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[54] **SYSTEM AND METHOD FOR MULTI-CURRENCY TRANSACTIONS**

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[52] **U.S. Cl.** **705/26**; 705/39; 705/42; 705/43; 705/38; 235/379; 235/380

[58] **Field of Search** 705/39, 42, 43, 705/38, 26; 235/379, 380

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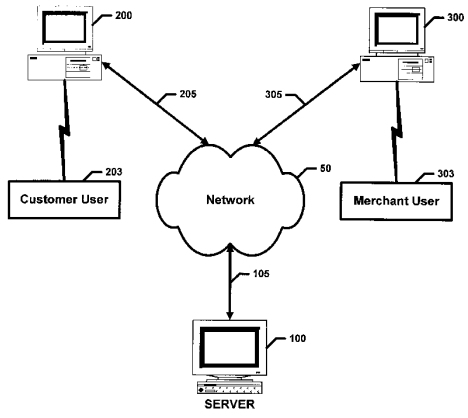
[57] **ABSTRACT**

A system and method for determining approval of a multi-currency transaction between a customer and a merchant over a network. The system includes a customer computer which is connected to a communication network, a merchant computer which is connected to the communication network, and a server connected to both the customer computer via the communication network and to the merchant computer via the communication network. The customer computer includes a first set of data which contains an amount the customer is willing to pay the merchant for a product in a first currency. The merchant computer includes a second set of data which contains a product price at which the merchant agrees to sell the product in a second currency. The server receives the first set of data and the second set of data. The server then converts the amount in the first currency into a converted amount in the second currency. The server approves the transaction if the converted amount in the second currency is within a risk range of the product price in the second currency in accordance with current exchange rates. Once the transaction is approved, the approving entity may settle the transaction at its discretion thereby bearing the risk associated with currency exchange. The parties, however, incur no risk. The customer will pay be amount in the first currency and the merchant will receive the price in the second currency. These are values known and agreed to by the parties at the time of the transaction.

24 Claims, 2 Drawing Sheets



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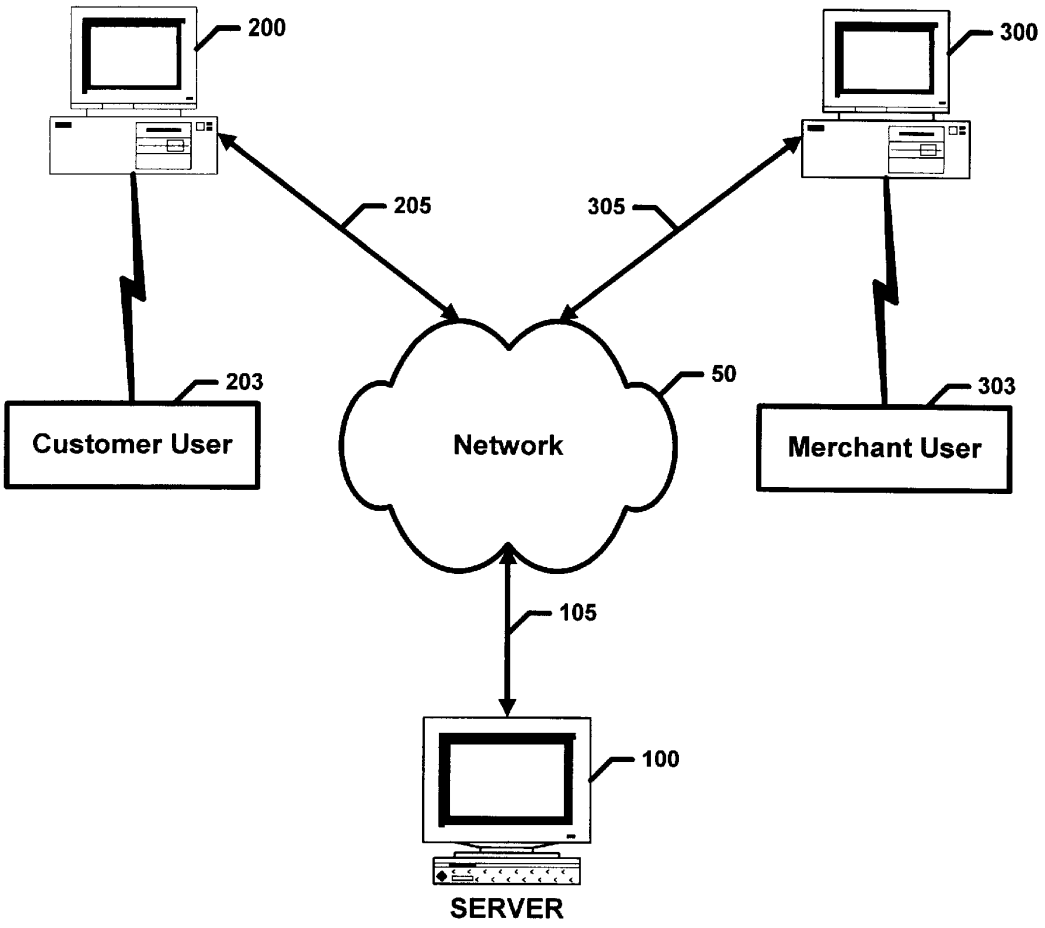
200
300
205
305
203
50
303
Customer User
Network
Merchant User
105
100
SERVER

