PAYMENT CARD ACCOUNT MANAGEMENT SYSTEMS AND METHODS

Field of the Invention

[0001] The present disclosure relates to systems and methods for management of multiple payment card accounts.

Background of the invention

[0002] Many consumers have multiple payment cards. For example a consumer may hold a debit card and several different credit cards. Financial institutions such as banks often provide internet or smart phone app based account management systems which allow consumers to manage payment card accounts on-line. This on-line management may include activities such as submitting a balance enquiry to obtain an up-to-date indication of a balance of a payment card account and reporting that a payment card has been lost or stolen so that the payment card is added to a 'hot-list' of payment cards to prevent fraudulent use of the payment card.

[0003] When a consumer has multiple payment card accounts with a single financial institution, the account management system provided by that institution may allow the consumer to manage multiple accounts, however, when a consumer has multiple payment card accounts with different financial institutions, in order to perform account management operations the consumer generally has to access separate account management systems in order to manage their payment card accounts. This can be cumbersome for the consumer. This is particularly the case when a consumer wishes to 'hot-list' multiple payment cards, for example, when their wallet is lost or stolen. The consumer will generally have to separately contact the corresponding banks or financial institutions which issued the individual payment cards.

[0004] US Patent 8127986 and 8781953 describe a card registry system in which payment card information associated with a user can be stored. The user can perform operations such as the cancelling of multiple credit card accounts using the system. The document describes that the payment card information may be populated using information from credit files. However in order for actions to be performed on payment card accounts, the means to contact the corresponding financial institutions must be individually entered into the system.

[0005] PCT Patent Application WO 2010/017270 describes a system for updating payment card information held by a merchant. The system transmits updated attributes to merchants which may be identified in payment transaction records. There is no disclosure

of how to perform account management operations on payment card accounts issued by different payment card issuing institutions.

[0006] PCT Patent Application WO 2005/045643 describes a multiple credit card management system. The system allows multiple payment card accounts to be managed through a single universal account. The system requires the user to enter detailed information on the payment card accounts and there is no disclosure of how account management operations are relayed to the correct issuing institution.

[0007] US Patent 8955744 describes a credit card with a display which can provide the current balance of the credit card account. When a transaction is carried out on the credit card balance information is sent to the credit card over a payment network via a point of sale device which processes the transaction. The transmission of balance information over the payment network is specific to this particular type of card.

[0008] None of the above prior art systems describe how to provide account management for multiple payment card accounts corresponding to different issuing institutions and different payment networks without limitations on the type of card or the requirement for the consumer to enter detailed information about the card and / or specific contact details for the issuing institution to be required.

Summary of the invention

[0009] In accordance with a first aspect of the present invention there is provided a data processing system for managing multiple payment card accounts. The data processing system comprises: a computer processor and a data storage device, the data storage device storing instructions operative by the processor to: receive an account management request message from a user device, the account management request message comprising an indication of an account management operation and an indication of at least a first payment card and a second payment card; determine a first payment network associated with the first payment card; determine a second payment network associated with the second payment card; generate a first request message comprising an indication of the account management operation and an indication of the first payment card; generate a second request message comprising an indication of the account management operation and an indication of the second payment card; send the first request message over the first payment network; send the second request message over the second payment network; receive a first request message response from the first payment network; receive a second request message response from the second payment network; generate an account management operation response using the first request response message and the second

request response message; and provide the account management operation response to the user device.

[0010] In an embodiment the account management operation is a request to hot list payment cards, and the first response message comprises an indication that the first payment card has been successfully added to a hot list and the second response message comprises an indication that the second payment card has been successfully added to a hot list.

[0011] In an embodiment the account management operation is a balance enquiry, and the first response message comprises an indication of a balance associated with the first payment card and the second response message comprises an indication of a balance associated with the second payment card. The account management operation response may comprise an indication of an aggregate balance of at least the first card and the second payment card.

[0012] In an embodiment the data processing system further comprises storage for a routing table. The routing table comprises mappings between parts of payment card identifiers and payment networks.

[0013] The first request message and / or the second request message may be formatted according to the ISO 8583 standard.

[0014] In accordance with a second aspect of the present invention there is provided a data processing device for managing multiple payment card accounts. The data processing device comprises a computer processor and a data storage device, the data storage device storing instructions operative by the processor to receive a user input, the user input indicating an account management operation and at least a first payment card and a second payment card; generate an account management request message, the account management request message comprising an indication of the account management operation and an indication of the first payment card and the second payment card send the account management request message to an account management server receive an account management operation response message from the account management server; and provide an indication of the account management operation response to the user.

[0015] In an embodiment the account management operation is a request to hot list payment cards, and the account management operation response comprises an indication that the first payment card and the second payment card have been successfully added to respective hot lists.

[0016] In an embodiment the account management operation is a balance enquiry, and the account management operation response comprises an indication of an aggregate balance of at least the first card and the second payment card.

[0017] In an embodiment the account management operation is a balance enquiry, and the account management operation response comprises an indication of a balance associated with the first payment card and an indication of a balance associated with the second payment card and wherein the indication of the account management response comprises an aggregate balance of at least the first card and the second payment card.

