Switch for routing payment instruction

FIELD OF INVENTION

[0001] The present invention relates broadly, but not exclusively, to a switch that facilitates push or pull payment modes when electronic payment is used.

BACKGROUND

[0002] Although the QR (Quick Response) code was first designed for the automotive industry in Japan, its use has spread to electronic payment. This is done by configuring a data specification for QR codes for compatibility with payment scheme networks that support such electronic payments.

[0003] Several merchants deploy their own QR code format for push or pull payments. As such, there are multiple standards which have to be considered when designing a QR code for electronic payment. This is highly undesirable for merchants, acquirers and consumers and presents an impediment for the adoption of QR codes. Ideally, the consumer should only be concerned with selecting a funding source and not worry whether a push or pull payment is being effected.

[0004] According to Scanbuy's Mobile Barcode Trend Q4 2014 Report, there was a year-on-year 20% growth on usage of its software to scan QR codes. There is thus a need to tap into this growth trend by improving how QR codes, or alternative forms of optical code, are processed.

SUMMARY

[0005] According to a first aspect of the present invention, there is provided a payment facilitator switch configured to route a payment instruction determining a flow of funds, the payment facilitator switch comprising: an input port; a processor; and at least one memory including computer program code; the at least one memory and the computer program code configured to, with the at least one processor, cause the payment facilitator switch at least to: receive, through the input port, payment facilitation data generated from a purchase made at a merchant; receive, through the input port, details of a funding source selected to pay for the purchase;

generate the payment instruction in response to receipt of the payment facilitation data; and route the payment instruction to either an issuer or an acquirer, depending on the selected funding source and analysis of the payment facilitation data, the issuer being a bank for the funding source and the acquirer being a bank for the merchant, wherein routing of the payment instruction to the issuer causes pushing of funds from the issuer to the acquirer and routing of the payment instruction to the acquirer causes pulling of funds from the issuer to the acquirer.

[0006] According to a second aspect of the present invention, there is provided a method for routing payment instruction determining a flow of funds, the method comprising: receiving payment facilitation data generated from a purchase made at a merchant; receiving details of a funding source selected to pay for the purchase; generating the payment instruction in response to receipt of the payment facilitation data; and routing the payment instruction to either an issuer or an acquirer, depending on the selected funding source and analysis of the payment facilitation data, the issuer being a bank for the funding source and the acquirer being a bank for the merchant, wherein routing of the payment instruction to the issuer causes pushing of funds from the issuer to the acquirer and routing of the payment instruction to the acquirer causes pulling of funds from the issuer to the acquirer.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] Embodiments of the invention will be better understood and readily apparent to one of ordinary skill in the art from the following written description, by way of example only, and in conjunction with the drawings, in which:

[0008] Figure 1 illustrates a sequence flow when push payment occurs in a system having a payment facilitator switch in accordance with one embodiment of the invention.

[0009] Figure 2 illustrates a sequence flow when pull payment occurs in a system having a payment facilitator switch in accordance with one embodiment of the invention.

[0010] Figure 3 shows a schematic of a computing device used to realise the payment facilitator switch shown in Figures 1 and 2.

[0011] Figure 4 shows a method for routing payment instruction determining a flow of funds.

DETAILED DESCRIPTION

[0012] Embodiments of the present invention will be described, by way of example only, with reference to the drawings. Like reference numerals and characters in the drawings refer to like elements or equivalents.

[0013] Some portions of the description which follows are explicitly or implicitly presented in terms of algorithms and functional or symbolic representations of operations on data within a computer memory. These algorithmic descriptions and functional or symbolic representations are the means used by those skilled in the data processing arts to convey most effectively the substance of their work to others skilled in the art. An algorithm is here, and generally, conceived to be a self-consistent sequence of steps leading to a desired result. The steps are those requiring physical manipulations of physical quantities, such as electrical, magnetic or optical signals capable of being stored, transferred, combined, compared, and otherwise manipulated.

[0014] Unless specifically stated otherwise, and as apparent from the following, it will be appreciated that throughout the present specification, discussions utilizing terms such as “scanning”, “calculating”, “determining”, “replacing”, “generating”, “initializing”, “outputting”, or the like, refer to the action and processes of a computer system, or similar electronic device, that manipulates and transforms data represented as physical quantities within the computer system into other data similarly represented as physical quantities within the computer system or other information storage, transmission or display devices.

[0015] The present specification also discloses apparatus for performing the operations of the methods. Such apparatus may be specially constructed for the required purposes, or may comprise a computer or other device selectively activated or reconfigured by a computer program stored in the computer. The algorithms and displays presented herein are not inherently related to any particular computer or other apparatus. Various machines may be used with programs in accordance with the teachings herein. Alternatively, the construction of more specialized apparatus to

perform the required method steps may be appropriate. The structure of a conventional computer will appear from the description below.

