "U.S. dollars".

Customer user **203** is prompted to enter a password. Customer user **203** then enters "enterprise". Customer user **203** is prompted to re-enter the password and complies. Customer application software **210** then generates a RSA public/private key pair and initiates the creation of message R**1** as previously described, which message will include the following:

transaction-number:	2277052
date:	19951105100505456
serverkey:	CC1001
type:	registration
service-category:	admin
opaque:	
server-date:	19951105100506656
swversion:	1.0win
content-language:	en-us
default-currency:	usd
requested-id:	BrianB
email:	brianb@reality.com
agreements:	75
autoclose-passphrase:	badnews
pubkey:	aslfflasdflasjylfdjslyafkjfjslakjfyldskajyflkajsyldfjlaskfaslfj flasflasjykjfjslakjfjuyresdfutkpoiuqwasderfgthyujikolpkm n75cxz1
signature:	sdjflsajflksjdlkfjlsakjflkdsajflksjfjslakjfyldskajyjfjslakjfylds kajydjlfasdloprytuazxcnmklokmnuhbvgytfcdxszaqwe3r5t6 y7u8io09km+

V. Sample Transaction

Below is a description of a sample transaction. In the sample transaction, customer user **203** and merchant user **303** each perform registration process **401**, instrument binding process **403**, load/unload process **405**, open session process **407**, transaction payment process **409**, and close session process **411**. By performing these processes, customer user **203** is able to purchase a pair of "rocket shoes" from Acme Products.

It should be noted that in the current invention, message label-value pairs for which no value have been assigned are preferably not included in a transmitted message. This attribute of the current invention is reflected in the sample messages depicted below.

Server computer **100** creates a new record **140**.1 in server message log **140** and saves a copy of message R**1** in field **140**E. Server computer **100** then unwraps message R**1** and processes it as previously described and updates record **140**.1 of server message log **140** as

persona-id:	brianb-23
session-id	
tranaction-number:	2277052
index:	
incoming-message:	copy of message R1
response-message:	

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Server computer **100** then compares the id requested by customer user **203** to the list of existing personas. If the requested persona id is unique, it creates a persona record **120**.1 for customer user **203** as follows:

persona-id:	brianb-23
email:	brianb@reality.com
public-key:	aslfjflasdflasjylfdjslyafkjfjslakjfyldskajyflkajsyldfjlaskfaslfjflasdfla sjykjfjslakjfjuyresdfutkpoiuqwasderfgthyujikolpkmn75cxz1
date-registered:	19951105100507556
content-language:	en-us
autoclose-passphrase:	badnews
cash-container-data:	
agreements:	
instrument-binding-data:	

Server computer **100** then assembles message R**2**, saves a copy of it in field **140**F of record **140**.1 of server message log data structure **140**, and transmits message R**2** to customer computer **200**. Message R**2** contains the following:

transaction:	2277052
date:	19951105100505456
type:	registration-response
service-category:	admin
opaque:	
server-date:	19951105100507556
requested-id:	brianb
response-id:	brianb-23
email:	brianb@reality.com
response-code:	success
pubkey:	aslfjflasdflasjylfdjslyafkjfjslakjfyldskajyflkajsyldfjlaskfaslfj flasdflasjykjfjslakjfjuyresdfutkpoiuqwasderfgthyujikolpkm n75cxz1
swseverity:	warning
swmessage;	New software is available.

Customer computer **200** unwraps and processes message R**2** as previously described. Customer application software **210** creates a record of persona "brianb-**23**" in customer persona data structure **220** as follows:

persona-id:	brianb-23
email:	brianb@reality.com
public-key:	aslfjflasdflasjylfdjslyafkjfjslakjfyldskajyflkajsyldfjlaskfaslfj flasdflasjykjfjslakjfjuyresdfutkpoiuqwasderfgthyujikolpkm n75cxz1
date-registered:	19951105100507556
content-language:	en-us
autoclose-passphrase:	badnews
cash-container-data:	
agreements:	75
instrument-binding data:	
software-options:	default
private-key:	8ikuhbrfvedc3erfg56yu87yg0okmsdfghjk3erfqwerty7yuh8i j7yfgdcsdfv6y89i0oolujmhncvzx2wdplkjhgffdsawe/9+45rf 6tg7yhkjhgf2waaz4ed5tgfv

B. Instrument Binding Process **403**

Instrument binding process **403** is the same for both customers and merchants. Only the binding of an instrument by customer user **203** will be described.