[0018] According to a third aspect of the present invention there is provided a data processing method for managing multiple payment card accounts. The method comprises: receiving an account management request message from a user device, the account management request message comprising an indication of an account management operation and an indication of at least a first payment card and a second payment card determining a first payment network associated with the first payment card; determining a second payment network associated with the second payment card; generating a first request message comprising an indication of the account management operation and an indication of the first payment card; generating a second request message comprising an indication of the account management operation and an indication of the second payment card; sending the first request message over the first payment network; sending the second request message over the second payment network; receiving a first request message response from the first payment network; receiving a second request message response from the second payment network; generating an account management operation response using the first request response message and the second request response message; and providing the account management operation response to the user device.

[0019] According to a fourth aspect of the present invention there is provided a data processing method in a user device for managing multiple payment card accounts. The method comprises: receiving a user input, the user input indicating an account management operation and at least a first payment card and a second payment card; generating an account management request message, the account management request message comprising an indication of the account management operation and an indication of the first payment card and the second payment card; sending the account management request message to an account management server; receiving an account management operation response message from the account management server; and providing an indication of the account management operation response to the user.

[0020] Embodiments of the invention may be expressed as a network of communicating devices (i.e. a “computerized network”). It may further be expressed in terms of a software

application downloadable into a computer device to facilitate the method. The software application may be a computer program product, which may be stored on a non-transitory computer-readable medium on a tangible data-storage device (such as a storage device of a server, or one within a user device).

Brief description of the drawings

[0021] Embodiments of the invention will now be described by way of example only with reference to the following drawings, in which:

Figure 1 is a block diagram showing a system for managing multiple payment card accounts according to an embodiment of the present invention;

Figure 2 is a block diagram showing the functional modules of the user device shown in Figure 1;

Figure 3 is a block diagram showing the functional modules of the account management server shown in Figure 1;

Figure 4 is a flowchart illustrating a method of storing payment card information for use in systems and methods according to embodiments of the present invention;

Figure 5 shows an example screen for entry of user payment card account details in an embodiment of the present invention;

Figure 6 is a flowchart illustrating method steps carried out by a user device in an embodiment of the present invention;

Figure 7 is a flowchart illustrating method steps carried out by an account management server in an embodiment of the present invention;

Figure 8 shows message flows in an embodiment of the present invention relating to hot listing of payment cards;

Figure 9 shows an example screen for selection of payment cards to hot list in an embodiment of the present invention;

Figure 10 shows an example screen indicating the account management response to a user in an embodiment of the present invention;

Figure 11 shows message flows in an embodiment of the present invention relating to a combined balance enquiry for multiple payment cards;

Figure 12 shows an example screen for selection of payment cards to be included in the balance enquiry in an embodiment of the present invention;

Figure 13 shows an example screen indicating the account management response to the user in an embodiment of the present invention;

Figure 14 is a block diagram showing a technical architecture of a user device according to an embodiment of the present invention; and

Figure 15 is a block diagram showing a technical architecture of an account management server according to an embodiment of the present invention.

Detailed description of certain embodiments

[0022] Figure 1 shows a system for managing multiple payment card accounts according to an embodiment of the present invention. The system 100 allows a user 102 to manage multiple payment cards – in this example a first payment card 104 and a second payment card 106 – via an application running on a user device 110.

[0023] In order to manage payment card accounts for the first payment card 104 and the second payment card 106, the application running on the user device 110 generates an account management request message 112 which comprises an indication of an account management operation and an indication of the first payment card 104 and an indication of the second payment card 106. The account management request message 112 is send to an account management server 120 which uses the indications of the first payment card 104 and the second payment card 106 to determine a first payment network 130 associated with the first payment card 104 and a second payment network 140 associated with the second payment card 106.

[0024] The account management server 120 then generates a first request message 122 and a second request message 124. The first request message 122 comprises an indication of the account management operation and an indication of the first payment card 104. The account management server 120 sends the first request message 122 over the first payment network 130. The first payment network 122 routes the first request message 122 to a first issuer bank server 150 which is associated with the first issuer bank. Similarly, the second request message 124 comprises an indication of the second payment card 106 and an indication of the account management operation. The account management server 120 sends the second request message 124 over the second payment network 140. The second payment network 140 routes the second request message to a second issuer bank server 160 which is associated with the second issuer bank.

[0025] In response to receiving the first request message 122, the first issuer bank server 150 performs the account management operation and generates a first request response message 152. The first issuer bank server 150 sends the first request response message 152 over the first payment network 130. The first payment network 130 routes the first request message response 152 to the account management server 120. Similarly, in response to receiving the second request message 124, the second issuer bank server 160 performs the account management operation and generates a second request response message 162. The second issuer bank server 160 sends the second request response message 162 over the second payment network 140. The second payment network 140 routes the second request response message 162 to the account management server 120.

[0026] The account management server 120 uses the first request response message 152 and the second request response message 162 to generate an account management operation response 126 which is send to the user device 110. The user device 110 provides an indication to the user 102 of the account management operation response 126.

[0027] As described above, embodiments of the present invention allow the user 102 to perform account management operations on multiple payment card accounts via a single interface. The system uses payment network infrastructure to route the request and response messages to and from the respective issuer bank servers, therefore only limited information input is required since the payment networks already include the infrastructure to route messages to the respective issuer bank servers.

