A system and method for processing off-line mobile payment transactions, when the mobile device is not connected to the data network, is described. The system comprises a mobile device 3 having a mobile wallet module 11 for initiating payment transactions from a mobile payment account associated with a payment service provider and operable to communicate with the payment service provider via a data network to settle the payment transaction. The mobile device 3 is adapted to enable a user to initiate an off-line payment transaction when the mobile device is not connected to the data network 9, and wherein the mobile device 3 is operable to communicate details of the off-line payment transaction to the payment service provider 5 when the mobile device 3 is re-connected to the data network 9. The mobile device 3 may comprise an offline credit limit 21 associated with a predefined funding account.
Mobile Handset “ON-LINE”

START

Download mobile wallet payment application

Receive user input of payment details

Receive authorisation of off-line credit limit

Download details of available vouchers from deal engine

Goes “on-line”

Transmit details of all off-line payments to payment service provider

Payment service provider processes payment and informs deal engine of voucher purchase

Receive and inform user of final confirmation of voucher purchase

END

Mobile Handset “OFF-LINE”

Receive user input to purchase an available voucher

Sufficient off-line credit?

YES

Inform user that off-line transaction not allowed

NO

Store details of off-line payment

Store voucher as purchased

Inform user that off-line transaction complete but awaiting confirmation of payment

FIG. 2
Mobile Wallet Payment System

Field of the Invention

[0001] This invention relates to a payment transaction processing and management system, and particularly to a system facilitating payment transactions from an electronic wallet associated with a mobile handset.

Background of the Invention

[0002] Conventional mobile wallet payment transaction systems are generally known, in which a mobile handset is provisioned with a wallet application for processing and management of secure payment transactions with a payment service provider. However, conventional mobile wallet payment transaction systems typically require the mobile device to be “on-line” and connected to the payment service provider via a data network, such as a cellular, wireless or Wi-Fi (RTM) data network, in order to request, authorize, verify, process and confirm a payment transaction. Typically, when mobile handsets go “off-line” and are disconnected from the data network, then the payment capability of the mobile wallet application is disabled.

[0003] What is desired is a payment transaction system that facilitates greater flexibility during a payment transaction process without requiring the mobile handset to be on-line and connected to a data network in order to initiate a transaction.

Statements of the Invention

[0004] Aspects of the present invention are set out in the accompanying claims.

[0005] According to one aspect of the present invention, there is provided a system for processing mobile payment transactions comprising a mobile device configured as a mobile wallet and operable to communicate with a payment service provider via a data network, wherein said mobile device is adapted to enable a user to initiate a payment transaction when the mobile device is “off-line” and not connected to the data network, and wherein the mobile device is operable to communicate details of the payment
transaction to the payment service provider when the mobile device is re-connected to the data network.

[0006] The mobile device may automatically download details of one or more offers or pre-paid vouchers from a deal engine when the mobile device is connected to the data network. The user may then select one or more downloaded offers or pre-paid vouchers to purchase when the mobile device loses connection to, or otherwise becomes disconnected from, the data network.

[0007] The mobile device may automatically transmit details of all off-line payment transactions to associated payment service providers once the mobile device is re-connected to a data network.

[0008] The mobile device may be configured with an off-line credit limit associated with a predefined funding account.

[0009] In another aspect, the present invention provides a method of processing mobile payment transactions by a mobile wallet module of a mobile handset, comprising computer-implemented processing steps of receiving user input to initiate a payment transaction when the mobile device is not connected to a data network, and communicating details of the payment transaction to a payment service provider when the mobile device is connected to a data network.

[0010] In yet another aspect, there is provided a computer program arranged to carry out the above method when executed by a programmable device.

Brief Description of the Drawings

[0011] There now follows, by way of example only, a detailed description of embodiments of the present invention, with references to the figures identified below.

[0012] Figure 1 is a block diagram showing the main components of a payment transaction system according to an embodiment of the invention.

