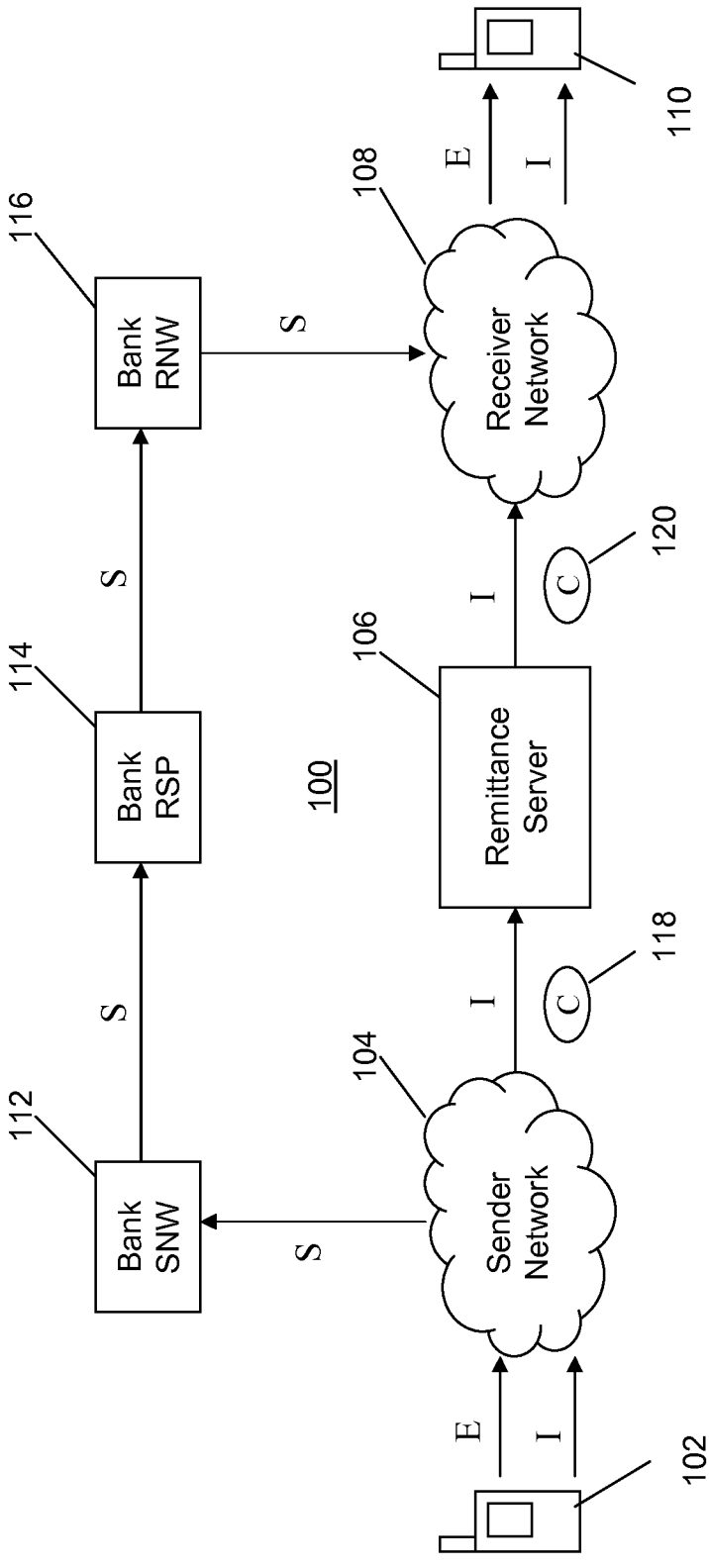


Figure 1

"I": per-transaction information Flow
"E": Fund flows on individual transaction level (Sending and Receiving via bank, SVA with MNO, or agent for cash in/out)
"S":Settlement flows on aggregated level (daily basis, netting is performed)

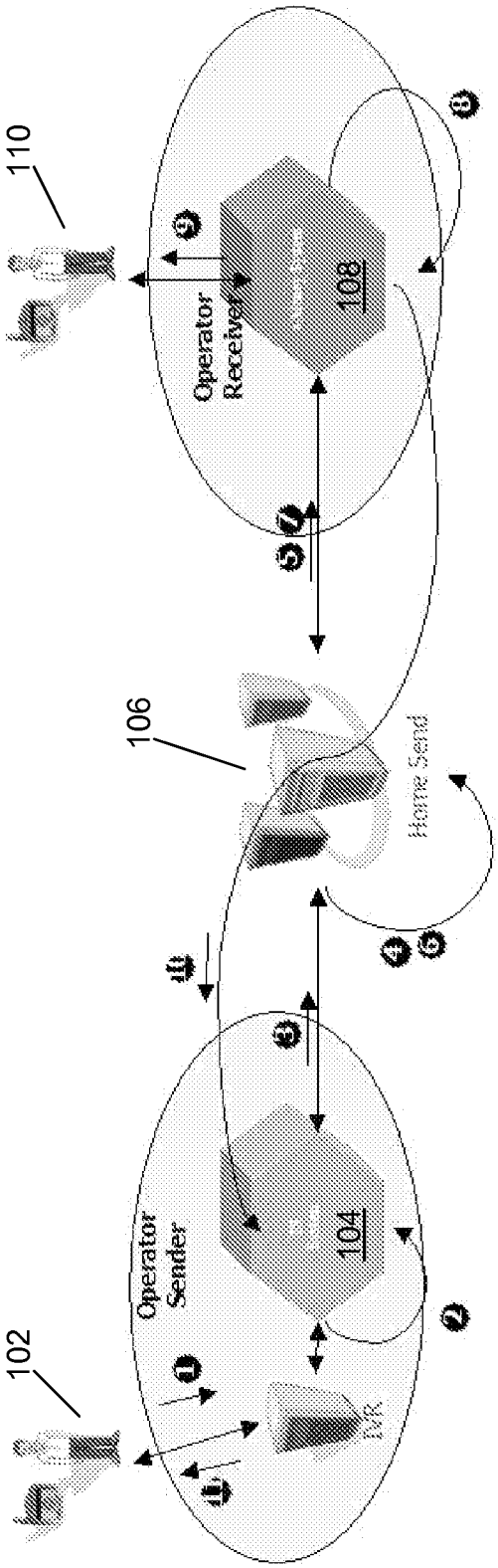

110
102
106
Operator Receiver
Operator Sender
108
104
IVR
Home Send

Figure 2

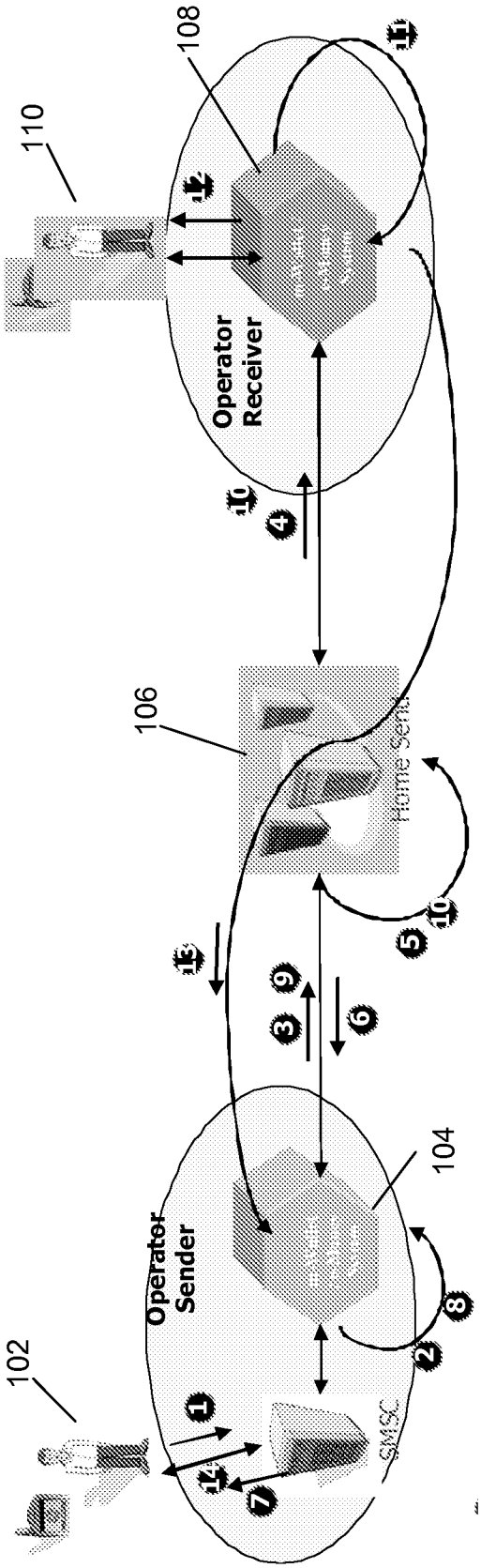

102
110
108
106
104
Operator Sender
Operator Receiver
SMSC
Home Serv
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

Figure 3

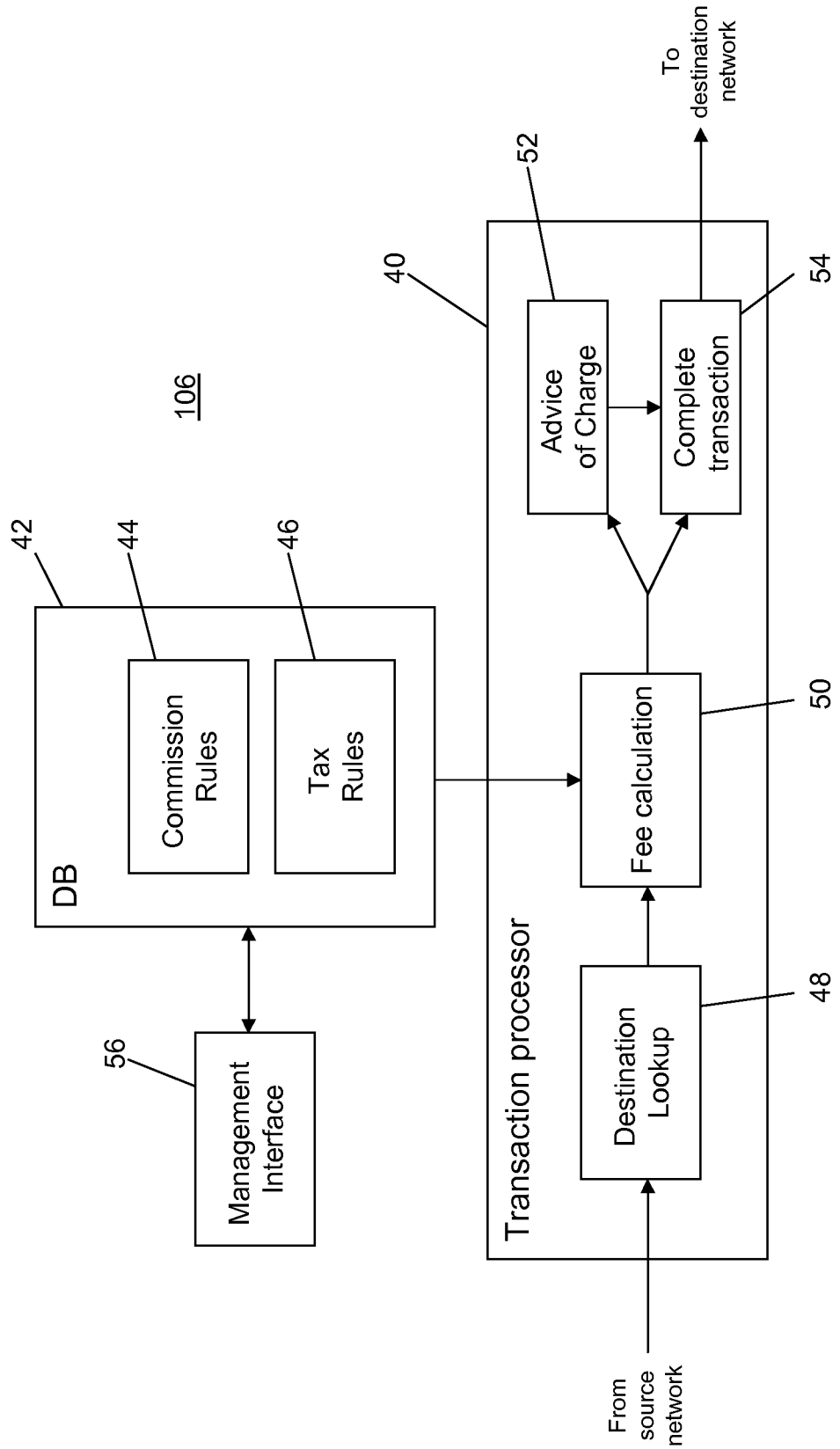

106
42
44
46
DB
Commission Rules
Tax Rules
56
Management Interface
40
Transaction processor
52
Advice of Charge
54
Complete transaction
50
Fee calculation
48
Destination Lookup
From source network
To destination network

Figure 4

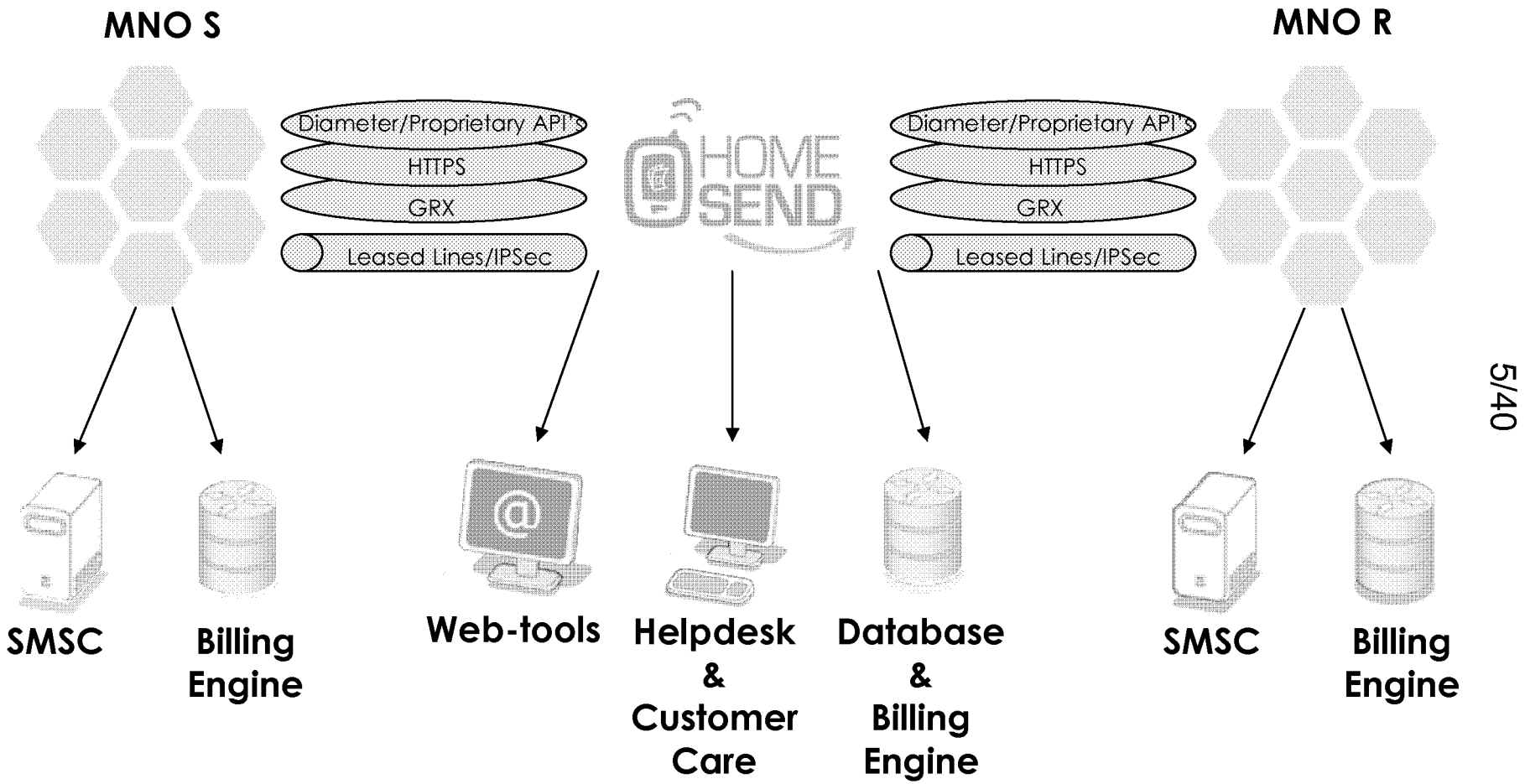

MNO S
MNO R
Diameter/Proprietary API's
HTTPS
GRX
Leased Lines/IPSec
Diameter/Proprietary API's
HTTPS
GRX
Leased Lines/IPSec
HOME SEND
SMSC
Billing Engine
Web-tools
Helpdesk & Customer Care
Database & Billing Engine
SMSC
Billing Engine

Figure 5

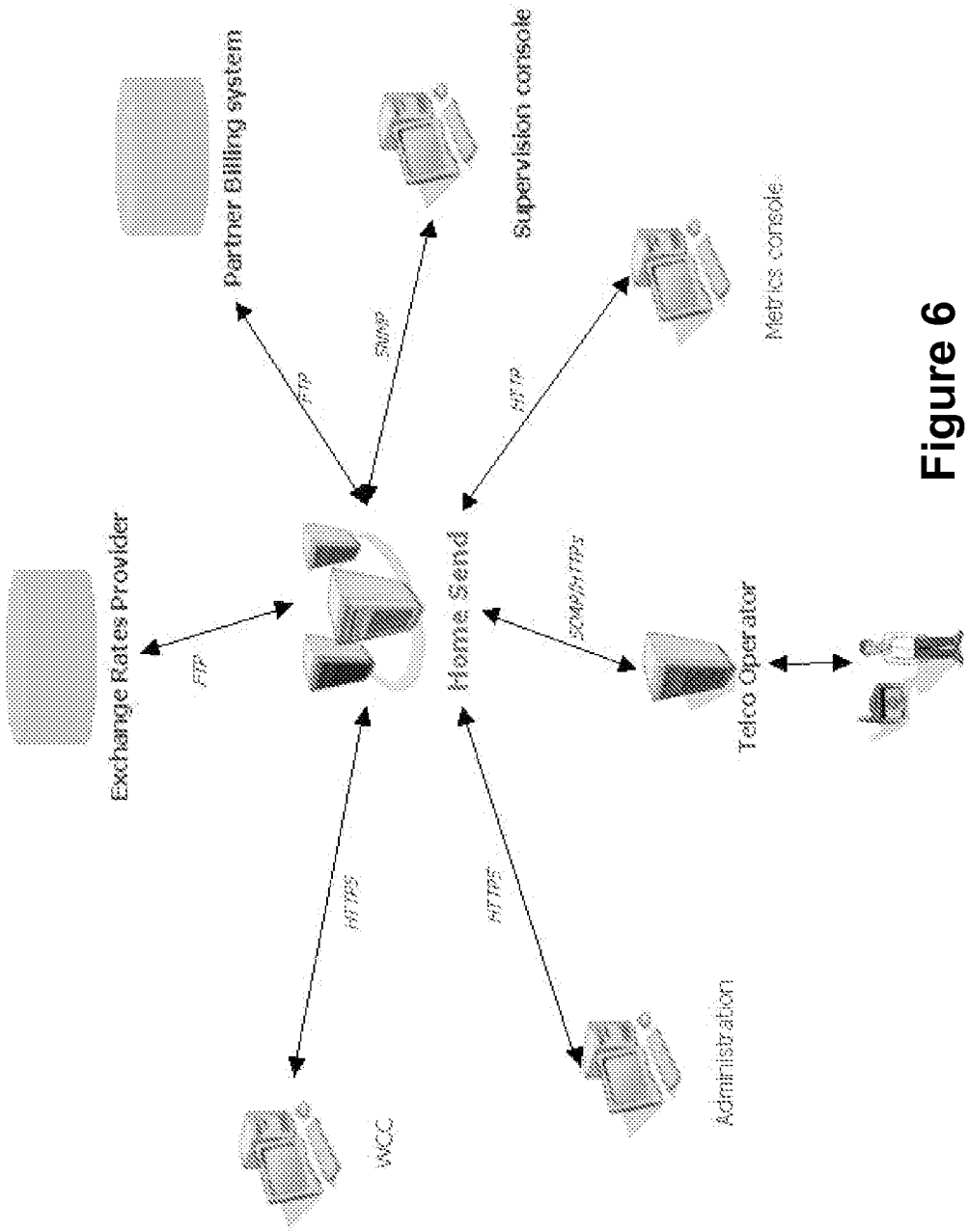

Partner Billing system
Supervision console
Metrics console
Exchange Rates Provider
FTP
SNMP
HTTP
Home Send
SOAP/HTTPS
Telco Operator
HTTPS
HTTPS
WCC
Administration