[0016] In addition, the present specification also implicitly discloses a computer program, in that it would be apparent to the person skilled in the art that the individual steps of the method described herein may be put into effect by computer code. The computer program is not intended to be limited to any particular programming language and implementation thereof. It will be appreciated that a variety of programming languages and coding thereof may be used to implement the teachings of the disclosure contained herein. Moreover, the computer program is not intended to be limited to any particular control flow. There are many other variants of the computer program, which can use different control flows without departing from the spirit or scope of the invention.

[0017] Furthermore, one or more of the steps of the computer program may be performed in parallel rather than sequentially. Such a computer program may be stored on any computer readable medium. The computer readable medium may include storage devices such as magnetic or optical disks, memory chips, or other storage devices suitable for interfacing with a computer. The computer readable medium may also include a hard-wired medium such as exemplified in the Internet system, or wireless medium such as exemplified in the GSM mobile telephone system. The computer program when loaded and executed on such a general-purpose computer effectively results in an apparatus that implements the steps of the preferred method.

[0018] Figures 1 and 2 each show a system 100 having the following components: a payment facilitator switch 102, an issuer 104, a network switch 106, an acquirer 108, a merchant 110 and a mobile terminal 112.

[0019] The system 100 enables push or pull payment modes when electronic payment occurs at the merchant 110, the electronic payment involving the parties of the issuer 104 (the bank that holds the source of the funds for the electronic payment) and the acquirer 108 (the bank that the merchant 110 uses to accept the funds from the issuer 104). A push payment mode refers to a scenario where the issuer 104 directly receives an instruction to make payment to the acquirer 108, i.e. funds are pushed or flow from the issuer 104 to the acquirer 108. A pull payment mode refers to a scenario where the acquirer 108 receives an instruction to obtain payment from the issuer 104, i.e. funds are pulled or flow from the acquirer 108 to

the issuer 104. In the context of the present disclosure, these instructions which determine a flow of funds are called payment instructions. Funds from sources like a debit card account and a bank account are typically obtained using push payment, while funds from sources like a credit card account are typically obtained using pull payment. However, depending on the payment scheme used to obtain the funds from these funding sources, a pull payment may be used when the funding source is a debit card account or a bank account, while a push payment may be used when the funding source is a credit card account.

[0020] The payment facilitator switch 102 is realised by one or more computer devices that is configured to perform the routing of such payment instructions, i.e. the payment facilitator switch 102 will transmit the payment instructions to the appropriate receiver, either directly or through one or more routers, when it is determined that a facilitated electronic payment uses a push payment mode or a pull payment mode. However, payment facilitation data needs to be received, through for example an input port of the payment facilitator switch 102, before routing of the payment instruction can occur.

[0021] Payment facilitation data refers to data that is used by one or more of the payment facilitator switch 102, the issuer 104, the network switch 106, the acquirer 108 and the merchant 110 to achieve the objective of the merchant 110 being paid for the purchase. The payment facilitation data is generated from a purchase made at the merchant 110.

[0022] The payment facilitation data may include purchase transaction details like a total cost of the purchase and a receipt number or transaction identifier for the purchase. The payment facilitation data may also include a merchant identifier of the merchant 110 from which the purchase is made, the merchant identifier allowing identification of the acquirer 108 which serves as a bank or funds receiver of electronic payment for purchases made at the merchant 110. The payment facilitation data may also include further details like the location of the merchant 110 and a timestamp of the purchase. In one implementation, an application in the mobile terminal 112 generates the payment facilitation data from the mobile terminal 112 by decoding it from an optical coderead during the purchase made at the merchant 110, whereby the application will then transmit the payment facilitation data to the payment facilitator switch 102. The optical code (which may be in QR, quick response, format) may include data elements, which when

processed by the mobile terminal 112 and/or the payment facilitator switch 102, is part of the information that the mobile terminal 112 and/or the payment facilitator switch 102 requires to determine which instruction set, effecting pull or push payment modes, is executed first. The sequence in relation to which payment mode instruction set is first executed may be stored in a priority list, which is interrogated when the mobile terminal 112 and/or the payment facilitator switch 102 receives the barcode data. The payment facilitator switch 102 receives the payment facilitation data from the mobile terminal 112. Thus, while the payment facilitation data originates from the merchant 110, it is not the merchant 110 that transmits the payment facilitation data to the payment facilitator switch 102, but rather the mobile terminal 112 during, for example, a data exchange sequence between the mobile terminal 112 and the payment facilitator switch 102 to complete the financial transaction.

[0023] Upon receipt of the payment facilitation data, the payment facilitator switch 102 performs several functions. The payment facilitator switch 102 verifies the authenticity of the payment facilitation data and performs transaction forwarding to either the acquirer 108 or the issuer 104. Transaction forwarding is described first, followed by payment facilitation data authentication.

