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(54) SYSTEM & METHOD FOR ON-LINE PAYMENT

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(57) **ABSTRACT**

In a computer based system and method for on-line payment, a transaction is completed between a shopper and a merchant using one or two trusted third parties. Both the shopper and merchant may use the same trusted third party or each may use its own trusted third party. A trusted third party receives and sends messages to and from the shopper and merchant as well as a payment center. Each message provides encrypted information on the nature of the transaction. The trusted third party does not have the capability to decrypt detailed transaction information and thus is not privy to the nature of the transaction. Should a dispute arise, all parties involved have sufficient encrypted information in the messages to determine the nature of the transaction and the steps concluded.

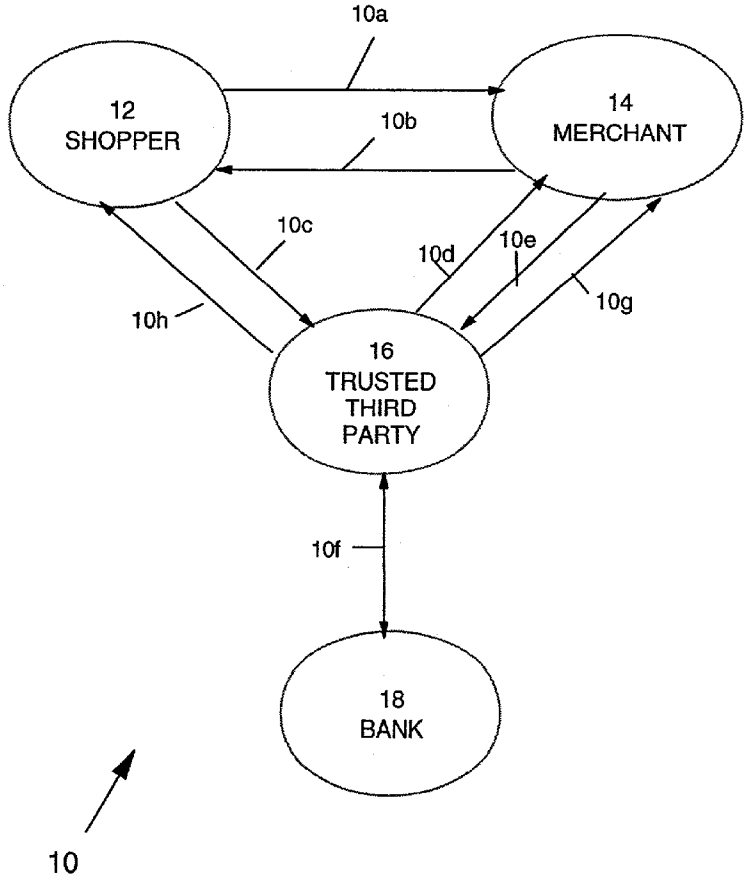
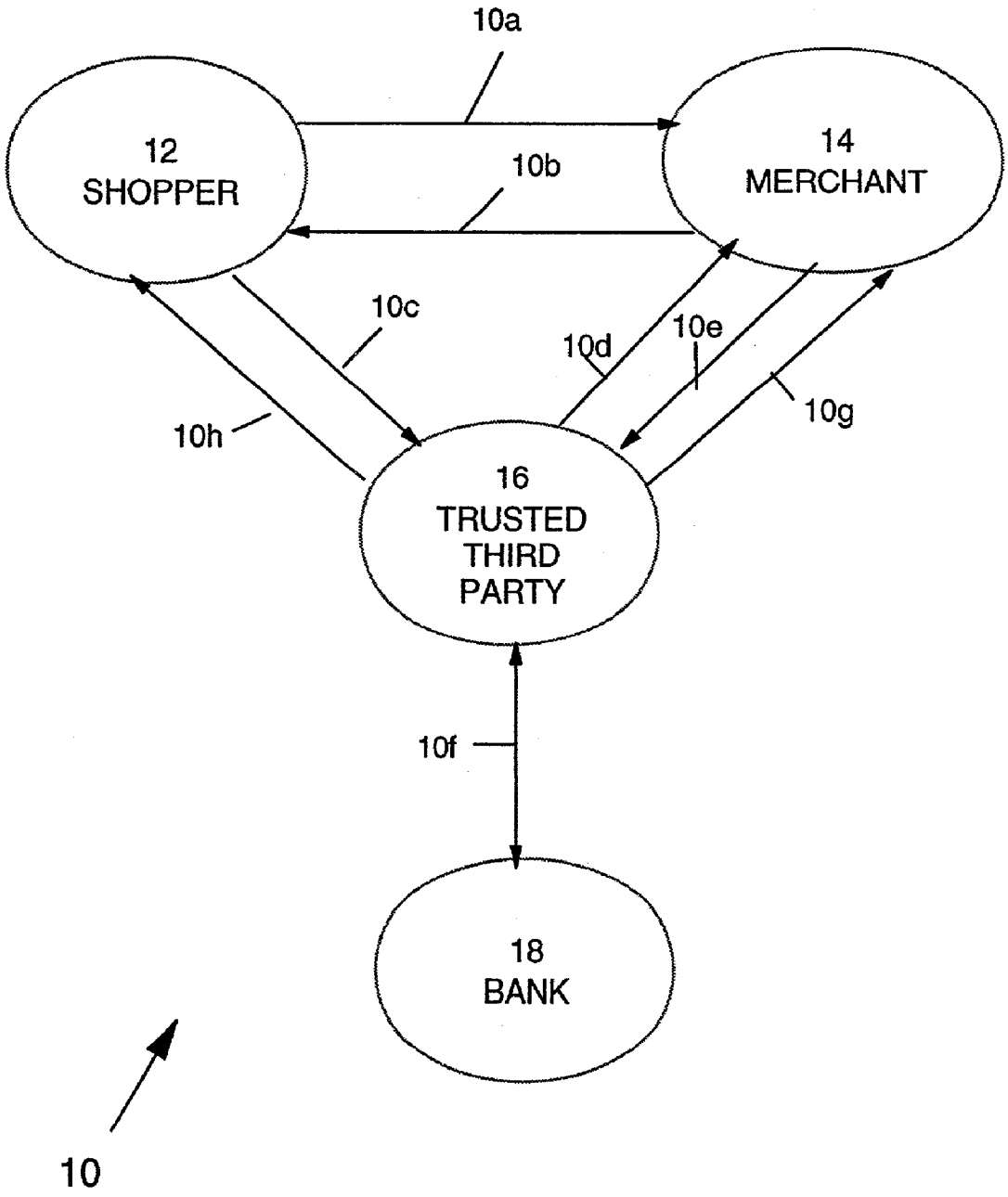