FIGURE 1

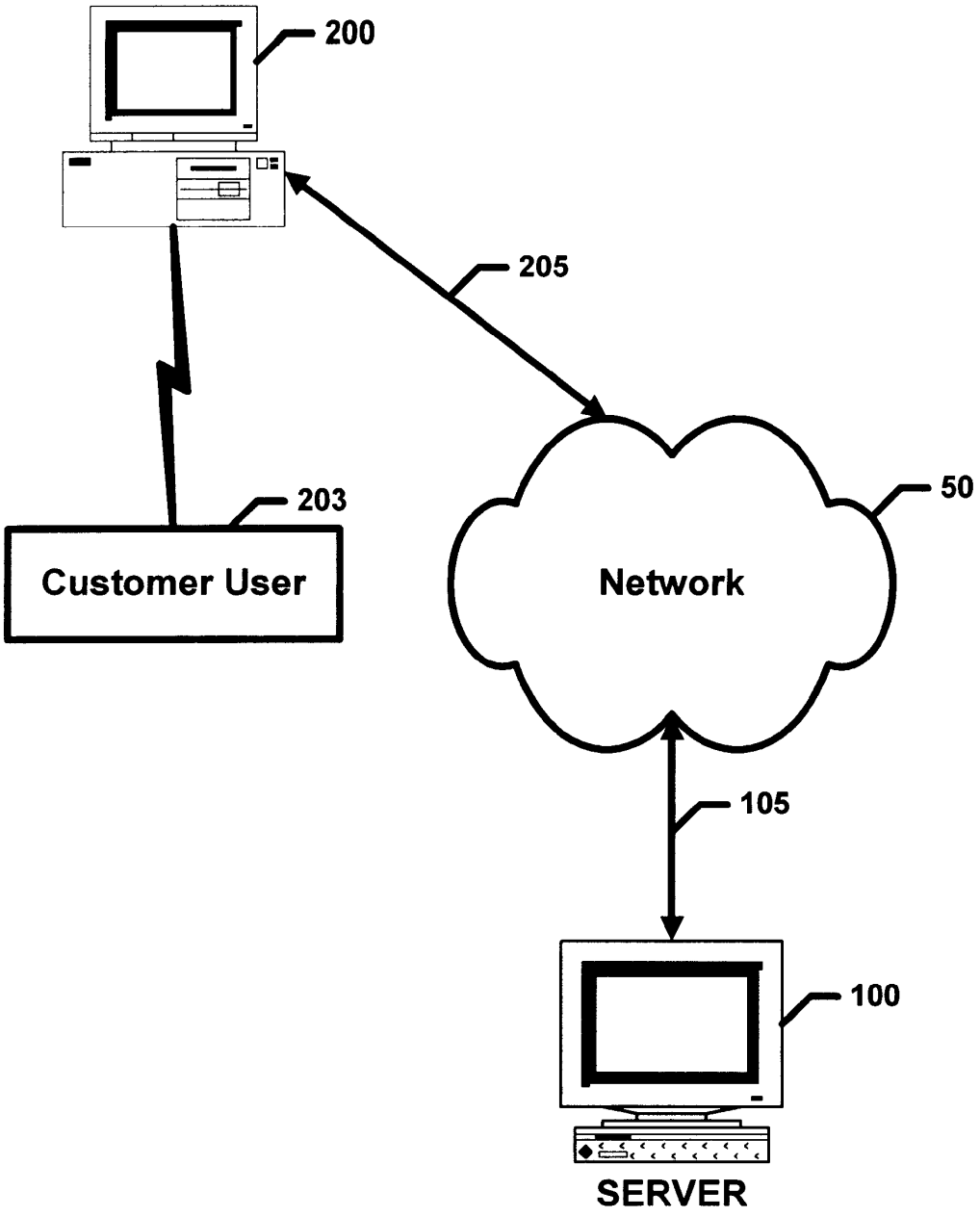

FIGURE 2

SYSTEM AND METHOD FOR MULTI-CURRENCY TRANSACTIONS

BACKGROUND OF THE INVENTION

1. Field of Invention

The present invention generally relates to a system and method for approving a transaction over a communications network between a merchant and a customer. More specifically, the present invention is directed to a system and method for approving a transaction between a merchant and a customer, wherein the transaction occurs over an electronic network (such as the Internet) and wherein the customer pays for a product using electronic cash in one currency and the merchant receives electronic cash for the product in a different currency.

2. Description of the Prior Art

Soon, international commerce may be a common experience for almost everyone. This is due, in large measure, to computer networks, including the Internet, which link individuals, consumers, businesses, financial institutions, educational institutions, and government facilities. In fact, the growth in international commerce appears limitless, given the forecasts relating to the commercial use of the Internet and the like.

There is a problem, however, inherent in international commerce, electronic or otherwise. The problem exists, for the most part, because monetary systems differ from country to country. That is, money is generally expressed in different currencies in different countries and the value of the different currencies vary greatly. Currency conversion is widely used to convert money from one currency into money of a different currency.

As used herein, the term "currency" includes, but is not limited to, denominations of script and coin that are issued by government authorities as a medium of exchange. A "currency" also may include a privately issued token that can be exchanged for another privately issued token or government script. For example, a company might create tokens in various denominations. This company issued "money" could be used by employees to purchase goods from merchants. In this case, an exchange rate might be provided to convert the company currency into currencies which are acceptable to merchants.

In each instance, currency conversion represents a significant economic risk to both buyers and sellers in international commerce. For example, assume a customer desires to buy a product from a merchant. Further consider the scenario where the customer pays his credit card bills in United States dollars and the merchant only accepts French francs for the products he sells. The customer uses his credit card to pay the merchant for the product. The merchant receives French francs.

Typically, at an undetermined later date, the company issuing the credit card would bill an amount to the customer in United States dollars. The amount billed to the customer is determined by an exchange rate used at the time the credit card company settles the transaction. This settlement is often at an indeterminate time and could be on the date of purchase or several days or weeks later. The time of this settlement is at the credit card company's discretion. The risk to the credit card company is minimal—it can settle the transaction when exchange rates are favorable. Thus, in this case, it is the customer who bears the risk that the value of the customer's currency will decline prior to this settlement.

As another example, consider a cash transaction where a merchant accepts a currency other than that of his country's

currency. In this case, the merchant sells the currency to a currency trader, usually at a discount. The price the merchant charges to the customer who pays cash reflects both the cost of currency conversion (the discount) and the risk that the rate used to establish the price of the product in a particular currency may have changed. This results in the customer paying a higher price for the product and the merchant incurring risk due to a possible change in currency exchange rates.

Thus, the described post sale methods of currency exchange may impart significant risk upon the customer and the merchant. Risk is typically on the side of whoever commits to the currency conversion. Specifically, in a cash transaction, the customer bears the risk when currency is converted prior to purchasing a product. The merchant sustains the risk when he converts the customer's currency into his own currency. Also, in the case of transactions on the scale of a few cents, the cost of currency conversion may be greater than the currency is worth.

As yet another example, consider the risks that an individual assumes when he converts from the currency of his country ("native currency") to a different second currency. In this case, the individual can purchase goods at a price in the second currency, but cannot be certain of the value of the second currency relative to his native currency. In this case, the currency exchange has occurred pre-sale. Thus, the individual assumes the risk of devaluation of the second currency against the first. Further, the customer bears the risk that the second currency may cease to be convertible into his native currency.

It is noted that if the individual desires to purchase an item in a third currency which differs from the native and second currencies, he must undertake at least one additional currency conversion (converting either his native currency to the third currency, the second currency to the third currency, or a combination of both). In this case, the customer assumes an additional risk.

The present invention recognizes that international commerce over electronic networks, such as the Internet, cannot reach potential unless customer and merchant obligations relating to transactions are fixed at the time of the transaction so that risk to these parties associated with currency exchange is minimized. Thus, what is needed to encourage the development of international commerce over such networks is a system and method that offers a means of eliminating the uncertainty associated with multi-currency transactions. One aspect of the invention disclosed herein shifts the risk associated with currency exchange from both the merchant and customer to a third party (e.g., a server) in real time. This server may assume the risk itself or may choose to subsequently pass on the risk to a fourth party (e.g., a bank or other financial institution).

