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Payne

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(54) **SYSTEM AND METHOD FOR DATA MANAGEMENT**

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G06F 15/173 (2006.01)

(52) **U.S. Cl.** **709/206**; 709/203; 709/224

(58) **Field of Classification Search** 709/203, 709/223, 224
See application file for complete search history.

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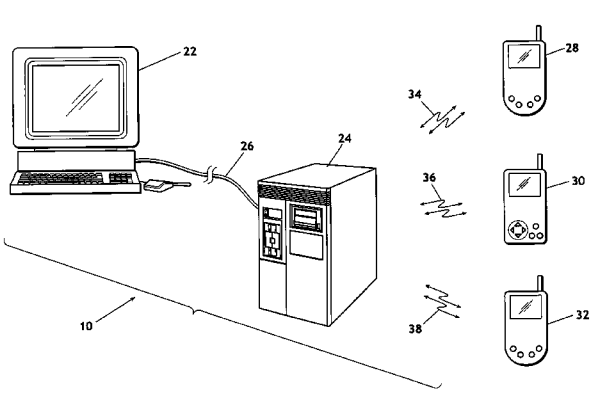
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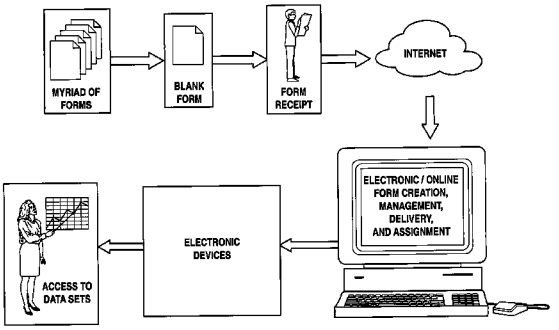
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(57) **ABSTRACT**

A method for the management of data collected from a remote computing device including the steps of: creating a questionnaire; transmitting the questionnaire to a remote computer; executing the questionnaire in the remote computer to prompt a user for responses to questions of the questionnaire; transmitting the responses to a sever via a network; making the responses available on the Web. Preferably, computers used in connection with the inventive method are loosely networked in that network connections between computers are not always available and, when a connection is not available, data is stored at a node of the network and transmitted at the earliest time when a connection is available. In one preferred embodiment, the inventive method is used to collect survey data and to make the responses to the survey available to a client in virtually real time over the Internet.

14 Claims, 6 Drawing Sheets





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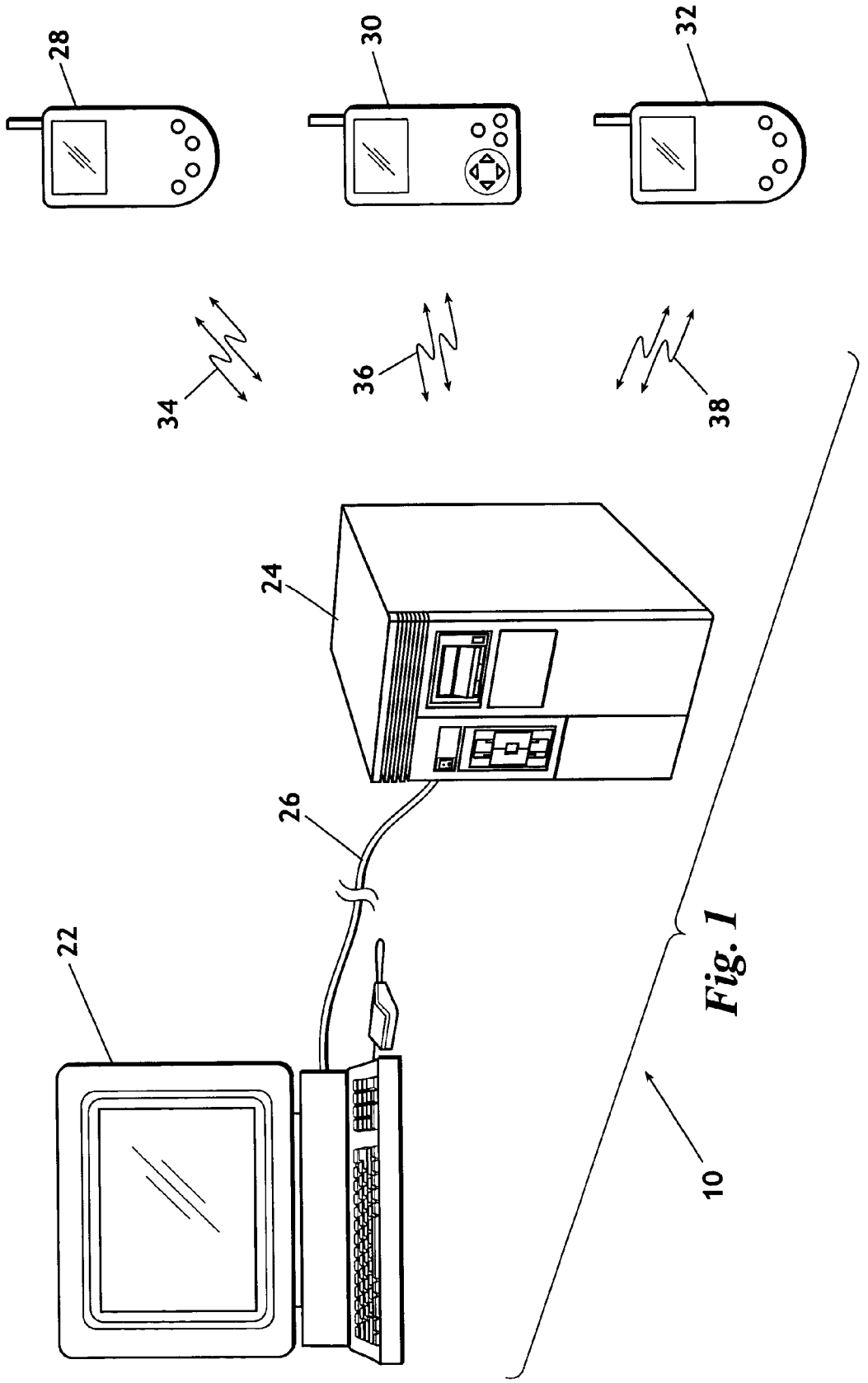