FIGURE 1


10a
12
SHOPPER
10b
14
MERCHANT
10c
10d
10e
10h
10g
16
TRUSTED
THIRD
PARTY
10f
18
BANK
10

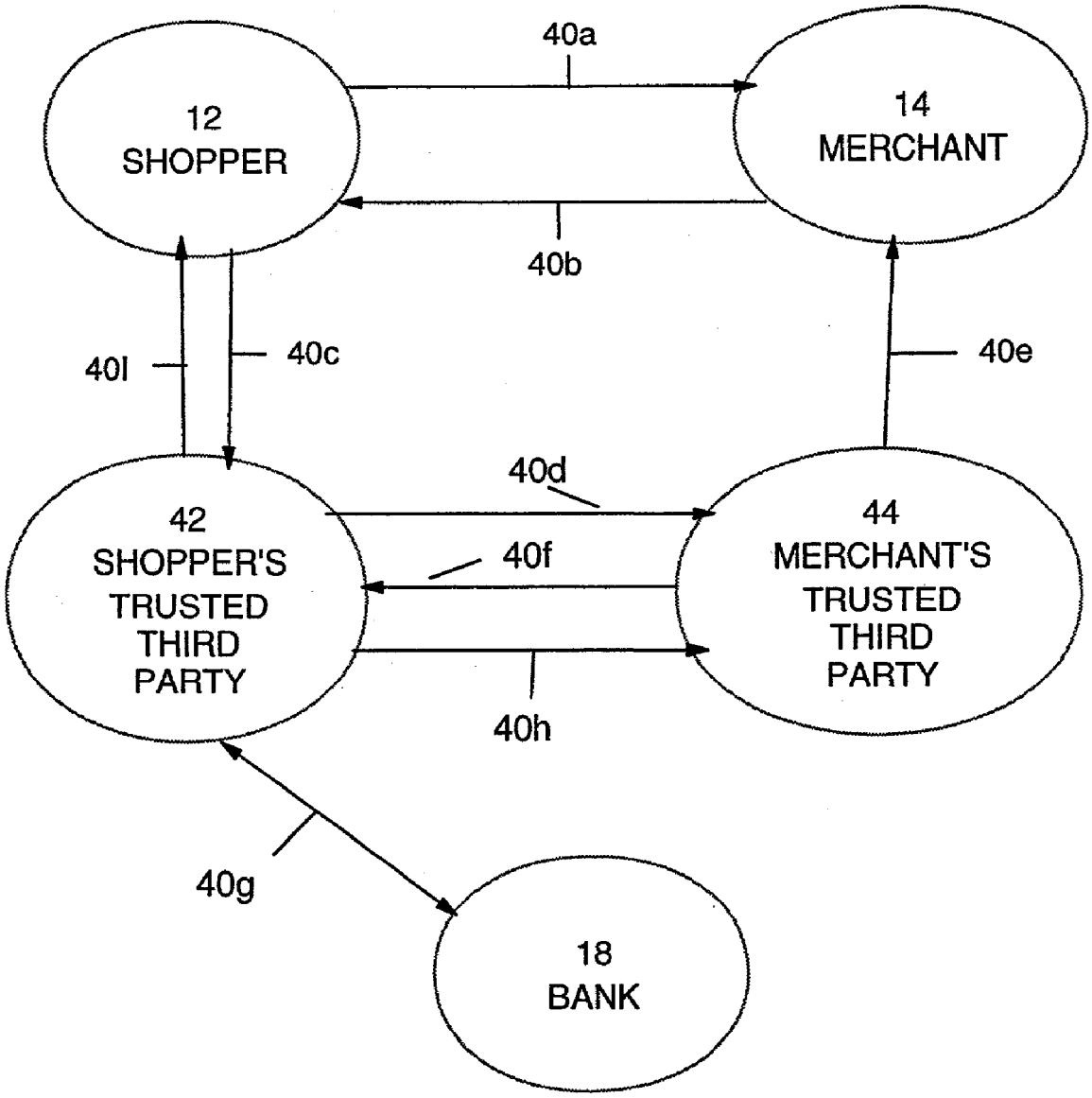

40a
12
SHOPPER
14
MERCHANT
40b
40l
40c
40e
40d
42
SHOPPER'S
TRUSTED
THIRD
PARTY
40f
44
MERCHANT'S
TRUSTED
THIRD
PARTY
40h
40g
18
BANK

FIGURE 2

SYSTEM & METHOD FOR ON-LINE PAYMENT

FIELD OF THE INVENTION

[0001] The present invention relates to a system and method for providing secure and trusted on-line payment for goods or services.

BACKGROUND OF THE INVENTION

[0002] Traditionally the prevalent payment method for on-line shopping has been credit card based. Typically, a shopper transmits credit card information to a merchant using secure communication. A popular method for providing secure communication is secure socket layer (SSL). This method does not require a shopper to sign for the credit card purchase. There is therefore the potential for fraud; e.g., a shopper may use someone else's credit card. Digital signing for credit card purchase is supported by a Secure Electronic Transaction (SET) protocol, which is quite complex in implementation.

[0003] A number of methods and systems for providing on-line payment exist. Some of these are discussed in the following paragraphs.

[0004] U.S. Pat. No. 6,088,797 discloses a system comprising two tamperproof electronic processing devices, one for a merchant, the other for a customer. Each device is connected to a separate money module. Goods are exchanged electronically between the devices once payment has been exchanged between the money modules. The devices are referred to as trusted agents. Each trusted agent is part of a hierarchy of trusted servers that issue certificates and keys to the trusted agents. The trusted agents also receive a list of other trusted agents as well as untrusted agents. In addition, a trusted server is initialized by a primary trusted server. This hierarchy is unnecessarily complex and requires that each trusted agent have knowledge of who it can and cannot communicate with. Further, the primary trusted server must be aware of all trusted servers and the trusted server must be aware of all trusted agents. Finally the disclosure does not permit a trusted agent to act for both shopper and merchant in the same transaction.

[0005] U.S. Pat. No. 5,987,140 discloses a system whereby a client sends all transaction information directly to a merchant. The merchant then interfaces with a payment gateway and informs the customer directly if the transaction has been accepted. Such a system does not provide an audit trail for the user and entrusts the merchant to maintain the confidentiality of user information that he is able to discover.

[0006] U.S. Pat. No. 5,790,677 discloses a system and method for secure electronic commerce transactions. Each transaction or set of transactions comprises two phases, a registration phase and a transaction phase. During the registration phase, each participant sends registration information to a central binding server. The server then provides unique keys to each participant. During transmission of data, an originator signs and encrypts the data in a manner that ensures that only the intended registered participants may decrypt the data. Each participant must register and be issued a unique key. Further, registrants must be aware of all eligible recipients for their message. Although data is encrypted, the design of the system provides for others than the final recipient to have access to the data on the assumption that they will not be able to decrypt it and then pass it on to the correct recipient.

[0007] U.S. Pat. No. 5,671,279 discloses an electronic transaction system where payment is made by credit card. The main entities in the system are a customer; a merchant and a gateway (e.g. a bank). The implementation of secure channels of communication between the customer and the merchant and the gateway is required. As with U.S. Pat. No. 5,790,677 a single message may contain information intended for distinct parties. Thus each party is capable of reading only the portion of the message intended for them.

