(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
27 December 2001 (27.12.2001)

PCT

(10) International Publication Number
WO 01/98958 A2

(51) International Patent Classification[7]: G06F 17/60

(21) International Application Number: PCT/IB01/01260

(22) International Filing Date: 21 June 2001 (21.06.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/602,502 23 June 2000 (23.06.2000) US

(71) Applicant: **ELECTRONIC BROKING SERVICES LIMITED** [GB/GB]; 55-56 Lincolns Inn Fields, London WC2A 3LJ (GB).

(72) Inventors: **JAIN, Neena**; 3756 Victory Street, South Plainfield, NJ 07080 (US). **IACCHEO, Steven**; 41 West William Street, Lincoln Park, NJ 07035 (US).

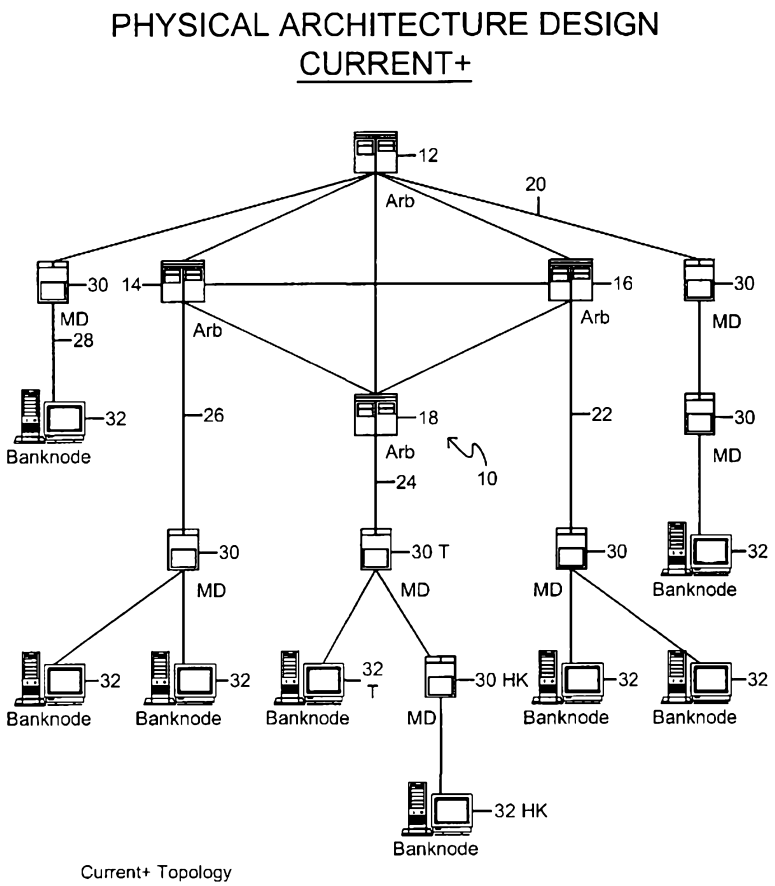
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— *without international search report and to be republished upon receipt of that report*

[Continued on next page]

(54) Title: ANONYMOUS TRADING SYSTEM



Current+ Topology

(57) Abstract: In an anonymous trading system orders are input into the system from trader terminals (33) each of which is connected to a bank node (32), and each of which receives a market view prepared by a market distributor (30). The market distributors are connected between an arbitrator (12, 14, 16, 18) and the bank node. A number of arbitrators are arranged as a clique and perform order matching and deal execution. More than one market distributor may be connected between a given arbitrator and a given bank node. This permits a single link to be in place across expensive links with local fan out of a number of branches each having its own market distributor.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

ANONYMOUS TRADING SYSTEM

FIELD OF THE INVENTION

This invention relates to electronic brokerage or trading systems and in particular to systems in which counterparties trade anonymously within fixed credit limits. Such systems may trade financial instruments such as foreign exchange and forward rate agreements.

BACKGROUND TO THE INVENTION

A number of anonymous trading systems are known in the art. EP-A-0,399,850, EP-A-0,406,026 and EP-A-0,411,748 all assigned to Reuters Ltd disclose aspects of an automated matching system in which a host computer maintains a central database of bids and offers submitted by terminals connected to the host via a network. The host also maintains records of credit limits between each trading bank and the possible counterparties with which it is willing to trade. The host computer uses information in its central database to match bids and offers and buy and sell orders based on matching criteria which include the counter party credit limits.

Generally, counterparty credit limits are set for each bank or each trading floor and the host computer establishes a gross counter party credit limit for each possible pair of counterparties. The gross counter party credit limit is the minimum amount of remaining credit between two counterparties.

A trader's terminal will display a subset of the trading book, typically the best few bids and offers. These will be updated periodically to ensure that the trader sees the true state of the market.