[0028] In one embodiment, the account management operation is a request for a consolidated balance of multiple payment card accounts comprising the first payment card account and the second payment card account. In this embodiment, the first and second request messages comprise balance inquiry request messages. The respective first and second request response messages comprise balance indications for the first and second payment card accounts. The account management server 120 uses the balances contained in the first and second request response messages to calculate a consolidated balance. This consolidated balance is provided to the user device 110 in the account management operation response.

[0029] In another embodiment, the account management operation is a request to 'hot list' multiple payment cards. Thus the first and second request messages comprise 'hot list' requests which are routed to the respective issuer banks. The first and second request response messages comprise indications that the respective payment cards have been successfully hot listed. The account management operation response thus comprises an indication that the multiple payment cards have been successfully hot listed.

[0030] In further embodiments the account management operation may comprise requests to upgrade an international and / or domestic spend limit on credit and / or debit cards, requests to enable or disable international spending on multiple payment cards, and requests to change or issue a new PIN number for multiple payment card account.

[0031] The account management server 120 may comprise a routing table which maps payment card account numbers to payment networks. The routing table may indicate that payment card numbers starting with a specific sequence of numbers correspond to a specific payment network. The first request message 122 and the second request message 124 may be formatted according to the ISO8583 standard. The messages may include an indication of the account management operation in data element DE3. The first request message 122 and the second request message 124 may include indications that the originating party is the account management server 120 and the respective issuer banks may use this information to address the request response messages back to the account management server 120.

[0032] Figure 2 is a block diagram showing the functional modules of the user device shown in Figure 1. As shown in Figure 2, the user device 110 comprises a user interface module 224a; a storage module 224b; a network interface module 224c; and an account management request generation module 224d. A technical architecture of the user device is described in detail below with reference to Figure 14.

[0033] Figure 3 is a block diagram showing the functional modules of the account management server shown in Figure 1. As shown in Figure 3, the account management server 120 comprises a user device interaction module 324a, a payment network identification module 324b, a request message generation module 324c, a payment network interaction module 324d, an account management operation response generation module 324e and a routing table 128. The routing table 128 comprises mappings of parts of payment card account numbers to specific payment networks. The first block of a payment card account number may indicate which payment network a payment card corresponds to, and the routing table may include indications of this mapping. A technical architecture of the account management server is described in more detail below with reference to Figure 15

[0034] Figure 4 is a flowchart illustrating a method of storing payment card information for use in systems and methods according to embodiments of the present invention. The method 400 is carried out by a user device 110 as illustrated in Figure 2. In step 402, the user interface module 224a of the user device 110 receives a user log in to the account management application. The user log in may comprise the user 102 entering a password, security code and / or biometric information to authenticate the user 102. The user then

enters payment card accounts to be managed by the application. In step 404, user entry of the payment card accounts is received.

[0035] Figure 5 shows an example screen for entry of user payment card account details. As shown in Figure 5, the screen 500 has spaces for user entry of payment card account numbers. In this example, the user has entered the number 1234 5678 8999 1000 as a first payment card account number 502 and the number 8898 8697 0089 9090 as a second payment card account number 504. In the following description these examples assumed to be as follows: the first payment card with number 1234 5678 8999 1000 corresponds to a debit card issued by the bank HDFC for the payment network MasterCard and the second payment card with account number 8898 8697 0089 9090 corresponds to a debit card issued by the bank ICICI for the payment network VISA. Once the user 102 has entered the payment card numbers, the user selects the "submit" button 506 and the user device 110 stores the payment card numbers.

[0036] Returning now to Figure 4, in step 406, the storage module 224b of the user device 110 stores the payment card numbers.

[0037] Figure 6 is a flowchart illustrating method steps carried out by the user device in an embodiment of the present invention. The method 600 is carried out by a user device 110 as illustrated in Figure 2. In step 602, the user interface module 224a of the user device 110 receives a user input indicating a selection of payment cards and an account management operation to be performed on the payment cards. In step 604, the account management request generation module 224c of the user device 110 generates an account management request message which comprises an indication of the payment cards selected in step 602 and an indication of the account management operation indication by the user input received in step 602.

[0038] In step 606, the network interface module 224d of the user device 110 sends the account management request message to the account management server 120. The account management request message may be sent over a network such as the internet using wireless data transfer, for example over a Wi-Fi or mobile internet network. The account management request message may be sent using a secure communications protocol such as secure sockets layer (SSL).

[0039] In step 608, the network interface module 224d of the user device 110 receives an account management operation response from the account management server 120.

[0040] In step 610, the user interface module 224a of the user device 110 displays an indication of the account management response to the user 102.

[0041] Figure 7 is a flowchart illustrating method steps carried out by the account management server in an embodiment of the present invention. The method 700 is carried out by an account management server 120 as illustrated in Figure 3.

[0042] In step 702, user device interaction module 324a of the account management server 120 receives an account management request message from the user device 110. The account management request message comprises an indication of at least two payment cards and an indication of an account management activity.

[0043] In step 704, the payment network identification module 324b of the account management server 120 uses the routing table 128 to identify a payment network associated with each of the payment cards indicated in the account management request message.