[0024] The following occurs when the payment facilitator switch 102 performs the function of transaction forwarding. The payment facilitator switch 102 generates the payment instruction after receiving, through its input port, the payment facilitation data generated from a purchase made at the merchant 110. Given that the payment instruction is generated only after the payment facilitation data is received, the payment instruction and the payment facilitation data are thus two separate data sets. Before the payment instruction can be routed, the payment facilitator switch 102 needs to be aware of the funding source used to pay for the purchase. Therefore, the payment facilitator switch 102 receives, through its input port, details of a funding source selected to pay for the purchase. Similar to the payment facilitation data, the selected funding source is received from the mobile terminal 112, for example during the above data exchange sequence where the payment facilitation data is transmitted to the payment facilitator switch 102. The funding source may be selected at the time of purchase. Alternatively, the selected funding source may be selected before the purchase, so that the selected funding source is automatically chosen when a purchase is made. The funding source may be selected from a plurality of funding source options stored in a digital wallet

application operating in the mobile terminal 112, whereby each of these funding sources is linked to a payment card. The linked payment cards may include credit, debit or stored value cards, for example.

[0025] The routing of the payment instruction to either the acquirer 108 or the issuer 104 depends on the selected funding source and analysis of the payment facilitation data. For instance, if the selected funding source is configured such that any drawn payment is effected by way of push payment and the payment facilitation data indicates that the merchant 110 uses a payment network that supports push payment, then the payment instruction is sent to the issuer 104. On the other hand, if the selected funding source is configured such that any drawn payment is effected by way of pull payment and the payment facilitation data indicates that the merchant 110 uses a payment network that supports pull payment, then the payment instruction is sent to the acquirer 108. Given that the selected funding source may have access to one or more payment networks that the issuer 104 uses, the routing of the payment instruction may also depend on whether the merchant 110 payment network is supported by the selected funding source.

[0026] For example, in a first implementation, the payment facilitator switch 102 decides or determines to which of the issuer 104 or the acquirer 108 the payment instruction is sent. In this first implementation, analysis of both the selected funding source and the payment facilitation data to determine whether a push or a pull payment mode is to be effected, along with the decision as to which of the issuer 104 or the acquirer 108 the payment instruction is sent, are all done by the payment facilitator switch 102.

[0027] In an alternative implementation, an application in the mobile terminal 112 determines to which of the issuer 104 or the acquirer 108 the payment instruction is sent. The payment facilitator switch 102 will receive, through its input port, a command indicating to which of the issuer or the acquirer the payment instruction is sent. This command may be sent by the application in the mobile terminal 112. Also, in contrast to the first implementation, the analysis of both the selected funding source and the payment facilitation data to determine whether a push or a pull payment mode is to be effected is performed by the application in the mobile terminal 112. The payment facilitator switch 102 will route the payment instruction to the acquirer 108 if the command specifies that the pull payment mode is

selected; or route the payment instruction to the issuer 104 if the command specifies that the push payment mode is selected. The payment facilitator switch 102 provides standard interfaces (API's) for different mobile terminals 112 to request services, and for different issuers 104 and acquirers 108 to connect to the payment facilitator switch 102.

[0028] The following occurs when the payment facilitator switch 102 performs the function of payment facilitation data authentication. Such payment facilitation data authentication is generally done before the payment instruction is routed to either the issuer 104 or the acquirer 108. The authentication may be undertaken in response to a request from the mobile terminal 110, for example when the payment facilitation data is decoded from an optical code, such as a QR code, read by the mobile terminal 110. However, it will be appreciated that such authentication may also be performed for payment facilitation data that does not originate from an optical code.

[0029] As used herein, the term "optical code" refers to any optical, machine-readable representation of data. Optical codes may include linear barcodes, or matrix barcodes such as QR codes, Aztec codes (ISO/IEC 24778), CrontoSigns (as described in EP1959374, for example), Data Matrix codes (ISO/IEC 16022), EZcodes of ScanBuy, Inc., High Capacity Color Barcodes of Microsoft, Inc., and Han Xin barcodes.

[0030] In one scenario, the acquirer 108 may provide authentication data to the merchant 110 which is usable to verify the authenticity of the payment facilitation data. The payment facilitation data that originates from the merchant 110 may be populated with this authentication data. Upon receipt of the payment facilitation data, the payment facilitator switch 102 locates for the presence of the authentication data. The payment facilitator switch 102 will then send a request to the acquirer 108 to inquire that the the authentication data originated from the acquirer 108.

[0031] In another scenario, which may also be used together with the earlier scenario, the payment facilitator switch 102 may provide data that is used to verify the authenticity of the payment facilitator data. Such data may be a tokenized form of a merchant account number that can be used to receive the payment for the purchase, whereby this merchant account number corresponds to the merchant identifier of the merchant 110. The payment facilitator switch 102 will generate the tokenized data, which will be transmitted to the merchant 110. The tokenized data is included into

the payment facilitation data during generation of the payment facilitation data. When the payment facilitator switch 102 receives the payment facilitation data, the payment facilitator switch 102 will realise that the payment facilitation data contains tokenized data that is in a format recognised by the payment facilitator switch 102.