[0008] There is a need for a system and method of making on-line payments that is secure and that also provides an audit trail on the details of a transaction. The present invention addresses this need.

SUMMARY OF THE INVENTION

[0009] The present invention relates to a system for the on-line purchase and payment of goods or services. The system includes a communication network having a shopper node, a merchant node, a trusted third party node and payment center node. The trusted third party node is the only node communicating with the payment center node.

[0010] In accordance with another aspect of the present invention there is provided a method for the on-line purchase of goods or services. A shopper initiates a transaction with a merchant. When the shopper is ready to order, the merchant requests payment information from the shopper. The shopper sends the payment information directly to a trusted third party. The trusted third party queries the merchant for the details of the transaction for the purpose of confirming the transaction. When the merchant returns confirmation of the transaction to the trusted third party, the trusted third party requests payment from a payment center. After receiving payment, the trusted third party informs the merchant that payment has been made and sends a receipt directly to the shopper confirming that payment has been made.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] **FIG. 1** is a data interchange diagram of a first embodiment of the present invention.

[0012] **FIG. 2** is a data interchange diagram of a second embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0013] Referring to **FIG. 1, a** data interchange diagram of a first embodiment of the present invention is shown generally as system **10**. System **10** has several nodes, specifically, shopper **12**, merchant **14**, trusted third party (TTP) **16**, and payment center **18**. System **10** further comprises data interchanges **10***a* to **10***h*.

[0014] In system **10**, data interchanges **10***a* to **10***h* consist of messages that enable shopper **12** to purchase goods or services from merchant **14**. A brief overview of data interchanges **10***a* to **10***h* follows.

[0015] **10***a*) Shopper **12** sends order information to merchant **14**;

[0016] **10***b*) Merchant **14** requests payment from shopper **12**;

[0017] **10***c*) Shopper **12** sends payment information and amount of payment to TTP **16**;

[0018] **10***d*) TTP **16** queries merchant **14** for confirmation of the transaction and the amount of payment;

[0019] **10***e*) Merchant **14** returns confirmation;

[0020] **10***f*) TTP **16** requests payment from payment center **18** and receives confirmation on payment;

[0021] **10***g*) TTP **16** sends receipt to merchant **14** to confirm that payment has been made; and

[0022] **10***h*) TTP **16** sends receipt to shopper **12** to confirm that payment has been made.

[0023] In a preferred embodiment, the present invention makes use of public key cryptography and public key certification. Any public key certification mechanism can be used; including Pretty Good Privacy (PGP) or a PKI-based Certification Authority. Through the use of cryptography, messages sent between a shopper, a merchant and a TTP are signed, providing a useful confidential audit trail should dispute resolution be required.

[0024] A cryptographic message digest of a message is the result of a one-way transformation of the message. A message digest is typically fixed-length, regardless of the length of the original message. A cryptographic message digest function has the following properties:

[0025] a) The original message cannot be recovered from the digest;

[0026] b) Two different messages are highly unlikely to produce the same digest; and

[0027] c) given a message and its digest, it is computationally infeasible to create a second message, which would have the same digest.

[0028] One method of creating a digest is through the use of a hash function to transform the original message. As one skilled in the art will understand, there are numerous mathematical transformations that may be utilized to create a digest.

[0029] In describing the content of the messages passed in data interchanges, **10***a*) to **10***h*) of **FIG. 1**, the following notation is utilized:

[0030] CERT The certificate in the name of "j", (j=s for shopper, j=m for merchant, j=t for TTP). A certificate may be a PGP public key or some other form of certificate to uniquely identify the party.

[0031] H(x) a cryptographic digest of x

[0032] Sj(y) Signature on y using private key of (j=s for shopper, j=m for merchant, j=t for TTP)

[0033] *abc abc is an optional field

[0034] In the preferred embodiment all data interchanges are secured using cryptographic technology, such as Secure Socket Layer (SSL).

[0035] The data interchanges **10***a* to **10***h* of **FIG. 1** will be described in greater detail. In data exchange **10***a*), shopper **12** sends an "order" message to merchant **14**. The "order" message preferably contains the following information: Order=items to be purchased, shipping information, previously quoted price and timestamp. The previously quoted price is an optional field. The timestamp is an optional field included to prevent replay attack, i.e. to avoid a vandal submitting multiple identical orders in an attempt to disrupt the service of merchant **14** or to impersonate the shopper **12**.

[0036] For data exchange **10***b*), upon receiving the order message, merchant **14** returns a "payment request" message to shopper **12**. The "payment request" message contains the following information: Payment request=transaction ID, amount, order, validity period, $CERT_m$,,purchase agreement, S_m(transaction ID, amount, order, validity period, $CERT_m$, purchase agreement)

[0037] The transaction ID is generated by merchant **14**, and used by merchant **14** and TTP **16** to keep track of all transactions. The order information is the same as that provided by shopper **12** in data exchange **10***a*. The validity period specifies the time during which the payment must be confirmed. The certificate of merchant **14** can be used by shopper **12** to verify a digital signature S_m of merchant **14**. The purchase agreement is an optional field, which contains information such as refund policy, product quality, warranty, or any other information merchant **14** may wish to provide. In data exchange **10***c*) shopper **12**, after verifying the signature of merchant **14**, proceeds by sending a "payment" message to TTP **16**.

[0038] The "payment" message may contain the following information: Payment=payment info, amount, merchant, transaction ID, $CERT_s$, timestamp, S_s(payment info, amount, merchant, transaction ID, $CERT_s$, timestamp)

[0039] The payment info field contains payment information, such as a credit card number, card holder ID, and expiration date. The use of a credit card is meant only as an example, any form of information that will allow for electronic payment is considered by the inventors to be within the scope of the invention. Examples include debit cards, bank account numbers and electronic coupons. The transaction ID is the same as that provided by merchant **14** during interchange **10***b*. The certificate of shopper **12** can be used by TTP **16** to verify the digital signature of shopper **12**. Again, an optional timestamp may be included to prevent replay attack. A shopper digital signature S_s is included as part of the payment message.

[0040] For data exchange **10***d*), TTP **16**, after verifying the signature of shopper **12** in interchange **10***c*, requests a confirmation from merchant **14** by sending a "confirmation request" message to merchant **14**. The "confirmation request" message contains the following information: Confirmation request=transaction ID, amount, status, S_t(transaction ID, amount, status)

[0041] This message contains the transaction ID, amount, and payment status. A TTP digital signature S_t is included as part of the confirmation request message. In data exchange **10***e*), merchant **14**, upon receiving the confirmation request message, verifies the transaction ID and amount, and sends a "transaction confirmed" message to TTP **16**.