SUMMARY OF INVENTION

The present invention is directed to a system for determining approval of a transaction between a merchant and a customer. The system comprises a merchant device associated with the merchant. The merchant device has a first set of data including a product price in a first currency The system also has a customer device associated with the customer. The customer device has a second set of data including a first amount in a second currency. The system further has a server device connected to both the customer device and the merchant device for receiving the first and second sets of data and for approving the transaction when the first amount in the second currency is within a risk range

of the price in the first currency in accordance with current exchange rates.

Another aspect of the present invention is directed to a system for determining approval of a transaction between a merchant and a customer. The transaction includes the merchant providing a product to the customer at a price in a first merchant currency. The price in the first merchant currency is known by the customer. The system comprises a customer device associated with the customer. The customer device has a first set of data including a customer amount in a customer currency. The system also includes a server connected to the customer device having the merchant price in the first merchant currency for receiving the first set of data, and for approving the transaction when the customer amount in the customer currency is within a risk range of the price in the merchant currency in accordance with current exchange rates.

Still another aspect of the present invention is directed to a method for determining approval of a transaction between a merchant having a merchant device and a customer having a customer device. The merchant device and the customer device are connected to a server. The method comprises transmitting a first set of data from the merchant device to the customer device. The first set of data includes a merchant price in a first merchant currency. The method includes receiving the first set of data by the customer device, wherein the customer device has a second set of data including a customer amount in a first customer currency. The method further includes transmitting the first and the second sets of data by the customer device to the server and transmitting the first and second sets of data by the customer device to the server. The server is for approving the transaction when the customer amount in the first customer currency is within a risk range of the merchant amount in the merchant currency in accordance with current exchange rates.

BRIEF DESCRIPTION OF DRAWINGS

Representative embodiments of the present invention will be described with reference to the following drawings:

FIG. **1** is a diagrammatic representation of one aspect of the present invention.

FIG. **2** is a diagrammatic representation of another aspect of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference is now made to FIGS. **1–2** for the purpose of describing, in detail, the preferred embodiments of the present invention. The Figures and accompanying detailed description are not intended to limit the scope of the claims appended hereto.

The preferred architecture of the present invention is generally depicted in FIG. **1**. FIG. **1** shows three entities: a server **100**, a customer computer **200**, and a merchant computer **300**, connected to each other via a network **50**. The network **50** may be a private, public, secure, or an insecure network. The preferred embodiments of the present invention contemplate use of an insecure network, for example, the Internet. The connections to the network **50** are identified by lines **105**, **205**, and **305**, respectively, and are well known in the art.

The merchant computer **300** represents the computer of an individual, for example, a merchant user **303**, who sells products via the network **50**. A "product" may include goods, services, information, data, and the like. The customer computer **200** represents the computer of an individual, for example, a customer user **203**, who wants to buy a product (or products) from the merchant user **303** over the network **50**. The mechanism of delivery of the product is not a part of this patent. Product delivery could be coincident with payment, before payment, or after payment.

The server **100** represents a computer of an entity who processes transactions between the customer user **203** and the merchant user **303**. The server **100** has a database including at least one customer account in a first currency associated with the customer user **203** and one merchant account in a second currency associated with the merchant user **303**. The first currency differs from the second currency. The accounts preferably store electronic funds of the parties, for example, electronic cash. The electronic funds are a representation of funds (real cash, credit, etc.).

The server **100** also has its own server accounts. The server accounts are in currencies corresponding to the currencies of the customer and merchant accounts. The server accounts represent real cash, credit, etc. corresponding to the electronic funds stored in the customer and merchant accounts.

We prefer to maintain local accounts at the merchant computer **300** and the customer computer **200**. The local accounts represent the electronic funds in the merchant account and the customer account maintained at the server **100**, respectively. The local accounts of the customer and the merchant are sometimes referred in the art as "wallets" and "cash registers", respectively. The server accounts may be arranged with a bank or other financial institution.

To illustrate how these accounts might be set up, consider the situation where a customer user **203** lives in the United States and purchases products using U.S. dollars. Further assume that a merchant user **303** located in France conducts his operations in French francs. In this case, the server **100** may have a customer account in United States dollars and a merchant account in French francs. The server **100** processing transactions between these parties may have two electronic accounts representing all user accounts whose currencies are in dollars and all user accounts whose currencies are in francs as well as two real accounts in a bank. One server account would be in United States dollars and the other server account in French francs.

When the network **50** is insecure, we prefer to take measures to assure that the server **100**, customer computer **200**, and the merchant computer **300** can communicate securely over the network **50**. Of course, secure communication is not required for the present invention, but is only a preferred form of such communication.

Central to achieving such security while maintaining a high performance payment system is the use of "sessions". A session is an opportunity (or window) in which the customer user **203** may purchase a product from the merchant user **303** over the network **50** or which the merchant user **303** may sell a product to the customer user **203** over the network **50**. By using a session, a merchant can securely communicate with a customer over an insecure network. The customer user **203** and the merchant user **303** have their own independent sessions. Sessions are of limited duration. This duration is governed by predetermined parameters. These parameters are preferably set by the customer user **203** and the merchant user **303**. However, the server **100** may set or limit values of such parameters.

We prefer that the parameters relating to the session of customer user **203** limit an amount of electronic funds (the

"session amount"), a maximum amount of time that the customer's session may last, and a maximum number of transactions that the customer user **203** may conduct. The session amount is the maximum amount of electronic funds that the customer user **203** may spend during the customer's session. Also, we prefer that the session of merchant user **303** is limited by a maximum amount of time that the merchant's session may last and a maximum number of transactions that the merchant user **303** may conduct.

To accomplish such secure communication over the insecure network, a first session associated with the customer user **203** is created. The first session has first use parameters for limiting the duration that the first session can be used and a set of customer data. The first use parameters and the set of customer data are identifiable by the server **100**. A second session associated with the merchant user **303** is also created. The second session has second use parameters for limiting the duration that the second session can be used and a set of merchant data. The second use parameters and the set of merchant data are identifiable by the server **100**. Over the insecure network, a portion of the first session and a portion of the second session are linked. The portion of the first session includes the set of customer data and the first use parameters. The set of customer data may include a customer identification string which identifies the customer user **203**. The portion of the second set of data includes the set of merchant data and the second use parameters. The set of merchant data may include a merchant identification string which identifies the merchant user **303**. The server **100** verifies the customer user **203** and the merchant user **303** based upon at least portions of the set of customer data and the set of merchant data and determines that the first and second sessions can be used. In this manner, confidential details of the payment between the customer user **203** and the merchant user **303** are assured of being communicated securely. This procedure of establishing secure communication is more fully set forth in our copending U.S. patent application Ser. No. 08/572,425, filed on Dec. 14, 1995, and entitled "Electronic Transfer System And Method" which is incorporated herein by reference. Of course, other methods and systems for establishing secure communication over an insecure network may be used to use the invention set forth herein.