Fig. 1

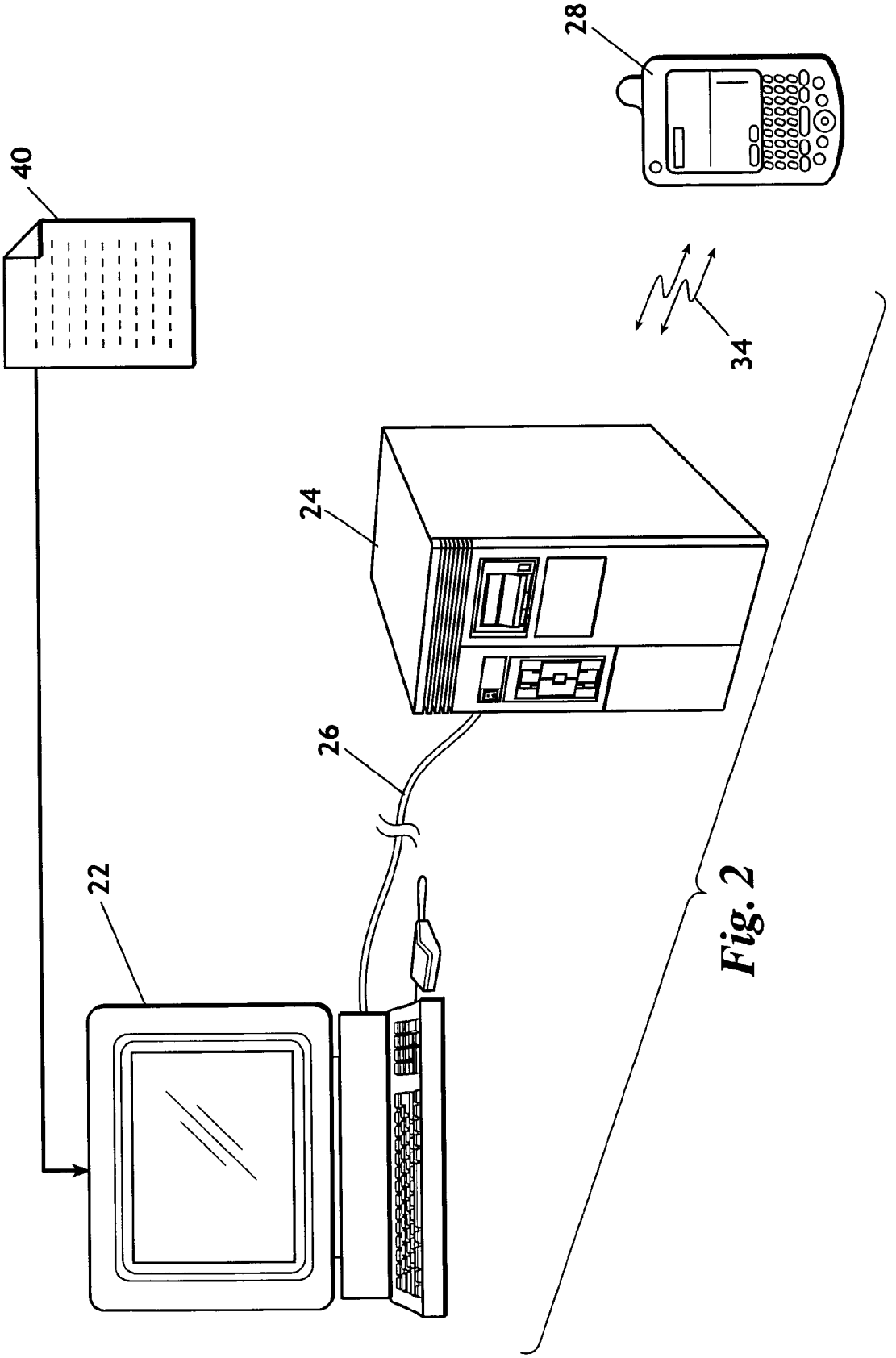


Fig. 2

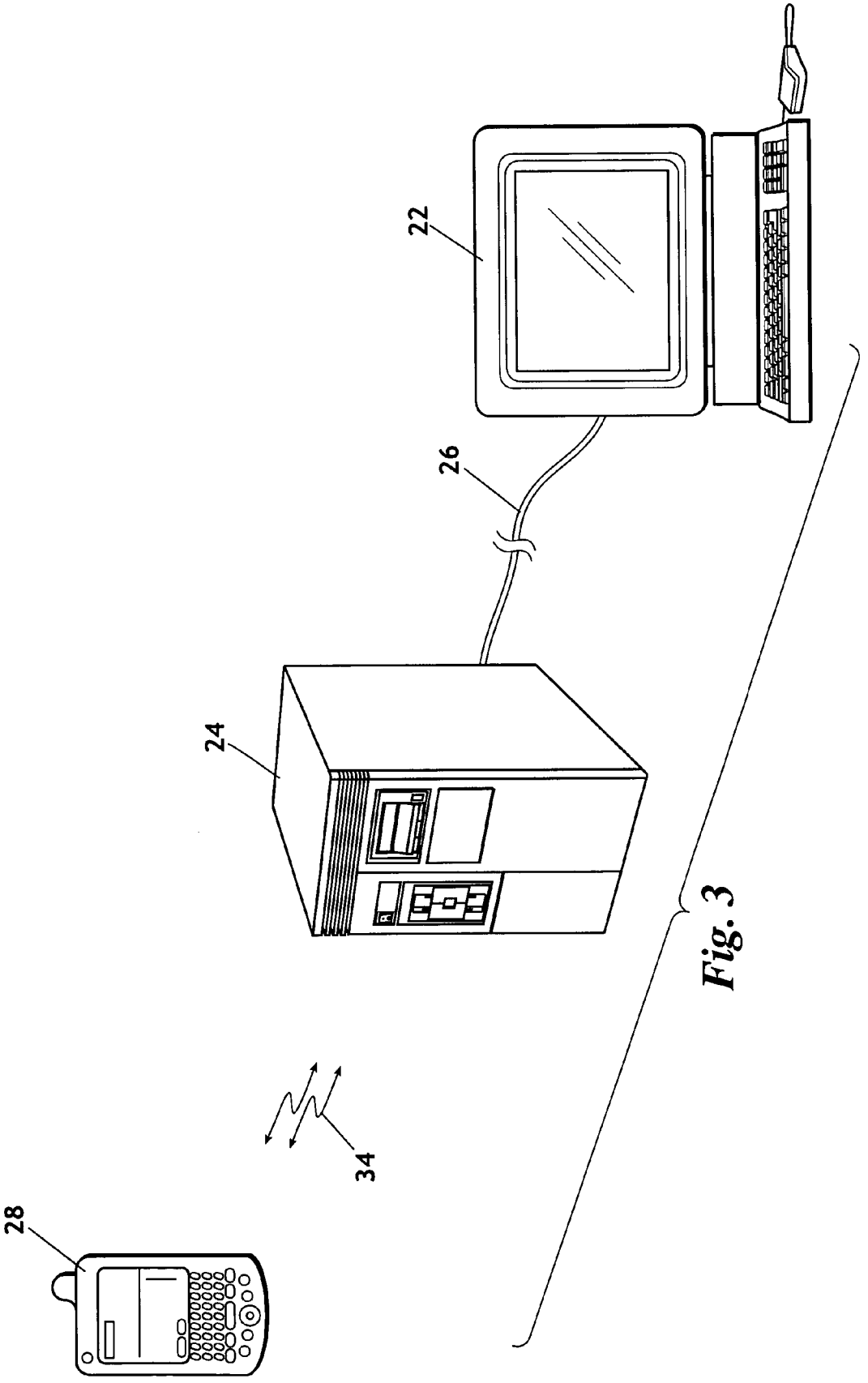


Fig. 3

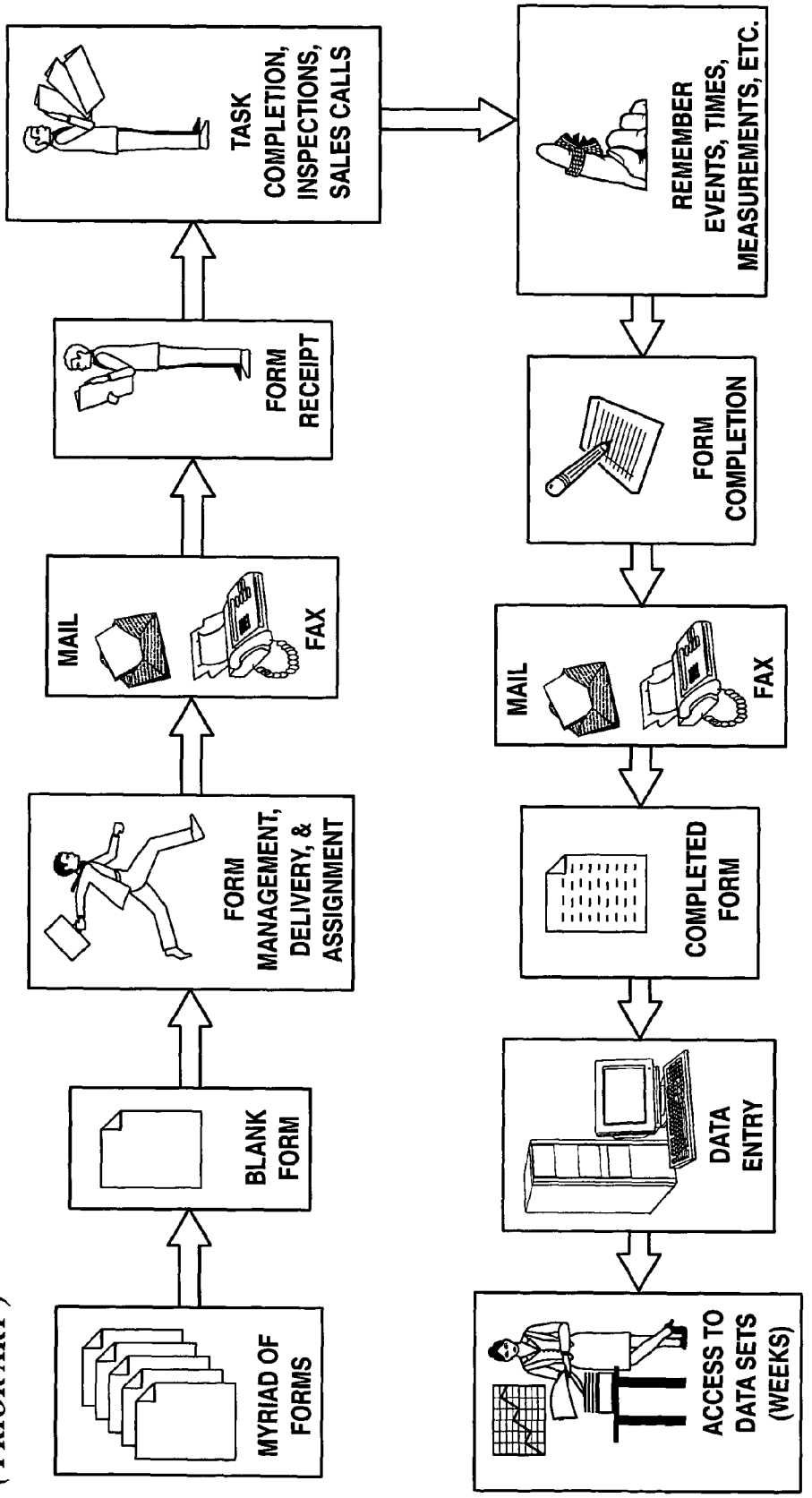


Fig. 4
(PRIOR ART)