A problem with the system outlined above is that the trader sees the bids and offers irrespective of whether he has sufficient credit with the counter party submitting that bid or offer to trade. As a result, a trader can attempt to trade when there is no available credit. As the system is anonymous the trader has no knowledge of the counterparty until a trade as been completed and so, when he hits a bid or offer, has no idea as to whether it is likely to be accepted or rejected for lack of credit. This is extremely frustrating for a trader, particularly in a fast moving market in which trading opportunities can easily be lost. The problem arises as the host computer only checks available credit after a deal has been proposed and a potential match identified.

This problem was solved in WO93/15467 now assigned to EBS Dealing Resources inc. Instead of displaying the actual trading book, or a part of it, to each trader, a different market view is shown to each trader in which bids and offers from counterparties which whom they have insufficient or no credit are screened out. Thus, the trader only sees prices with which he knows he can deal.

The architecture of the system of WO93/15467 is very different from the of the Reuters system and is based on a distributed network with a number of arbitrators which perform matching. Actual credit limits are stored at local bank nodes to which each of a bank's trading terminals are connected ensuring that sensitive credit data does not leave the bank's physical site. The actual trading book is sent by the arbitrators to the market distributor. The market distributor forms a market view specific to a given trading floor and sends it to the relevant bank node. A different market view may be formed for each trading floor depending on credit criteria. Thus, the market view which is

distributed to each of the bank nodes is the complete market view with credit screening taking place, the market distributor to filter out any prices with which the bank, or a given trading floor within the bank, has insufficient credit.

In addition, the market distributers also have limited credit information, maintaining a credit matrix which may store a simple "yes-no" credit indicator for given counterparties. When a match is made, the prices having already been screened for credit, the bank node will make a second credit check using the credit matrix to see whether any previously extended credit has already been exhausted.

Both the above systems have been used successfully for many years. The Reuters system uses a single host computer based in Long Island, New York, USA from where prices and deal information are distributed to the users. The EBS system used for foreign exchange (forex) trading used three arbitrators, one each in New York, London and Tokyo. Each of the arbitrators perform price matching and price distribution is performed by the market distributors. The system for trading Forward Rate Agreements (FRAs) uses a single arbitrator. It has been found that this architecture does not perform satisfactorily in all circumstances.

From the single arbitrator in the FRA system, or from each of the arbitrators in the forex system, there radiates a number of branches each of which includes a market distributor. This can be extremely expensive as the market distributors may be in a number of countries spread over a wide geographical area requiring a number of high cost leased lines. This is disadvantageous as it increases the cost of operating the system which in turn increases the costs passed on to users making it more difficult to

persuade users to use anonymous electronic systems instead of conventional methods such as voice brokers.

The invention aims to overcome the disadvantage outlined above and to provide an architecture which is potentially cheaper to operate.

In its broadest form the invention contemplates including one or more additional market distributors in at least on of the branches. This allows a single link to be in place across the expensive links with local fanout of a number of branches each having its own market distributor.

As an example, for a system having a single arbitrator in London, a single market distributor will distribute process to, say, Tokyo from where separate branches will distribute, through their own market distributors, to local cities in the region. This saves the considerable cost of least lines from London to each of the local cities. More specifically the invention is defined by the independent claims to which reference should be made.

An embodiment of the invention will now be described, by way of example only, and with reference to the accompanying drawings, in which:

Figure 1 shows a map of the world to illustrate the prior art distribution of price information;

Figure 2 shows a map of the world to illustrate the distribution of price information in accordance with an embodiment of the invention;

Figure 3 is a similar view to Figure 2 illustrating a second embodiment of the invention;

Figure 4 is a schematic diagram showing the system architecture of all embodiments of the invention.

Figure 1 shows geographically how the prices may be distributed from a simple arbitrator system such as the project EBS FRA system. Price matching and deal execution is performed by the arbitrator and process are distributed by the marked distributor, located close to the arbitrators in London to a number of city nodes.

The example shown only shows five market distributors, each located in different cities: Tokyo, Seoul, Hong Kong, Singapore and Melbourne for simplicity. In practice there may be very many more. Each of these city nodes requires a leased line from London which is highly expensive. For simplicity, figure 1 only shows the Far Eastern branches of the network. In practice there will be branches to many other cities, for example in Europe and North America.