The merchant user **303** and the customer user **203** endeavor ultimately to effect a "transaction", that is, the purchase of a product by the customer user **203** from the merchant user **303**. The merchant user **303** and the customer user **203** need not have any prior existing relationship to transact business. This is so because the merchant user **303** and the customer user **203** each have a pre-established relationship with the server **100** prior to transacting business.

How the parties form this relationship is not part of the present invention. Rather, what is important is that the customer and merchant accounts, described above, exist with the server **100**. To form the relationship, we prefer that the customer user **203** provide information using customer computer **200** to the server **100**. Such information may include the name of customer user **203** and the currency in which he intends to purchase products. In the case of the merchant user **303**, this information may include the name of the merchant user **303** and the currency in which he intends to ultimately receive for providing products. Other information can be provided as deemed necessary by the server **100**.

This relationship may be either direct or indirect. An indirect relationship, for example, would include the situation where one or more entities, previously known to the server **100**, vouch for the merchant user **303** and/or the customer user **203**. Public key crypto systems are generally used in this type of vouching process and are well known to those skilled in the art. The process of using public key crypto systems as such is known in the art as "certificate management". In this case, vouching entities are known as "certificate authorities". Certificates, certificate management, and certificate authorities are well known in the art and are not the subject of the present invention.

The present invention is directed toward "approval" of a multi-currency transaction in which the customer user **203** pays in a first currency and the merchant user **303** accepts the payment in a second currency which differs from the first currency, rather than the completed transaction itself. As will be described below, approval commits the customer user **203** and the merchant user **303** to the terms of the transaction and commits the server **100** to perform virtual settlement of the transaction.

As used herein, "virtual settlement" of the transaction represents at least the movement of electronic funds to a merchant account of merchant user **303** held by the server **100**. It may also represent the movement of electronic funds from a customer account of the customer user **203** held by the server **100**. This is to be distinguished from actual settlement of the transaction. As used herein, "actual settlement" of the transaction includes at least converting real funds in an amount equal to the amount in the customer selected currency into real funds in the merchant accepted currency.

The parties are committed as such because of pre-existing bilateral contractual obligations between merchant user **303** and the operator of server **100** and between customer user **203** and the operator of the server **100**. The contractual obligations are preferably formed during the commencement of service relationship between the server **100** and the customer user **203** and the merchant user **303** respectively.

The obligations may include the agreement of customer user **203** and the merchant user **303** to permit the server **100** to perform virtual settlement of the transaction. In return, the server **100** may agree to incur the risks associated with currency exchange when it performs actual settlement of the transaction. We prefer that the customer user **203** and the merchant user **303** agree to allow the server **100** (on behalf of the operator of the server **100**) to maintain accounts and balances of funds managed by the server **100**. Further, we prefer that the movement of funds between those accounts be coincident with the transaction.

In this way, the customer user **203** knows substantially the amount in the currency he will pay for the product. Similarly, the merchant user **303** knows substantially the price in the currency he will receive for the product. Thus, the customer user **203** and the merchant user **303** do not bear the above-described risks associated with currency exchange. The amount the customer user **203** knows and the price the merchant user **303** knows is substantially the respective amount and price because there may be minor factors that affect these actual values. Such factors will be discussed in terms of risk factors. It is the entity charged with performing actual settlement of the transaction who bears such risks when the transaction is actually settled.

The present invention is directed to approval of multi-currency transactions in which the customer user **203** pays in a first currency and the merchant user **303** accepts the payment in a second currency which differs from the first currency. To transact business, the customer user **203** may

shop over the network **50** among the merchant users **303** who also have been permitted by server **100** to transact business (which may be, for example, those who have merchant sessions). Using well known techniques, the customer user **203** and a merchant user **303** agree on a product to be purchased at a price and in a currency.

Thus, the merchant user **303** will accept a price and receive payment for the product sold to the customer user **203**. The price for the product is in a currency accepted by the merchant user **303**, referenced herein as the "price in the merchant accepted currency P(MAC)". The customer user **203** will pay an amount to the merchant user **303** for a selected product. The amount will be paid in a currency selected by customer user **203**, referenced herein as the "amount in the customer selected currency A(CSC)". The currency selected by the merchant user **303** is different than the currency selected by the customer user **203**. Hence, currency exchange is used to approve the transaction contemplated by the present invention.

In a first embodiment of the present invention, the server **100** is used to approve the transaction between the merchant user **303** and the customer user **203**. As stated previously, approval commits the customer user **203** and the merchant user **303** to the terms of the transaction and commits the server **100** to perform virtual settlement of the transaction.

In this embodiment, the customer user **203** and the merchant user **303** have established and agreed upon a product to be purchased at a price the merchant user **303** will accept. This product and price are referred to herein as the "agreed product" and the "agreed price", respectively.

Having agreed upon the product and the price, the merchant computer **300** transmits a first set of data to the server **100**. This first set of data includes the agreed price that the merchant user **303** is willing to receive for his product. The transmitted agreed price is in the merchant accepted currency. Other information may be transmitted by the merchant computer **300** as needed by the server **100**, for example, information identifying the merchant user **303**, the product to be purchased, account information, etc.

Having agreed upon the product and the price, the customer computer **200** transmits a second set of data to server computer **100**. This second set of data includes the amount that the customer user **203** is willing to pay for the agreed product. The transmitted amount is in the customer selected currency. As previously stated, the customer selected currency is contemplated as being different than the merchant accepted currency.

In a further aspect of this embodiment, we prefer that along with providing the amount in the customer selected currency A(CSC), the customer computer **200** also transmit the agreed price in the merchant accepted currency P(MAC) to the server **100**. This assures that the customer user **203** and the merchant user **303** have actually reached agreement on the terms of the transaction and precludes either party from denying such agreement. Other information may be transmitted by the customer computer **200** as needed by the server, for example, a requested payment range (described later), information identifying the customer user **203**, the product to be purchased, account information, etc.

It is not required that the merchant user **303** know or approve the customer selected currency, that is, the currency in which the customer user **203** will pay. There is no requirement that the customer user **203** approve the merchant accepted currency, that is, the currency which the merchant user **303** will receive. What is required in this embodiment of the present invention is that the server **100** be able to convert one such currency into the other.