[0013] Figure 2 is a flow diagram illustrating the main processing steps performed by the system of Figure 1 according to an embodiment.
Detailed Description of Embodiments of the Invention

Overview

[0014] Referring to Figure 1, there is illustrated a functional block diagram of a mobile payment transaction system 1 for implementing an “off-line” mobile payment transaction between a mobile handset 3, a payment service provider 5 and a deal engine 7 according to an embodiment of the present invention. The deal engine 7 provides details of available vouchers that can be purchased through the user’s mobile handset 3 to obtain a defined benefit at a merchant, and processes user access to the vouchers for pre-purchase (i.e. prior to redemption or claiming of the associated benefit). The vouchers can be coupons, offers, tickets, or the like and the associated benefits can be a monetary discount or reward. The deal engine also provides merchants with a voucher offer publishing, distribution and redemption service for free vouchers or vouchers for purchase. The deal engine can be provided as an on-line service of a type that is known per se, and need not be described further.

[0015] The mobile handset 3 communicates electronically with the payment service provider 5 and the deal engine 7 via a data network 9, to receive and pre-purchase vouchers from the deal engine 7. The data network 5 may be any suitable data communication network such as a wireless network, a local- or wide-area network including a corporate intranet or the Internet, using for example the TCP/IP protocol, or a cellular communication network such as GPRS, EDGE or 3G, for example. Such communication protocols are of a type that are known per se in data networks and need not be described further.

[0016] The mobile handset 3 includes a mobile wallet module 11 that communicates with the payment service provider 5 and the deal engine 7 through a network interface 23. The mobile wallet module 11 is issued by the payment service provider 5, such as an ID card provider, credit card issuer or bank, which is responsible for authorizing and settling the payment of funds for service or products purchased by the user of the mobile handset 3 from the deal engine 7. The mobile wallet module 11 can be provided as application software running on the handset operating system 13. The mobile wallet module 11 can download and store details of vouchers 25 from the deal engine 7 when
the mobile handset 3 is on-line and connected to the data network 9. The mobile wallet module 11 also stores details of vouchers 27 that have been purchased by the user, even when the mobile handset 3 is off-line and not connected to the data network 9, as will be described below.

[0017] The mobile wallet modules 11 accesses a secure memory 15 of the mobile handset 3 storing mobile wallet secure data 17 including payment account data for one or more mobile payment accounts that have been set up on the mobile handset 3. The payment account data can include data identifying a user’s account at a payment service provider 5 from which funds can be transferred to a bank associated with the deal engine 7 to complete a transaction via a payment scheme network 19. The payment account data also includes data defining an off-line credit limit 21, that is a predetermined and pre-authorised maximum amount of funds that the mobile wallet module 11 is allowed to use to complete purchase of vouchers or the like when the mobile handset 3 is off-line and not connected to the data network 9.

[0018] The payment account data can additionally include data defining an amount of pre-paid funds that are available through the mobile wallet module 11. In this way, the mobile wallet can include a payment account linked to multiple funding sources, such as a pre-paid account, deposit account and/or credit account. As an alternative, the electronic wallet can include a plurality of mobile payment accounts, each linked to a respective funding source.

[0019] The secure memory 15 may for example be a Universal Integrated Circuit Card (UICC) secure element, any other secure memory configuration, such as an embedded secure element chip, or as part of a peripheral accessory device to the mobile handset 3, such as a micro Secure Digital card - otherwise known as a micro SD card, as are known in the art. Other forms of mobile handset software and/or hardware can be implemented to provide built-in secure electronic wallet functionality for accessing the secure memory 15, including encryption and decryption of the mobile wallet secure data 17, as necessary. The mobile handset 3 can be configured with built-in functionality providing access to the secure memory 15 on the Subscriber Identity Module (SIM) card in the mobile handset 3.
It will be appreciated that the mobile handset 3 may include additional components included in commonly known mobile handsets, such as a user input interface, a display, a microphone, an earpiece speaker, a camera and controller, and/or a GPS receiver etc., which are not shown for clarity.

Off-line Payment Transaction Process

Referring now to Figure 2, there is illustrated a flow diagram describing a computer-implemented payment transaction process of the present embodiment, using the mobile handset 3 in intermittent communication with the payment service provider 5 via the data network 7.