Figure 2 shows how the architecture of figure 1 is modified in an embodiment of the invention. Instead of individual link to city nodes from the London market distributor, the Tokyo branch has an additional market distributor, all the data for the Far Eastern cities is sent on the Tokyo branch and distributed to the city nodes from Tokyo. In the example shown some of the distances between the Tokyo distributor and city nodes are still large but they are considerably shorter than the distances between the respective city nodes and London. In an alternative embodiment, one or more further market distributors are included. For example, the Melbourne city node may have a market distributor which distributes prices from Tokyo market distributors to other Australian and New Zealand cities. This possibility is shown in figure 3. Thus, separate international lines from Tokyo to each of the cities shown are replaced by a single international line from Tokyo to Melbourne and then inland lines to other Australian cities. This example also requires an

international line from Melbourne to each New Zealand city but it will be appreciated that further market distributors could be located in, say, Auckland to distribute prices out to other New Zealand cities.

Turning now to figure 4, the actual constitution of each of the component parts of the network is the same as described in WO93/15467 the contents of which are incorporated herein by reference and further detailed description is not necessary. As shown in figure 4, the network comprises a clique (10) of arbitrators (12, 14, 16, 18). It will be appreciated that this example is based on the current multi-arbitrator system used for forex trading and could, by removal of three arbitrators and connection of the various branches to the remaining arbitrator, be adapted for the single arbitrator model discussed with respect to figures 2 and 3.

The arbitrators (12, 14, 16, 18) of the clique are all interconnected and, in practice, located in geographically different areas. For example, one may be in New York and one in Tokyo and two in London reflecting the amount of business passing through the London market. To each of the arbitrators is attached a branch (20, 22, 24, 26, 28) having one or more market distributors (30) and one or more bank nodes (32). In the example shown, branches 20 and 24 each have two market distributors and in branch 24 the first, closest market distributor to the arbitrator has attached to it a bank node (32) as well as a further market distributor. The architecture illustrated is highly schematic. In practice, each of the market distributors at the end of each branch may fan out to a large number of bank nodes. For example, arbitrator 18 may represent the Tokyo arbitrator and market distributor 30T the Tokyo market distributor which distributes process to Tokyo banks via bank nodes 32T.

The Tokyo market distributor is also connected to a further down stream market distributor, the Hong Kong market distributor 30HK which in turn distributes prices to Hong Kong banks via Hong Kong bank nodes 32HK. There may be more market distributors in the chain.

To each of the bank nodes are connected a number of trader terminals of which some only, 33T , 33HIC are shown. In practice, each bank node will have one or more trading floors connected. the trader terminals are an example of order input means by which quotes such as buy or sell orders are input into the system. The input may be manual, for example an input from the trader via a keypad which is input to the bank node, or automatic. An example of an automatic order is a pre-stored but or sell order entered by a trader which is activated when the market reaches a certain condition. The order input may be fully automatic and integrated into an institutions and dealing systems.

As the architecture is based closely on that of WO93/15467 it follows that all matching is performed by the arbitrators and the invention resides in the idea of having multiple levels of market distribution. In fact, this could be at the arbitrator, market distributor or bank node level. In each case, although the stage may not be identified as a market distributor as such, it performs a market distribution function and as such is a means for distributing market prices to traders.

Deployment of the market distributor at the bank node will give a bank access to the complete order book. In the present system credit screening occurs before the prices reach the bank node such that the bank node only sees an order book which is tailored to its own credit limits.

While this is extremely advantageous from the point of view of eliminating attempted trade with counterparties with whom there is no credit, it can lead to incorrect price aggregation at the bank node under the same circumstances by making market distribution functionality available at the bank node. This problem may be overcome whilst retaining pre-screening for credit. It will be appreciated that placing market distribution functionality at the bank node requires a higher bandwidth connection to the bank node than in conventional systems.

Unlike the system of WO93/15467 deal execution may take place at the arbitrators as will be described. This avoids the need for connections between bank nodes together with the associated message flow and simplifies recovery procedures for broken deals as well as troubleshooting procedures where deals are broken. It also allows verification of credit to be performed either at the bank node or the arbitrator depending where credit data for a bank is stored. Thus, the system can accommodate user banks who are reluctant to allow sensitive credit limit data off their premises.

The manner in which the system operates is as follows. When a bank node (32) receives a "submit quote" request from a trader who wishes to place a buy or sell order onto the system, the bank node first validates the quote and decides whether or not to accept it. If the quote is accepted it is forwarded to the arbitrator. In practice it will pass physically through the market distributor(s) but they are transparent to the message and the logical connection is between the bank node and the arbitrator. The arbitrator then validates the quote and puts the order in its order book and tells the market distributor that a quote has been put in the market. This message is communicated directly to

the market distributors in branches connected directly to the arbitrator in question and for other branches passes through the relevant arbitrator in the clique. The market distributors in turn inform the bank nodes (32) about the quote who in turn inform the deals at the various banks.