[0044] In step 706, the request generation module 324c of the account management server 120 generates individual request messages for each of the payment cards indicated in the account management request message. Each of the request messages comprises an indication of the respective payment card and an indication of the account management activity. The requests may be formatted according to the ISO 8583 standard.

[0045] In step 708, the payment network interaction module 324d of the account management server 120 sends the request messages over the payment networks identified in step 704.

[0046] In step 710, the payment network interaction module 324d of the account management server 120 receives response messages corresponding to the request messages. The response messages are received over the respective payment networks.

[0047] In step 712, the account management operation response generation module 324e of the account management server 120 generates an account management response using the response messages received in step 710.

[0048] In step 714, the user device interaction module 324a sends the account management response to the user device 110.

[0049] Figure 8 shows message flows in an embodiment of the present invention relating to hot listing of payment cards. The example shown in Figure 8 relates to the two payment cards described in relation to Figure 5.

[0050] In this example scenario, the user has lost his wallet containing two debit cards issued by different issuers and wishes to hot list the cards to prevent them from being fraudulently used.

[0051] Initially, the customer logs into the card management application on the user device 110 and selects an option to hot list the registered payment cards, the user may have the option to select the reason that the cards are to be hot listed. The user may be provided with a list of options such as: "card lost", "card stolen", "fraud suspected", "captured in own bank ATM", and "captured in other bank ATM". The user is presented with details of the registered payment cards by the user interface module 224a of the user device 110. Figure 9 shows an example of the display screen of the user device.

[0052] Figure 9 shows an example screen for selection of payment cards to hot list. The display screen 900 displays an indication of the first payment card 902, and an indication of the second payment card 904. A first selection box 906 allows the user to select the first payment card 902 and a second selection box 908 allows the user to select the second payment card 904. In this example the user has selected both the first selection box 906 and the second selection box 908. Once the user has completed the selection of payment cards, the user selects the "submit" button 910.

[0053] Returning now to Figure 9, upon the user selecting the "submit" button 910, the account management request generation module 224c of the user device 110 generates an account management request message 802. As shown in Figure 8, the account management request message comprises indications of the payment card account numbers of the two payment card accounts "1234 5678 8999 1000" and "8898 8697 0089 9090", an indication that the account management operation is a hot list request and an indication of the reason for the hot list request which in this case is "L" which indicates that the payment cards have been lost.

[0054] The network interface module 224d of the user device 110 then sends the account management request message 802 to the account management server 120. The user device interaction module 324a of the account management server 120 receives the account management request message 802.

[0055] The payment network identification module 324b of the account management server 120 uses the routing table 128 to identify the payment network associated with each of the payment cards. In this example, the routing table 128 indicates that payment cards with numbers beginning with "1234" are associated with the MasterCard payment network, thus from the initial part of the payment card number of the first payment card, the payment network identification module 324b identifies that the first payment network 130 is the MasterCard payment network. Similarly, the routing table 128 indicates that payment cards with numbers beginning with "8898" are associated with the VISA payment network and thus the payment network identification module 324b identifies that the second payment network 140 is the VISA payment network.

[0056] The request generation module 324c of the account management server 120 then generates a first request message 804 and a second request message 806. The first request message 804 and the second request message 806 are generated in the ISO 8583 message format. As shown in Figure 8, the first request message 804 and the second request message 806 each comprise an indication of the respective payment card number. The first request message 804 and the second request message 806 also comprise an indication in data element 3 (DE3) that the processing code corresponds to a hot list request. Further, the first request message 804 and the second request message 806 also comprise an indication in data element 48 (DE48) that the reason for the hot list request is "L" which indicates the reason "lost".

[0057] As shown in Figure 8, the payment network interaction module 324d of the account management server 120 sends the first request message 804 over the first payment network 130 and sends the second request message 806 over the second payment network 140.

[0058] The first payment network 130 uses the payment card account number to determine to which issuer bank to route the first request message 804. As described above, in this example, the first issuer bank is HDFC, thus, the first payment network 130 determines that the first request message 804 is to be routed to the first issuer bank server 150 corresponding to HDFC. Similarly, the second payment network 140 uses the payment card account number to determine to which issuer bank to route the second request message 806. In this example, the second issuer bank is ICICI, thus the second payment network 140 determines that the second request message 806 is to be routed to the second issuer bank server 160 corresponding to ICICI.

[0059] Upon receiving the first request message 804, the first issuer bank server 150 identifies that the first request message 804 corresponds to a hot list request and performs the task of adding the payment card number for the first payment card to a hot list. Once this task is completed, the first issuer bank server 150 generates a first request response message 808. As shown in Figure 9, the first request response message 808 comprises an indication of the payment card account number and an indication of the outcome of the hot list request. In this case the outcome is "SUCCESS" indicating that the payment card was successfully added to the hot list.

[0060] Similarly, upon receiving the second request message 806, the second issuer bank server 160 identifies that the second request message 806 corresponds to a hot list request and performs the task of adding the payment card number for the second payment card to a hot list. The second issuer bank server then generates a second response message 810 which comprises an indication of the second payment card account number

and an indication "SUCCESS" indicating that the payment card was successfully added to the hot list.