It is noted that not requiring "approval" of a currency by the merchant user **303** and/or the customer user **203** is distinguishable from the approval of a "transaction" by the server **100**. Approval of a currency would be, for example, where the customer user **203** would need the permission of the merchant user **303** to pay in a given customer selected currency. Approval of transaction, on the other hand, commits the customer user **203** and the merchant user **303** to the terms of the transaction and commits the server **100** to perform virtual settlement of the transaction. The present invention does not require approval of a currency.

The first and second sets of data transmitted to the server **100** need not come directly from the merchant computer **300** and the customer computer **200**. This information may be transmitted via alternative routes. For example, we prefer that customer computer **200** transmit the second set of data to the merchant computer **300**. Upon receipt of the second set of data, the merchant computer **300** transmits at least the amount in the customer selected currency A(CSC) and the first set of data including price in the merchant accepted currency P(MAC) to the server **100** for approval of the transaction. In this case the second set of data may be protected to prevent the merchant from altering it.

Upon receiving the amount in the customer selected currency A(CSC) and the agreed price in the merchant accepted currency P(MAC), the server **100** approves the transaction. The approval process performed by server **100** is based upon the relative value of the customer selected currency in terms of the merchant accepted currency. This relative value may be established by the operator of server **100**, a third party, or in other aspects of the present invention, the customer user **203** or the merchant user **303**. This preferably includes a rate of exchange at which the customer selected currency can be converted into the merchant accepted currency. Alternatively, or in addition, this information may include a rate at which the merchant accepted currency can be converted into the customer selected currency.

Approval of the transaction occurs when the amount in the customer selected currency A(CSC) is sufficient to pay the merchant user **303** the agreed price in the merchant accepted currency P(MAC). The sufficiency determination process preferably includes converting the amount in the customer selected currency A(CSC) into an amount in the merchant accepted currency, referenced herein as the "amount in the merchant accepted currency A(MAC)", using a current exchange rate.

The current exchange rate data is preferably maintained by the entity charged with approving the transaction. Thus, in this embodiment, the server **100** may obtain it from a currency broker or bank. In a further aspect of this embodiment, the approving entity may decide to buy and sell currencies and establish its own exchange rates. In addition, as the server **100** has the opportunity to aggregate transactions prior to committing to actually exchange currency with an external agency, it may obtain preferential exchange rates by converting money in relatively large units.

The frequency that the current exchange rate data is updated depends upon the level of risk that the approving entity may be willing to accept and the availability of updates from currency brokerage services. It is preferred that when the server **100** is the approving entity, it receives updates to the exchange rate data on-line from one or more currency brokers. Frequency and timing of updates are based on business rules agreed between the operator of the server **100** and the currency broker or brokers. This manages the

risk of a significant change between the current exchange rate and the exchange rate used when the transaction is actually settled.

Approval of the transaction by the server **100** is preferably based upon predetermined criteria. These criteria may be established by any of the parties to the transaction or a third party. For example, we prefer that the server **100** approve the transaction if the amount in the merchant accepted currency A(MAC) equals or exceeds the price in the merchant accepted currency P(MAC).

Alternatively, the server **100** could approve the transaction if the amount in the merchant accepted currency A(MAC) is less than the price in the merchant accepted currency P(MAC). In this instance, the server **100** may absorb differentials (as where the cost associated with disapproving the transaction and reprocessing it exceeds the differential). Acceptable differentials may be dependent upon the creditworthiness of the customer user **203** or the merchant user **303**, the acceptable deficit balance that the customer user **203** or the merchant user **303** are allowed to incur, or other market conditions such as, for example, fluctuations in exchange rates. These acceptable differentials are referred to with respect to each party of the transaction as a "risk range".

Also, in the case where the amount in the merchant accepted currency A(MAC) is less than the price in the merchant accepted currency P(MAC) but within a predetermined range, the server **100** could record the differentials as they occur and collect them from the customer user **203** at a later time. This range is contemplated as being a small range and is referred to herein as the "payment range". The payment range may be predetermined by the customer user **203** or preferably, by the server **100**. For the purpose of this application, the amount in the customer selected currency A(CSC) is equal to the amount in the customer selected currency A(CSC) plus or minus the payment range. The payment range thus defines the amount of conversion error permitted in the transaction.

Approval of the transaction may also be contingent upon the customer user **203** having access to electronic funds in an amount equal to or exceeding the amount in the customer selected currency A(CSC). These funds may be stored or represented in a customer account associated with the customer user **203**. In this case, the server approves the transaction when the amount in the merchant accepted currency A(MAC) meets the predetermined criteria described above and the customer account contains electronic funds in an amount at least equal to the amount in the customer selected currency A(CSC). Using any of the above methods for approval, alone or in combination, the server **100** approves the transaction.

In order to avoid having to access the customer account of the customer user **203** and for security reasons, we prefer to limit the amount in the second set of data that a customer user **203** can transmit to the server **100** by the session amount. The session amount is an amount known by the server **100** to which the customer has access when the customer user **203** is permitted to shop. The limited amount is reduced as the customer user **203** purchases products over the network **50**. The customer computer **200** temporarily prohibits the customer user **203** from transmitting an amount exceeding the session amount to the server **100** to be considered for sufficiency until more electronic funds is added to the session in which case the session amount has been increased. It is preferred that under such circumstances, the existing session will automatically close and a new session will be opened with funds at least sufficient to complete the transaction. Once the subsequent session is opened, the transaction may be approved. Of course, if the server computer **100** determines that customer user **203** does not have enough funds available to it to open a subsequent session of sufficient value, the transaction may be refused by server **100** altogether or the server **100** may approve the transaction as described herein.

It is preferred that the funds available to customer user **203** during its session and the funds received by the merchant user **303** during its session be maintained to two decimal positions to the right of the minor unit of a currency. For example, in the case of U.S. dollars, the present invention preferably would carry the value of session funds to one hundredth of a penny to assure that rounding errors are minimized during a session, thus decreasing rounding errors during currency conversion of small transactions. When a session closes, the balance in the session is adjusted to whole minor currency units (this adjustment may be rounding or truncation).

Once the transaction is approved, the customer user **203** and the merchant user **303** are committed to the terms of the transaction. Specifically, the customer user **203** is committed to pay the amount in the customer selected currency A(CSC). Similarly, the merchant user **303** is committed to accept the price in the merchant accepted currency P(MAC) for the product. The parties are committed as such through the contractual arrangement previously described.