One of the functions of the market distributor is to compile a market view which is unique to each trading floor, taking into account the credit limits that floor has with other counter parties in the system. Quotes from parties with which there is no credit will not be shown to traders and so will not form a part of the market view. If there are two or more market distributors in a branch, the formation of individual market views is left to the last market distributor before the bank node for whose traders the market views are to be formed. Thus, market distributor 30T will form market views for traders terminals 33T connected to bank node 32T but will pass the whole book to market distribution 30HK which will prepare market views for trader terminals 33HK connected to bank node 32 HK.

The arbitrator who receives the "submit quote" message will own the quote. The owning arbitrator them notifies all the remaining arbitrators about the quote. Those arbitrator put the quote in their order book before putting it in their book and distributing it down the branches attached to them.

A dealer who sees a price displayed with which he wishes to trade may "hit" that price. A hit is a fill or kill order which the arbitrator either satisfies or deletes. A hit is not entered into the order book. The hit is transmitted by the traders bank node to the branch's arbitrator. That arbitrator initiates a deal with the quote that has been hit, which may be local or remote, this is it may be owned by the same or a different arbitrator. The

deal request is passed to the owning arbitrator of the quote that has been hit, if it is not the arbitrator which first received the hot order and the owning arbitrator will fail the deal request if the original quote that has been hit is no longer available.

The process operates, for the various different parties in the system, as follows:

Trader

A trader submits a "Hit" request to its bank node. The bank node forwards the request to its arbitrator.

For the Owning Arbitrator of the Hit:

When an arbitrator receives a hit request from a trader, it looks at its order book to find one or multiple quotes, based on the trading rules defined by the market, to fill up the request. If the arbitrator can not find any quote, the arbitrator fails the request immediately. If the arbitrator finds a quote and the quote is local quote, it performs the following actions:

(I) updates the quote and the hit;
(ii) initiates a deal;
(iii) responds back to the requesting trader;
(iv) tells all its neighbour arbitrators and its market distributors about the quote status change; and
(v) starts deal execution process for the deal.

The quote update is propagated in the same way as the "submit a quote" message. If the quote is a remote quote, the owning arbitrator for the hit updates the hit request to

lock a certain amount and updates the status of the quote to reserve a certain amount. It then sends a deal request containing the quote, hit and amount to the arbitrator who notified it of the existence of the quote.

For the Owning Arbitrator of the Quote:

When an arbitrator who owns a quote receives a deal request for the quote, it checks the availability of the quote. If the quote is still available for the requested amount, the arbitrator updates the quote to reserve the quote with the requested amount and initiates a deal for the request. It then replies back to the requester that the deal has been initiated. It also tells all its neighbour arbitrators; the arbitrators that have the direct connection with it, except for the requesting arbitrator, that the quote has been changed with a marked update message in this manner all the arbitrators are advised of the quote update. It then starts the deal execution process. If the quote is no longer available, the arbitrator fails the deal request.

If the quote is only partially available, the arbitrator needs to see if the request can be partially filled. If the request can not be partially filled, the arbitrator shall fail the request. Otherwise, it will initiate a deal with a modified amount, it then sends the request back and tells its neighbour arbitrators about quote status update. It then starts to execute the deal.

For Passive Arbitrators, those that are not on the path of Deal Traversal:

These arbitrators only receive market update messages. When an arbitrator receives a quote update with market update messages, it will update the quote in its order book and then propagate the message to all its market distributors.

For the Arbitrator who initiates a Deal Request:

When the arbitrator receives a response for a deal request, if the request has been fulfilled, the arbitrator responds back to the trader that its request has been fulfilled. If the request is rejected, the arbitrator needs to search its order book in order to find another quote (or quotes) to fill the request. If it can find one or some quote(s) it sends its deal request (or requests) to the owning arbitrator (or arbitrators). If the request is partially filled, the arbitrator may need to find one or more other quotes to fill the remaining part of the request. At a certain point, the arbitrator needs to respond back to the trader requester to tell it about the overall fulfilment of the request.

As well as executing deals on the basis of hits by traders of quoted prices, the arbitrator also automatch bids and offers input into the trading book where price and quantities are compatible. The automatch is performed in the same manner as the present system described in WO93/15467 and includes the following operating and rules:

(i) only the owning arbitrators of quotes can match two quotes together and initiate an automatched deal request when the quotes become available, i.e., passive arbitrators will not initiate automatch deals.

(ii) when an arbitrator receives a quote from a trader, it automatches the quote as taker.

(iii) when a remote bid becomes available, it can be automatched with a local offer and the local offer will be the taker.

After an arbitrator initiates a dead for automatch, if there is a remaining amount left for the quote, the arbitrator will broadcast the quote.