[0042] The "transaction confirmed" message contains the following information: Transaction confirmed=transaction ID, amount, status, S_m(transaction ID, amount, status),(H (transaction ID, amount, order, validity period, purchase agreement), S_m(H (transaction ID, amount, order, validity period,purchase agreement)))

[0043] This message contains the transaction ID, amount, and payment status. As an option, a cryptographic digest of the transaction details (namely transaction ID, order, amount, validity period, purchase agreement), as contained in the payment request message in interchange **10***b*, may be included. This digest, together with a merchant digital signature of the digest included as part of the transaction confirmed message, will be useful for dispute resolution purposes. A merchant digital signature Sm is included as part of the transaction confirmed message.

[0044] Data exchange **10***f*) is to obtain authorization from a payment center. Upon receiving the transaction confirmed message, TTP **16** requests the authorized amount from payment center **18**. Payment center **18** returns an approval to TTP **16**. Any payment protocol can be used.

[0045] The requirement for payment approval may be tied to the payment policy of TTP **16**. It is possible that in some cases (e.g. for preferred customers) TTP **16** would not wait for credit approval, but would process the payment right away. In this case, TTP **16**, rather than payment center **18**, would take on the responsibility for the payment.

[0046] Furthermore, different TTP's **16** may have different policies on handling unknown or delayed credit approval requests. For example, if the approval request times out, TTP **16** may either refuse to process the payment, or may take the risk of processing it. Similarly, even if payment center **18** rejects the request, TTP **16** may still process it, taking on the payment responsibility as described above. This issue is relevant for those payment methods, such as debit card, that do not support payment authorization. In this case, TTP **16** has the choice of taking on payment risk, as described above, or initiating funds capture at this point. However, the latter is only possible in a limited number of cases since TTP **16** has to rely on merchant **14** shipping the goods within a short amount of time. This would be feasible, based on an agreement with merchant **14**, where merchant **14** guarantees goods shipment; as is possible, for example, with "soft goods" or goods distributed on-line.

[0047] In data interchange **10***g*) TTP **16** sends a signed "merchant receipt" message to merchant **14**. The "merchant receipt" message contains the following information: Merchant receipt=payment ID, transaction ID, amount, S_t(payment ID, transaction ID, amount). In data exchange **10***h*), TTP **16** sends a signed "shopper receipt" message to shopper **12**. The "shopper receipt" message contains the following information: Shopper receipt=payment ID, transaction ID, amount, S_t(payment ID, transaction ID, amount)

[0048] In data interchange **10***i*) TTP **16** captures the payment and transfers the funds to merchant **14**. This final interchange occurs offline, and is not shown in **FIG. 1**. Interchange **10***i* involves actual payment capture. For example, if the payment were provided by credit card, TTP **16** would be actually charging the card. The specific payment capture process is beyond the scope of this invention; for example, payment capture could be done weekly as a batch job, or on a per-order basis. TTP **16** may also retain a portion of the payment as fee for the payment service.

[0049] As an enhanced version of this payment method, payment is not captured until shipment of the order has been confirmed by merchant **14**. For this case, interchange **10***i* is replaced by the following two interchanges: **10***i*) Merchant **14** sends a signed "shipment confirmed" message to TTP **16**, confirming the shipment of the order. The "shipment confirmed" messaged contains the following information: Shipment confirmation=transaction ID, shipment status, S_m (transaction ID, shipment status). In data interchange **10***j*, TTP **16** captures the payment and transfers the funds to merchant **14**.

[0050] The above interchanges **10***a* to **10***h* are sequential in nature. The transaction is not complete until interchange **10***h* is performed. A timer is used at each interchange to protect against unusual situations where one of the parties (shopper **12**, merchant **14**, or TTP **16**) is not proceeding with the next interchange within a predetermined time. For interchanges **10***a* to **10***f*, if the timer expires, the transaction is assumed to be aborted. Any subsequent messages regarding this transaction will be ignored. Up to this point, any party can abort the transaction by simply not continuing with the next interchange.

[0051] At interchange **10***g*, if merchant **14** does not receive the receipt within a configuration specified time-out period, merchant **14** attempts to obtain the receipt by sending a request message to TTP **16**. If a receipt is not received after a pre-specified number of attempts, the transaction is assumed to be aborted. In this case, shopper **12** will not receive the order, but shopper **12** can contact TTP **16** to request a refund.

[0052] At interchange **10***h*, if shopper **12** does not receive the receipt within a time-out period, shopper **12** may request a receipt from TTP **16** at a later time. This would not affect the transaction, as the order will be shipped by merchant **14** as long as merchant **14** has received the receipt.

[0053] A description of the steps taken by each of shopper **12**, merchant **14** and TPP **16** during a purchase is now provided.

[0054] A. Process for Shopper.

[0055] Shopper **12** in initiating a process transaction performs the following steps:

[0056] A1. Prepare "order" message.

[0057] A2. Send "order" message to merchant **14**.

[0058] A3. Start timer T1.

[0059] A4. If T1 expires before "payment request" message is received from merchant, abort the transaction.

[0060] A5. Verify signature of merchant **14**.

[0061] A6. If signature is not valid, abort transaction.

[0062] A7. Log "payment request" message.

[0063] A8. Prepare "payment" message.

[0064] A9. Send "payment" message to TTP **16**.

[0065] A10. Log "payment" message.

[0066] A11. Wait for receipt from TTP **16**.

[0067] At step A11, if shopper **12** does not receive the receipt within a time-out period, shopper **12** may request a receipt at a later time. This would not affect the transaction because the order will be shipped by merchant **14** as long as merchant **14** has received the receipt.

[0068] B. Process of Merchant **14**.

[0069] Upon receiving an "order" message from shopper the following steps are performed:

[0070] B1. Generate transaction ID.

[0071] B2. Prepare "payment request" message.

[0072] B3. Send "payment request" message to shopper.

[0073] B4. Log "payment request" message.

[0074] B5. Start timer T2; value of timer is set to the length of the validity period.

[0075] B6. If timer T2 expires before "confirmation request" is received from TTP **16**, abort transaction.

[0076] B7. Verify signature of TTP **16**.

[0077] B8. If signature is not valid, abort transaction.

[0078] B9. If amount paid is not accurate, abort transaction.

[0079] B10. Log "confirmation request" message.

[0080] B11. Prepare "transaction confirmed" message.

[0081] B12. Send "transaction confirmed" message to TTP **16**.

[0082] B13. Log "transaction confirmed" message.

[0083] B14. Start timer T3.

[0084] B15. If receipt is received before T3 expires, transaction is completed successfully.

[0085] B16. Send a request to TTP **16** for the receipt and restart timer T3. This step is repeated if timer T3 expires again. If a receipt is not received from TTP **16** after a fixed number of attempts, abort transaction.

[0086] If the transaction is aborted at B16, shopper **12** will not receive the order, but shopper **12** can contact TTP **16** to request a refund.

[0087] If a "confirmation request" message is received from TTP **16** for an order where the validity period has expired (i.e., the corresponding transaction has already been aborted in B6), the confirmation request is simply ignored. For the enhanced version of this payment method where payment is not captured until shipment of the order has been confirmed by merchant **14**, a merchant **14** signed "shipment confirmed" message is sent to TTP **16** at step B15 if the receipt is received before T3 expires.