[0061] It is noted that the first request message 804 and the second request message 806 include an indication of the sending entity which this the account management server 120, thus when the first issuer bank server 150 and the second issuer bank server 160 generate the respective request response messages an indication that the destination of these messages is the 120 is included in the response messages.

[0062] The first issuer bank server 150 sends the first response message 808 to the first payment network 130 which routes the first response message 808 to the account management server 120. Similarly, the second issuer bank server 160 sends the second response message 810 to the second payment network 140 which routes the second response message 810 to the account management server 120.

[0063] The payment network interaction module 324d of the account management server 120 receives the first response message 808 and the second response message 810. In response to receipt of the respective response messages, the account management operation response generation module 324e of the account management server 120 generates an account management operation response 812. As shown in Figure 8, the account management operation response 812 comprises indications of the respective payment card account numbers and an indication that the payment cards have been successfully hot listed. The user device interaction module 324a of the account management server 120 sends the account management operation response 812 to the user device 110.

[0064] The network interface module 224d of the user device 110 receives the account management operation response 812. In response to receipt of the account management operation response 812, the user interface module 224a displays a user indication of the account management operation response to the user.

[0065] Figure 10 shows an example screen indicating the account management response to the user. The display screen 1000 displays an indication that the first payment card was successfully hot listed and an indication that the second payment card was successfully hot listed 1004.

[0066] Figure 11 shows message flows in an embodiment of the present invention relating to a combined balance enquiry for multiple payment cards. The example shown in Figure 11 also relates to the two payment cards described in relation to Figure 5.

[0067] Initially, the customer logs into the card management application on the user device 110 and selects an request to get balances for all cards. Figure 12 shows an example of the display screen of the user device.

[0068] Figure 12 shows an example screen for selection of payment cards to be included in the balance enquiry. The display screen 1200 displays an indication of the first payment card 1202, and an indication of the second payment card 1204. A first selection box 1206 allows the user to select the first payment card 1202 and a second selection box 1208 allows the user to select the second payment card 1204. In this example the user has selected both the first selection box 1206 and the second selection box 1208. Once the user has completed the selection of payment cards, the user selects the "submit" button 1210.

[0069] Returning now to Figure 11, upon the user selecting the "submit" button 1210, the account management request generation module 224c of the user device 110 generates an account management request message 1102. As shown in Figure 8, the account management request message comprises indications of the payment card account numbers of the two payment card accounts "1234 5678 8999 1000" and "8898 8697 0089 9090", and an indication that the account management operation is a balance enquiry.

[0070] The network interface module 224d of the user device 110 then sends the account management request message 1102 to the account management server 120. The user device interaction module 324a of the account management server 120 receives the account management request message 1102.

[0071] The payment network identification module 324b of the account management server 120 uses the routing table 128 to identify the payment network associated with each of the payment cards. In this example, the routing table 128 indicates that payment cards with numbers beginning with "1234" are associated with the MasterCard payment network, thus from the initial part of the payment card number of the first payment card, the payment network identification module 324b identifies that the first payment network 130 is the MasterCard payment network. Similarly, the routing table 128 indicates that payment cards with numbers beginning with "8898" are associated with the VISA payment network and thus the payment network identification module 324b identifies that the second payment network 140 is the VISA payment network.

[0072] The request generation module 324c of the account management server 120 then generates a first request message 1104 and a second request message 806. The first request message 1104 and the second request message 806 are generated in the ISO 8583 message format. As shown in Figure 11, the first request message 1104 and the

second request message 806 each comprise an indication of the respective payment card number. The first request message 1104 and the second request message 1106 also comprise an indication in data element 3 (DE3) that the processing code corresponds to a balance enquiry.

[0073] The routing of the messages is as described above in relation to Figure 8. Upon receiving the first request message 1104, the first issuer bank server 150 identifies that the first request message 1104 corresponds to a balance enquiry and determines the balance for the first payment card account. The first issuer bank server 150 generates a first request response message 1108. As shown in Figure 11, the first request response message 1108 comprises an indication of the payment card account number and an indication of the balance which in this example is 50000 currency units.

[0074] Similarly, upon receiving the second request message 1106, the second issuer bank server 160 identifies that the second request message 1106 corresponds to a balance enquiry and determines the balance for the second payment card account The second issuer bank server then generates a second response message 1110 which comprises an indication of the second payment card account number and an indication of the balance which in this example is 10000 currency units.

[0075] The first issuer bank server 150 sends the first response message 1108 to the first payment network 130 which routes the first response message 1108 to the account management server 120. Similarly, the second issuer bank server 160 sends the second response message 1110 to the second payment network 140 which routes the second response message 1110 to the account management server 120.

[0076] The payment network interaction module 324d of the account management server 120 receives the first response message 1108 and the second response message 1110. In response to receipt of the respective response messages, the account management operation response generation module 324e of the account management server 120 generates an account management operation response 1112. As shown in Figure 11, the account management operation response 1112 comprises indications of the respective payment card account numbers and an indication of the balance associated with each account. The Account management operation response generation module 324e also determines the combined balance by adding the respective balances together and an indication of the sum of the balances which in this case is 60000 currency units is also included in the account management operation response 1112. The user device interaction module 324a of the account management server 120 sends the account management operation response 1112 to the user device 110.