Figure 6

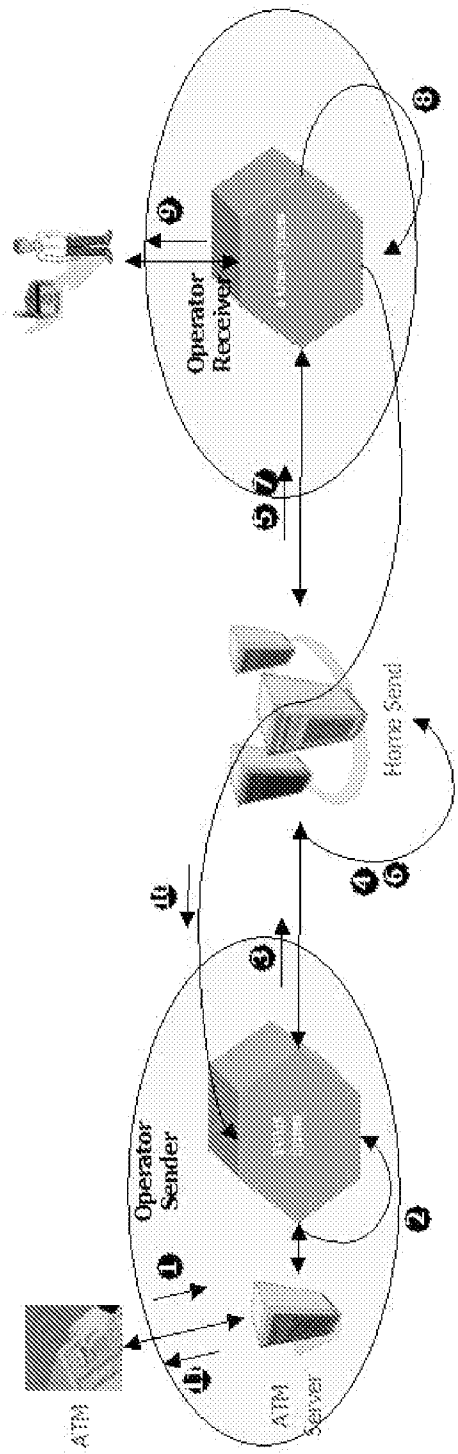
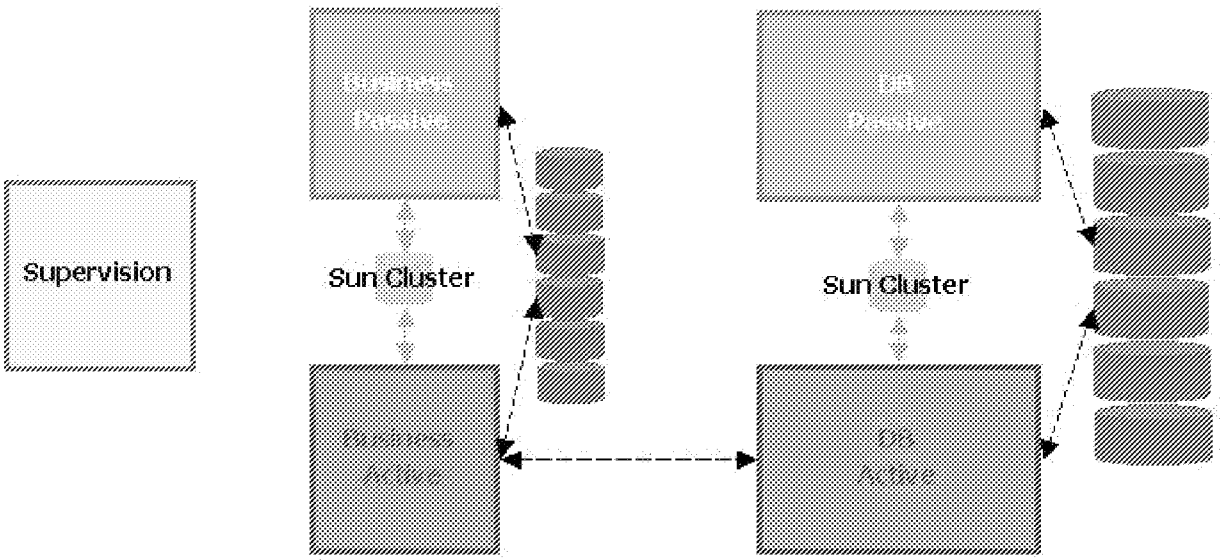

ATM
Operator Sender
ATM Server
Home Send
Operator Receiver

Figure 7



Supervision servers => ***Sun Fire X4200 M2 Server*** 2 Dual-Core AMD Opteron - Model 2216, 2.4 GHz - 4 GB (4 x 1 GB DIMMs) -146 GB (2 x 73 GB) 10000 rpm SAS Disks

Business servers => ***Sun Fire X4200 M2 Server*** 2 Dual-Core AMD Opteron - Model 2220, 2.8 GHz - 8 GB (4 x 2 GB DIMMs) -292 GB (2 x 146 GB) 10000 rpm SAS Disks

DB servers => ***Sun Fire X4600 M2 Server*** 4 Dual-Core AMD Opteron - Model 8220 , 16 GB (8 x 2 GB DIMMs), 292 GB (2 x 146 GB) 10000 rpm SAS Disk

Disk Array Quorum => ***Sun StorageTek 2530 Array*** 365 GB (5 x 73GB) 15000 rpm SAS Disks

Disk Array Real Time DB Server => ***EMC CX-20*** 4500 GB (15 x 300 GB) 15000 rpm 4 GB FC

Figure 8

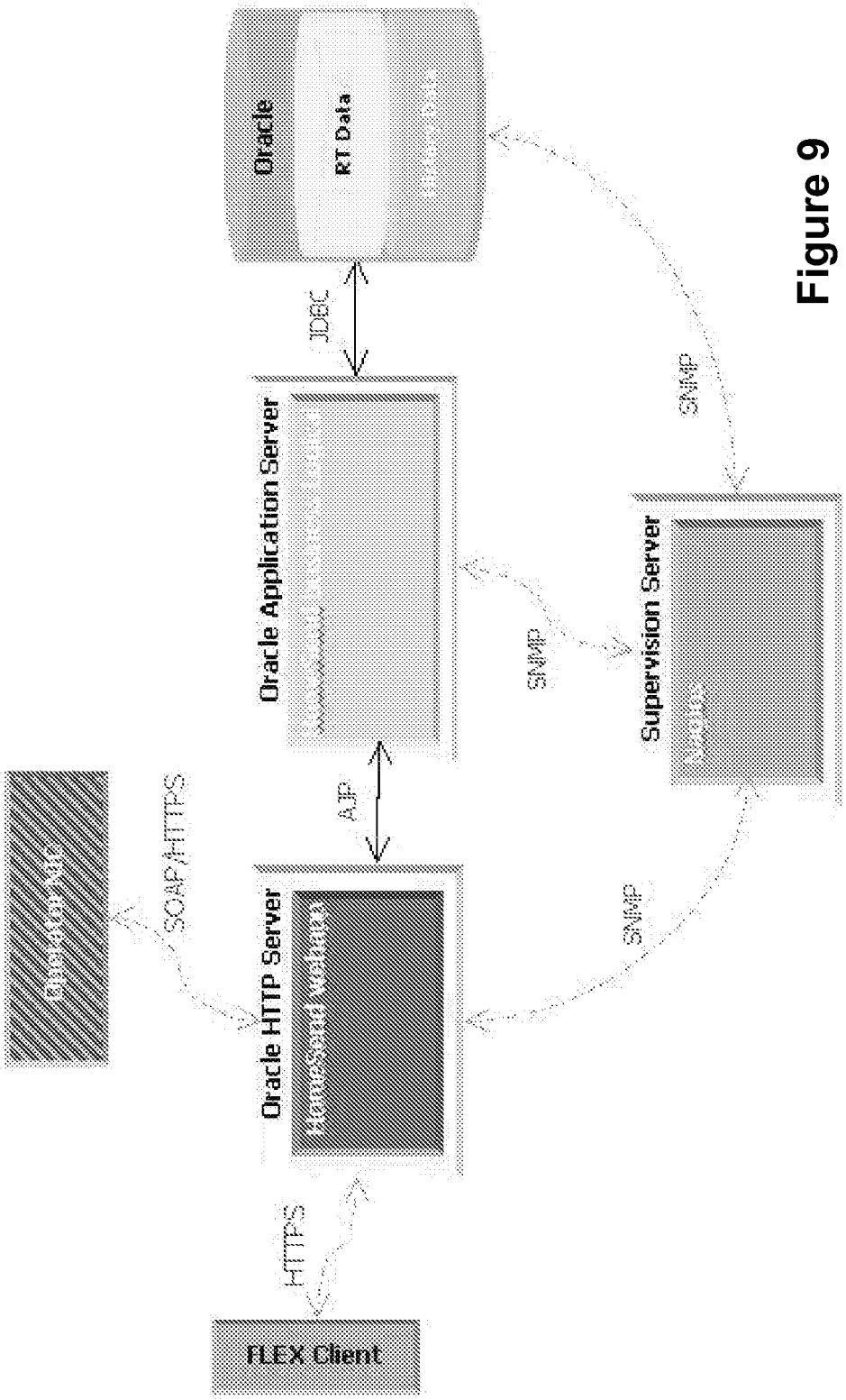

Oracle
RT Data
JDBC
Oracle Application Server
SNMP
Supervision Server
SNMP
AJP
Oracle HTTP Server
SOAP/HTTPS
SNMP
HTTPS
TLEX Client

Figure 9

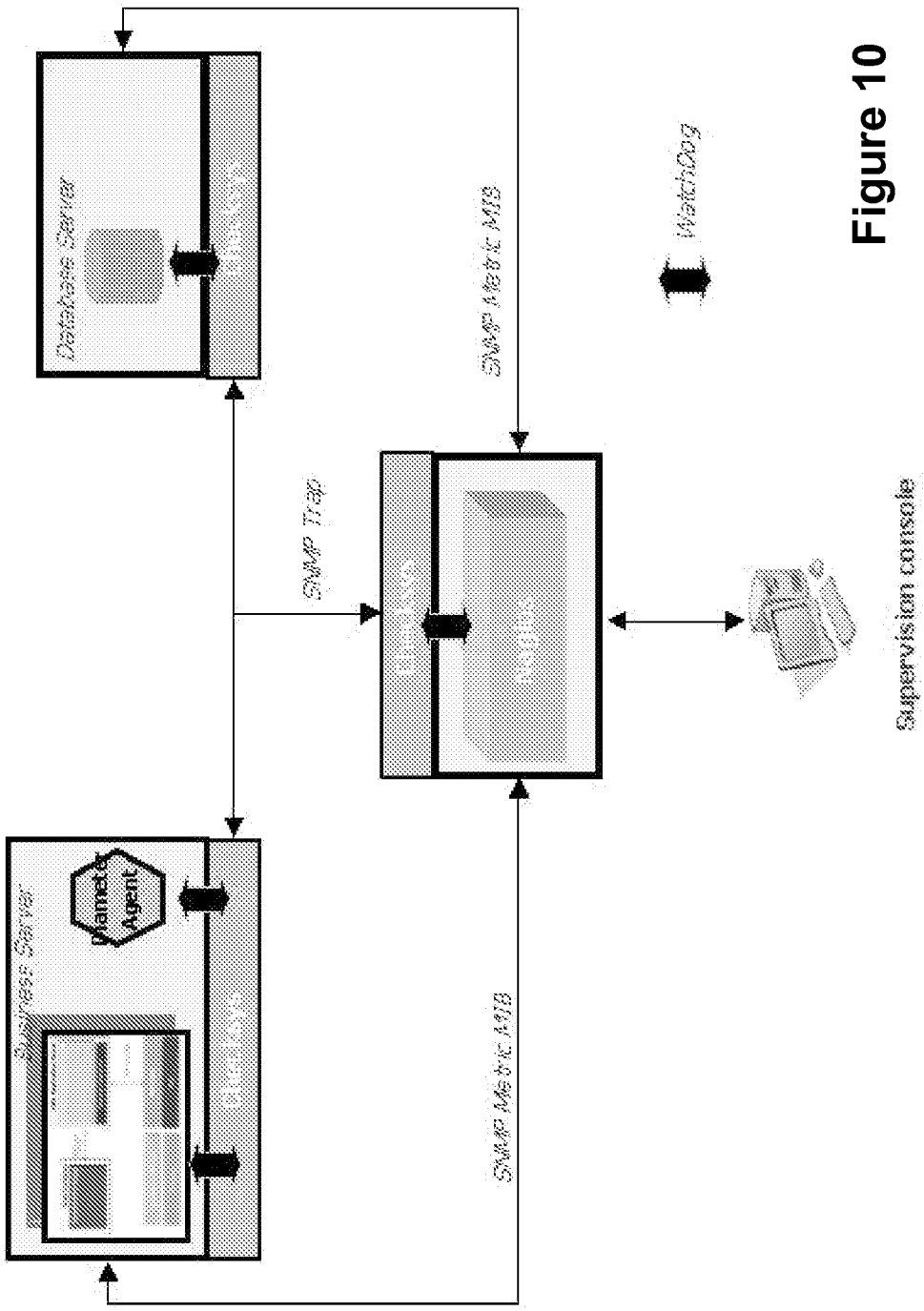

Database Server
SNMP Trap
SNMP Metric MIB
WatchDog
Supervision console
SNMP Metric MIB

Figure 10

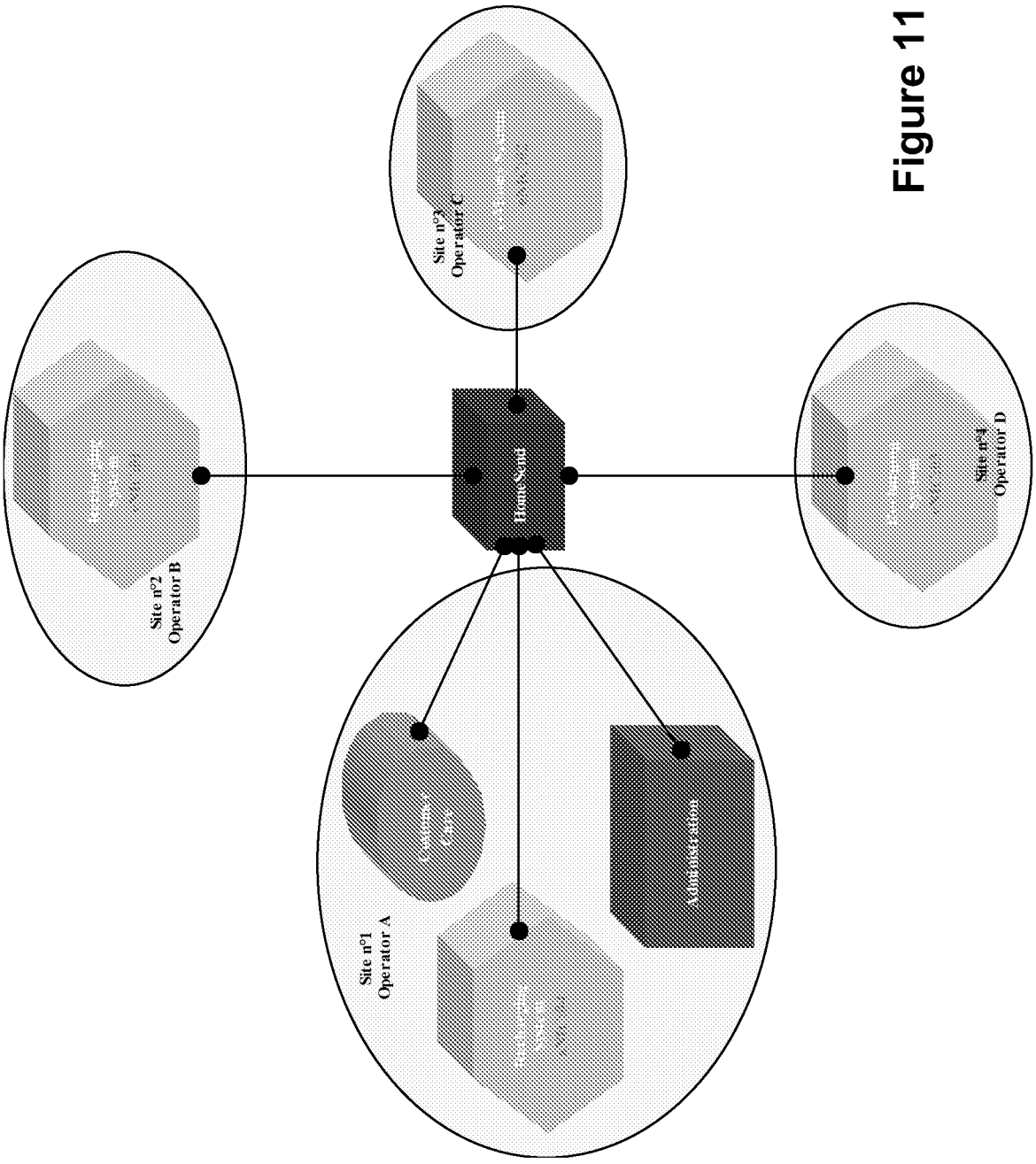

Site n°1
Operator A
Site n°2
Operator B
Site n°3
Operator C
Site n°4
Operator D
Home Send
Administration

Figure 11

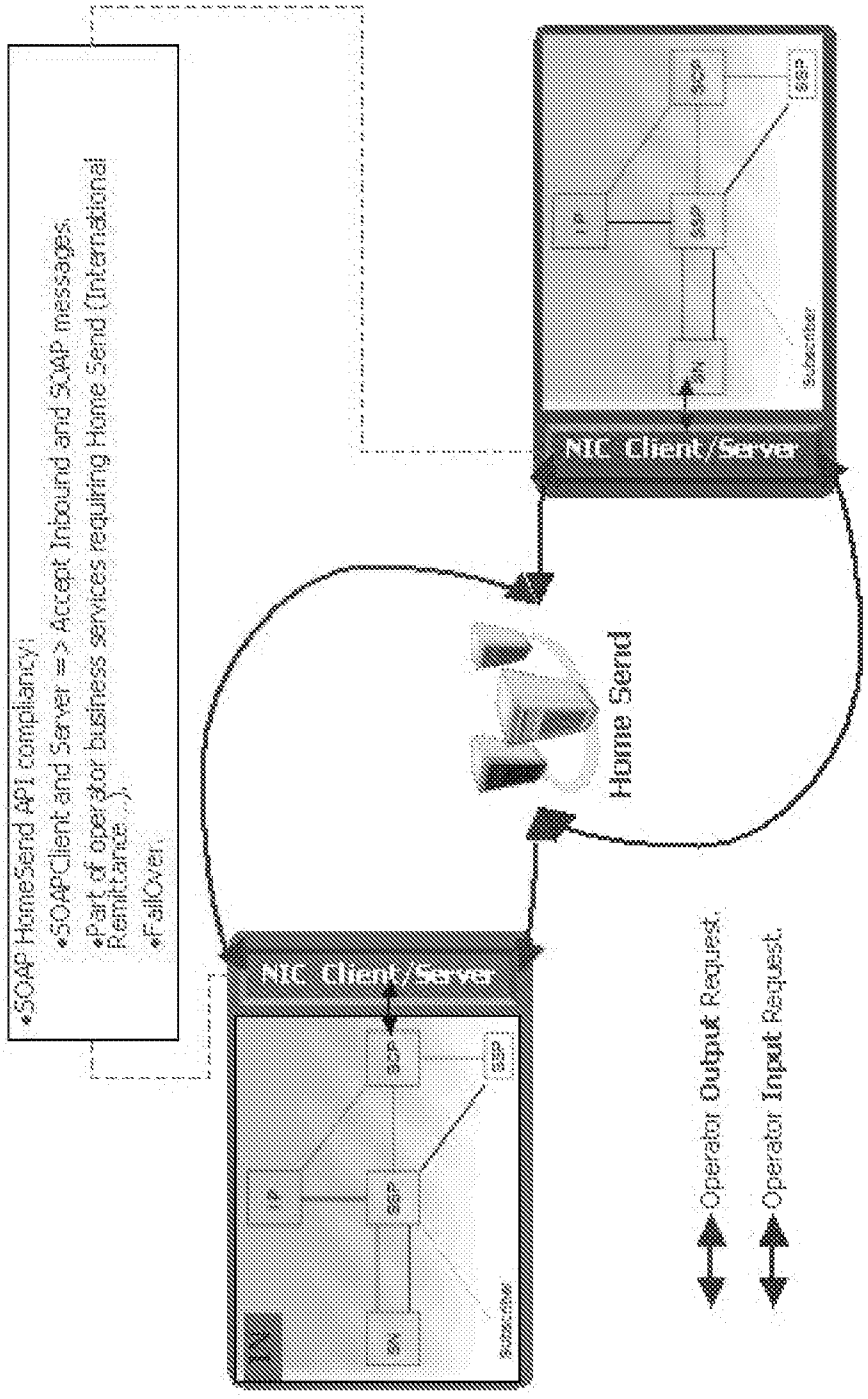

•SOAP HomeSend API compliancy!
•SOAPClient and Server ==> Accept Inbound and SOAP messages.
•Part of operator business services requiring Home Send (International Remittance).
•FailOver.
NIC Client/Server
NIC Client/Server
Home Send
Operator Output Request.
Operator Input Request.