[0032] The issuer 104, the acquirer 108 and the network switch 106 can be understood as the main components of a four party model used by Visa® or MasterCard® to process a payment transaction made using their respective acceptance mark. The issuer 104 refers to a bank for the funding source and the acquirer 108 refers to a bank for the merchant 110. The network switch 106 routes information between the acquirer 108 and the issuer 104, to support the push or pull payment modes used in the system 100.

[0033] The merchant 110 is the party from which purchases are made. The merchant 110 may have a payment terminal which communicates payment facilitation data, generated in response to the purchases made at the merchant 110, to the mobile terminal 112. The payment facilitation data may be provided to the mobile terminal 112 as coded data. In one implementation, the coded data of the payment facilitation data is generated as an optical barcode, such as QR (quick response) format, where all the payment facilitation data is provided in a single QR image. Accordingly, the payment facilitation data originates from coded data in QR format. This QR code 114 is shown on a display screen in communication with the payment terminal. An image sensor of the mobile terminal 112, such as a camera, is used to capture the QR code 114. An application in the mobile terminal 112 is configured to decode the QR code 114 to obtain the payment facilitation data. The mobile terminal 112 application may then combine the payment facilitation data with stored data of the funding sources that provide the consumer's payment choices and credentials, and forward the combined data to the payment facilitator switch 102 as a payment request. The mobile terminal 112 application may also determine the payment facilitator switch 102 to which the coded data is to be sent, amongst a plurality of switches.

[0034] The mobile terminal 112 may be a smart phone with an advanced mobile operating system, such as iOS of Apple Inc. or Android of Google Inc. The operating system hosts one or more banking applications, developed for communicating with the payment terminal of the merchant 110 and the payment facilitator switch 102 to allow the payment facilitator switch 102 to route payment instructions. The one or more banking applications may include an optical code

reader and a digital wallet. The optical code reader application is responsible for reading the optically coded data (i.e. the QR code 114) that contains the payment facilitation data. The digital wallet application stores a plurality of funding source options from which the funding source to pay for the purchase made at the merchant 110 is selected. These funding source options may be one or more credit or debit cards stored in electronic form. In one implementation, the optical code reader application works in conjunction with the digital wallet application and activates the digital wallet application when the optical code reader application detects that the QR code 114 has been captured. Activation of the digital wallet application occurs so that the mobile terminal 112 can transmit the received payment facilitation data and details of the funding source selected to pay for the purchase. Alternatively, the digital wallet application may already have optical code reading functionality; or a customised application may be developed, which integrates both optical code reading and digital wallet functions, whereby the customised application is responsible for transmitting both the payment facilitation data and the details of the funding source. Upon receipt of the payment facilitation data and details of the selected funding source from the mobile terminal 112, the payment facilitator switch 102 may extract a subset of this data for inclusion into the payment instruction that the mobile terminal 112 generates for routing to either the issuer 104 or the acquirer 108. The extracted subset of data is to further facilitate payment of the purchase made at the merchant 110 and therefore may include purchase transaction details, like the total cost of the purchase at the merchant 110.

[0035] Figure 1 illustrates a sequence flow when push payment occurs in the system 100.

[0036] In step 1, a digital wallet application of the mobile terminal 112 is used to capture the QR code 114 that is generated by the merchant 110 after a purchase is made at the merchant 110. As mentioned above, this QR code 114 provides payment facilitation data details, which includes a merchant identifier that identifies the merchant 110 from which the purchase is made and transaction details of the purchase.

[0037] In a first implementation of step 2, the digital wallet application transmits the QR code 114 and details of a funding source selected to pay for the purchase made at the merchant 110 to the payment facilitator switch 102. In one implementation, the card number of the selected funding source is part of the details of the selected funding source. The payment facilitator switch 102 generates a payment instruction after receipt of the QR code. In the case of Figure 1, the payment

facilitator switch 102 recognises from the selected funding source details that push payment is supported. The payment facilitator switch 102 thus routes the payment instruction to the issuer 104 maintaining the selected funding source. The payment instruction may also be accompanied with transaction details of the payment made at the merchant 110 and the identity of the acquirer 108 which is used by the merchant 110.

[0038] In a second implementation of step 2, the digital wallet application decodes the QR code 114 to extract the merchant identifier and the purchase data and performs security and integrity checks to verify the authenticity of the extracted data. After verification, this extracted data is transmitted to the payment facilitator switch 102, along with an indication that push payment is to be effected. The payment facilitator switch 102 then routes the payment instruction to the issuer 104

[0039] In step 3, the issuer 104 determines that the selected funding source has enough funds to pay for the purchase. The issuer 104 then provides the identity of the acquirer 108 to the network switch 106, so that the network switch 106 can route the funds payment to the acquirer 108 in step 4.