The system has been described in the context of a distributed system using multiple arbitrators and alternatively separate arbitrators and market distributors. It is to be understood that it is applicable to any trading system, anonymous or not in which there is a market distribution functionality. This may include, systems using a single host computer and system in which the matching, market distribution and deal execution are all performed at the same function to give a broking functionality mimicking the steps performed by a human broker.

Other modification are possible and will occur to those skilled in the art without departing from the scope of the invention which is defined by the claims appended hereto.

CLAIMS

What is claimed is:

1. A trading system for trading instruments between traders, comprising:

a communications network for transmitting electronic messages;

a plurality of order input devices connected to the communications network each for generating electronic price quotation messages including bid and/or offer price and for communication to a trader of price information received from others of said plurality of order input devices over the network;

at least one matching engine connected to the network for matching bids and offers input into the system and for executing deals where prices are matched; and

a first market distributor arranged between the matching engine and the trader terminals for distributing price messages to the trader terminals, the market distributor being responsive to the price quotation messages and the matching engine, characterised by at least one further market distribution means arranged between the first market distribution means and the order input devices, the further market distributor receiving price messages from the first market distribution means and distributing said price messages to the order input devices, said further market distributor being responsive to said price quotation messages and said matching engine.

2. A trading system according to claim 1, wherein said matching engine and said first market distributor are combined to form a broking node.

3. A trading system according to claim 1 or 2, comprising a bank node for receiving price messages distributed to the order input devices of a given bank and passing those price messages to the bank order input devices.

4. A trading system according to claim 3, wherein the further market distributor is located at the bank node.

5. A trading system according to any of claims 1 to 4, wherein said first and further market distributor and said order input devices form a branch from said matching engine, the matching engine having a plurality of branches attached hereto.

6. A trading system according to claim 1, comprising a plurality of interconnected matching engines, each matching engine having at least one branch having a market distributor and a plurality of order input devices connected thereto.

7. A trading system according to claim 3, wherein the bank node receives a credit screened version of said price messages and comprising means for receiving additional price messages to provide the bank node with a complete view of the bids and offers entered into the system.

8. A trading system according to claim 7, wherein the at least one further market distributor means prepares a credit screen market view for the order input means attached to the bank node to which the lat least one further market distributor is connected.

9. A trading system according to claim 1 wherein the order input means comprises one or more trader terminals each having a means for inputting orders into the system and a

means for receiving market views from the at least one further market distributor.

10. An anonymous trading system for trading financial instruments between traders, comprising:

a plurality of order input nodes for exchanging trading instructions to and from traders and for passing a view of the trading book to traders;

at least one matching engine for holding trading instructions input into the system and for identifying and executing trades; and

a plurality of market distributors arranged between the matching engine and the trader terminals, the matching engine distributing price messages to the trader terminals and being responsive to trading instructions and the matching engine, wherein at least one of said plurality of market distributors distributes price messages to another of the plurality of market distributors.

11. A trading system according to claim 10, wherein the order input means comprises one or more trader terminals each having a means for inputting orders into the system and a means for receiving market views from the at least one further market distributor.

12. A trading system according to claim 10 wherein the market distributor nodes includes means for preparing a credit screened market view for those order input nodes.