[0088] C. Process of TTP **16**.

[0089] Upon receiving a "payment" message from shopper **12** the following steps are performed:

[0090] C1. Verify signature of shopper **12**.

[0091] C2. If signature is not valid, ignore message.

[0092] C3. Log "payment" message.

[0093] C4. Prepare "confirmation request" message.

[0094] C5. Send "confirmation request" message to merchant **14**.

[0095] C6. Log "confirmation request" message.

[0096] C7. Start timer T4.

[0097] C8. If timer T4 expires before "transaction confirmed" is received from merchant **14**, abort transaction.

[0098] C9. Verify signature of merchant **14**.

[0099] C10. If signature is not valid, abort transaction.

[0100] C11. Log "transaction confirmed" message.

[0101] C12. Request authorization from payment center **18** using secure communications, for payment of the confirmed transaction.

[0102] C13. If amount is not approved by payment center **18**, abort transaction.

[0103] C14. Send receipt to merchant **14**.

[0104] C15. Send receipt to shopper **12**.

[0105] For C14, additional actions may be required if the receipt is not delivered within the time-out period set by merchant **14**. These actions are outlined in B16 of process of merchant **14** above.

[0106] For C15, additional actions may be required if the receipt is not delivered within the time-out period set by shopper **12**. These actions are outlined in the discussion of step A11 in the process for shopper **12**, above.

[0107] If a message is received from merchant **14** asking for a receipt for a transaction that has been aborted, the message is ignored. This can happen if timer T4 has expired at C8 or transaction has been aborted at C10 or C13, and subsequently, a request for receipt is received as a result of step B16 of process of merchant **14**.

[0108] Referring now to **FIG. 2***a* data interchange diagram of a second embodiment of the present invention is shown generally as **40**.

[0109] System **40** has nodes for shopper **12**, merchant **14** and payment center **18** which are identical to corresponding nodes in system **10**. However, rather than the single node TTP **16** of system **10**, system **40** utilizes two trusted third party nodes; namely, shopper's trusted third party (TTP-s) **42** and merchant's trusted third party (TTP-m) **44**.

[0110] The definition of $S_j(y)$ is extended to include TTP-s and TTP-m. That is, $S_j(y)$ is a digital signature on y using private key of j(j=s for shopper, j=m for merchant, j=ts for TTP-s, j=tm for TTP-m). All other definitions provided in describing system **10** remain the same.

[0111] In system **40**, data interchanges **40***a* to **40***k* consist of messages that enable shopper **12** to purchase goods or services from merchant **14**. A brief overview of data interchanges **40***a* to **40***k* follows.

[0112] **40***a*) Shopper **12** sends the order information to merchant **14**;

[0113] **40***b*) Merchant **14** requests payment from shopper **12**;

[0114] **40***c*) Shopper **12** sends payment information and amount of payment to trusted third party TTP-s **42**;

[0115] **40***d*) TTP-s **42** checks with TTP-m **44** to get a confirmation of transaction and the amount of payment;

[0116] **40***e*) TTP-m **44** checks with merchant **14** to get a confirmation of transaction and the amount of payment;

[0117] **40***f*) Merchant **14** returns a confirmation to TTP-m **44**;

[0118] **40***g*) TTP-m **44** returns confirmation to TTP-s **42**;

[0119] **40***h*) TTP-s **42** requests the authorized amount from payment center **18**, and payment center **18** issues the credit;

[0120] **40***i*) TTP-s **42** sends a receipt to TTP-m **44** to confirm that payment has been made;

[0121] **40***j*) TTP-m **44** forwards the receipt to merchant **14**; and

[0122] **40***k*) TTP-s **42** sends a receipt to the shopper to confirm that payment has been made.

[0123] As with system **10**, in the preferred embodiment of system **40**, all data interchanges are secured using cryptographic technology, such as Secure Socket Layer (SSL).

[0124] The content of the data interchanges **40***a* to **40***k* of **FIG. 2** will be described in more detail below. In **40***a*) Shopper **12** sends an "order" message to merchant **14**. The "order" message may contain the following information: Order=items to be purchased, shipping information, previously quoted price, timestamp. The previously quoted price is an optional field. The timestamp is an optional field included to prevent replay attack.

[0125] In **40***b*) Merchant **14**, upon receiving the order message, returns a "payment request" message to shopper **12**. The "payment request" message contains the following information: Payment request=transaction ID, amount, order, validity period, $CERT_m$, purchase agreement, TTP-m, S_m(transaction ID, amount, order, validity period, $CERT_m$, purchase agreement, TTP-m)

[0126] The transaction ID is generated by merchant **14**, and used by merchant **14**, TTP-s **42** and TTP-m **44** to keep track of all the transactions. The order information is the same as that provided by shopper **12**. The validity period specifies the time during which the payment must be confirmed. The certificate of merchant **14** can be used by shopper **12** to verify the signature of merchant **14**. The purchase agreement is an optional field, which contains information such as refund policy, product quality, warranty, or other information as determined by the merchant. TTP-m is the identity and address of the TTP-m **44** that merchant **14** wants to use. A merchant digital signature S_m is included as part of the payment request message.

[0127] In **40***c*) Shopper **12**, after verifying the signature of merchant **14**, proceeds by sending a "payment" message to TTP-s **42**. The "payment" message contains the following information: Payment=payment info, amount, merchant, transaction ID, CERTs, TTP-m, timestamp, S_s(payment info, amount, merchant, transaction ID, CERTs, TTP-m, timestamp) The payment info field contains payment information, such as the credit card number, card holder ID, and expiration date.

[0128] The use of a credit card is meant only as an example, any form of information that will allow for electronic payment is considered by the inventors to be within the scope of the invention. Examples include debit cards, bank account numbers and electronic coupons. The transaction ID is the same as that provided by merchant **14**. The certificate of shopper **12** can be used by TTP-s **42** to verify the signature of shopper **12**. TTP-m indicates a specific TTP-m **44** used by merchant **14**. Again, an optional timestamp may be included to prevent replay attack. A shopper digital signature S_s is included as part of the payment message.

[0129] In **40***d*), TTP-s **42**, after verifying the signature of shopper **12**, requests a confirmation from TTP-m **44** by sending a "TTP-s confirmation request" message to TTP-m **44**. The "TTP-s confirmation request" message contains the following information: TTP-s confirmation request=transaction ID, amount, status, merchant, S_{ts}(transaction ID, amount, status, merchant). This message contains the transaction ID, amount, merchant identification, and payment status. A TTP-s digital signature Sts is included as part of the TTP-s confirmation request message.