Figure 12

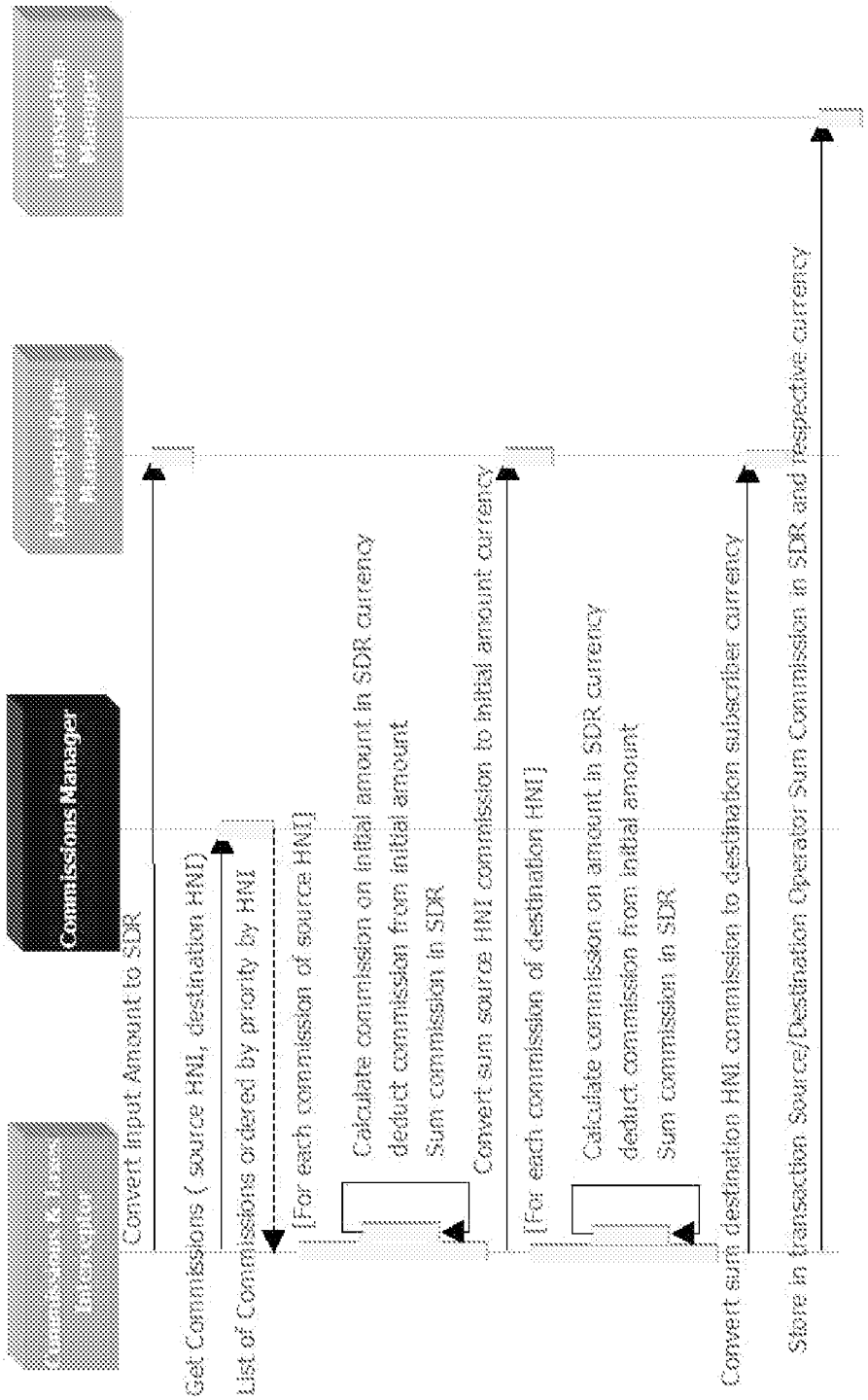

Commissions Manager
Convert input Amount to SDR
Get Commissions (source HNI, destination HNI)
List of Commissions ordered by priority by HNI
[For each commission of source HNI]
Calculate commission on initial amount in SDR currency
deduct commission from initial amount
Sum commission in SDR
Convert sum source HNI commission to initial amount currency
[For each commission of destination HNI]
Calculate commission on amount in SDR currency
deduct commission from initial amount
Sum commission in SDR
Convert sum destination HNI commission to destination subscriber currency
Store in transaction Source/Destination Operator Sum Commission in SDR and respective currency

Figure 13

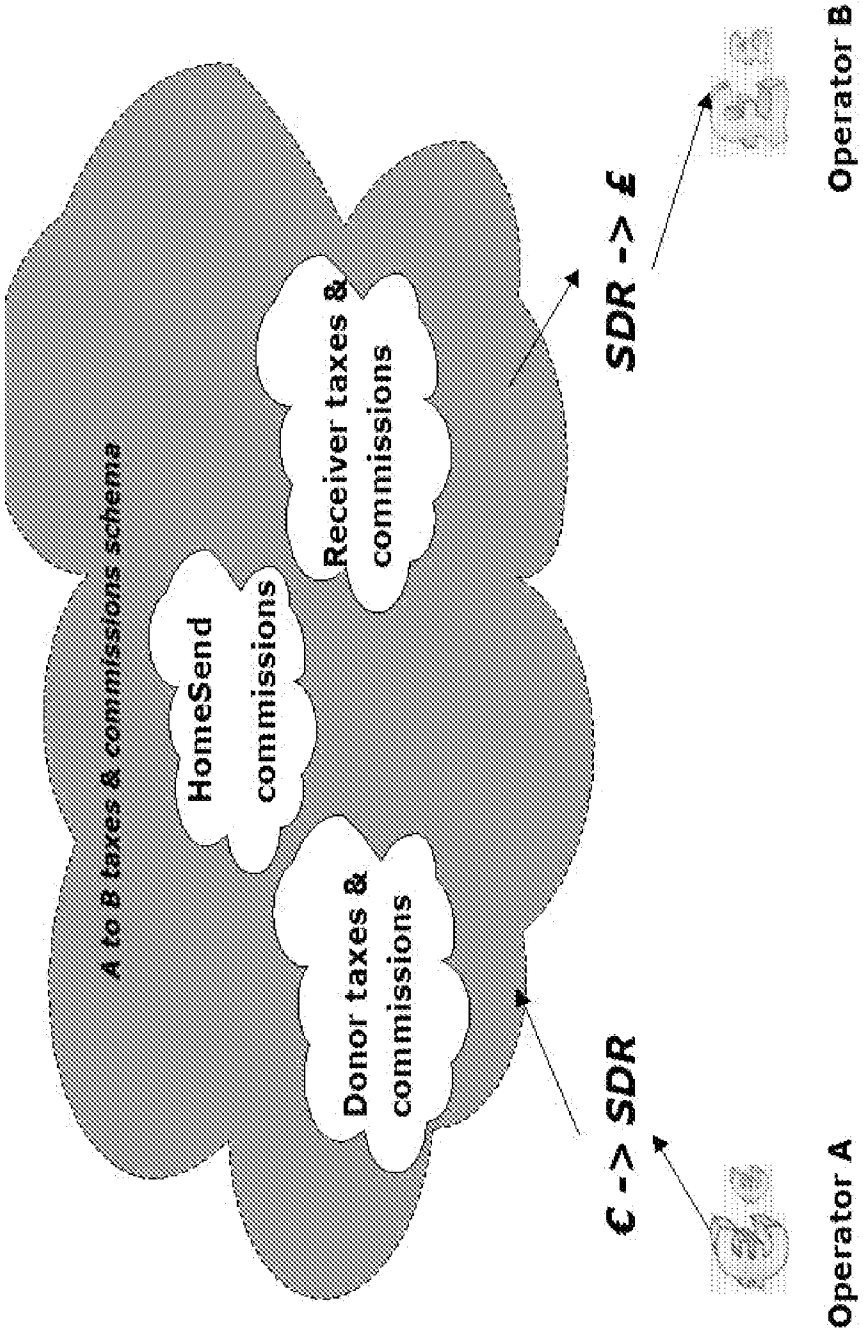
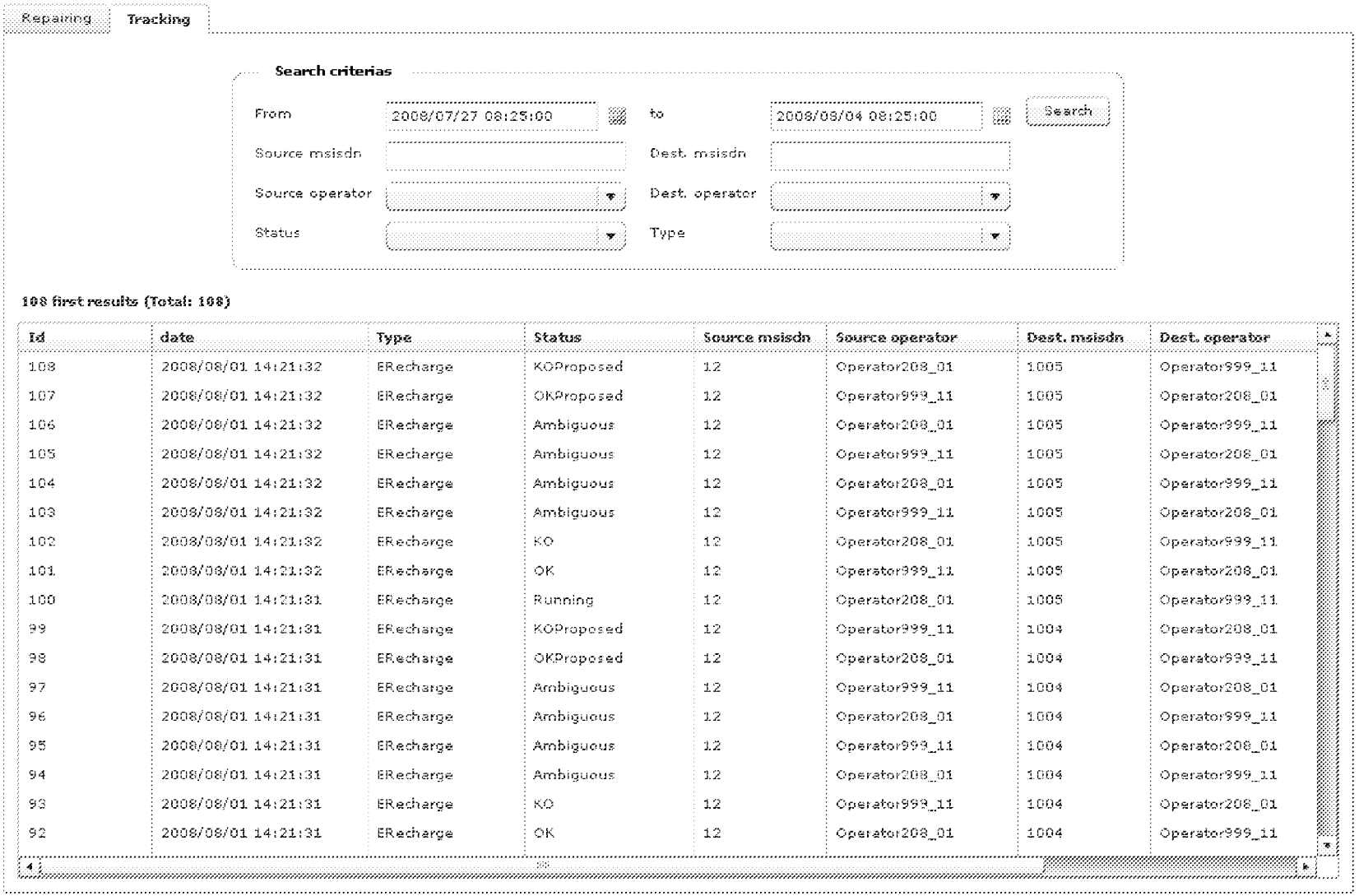

A to B taxes & commissions schema
HomeSend commissions
Receiver taxes & commissions
Donor taxes & commissions
€ -> SDR
SDR -> £
Operator A
Operator B

Figure 14



Id	date	Type	Status	Source msisdn	Source operator	Dest. msisdn	Dest. operator
108	2008/08/01 14:21:32	ERecharge	KOProposed	12	Operator208_01	1005	Operator999_11
107	2008/08/01 14:21:32	ERecharge	OKProposed	12	Operator999_11	1005	Operator208_01
106	2008/08/01 14:21:32	ERecharge	Ambiguous	12	Operator208_01	1005	Operator999_11
105	2008/08/01 14:21:32	ERecharge	Ambiguous	12	Operator999_11	1005	Operator208_01
104	2008/08/01 14:21:32	ERecharge	Ambiguous	12	Operator208_01	1005	Operator999_11
103	2008/08/01 14:21:32	ERecharge	Ambiguous	12	Operator999_11	1005	Operator208_01
102	2008/08/01 14:21:32	ERecharge	KO	12	Operator208_01	1005	Operator999_11
101	2008/08/01 14:21:32	ERecharge	OK	12	Operator999_11	1005	Operator208_01
100	2008/08/01 14:21:31	ERecharge	Running	12	Operator208_01	1005	Operator999_11
99	2008/08/01 14:21:31	ERecharge	KOProposed	12	Operator999_11	1004	Operator208_01
98	2008/08/01 14:21:31	ERecharge	OKProposed	12	Operator208_01	1004	Operator999_11
97	2008/08/01 14:21:31	ERecharge	Ambiguous	12	Operator999_11	1004	Operator208_01
96	2008/08/01 14:21:31	ERecharge	Ambiguous	12	Operator208_01	1004	Operator999_11
95	2008/08/01 14:21:31	ERecharge	Ambiguous	12	Operator999_11	1004	Operator208_01
94	2008/08/01 14:21:31	ERecharge	Ambiguous	12	Operator208_01	1004	Operator999_11
93	2008/08/01 14:21:31	ERecharge	KO	12	Operator999_11	1004	Operator208_01
92	2008/08/01 14:21:31	ERecharge	OK	12	Operator208_01	1004	Operator999_11

Figure 15

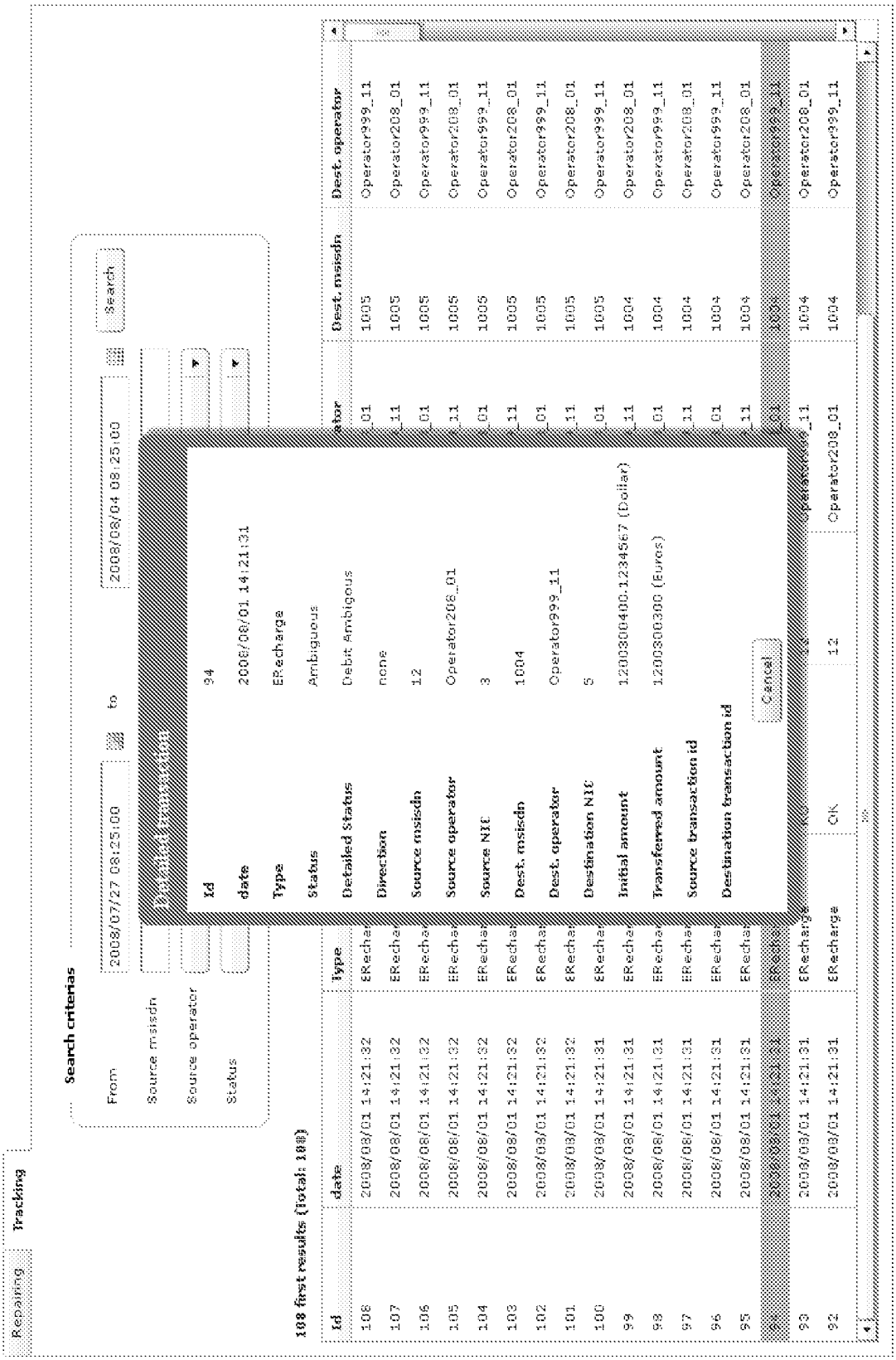

Repairing
Tracking
Search criteria
From
2008/07/27 08:25:00
to
2008/08/04 08:25:00
Search
Source msisdn
Source operator
Status
Detailed transaction
Id
94
date
2008/08/01 14:21:31
Type
ERecharge
Status
Ambiguous
Detailed Status
Debit Ambiguous
Direction
none
Source msisdn
12
Source operator
Operator208_01
Source NIC
3
Dest. msisdn
1004
Dest. operator
Operator999_11
Destination NIC
5
Initial amount
12003600400.1234567 (Dollar)
Transferred amount
12003600300 (Euros)
Source transaction id
Destination transaction id
Cancel
100 first results (total 100)
Id
date
Type
Dest. msisdn
Dest. operator
108
2008/08/01 14:21:32
ERecha
1005
Operator999_11
107
2008/08/01 14:21:32
ERecha
1005
Operator208_01
106
2008/08/01 14:21:32
ERecha
1005
Operator999_11
105
2008/08/01 14:21:32
ERecha
1005
Operator208_01
104
2008/08/01 14:21:32
ERecha
1005
Operator999_11
103
2008/08/01 14:21:32
ERecha
1005
Operator208_01
102
2008/08/01 14:21:32
ERecha
1005
Operator999_11
101
2008/08/01 14:21:32
ERecha
1005
Operator208_01
100
2008/08/01 14:21:31
ERecha
1005
Operator999_11
99
2008/08/01 14:21:31
ERecha
1004
Operator208_01
98
2008/08/01 14:21:31
ERecha
1004
Operator999_11
97
2008/08/01 14:21:31
ERecha
1004
Operator208_01
96
2008/08/01 14:21:31
ERecha
1004
Operator999_11
95
2008/08/01 14:21:31
ERecha
1004
Operator208_01
94
2008/08/01 14:21:31
ERecha
1004
Operator999_11
93
2008/08/01 14:21:31
ERecharge
1004
Operator208_01
92
2008/08/01 14:21:31
ERecharge
OK
12
Operator208_01
1004
Operator999_11