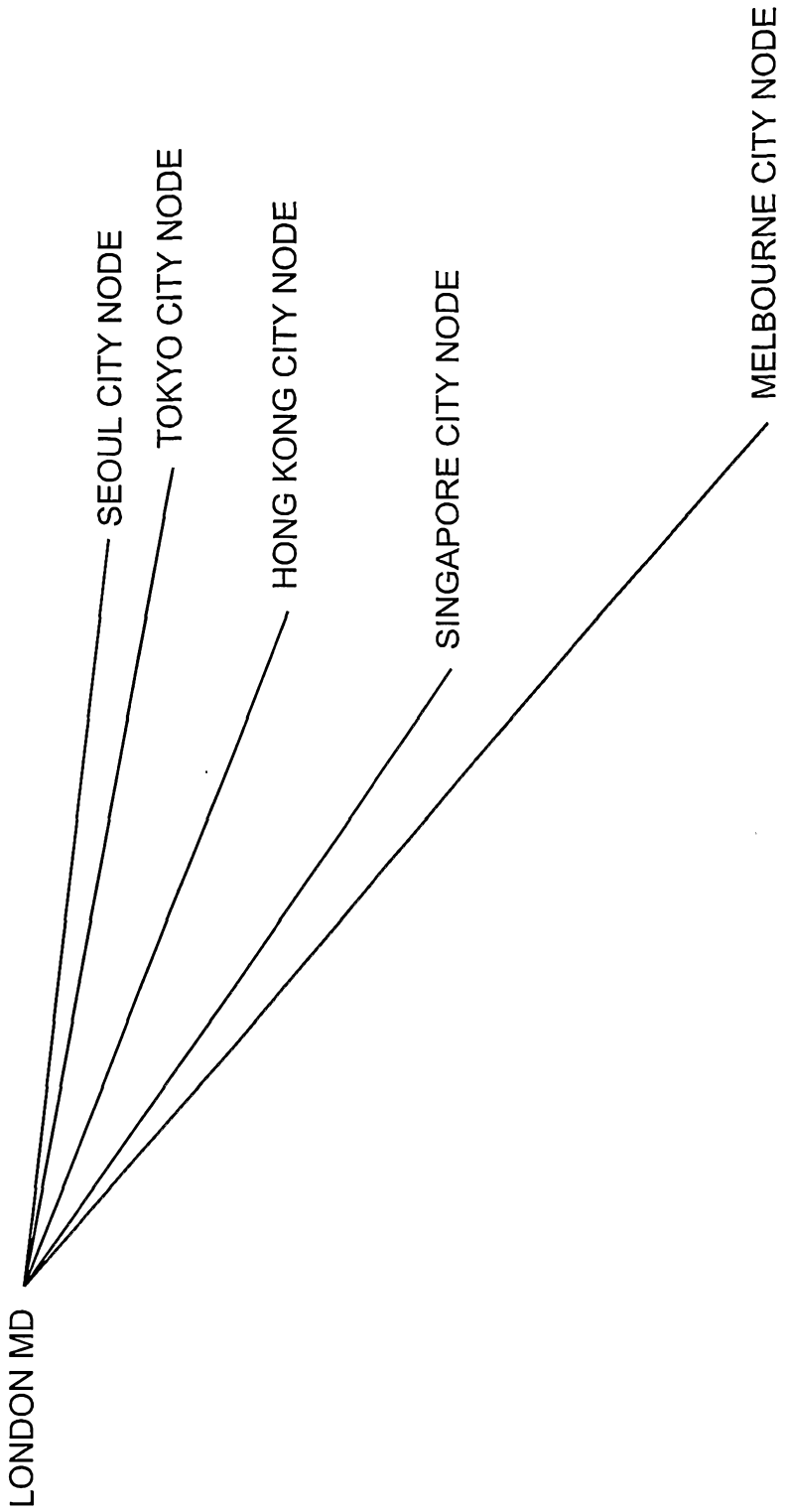

Figure 1
(PRIOR ART)

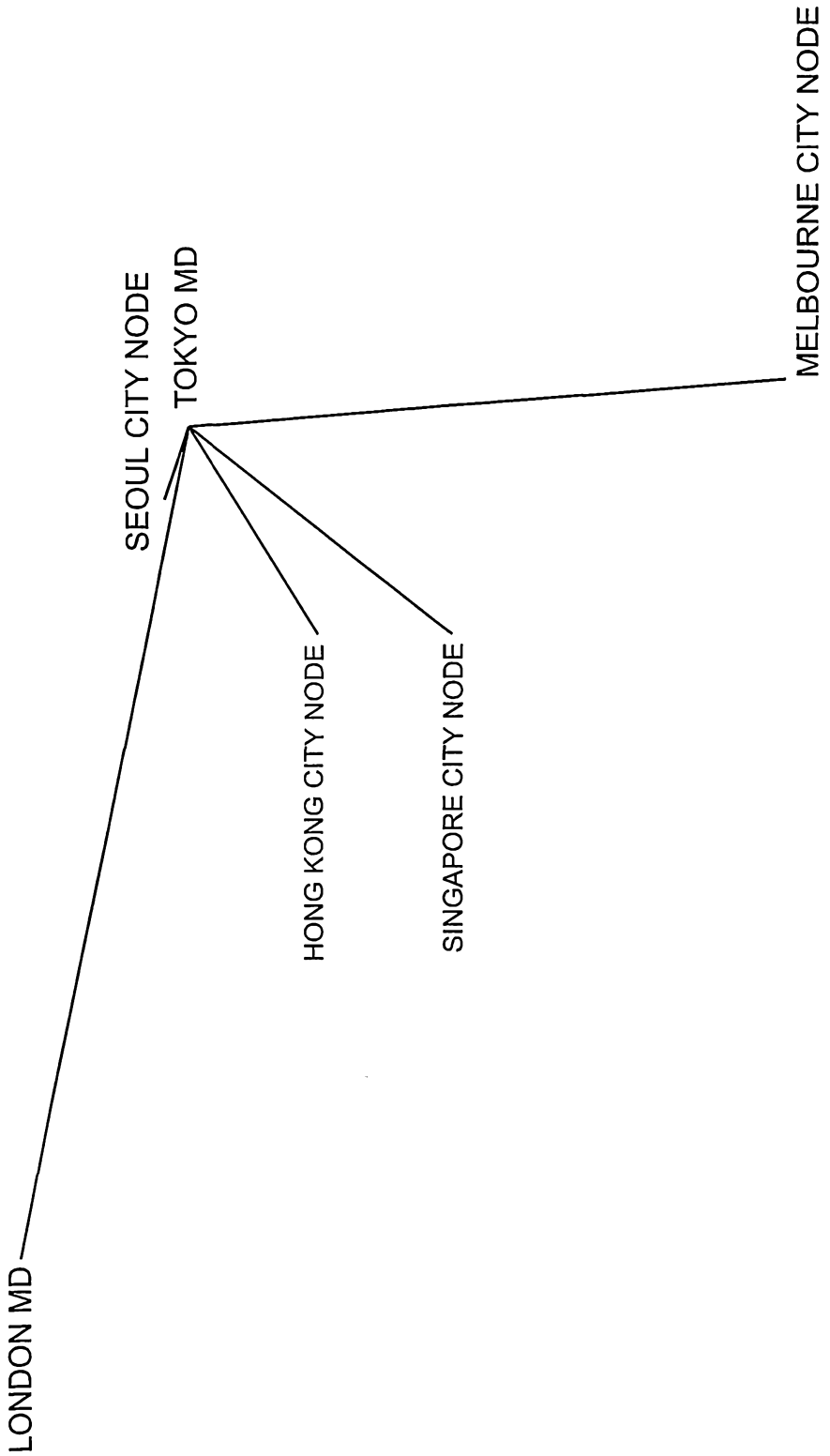
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Figure 2