[0077] The network interface module 224d of the user device 110 receives the account management operation response 1112. In response to receipt of the account management operation response 1112, the user interface module 224a displays a user indication of the account management operation response to the user.

[0078] In one embodiment, the account management operation response comprises indications of the respective balances of the first payment card and the second payment card. In such an embodiment, the user device 110 calculates the combined balance as the sum of the respective balances of the individual payment cards and then the user interface module 224a of the user device 110 displays a user indication comprising the combined balance to the user.

[0079] Figure 13 shows an example screen indicating the account management response to the user. The display screen 1300 displays an indication of the balance for the first payment card account 1302, an indication of the balance for the second payment card account 1304 and an indication of the combined balance 1306.

[0080] Figure 14 is a block diagram showing a technical architecture 200 of the user device 110 for performing steps of exemplary methods described above. Typically, the methods are implemented by a number of computers each having a data-processing unit. The block diagram as shown in Figure 14 illustrates a technical architecture 200 of a computer which is suitable for implementing one or more embodiments herein.

[0081] The technical architecture 200 includes a processor 222 (which may be referred to as a central processor unit or CPU) that is in communication with memory devices including secondary storage 224 (such as disk drives), read only memory (ROM) 226, random access memory (RAM) 228. The processor 222 may be implemented as one or more CPU chips. The technical architecture 220 may further comprise input/output (I/O) devices 230, and network connectivity devices 232.

[0082] The secondary storage 224 is typically comprised of one or more disk drives or tape drives and is used for non-volatile storage of data and as an over-flow data storage device if RAM 228 is not large enough to hold all working data. Secondary storage 224 may be used to store programs which are loaded into RAM 228 when such programs are selected for execution. In this embodiment, the secondary storage 224 has a user interface module 224a, a storage module 224b, an account management request generation module 224c, and a network interface module 224d comprising non-transitory instructions operative by the processor 222 to perform various operations of the method of the present disclosure. As depicted in Figure 14, the modules 224a-224d are distinct modules which perform respective functions implemented by the user device 110. It will be appreciated that the

boundaries between these modules are exemplary only, and that alternative embodiments may merge modules or impose an alternative decomposition of functionality of modules. For example, the modules discussed herein may be decomposed into sub-modules to be executed as multiple computer processes, and, optionally, on multiple computers. Moreover, alternative embodiments may combine multiple instances of a particular module or sub-module. It will also be appreciated that, while a software implementation of the modules 224a-224d is described herein, these may alternatively be implemented as one or more hardware modules (such as field-programmable gate array(s) or application-specific integrated circuit(s)) comprising circuitry which implements equivalent functionality to that implemented in software. The ROM 226 is used to store instructions and perhaps data which are read during program execution. The secondary storage 224, the RAM 228, and/or the ROM 226 may be referred to in some contexts as computer readable storage media and/or non-transitory computer readable media.

[0083] The I/O devices may include printers, video monitors, liquid crystal displays (LCDs), plasma displays, touch screen displays, keyboards, keypads, switches, dials, mice, track balls, voice recognizers, card readers, paper tape readers, or other well-known input devices.

[0084] The network connectivity devices 232 may take the form of modems, modem banks, Ethernet cards, universal serial bus (USB) interface cards, serial interfaces, token ring cards, fiber distributed data interface (FDDI) cards, wireless local area network (WLAN) cards, radio transceiver cards that promote radio communications using protocols such as code division multiple access (CDMA), global system for mobile communications (GSM), long-term evolution (LTE), worldwide interoperability for microwave access (WiMAX), near field communications (NFC), radio frequency identity (RFID), and/or other air interface protocol radio transceiver cards, and other well-known network devices. These network connectivity devices 232 may enable the processor 222 to communicate with the Internet or one or more intranets. With such a network connection, it is contemplated that the processor 222 might receive information from the network, or might output information to the network in the course of performing the method operations described herein. Such information, which is often represented as a sequence of instructions to be executed using processor 222, may be received from and outputted to the network, for example, in the form of a computer data signal embodied in a carrier wave.

[0085] The processor 222 executes instructions, codes, computer programs, scripts which it accesses from hard disk, floppy disk, optical disk (these various disk based systems may all be considered secondary storage 224), flash drive, ROM 226, RAM 228, or the network connectivity devices 232. While only one processor 222 is shown, multiple processors may

be present. Thus, while instructions may be discussed as executed by a processor, the instructions may be executed simultaneously, serially, or otherwise executed by one or multiple processors.

[0086] It is understood that by programming and/or loading executable instructions onto the technical architecture 200, at least one of the CPU 222, the RAM 228, and the ROM 226 are changed, transforming the technical architecture 200 in part into a specific purpose machine or apparatus having the novel functionality taught by the present disclosure. It is fundamental to the electrical engineering and software engineering arts that functionality that can be implemented by loading executable software into a computer can be converted to a hardware implementation by well-known design rules.

[0087] Figure 15 is a block diagram showing a technical architecture 300 of the account management server 120 for performing steps of the methods described above. Typically, the methods are implemented by a number of computers each having a data-processing unit. The block diagram as shown in Figure 15 illustrates a technical architecture 300 of a computer which is suitable for implementing one or more embodiments herein.