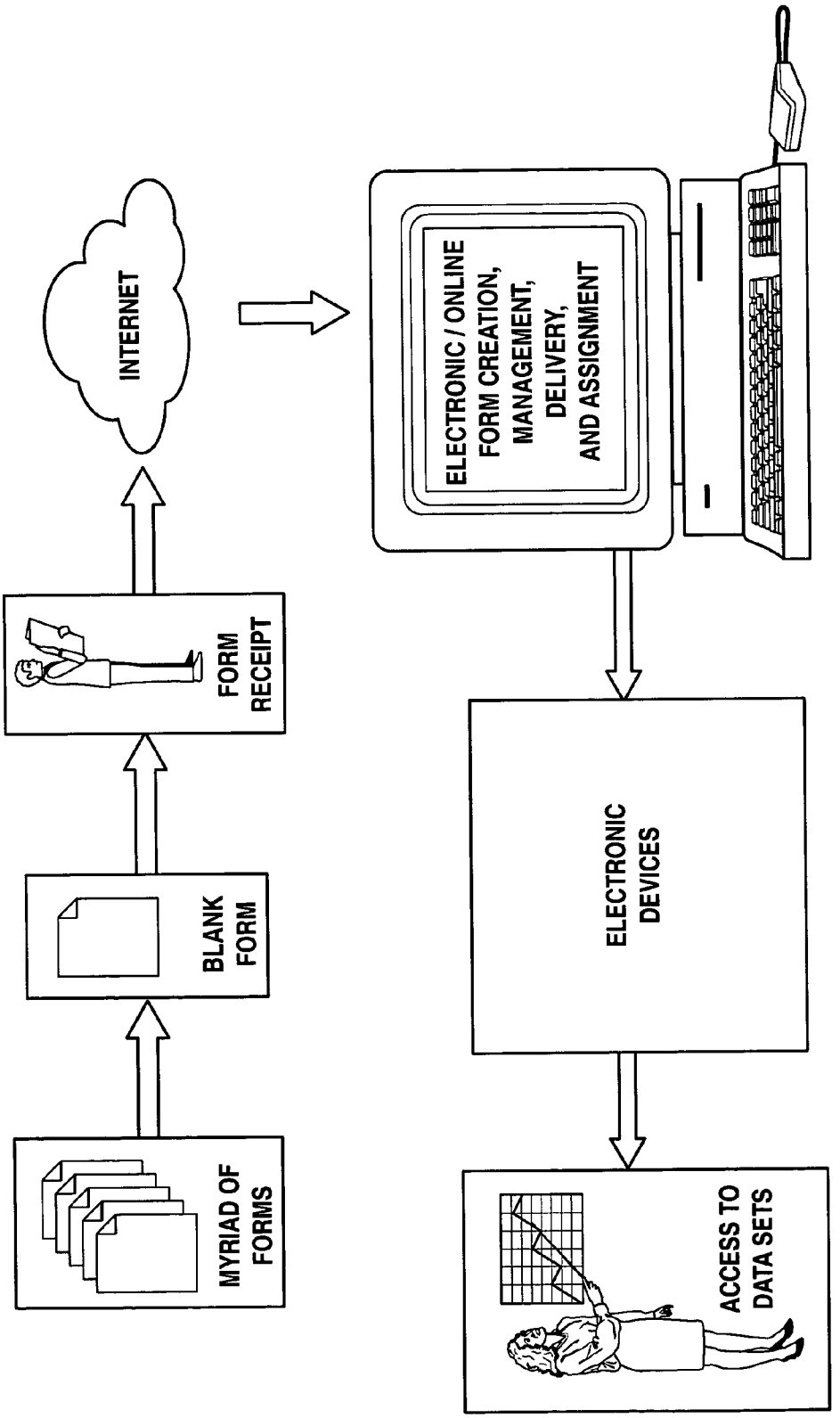

MYRIAD OF FORMS
BLANK FORM
FORM RECEIPT
INTERNET
ELECTRONIC / ONLINE FORM CREATION, MANAGEMENT, DELIVERY, AND ASSIGNMENT
ELECTRONIC DEVICES
ACCESS TO DATA SETS