Figure 16

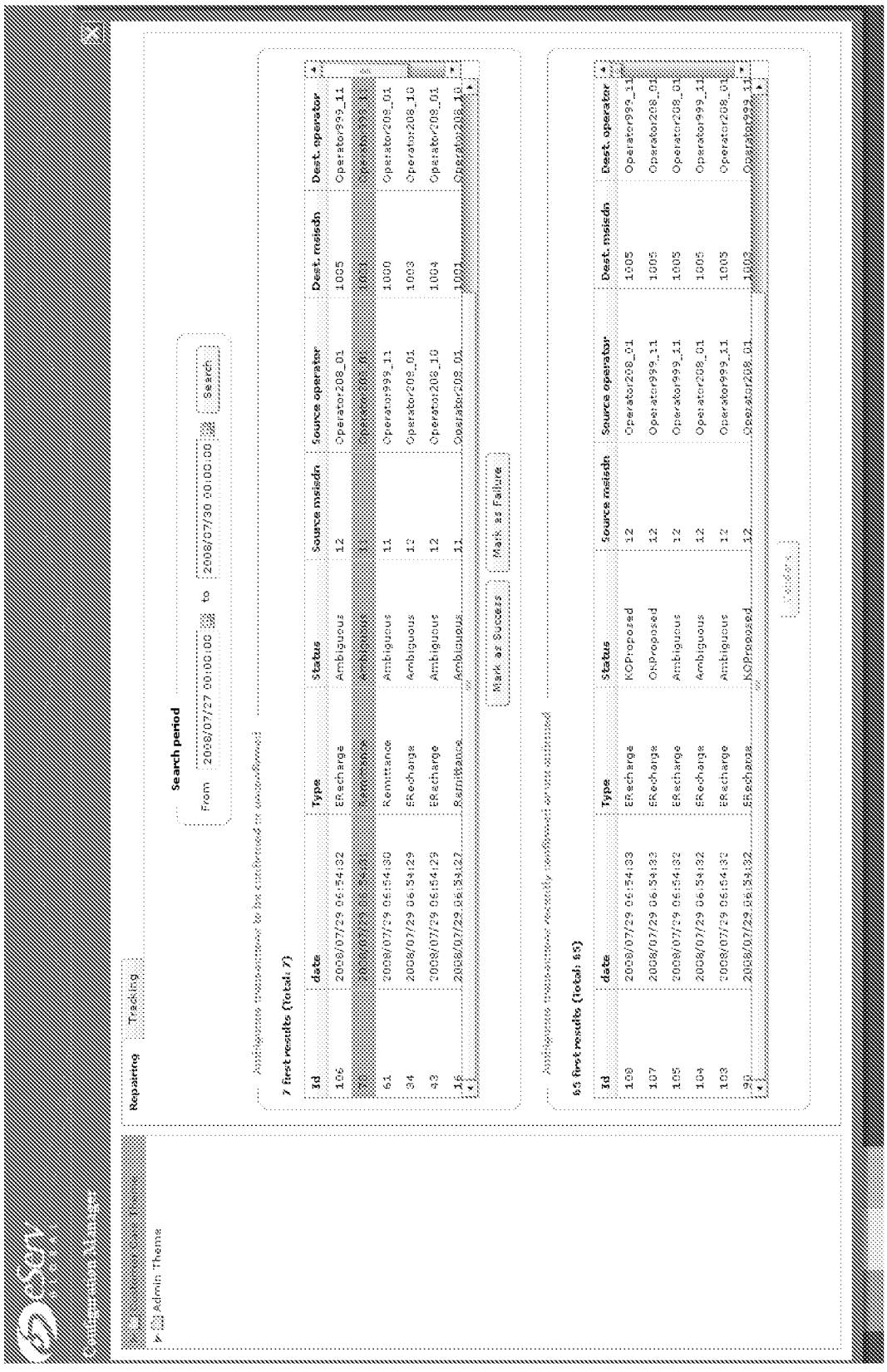

Confirmation Manager
Admin Theme
Repairing
Tracking
Search period
From 2008/07/27 00:00:00
to 2008/07/30 00:00:00
Search
7 first results (total: 7)
Id
date
Type
Status
Source msisdn
Source operator
Dest. msisdn
Dest. operator
106 2008/07/29 06:54:32 ERecharge Ambiguous 12 Operator208_01 1005 Operator999_11
61 2008/07/29 06:54:30 Remittance Ambiguous 11 Operator999_11 1000 Operator209_01
34 2008/07/29 06:54:29 ERecharge Ambiguous 12 Operator209_01 1003 Operator208_10
43 2008/07/29 06:54:29 ERecharge Ambiguous 12 Operator208_10 1004 Operator209_01
16 2008/07/29 06:54:27 Remittance Ambiguous 11 Operator209_01 1001 Operator208_10
Mark as Success
Mark as Failure
65 first results (total: 65)
108 2008/07/29 06:54:33 ERecharge KOProposed 12 Operator208_01 1005 Operator999_11
107 2008/07/29 06:54:33 ERecharge OkProposed 12 Operator999_11 1005 Operator208_01
105 2008/07/29 06:54:32 ERecharge Ambiguous 12 Operator999_11 1005 Operator208_01
104 2008/07/29 06:54:32 ERecharge Ambiguous 12 Operator208_01 1005 Operator999_11
103 2008/07/29 06:54:32 ERecharge Ambiguous 12 Operator999_11 1005 Operator208_01
90 2008/07/29 06:54:32 ERecharge KOProposed 12 Operator208_01 1005 Operator999_11

Figure 17

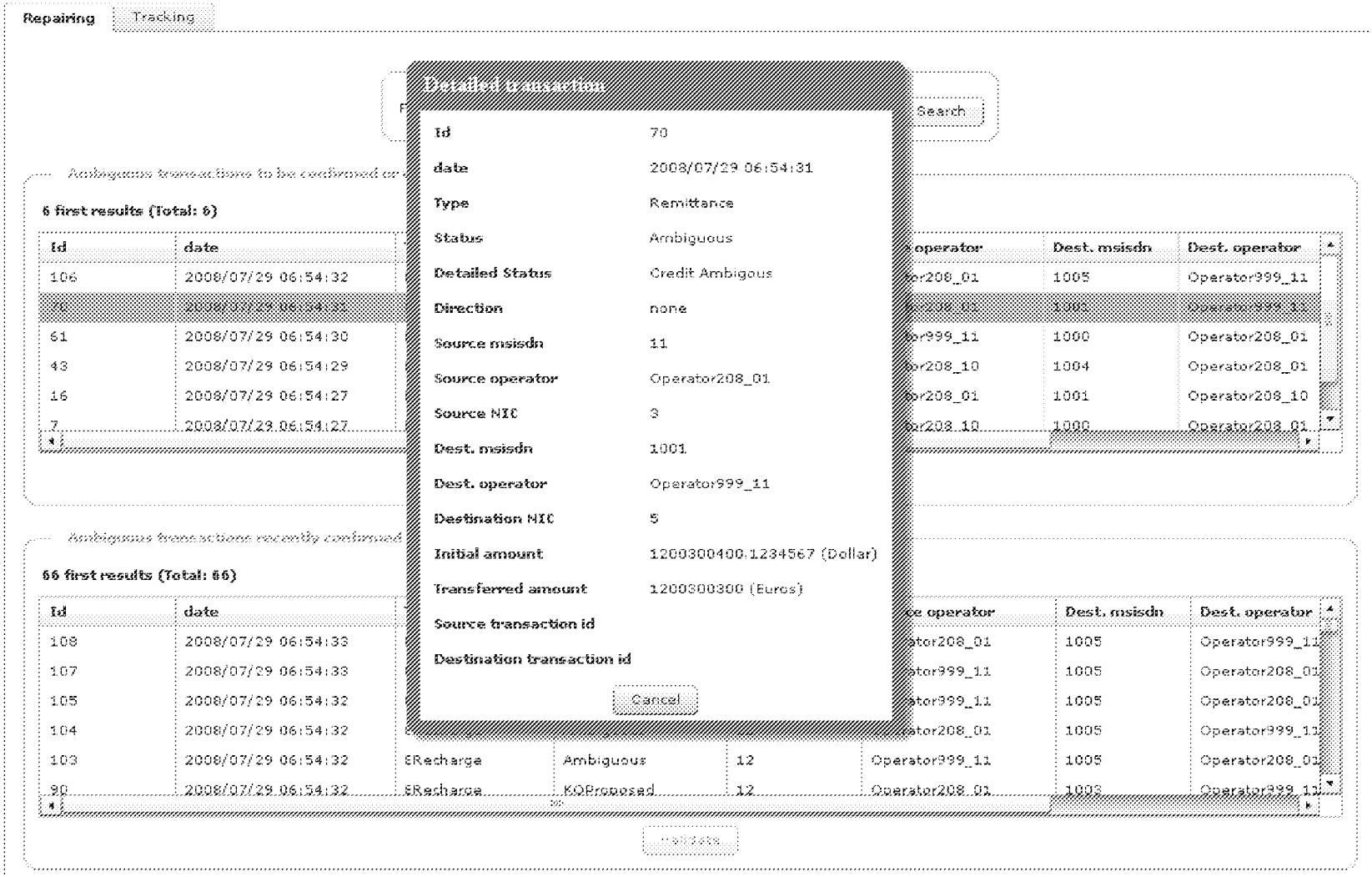

Repairing
Tracking
Search
Detailed transaction
Id 70
date 2008/07/29 06:54:31
Type Remittance
Status Ambiguous
Detailed Status Credit Ambigous
Direction none
Source msisdn 11
Source operator Operator208_01
Source NIC 3
Dest. msisdn 1001
Dest. operator Operator999_11
Destination NIC 5
Initial amount 1200300400.1234567 (Dollar)
Transferred amount 1200300300 (Euros)
Source transaction id
Destination transaction id
Cancel
6 first results (Total: 6)
Id
date
106 2008/07/29 06:54:32
61 2008/07/29 06:54:30
43 2008/07/29 06:54:29
16 2008/07/29 06:54:27
7 2008/07/29 06:54:27
Dest. msisdn
Dest. operator
1005 Operator999_11
1000 Operator208_01
1004 Operator208_01
1001 Operator208_10
66 first results (Total: 66)
108 2008/07/29 06:54:33
107 2008/07/29 06:54:33
105 2008/07/29 06:54:32
104 2008/07/29 06:54:32
103 2008/07/29 06:54:32 ERecharge Ambiguous 12 Operator999_11 1005 Operator208_01
90 2008/07/29 06:54:32 ERecharge KOProposed 12 Operator208_01 1005 Operator999_11

Figure 18

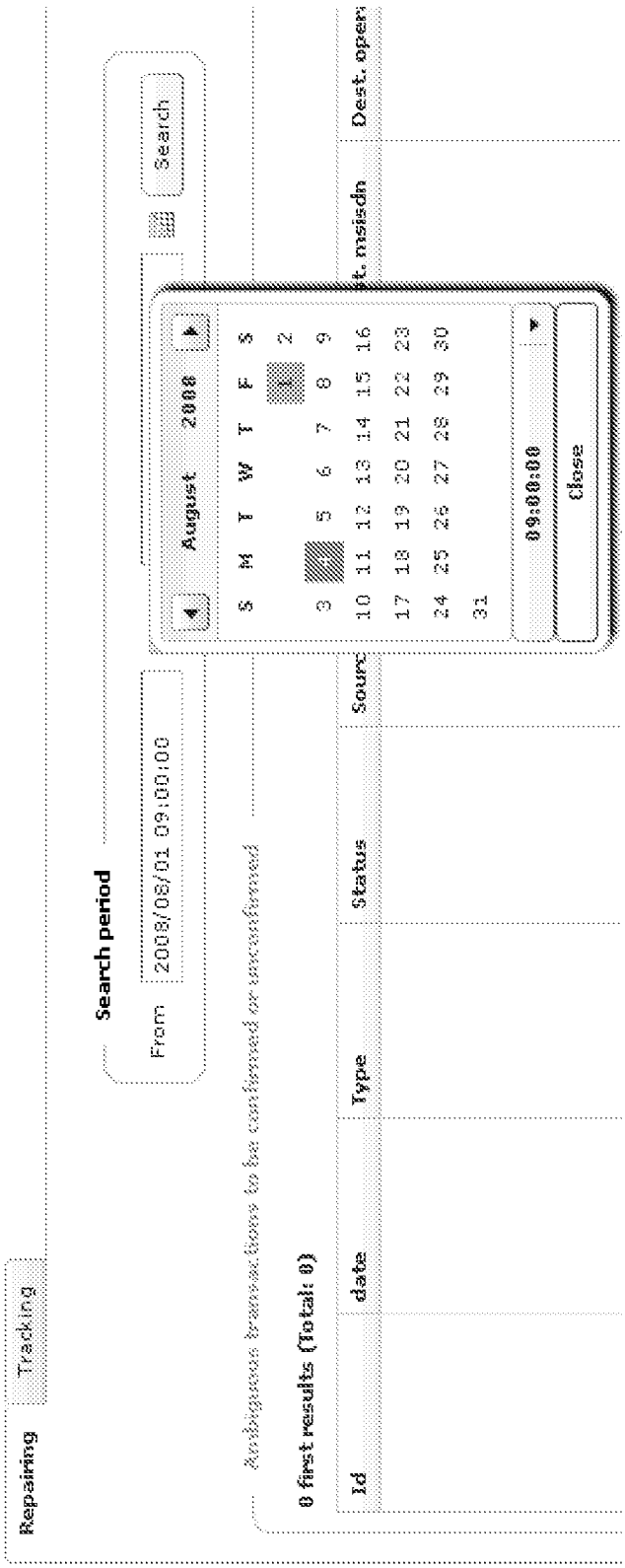

Repairing
Tracking
Search period
From
2008/08/01 09:00:00
Search
August 2008
S M T W T F S
2
3 4 5 6 7 8 9
10 11 12 13 14 15 16
17 18 19 20 21 22 23
24 25 26 27 28 29 30
31
09:00:00
Close
Ambiguous transactions to be confirmed or unconfirmed
0 first results (Total: 0)
Id
date
Type
Status
Sourc
t. msisdn
Dest. oper

Figure 19

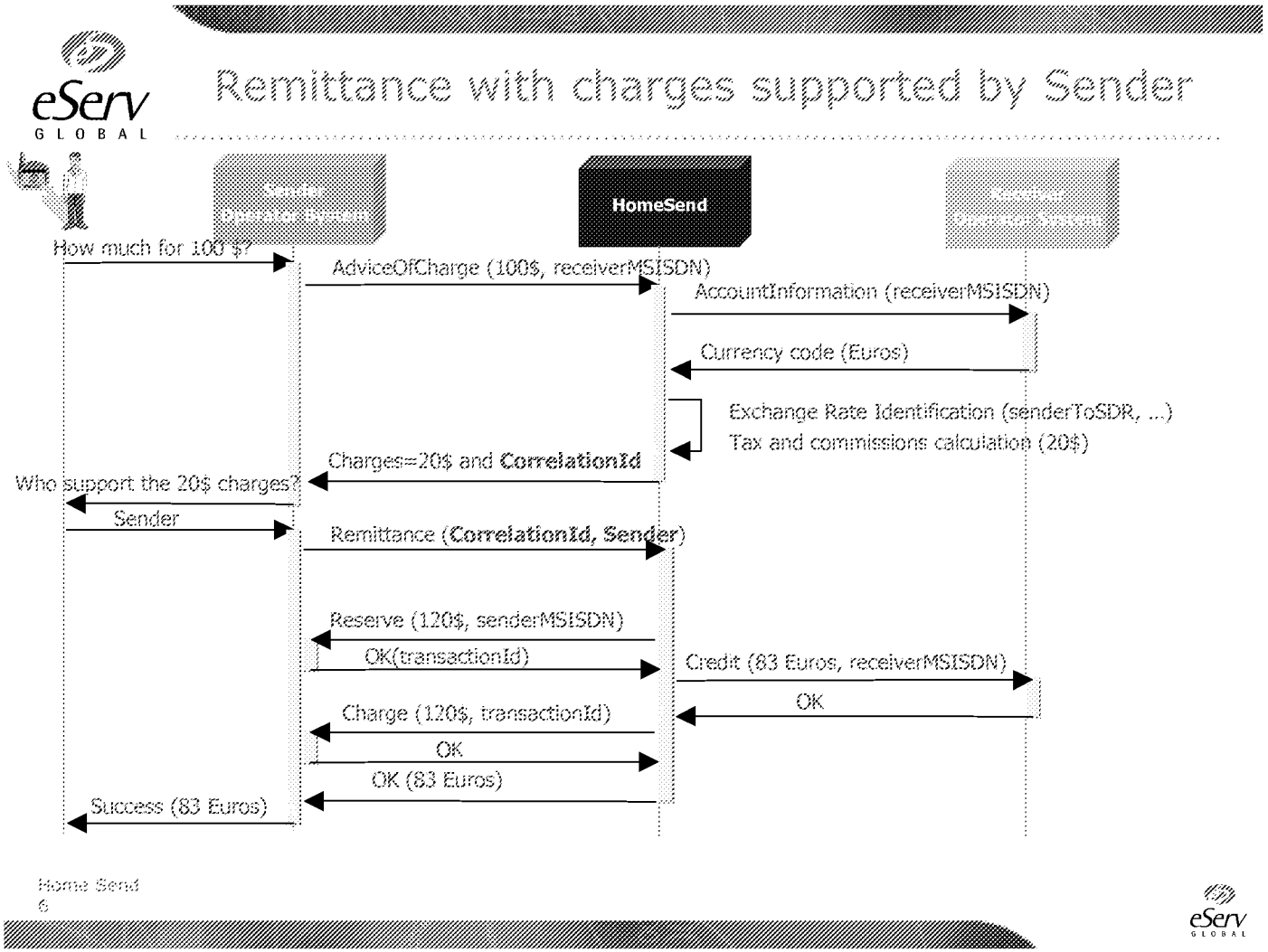

eServ
GLOBAL
Remittance with charges supported by Sender
HomeSend
How much for 100 $?
AdviceOfCharge (100$, receiverMSISDN)
AccountInformation (receiverMSISDN)
Currency code (Euros)
Exchange Rate Identification (senderToSDR, ...)
Tax and commissions calculation (20$)
Charges=20$ and CorrelationId
Who support the 20$ charges?
Sender
Remittance (CorrelationId, Sender)
Reserve (120$, senderMSISDN)
OK(transactionId)
Credit (83 Euros, receiverMSISDN)
OK
Charge (120$, transactionId)
OK
OK (83 Euros)
Success (83 Euros)
Home Send
6