[0040] In step 4, the acquirer 108 receives the funds and channels it to the merchant identity (MID) account, i.e. the account the merchant 110 has with the acquirer 108.

[0041] In step 5, the merchant 110 may receive a notification after the funds are successfully deposited into the MID account.

[0042] Figure 2 illustrates a sequence flow when pull payment occurs in the system 100.

[0043] Similar to Figure 1, in step 1 of Figure 2, a digital wallet application of the mobile terminal 112 is used to capture the QR code 114 that is generated by the merchant 110 after a purchase is made at the merchant 110. As mentioned above, this QR code 114 provides payment facilitation data details, which includes a merchant identifier that identifies the merchant 110 from which the purchase is made and transaction details of the purchase.

[0044] In a first implementation of step 2, the digital wallet application transmits the QR code 114 and details of a funding source selected to pay for the purchase made at the merchant 110 to the payment facilitator switch 102. The payment facilitator

switch 102 generates a payment instruction after receipt of the QR code 114. In the case of Figure 2, the payment facilitator switch 102 recognises from the selected funding source details that pull payment is supported. This may be done by pairing the QR code 114 with the data provided by the digital wallet application of the mobile terminal 112. Once paired, the payment facilitator switch 102 gets consumer data, such as the card number of the selected funding source, for processing through the acquirer 108. This card number is kept in Card On File storage located in the digital wallet application and provided to payment facilitator switch 102 as part of the selected funding source data. The payment instruction may also be accompanied with transaction details of the payment made at the merchant 110 and the identity of the acquirer 108 with which the merchant 110 has an account. The payment facilitator switch 102 then routes the payment instruction to the acquirer 108 using the identity information.

[0045] In a second implementation of step 2, the digital wallet application decodes the QR code 114 to extract the merchant identifier and the purchase data and performs security and integrity checks to verify the authenticity of the extracted data. After verification, this extracted data is transmitted to the payment facilitator switch 102, along with an indication that pull payment is to be effected. The payment facilitator switch 102 then routes the payment instruction to the acquirer.

[0046] In step 3, the acquirer 108 sends the transaction details of the purchase to the network switch 106 for routing to the issuer 104, whereby the issuer 104 is identified from the payment instruction that the acquirer 108 receives from the payment facilitator switch 102. In step 4, the issuer 104 performs an authorisation check against the funding source selected to pay for the purchase. When authorisation is obtained, the issuer 104 releases the funds to pay the purchase, which is routed back to the acquirer 108 through the network switch 106. The acquirer 108 receives the funds and channels it to the merchant identity (MID) account, i.e. the account the merchant 110 has with the acquirer 108.

[0047] In step 5, the merchant 110 may receive a notification after the funds are successfully deposited into the MID account.

[0048] In both Figures 1 and 2, a single QR image may be used to encode the payment facilitation data. The QR image may contain one or more of the following:

- information such as the merchant identifier and payment account information of the merchant 110, which is distributed by the acquirer 108.

This information may be provided in native or tokenized form. The tokenized form of the information may be provided by the payment facilitator switch 102 before a purchase is made at the merchant 110;

- purchase transaction data such as purchase amount and time of purchase;
- data identifying payment networks over which the merchant 110 can accept payment; and
- merchant contact and web access data for completing a pull transaction and for customer service, usually in the form of a URL.

[0049] Table 1 provides examples of further data parameters that a QR image, configured to facilitate both push and pull payment modes, can contain.

Table 1: Data Parameters for QR image

Merchant identifier (as defined by network)		AN	Variable as defined by network Anything more than one is optional	**Push payments**
	02			Tag to be followed by length and data as defined by Network 1
	03			Tag to be followed by length and data as defined by Network 1
	04			Tag to be followed by length and data as defined by Network 2
	05			Tag to be followed by length and data as defined by Network 2
	06			Tag to be followed by length and data as defined by Network 3
	07			Tag to be followed by length and data as defined by Network 3
				Pull Payments
	08			Tag to be followed by length and data as defined by Network 1, e.g. Merchant Checkout ID
	09			Tag to be followed by length and data as defined by Network 1, e.g. Pairing Token
	10-51			Reserved for future use

[0050] Data parameters 2 to 7 may be reserved for the push payment scheme of Figure 1, where these parameters are used to support a pairing token that is generated to pair data provided by the digital wallet application of the mobile terminal 112 to the QR code 114 and allow the backend system (i.e. the issuer 104, the network switch 106 and the acquirer 108) to process the payment and notify the mobile terminal 112 and the merchant 110 accordingly. The pull payment scheme of Figure 2 may use the data parameters 8 and 9 to hold data elements that are decoded in one or more of the steps 1 to 3, to support one or more generated pairing tokens.