[0088] The technical architecture 300 includes a processor 322 (which may be referred to as a central processor unit or CPU) that is in communication with memory devices including secondary storage 324 (such as disk drives), read only memory (ROM) 326, random access memory (RAM) 328. The processor 322 may be implemented as one or more CPU chips. The technical architecture 320 may further comprise input/output (I/O) devices 330, and network connectivity devices 332.

[0089] The secondary storage 324 is typically comprised of one or more disk drives or tape drives and is used for non-volatile storage of data and as an over-flow data storage device if RAM 328 is not large enough to hold all working data. Secondary storage 324 may be used to store programs which are loaded into RAM 328 when such programs are selected for execution. In this embodiment, the secondary storage 324 has a user device interaction module 324a, a payment network identification module 324b, a request message generation module 324c, a payment network interaction module 324d and an account management operation response generation module 324e comprising non-transitory instructions operative by the processor 322 to perform various operations of the method of the present disclosure. As depicted in Figure 15, the modules 324a-324d are distinct modules which perform respective functions implemented by the account management server 120. It will be appreciated that the boundaries between these modules are exemplary only, and that alternative embodiments may merge modules or impose an alternative decomposition of functionality of modules. For example, the modules discussed herein may be decomposed into sub-modules to be executed as multiple computer

processes, and, optionally, on multiple computers. Moreover, alternative embodiments may combine multiple instances of a particular module or sub-module. It will also be appreciated that, while a software implementation of the modules 324a-324e is described herein, these may alternatively be implemented as one or more hardware modules (such as field-programmable gate array(s) or application-specific integrated circuit(s)) comprising circuitry which implements equivalent functionality to that implemented in software. The ROM 326 is used to store instructions and perhaps data which are read during program execution. The secondary storage 324, the RAM 328, and/or the ROM 326 may be referred to in some contexts as computer readable storage media and/or non-transitory computer readable media.

[0090] The I/O devices may include printers, video monitors, liquid crystal displays (LCDs), plasma displays, touch screen displays, keyboards, keypads, switches, dials, mice, track balls, voice recognizers, card readers, paper tape readers, or other well-known input devices.

[0091] The network connectivity devices 332 may take the form of modems, modem banks, Ethernet cards, universal serial bus (USB) interface cards, serial interfaces, token ring cards, fiber distributed data interface (FDDI) cards, wireless local area network (WLAN) cards, radio transceiver cards that promote radio communications using protocols such as code division multiple access (CDMA), global system for mobile communications (GSM), long-term evolution (LTE), worldwide interoperability for microwave access (WiMAX), near field communications (NFC), radio frequency identity (RFID), and/or other air interface protocol radio transceiver cards, and other well-known network devices. These network connectivity devices 332 may enable the processor 322 to communicate with the Internet or one or more intranets. With such a network connection, it is contemplated that the processor 322 might receive information from the network, or might output information to the network in the course of performing the method operations described herein. Such information, which is often represented as a sequence of instructions to be executed using processor 322, may be received from and outputted to the network, for example, in the form of a computer data signal embodied in a carrier wave.

[0092] The processor 322 executes instructions, codes, computer programs, scripts which it accesses from hard disk, floppy disk, optical disk (these various disk based systems may all be considered secondary storage 324), flash drive, ROM 326, RAM 328, or the network connectivity devices 332. While only one processor 322 is shown, multiple processors may be present. Thus, while instructions may be discussed as executed by a processor, the instructions may be executed simultaneously, serially, or otherwise executed by one or multiple processors.

[0093] It is understood that by programming and/or loading executable instructions onto the technical architecture 300, at least one of the CPU 322, the RAM 328, and the ROM 326 are changed, transforming the technical architecture 300 in part into a specific purpose machine or apparatus having the novel functionality taught by the present disclosure. It is fundamental to the electrical engineering and software engineering arts that functionality that can be implemented by loading executable software into a computer can be converted to a hardware implementation by well-known design rules.

[0094] Although the technical architecture 300 is described with reference to a computer, it should be appreciated that the technical architecture may be formed by two or more computers in communication with each other that collaborate to perform a task. For example, but not by way of limitation, an application may be partitioned in such a way as to permit concurrent and/or parallel processing of the instructions of the application. Alternatively, the data processed by the application may be partitioned in such a way as to permit concurrent and/or parallel processing of different portions of a data set by the two or more computers. In an embodiment, virtualization software may be employed by the technical architecture 300 to provide the functionality of a number of servers that is not directly bound to the number of computers in the technical architecture 300. In an embodiment, the functionality disclosed above may be provided by executing the application and/or applications in a cloud computing environment. Cloud computing may comprise providing computing services via a network connection using dynamically scalable computing resources. A cloud computing environment may be established by an enterprise and/or may be hired on an as-needed basis from a third party provider.

[0095] Whilst the foregoing description has described exemplary embodiments, it will be understood by those skilled in the art that many variations of the embodiments can be made in accordance with the appended claims.