Figure 20

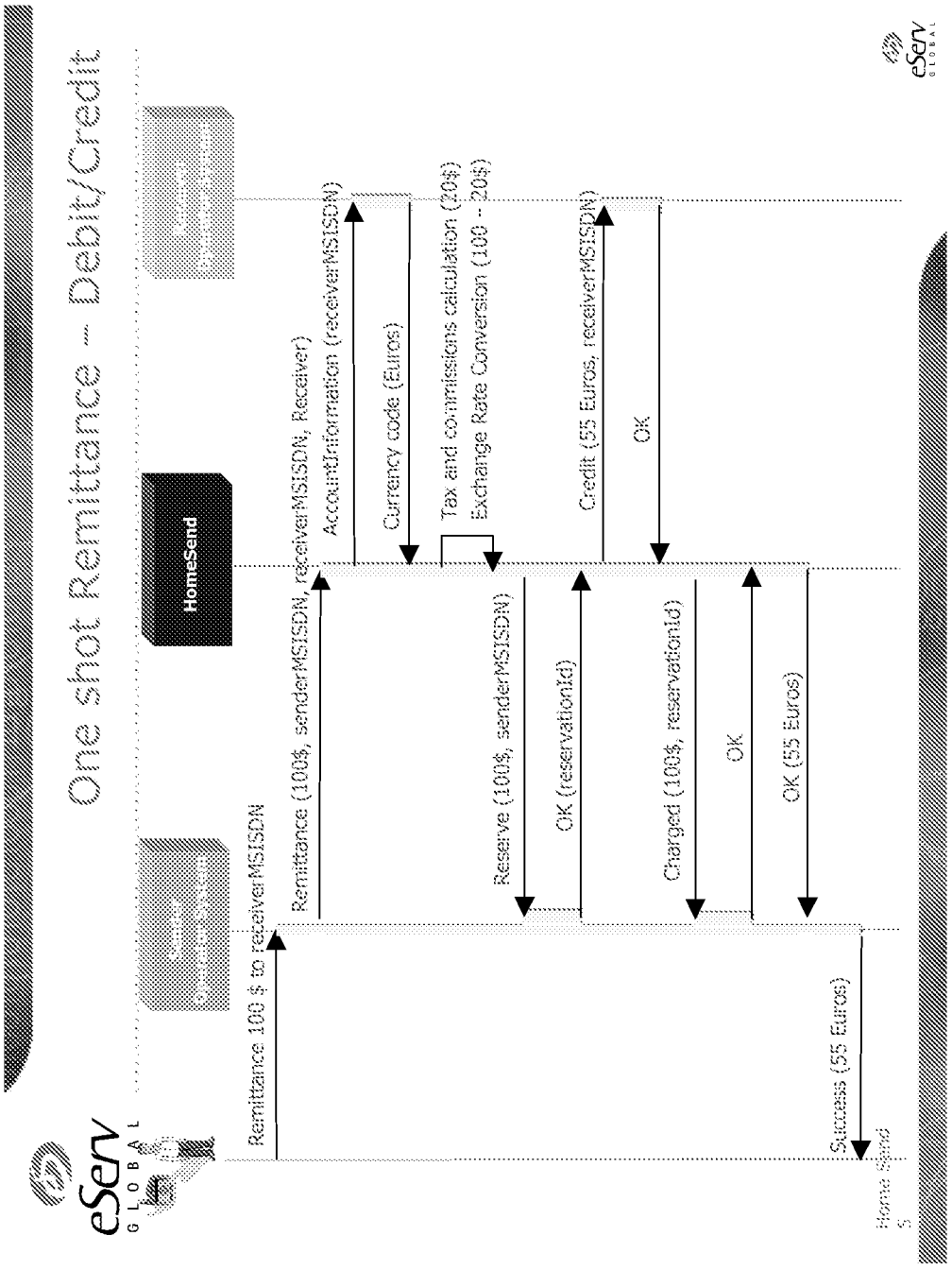

One shot Remittance – Debit/Credit
eServ GLOBAL
HomeSend
Remittance 100 $ to receiverMSISDN
Remittance (100$, senderMSISDN, receiverMSISDN, Receiver)
AccountInformation (receiverMSISDN)
Currency code (Euros)
Tax and commissions calculation (20$)
Exchange Rate Conversion (100 - 20$)
Reserve (100$, senderMSISDN)
OK (reservationId)
Credit (55 Euros, receiverMSISDN)
OK
Charged (100$, reservationId)
OK
OK (55 Euros)
Success (55 Euros)
Home Send
S

Figure 21

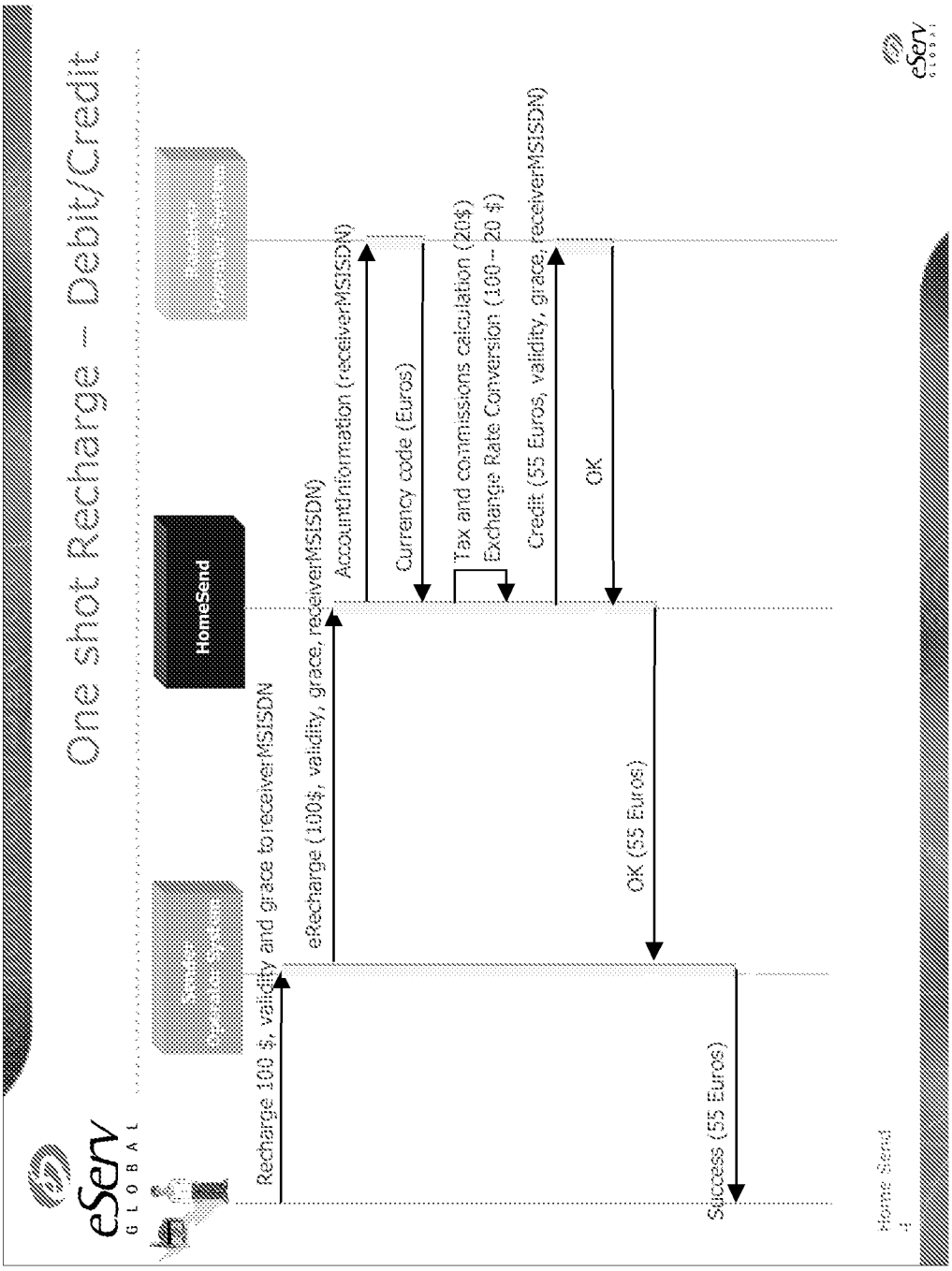

eServ GLOBAL
One shot Recharge – Debit/Credit
HomeSend
Recharge 100 $, validity and grace to receiverMSISDN
eRecharge (100$, validity, grace, receiverMSISDN)
AccountInformation (receiverMSISDN)
Currency code (Euros)
Tax and commissions calculation (20$)
Exchange Rate Conversion (100 -- 20 $)
Credit (55 Euros, validity, grace, receiverMSISDN)
OK
OK (55 Euros)
Success (55 Euros)
Home Send

Figure 22

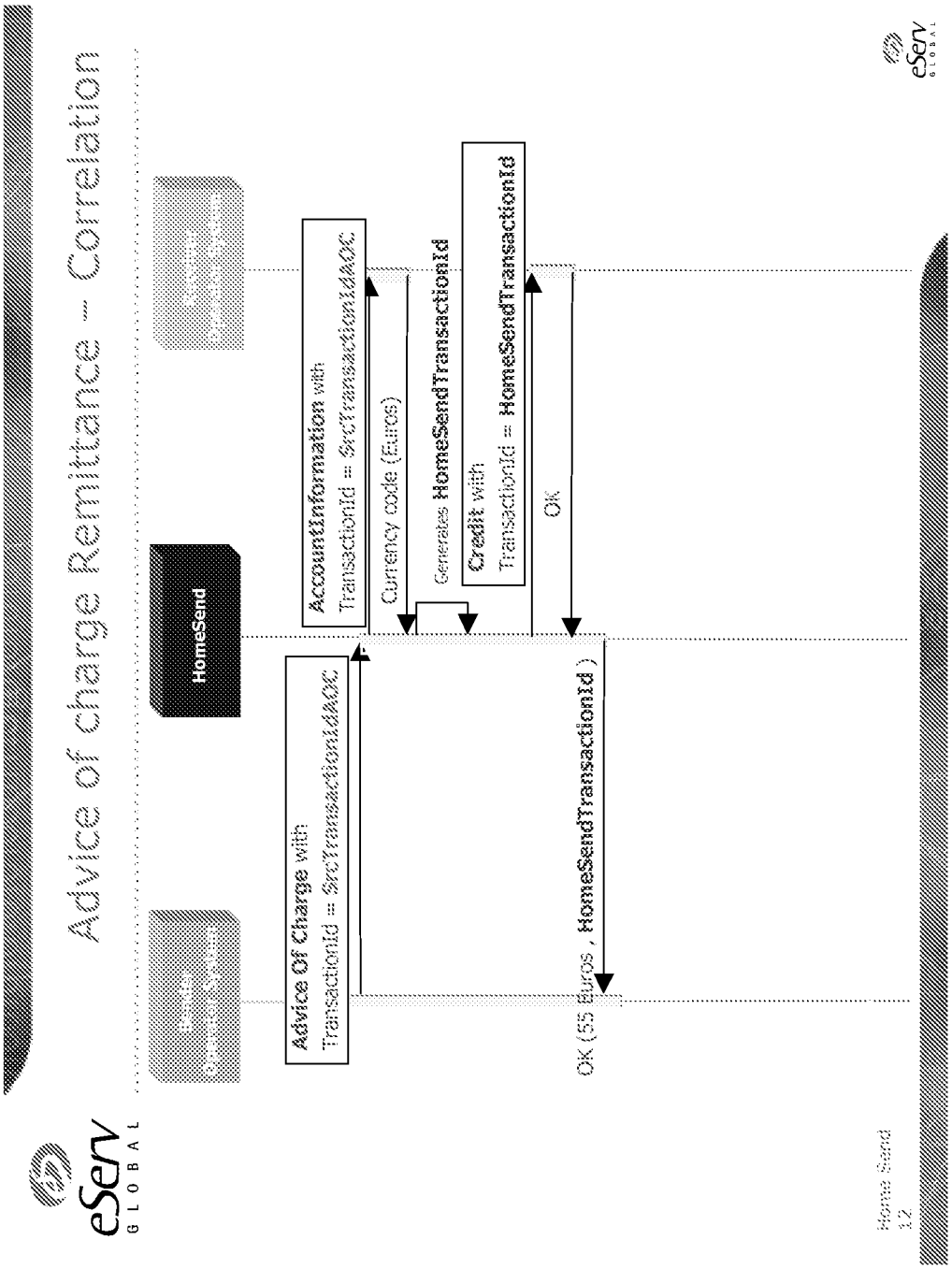

eServ GLOBAL
Advice of charge Remittance – Correlation
HomeSend
Advice Of Charge with TransactionId = SrcTransactionIdAOC
AccountInformation with TransactionId = SrcTransactionIdAOC
Currency code (Euros)
Generates HomeSendTransactionId
Credit with TransactionId = HomeSendTransactionId
OK
OK (55 Euros , HomeSendTransactionId)
Home Send 12
eServ GLOBAL

Figure 23

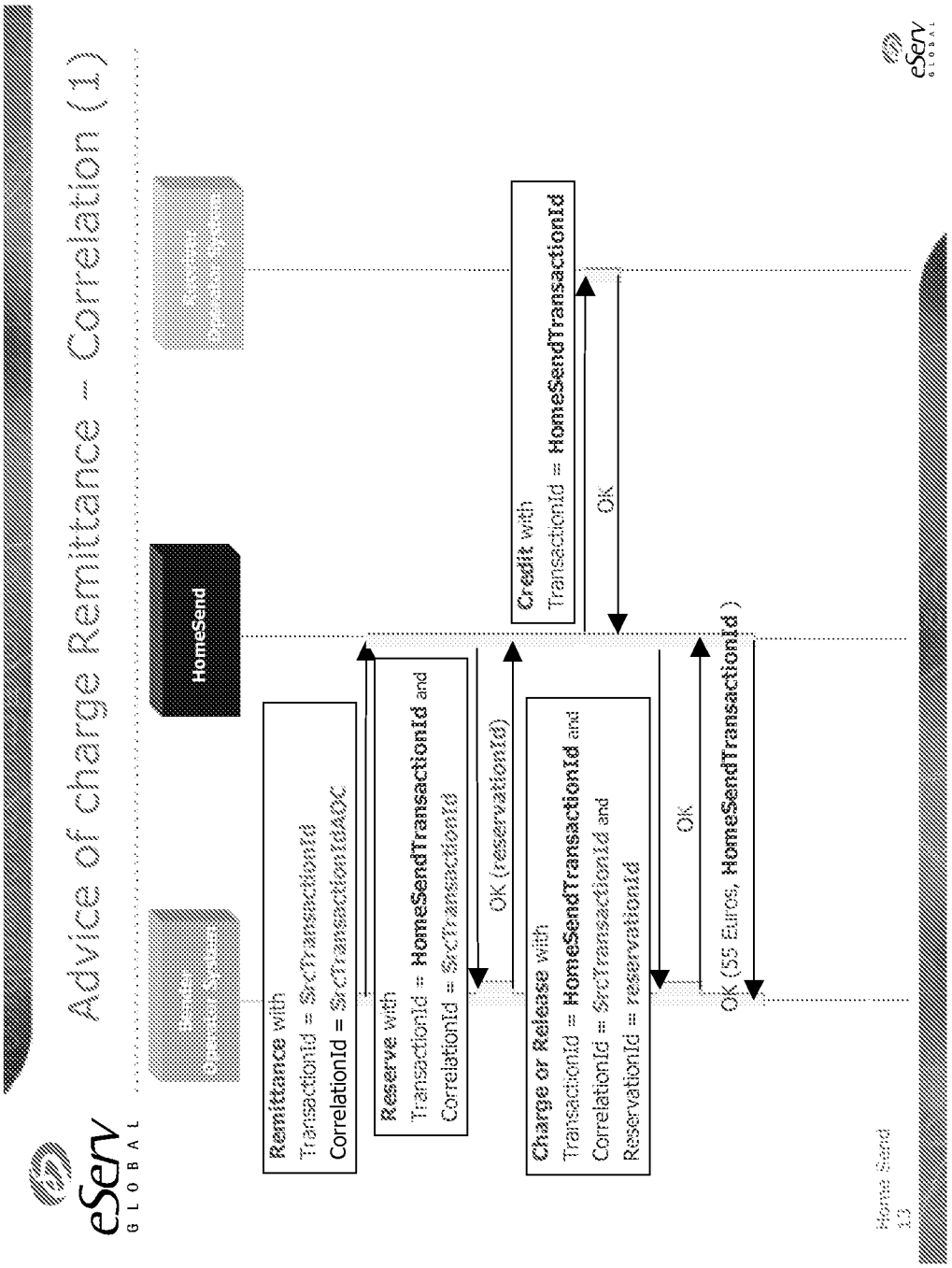

eServ GLOBAL
Advice of charge Remittance – Correlation (1)
HomeSend
Remittance with
TransactionId = SrcTransactionId
CorrelationId = SrcTransactionIdAdvc
Reserve with
TransactionId = HomeSendTransactionId and
CorrelationId = SrcTransactionId
OK (reservationId)
Credit with
TransactionId = HomeSendTransactionId
OK
Charge or Release with
TransactionId = HomeSendTransactionId and
CorrelationId = SrcTransactionId and
ReservationId = reservationId
OK
OK (55 Euros, HomeSendTransactionId)
Home Send
13
eServ GLOBAL

Figure 24

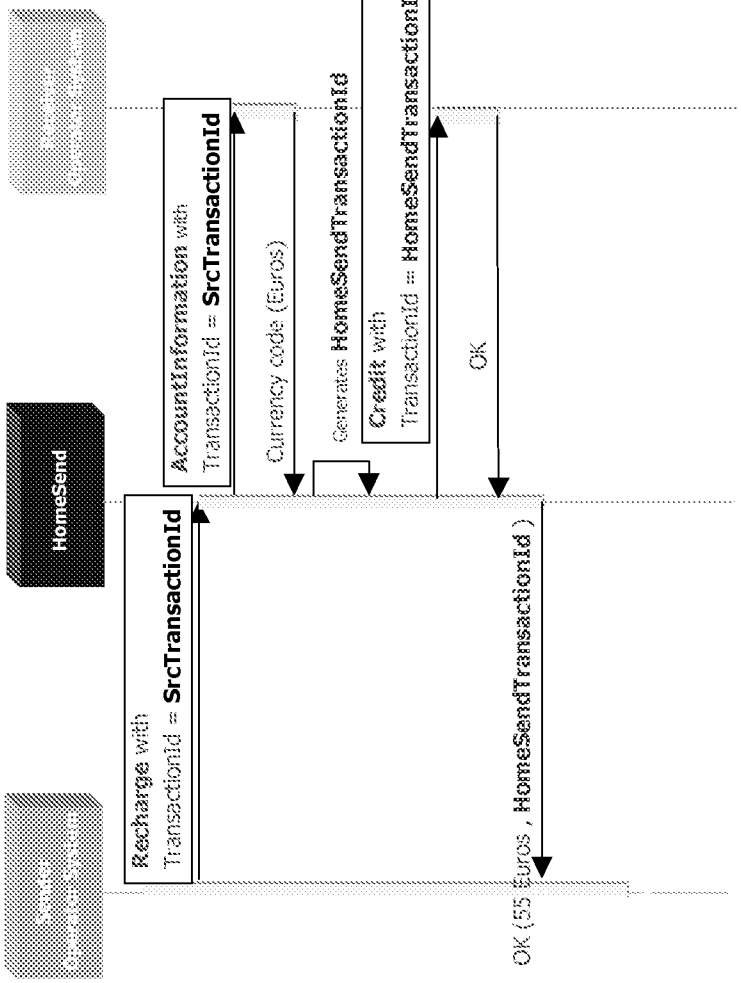

HomeSend
Recharge with
TransactionId = SrcTransactionId
AccountInformation with
TransactionId = SrcTransactionId
Currency code (Euros)
Generates HomeSendTransactionId
Credit with
TransactionId = HomeSendTransactionId
OK
OK (55 Euros , HomeSendTransactionId)