By the contractual obligations described above, the server **100** is committed to perform virtual settlement of the transaction. Therefore, according to this aspect of the present invention, a merchant account may be maintained for the merchant user **303** and a customer account may be maintained for the customer user **203**. The merchant and customer accounts are preferably maintained by the server **100**. However, one or both of the accounts may be maintained by a party other than the server **100**.

The merchant account and customer account may be debit or credit accounts. We prefer that the customer account be a debit account and that the merchant account be a credit account and that each such account represent funds in the form of electronic funds. However, other types of accounts may be used as known by those skilled in the art.

In the case where a party other than the server **100** maintains a merchant account and/or a customer account, the server **100** may transmit data to the party to enable virtual settlement. For example, if the party maintained the merchant account and the customer account, the server **100** may transmit data identifying the merchant account and the price in the merchant accepted currency P(MAC) to be credited, and the customer account and the amount in the customer selected currency A(CSC) to be debited. Then, the party would debit the customer account and credit the merchant account accordingly.

In this process, upon approval of the transaction, the customer account is debited by the amount in the customer selected currency A(CSC). The merchant account is credited with the agreed price in the merchant accepted currency P(MAC). This amount and price were known by and agreed to by the customer user **203** and the merchant user **303**. Thus, there is no uncertainty as to the amount or currency to be paid by customer user **203** or the price or currency to be received by merchant user **303**.

Several variations on the above described embodiment provides that the currency used in the customer selected currency may be selected by the customer user **203** (or the

server **100**) from a plurality of currencies, referred to herein as "customer currencies". Also, the currency used in the merchant accepted currency may be selected by the customer user **203** from a plurality of currencies, referred to herein as "merchant currencies". A description of these variations is now provided.

A customer user **203** may have access to amounts in a plurality of customer currencies. For example, a customer user **203** may have accounts containing amounts in United States dollars, French francs, and Japanese yen. The customer user **203** may purchase products using amounts from any of these accounts. To effect this option, the customer computer **200** presents an amount in each of the plurality of customer currencies to the customer user **203**. This is done using exchange rate data for each customer currency to convert the merchant accepted currency into amounts in each of the customer currencies. It is preferred that the exchange rate data be provided to customer computer **200** by server **100** at various times. Other mechanisms for obtaining such data include the use of brokers. The customer user **203** selects an amount in one of the plurality of customer currencies in which the customer user **203** will spend for the product. This selected amount represents the amount in the customer selected currency A(CSC) described previously.

In the above description, the method by which the customer computer **200** can determine the amount of customer currency to pay for a purchase in the merchant computer **300**'s currency is omitted. While there are a number of ways to enable this conversion, we prefer that prior to the inception of the customer computer **200**'s session, that the customer computer **200** request exchange rate data. This data will contain at least conversion rates from the session currency to other convertible currencies, it may also contain additional data such as anticipated expiration of the exchange rates. These rates are used by the customer computer **200** to estimate the amount of customer currency to pay for a purchase in merchant currency. As conversion rates may change rapidly, we prefer that this data be advisory only. the server **100** may send updated data to the customer computer **200** during any communication between them. The implication of this decision is that if the customer computer **200** pays insufficient funds to convert, it is viewed as a natural error due to obsolete data, not an attempt to defraud.

This aspect of the present invention may further include an optimization feature. The optimization feature is preferably executed by the customer computer **200** to determine whether it is advantageous for the customer user **203** to pay in one customer currency over another.

More specifically, the customer computer **200** determines the agreed price in the merchant accepted currency corresponding to the amount in each of the plurality of customer currencies. For example, assume the merchant user **303** will receive a price in currency C for the product and the customer user **203** has two customer currencies A and B available to pay the merchant user **303**. The customer computer **200** determines amounts in currencies A and B which equate to the merchant price in currency C. These amounts may be compared by converting them to a reference currency of the customer computer **200**'s choice. The customer user **203** may choose (or the customer computer **200** may be programmed to choose) to pay the agreed price in the currency (A or B) which corresponds to the lesser amount in the reference currency. The amount in the chosen currency represents the amount in the customer selected currency A(CSC).

According to another variation to this optimization feature, the customer computer **200** may also determine whether it is less expensive to first convert currency A into currency B, and then to convert currency B into currency C. In any case, the customer user **203** pays using the optimal payment currency. This preferred mode reduces complexity of currency exchange to the customer user **203** without reducing the options available to the customer user **203**.

It is also contemplated that the server **100** may execute an optimization feature. In this case, the server **100** may include the plurality of customer currencies available to the customer user **203**. For example, data indicating the plurality of customer currencies may be transmitted in the second set of data from the customer computer **200** to the server **100** in lieu of the amount in the customer selected currency A(CSC). In a manner similar to that described above, the server **100** determines the agreed amount in the merchant accepted currency A(MAC) for each of the plurality of customer currencies. The server **100** then chooses an amount in one of the customer currencies corresponding to the amount in the merchant accepted currency which is least when converted to the reference currency. The amount in the chosen currency represents the amount in the customer selected currency A(CSC).

In another embodiment of the present invention, it is expected that a merchant user **303** may desire to transact business in more than one currency. Therefore, the merchant user **303** will accept a price for the product in one of a plurality of merchant currencies. The merchant computer **300** communicates the agreed price for the product in each of the merchant currencies to the customer computer **200**. The customer computer **200** presents the agreed price in each of the merchant currencies to the customer user **203**. The customer user **203** selects the agreed price in one of the merchant currencies that the merchant user **303** will accept. This selected currency may be recommended by the optimization procedure described above. This selected price represents the price in the merchant accepted currency P(MAC), although it is actually selected by the customer user **203**.

According to a variation to this optimization feature, the customer computer **200** may also determine which customer currency-merchant currency pair represents the best value to customer user **203**. This is accomplished by customer computer **200** using exchange rate data to convert the price of the product in each merchant accepted currency into each of the customer currencies and selecting the lowest value among the results. For example, if customer user **203** has access to currencies A, B, C and merchant user **203** is willing to accept currencies y and z, the customer computer **200** will determine the cost of the products as quoted in merchant accepted currencies y and z in terms of customer accepted currency A. Whichever of these conversions yields the lowest cost to customer user **203** is the optimal customer currency-merchant currency pair for customer currency A. This process is repeated until an optimal currency pair is computed for each customer currency. For example, this process may yield the following results: A to y, B to y, and C to z.

The next step is to decide which of these currency pairs represents the best value to customer user **203**. It is preferred that this be accomplished by converting each customer currency to a single reference currency. The conversion that yields the smaller number is identified as the "best" choice and is displayed to customer user **203**. Clearly, other approaches to determining the optimum currency can be devised by those skilled in the art.