[0130] In **40***e*) TTP-m **44**, after verifying the signature of TTP-s **42**, requests a confirmation from merchant **14** by sending a "TTP-m confirmation request" message to merchant **14**. The "TTP-m confirmation request" message contains the following information: TTP-m confirmation request=transaction ID, amount, status, S_{tm} (transaction ID, amount, status). This message contains the transaction ID, amount, and payment status. A TTP-m digital signature S_{tm} is included as part of the TTP-m confirmation request message.

[0131] In **40***f*) Merchant **14**, upon receiving the TTP-m confirmation request message, verifies the transaction ID and amount, and sends "merchant transaction confirmed" message to TTP-m **44**. The "merchant transaction confirmed" message contains the following information: Merchant transaction confirmed=transaction ID, amount, status, S_m (transaction ID, amount, status), (H (transaction ID, amount, order, validity period, purchase agreement), S_m (H (transaction ID, amount, order, validity period, purchase agreement))). This message contains the transaction ID, amount, and payment status.

[0132] As an option, a cryptographic digest of the transaction details (namely transaction ID, order, amount, validity period, purchase agreement), as contained in the payment request message in interchange **40***b*, may be included. This digest, together with a merchant digital signature of the digest included as part of the transaction confirmed message, will be useful for dispute resolution purposes. A merchant digital signature S_m is included as part of merchant **14** transaction confirmed message.

[0133] In interchange **40***g*) TTP-m **44**, upon receiving merchant **14** transaction confirmed message from merchant **14**, verifies the transaction ID and amount, and sends a "TTP-m transaction confirmed" message to TTP-s **42**. The "TTP-m transaction confirmed" message contains the following information: TTP-m transaction confirmed=transaction ID, amount, status, S_{tm} (transaction ID, amount, status), (H (transaction ID, amount, order, validity period, purchase agreement), S_{tm} (H (transaction ID, amount, order, validity period, purchase agreement))).

[0134] This message contains the transaction ID, amount, and payment status. The digest of the transaction details (namely transaction ID, order, amount, validity period, purchase agreement), is the same as that provided by merchant **14**. This digest will be useful for dispute resolution purposes. A TTP-m digital signature S_{tm} is included as part of the TTP-m transaction confirmed message.

[0135] Interchange **40***h*) is to obtain authorization from payment center. Upon receiving the transaction confirmed message, TTP-s **42** requests the authorized amount from payment center **18**. Payment center **18** returns an approval to TTP-s **42**. Any payment protocol can be used.

[0136] The requirement for payment approval is determined by the policy of TTP-s **42**. It is possible that in some cases (e.g. for preferred customers) TTP-s **42** would not wait for credit approval, but would process the payment right away. In this case, TTP-s **42**, rather than payment center **18**, would be taking on the responsibility for the payment.

[0137] Furthermore, each TTP-s **42** may have different policies on handling unknown or delayed credit approval requests. For example, if the approval request times out, TTP-s **42** may either refuse to process the payment or may take the risk of processing it. Similarly, even if payment center **18** rejects the request, TTP-s **42** may still process it, taking on the payment responsibility as described above. This issue is relevant for those payment methods, such as debit card, that do not support payment authorization. In this case, TTP-s **42** has the choice of taking on payment risk, as described above or initiating funds capture at this point. However, the latter is only possible in a limited number of cases since TTP-**242** has to rely on merchant **14** shipping the goods within a short amount of time. This would be feasible, based on an agreement with merchant **14**, where merchant **14** guarantees goods shipment; as is possible, for example, with "soft goods" or goods distributed online.

[0138] In interchange **40***i*) TTP-s **42** sends a signed "merchant receipt" message to TTP-m **44**. The "merchant receipt" message contains the following information: Merchant receipt=payment ID, transaction ID, amount, merchant, S_{ts} (payment ID, transaction ID, amount, merchant).

[0139] In interchange **40***j*) TTP-m **44** verifies the receipt and sends a signed "merchant receipt" message to merchant **14**. The "merchant receipt" message contains the following information: Merchant receipt=payment ID, transaction ID, amount, S_{tm} (payment ID, transaction ID, amount).

[0140] In interchange **40***k*) TTP-s **42** sends a signed "shopper receipt" message to shopper **12**. The "shopper receipt" message contains the following information: Shopper receipt=payment ID, transaction ID, amount, S_{ts} (payment ID, transaction ID, amount).

[0141] In interchange **40***l*) TTP-s **42** captures the payment and the funds are transferred to TTP-m **44**. This last step happens offline, is not shown in **FIG. 2**, and involves actual payment capture. For example, if the payment were done by credit card, TTP-s **42** would be actually charging the card. The specific payment capture process is beyond the scope of this invention; for example, payment capture could be done weekly as a batch job or on a per-order basis.

[0142] The description of how TTP-s **42** transfers the funds to merchant **14** is also beyond the scope of this invention. TTP-s **42** may in fact transfer the funds to TTP-m **44**, which in turn would transfer the funds to merchant **14**. TTP-s **42** and TTP-m **44**, may in the end retain a portion of the payment as fee for the payment service.

[0143] As an enhanced version of this payment method, payment is not captured until shipment of the order has been confirmed by merchant **14**. For this case, interchange **40***l* is replaced by the following three interchanges

[0144] **40***l*) Merchant **14** sends a signed "shipment confirmed" message to TTP-m **44**, confirming the shipment of the order. The "shipment confirmed" messaged contains the following information: Shipment confirmation=transaction ID, shipment status, S_m (transaction ID, shipment status).

[0145] **40***m*) TTP-m **44** forwards the "shipment confirmed" message to TTP-s **42**, confirming the shipment of the order.

[0146] **40***n*) TTP-s **42** captures the payment and the funds are transferred to TTP-m **44**.

[0147] Interchanges **40***a* to **40***k* are sequential in nature. The transaction is not complete until the last step (**40***k*) is performed. A timer is used at each step to protect against unusual situations where one of the parties (shopper **12**, merchant **14**, TTP-s **42** or TTP-m **44**) is not proceeding with the next step within a predetermined time. For interchanges **40***a* to **40***h*, if the timer expires, the transaction is assumed to be aborted. Any subsequent messages regarding this transaction will be ignored. Up to this point, any party can abort the transaction by simply not continuing with the next step.

[0148] At interchange **40***i*), if TTP-m **44** does not receive the receipt within a configuration specified time-out period, TTP-m **44** attempts to obtain the receipt by sending a request message to TTP-s **42**. If a receipt is not received after a pre-specified number of attempts, the transaction is assumed to be aborted. In this case, shopper **12** will not receive the order, but shopper **12** can contact TTP-s **42** to request a refund.

[0149] At interchange **40***j* if merchant **14** does not receive the receipt within a configuration specified time-out period, merchant **14** attempts to obtain the receipt by sending a request message to TTP-m **44**. If a receipt is not received after a pre-specified number of attempts, the transaction is assumed to be aborted. In this case, shopper **12** will not receive the order, shopper **12** can contact TTP-s **42** to request a refund.