Figure 25

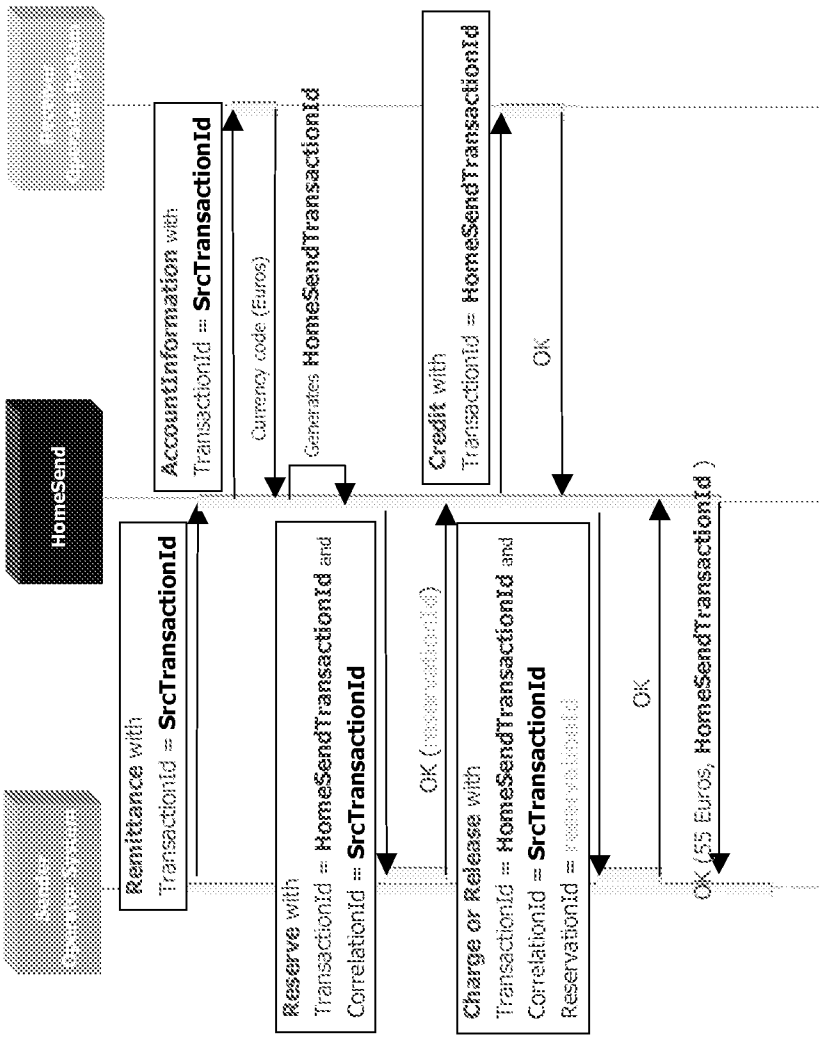

HomeSend
Remittance with
TransactionId = SrcTransactionId
AccountInformation with
TransactionId = SrcTransactionId
Currency code (Euros)
Generates HomeSendTransactionId
Reserve with
TransactionId = HomeSendTransactionId and
CorrelationId = SrcTransactionId
OK (
Credit with
TransactionId = HomeSendTransactionId
OK
Charge or Release with
TransactionId = HomeSendTransactionId and
CorrelationId = SrcTransactionId
Reservation
OK
OK (55 Euros, HomeSendTransactionId)

Figure 26

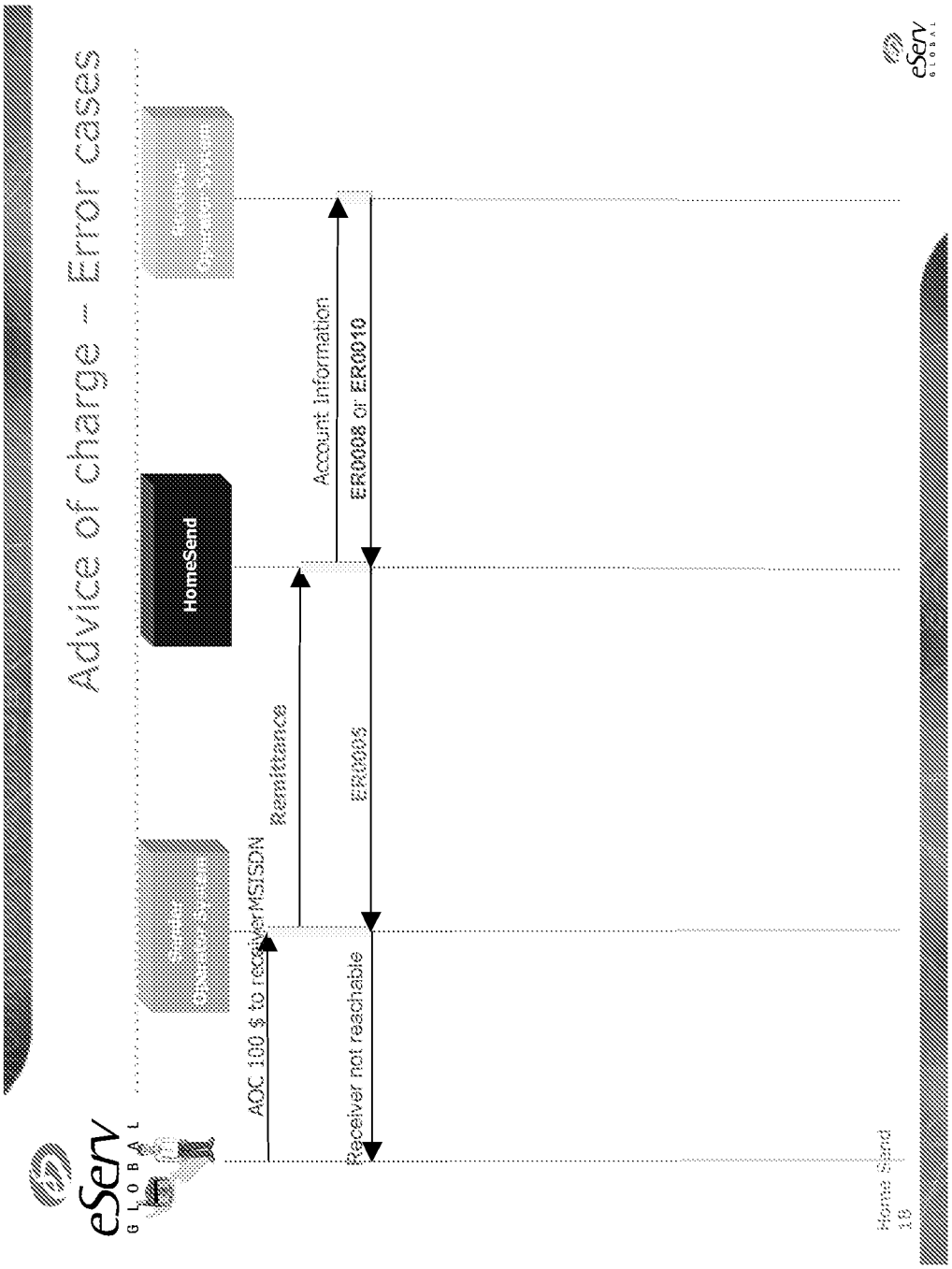

Advice of charge – Error cases
eServ GLOBAL
HomeSend
AOC 100 $ to receiverMSISDN
Remittance
ER0005
Account Information
ER0008 or ER0010
Receiver not reachable
Home Send 18

Figure 27

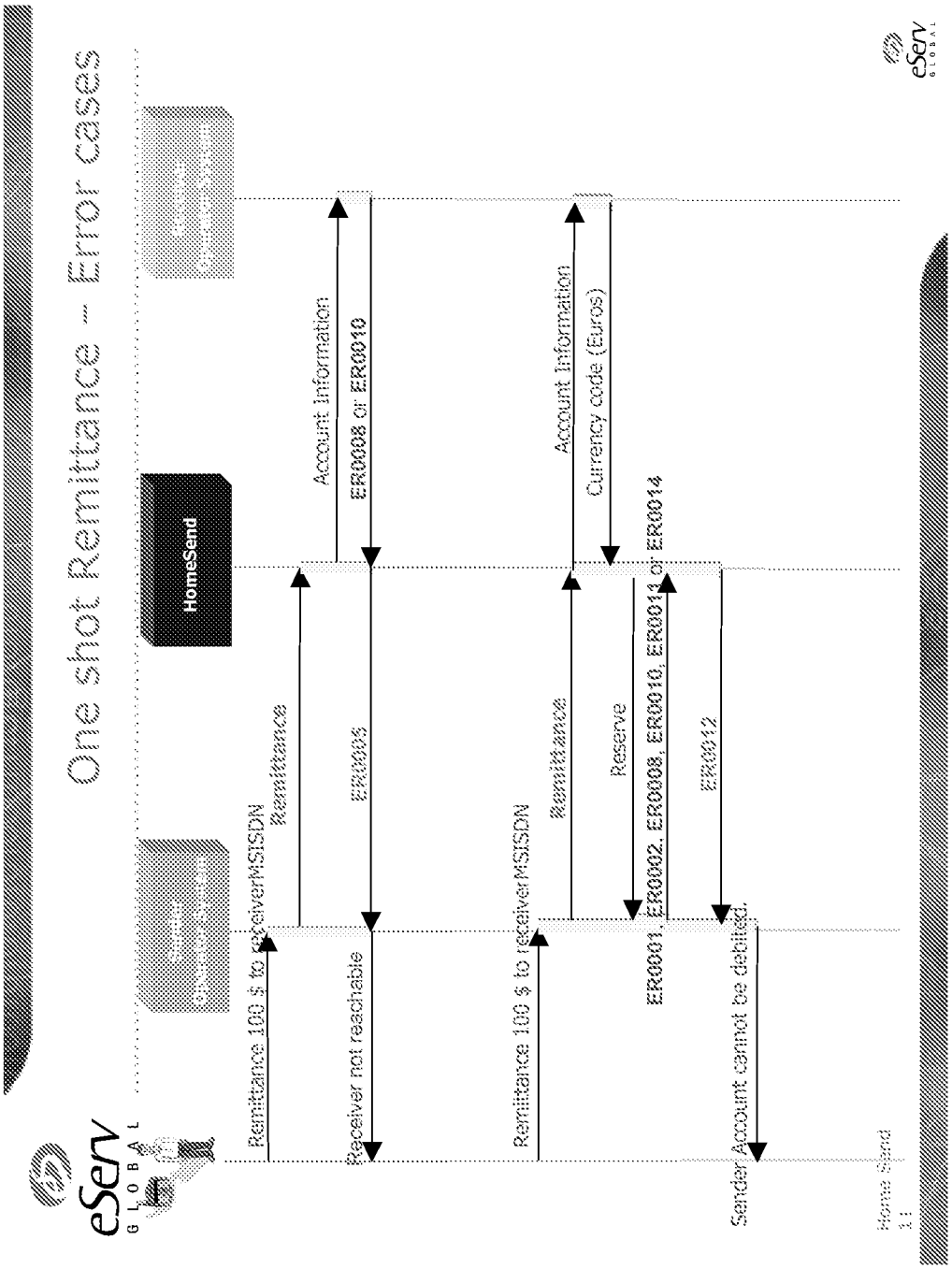

One shot Remittance - Error cases
eServ GLOBAL
HomeSend
Remittance 100 $ to receiverMSISDN
Remittance
Account Information
ER0008 or ER0010
Receiver not reachable
ER0005
Remittance 100 $ to receiverMSISDN
Remittance
Account Information
Currency code (Euros)
Reserve
ER0001, ER0002, ER0008, ER0010, ER0011 or ER0014
ER0012
Sender Account cannot be debited
Home Send
1.1

Figure 28

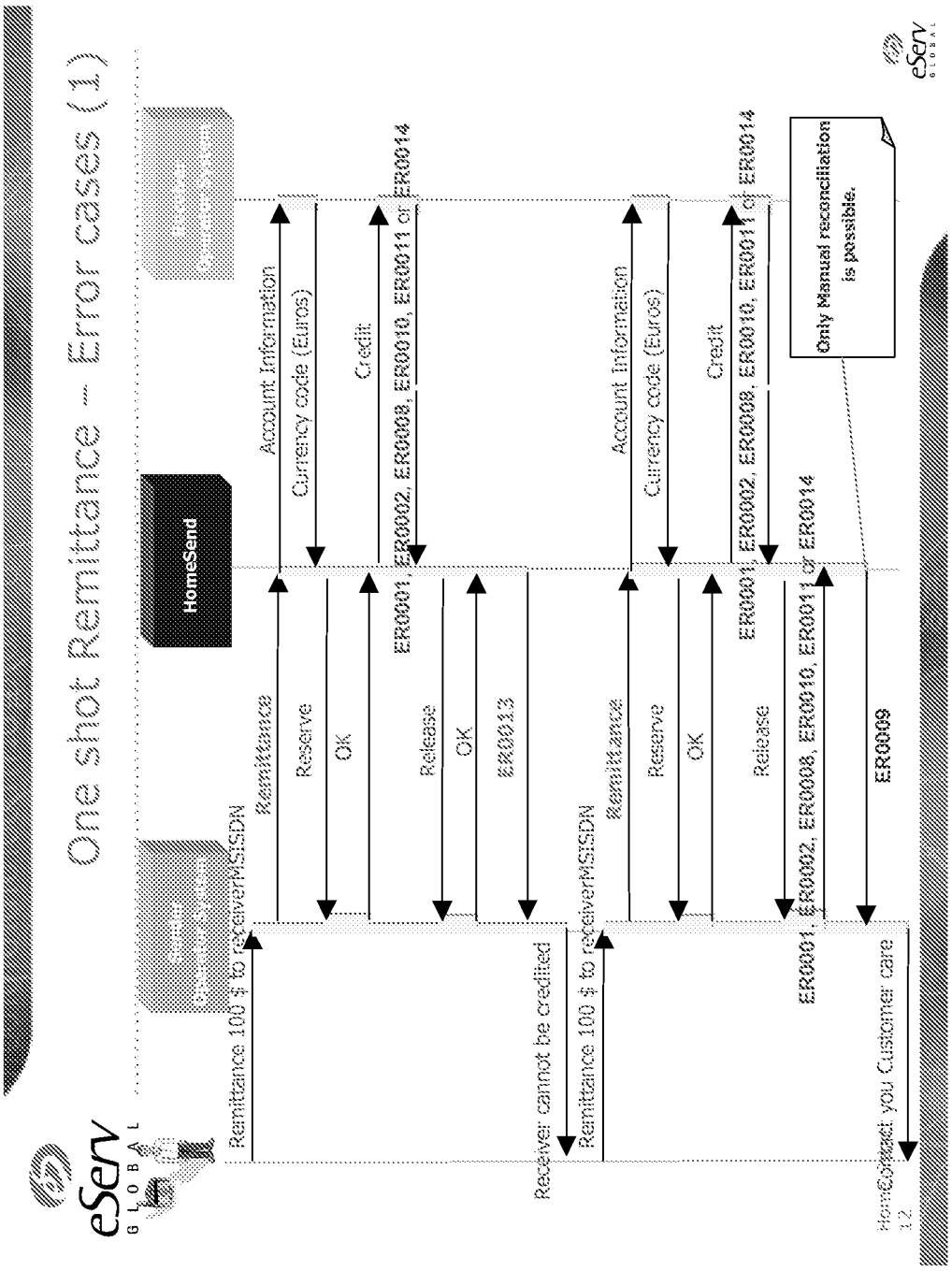

One shot Remittance – Error cases (1)
eServ GLOBAL
Client Application
HomeSend
Home Office Application
Remittance 100 $ to receiverMSISDN
Remittance
Reserve
OK
Account Information
Currency code (Euros)
Credit
ER0001, ER0002, ER0008, ER0010, ER0011 or ER0014
Release
OK
ER0013
Receiver cannot be credited
Remittance 100 $ to receiverMSISDN
Remittance
Reserve
OK
Account Information
Currency code (Euros)
Credit
ER0001, ER0002, ER0008, ER0010, ER0011 or ER0014
Release
ER0001, ER0002, ER0008, ER0010, ER0011 or ER0014
ER0009
Only Manual reconciliation is possible.
HomeSend you Customer care
12
eServ GLOBAL

Figure 29

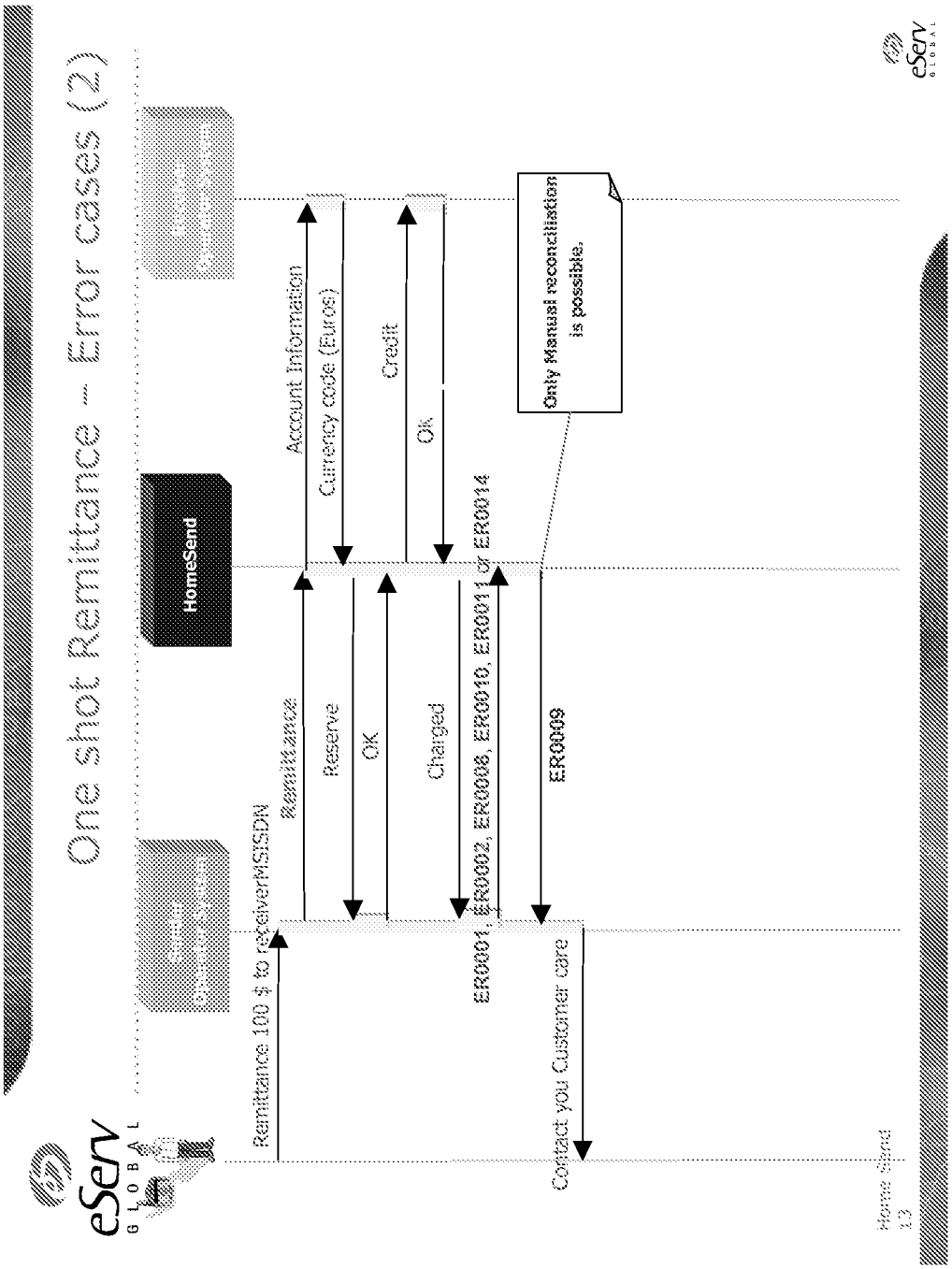

One shot Remittance - Error cases (2)
eServ GLOBAL
Remittance 100 $ to receiverMSISDN
Remittance
Reserve
OK
Charged
ER0001, ER0002, ER0008, ER0010, ER0011 or ER0014
ER0009
Contact you Customer care
HomeSend
Account Information
Currency code (Euros)
Credit
OK
Only Manual reconciliation is possible.
Home Send 13