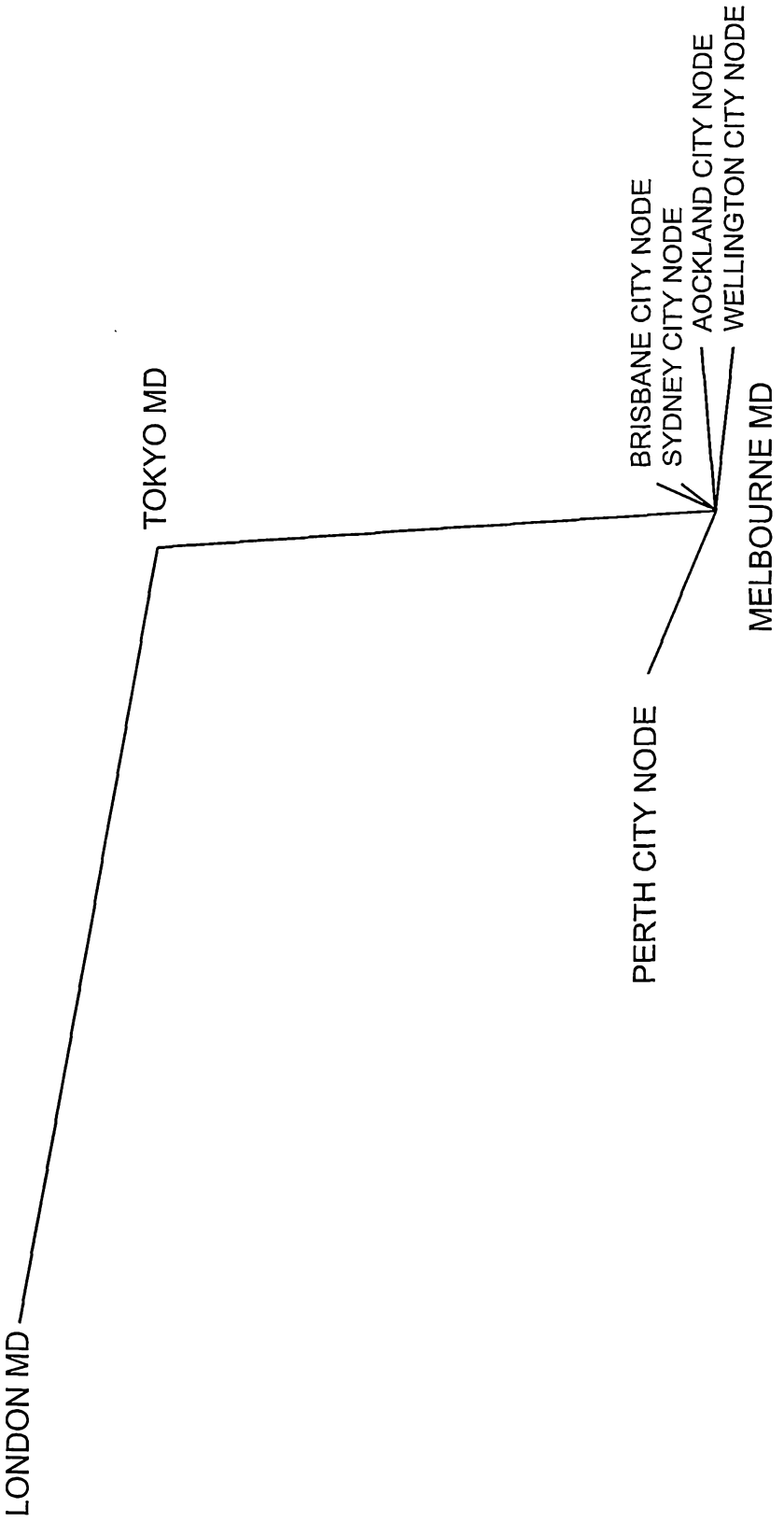
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Figure 3