Fig. 5

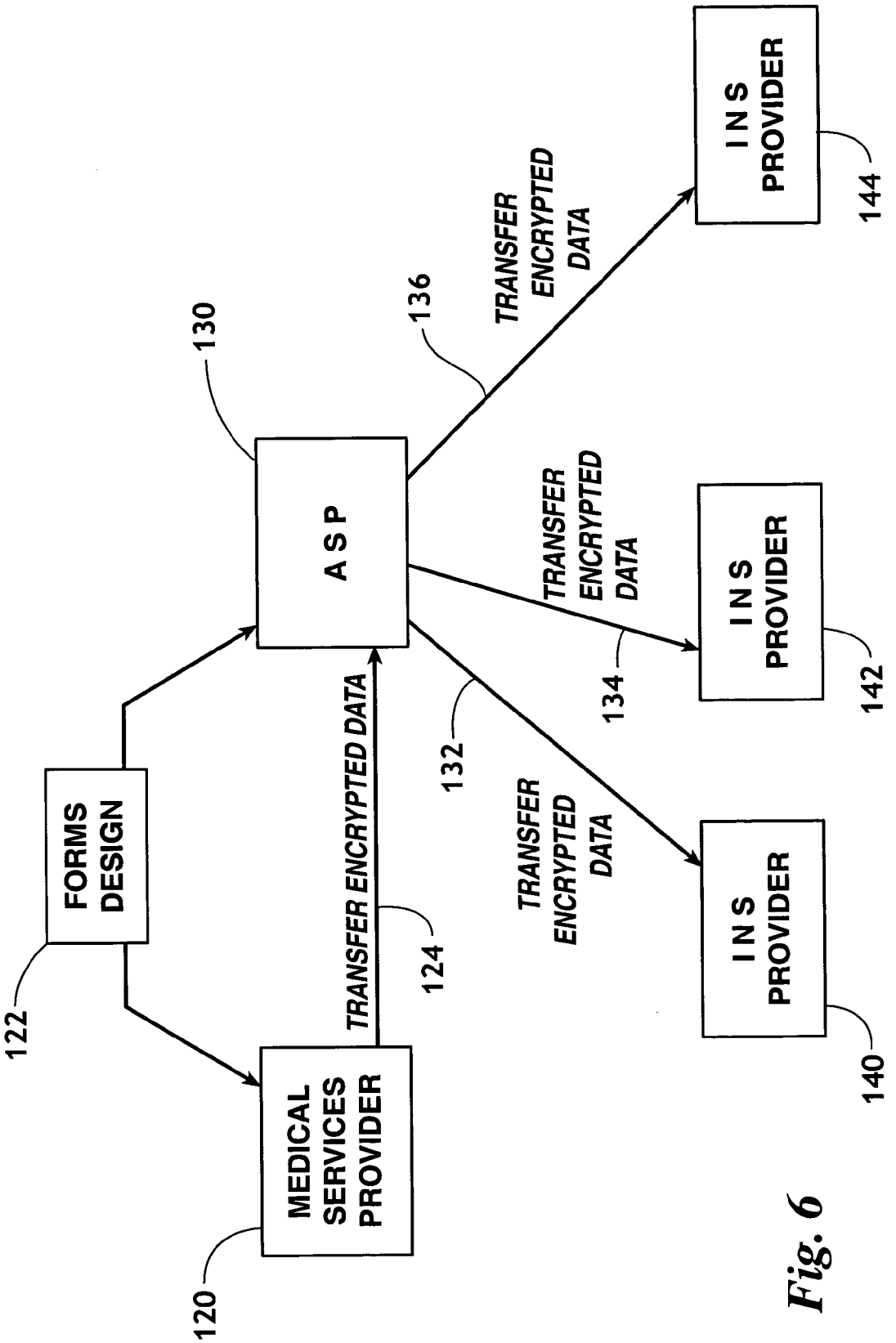

FORMS DESIGN
122
MEDICAL SERVICES PROVIDER
120
TRANSFER ENCRYPTED DATA
124
A S P
130
132
TRANSFER ENCRYPTED DATA
136
TRANSFER ENCRYPTED DATA
134
TRANSFER ENCRYPTED DATA
INS PROVIDER
140
INS PROVIDER
142
INS PROVIDER
144

Fig. 6

SYSTEM AND METHOD FOR DATA MANAGEMENT

CROSS REFERENCE TO RELATED APPLICATION

This application claims the benefit of U.S. Provisional Application No. 60/404,491 filed Aug. 19, 2002.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a system of computing devices for the collection and management of information. More particularly, but not by way of limitation, the present invention relates to a system for collecting and managing information including a plurality of computer devices loosely networked to a server and an operating system for a computer which provides a number of features favorable for use in the inventive system.

2. Background of the Invention

Virtually all business software applications involve the collection of information in some form or another. Where information is gathered away from the convenience of a desktop, workers have traditionally entered the information on paper forms. This data is then entered into a computer in a second step. This extra step leads to delays and inaccuracies which are costly and, more importantly, unnecessary.

Handheld computers are well known in the art. In fact such computers are presently available from numerous manufacturers offering a vast assortment of operating systems and hardware configurations. While such devices come in a host of variations, generally handheld computers include an LCD display, a method for gathering manual input, storage, and a variety of machine interfaces, i.e., an IR link, a USB port, a serial port, etc.

As with their desktop, and laptop counterparts, a handheld computer will also include an operating system which provides an operator interface, file management, and standardized I/O, as well as facilitating the running of application programs. Thus far, handheld operating systems mimic those of desktop and laptop systems, despite the fact that handheld devices are typically used in a different manner and have radically different resources.

As with other types of computers, handheld computers suffer from compatibility issues, especially in the operation of application programs. Generally speaking, software programs must typically be tailored to a specific family of processors and to a specific operating system. Most applications are developed in a high level language and then compiled for a specific target processor. As different manufacturers select different processors, an application written for one family of processors must be recompiled to execute in a processor of a different family. Even when two manufacturers select compatible processors, if they chose different operating systems, applications written for one device will probably not run correctly on the other device. Since the operating system provides access to the various hardware resources and manages the file system, it is almost unfathomable that the operating systems of independent authors would be compatible, unless one specifically set out to copy the other. Thus, particular applications tend to grow up around a particular family of devices which share an operating system and, unfortunately, the application may not be available for non-compatible devices.

Another issue which is common to all computers is the transferability of stored information, specifically, the ability

to move files from machine-to-machine. While most handheld computers include an infrared port for communicating with other infrared devices, including other handhelds, files transferred in such a manner may not be usable by software on the receiving device. This is especially true of information formatted for a particular application such as a word processor, spread sheet program, data base manager, or the like.

To overcome the necessity of compiling a program for a particular machine, an application may be written in an interpreted language, or a language which can be compiled to produce an intermediate language (i.e., a language that falls somewhere between source code and object code) such as i-code or tokens. In such a scheme, each device is provided with a run-time package which can execute the compiled i-code or tokens, the runtime package having been written for that particular device, thus, only the run-time package needs to be modified in order to port a program to a new computing environment. Once the run-time package is installed, any application authored in the language and which has been compiled to i-code will run on the target device. Unfortunately, such languages typically lack effective optimization and generally do not provide a broad range of support for hardware resources. Regardless of the language selected, whether compiled, interpreted, or whatever, software coding requires at least a nominal degree of programming skill to create the application program.