[0051] With the QR image configured to be able to support both push and pull payment modes ad the facilitator switch 102 being responsible for routing of the payment instruction, there is no longer a need for the merchant 110 payment terminal to be aware of the payment mode that is used to make electronic payment to create an appropriately coded QR image. QR image generation can thus be standardised, which simplifies the electronic payment process. This eliminates the situation where a QR image, of compatible format, has to be created when a push payment is used and another QR image, of compatible format, has to be created when a pull payment is used.

[0052] Figure 3 depicts an exemplary computing device 300, hereinafter interchangeably referred to as a computer system 300, where one or more such computing devices 300 may be used to implement the payment facilitator switch 102 shown in Figures 1 and 2. The following description of the computing device 300 is provided by way of example only and is not intended to be limiting.

[0053] As shown in Figure 3, the exemplary computing device 300 includes a processor 304 for executing software routines. Although a single processor is shown for the sake of clarity, the computing device 300 may also include a multi-processor system. The processor 304 is connected to a communication infrastructure 306 for communication with other components of the computing device 300. The communication infrastructure 306 may include, for example, a communications bus, cross-bar, or network.

[0054] The computing device 300 further includes a main memory 308, such as a random access memory (RAM), and a secondary memory 310. The secondary memory 310 may include, for example, a storage drive 312, which may be a hard disk drive, a solid state drive or a hybrid drive and/or a removable storage drive 314, which may include a magnetic tape drive, an optical disk drive, a solid state storage drive (such as a USB flash drive, a flash memory device, a solid state drive or a memory card), or the like. The removable storage drive 314 reads from and/or writes to a removable storage medium 344 in a well-known manner. The removable storage medium 344 may include magnetic tape, optical disk, non-volatile memory storage medium, or the like, which is read by and written to by removable storage drive 314. As will be appreciated by persons skilled in the relevant art(s), the removable storage medium 344 includes a computer readable

storage medium having stored therein computer executable program code instructions and/or data.

[0055] In an alternative implementation, the secondary memory 310 may additionally or alternatively include other similar means for allowing computer programs or other instructions to be loaded into the computing device 300. Such means can include, for example, a removable storage unit 322 and an interface 350. Examples of a removable storage unit 322 and interface 350 include a program cartridge and cartridge interface (such as that found in video game console devices), a removable memory chip (such as an EPROM or PROM) and associated socket, a removable solid state storage drive (such as a USB flash drive, a flash memory device, a solid state drive or a memory card), and other removable storage units 322 and interfaces 350 which allow software and data to be transferred from the removable storage unit 322 to the computer system 300.

[0056] The computing device 300 also includes at least one communication interface 324. The communication interface 324 allows software and data to be transferred between computing device 300 and external devices via a communication path 326. In various embodiments of the inventions, the communication interface 324 permits data to be transferred between the computing device 300 and a data communication network, such as a public data or private data communication network. The communication interface 324 may be used to exchange data between different computing devices 300 which such computing devices 300 form part an interconnected computer network. Examples of a communication interface 324 can include a modem, a network interface (such as an Ethernet card), a communication port (such as a serial, parallel, printer, GPIB, IEEE 1394, RJ45, USB), an antenna with associated circuitry and the like. The communication interface 324 may be wired or may be wireless. Software and data transferred via the communication interface 324 are in the form of signals which can be electronic, electromagnetic, optical or other signals capable of being received by communication interface 324. These signals are provided to the communication interface via the communication path 326.

[0057] As shown in Figure 3, the computing device 300 further includes a display interface 302 which performs operations for rendering images to an associated display 330 and an audio interface 332 for performing operations for playing audio content via associated speaker(s) 334.

[0058] As used herein, the term "computer program product" may refer, in part, to removable storage medium 344, removable storage unit 322, a hard disk installed in storage drive 312, or a carrier wave carrying software over communication path 326 (wireless link or cable) to communication interface 324. Computer readable storage media refers to any non-transitory, non-volatile tangible storage medium that provides recorded instructions and/or data to the computing device 300 for execution and/or processing. Examples of such storage media include magnetic tape, CD-ROM, DVD, Blu-ray™ Disc, a hard disk drive, a ROM or integrated circuit, a solid state storage drive (such as a USB flash drive, a flash memory device, a solid state drive or a memory card), a hybrid drive, a magneto-optical disk, or a computer readable card such as a PCMCIA card and the like, whether or not such devices are internal or external of the computing device 300. Examples of transitory or non-tangible computer readable transmission media that may also participate in the provision of software, application programs, instructions and/or data to the computing device 300 include radio or infra-red transmission channels as well as a network connection to another computer or networked device, and the Internet or Intranets including e-mail transmissions and information recorded on Websites and the like.

[0059] The computer programs (also called computer program code) are stored in main memory 308 and/or secondary memory 310. Computer programs can also be received via the communication interface 324. Such computer programs, when executed, enable the computing device 300 to perform one or more features of embodiments discussed herein. In various embodiments, the computer programs, when executed, enable the processor 304 to perform features of the above-described embodiments. Accordingly, such computer programs represent controllers of the computer system 300.