Figure 30

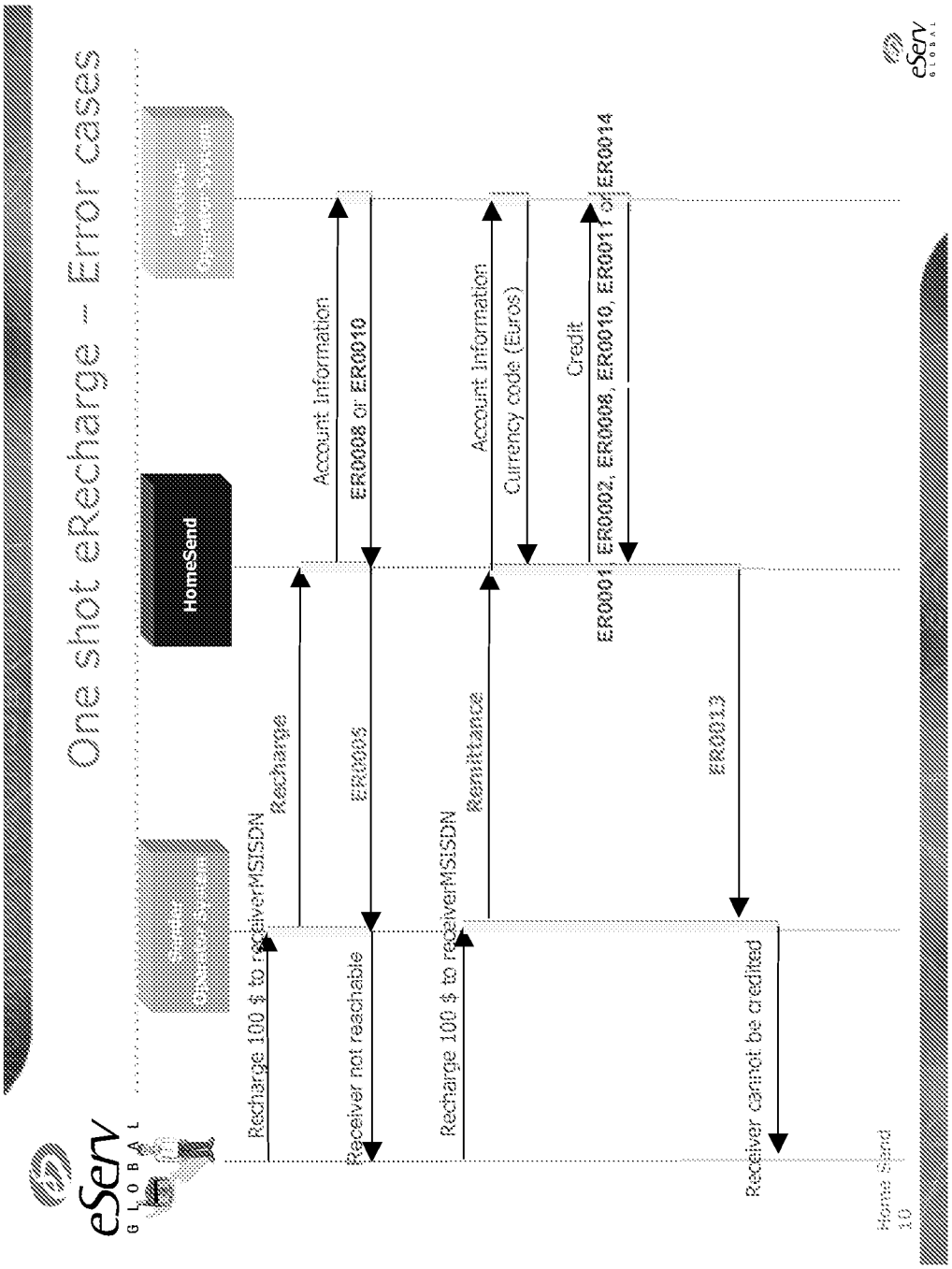

One shot eRecharge – Error cases
eServ GLOBAL
HomeSend
Recharge
Remittance
Recharge 100 $ to receiverMSISDN
Receiver not reachable
Recharge 100 $ to receiverMSISDN
Receiver cannot be credited
Account Information
ER0008 or ER0010
Account Information
Currency code (Euros)
Credit
ER0001, ER0002, ER0008, ER0010, ER0011 or ER0014
ER0005
ER0013
Home Send 10
eServ GLOBAL

Figure 31

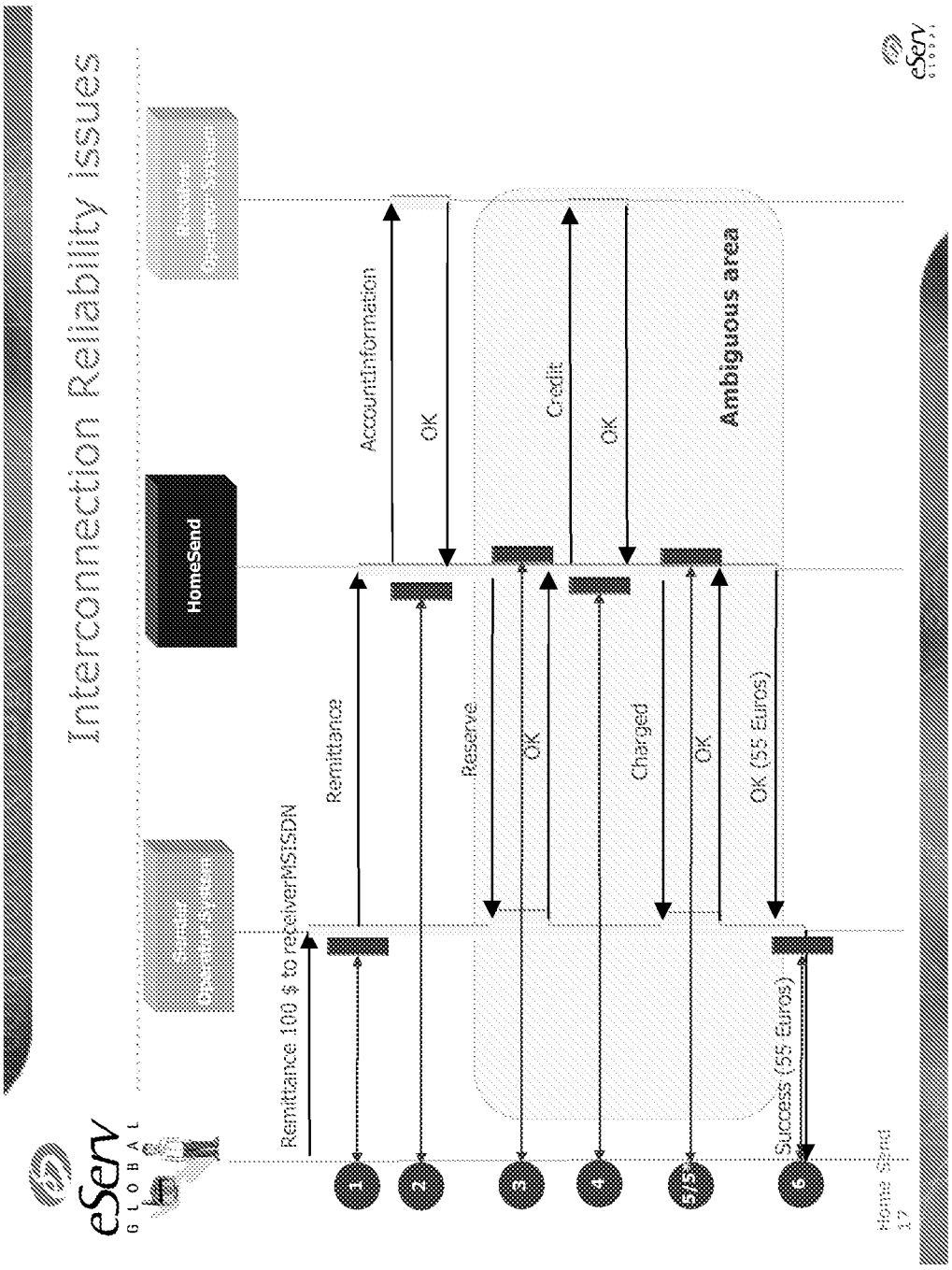

Interconnection Reliability issues
eServ GLOBAL
HomeSend
Remittance 100 $ to receiverMSISDN
Remittance
AccountInformation
OK
Reserve
OK
Credit
OK
Charged
OK
OK (55 Euros)
Success (55 Euros)
Ambiguous area
1
2
3
4
5
6
eServ GLOBAL

Figure 32

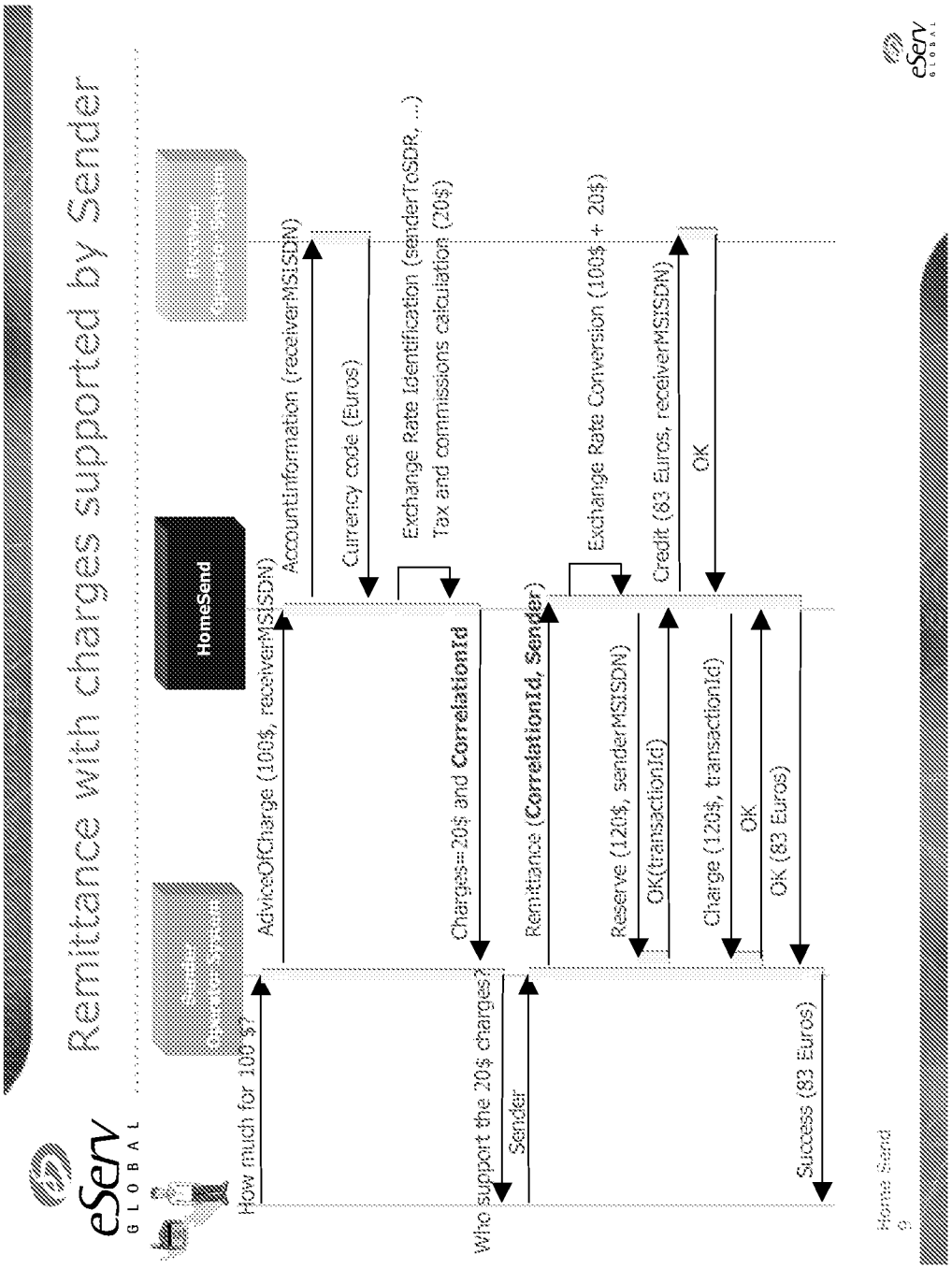

eServ GLOBAL
Remittance with charges supported by Sender
HomeSend
How much for 100 $?
AdviceOfCharge (100$, receiverMSISDN)
AccountInformation (receiverMSISDN)
Currency code (Euros)
Exchange Rate Identification (senderToSDR, ...)
Tax and commissions calculation (20$)
Charges=20$ and CorrelationId
Who support the 20$ charges?
Sender
Remittance (CorrelationId, Sender)
Exchange Rate Conversion (100$ + 20$)
Reserve (120$, senderMSISDN)
OK(transactionId)
Credit (83 Euros, receiverMSISDN)
OK
Charge (120$, transactionId)
OK
OK (83 Euros)
Success (83 Euros)
Home Send
eServ GLOBAL

Figure 33

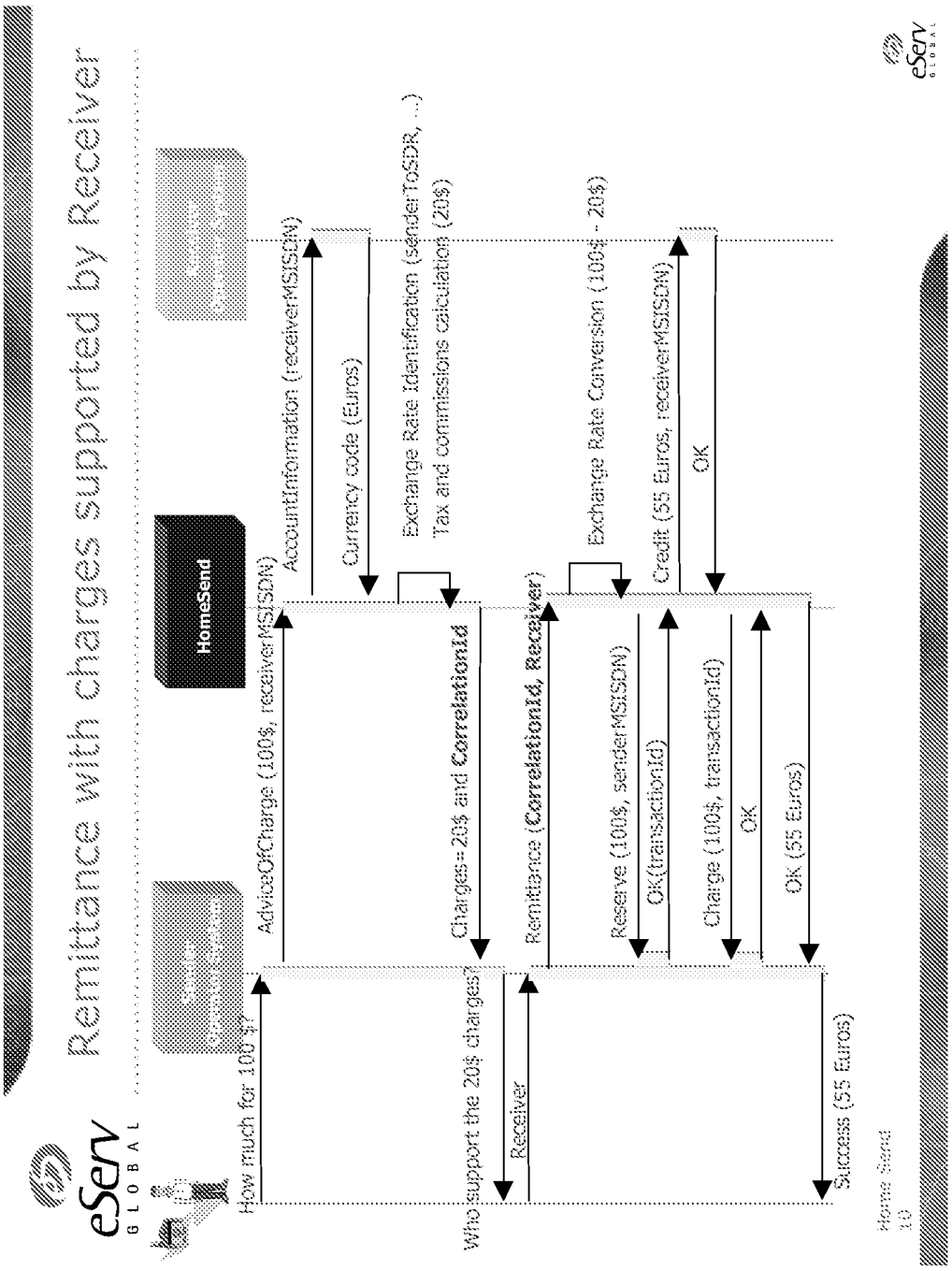

eServ GLOBAL
Remittance with charges supported by Receiver
HomeSend
How much for 100 $?
AdviceOfCharge (100$, receiverMSISDN)
AccountInformation (receiverMSISDN)
Currency code (Euros)
Exchange Rate Identification (senderToSDR, ...)
Tax and commissions calculation (20$)
Who support the 20$ charges?
Receiver
Charges=20$ and CorrelationId
Remittance (CorrelationId, Receiver)
Exchange Rate Conversion (100$ - 20$)
Reserve (100$, senderMSISDN)
OK(transactionId)
Credit (55 Euros, receiverMSISDN)
OK
Charge (100$, transactionId)
OK
OK (55 Euros)
Success (55 Euros)
Home Send
10
eServ GLOBAL

Figure 34

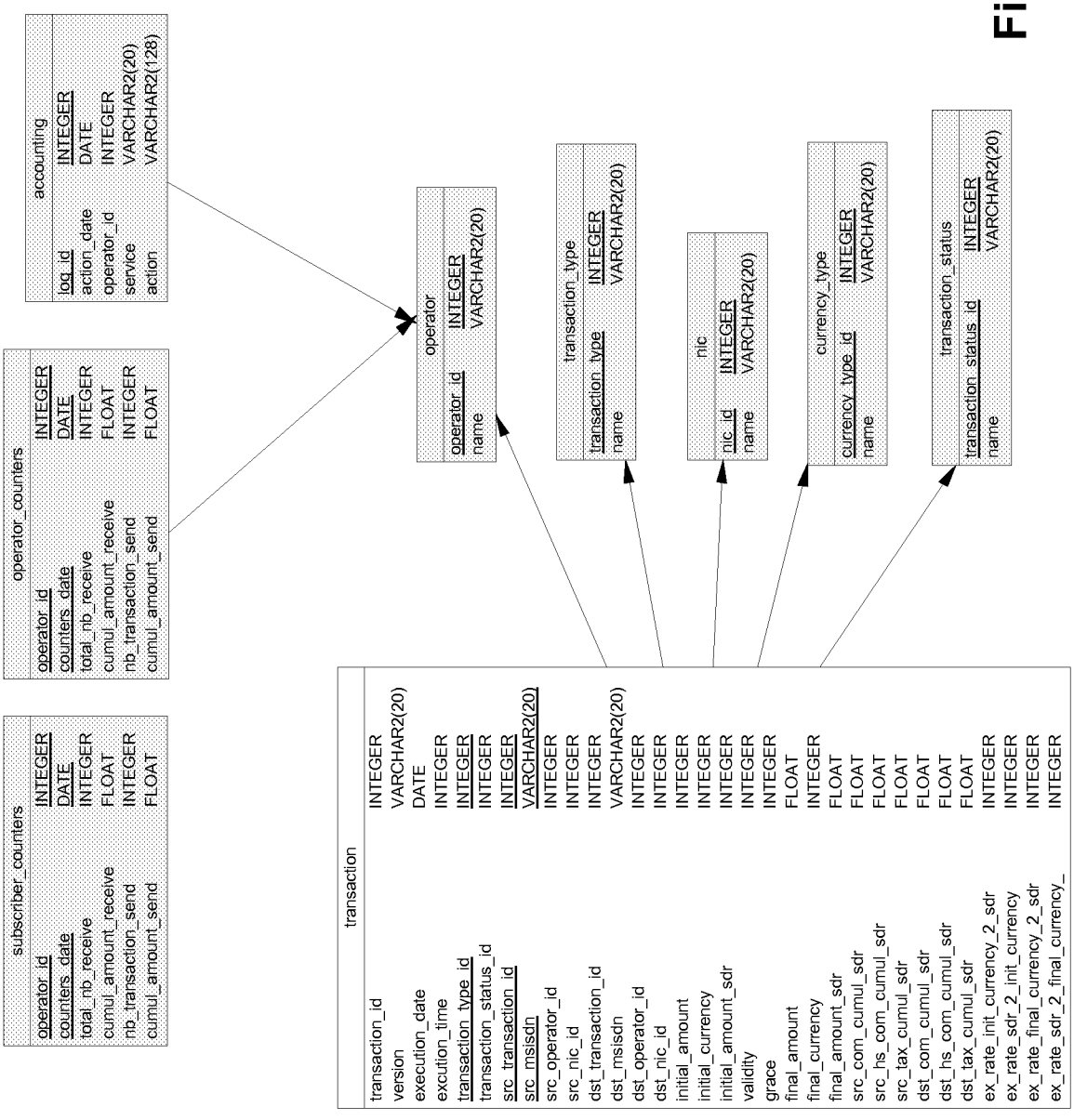

subscriber_counters
operator_id INTEGER
counters_date DATE
total_nb_receive INTEGER
cumul_amount_receive FLOAT
nb_transaction_send INTEGER
cumul_amount_send FLOAT
operator_counters
operator_id INTEGER
counters_date DATE
total_nb_receive INTEGER
cumul_amount_receive FLOAT
nb_transaction_send INTEGER
cumul_amount_send FLOAT
accounting
log_id INTEGER
action_date DATE
operator_id INTEGER
service VARCHAR2(20)
action VARCHAR2(128)
operator
operator_id INTEGER
name VARCHAR2(20)
transaction_type
transaction_type INTEGER
name VARCHAR2(20)
nic
nic_id INTEGER
name VARCHAR2(20)
currency_type
currency_type_id INTEGER
name VARCHAR2(20)
transaction_status
transaction_status_id INTEGER
name VARCHAR2(20)
transaction
transaction_id INTEGER
version VARCHAR2(20)
execution_date DATE
excution_time INTEGER
transaction_type_id INTEGER
transaction_status_id INTEGER
src_transaction_id INTEGER
src_msisdn VARCHAR2(20)
src_operator_id INTEGER
src_nic_id INTEGER
dst_transaction_id INTEGER
dst_msisdn VARCHAR2(20)
dst_operator_id INTEGER
dst_nic_id INTEGER
initial_amount INTEGER
initial_currency INTEGER
initial_amount_sdr INTEGER
validity INTEGER
grace INTEGER
final_amount FLOAT
final_currency INTEGER
final_amount_sdr FLOAT
src_com_cumul_sdr FLOAT
src_hs_com_cumul_sdr FLOAT
src_tax_cumul_sdr FLOAT
dst_com_cumul_sdr FLOAT
dst_hs_com_cumul_sdr FLOAT
dst_tax_cumul_sdr FLOAT
ex_rate_init_currency_2_sdr INTEGER
ex_rate_sdr_2_init_currency INTEGER
ex_rate_final_currency_2_sdr INTEGER
ex_rate_sdr_2_final_currency_ INTEGER