The process begins at step S2-1 where the mobile handset 3 is on-line and connected to the data network 9 and downloads the mobile wallet module 13 that is issued by the payment service provider 5. When the user first downloads the mobile wallet module 11, they are required to provide payment details such as a credit or debit card in order to register a mobile payment account with the payment service provider 5. Therefore, at step S2-3, the mobile handset 3 receives user input of the payment details and communicates with the payment service provider 5 to establish the mobile payment account. In this embodiment, the payment service provider 5 automatically pre-authorises and defines an off-line credit limit 21 for the mobile payment account. The authorized off-line credit limit is received by the mobile wallet module 11 at step S2-5 and stored in the mobile wallet secure data 17.

The credit limit can be periodically and automatically reviewed and updated without user intervention. During use, when the mobile wallet module 11 determines that the off-line credit limit has been reached or exceeded, or that the provided payment details have expired, then the user can be prompted to provide a new payment method whilst on-line.

At step S2-7, the mobile handset 3 downloads details of available vouchers from the deal engine 7 via the data network 9. It will be appreciated that details of available vouchers for deals can be automatically downloaded by the mobile wallet module 11 when an on-line data connection is available, for example as a background task of the
module, to ensure that a list of active deals is available for browsing and purchase when the mobile handset 3 is off-line.

[0025] This is illustrated in Figure 2 after step S2-7, where the mobile handset 3 goes off-line and is disconnected from the data network 9. It will be appreciated that the mobile handset 3 can go off-line when it is out of range of a cellular, wireless or Wi-Fi (RTM) signal. When off-line, the mobile wallet module 11 is not able to communicate with the payment service provider 5 nor the deal engine 7. However, in this embodiment, the user is able to browse and purchase downloaded vouchers 25 that are stored in the mobile wallet module 11 while the mobile handset 3 is off-line. Accordingly, at step S2-9, the mobile wallet module 11 receives user input to purchase one or more available downloaded vouchers 25. This can involve the user browsing a list of the downloaded vouchers 25 and selecting a desired offer that require pre-purchase before the voucher can be presented to a merchant to claim the associated benefit. The mobile wallet module 11 can be configured to restrict the ability to buy specific types of vouchers off-line based on pre-defined rules and criteria, such as vouchers which have a maximum number available for sale.

[0026] The mobile wallet module 11 may prompt the user to confirm that payment for the voucher should be taken using the stored payment card credentials. At step S2-11, the mobile wallet module 11 determines whether the user has sufficient pre-authorised off-line credit to complete the purchase of the selected voucher. This can be determined by comparing the total purchase amount of all off-line transactions since the mobile handset 3 was last on-line, and checking that the total amount with the amount for the selected voucher does not exceed the pre-authorised off-line credit limit 21. Alternatively, the stored off-line credit limit 21 can be updated with each successful off-line transaction to enable a comparison of the purchase amount to the remaining available off-line credit.

[0027] When the mobile wallet module 11 determines that the purchase amount for the selected voucher exceeds the off-line credit limit 21, then at step S2-13, the user is informed that the off-line transaction is not allowed and processing returns to step S2-9 where the user can select another offer to purchase while the mobile handset 3 remains off-line. On the other hand, when the mobile wallet module 11 determines that there is
sufficient off-line credit to complete the transaction, then at step S2-15, details of the off-line payment for the selected voucher are stored in the mobile wallet secure data 17. The off-line payment details can include data identifying the payer account and the payee account, and a unique voucher identifier and the quantity purchased. The purchase payment details are stored within the secure memory 15. The purchased voucher 27 is stored by the mobile wallet module 11 at step S2-17. It will be appreciated that the downloaded and purchased vouchers can be stored together and distinguishable by associated data identifying the purchase state of the voucher.