Claims

1. A data processing system for managing multiple payment card accounts, the data processing system comprising:

a computer processor and a data storage device, the data storage device storing instructions operative by the processor to:

receive an account management request message from a user device, the account management request message comprising an indication of an account management operation and an indication of at least a first payment card and a second payment card;

determine a first payment network associated with the first payment card;

determine a second payment network associated with the second payment card;

generate a first request message comprising an indication of the account management operation and an indication of the first payment card;

generate a second request message comprising an indication of the account management operation and an indication of the second payment card;

send the first request message over the first payment network;

send the second request message over the second payment network;

receive a first request message response from the first payment network;

receive a second request message response from the second payment network;

generate an account management operation response using the first request response message and the second request response message; and

provide the account management operation response to the user device.

2. A data processing system according to claim 1, wherein the account management operation is a request to hot list payment cards, and wherein the first response message comprises an indication that the first payment card has been successfully added to a hot list and the second response message comprises an indication that the second payment card has been successfully added to a hot list.

3. A data processing system according to claim 1, wherein the account management operation is a balance enquiry, and wherein the first response message comprises an indication of a balance associated with the first payment card and the second response message comprises an indication of a balance associated with the second payment card.

4. A data processing system according to claim 3, wherein the account management operation response comprises an indication of an aggregate balance of at least the first card and the second payment card.

5. A data processing system according to any preceding claim further comprising storage for a routing table, the routing table comprising mappings between parts of payment card identifiers and payment networks.

6. A data processing system according to any preceding claim wherein the first request message and / or the second request message are formatted according to the ISO 8583 standard.

7. A data processing device for managing multiple payment card accounts, the data processing device comprising:

a computer processor and a data storage device, the data storage device storing instructions operative by the processor to:

receive a user input, the user input indicating an account management operation and at least a first payment card and a second payment card;

generate an account management request message, the account management request message comprising an indication of the account management operation and an indication of the first payment card and the second payment card;

send the account management request message to an account management server;

receive an account management operation response message from the account management server; and

provide an indication of the account management operation response to the user.

8. A data processing device according to claim 7, wherein the account management operation is a request to hot list payment cards, and wherein the account management operation response comprises an indication that the first payment card and the second payment card have been successfully added to respective hot lists.

9. A data processing device according to claim 7, wherein the account management operation is a balance enquiry, and wherein the account management operation response comprises an indication of an aggregate balance of at least the first card and the second payment card.

10. A data processing device according to claim 7, wherein the account management operation is a balance enquiry, and wherein the account management operation

response comprises an indication of a balance associated with the first payment card and an indication of a balance associated with the second payment card and wherein the indication of the account management response comprises an aggregate balance of at least the first card and the second payment card.

11. A data processing method for managing multiple payment card accounts, the method comprising:

receiving an account management request message from a user device, the account management request message comprising an indication of an account management operation and an indication of at least a first payment card and a second payment card;

determining a first payment network associated with the first payment card;

determining a second payment network associated with the second payment card;

generating a first request message comprising an indication of the account management operation and an indication of the first payment card;

generating a second request message comprising an indication of the account management operation and an indication of the second payment card;

sending the first request message over the first payment network;

sending the second request message over the second payment network;

receiving a first request message response from the first payment network;

receiving a second request message response from the second payment network;

generating an account management operation response using the first request response message and the second request response message; and

providing the account management operation response to the user device.

12. A data processing method according to claim 11, wherein the account management operation is a request to hot list payment cards, and wherein the first response message comprises an indication that the first payment card has been successfully added to a hot list and the second response message comprises an indication that the second payment card has been successfully added to a hot list.

13. A data processing method according to claim 11, wherein the account management operation is a balance enquiry, and wherein the first response message comprises an indication of a balance associated with the first payment card and the second response message comprises an indication of a balance associated with the second payment card.

14. A data processing method according to claim 13, wherein generating an account management response comprises calculating an aggregate balance of at least the first card and the second payment card.

15. A data processing method according to any one of claims 11 to 14 wherein determining the first payment network and / or determining the second payment network comprises using parts of payment card identifiers to look up respective payment networks in a routing table, the routing table comprising mappings between parts of payment card identifiers and payment networks.

16. A data processing method according to any one of claims 11 to 15, wherein the first request message and / or the second request message are formatted according to the ISO 8583 standard.

17. A data processing method in a user device for managing multiple payment card accounts, the method comprising:

receiving a user input, the user input indicating an account management operation and at least a first payment card and a second payment card;

generating an account management request message, the account management request message comprising an indication of the account management operation and an indication of the first payment card and the second payment card;

sending the account management request message to an account management server;

receiving an account management operation response message from the account management server; and

providing an indication of the account management operation response to the user.

18. A data processing method according to claim 17, wherein the the account management operation is a request to hot list payment cards, and wherein the account management operation response comprises an indication that the first payment card and the second payment card have been successfully added to respective hot lists.

19. A data processing method according to claim 17, wherein the the account management operation is a balance enquiry, and wherein the account management operation response comprises an indication of an aggregate balance of at least the first card and the second payment card.

20. A data processing method according to claim 17, wherein the the account management operation is a balance enquiry, and wherein the account management operation response comprises an indication of a balance associated with the first payment card and an indication of a balance associated with the second payment card and wherein the indication of the account management response comprises an aggregate balance of at least the first card and the second payment card.

21. A non-transitory computer readable medium carrying computer executable instructions which when executed on at least one processor cause the at least one processor to carry out a method according to any one of claims 11 to 20.