Another embodiment of the present invention, as shown in FIG. **2**, again uses the server **100** to approve the trans-

action between the merchant user **303** and the customer user **203**. However, the merchant computer need not be connected to the network **50** according to this aspect of the invention.

More particularly, in this embodiment, the customer user **203** has knowledge about the product that the merchant user **303** is providing and the price in the merchant selected currency for the product before submitting the second set of data to the server **100**. This knowledge need not be gained while the customer user **203** shops over the network **50**. For example, the merchant user **303** may have distributed catalogs to the customer user **203** (via regular mail, email, etc.) illustrating products, prices, and currencies therefor. The server **100** would receive the same information, that is, data representing the same products, prices and currencies from the merchant user **303**. This data may be received by the server **100** electronically over the network **50** or by some other means. For example, the merchant user **303** might provide the data representing the products, prices and currencies therefor via a network to which the customer computer **200** is not connected or by mail on a diskette. However received, this data would be accessible by the server **100**.

After viewing the catalog, the customer user **203** may purchase a product over the network **50**. In this case, the customer computer **200** transmits to the server **100** a description of a desired product (e.g., model number) and an amount in the customer selected currency A(CSC) for the desired product.

The server **100** thus has access to data indicating the amount in the customer selected currency A(CSC) which the customer user **203** is willing to pay for a product and the price in the merchant accepted currency P(MAC) which the merchant user **303** is willing to accept for the product. With this data, the server **100** approves the transaction as indicated above.

In any of the foregoing embodiments, notice of approval of the transaction may be provided by the server **100** to the merchant user **303** and the customer user **203**. For example, the server **100** may transmit data indicating approval to the merchant computer **300**. After the merchant computer **300** receives the data indicating approval, the merchant computer **300** may transmit at least a portion of the data indicating approval to the customer computer **200**. In a similar manner, data indicating approval may be communicated from the server **100** to the customer computer **200**, which, in turn, would forward this data to the merchant computer **300**. In this manner, the customer user **203** and the merchant user **303** may be informed that the transaction was approved. Alternatively, the server **100** may separately transmit data indicating approval to the merchant computer **300** and the customer computer **200**. In yet another embodiment, the absence of notice from the server **100** may be deemed as affirmative notice that the transaction was approved. According to any of these procedures, or other preestablished procedures, notice may be provided to the participants in the transaction. Further, once notice of approval is provided, the product which is the subject of the transaction may be provided to the customer user **203** and the payment of the funds corresponding to the agreed price will be received by the merchant user **303** in the merchant accepted currency.

Actual settlement may occur contemporaneously with the approval of the transaction or it may be deferred. As is described below, it is the entity charged with performing the actual settlement who bears the risk.

We prefer that the server **100** perform actual settlement of the transaction. Therefore, according to this aspect of the present invention, the server **100** also has its own server accounts. The server accounts are in currencies corresponding to the currencies of the customer and merchant accounts. The server accounts represent real cash, credit, etc. corresponding to the electronic funds stored in the customer and merchant accounts.

To perform actual settlement, the server **100** may transmit data to a currency broker, bank or financial institution to enable actual settlement. For example, the server **100** may transmit data identifying the server account and the amount in the customer selected currency A(CSC) so that the entity can convert real funds in an amount equal to the amount in the customer selected currency into real funds in the merchant accepted currency.

We prefer that the server **100** aggregate the amounts in each currency before settling. This may decrease the number of actual conversions that must be made from possibly hundreds per second to a few times per hour (or day). The frequency may vary depending on the volatility of the currency exchange market and on the relative currency balances in the server **100**'s various currency accounts.

Note that the server **100** is bound even if the later currency exchange rates are or become unfavorable to the server **100** as compared to the current exchange rates used during the virtual settlement. By eliminating the risk to the customer user **203** and the merchant user **303**, such risk is passed to the server **100**.

We prefer to take measures to manage the risk associated with the currency exchange to the server **100**. For example, we contemplate that the server **100** may have a preestablished agreement with the bank or financial institution. The terms of such an agreement might include a commitment on the part of the server **100** to settle transactions within a predetermined amount, time, and/or within a predetermined currency rate deviation. The predetermined amount of time may be on the order of several seconds or minutes. During this predetermined amount of time, we prefer that the server **100** aggregate transactions and submit them in batch for exchange. In return for the server **100**'s commitment, the entity may offer the server **100** a favorable currency exchange rate.

It is seen from the above detailed description that customer and merchant obligations relating to multi-currency transactions can be fixed at the time of the transaction. In this manner, risks to these parties heretofore associated with currency exchange is minimized. To this end, the parties to a multi-currency transaction authorize an approving entity to settle the transaction. Authorization is granted by virtue of the customer user **203** and merchant user **303** setting up their respective accounts, knowing that transactions will be submitted and processed. The parties transmit data representing the transaction to the approving authority. This data includes an amount in a first currency that a customer user **203** is willing to pay for a product and a price in a different second currency which a merchant user **303** is willing to accept for the product. Using predetermined criteria, the approving entity approves the transaction. Once the transaction is approved, the approving entity may actually settle the transaction at its discretion thereby bearing the risk associated with currency exchange. The parties, however, incur no risk. The customer user **203** will pay the amount in the first currency and the merchant user **303** will receive the price in the second currency. These are values known and agreed to by the parties at the time of the transaction.

An alternate method of managing risk for extremely volatile currencies, the server **100** may choose to withdraw a currency or currencies from the list of convertible currencies.

Although the particular embodiments shown and described above will prove to be useful in many applications relating to the arts to which the present invention pertains, further modifications of the present invention herein disclosed will occur to persons skilled in the art. All such modifications are deemed to be within the scope and spirit of the present invention as defined by the appended claims.

We claim:

1. A system for determining approval of a transaction between a merchant and a customer over a network, wherein the system comprises:

a network;

a customer computer associated with a customer and connected to the network, wherein the customer computer further comprises a first set of data including an amount the customer agrees to pay a merchant for a product in a first currency;

a merchant computer associated with the merchant and connected to the network, wherein the merchant computer further comprises a second set of data including a product price at which the merchant agrees to sell the product in a second currency; and

a server connected to both the customer computer via the network and the merchant computer via the network for receiving the first set of data and the second set of data, for converting the amount in the first currency into a converted amount in the second currency, and for approving the transaction when the converted amount in the second currency is within a risk range of the product price in the second currency in accordance with current exchange rates.

2. The system of claim **1**, wherein the server further comprises a customer balance account associated with the customer, wherein the customer balance account comprises a customer balance in the first currency and wherein the server deducts the amount in the first currency from the balance in the customer balance account.