[0027] Once off-line payment details have been stored for the purchased voucher 27, then at step S2-19, the mobile wallet module 11 outputs an initial confirmation to inform the user that the off-line transaction is complete but is awaiting confirmation of actual transfer of funds from the payment service provider 5 to the deal engine 7 or its associated payment service provider. It will be appreciated that at this stage, the off-line purchase of a downloaded voucher has been completed by the mobile wallet module 11 and the user is able to select another voucher to purchase while the mobile handset 3 remains off-line, as described in steps S2-9 to S2-19 above.

[0029] When the mobile handset 3 is reconnected to the data network 9 and goes on-line, then at step S2-21, the mobile wallet module 11 retrieves the details of all off-line payments that have been stored in the secure memory 15 while the mobile handset 3 was off-line. It will be appreciated that the mobile handset operating system 13 typically monitors for and determines when a data network 9 is available and handles re-connection to the data network 9. Once the mobile handset 3 is connected and on-line, the retrieved off-line payment details are transmitted by the mobile wallet module 11 to the payment service provider 5 associated with the pre-authorised off-line credit.

At step S2-23, the payment service provider 5 processes the received payment details to effect the actual transfer of funds for the purchased vouchers to the payment service provider associated with the deal engine 7. The payment service provider 5 then transmits details of the vouchers that were purchased off-line to the deal engine 7 and transmits a message with data indicating final confirmation of the voucher purchases to the mobile handset 3. At step S2-25, the mobile wallet module 11 receives the message
from the payment service provider 5 and outputs final confirmation of the purchased vouchers to the user.

Advantages

A number of advantages will be understood from the above description of an embodiment of the present invention.

In particular, the embodiment enables customers of a web site such as a daily deal site to pre-purchase offers and pre-paid vouchers in a mobile application of a device, without the need for the device to be on-line at the time of the transaction. The purchase of a pre-paid voucher can be completed within the mobile application without the need to have a real-time data connection to the payment service provider. This advantageously enables customers to never miss out on an offer due to lack of data network connectivity, particularly when a voucher or offer is time sensitive with an impending time limit or purchase deadline.

Additionally, details of available vouchers for deals can be automatically downloaded in the background to the application when an on-line data connection is available to ensure that a list of active deals is available when the device is off-line. The details of the voucher payment can be automatically passed to the payment service provider and details of the purchased voucher will be passed to the deal site or provider when the mobile device is next on-line.

Alternative Embodiments

It will be understood that embodiments of the present invention are described herein by way of example only, and that various changes and modifications may be made without departing from the scope of the invention.

For example, in the embodiments described above, the mobile wallet module is arranged to download vouchers from a deal engine, and the downloaded vouchers can be purchased by a user when the mobile handset is off-line. It will be appreciated that the off-line purchase processing by the mobile wallet module can be adapted to enable users to perform off-line remote payments for any other form of purchasable entity that is stored on the mobile handset.
[0035] As a further modification, while on-line, the mobile handset can be configured to download data defining a merchant web site that is activated for off-line purchasing. This will include a pre-loaded merchant site and payment functionality to enable purchases to be completed by the mobile handset when off-line. Merchant off-line sites can be periodically refreshed and updated when the mobile handset is on-line. If the mobile handset has been off-line for an extended period of time, then remote off-line purchasing can be disabled to avoid customers completing purchases for entities that are no longer available or have been re-priced. After pre-loading the merchant site, a customer is therefore able to initiate a purchase journey through the pre-loaded merchant site even when the mobile handset is off-line. The customer is also able to complete a purchase journey if the connection to the data network is lost. On completion of an off-line purchase through the pre-loaded merchant site, details of the off-line payment are stored by the mobile handset and transmitted to the payment service provider when the mobile handset is re-connected to the data network, as in the embodiment described above.

[0036] In the embodiment described above, the mobile device stores the mobile wallet module (also referred to as an application, computer program or software) in memory, which when executed, enable the mobile handset to implement embodiments of the present invention as discussed herein. As those skilled in the art will appreciate, the software may be stored in a computer program product and loaded into the mobile handset using any known instrument, such as removable storage disk or drive, hard disk drive, or communication interface, to provide some examples.