Perhaps because handheld computers are not as evolved as their desktop counterparts, or because it is typically cumbersome to enter information, or maybe due to the lack of a true front-runner in operating systems, handheld computers have not inspired the full range of software products available for larger computers. The result has been a rather limited selection of retail software applications for handheld devices as compared with their desktop counterparts, such software is aimed primarily at organizational tools, e-mail, and games. However, at the other end of the spectrum, custom programs tailored for a specific customer, handheld computers are gaining momentum in replacing manual forms which are often filled-out in remote areas, away from a desktop, i.e. manufacturing inventory, quality inspections, delivery systems, and the like. One reason for the increasing movement toward the use of handheld computers for data gathering tasks is that they can be easily transported to the source of the data and have the information directly entered into them, thereby eliminating the potentially error-prone step of manual data entry of information on previously completed paper forms. Eliminating the extra step additionally saves unnecessary labor, and allows the data to be entered in a more timely fashion.

Due to their incredible portability, handhelds are particularly well suited to this type of data gathering, despite an obvious lack of software infrastructure in this area. The present trend is for a business to commission the authoring of a custom program aimed at a particular need. While the cost of such an application is usually high, the accuracy of the information, the timeliness of the information, and the accessibility of the information are likely worth the cost. In fact, while such systems may seem cost prohibitive to develop, in many cases the actual cost on a per-data-entry basis may prove to be relatively small, especially in light of the timeliness and accuracy associated with real time data collection.

To develop software for a handheld computer, a custom program is typically developed and tested on a larger system. When the developer is satisfied with the program, it is compiled for a particular target device and transferred to handheld devices through a communication link. If users are using more than one type of device, the same program must be tested and compiled for each type of device. If a change is

required, the developer must make the change on the development system and re-transfer the entire program to each target device.

In a typical data gathering application, information is entered into custom designed forms on the handheld computer. Eventually, the data entered in the handheld finds its way to a database, which is typically located on a server which is accessible to those needing the information or from which it may be accessed by other programs such as accounting systems, materials management programs, etc. Present day servers are well suited to the task of information management and generally provide broad access to and searchability to collected data.

One problem area in such systems becomes apparent when the data is transferred from the handheld to the server. While it would seem that wireless interfaces and handhelds were made for each other, the marriage of the two is not without its own set of problems. Wireless interfaces fall into a number of different categories. At one extreme is the infrared ("IR") port often found on handheld devices. The range of this type of interface is usually limited to a few feet and typically supports transfer rates of 115 kbaud, or less.

Another method for wireless communication is via a wireless local area network or "WLAN." A typical example of a WLAN is that defined by the IEEE 802.11 standard. When a handheld computer is equipped with a WLAN interface, the device can communicate with other computers also equipped with a WLAN interface, or even computers networked to a WLAN equipped computer by a wired network. Typically, WLAN interfaces provide a range of several hundred feet. As long as a handheld is within the range of another WLAN equipped computer, the network connection is continuous. Wireless local area networks sport data rates from a few thousand bits per second up to at least 52 million bits per second, depending on the particular standard employed.

Yet another known wireless interface for handheld computers is a CDPD interface, CDMA interface, GSM interface, or similar wireless interface or modem. While there are some variations, these systems are often built around a cellular phone network and provide coverage similar to that of a cellular phone, typically national, or even international, coverage. Such interfaces will experience the same gaps in service as can be expected with a cell phone. While such systems provide an exceptionally wide area of coverage, they typically do so at limited bandwidth, e.g. 19.2 kbaud.

Of course handheld devices are not limited to wireless communications. Typically such devices can be connected to another computer through a universal serial bus ("USB") connection, an RS-232 connection, an Ethernet connection on a properly equipped device, or similar hardwired connection. While these interfaces range from moderately paced to the extremely fast, they are exceptionally reliable, at least while the connection is in place. Unfortunately, few environments are well suited to tethering a handheld to allow a continuous wired connection.

It can be seen that perhaps the greatest drawback to using a handheld for data gathering as part of a larger system are the limitations of the data link: 1) it is unlikely that the data link will always be available; and 2) the bandwidth of most of the practical wireless options is restrictive. Presently there are two methods for dealing with the problem of data link availability. In one scheme, data is transmitted as it is collected. The advantage of such a scheme is that the database is updated in real time and represents current data. The disadvantages are, for all practical purposes, the scheme is limited to systems using a wireless interface and when the wireless link is not operational, generally data cannot be entered.

Alternatively, entered data can be stored locally on the handheld and transmitted in a batch process when a link is established. The advantage of this system is that it is tolerant of gaps in the communication link and works well with wired transfers of data. Unfortunately, data is not delivered in real time and the data base may be somewhat stale, depending on the length of time between the collection of data and the presence of the link.

The issue of bandwidth may be problematic on several fronts. If programs are updated periodically, the entire program must be sent and the time to reload may be objectionable. In the opposite direction, if large amounts of data are collected, it may be time consuming to send the data collected from the handheld to the server, particularly when performed in a batch fashion.

It is thus an object of the present invention to provide an operating system for a handheld computer which will allow a program to execute on any handheld computer.

It is a further object of the present invention to provide an operating system for a handheld computer wherein programming changes will only necessitate incremental transfers of program instructions.

It is still a further object of the present invention to provide an operating system for a handheld computer wherein files may be transferred among devices without a translation or conversion.

It is yet a further object of the present invention to provide an operating system for a handheld computer wherein programming steps and data are tokenized to reduce the load on a communication channel of finite bandwidth.

It is yet a further object of the present invention to provide a system of networked computers in which modifications to a computer program for a remote computer are sent in real time to the remote computer and are implemented immediately and seamlessly without the requirement of user installation.

SUMMARY OF THE INVENTION

The present invention provides a system and method for the management of information which solves the problems and alleviates the needs discussed above. In its broadest sense, the present invention is a method designed to accomplish the following:

1) Allow any computer(s) (desktops, laptops, handhelds, portables, etc.) to be used to capture information;
2) Transfer the information to a data center (via file transfer methods such as a network, to include, but not necessarily, Internet based) in a form that the data center can recognize;
3) Allow another computer(s) to access the information and download it from the data center in a format that can be readily used regardless of the format in which the original information was gathered.

In a preferred embodiment, a server is loosely networked to a plurality of computers (handheld, laptop, or desktop). Each computer is equipped with an operating system which allows common programming to execute on any device, regardless of hardware differences or native operating system differences among the plurality of devices.

With regard to the present invention, the term "loosely networked" is used to describe a networked computer system wherein devices on the network are tolerant of intermittent network connections and, in fact, tolerant of the type of network connection available. In particular, if any communication connection is available between devices wishing to communicate, network transmissions occur normally, in real time.

If a network connection is unavailable at that moment, the information is temporarily stored in the device and later transmitted when the connection is restored. Unless otherwise specified, hereinafter the terms "network" or "networked" refer to loosely networked devices.

Thus, the operating system may be thought of as device indifferent and communication channel indifferent. In the preferred embodiment, any computer can execute any program developed for the inventive system and will communicate with other members of the system through any communication method the device can find available.