Bind instrument process **403** begins when customer user **203** selects the bind instrument operation from the client application. Customer application software **210** prompts customer user **203** for a default name and address. Customer user **203** then enters "Brian Brian, 100 Elm Street, Nice Place, Va. 00000 U.S.A.".

Customer user **203** selects "bank account" and is prompted for the following information: bank account number; whether the bank account is the autoclose account for the persona; a description of the account; and customer user **203**'s assent to one more legal agreement. Customer user **203** is prompted to change any information necessary to describe the name, address, and telephone number of the holder of the instrument.

In response to a prompt for a the bank account number, customer user **203** enter "059013218175654". In response to a prompt to the response for whether the account is the autoclose account for the persona, customer user **203** enters "yes". In response to a prompt to change the displayed name, address, and telephone number, customer user **203** declines.

In response to a prompt for a description of the account, customer user **203** enters "My fun account". In response to a prompt for customer user **203**'s assent to a legal agreement, customer selects "agreed". Customer user **203** is prompted to "bind instrument" with server computer **100**.

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This act causes customer application software **210** to create a message BI**1** as previously described, which message will include the following:

id:	brianb-23
transaction-number:	2277053
date:	19951125100510589
serverkey:	CC1001
service-category:	admin
opaque:	
type:	bind-instrument
server-date:	19951125100512689
swversion:	1.0win
instrument-number;	059013218175654
instrument-type:	dda
instrument-category:	dda
instrument-functions:	load, unload
instrument-salt:	4bnm8poetqv=
instrument-name:	Brian Q. Brian
instrument-street:	100 Elm Street
instrument-city:	Nice Place
instrument-state:	VA
instrument-postal-code:	0000
instrument-country:	USA
agreements:	75,123
autoclose:	yes
autoclose-passphrase:	badnews
key:	4/Roos+2ac8=
signature:	sjadlkaslzfzlksajzlffzlksajzlffzlksajzlffzlksajzlffzlks ajzl ffzlksajzlfjszlfjsldfjlskflsajfsa/9iu7hgfce/juy+poiuh nbvcdewqazxp

Server computer creates a new record **140.2** in server message log **140** and saves a copy of message BI**1** in field **140**E. Server computer **100** then unwraps message BI**1** and processes it as previously described and updates record **140.2** of server message log **140** as follows:

persona-id:	brainb-23
session-id	
transaction-number:	2277053
index:	
incoming-message:	copy of BI1
response-message:	

Server computer **100** then updates server persona data structure **120.1** for persona "brianb-**23**" by entering "badnews" into the autoclose passphrase field **120**F and by adding instrument binding data to field **120**H as follows:

persona-id:	brianb-23
instrument-type:	dda
Instrument-number:	aswerfcvg [encrypted]
Instrument-native currency	usd
Instrument-prefix:	055654
Legal-agreements:	75, 123
Instrument-hash:	uou980y57rd98jnhgt54e3==
Issuer-identification number:	735980
Instrument-holder-name:	lkpipoipoi [encrytped]
Instrument-holder-address:	oipipoipipo [encrypted]
Instrument-bind-date:	19951125100513583
Instrument-first-used-date:	
Binding-status:	created
Sale-transaction-enabled:	no
Sale-transaction-limit:	
Credit-transaction-enabled:	no
Credit-transaction-limit:	
Load-cash-enabled:	yes
Load-cash-transaction limit:	usd 1000.00
Unload-cash-enabled:	yes

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Unload-cash-transaction limit:	−1
Autoclose-binding:	yes

Server computer **100** then assembles message BI**4**, saves a copy of it in field **140**F of record **140.2** of server message log **140**, and sends message BI**4** to customer user **203**. Message BI**4** contains the following:

persona-id:	brianb-23
transaction-number:	2277053
date:	19951125100510589
service-category:	admin
opaque:	
type:	bind-instrument-response
server-date:	19951125100513583
response-code:	success
swseverity:	warning
swmessage;	New software is available.
instrument-number:	059013218175654
instrument-type:	dda
instrument-issuer:	East Bank of the Mississippi
instrument-issuer-country:	us
instrument-functions:	load, unload
instrument-number:	059013218175654
instrument-type:	dda
instrument-issuer:	East Bank of the Mississippi
instrument-issuer-country:	us
instrument-functions:	load, unload
instrument-salt:	4bnm8poetqv=

Customer computer **200** unwraps message BI**4** and processes it as previously described, then updates record **220.1** in customer persona data structure **220** for persona "brianb-**23**" by adding instrument binding data to field **220**J as follows:

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persona-id	brianb-23
instrument-number:	059013218175654
instrument-description:	my fun account
holder-name:	Brian Brian
holder-address:	100 Elm Street
holder-city:	Nice Place, VA
holder-country:	USA
holder-postal-code:	00000
holder-country-code:	1
holder-area-code:	703
holder-telephone:	555-1212
currency:	usd
transact-sale-flag:	no
transact-credit-flag:	no
unload-funds-flag:	yes
load-funds-flag:	yes
status:	approved
instrument-recurring-data:	instrument-number:059013218175654|instrument-type:dda|instrument-issuer:EastBankofthe Mississippi|instrument-issuer-country:us|instrument-functions:load,unload|instrument-salt:4bnm8poetqv=
agreements:	75,123

C. Load/unload Process **405**

Load/unload process **405** begins when customer user **203** selects the load operation from customer application software **210**. Customer application software **210** then prompts customer user **203** for the instrument from which to load funds to persona brianb-**23**. Customer user **203** selects "my fun account" and is prompted for the amount to be transferred. In response to a prompt for the amount, customer user **203** enters $100.00. Customer application software **210** then assembles message LU**1** as previously described and sends it to server computer **100**. Message LU**1** contains the following information:

id:	brianb-23
transaction-number:	2277054
date:	19951105103517688
serverkey:	CC1001
service-category:	cash
opaque:	
type:	load-unload-funds
server-date:	19951105103519788
amount:	usd 100.00
key:	4/Roos+2ac8=
signature:	lljwlrjwlimceiwlcefjdwewleiciwlcefjdwewleiciwl cefjdwewleicjwlierqiqhodqhoiwehqxq23jioerpoiuklhgr qwer7y6tghjuiko09p+po9ijht5re3wx

Server computer creates a new record **140.3** in server message log **140** and saves a copy of message LU**1** in field **140**E. Server computer **100** then unwraps message LU**1** and processes it as previously described and updates record **140.3** of server message log **140** as follows:

persona-id:	brainb-23
session-id:	
transaction-number:	2277054
index:	
incoming-message:	copy of LU1
response-message:	

Server computer **100** then updates customer persona record **120.1** by adding cash container data to field **120**G as follows:

Currency:	usd
Available-balance:	100.00
On-hold-balance:	0.00
Agency-account-number:	113317834

Server computer **100** then assembles message LU**2**, saves a copy of it in field **140**E of record **140.3** of server message log **140**, and transmits message LU**2** to customer computer **100**. Message LU**2** contains the following information:

id:	brianb-23
transaction-number:	2277054
date:	19951105103517688
service-category:	cash
opaque:	
type:	load-unload-response
server-date:	19951105103607914
amount:	usd 100.00
response-code:	success
message;	funds-loaded
swseverity:	warning
swmessage:	New software is available.
fee:	usd 0.0
balance:	usd 100.00
session-funds:	usd 0.00
on-hold:	usd 0.00

Customer computer **200** unwraps message LU**2** and processes it as previously described, then updates record **220.1**

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in customer persona data structure **220** for persona "brianb-**23**" by entering "usd **100**" into cash container field **220**J.

D. Open Session Process **407**

Create session process **407** begins when customer user **203** selects the open session operation from customer application software **210**. Customer application software **203** then prompts customer user **203** for the following information: desired session lifetime in minutes; maximum number of transactions to be conducted during session; the amount of funds to be available during the session; and a memo describing the session.

In response to a prompt for the desired lifetime of the session in minutes, customer user **203** enters "120". In response to a prompt for the maximum number of transaction to be conducted during the session, customer user **203** enters "25". In response to the prompt for the amount of funds to be available during the session, customer enters "70.00". In response to a prompt for a memo describing the session, customer user **203** enters "Christmas shopping spree."