[0037] Alternative embodiments may be envisaged, which nevertheless fall within the scope of the following claims.
CLAIMS

1. A system for processing mobile payment transactions comprising a mobile device having a mobile wallet module for initiating payment transactions from a mobile payment account associated with a payment service provider and operable to communicate with the payment service provider via a data network to settle the payment transaction, wherein said mobile device is adapted to enable a user to initiate an off-line payment transaction when the mobile device is not connected to the data network, and wherein the mobile device is operable to communicate details of the off-line payment transaction to the payment service provider when the mobile device is re-connected to the data network.

2. The system of claim 1, wherein the mobile device is operable to download details of one or more purchasable entities from a remote database when the mobile device is connected to the data network.

3. The system of claim 2, wherein the mobile device comprises an off-line credit limit associated with a predefined funding account.

4. The system of claim 3, wherein the mobile device is operable to check that a user-initiated off-line payment transaction does not exceed the off-line credit limit.

5. The system of claim 4, wherein the mobile wallet module is operable to store a downloaded entity as a purchased entity after the off-line credit limit check and before the mobile device is re-connected to the data network.

6. The system of any preceding claim, wherein the payment service provider is operable to settle the off-line payment transaction in response to receipt of the details and to communicate confirmation of the settled transaction to the mobile device.
7. The system of any preceding claim, wherein the mobile device is operable to receive user input to initiate a plurality of off-line payment transactions and to automatically transmit details of all off-line payment transactions to associated payment service providers when the mobile device is re-connected to a data network.

8. The system of any preceding claim, wherein the mobile device stores data identifying a plurality of mobile payment accounts associated with the mobile wallet module.

9. The system of any preceding claim, wherein the mobile device comprises a secure memory for storing data associated with the mobile wallet module.

10. A method of processing payment transactions by a mobile wallet module in a mobile device, the method comprising initiating an off-line payment transaction when the mobile device is not connected to the data network, and communicating details of the off-line payment transaction to the payment service provider when the mobile device is re-connected to the data network.

11. The method of claim 10, wherein the mobile wallet module stores data defining an amount of stored funds that is available for said off-line payment transaction.

12. The system of claim 11, wherein the mobile device checks that a user-initiated off-line payment transaction does not exceed the amount of stored funds that is available for said off-line payment transaction.

13. The method of claim 12, wherein the mobile wallet module completes the off-line payment transaction using the stored funds when the mobile device is not connected to the data network.
14. The method of claim 13, further comprising downloading details of one or more purchasable entities from a remote database when the mobile device is connected to the data network.

15. The method of claim 14, further comprising storing a downloaded entity as a purchased entity after checking the available stored funds and before the mobile device is re-connected to the data network.

16. The system of one of claims 10 to 15, further comprising the payment service provider settling the off-line payment transaction in response to receiving the off-line payment transaction details and communicating confirmation of the settled transaction to the mobile device.

17. The system of any one of claims 10 to 16, further comprising the mobile handset receiving user input to initiate a plurality of off-line payment transactions and automatically transmitting details of all off-line payment transactions to associated payment service providers when the mobile device is re-connected to a data network.

18. A mobile handset substantially as hereinbefore described with reference to, or as illustrated in Figure 1 of the accompanying drawings.

19. An off-line payment processing system substantially as hereinbefore described with reference to, or as illustrated in Figure 1 of the accompanying drawings.

20. A method of processing payment transactions substantially as hereinbefore described with reference to, or as illustrated in Figure 2 of the accompanying drawings.
**Patents Act 1977: Search Report under Section 17**

**Documents considered to be relevant:**

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<th>Relevant to claims</th>
<th>Identity of document and passage or figure of particular relevance</th>
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<td>WO 2008/075143 A1 (FUNDAMO PROPRIETARY LTD) see e.g. page 7 lines 1-6&amp;19-25 and page 8 lines 18-22</td>
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- X: Document indicating lack of novelty or inventive step
- Y: Document indicating lack of inventive step if combined with one or more other documents of the same category
- &: Member of the same patent family
- A: Document indicating technological background and/or state of the art.
- P: Document published on or after the declared priority date but before the filing date of this invention.
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**Field of Search:**

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC:

**International Classification:**

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