The operating system provided in each computer device allows the use of a common instruction set in any such device, regardless of compatibility issues between the devices, wherein "instruction set" is used herein to mean the commands, tokens, etc., that are recognized by the operating system as valid instructions. Unlike conventional computer programs, the operating system employed in the inventive system allows incremental changes to the program without the need to reload the entire program. Additionally, a programming change made at a central office will automatically propagate to loosely networked computers dispersed throughout the field.

In one aspect of the invention, branching logic depending on the programs are created for handheld or other computer devices by simply entering questions and providing response specification, in the form of a questionnaire, for the end-user. Thus, no particular programming skill is required to generate programs for data gathering. As will be appreciated by those familiar with data collection, data can be collected by posing a series of questions, or otherwise prompting for specific input from the user, as in the manner used with paper forms. A number of useful subsystems, which may already be present in the handheld device, or easily added later, may be utilized so that at least some of the information which is responsive to the designed questionnaire may be collected automatically rather than entered manually, e.g., time and date, position information if the device includes a GPS receiver, etc.

In another aspect of the present invention, the program and user responses are coded in such a fashion as to substantially reduce the bandwidth requirements of the network connection. Since many of the networking options for handheld devices provide limited bandwidth, best use may be made of the available throughput by coding, or tokenizing, program information and responses.

In practice, a program is created by entering a series of prompts and providing direction for how the system is to respond to particular responses. This process of data gathering may then be performed by a person having no programming skill whatsoever. The program may then be sent to all, or selected, computer devices on the network. Those devices having a connection may immediately be updated. Those devices in which a network connection is temporarily not available will be updated when the connection is next restored.

The user of the computer device is then prompted for specific input. As the user enters data, if the network connection is available, the information is immediately sent to the server. If the network connection is unavailable, the information is stored locally in the handheld device and sent upon restoration of the network connection. At the server, the information is typically processed upon receipt such that users of the data have real time, or virtually real time, information available.

In another aspect of the invention, the inventive system may be provided to end users according to an application service provider ("ASP") business method. ASPs are an emerging trend in the computer software industry. Traditionally, a company seeking a software solution would either acquire a preprogrammed package which suits its needs or commission the programming of custom software. In many instances preprogrammed software is unavailable or requires too many compromises to be attractive. In either case, the software is purchased and, invariably, represents a large capital expense to the company. Once purchased, modifications, evolutional upgrades, changing management practices, and the like, result in additional expenses to keep the software up-to-date.

In contrast an ASP typically provides software on a pay-as-you-go basis. An ASP typically provides custom, or semi-custom software to companies. Each user is billed for the time it uses the software. The advantages to the end user are obvious. There is no crippling up-front expense, modifications and upgrades are the responsibility of the ASP, if the software does not perform satisfactorily the customer simply walks away and never incurs large expenses. On the ASP side, the software vendor enjoys recurring income and the ability to adapt the same software model to numerous customers. While differing slightly from the traditional ASP model, the present invention is particularly well suited to a per-transaction billing model.

With regard to the current system, an ASP can provide a web site which allows users to build an application on line, possibly without incurring any expense. Once the customer is satisfied with the program, it can automatically be deployed to designated computer devices within the system. When a user provides input, the computer device can find a direct network connection to the ASP or, more likely, find an Internet connection and report the data to the ASP via the Internet connection. Once received at the ASP, the data can be processed and is available for viewing or use by the client virtually instantly via the Internet. Thus, data entered at any location may be viewed by the client in real time, worldwide.

Further objects, features, and advantages of the present invention will be apparent to those skilled in the art upon examining the accompanying drawings and upon reading the following description of the preferred embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** provides a diagram of the inventive system.

FIG. **2** provides a diagram of the inventive system as used for form creation.

FIG. **3** provides a diagram of the inventive system as used for information collection and review.

FIG. **4** depicts a sequence of tasks for collecting data through the use of prior art systems.

FIG. **5** depicts the tasks of FIG. **4** utilizing the inventive system.

FIG. **6** is a work flow diagram of an embodiment utilizing the inventive system.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Before explaining the present invention in detail, it is important to understand that the invention is not limited in its application to the details of the construction illustrated and the steps described herein. The invention is capable of other embodiments and of being practiced or carried out in a variety of ways. It is to be understood that the phraseology and terminology employed herein is for the purpose of description and not of limitation.

Referring now to the drawings, wherein like reference numerals indicate the same parts throughout the several views, a diagram of the inventive system is shown in FIG. **1**. Typically, the system for data management **10** includes: at least one server **24** preferably having an Internet connection **26**; a plurality of handheld computers **28-32** operated remotely from server **24**, each handheld **28-32** including a network connection **34-38**, respectively, for loosely networking handhelds **28-32** to server **24**; and a computer **22** connected to the Internet for providing administration of the system and for reviewing data collected by the system.

Server **24** is shown preferably connected to the Internet **26** and loosely networked to handheld computers **28-32** through connections **34-38**, respectively. As will be apparent to those skilled in the art, network connection **26** could instead be local area network or a private wide area network. Similarly, connections **34-38** may be any one of a number of optional connections which ultimately connect a remote device to server **24**. By way of example and not limitation, connection **34** could be a simple dial up connection through a conventional telephone line to connect handheld **28** directly to server **24**. At the same time, connection **36** could be an infrared (IR) connection between handheld **30** and a desktop computer (not shown) which in turn, is connected to server **24** via the Internet. Connection **38** could be a wireless modem, i.e., a CDPD interface, a CDMA interface, a GSM interface, an analog cellular modem, or the like, which either establishes a direct connection with server **24** or establishes an Internet connection to reach server **24** via the Internet. Other options would include a wireless LAN connection, a direct RS-232 connection, a docking station connected to a desktop computer, etc. It should be noted that, regardless of the type of connection, handhelds **28-32** are ultimately connectable to server **24** in a loosely networked fashion.

It should be noted that handheld computers **28-32** need not be the same type, or even compatible devices. As a part of the inventive system each remote device, preferably a handheld computer, is provided with an operating instruction system ("OIS") which overlays its native operating system. Once equipped with the OIS, a remote device can be programmed according to methods described hereinafter. Any program developed under the inventive system will run on any handheld computer equipped with the OIS and files on one such handheld will transfer freely to any other handheld or any computer connected to the inventive system.

As noted above, with regard to the present invention, the term "loosely networked" is used to describe a networked computer system wherein devices on the network are tolerant of intermittent network connections. In particular, if any communication connection is available between devices wishing to communicate, network transmissions occur normally, in real time. If a network connection is unavailable, the information is temporarily stored in the device and later transmitted when the connection is restored. Unless otherwise specified, hereinafter the terms "network" or "networked" refer to loosely networked devices.

It should also be noted that the inventive system is indifferent as to the particular type of communication channel used for connections **34-36**. Thus, by way of example and not limitation, while connection **36** might today be an IR link to a desktop computer which accesses server **24** via the Internet, tomorrow, handheld **30** might establish a connection **36** with server **24** via a CDPD interface. The particular link selected will be the first available link.

The inventive system may be thought of as taking on two distinct modes of operation. First, as shown in FIG. **2**, the system provides an administrative function. From any computer **22** connected to the Internet **26**, a client can access server **24** to administer the inventive system. Administration involves tasks such as form creation, management, and validation; user setup, and management of system security.