[0060] Software may be stored in a computer program product and loaded into the computing device 300 using the removable storage drive 314, the storage drive 312, or the interface 350. The computer program product may be a non-transitory computer readable medium. Alternatively, the computer program product may be downloaded to the computer system 300 over the communications path 326. The software, when executed by the processor 304, causes the computing device 300 to perform functions of embodiments described herein.

[0061] It is to be understood that the embodiment of Figure 3 is presented merely by way of example. Therefore, in some embodiments one or more features of the computing device 300 may be omitted. Also, in some embodiments, one or more features of the computing device 300 may be combined together. Additionally, in some embodiments, one or more features of the computing device 300 may be split into one or more component parts. The main memory 308 and/or the secondary memory 310 may serve(s) as the memory for the payment facilitator switch 102; while the processor 304 may serve as the processor of the payment facilitator switch 102.

[0062] In the case of Figures 1 and 2, the memory (310, 308) contains computer program code, where the memory (310, 308) and the computer program code are configured to, with the processor 304, cause the payment facilitator switch 102 at least to receive, through an input port (such as the communication interface 324), payment facilitation data generated from a purchase made at a merchant and receive, through the input port, details of a funding source selected to pay for the purchase. The payment facilitator switch 102 generates a payment instruction, determining a flow of funds, in response to receipt of the payment facilitation data and routes the payment instruction to either an issuer or an acquirer, depending on the selected funding source and analysis of the payment facilitation data. The issuer is a bank for the funding source and the acquirer is a bank for the merchant. Routing of the payment instruction to the issuer causes pushing of funds from the issuer to the acquirer and routing of the payment instruction to the acquirer causes pulling of funds from the issuer to the acquirer.

[0063] The payment facilitator switch 102 may be further configured to receive, through the input port, a command indicating to which of the issuer or the acquirer the payment instruction is sent. Alternatively, the payment facilitator switch 102 may be further configured to, when routing of the payment instruction, decide to which of the issuer or the acquirer the payment instruction is to be routed.

[0064] The payment facilitator switch 102 may be further configured to: determine, from the payment facilitation data, a merchant identifier of the merchant from which the purchase is made; and ascertain the acquirer, which receives the funds for the purchase made at the merchant, from the merchant identifier.

[0065] The payment facilitator switch 102 may be further configured to, when the merchant identifier is provided as tokenized data, detokenize the tokenized data to retrieve the merchant identifier. It may do this directly if the payment facilitator switch 102 is coupled to a token vault which stores a mapping from tokenized merchant identifiers to actual merchant identifiers. Alternatively, it may request, from a token service provider (not shown) with which it is in communication, detokenization of a tokenized merchant identifier.

[0066] The payment facilitator switch 102 may be further configured to, before receipt of the tokenized data, generate the tokenized data; and transmit, to the merchant, the tokenized data for inclusion into the payment facilitation data during generation of the payment facilitation data.

[0067] The payment facilitator switch 102 may be further configured to, before routing of the payment instruction: locate, from the payment facilitation data, presence of authentication data used to authenticate the payment facilitation data; and inquire, with the acquirer, that the authentication data originated from the acquirer.

[0068] The payment facilitation data may have originated from coded data in QR format and may be contained in a single QR image.

[0069] The payment facilitation data may include transaction details of the purchase made at the merchant. The payment facilitator switch 102 may be further configured to include the purchase transaction details into the payment instruction.

[0070] The payment facilitator switch 102 may be further configured to communicate with an application, from which the payment facilitation data and the details of the selected funding source are received. The application may have a digital wallet to store a plurality of funding source options from which the funding source to pay for the purchase made at the merchant is selected.

[0071] Figure 4 shows a method 400 for routing payment instruction determining a flow of funds. The method 400 is performed by the computing device 300 of Figure 3.

[0072] Step 402 involves receiving a payment facilitation data generated from a purchase made at a merchant.

[0073] Step 404 involves receiving details of a funding source selected to pay for the purchase.

[0074] Step 406 involves generating the payment instruction in response to receipt of the payment facilitation data.

[0075] Step 408 involves routing the payment instruction to either an issuer or an acquirer, depending on the selected funding source and analysis of the payment facilitation data, the issuer being a bank for the funding source and the acquirer being a bank for the merchant, wherein routing of the payment instruction to the issuer causes pushing of funds from the issuer to the acquirer and routing of the payment instruction to the acquirer causes pulling of funds from the issuer to the acquirer.

[0076] It will be appreciated by a person skilled in the art that numerous variations and/or modifications may be made to the present invention as shown in the specific embodiments without departing from the spirit or scope of the invention as broadly described. The present embodiments are, therefore, to be considered in all respects to be illustrative and not restrictive.