Customer **200** then assembles a message OS**1** and sends it to server computer **100**. Message OS**1** includes the following information:

id:	brianb-23
transaction-number:	2277055
date:	19951105104131914
serverkey:	CC1001
service-category:	cash
opaque:	
type:	open-session
server-date:	19951105104134014
swversion:	1.0win
record-note:	Christmas shopping spree
amount:	usd 70.00
key-lifetime:	0120
key-uselimit:	25
key:	4/Roos+2ac8=
signature:	kasdjflasjdzlkfuoi579384ng09kdfgj09eurtndfbnb909nl ktujwjsi86tjf9086ptjfgr6jir46edcloplaszxewqnym+09u hgtr432zxcvbhgrewq12rg8mko01

Server computer creates a new record **140.4** in server message log **140** and saves a copy of message OS**1** in field **140**E. Server computer **100** then unwraps message OS**1**, processes it as previously described, and updates record **140.4** of server message log **140** as follows:

persona-id:	brainb-23
session-id:	
transaction-number:	2277055
index:	
incoming-message:	copy of OS1
response-message:	

Server computer **100** then creates a record **130.1** in server session data structure **130** associated with persona id "brianb-**23**". Record **130.1** contains the following

Session-ID:	J/Pi+sqGtgH=
Session-Key:	7ujm8iktgTRrfv3edc9olk==
Session-Salt:	aa5yh8fdkl+=
Currency:	usd
Opening-Amount:	70.00
Current-Amount	70.00
Opening-Date:	1995110510137179
Closing-Date:	
Key-Use-limit:	15
Key-lifetime:	0060

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Persona-ID:	brainb-23
Status:	open
Memo:	christmas shopping spree
Transaction-data:	

Server computer **100** also updates record **120.1** in server persona data structure **120** associated with persona "brianb-**23**" by deducting the amount "70.00" from the amount "100.00" from the available balance field **120**G.**2** of the cash container previously described. Server computer assembles a message OS**2**, saves a copy of it in field **140**F of record **140.4**, and transmits message OS**2** to customer computer **200**. Message OS**2** includes the following information:

id:	brianb-23
transaction:	2277055
date:	19951105104131914
service-category:	cash
opaque:	
type:	open-session-response

-continued

server-date:	19951105104137179
response-code:	success
swseverity:	warning
swmessage;	New software is available.
key-lifetime:	0060
key-uselimit:	15
amount:	usd 70.00
foreign-exchange:	cad 0.60 gbp 1.55
session-funds:	usd 70.00
balance:	usd 30.00
on-hold:	usd 0.00
fee:	usd 0.00
session-id:	J/Pi+sqGtgH=
session-key:	7ujm8iktgTRrfv3edc9olk==
session-salt:	aa5yh8fdkl+=

Customer computer **200** unwraps message OS**2** and processes it as previously described, then creates a new record **240.1** in customer session data structure **240** associated with persona "brianb-**23**" as follows:

Session-ID:	J/Pi+sqGtgH=
Session-Key:	7ujm8iktgTRrfv3edc9olk==
Session-Salt:	aa5yh8fdkl+=
Currency:	usd
Opening-Amount:	70.00

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Current-Amount	70.00
Opening-Date:	19951105104137179
Key Use-limit:	15
Key-lifetime:	0060
Memo:	christmas shopping spree

The process whereby merchant user **303** opens a session is the same except that a merchant will not transfer funds from its persona cash container to a session register. This is because a merchant expects to receive funds and does not need funds available to it during a selling session. Server computer **100** creates a record **130.2** in server session data structure **130** associated with merchant user **303**'s persona "acme-**12**" as follows:

session-ID:	k/iL+tpPmHg=
session-key:	3ejkPOM7T+poBQW9ipqwZ8==
session-salt:	qw89lk3vAZ==
currency:	usd
opening-amount:	0.00
current-amount:	0.00
opening-date:	110595063012147
closing-date:	
key-use-limit:	090
key-lifetime:	0960
persona-ID:	acme-12
status:	open
memo:	shoe department sales
transaction-data:	

Upon opening a session, merchant computer **303** creates a new record **370.1** in merchant cash log data structure **370** as follows:

type:	open-session
status:	open
transaction-number:	55443322
requested-session-duration:	0960
requested-session-count:	90
session-id:	k/iL+tpPmHg=
result-code:	success

E. Transaction Payment Process **409**

Transaction payment process **409** begins when customer user **203** responds to an offer from merchant user **303** to sell rocket shoes under specified terms by selecting "cash payment" as the mechanism for payment. This act causes merchant computer **300** to assemble message PR**1** and transmit it to customer computer **200** as previously described. Message PR**1** includes the following information:

type:	payment-request
merchant-ccid:	Acme-12
merchant-order-id:	1231-3424-234242
merchant-date:	19951105104536378
merchant-swversion:	foo69
note;	ACME Products Purchase of 1 pair "Rocket Shoes" at $37.50 ea. Shipping and handling $5.00 Total Price: $42.50 Ship to: Brian Brian 100 Elm Street Nice Place, VA 00000 USA
merchant-amount:	usd 42.50
merchant-amount2:	cad 54.25
accepts:	visa; master; amex; JCPenny; macy
url-pay-to:	http://www.ACME.com/ServerPayment
url-cancel:	http://www.ACME.com/CyberPayment Cancel
url-success:	hffp://www.ACME.com/ordersuccess
url-fail:	http://www.ACME.com/orderfail
merchant-signed-hash-key:	lSLzs/vFQ0BXfU98LZNWhQ==
merchant-signed-hash:	klfjlkdfglkdfsutkdfjglds7503qwrtjtyuvnvidur09e58fdj908 6jCS985kf9086kg9894j6g-r094543jvndmkzazqpl

Merchant computer **300** also creates a new record **350.1** of merchant amount data structure **350** as follows:

order-id:	1231-3424-234242
amount-of-transaction:	usd 42.50
flag:	pending

Customer computer **200** processes message PR**1** as previously described. In response to a prompt from customer application software **210**, customer user **203** indicates its acceptance of the offer of merchant user **203** by selecting "pay cash". This act causes customer computer **200** to assemble message CA**1** and transmit it to merchant computer **300**. Message CA**1** includes the following information:

type:	cash-payment
version:	1
session-id:	J/Pi+sqGtgH=
index:	1
payee-currency:	usd
note-hash:	tyriokljhgbvxczm7rfde4==
payee-id:	acme-12
order-id:	1231-3424-234242
service-category:	cash
opaque:	
amount:	usd 42.50
auth-code:	iou234rfgvbmcxp+poliu7==

Merchant computer **300** processes message CA**1** as previously described. Merchant computer **100** then assembles message CA**2** as previously described and transmits it to server computer **100**. Message CA**2** includes the following information:

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version:	1
session-id:	k/iL+tpPmHg=
index:	77
service-category:	cash
merchant-opaque:	
type:	cash-collection
version:	1
$type_n$:	Cash-payment
$subversion_n$:	1
$payer\text{-}session\text{-}id_n$:	J/Pi+sqGtgH=
$payer\text{-}index_n$:	1
$note\text{-}hash_n$:	kchfiZ5WAUlpk1/vlogwuQ==
$payee\text{-}id_n$:	Acme-12
$order\text{-}id_n$:	1231-3424-234242
$merchant\text{-}amount_n$:	usd 42.50
auth-code:	UjkHgtK/38uhzxs9io3+PL==
customer-opaque:	jksyfditdfkjgdfut029jf9q0875jCSjmgmbnfiur86fm9345kd kjrjghnvmfhazaplaksdijdfhjgutiroklop8trewqasz

Merchant computer **300** updates record **370.1** of merchant cash log data structure **370** by adding the following additional data to the existing record (all of record **370.1** is shown for clarity):

type:	cash payment
status:	pending
order-id:	1231-3424-234242
customer-session-ID:	J/Pi+sqGtgH=
customer-index-number:	1
customer-currency:	usd
merchant-session-ID:	k/iL+tpPmHg=
merchant-index-number:	77
merchant-currency:	usd
merchant-amount-requested:	42.50
amount-credited:	42.50
fees-paid:	0.00
type:	open-session
status:	open
transaction-number:	78765437
requested-session-duration:	0960
requested-session-count	90
session-ID:	k/iL+tpPmHg=
result-code	success

Server computer creates a new record **140.5** in server message log **140** and saves a copy of message CA**2** in field **140**E. Server computer **100** then unwraps message CA**2**, processes it as previously described. Server computer **100** checks records **130.1** and **130.2** of server session data structure **130** to determine if both persona brianb-**23** and persona acme-**12** have open sessions. If a session is invalid, server computer terminates transaction payment process **409**. Here, server computer **100** proceeds and updates record **140.5** of server message log **140** as follows:

persona-id:	acme-12
session-id:	k/iL+tpPmHg=
transaction-number:	
index:	77
incoming-message:	copy of message CA2
response-message	

Server computer also updates record **130.1** of server session data structure **130** by associating the following information with transaction data field **130**N:

amount:	usd 42.50
customer-session-id:	J/Pi+sqGtgH=

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merchant-order-id:	1231-3424-234242
merchant-persona-id:	acme-12
customer-index:	1

Server computer also updates record **130.2** of server session data structure **130** by associating the following information with transaction data field **130**NN:

amount:	usd 42.50
customer-session-id:	J/Pi+sqGtgH=
merchant-order-id:	1231-3424-234242
merchant-persona-id:	acme-12
merchant-index:	77