In terms of the present invention, handheld computers are favored for their portability and their usefulness in gathering data from the field, whether the field is a stockroom for a manufacturing facility, a production floor, a delivery site for a product, etc. More generally, field locations are typically areas where people work without the convenience of a desktop.

According to the preferred arrangement, data may be gathered by prompting the user via the handheld **28** with a series of questions or statements, each of which calls for a response. This series of questions or statements will have been constructed on computer **22** and reduced to tokenized form for transmission to the handheld **28**. For purposes of the instant disclosure, the series of questions/statements will collectively be referred to as a questionnaire. As will be discussed in greater detail below, the questionnaire is actually designed to include internal branching logic which is implemented by the OIS. Hence, with regard to the present invention, the terms "program" and "form" are used interchangeably with questionnaire.

An important aspect of the invention is the ease with which a client can create a form and distribute the form to the appropriate handheld devices in the field. Continuing with FIG. **2**, typically a client uses a computer **22** having access to the Internet **26** to communicate with server **24**. As part of the administrative function provided by system **10**, computer **22** provides a web-based interface which allows a client to create a questionnaire. As a first step, preferably, the client selects a type of question from a list of standard question types. This list would include alternatives for the way the question is posed to the user, for example visual or vocal, and the type of answer to expect, whether yes/no, multiple choice, narrative, numerical, etc.

As the client creates a list of questions, symbols from a tool bar may be used to control conditional branching based on the user's response. As the client enters questions and selects response types, server **24** builds a stack of questions and responses, and assigns indices, or tokens, which point to each question or response. Each token preferably corresponds to a logical, mathematical, or branching operation and is preferably selected and made a part of the questionnaire through a graphical user interface. By this mechanism, a user is able to create a series of questions, the precise nature of which is dependent on the user's responses. For example, the questionnaire designer might desire to create a form that asks the user different questions; depending on whether the user was male or female. In order to do this, the designer would enter the questions ("Are you a man or woman?"); select a response (a "pop up" list of two entries male and female); select a token (branch if "male"); assign that token to this question; and, specify an "end" location for the "branch" (i.e., the first question asked of "males").

When the questionnaire **40** is complete, server **24** sends the stack of questions and defined responses to the appropriate handheld devices, as represented by handheld **28**, via the loosely networked connection **34**. In addition, server **24** sends the operating logic for that questionnaire, which is simply a list of tokens which point to the questions and responses to each question as well as tokens for program control or math operations. As will be apparent to those skilled in the art, if a question or response is repeated within the questionnaire, only a pointer need be repeated in the program list, not the entire question.

According to another preferred arrangement, there is provided a system, substantially as defined above, wherein the questionnaire which is transmitted to the handheld can be incrementally updated on each networked handheld **28**, rather than resending the entire questionnaire. For example, if a question is modified or replaced, the new question and a new list are the only information which need to be transmitted to the handheld device **28**. This incremental update capability dramatically reduces the quantity of computer instructions required to update a form. It should be noted that, if connection **34** is present, the program update will take place virtually at the same time the client finishes questionnaire **40** at computer **22**. If the network connection is unavailable, the update will happen automatically as soon as the connection **34** is restored.

Turning next to FIG. **3**, in a preferred embodiment the user will initiate the execution of the questionnaire according to instructions previously provided to him or her. For example, the user might be instructed to initiate the questionnaire as soon as he or she pulls into the drive-in lane of a take-out eatery. This would be the case if the questionnaire were designed to collect information regarding service at that establishment. In such an event, the questionnaire might contain questions related to service time, cleanliness, friendliness of the employees, etc., all of which would potentially be of interest to the owner/client. The user will preferably respond to each question in turn, the questions being presented according to the logic defined by the client and built into the questionnaire. In some instances, the text of the question might instruct the user to perform acts and/or wait until a certain event happens before responding (e.g., "Pull up to the take-out window. How long was it before you received your order?") The user's responses to the items in the questionnaire are stored within the handheld **28** as they are collected. In some cases, the questionnaire logic might allow the user to skip questions and (optionally) return to them later. Additionally, the questionnaire designer might include a token that initiates a final review of the data collected from the user in this instance to make certain that all "required" questions, (which have preferably been so designated by marking them with the appropriate token) have been answered. Failure by the user to respond to a required question will result in the OIS prompting the user again for a response.

Several options are available for the transmission of responses from handheld **28** to server **24**. First, regardless of the availability of connection **34**, responses may be stored locally at handheld **28** until the form is fully completed and then sent as a batch to server **24**. This transfer may optionally occur automatically, or upon direction of the user as specified by the client during the creation of the form. If the link is not available at the time of completion of the form, transmission will be automatically delayed until connection **34** is restored.

Alternatively, selected responses, or all responses, may be configured to transmit immediately upon entry, assuming of course that connection **34** is available. This option is particularly important where the user of handheld **28** has entered information which might be indicative of a problem with a process or indicate an emergency. Again, if connection **34** is unavailable, immediate transmissions will also be delayed until a connection is available.

As data from a handheld is received at server **24** it is processed, as necessary, and placed in a database where it can be accessed via the Internet **26**. A client can then use a computer **22** with Internet access to review or use the data from virtually anywhere in the world.

Turning next to FIG. **4**, wherein a prior art system built around paper forms is shown, in the past, a paper form had to be created, printed, and delivered to a user of the form. Armed with the form, the user had to complete the assigned task and complete the form reflecting observations made during the task. If the user delayed in filling out the form, these observations were subject to the inaccuracies associated with human memory. A completed form was then typically delivered to yet another person for data entry before the information was finally available to others in the company. As will be appreciated by those familiar with such operations, whether a result of unreadable forms or a result of human error at data entry, this step is responsible for a significant level of errors.

Turning next to FIG. **5**, in contrast to prior systems, with the present system, a form may be entered on-line, the form is automatically sent to the handheld computer of the user, usually within seconds, the user enters data directly at the location of the user's assigned task, eliminating memory errors, and made available to others in the organization in virtually a real time fashion. Thus, not only is the data almost instantly available, at least two sources of error, the memory of the user and data entry, have been eliminated.

An example of where the inventive system is particularly useful is in the area of mystery shoppers. Many restaurant chains and retail chain stores employ mystery shoppers to patronize one of the chain's establishments and report on the experience. In the area of fast food, a mystery shopper might, for example, use the drive through window to purchase a breakfast sandwich and a cup of coffee.

Prior to the trip to the restaurant, an employee of the client restaurant develops a questionnaire and enters it on the web site of the ASP that is providing the mystery shopper support service. In this case, the restaurant is interested in the waiting time of their patrons, the service provided to their patrons, and the quality of the food served. A questionnaire is designed to elicit such information from the shopper/user. The results of the mystery shopper's experience will be compared to quality standards established for the entire chain and used to rate the franchisee/owner of particular restaurants.

As the mystery shopper enters the parking lot, the shopper will be prompted to enter a store number or location. If the handheld computer is equipped with a GPS receiver, this information could be entered automatically. Of course the time and date from the computer's real time clock are preferably recorded in the form. As the shopper reaches the end of the drive through line, she starts a timer on the hand held computer, preferably by "tapping" on the face of the handheld in the appropriate region of the screen. When the speaker is reached, the first timer is stopped and a second timer is started.