3. The system of claim **1**, wherein the server further comprises a merchant balance account associated with the merchant, wherein the merchant balance account comprises a balance in the second currency and wherein the server adds the converted amount in the second currency to the balance in the merchant balance account.

4. The system of claim **1**, wherein the first set of data further comprises a plurality of currencies, wherein the server selects a selected currency from the plurality of currencies, which when converted to the converted amount in the second currency, the merchant price is the least expensive.

5. The system of claim **1**, wherein the network is selected from the group consisting of the Internet, an intranet, and a Local Area Network (LAN).

6. A system for determining approval of a transaction between a customer and a merchant over a network, wherein the system comprises:

a network;

a customer computer associated with a customer and connected to the network, wherein the customer computer further comprises a first set of data including an amount the customer agrees to pay to a merchant in a first currency;

a merchant computer associated with a merchant and connected to the network, wherein the merchant computer further comprises a second set of data including a product price at which the merchant is willing to sell the product to the customer in a second currency; and

a server connected to both the customer computer via the network and the merchant computer via the network for receiving the first set of data and the second set of data, for converting the amount in the first currency into a converted amount in the second currency, for approving the transaction when the converted amount in the second currency is within a risk range of the product price in the second currency in accordance with current exchange rates, and for recording an insufficiency when the product price in the second currency exceeds the converted amount in the second currency.

7. The system of claim **6**, wherein the server further comprises a customer balance account associated with the customer, wherein the customer balance account comprises a balance in the first currency and wherein the server deducts the amount in the first currency from the balance in the consumer balance account.

8. The system of claim **6**, wherein the server further comprises a merchant balance account associated with the merchant, wherein the merchant balance account comprises a balance in the second currency and wherein the server adds the converted amount in the second currency to the balance in the merchant balance account.

9. The system of claim **6**, wherein the first set of data further comprises a plurality of currencies, wherein the server selects a selected currency from the plurality of currencies, which when converted to the converted amount in the second currency, the product price is the least expensive.

10. The system of claim **6**, wherein the network is selected from the group consisting of the Internet, an intranet, and a Local Area Network (LAN).

11. A system for determining approval of a transaction between a customer and a merchant over a network, wherein the transaction includes the merchant providing a product to the customer at a product price in a second currency, wherein the product price in the second currency is known by the customer, wherein the system comprises:

a network;

a customer computer associated with a customer and connected to the network, wherein the customer computer comprises a first set of data including an amount in a first currency; and

a server connected to the customer computer via the network and having the product price in the second currency, for receiving the first set of data, converting the amount in a first currency into a converted amount in the second currency, and for approving the transaction when the amount in the first currency is within a risk range of the product price in the second currency in accordance with current exchange rates.

12. The system of claim **11**, wherein the server further comprises a customer balance account associated with the customer, wherein the customer balance account comprises a balance in the first currency and wherein the server deducts the amount in the first currency from the balance in the consumer balance account.

13. The system of claim **11**, wherein the server further comprises a merchant balance account associated with the merchant, wherein the merchant balance account comprises a balance in the second currency and wherein the server adds the converted amount in the second currency to the balance in the merchant balance account.

14. The system of claim **11**, wherein the first set of data further comprises a plurality of customer currencies, wherein the server selects a customer currency from the plurality of customer currencies, which when converted to

the converted amount in the merchant currency, the merchant price is the least expensive.

15. The system of claim **11**, wherein the network is selected from the group consisting of the Internet, an intranet, and a Local Area Network (LAN).

16. A system for determining approval of a transaction between a customer and a merchant over a network, wherein the transaction includes the merchant providing a product to the customer at a product price in a second currency, wherein the product price in the second currency is known by the customer, wherein the system comprises:

a network;

a customer computer associated with a customer and connected to the network, wherein the customer computer comprises a first set of data including an amount in a first currency; and

a server connected to the customer computer via the network and having the product price in the second currency, for receiving the first set of data, and for approving the transaction when the amount in the first currency is within a risk range of the product price in the second currency in accordance with current exchange rates.

17. The system of claim **16**, wherein the server further comprises a customer balance account associated with the customer, wherein the customer balance account comprises a balance in the first currency and wherein the server deducts the amount in the first currency from the balance in the consumer balance account.

18. The system of claim **16**, wherein the server further comprises a merchant balance account associated with the merchant, wherein the merchant balance account comprises a balance in the second currency and wherein the server adds the converted amount in the second currency to the balance in the merchant balance account.

19. The system of claim **16**, wherein the first set of data further comprises a plurality of customer currencies, wherein the server selects a customer currency from the plurality of customer currencies, which when converted to the converted amount in the merchant currency, the merchant price is the least expensive.

20. The system of claim **16**, wherein when the product price in the second currency exceeds the converted amount in the second currency, the server records the insufficiency.

21. The system of claim **16**, wherein the network is selected from the group consisting of the Internet, an intranet, and a Local Area Network (LAN).

22. A method for determining approval of a transaction over a network between a customer having a customer computer connected to the network and a merchant having a merchant computer connected to the network, wherein the customer computer and the merchant computer are connected to a server via the network, wherein the method comprises:

transmitting a first set of data from a customer computer to a server, wherein the first set of data includes an amount in a first currency;

transmitting a second set of data by a merchant computer to the server; wherein the second set of data includes a product price in a second currency;

receiving the first set of data and the second set of data by the server; and

approving the transaction by the server when the amount in the first currency is within a risk range of the product price in the second currency in accordance with current exchange rates.

23. A method for determining approval of a transaction over a network between a customer having a customer computer connected to the network and a merchant having a merchant computer connected to the network, wherein the customer computer and the merchant computer are connected to a server via the network, wherein the method comprises:

transmitting a second set of data from a merchant computer to a customer computer, wherein the second set of data includes a product price in a second currency;

receiving the second set of data by the customer computer, wherein the customer computer has a first set of data including an amount in a first currency;

transmitting the first set of data and the second set of data by the customer computer to a server; and

approving the transaction when the server determines if the amount in the first currency is within a risk range of the product price in the second currency in accordance with current exchange rates.

24. A method for determining approval of a transaction over a network between a customer having a customer computer connected to the network and a merchant having a merchant computer connected to the network, wherein the customer computer and the merchant computer are connected to a server via the network, wherein the method comprises:

transmitting a first set of data from a customer computer to a merchant computer, wherein the first set of data includes an amount in a first currency;

receiving the first set of data by the merchant computer, wherein the merchant computer has a second set of data including a product price in a second currency;

transmitting the first set of data and second set of data by the merchant computer to a server; and

approving the transaction by the server when the amount in the first currency is within a risk range of the product price in the second currency in accordance with current exchange rates.

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