[0150] At interchange **40***k*, if shopper **12** does not receive the receipt within a time-out period, shopper **12** may request a receipt from TTP-s **42** at a later time. This would not affect the transaction because the order will be shipped by merchant **14** as long as merchant **14** has received the receipt.

[0151] A description of the steps taken by each of shopper **12**, merchant **14** TTP-s **42** and TTP-m **44** during a purchase is now provided.

[0152] A. Process of Shopper **12**. When shopper **12** initiates a process transaction, the following steps occur:

[0153] A1. Prepare "order" message.

[0154] A2. Send "order" message to merchant **14**.

[0155] A3. Start timer T1.

[0156] A4. If T1 expires before "payment request" message is received from merchant **14**, abort the transaction.

[0157] A5. Verify signature of merchant **14**.

[0158] A6. If signature is not valid, abort transaction.

[0159] A7. Log "payment request" message.

[0160] A8. Prepare "payment" message.

[0161] A9. Send "payment" message to TTP-s **42**.

[0162] A10. Log "payment" message.

[0163] A11. Wait for receipt from TTP-s **42**.

[0164] At A11, if shopper **12** does not receive the receipt within a time-out period, shopper **12** may request a receipt at a later time. This would not affect the transaction because the order will be shipped by merchant **14** as long as merchant **14** has received the receipt.

[0165] B. Process for Merchant **14**. Upon receiving an "order" message from shopper **12**, the following steps occur:

[0166] B1. Generate transaction ID.

[0167] B2. Prepare "payment request" message.

[0168] B3. Send "payment request" message to shopper **12**.

[0169] B4. Log "payment request" message.

[0170] B5. Start timer T2; value of timer is set to the length of the validity period.

[0171] B6. If timer T2 expires before "TTP-m confirmation request" is received from TTP-m **44**, abort transaction.

[0172] B7. Verify signature of TTP-m **44**.

[0173] B8. If signature is not valid, abort transaction.

[0174] B9. If amount paid is not accurate, abort transaction.

[0175] B10. Log "TTP-m confirmation request" message.

[0176] B11. Prepare "merchant transaction confirmed" message.

[0177] B12. Send "merchant transaction confirmed" message to TTP-m **44**.

[0178] B13. Log "merchant transaction confirmed" message.

[0179] B14. Start timer T3.

[0180] B15. If receipt is received before T3 expires, transaction is completed successfully.

[0181] B16. Send a request to TTP-m **44** for the receipt and restart timer T3. This step is repeated if timer T3 expires again. If a receipt is not received from TTP-m **44** after a fixed number of attempts, abort transaction. If the transaction is aborted at B16, shopper **12** will not receive the order, but shopper **12** can contact TTP-s **42** to request a refund.

[0182] If a "TTP-m confirmation request" message is received from TTP-m **44** for an order where the validity period has expired (i.e., the corresponding transaction has already been aborted in B6), the TTP-m confirmation request is simply ignored. For the enhanced version of this payment method where payment is not captured until shipment of the order has been confirmed, a signed "shipment confirmed" message is sent to TTP-m **44** at step B15 if the receipt is received before T3 expires.

[0183] C. Process for TTP-s **42**. Upon receiving a "payment" message from shopper **12**, the following steps occur:

[0184] C1. Verify signature of shopper **12**.

[0185] C2. If signature is not valid, ignore message.

[0186] C3. Log "payment" message.

[0187] C4. Prepare "TTP-s confirmation request" message.

[0188] C5. Send "TTP-s confirmation request" message to TTP-m **44**.

[0189] C6. Log "TTP-s confirmation request" message.

[0190] C7. Start timer T4.

[0191] C8. If timer T4 expires before "TTP-m transaction confirmed" message is received from TTP-m **44**, abort transaction.

[0192] C9. Verify signature of TTP-m **44**.

[0193] C10. If signature is not valid, abort transaction.

[0194] C11. Log "TTP-m transaction confirmed" message.

[0195] C12. Request authorization from payment center **18** using secure communications, for the payment of the confirmed transaction.

[0196] C13. If amount is not approved by payment center **18**, abort transaction.

[0197] C14. Send receipt to TTP-m **44**.

[0198] C15. Send receipt to shopper **12**.

[0199] For C14, additional actions may be required if the receipt is not delivered within the time-out period set by TTP-m **44**. These actions are outlined in step D15 of the Process for TTP-m **44** section, which follows.

[0200] For C15, additional actions maybe required if the receipt is not delivered within the time-out period set by shopper **12**. These actions are outlined in the discussion of step A11 in the process of shopper **12** section, above.

[0201] If a message is received from TTP-m **44** asking for a receipt for a transaction that has been aborted, the message is ignored. This can happen if timer T4 has expired at C8 or the transaction has been aborted at C8, C10 or C13, and subsequently, a request for receipt is received because of step B16 of the Process of Merchant **14**, see above.

[0202] D. Process of TTP-m **44**. Upon receiving a "TTP-s confirmation request" message from the TTP-s **42**, the following steps are taken:

[0203] D1. Verify signature of TTP-s **42**.

[0204] D2. If signature is not valid, ignore message.

[0205] D3. Log "TTP-s confirmation request" message.

[0206] D4. Prepare "TTP-m confirmation request" message.

[0207] D5. Send "TTP-m confirmation request" message to merchant **14**.

[0208] D6. Log "TTP-m confirmation request" message.

[0209] D7. Start timer T5.

[0210] D8. If timer T5 expires before "merchant transaction confirmed" message is received from merchant **14**, abort transaction.

[0211] D9. Verify signature of merchant **14**.

[0212] D10. If signature is not valid, abort transaction.

[0213] D11. Log "merchant transaction confirmed" message.

[0214] D12. Prepare "TTP-m transaction confirmed" message.

[0215] D13. Send "TTP-m transaction confirmed" message to the TTP-s **42**.

[0216] D14. Start timer T6.

[0217] D15. If timer T6 expires before receipt is received from TTP-s **42**, send a request to TTP-s **42** for the receipt and restart timer T6. This step is repeated if timer T6 expires again. If a receipt is not received from TTP-s **42** after a fixed number of attempts, abort transaction.

[0218] D16. Send receipt to merchant **14**.

[0219] For D16, additional actions may be required if the receipt is not received by merchant **14** within the time-out period set by merchant **14**. These actions are outlined in step B16 of the Process of Merchant section above.

[0220] For the enhanced version of this payment method where payment is not captured until shipment of the order has been confirmed by merchant **14**, an extra step is added after D16, namely, when a "shipment confirmed" message is received from the merchant, this message is forwarded to TTP-s **42**.

[0221] If a message is received from merchant **14** asking for a receipt for a transaction that has been aborted, the message is ignored. This can happen if timer T5 has expired at D8 or transaction has been aborted at D10 or D15, and subsequently, a request for receipt is received because of step B16 of the Process of Merchant **14**.