Server computer **100** then assembles message CA**3** and transmits it to merchant computer **300** as previously described. Message CA**3** includes the following information:

type:	from-server
version:	1
session-id:	k/iL+tpPmHg=
index:	77
service-category:	cash
merchant-opaque:	
subtype:	cash-batch-receipt
subversion:	1
request-version:	1
response-code:	success
fee:	usd 0.00
$subtype_n$:	cash-payment-receipt
$subversion_n$:	1
$payer\text{-}session\text{-}id_n$:	J/Pi+sqGtgH=
$payer\text{-}index_n$:	1
$response\text{-}code_n$:	success
$collected\text{-}amount_n$:	usd 42.50
order-id:	1231-3424-234242
auth-code:	p12P+/BNfr59dsXz+lmnTP==
customer-opaque:	
service-category:	cash
response-code:	success
amount:	usd 42.50
order-id:	1231-3424-234242
auth-code:	kjTUY7f7zr+pGB65RXE+hc==

Merchant computer **300** unwraps message CA**3** and processes it as previously described. Merchant computer **300** updates record **350.1** of merchant amount data structures **350** by setting flag field **350**C to "paid".

Merchant computer **300** updates record **370.1** of merchant cash log data structure **370** as follows:

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Status field **370**B is set to "success". Amount credited field **370**k is set to "usd **42.50**".

Merchant computer assembles message CA**4** and transmits it to customer computer **200**. Message CA**4** includes the following information:

type:	cash-payer-receipt
version:	1
session-id:	k/iL+tpPmHg=
service-category:	cash
index:	77
order-id:	1231-3424-234242
opaque:	
response-code:	success
amount:	usd 42.50
order-id:	1231-3424-234242
auth-code:	mhgD4QaBPkj+vWkjHytR5J==

Customer computer **200** unwraps and processes message CA**4** as previously described. Customer computer **200** updates record **240**.**1** of customer session data structure **240** by deducting "$42.50" from current amount field **240**F leaving a balance of $27.50.

F. Close Session Process **411**

Close session process **411** begins when customer user **203** chooses the close session prompt from the display on customer computer **200**. This act causes customer computer **200** to assemble message CS**1** and transmit it to server computer **100** as previously described. Message CS**1** includes the following information:

id:	brianb-23
transaction:	2277056
date:	19951105110223666
serverkey:	CC1001
service-category:	cash
opaque:	
type:	close-session
server-date:	19951105110225766
swversion:	1.0win
session-id:	J/Pi+sqGtgH=
request-log:	No
key:	4/Roos+2ac8=
signature:	kasdjfzlskadufsodpirulksdnzlskd803dipodsifdfsadybmipjg4eazqer 98jfejoiudfji98ytrnmvcxzaqw23rgtyhpmklo1qaszxsw34rfvgy+09o kiju7yhnbg

Server computer creates a new record **140**.**6** in server message log **140** and saves a copy of message CS**1** in field **140**E. Server computer **100** then unwraps message CS**1**, processes it as previously described, and updates record **140**.**6** as follows:

persona id:	brainb-23
session id:	
transaction:	2277057
index:	
incoming-message:	copy of CS1
response-message:	

Server computer **100** then updates record **130**.**1** in server session data structure **130** associated with persona id "brianb-**23**" by adding the value in current amount field **130**F ($27.50) to the amount in the available balance field **120**G.**2** of the cash container previously described for a balance of $57.50, by entering the value "19951105110301999" into closing date field **130**H, and by changing status field **130**L from "open" to "closed" and.

Server computer assembles a message CS**2**, saves a copy of it in field **140**F of recored **140**.**6**, and transmits message CS**2** to customer computer **200**. Message CS**2** includes the following information:

id:	brianb-23
transaction:	2277057
date:	19951105110223666
service-category:	cash
opaque:	
type:	close-session-response
server-date:	19951105110301999
response-code:	success
swseverity:	warning
swmessage;	New software is available.
fee:	usd 0.00
amount:	usd 27.50

Customer computer **200** unwraps and processes message CS**2** as previously described. Customer computer **200** updates field **220**I of record **220**.**1** of customer persona data structure **220** by adding $27.50 to the current value of field **220**I ($30.00) for a balance of $57.50. Customer computer **200** deletes record **240**.**1** of customer session data structure **240**.

While the foregoing description of the present invention has been given as an example, it will be appreciated by those of ordinary skill in the art that various modifications, alternate configurations and equivalents may be used without departing from the spirit and scope of the present invention.