CLAIMS

1. A payment facilitator switch configured to route a payment instruction determining a flow of funds, the payment facilitator switch comprising:

an input port;

a processor; and

at least one memory including computer program code;

the at least one memory and the computer program code configured to, with the at least one processor, cause the payment facilitator switch at least to:

receive, through the input port, payment facilitation data generated from a purchase made at a merchant;

receive, through the input port, details of a funding source selected to pay for the purchase;

generate the payment instruction in response to receipt of the payment facilitation data; and

route the payment instruction to either an issuer or an acquirer, depending on the selected funding source and analysis of the payment facilitation data, the issuer being a bank for the funding source and the acquirer being a bank for the merchant, wherein routing of the payment instruction to the issuer causes pushing of funds from the issuer to the acquirer and routing of the payment instruction to the acquirer causes pulling of funds from the issuer to the acquirer.

2. The payment facilitator switch of claim 1, wherein the payment facilitator switch is further configured to:

receive, through the input port, a command indicating to which of the issuer or the acquirer the payment instruction is sent.

3. The payment facilitator switch of claim 1, wherein routing of the payment instruction further comprises deciding to which of the issuer or the acquirer the payment instruction is to be routed.

4. The payment facilitator switch of any one of the preceding claims, wherein the payment facilitator switch is further configured to:

determine, from the payment facilitation data, a merchant identifier of the merchant from which the purchase is made; and

ascertain the acquirer, which receives the funds for the purchase made at the merchant, from the merchant identifier.

5. The payment facilitator switch of claim 4, wherein the merchant identifier is provided as tokenized data and wherein the payment facilitator switch is further configured to detokenize the tokenized data to retrieve the merchant identifier.

6. The payment facilitator switch of claim 5, wherein the payment facilitator switch is further configured to, before receipt of the tokenized data:

generate the tokenized data; and

transmit, to the merchant, the tokenized data for inclusion into the payment facilitation data during generation of the payment facilitation data.

7. The payment facilitator switch of any one of the preceding claims, wherein the payment facilitator switch is further configured to, before routing of the payment instruction:

locate, from the payment facilitation data, presence of authentication data used to authenticate the payment facilitation data; and

transmit a request to the acquirer to confirm that the authentication data originated from the acquirer.

8. The payment facilitator switch of any one of the preceding claims, wherein the payment facilitation data originates from coded data in an optical code format and is contained in a single optical code image.

9. The payment facilitator switch of claim 8, wherein the optical code format is QR format.

10. The payment facilitator switch of any of the preceding claims, wherein the payment facilitation data comprises transaction details of the purchase made at the merchant.

11. The payment facilitator switch of claim 10, wherein the payment facilitator switch is further configured to include the purchase transaction details into the payment instruction.

12. A method for routing payment instruction determining a flow of funds, the method comprising:

receiving payment facilitation data generated from a purchase made at a merchant;

receiving details of a funding source selected to pay for the purchase;

generating the payment instruction in response to receipt of the payment facilitation data; and

routing the payment instruction to either an issuer or an acquirer, depending on the selected funding source and analysis of the payment facilitation data, the issuer being a bank for the funding source and the acquirer being a bank for the merchant, wherein routing of the payment instruction to the issuer causes pushing of funds from the issuer to the acquirer and routing of the payment instruction to the acquirer causes pulling of funds from the issuer to the acquirer.

13. The method of claim 12, further comprising

receiving a command indicating to which of the issuer or the acquirer the payment instruction is sent.

14. The method of claim 12, wherein routing of the payment instruction further comprises deciding to which of the issuer or the acquirer the payment instruction is to be routed.

15. The method of any one of claims 12 to 14, further comprising

determining, from the payment facilitation data, a merchant identifier of the merchant from which the purchase is made; and

ascertaining the acquirer, which receives the funds for the purchase made at the merchant, from the merchant identifier.

16. The method of claim 15, wherein the merchant identifier is provided as tokenized data and wherein the method further comprises detokenizing the tokenized data to retrieve the merchant identifier.

17. The method of claim 16, further comprising, before receipt of the tokenized data:

generating the tokenized data; and

transmitting, to the merchant, the tokenized data for inclusion into the payment facilitation data during generation of the payment facilitation data.

18. The method of any one of claims 12 to 17, further comprising, before routing of the payment instruction:

locating, from the payment facilitation data, presence of authentication data used to authenticate the payment facilitation data; and

transmitting a request to the acquirer to confirm that the authentication data originated from the acquirer.

19. The method of any one of claims 12 to 18, wherein the payment facilitation data originates from coded data in an optical code format and is contained in a single optical code image.

20. The method of claim 19, wherein the optical code format is QR format.

21. The method of any one of claims 12 to 20, wherein the payment facilitation data comprises transaction details of the purchase made at the merchant.

22. The method of claim 21, further comprising including the purchase transaction details into the payment instruction.