[0222] In case of dispute, shopper **12** has a signed payment request from merchant **14** and a signed receipt from a TTP (**16** or **42**). Merchant **14** has a signed receipt from a TTP (**16** or **44**). The TTP (**16**, **42** or **44**) has a signed payment from shopper **12** and a signed confirmation from merchant **14**. The above information is sufficient for dispute resolution purposes.

[0223] Throughout the specification and the claims, when the inventors refer to the use of a credit card or other form of payment they simply refer to one example of payment. Any form of electronic payment is intended by the inventors to be considered, including direct payment center account numbers, debit cards, smart cards and any other form of negotiable instrument in the electronic medium.

[0224] Throughout the disclosure and claims, when the inventors refer to payment center **18** they intend to include all businesses that may recognize the credit of shopper **12** to pay for the purchase. For example, payment center **18** may include any number of institutions such as banks, credit card companies or credit unions. Further, a payment center **18** may further include existing networks that accept electronic payments, such as Interact or Cirrus. In essence, to the inventors, payment center **18** is someone who will authorize payment for a purchase.

[0225] Although **FIGS. 1 and 2** show only a single shopper **12** and merchant **14** there can of course be many shoppers **12** and merchants **14** all utilizing the invention with a variety of TTP's of their choice. Thus the present invention allows each party to be represented by their own TTP. Further, a single TTP may represent more than one shopper **12** and/or merchant **14**. The present invention does not require shopper **12** or merchant **14** to register with a TTP to utilize the invention.

[0226] As can be appreciated by one skilled in the art, shopper **12**, merchant **114**, payment center **18** and TTP's (**16**, **42**, and **44**) can all be viewed as nodes on a network. The nature of the network may be based upon the Internet, or it may utilize a protocol other than TCP/IP, perhaps proprietary. It may be wireless or wired. The point here being that to work the present invention it is merely necessary that some form of network exist to connect the above listed entities or nodes. One skilled in the art of the network utilized will be able to format the message data for the interchanges as described.

[0227] Although the format of the messages for each interchange in the network has been specified, one skilled in the art may easily modify the content of a message yet remain within the scope of the invention. For example, in some implementations message fields such as "validity period" may be programmed into the nodes, similarly a "transaction id" may be eliminated by using a timestamp or other means.

[0228] Although the invention has been described with reference to certain specific embodiments, various modifications thereof will be apparent to those skilled in the art without departing from the spirit and scope of the invention as outlined in the claims appended hereto.

What is claimed is:

1. A system for the on-line purchase and payment of goods or services, said system comprising a communication network, said network comprising a shopper node, a merchant node, a trusted third party node and payment center node; said trusted third party node being the only node communicating with said payment center node.

2. The system of claim 1 wherein said trusted third party node comprises a shopper's trusted third party node and a

merchant's trusted third party node; said shopper's third party node being the only node communicating with said payment center node.

3. The system of claim 1 comprising a plurality of nodes selected from the set consisting of: shopper node, merchant node, trusted third party node and payment center node.

4. The system of claim 2 comprising a plurality of nodes selected from the set consisting of: shopper node, merchant node, shopper's trusted third party node, merchant's trusted third party node and payment center node.

5. The system of claim 1 wherein said trusted third party node may be utilized by a plurality of shoppers and a plurality of merchants.

6. The system of claim 2 wherein said shopper's trusted third party node may be utilized by a plurality of shoppers and said merchant's trusted third party node may be utilized by a plurality of merchants.

7. A method for the on-line purchase of goods or services said method comprising the steps of:

a) enabling a shopper to initiate a transaction with a merchant;

b) enabling said merchant to request payment from said shopper;

c) enabling said shopper to send payment information to a trusted third party;

d) enabling said trusted third party to query said merchant on the details of said transaction for the purpose of confirming said transaction;

e) enabling said merchant returning confirmation of said transaction to said trusted third party;

f) enabling said trusted third party to request payment from a payment center;

g) enabling said trusted third party to inform said merchant that said payment has been made; and

h) enabling said trusted third party sending a receipt to said shopper confirming that said payment has been made.

8. The process of claim 7 wherein at step b) said merchant transmits to said shopper: a transaction identifier, an amount, order data, an encryption certificate and a digital signature.

9. The process of claim 7 wherein at step c) said shopper transmits to said trusted third party: a transaction identifier, an amount, a merchant identifier, an encryption certificate and a digital signature.

10. The process of claim 7 wherein at step e) said merchant transmits to said trusted third party: a transaction identifier, an amount, a status and a cryptographic digest containing details on said transaction.

11. A method for the on-line purchase of goods or services said method comprising the steps of:

a) enabling a shopper to initiate a transaction with a merchant;

b) enabling said merchant to request payment from said shopper;

c) enabling said shopper to send payment information to a shopper trusted third party;

d) enabling said shopper trusted third party to query a merchant trusted third party on the details of said transaction for the purpose of confirming said transaction;

e) enabling said merchant trusted third party to query said merchant on the details of said transaction for the purpose of confirming said transaction;

f) enabling said merchant to return confirmation of said transaction to said merchant trusted third party;

g) enabling said merchant trusted third party to return said confirmation to said shopper trusted third party;

h) enabling said shopper trusted third party to request payment from a payment center;

i) enabling said shopper trusted third party to inform said merchant trusted third party that payment has been made;

j) enabling said merchant trusted third party to inform said merchant that payment has been made; and

k) enabling said shopper trusted third party to send a receipt to said shopper confirming that said payment has been made.

12. A method for the on-line purchase and payment of goods or services, said method comprising the steps of:

a) enabling a shopper to initiate a transaction with a merchant;

b) enabling said merchant to acknowledge said transaction;

c) enabling said shopper and said merchant to interact with a single trusted third party to complete said transaction; and

d) enabling said trusted third party to confirm payment for said transaction with a payment center.

13. The method of claim 12 wherein said shopper interacts with a shopper's trusted third party and said merchant interacts with a merchant's trusted third party.

14. The method of claim 12 wherein messages between said merchant and said trusted third party include a cryptographic digest.

15. The method of claim 13 wherein messages between said merchant and said merchant's trusted third party include a cryptographic digest.

16. The method of claims **12** and **13** wherein messages between said shopper, said merchant, and said trusted third party are digitally signed.

17. The method of claim 1 wherein messages between said merchant node and said trusted third party node include a cryptographic digest.

18. A computer program for enabling the payment of on-line transactions, said program comprising:

a) program code for enabling a shopper to contact a merchant;

b) program code for enabling a merchant to contact a shopper;

c) program code for enabling said merchant and said shopper to communicate with a trusted third party; and

d) program code for enabling said trusted third party to communicate with a payment center.

19. The program of claim 18 wherein messages between said shopper, said merchant, said trusted third party and said payment center may be digitally signed.

20. The program of claim 18 wherein messages between said merchant and said trusted third party may include a cryptographic digest.

21. The program of claim 18 wherein said merchant and said shopper may each have a different trusted third party.

22. The program of claim 18 wherein said program is encoded in a computer readable medium.

23. The method of claim 12 wherein said method is encoded in a computer readable medium.

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