We claim:

1. A method for securely communicating in a communication system, wherein the communication system comprises a first device at a first party's location, a second device at a second party's location, and a server in communication therewith, wherein the method comprises:

(a) creating a first session associated with the first party, wherein said first session has first use parameters for limiting the duration that said first session can be used and a first set of data, wherein said first use parameters and said first set of data are identifiable by the server;

(b) creating a second session associated with the second party, wherein said second session has second use parameters for limiting the duration that said second session can be used and a second set of data, wherein said second use parameters and said second set of data are identifiable by the server; and

(c) linking a portion of said first session with a portion of said second session in the communication system, wherein said portion of said first session includes said first set of data and said first use parameters and said

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portion of said second session includes said second set of data and said second use parameters;

(d) verifying the first and second parties based upon at least portions of said first and second sets of data by the server; and

(e) determining whether said first and second sessions can be used based upon said first and second use parameters by the server

so that when the server verifies the first and second parties and determines that said first and second sessions can be used, the first and second parties are assured of communicating securely in the communication system.

2. The method of claim **1** wherein certain of said first set of data is not transmitted between the first device and the server after said first session is created and certain of said second set of data is not transmitted between the second device and the server after said second session is created.

3. The method of claim **2** wherein said first and second sets of data include first and second keys, respectively, and wherein the server verifies the first and second parties using said first and second keys.

4. The method of claim **1** wherein said first use parameters are determined by the first party and said second use parameters are determined by the second party.

5. The method of claim **1** wherein said first and second use parameters are determined by the server.

6. The method of claim **1** wherein said amount of electronic funds have (a) an amount of electronic funds available to the first party for the duration of said first session, (b) a length of time that said first session will last and (c) a number of transactions that the first party may perform during said first session.

7. The method of claim **1** wherein said second use parameters comprise (a) a length of time that said second session will last and (b) a number of transactions that the second party may perform during said second session.

8. A method for securely communicating in a communication system, wherein the communication system has a device at a user's location and a server in communication therewith, wherein the method comprises:

a. transmitting a request from the device to the server for creating a session having use parameters associated therewith;

b. encrypting a first key with a second key by the server;

c. transmitting said encrypted first key and said use parameters associated with said session from the server to the device;

d. receiving said encrypted first key and said use parameters by the device and decrypting said encrypted first key so that the device can communicate securely in the communication system by using said decrypted first key according to said use parameters.

9. The method of claim **8**, wherein said first key is a DES key.

10. The method of claim **9**, wherein said second key is a DES key.

11. The method of claim **8**, wherein said secure communication is at a security level greater than DES.

12. The method of claim **8**, further comprising a second device at a second user's location wherein said second device is also in communication with the user's device and the server and wherein the method further comprises:

a. transmitting a second request from the second device to the server for creating a second session having second use parameters associated therewith;

b. encrypting a third key with a fourth key by the server;

c. transmitting said encrypted third key and said second use parameters from the server to the second device;

d. receiving said encrypted third key and said second use parameters by the second device and decrypting said third key so that the second device can communicate securely in the communication system by using said decrypted third key according to said second use parameters.

13. The method of claim **12**, wherein said third key is a DES key.

14. The method of claim **12**, wherein said fourth key is a DES key.

15. The method of claim **12**, wherein said secure communication is at a security level greater than DES.

16. The method of claim **12**, further comprising:

a. transmitting a first set of data from the user's device to the second device, wherein said first set of data includes an encrypted portion and an unencrypted portion, wherein said encrypted portion is encrypted using said decrypted first key and at least a portion of said unencrypted portion of said first set of data;

b. receiving said first set of data by the second device and transmitting a second set of data together with said encrypted portion of said first set of data from the second device to the server, wherein said second set of data includes an encrypted portion and an unencrypted portion, wherein said encrypted portion of said second set of data includes at least a portion of said unencrypted portion of said first set of data, and wherein said encrypted portion of said second set of data is encrypted using said decrypted third key and at least a portion of said unencrypted portion of said second set of data; and

c. receiving said second set of data transmitted from said second device by the server and decrypting said encrypted portion of said second set of data using said third key and said portion of said unencrypted portion of said second set of data so that said portion of said first set of data included in said encrypted portion of said second set of data is decrypted, and decrypting said encrypted portion of said first set of data using said first key and said portion of said decrypted portion of said first set of data,

so that the user is verified by the server using said first key and the second user is verified by the server using said third key.