Figure 35

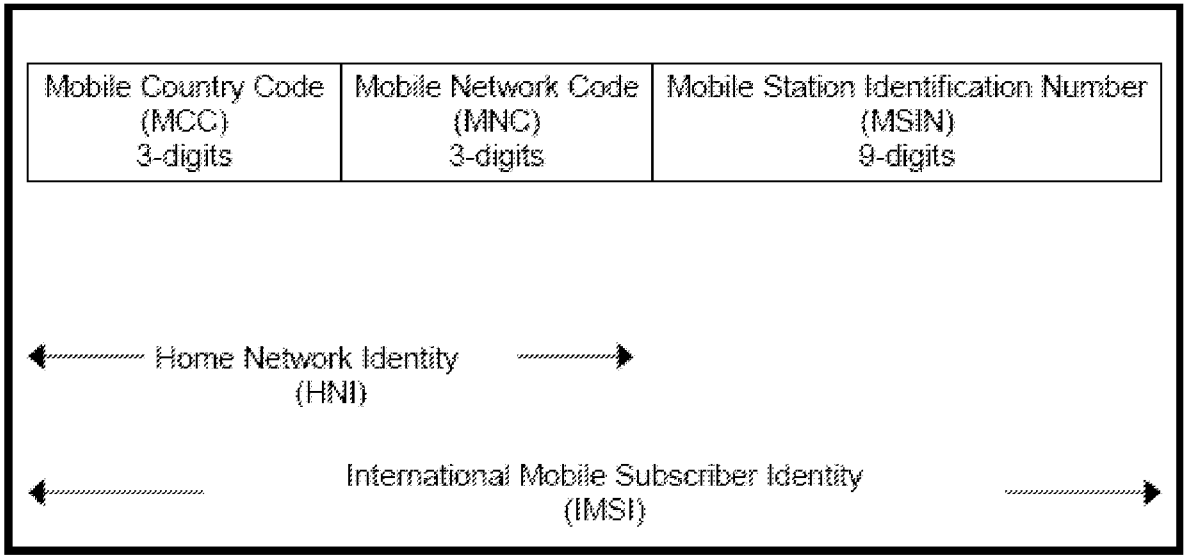


Figure 36

accounting	
accounting_id	NUMBER(10)
action_date	TIMESTAMP(6)
login	VARCHAR2(20)
mcc	VARCHAR2(3)
mnc	VARCHAR2(3)
service_id	NUMBER(10)
action	VARCHAR2(20)
description	VARCHAR2(40)
status	NUMBER(10)

Figure 40

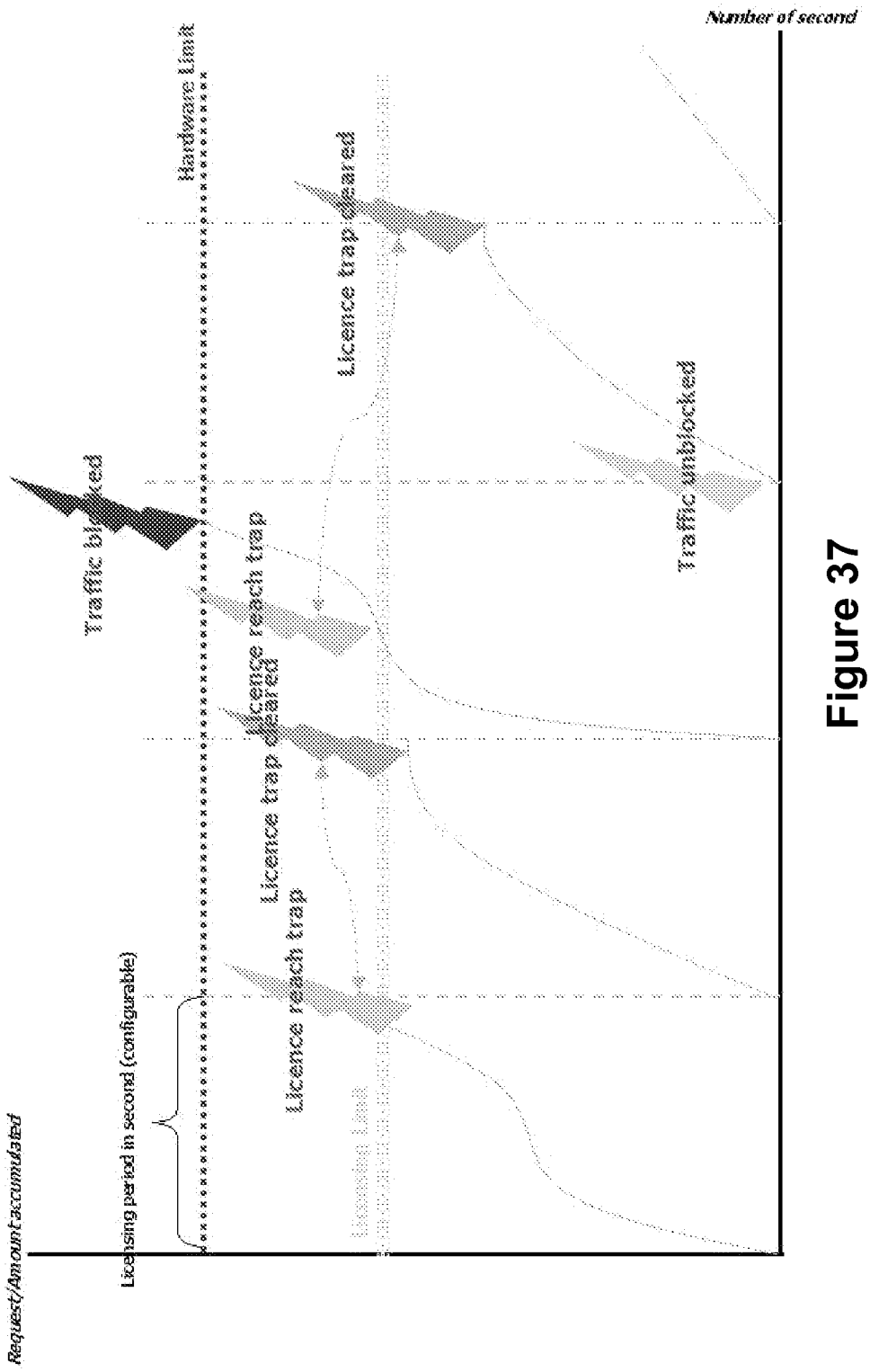
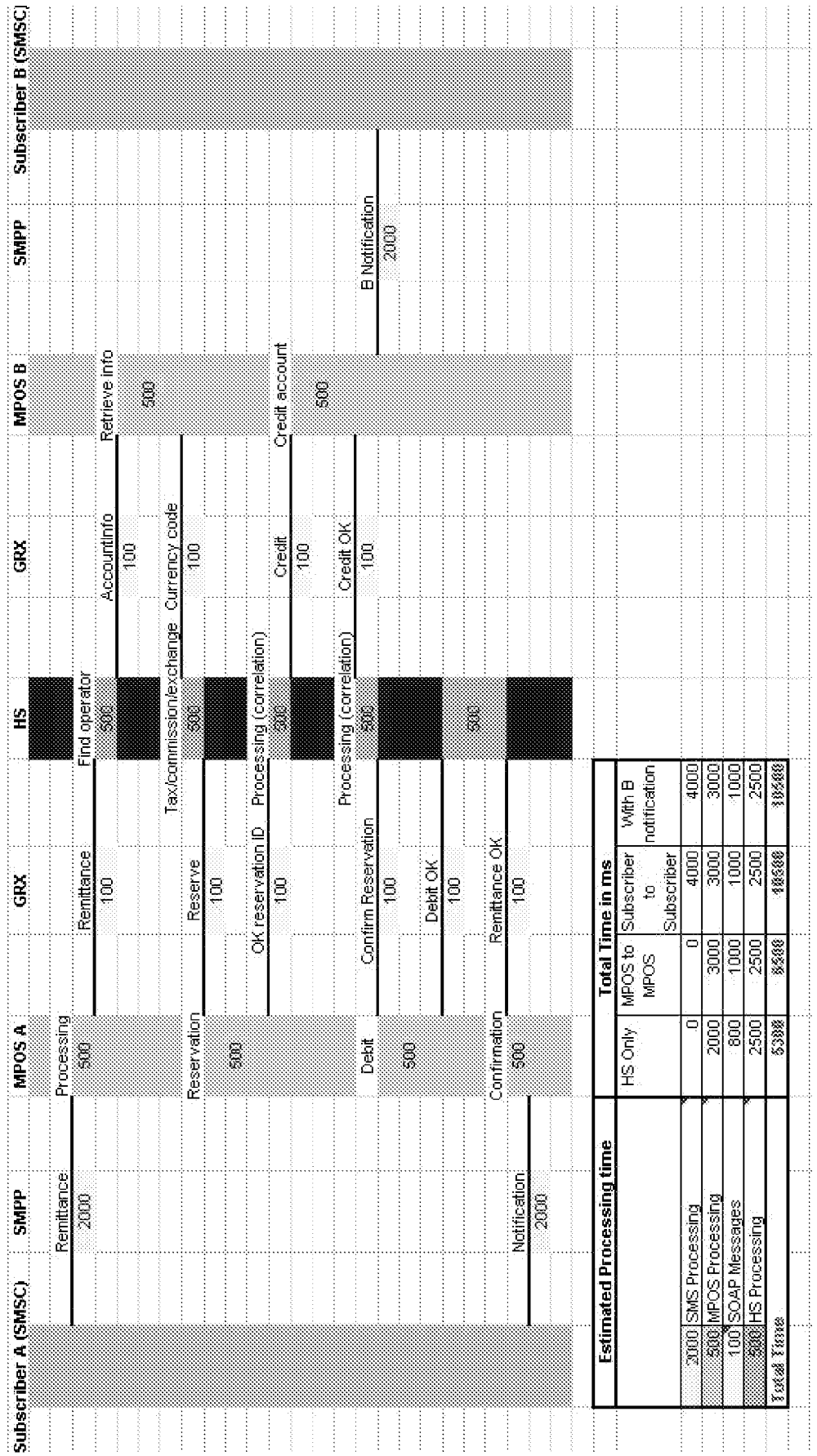

Request/Amount accumulated
Number of second
Licensing period in second (configurable)
Hardware Limit
Traffic blocked
Licence reach trap
Licence trap cleared
Licence reach trap
Licence trap cleared
Traffic unblocked

Figure 37



Estimated Processing time		Total Time in ms			
		HS Only	MPOS to MPOS	Subscriber to Subscriber	With B notification
2000	SMS Processing	0	0	4000	4000
500	MPOS Processing	2000	3000	3000	3000
100	SOAP Messages	800	1000	1000	1000
300	HS Processing	2500	2500	2500	2500
Total Time		5300	6500	10500	10500

Figure 38

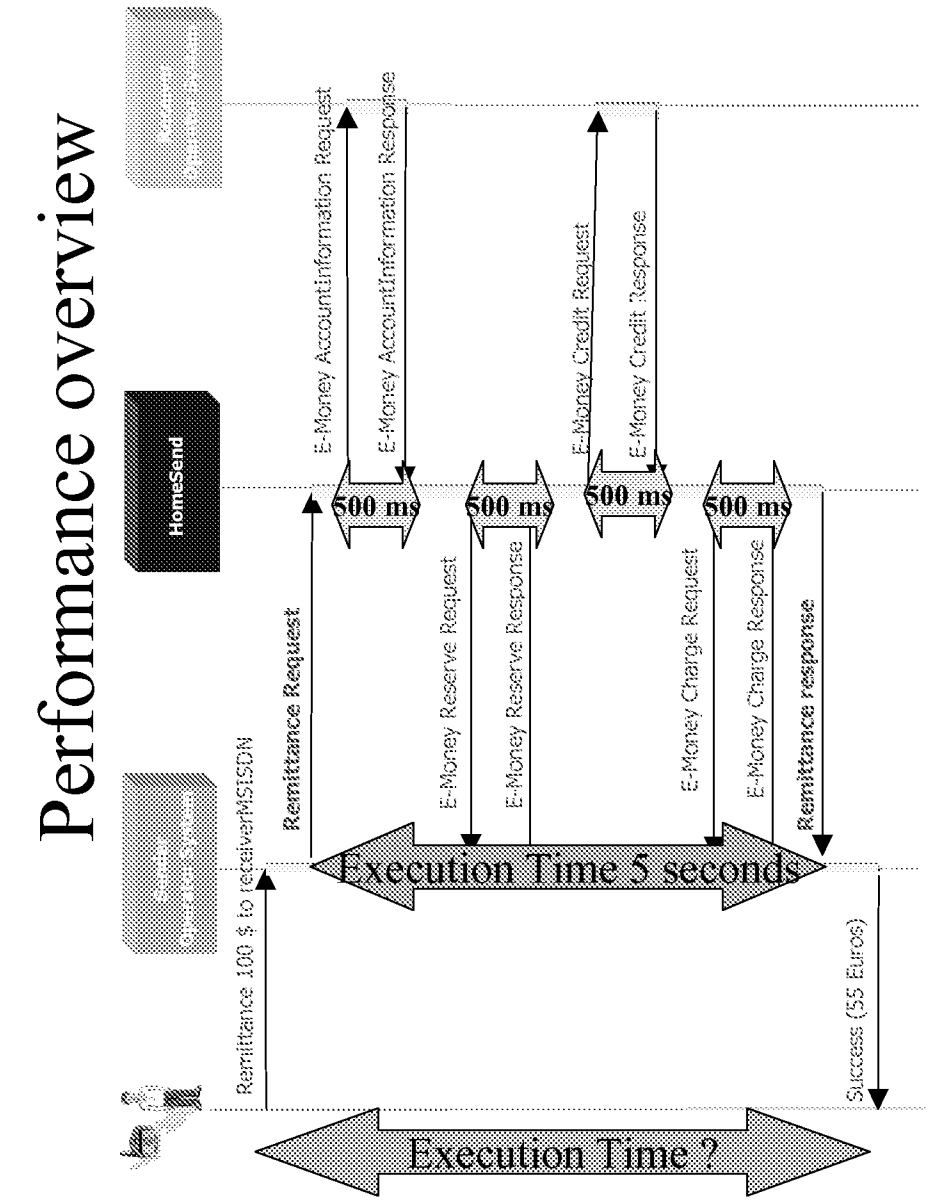

Performance overview
HomeSend
Remittance 100 $ to receiverMSISDN
Remittance Request
E-Money AccountInformation Request
E-Money AccountInformation Response
E-Money Reserve Request
E-Money Reserve Response
E-Money Credit Request
E-Money Credit Response
E-Money Charge Request
E-Money Charge Response
Remittance response
500 ms
500 ms
500 ms
500 ms
Execution Time 5 seconds
Success (55 Euros)
Execution Time ?

Figure 39

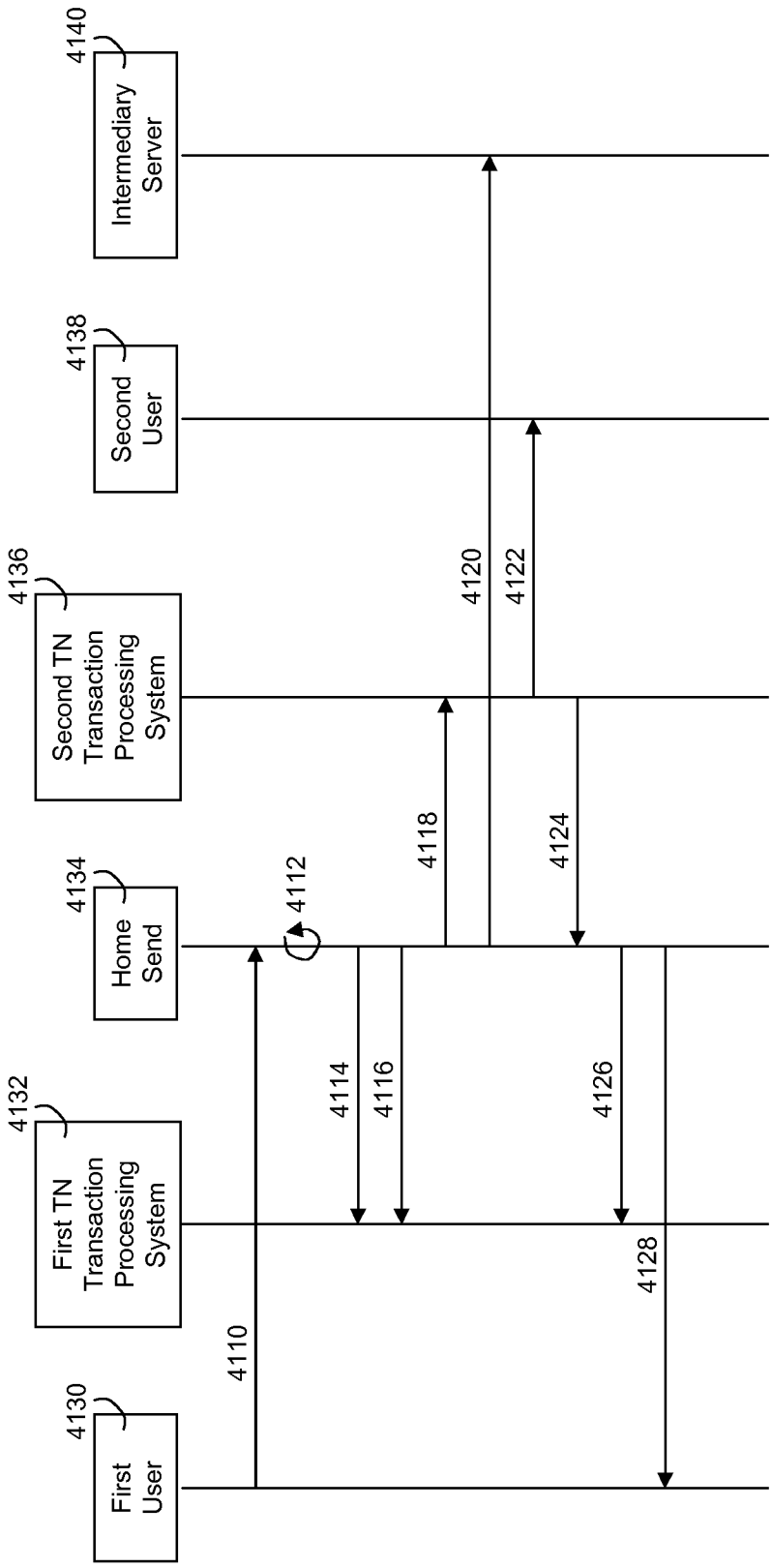

4140
Intermediary Server
4138
Second User
4136
Second TN Transaction Processing System
4134
Home Send
4132
First TN Transaction Processing System
4130
First User
4110
4112
4114
4116
4118
4120
4122
4124
4126
4128

Figure 41