PHYSICAL ARCHITECTURE DESIGN
CURRENT+

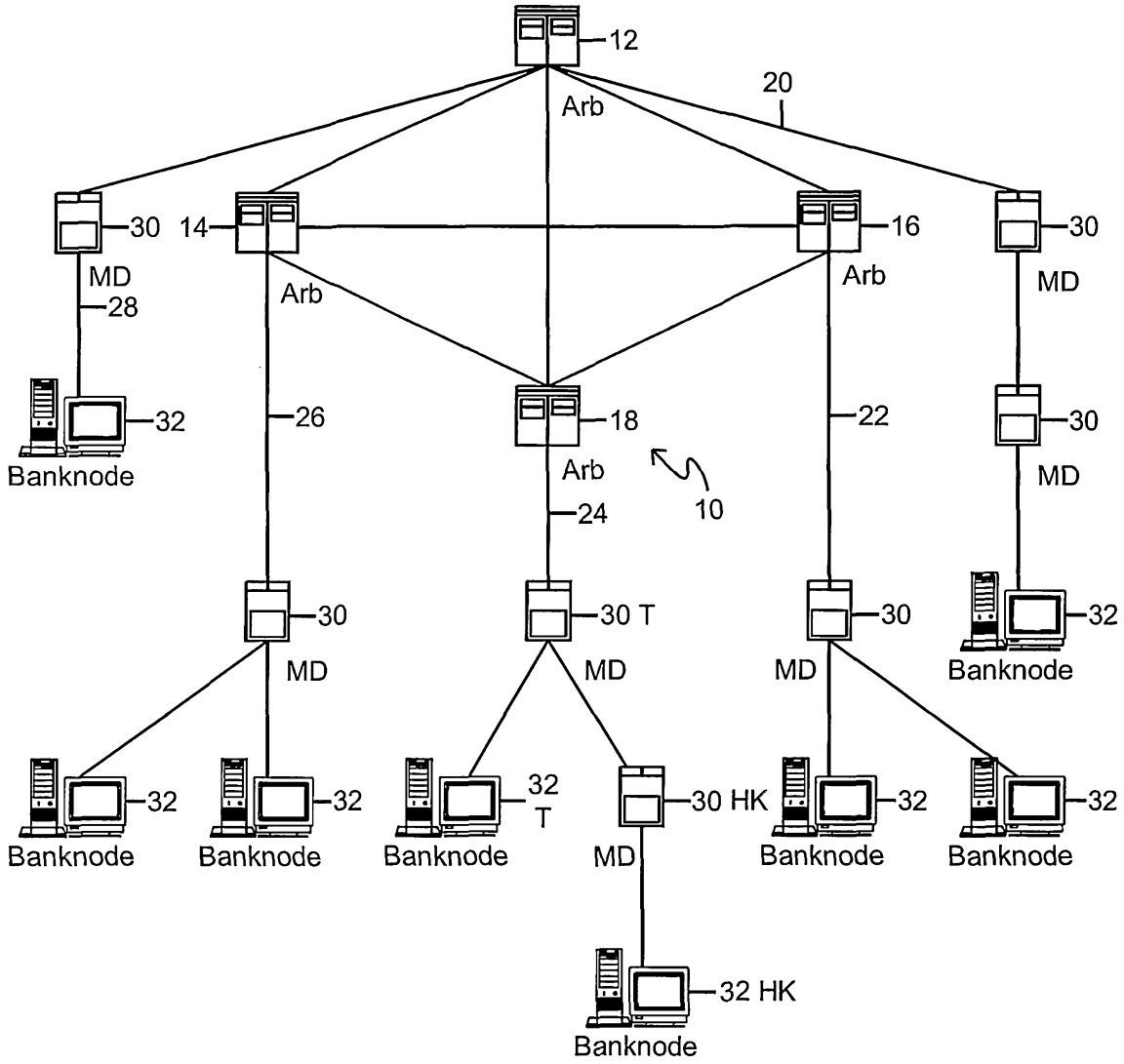

Figure 4 Current+ Topology

Figure 4