17. An electronic transfer system in a communication network for processing a transaction between a customer having a customer device, a merchant having a merchant device, and a server connected therewith, wherein the transaction has terms associated therewith and wherein the server transfers electronic funds from the customer to the merchant so that the merchant can provide a product to the customer, wherein the electronic transfer system comprises:

a. the merchant device for

(1) obtaining a first session from the server,

(2) transmitting an invoice including at least a portion of the terms of the transaction to the customer device,

(3) receiving a customer response to said invoice from the customer device and transmitting a first set of data representing the transaction to the server, wherein said first set of data includes at least a portion of said customer response,

(4) receiving a second set of data from the server indicating whether the transaction has been approved

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by the server, wherein said second set of data includes a merchant part and a customer part, wherein said merchant part and said customer part of said second set of data include at least a portion of said first set of data; and

(5) transmitting said customer part of said second set of data to the customer device;

b. the customer device for

(1) obtaining a second session from the server,

(2) receiving said invoice including said portion of the terms of the transaction from said merchant device and transmitting said portion of said customer response to the merchant device, and

(3) receiving said customer part of said second set of data from the merchant device;

c. the server having a merchant persona and customer persona stored therein, wherein said merchant persona represents the merchant and said customer persona represents the customer, wherein said merchant persona has a merchant electronic funds storage structure associated therewith for storing electronic funds received by the merchant and said customer persona has a customer electronic funds storage structure associated therewith for storing electronic funds of the customer, wherein the server is for

(1) providing said first session to said merchant device and said second session to said customer device,

(2) receiving said first set of data representing the transaction from the merchant device and processing said first set of data to determine whether the transaction has been approved,

(3) transferring electronic funds from said customer electronic funds storage structure to said merchant electronic funds storage structure if the transaction has been approved, and

(4) transmitting said second set of data to the merchant device indicating whether the transaction has been approved

so that if the transaction has been approved, the merchant can provide the product to the customer.

18. The electronic transfer system of claim **17**, wherein the merchant device further comprises communicating with the server to bind a first financial instrument to said merchant persona; and

wherein the customer device further comprises communicating with the server to bind a second financial instrument to said customer persona.

19. The electronic transfer system of claim **18**, wherein the customer device further comprises transmitting a request to the server to transfer funds from said second financial instrument to said customer electronic funds storage structure; and

wherein the server further comprises receiving and processing said request to transfer funds and for transferring funds from said second financial instrument to said customer electronic funds storage structure.

20. The electronic transfer system of claim **19**, wherein the customer device includes a customer session container for storing electronic funds of the customer during said second session, and further comprises transmitting a second request to the server for transferring electronic funds from said customer electronic funds storage structure to said customer session container; and

wherein the server further comprises processing said second request and transferring the electronic funds from said customer electronic funds storage structure to said customer session container.

21. The electronic transfer system of claim **20**, wherein the use of said first session is limited by first use parameters comprising (a) a length of time that said first session may last and (b) a number of transactions that the merchant may perform during said first session; and

wherein the use of said second session is limited by second use parameters comprising (a) an amount of electronic cash available to the customer during said second session, (b) a length of time that said second session may last and (c) a number of transactions that the customer may perform during said second session.

22. The electronic transfer system of claim **21**, wherein the merchant device further comprises transmitting a third request for transferring electronic funds from said merchant session container to said merchant electronic funds storage structure; and

wherein the customer device further comprises transmitting a fourth request for transferring electronic funds from said customer session container to said customer electronic funds storage structure; and

the server further comprising processing said third request and for transferring electronic funds from said merchant session container to said merchant electronic funds storage structure and for processing said fourth request and for transferring electronic funds from said customer session container to said customer electronic funds storage structure.

23. The electronic transfer system of claim **21**, wherein the server further comprises

transferring electronic funds from said merchant session container to said merchant electronic funds storage structure when at least one of said first use parameters is satisfied; and

transferring electronic funds from said customer session container to said customer electronic funds storage structure when at least one of said second use parameters is satisfied.

24. The electronic transfer system of claim **22** wherein the server further comprises terminating said first and second sessions when at least one of said first and second use parameters have been satisfied.

25. The electronic transfer system of claim **23**, wherein the merchant device further comprises transmitting a fifth request to the server for transferring electronic cash funds from said merchant electronic funds storage structure to said first financial instrument; and

the server for processing said fifth request and for transferring electronic funds from said merchant electronic funds storage structure to said first financial instrument.

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