If the shopper is asked to wait before ordering, a second timer is started and a third timer is started. Upon a request for her order, the mystery shopper stops the previous timers and yet a fourth timer is started. She orders her breakfast sandwich and coffee and pulls forward in line. While sitting in line, the handheld computer asks if the speaker could be clearly understood, if the menu was in good shape, and if the area around the menu appeared neat and clean.

Upon reaching the window, the shopper presses a button which stops the fourth timer and starts a fifth timer. As her money is taken, the fifth timer is stopped and yet a sixth timer is started. She pays with a twenty dollar bill and, upon receiving her change, notes the accuracy of her change, whether the person at the window is pleasant, stops the sixth timer and starts a seventh timer.

Upon receiving her food the seventh timer is stopped and she pulls into a parking place to sample the food and measure the temperature of the coffee with a temperature probe attached to her handheld computer. After entering her impres-

sion of the sandwich, the computer asks a few questions about the number of cars in the parking lot and the general appearance of the store.

As the shopper enters the last response, the CDPD modem attached to her handheld contacts the ASP and delivers the collected data which is forwarded to a database where it is accessible by the staff of the restaurant chain, only seconds after the shopper has taken her first bite of the sandwich.

Note that the user's interaction with the handheld in the previous example was all defined by logic that the client has incorporated into the questionnaire when it was designed. The text of the directions to the user (e.g., "Pull up to the drive-in window.") has been designed into the questionnaire. Additionally, preferably there will be tokens that represent "timers" which are designed to make it easy for the user to enter elapsed time information in response to a question (e.g., the user might be asked to tap the screen a first time to start the timer running and a second time to stop it, with the elapsed time being automatically calculated and stored as a response to a client question). Clearly, a goal of the instant system is to provide a client with the tools necessary to quickly and easily construct a complex questionnaire which presents the user with questions which are adaptively selected according to the wishes of the designer.

A second example of where the inventive system is particularly useful is the area of transfer by a medical service provider of a patient's medical information to an insurance company following treatment. In this example, data is exchanged between computers (handhelds, desktops, laptops, etc.) at different locations in a secure manner without providing an outside party access to the secure internal computer network of the medical service provider (MSP). The medical service provider is preferably a hospital, however, it is understood that this term could include clinics, minor emergency centers, physician's offices or any such provider of medical care/treatment.

Modern medical service providers are continually striving to develop methods of transferring medical records and data to insurance companies for rapid claims processing which requires the minimum of manual forms generation, handling, processing, and data entry. Moreover, pressure, both publicly and legislatively, is being applied to the healthcare industry as a whole to protect the privacy of this data including confidential patient information. As a result, transmission of medical information in secure, generally encrypted formats is required. However, such methods of data transfer require a high level of coordination between the medical service providers and the insurance companies, both of which are reluctant to allow the other, and especially third parties, access to their databases and network hardware necessary to achieve these levels of coordination.

The present system can be employed to manage the data flow in a manner that provides secure data transfer between parties without the necessity of either party allowing outside access to its respective data storage systems. In this embodiment, the medical service provider can use the system to design or update the medical forms as described above or contract with the ASP to develop and update such forms.

Referring to FIG. **6**, a system diagram is shown depicting medical services provider **120** (MSP), ASP **130** and insurance companies **140**, **142**, and **144**. As stated, the medical forms can be designed and/or updated seamlessly by the MSP or ASP as shown in **122**. The computers of MSP would be equipped with the inventive OIS thereon to allow forms design, branching logic, and cryptic data transfer at **122**. Once the medical form is designed, medical information can be entered onto the form(s) in the system following treatment by the MSP. Once entered, the data is converted to tokenized form by the OIS for encrypted transfer to the ASP **130** according to step **124**. In this way, a patient's medical data is continuously, seamlessly and securely transferred between MSP **120** and ASP **130**.

Once the ASP **130** receives the tokenized data from MSP **120** pursuant to transfer **124**, the data is stored in a standard database or a database customized for each insurance company within ASP **130**. In a preferred arrangement, the ASP will then alert one or more of the relevant insurance providers **140**, **142**, and/or **144** that data is present and available for immediate retrieval from the database of ASP **130**. In the alternative, the system could be embodied such that insurance providers **140**, **142**, and **144** would periodically query ASP **130** on a set time interval regarding the presence of information.

At the time insurance providers **140**, **142**, and/or **144** are aware that data is present and available from ASP **130**, the insurance provider can access the ASP via a global computer network such as the Internet for retrieval of such information. Typically, access to information maintained by ASP **130** is restricted by password or other similar security measures. Insurance provider **140**, **142**, and/or **144** can then download data from ASP **130** which is either encrypted in a standard format or in a format which is customized for the insurance provider (and may also be encrypted). The download step is depicted by arrows **132**, **134**, and **136**, respectively.

In this embodiment, the customer of ASP **130**, typically MSP **120**, would be billed for the transaction or by the volume of data transmitted.

Accordingly, a secure method of transfer of medical information between MSP **130** and insurance providers **140**, **142**, and/or **144** is defined using the method and apparatus of the present invention.

By way of example and not limitations, various preferred embodiments of the instant invention will include a number of desirable features or traits such as: 128-bit CerticomT end-to-end wireless security; ability of the administrator to clean erroneous data; all data and administrative transactions on one or more secure servers; form question responses are time stamped; centralized online repository of all form responses; the complete form is available for review or update on the Web; context-sensitive help; from the customer's perspective, the system is scalable and flexible; users, questionnaires, and responses manageable as groups; data exportation to CSV, XLS, XML, as well as any other format or external application; ability to define multiple form administrators; forms deployable wirelessly over the Internet; error checking for dropped connection in a loosely networked environment; a provider of the service can offer secondary services such as form design consulting services; partially completed forms can be saved and restarted; OIS allows data to be gathered in virtually any form factor, i.e. web, handheld, phone, laptop, and the like; the client can inspect individual responses from a form; multiple forms can be made available on same device; online data report generation and publishing from gathered responses; optional authentication of users; responses can be subjected to bounding and validation logic; real-time accessibility to form responses from an Internet connected desktop; responses retrievable or accessible anywhere in the world via a provider's web site; robust question branching logic; unlimited administrative control of the user, e.g. a user can be prevented from completing a form more than once; administrative hierarchy allowing some administrators to view other administrators' data, if allowed; web based service eliminates the need for client installation; archival of old forms and responses; user interfaces brandable with corporate identity;

ability to clone, or modify, existing forms into a new form; ability to create summary reports with informative charts; customizable reports can be designed to meet clients' specific needs; definable start and stop dates for forms allow control of a time frame over which data can be gathered; ability to include pictures in questions; responses from various forms can be merged into a common report; phone call completion of forms; administrators can be provided with predefined question and form libraries; responses can be reviewed prior to submitting; print form responses from the remote computer; administrative control of questionnaire aesthetics; software developers kit can be provided by the service provider; language controls available during question development, i.e. spell check, thesaurus, translation of multi-language forms, extended character sets, etc.; various events can be triggered from within a form; and reports can be viewed on the remote computer.

Thus, the present invention is well adapted to carry out the objects and attain the ends and advantages mentioned above as well as those inherent therein. While presently preferred embodiments have been described for purposes of this disclosure, numerous changes and modifications will be apparent to those skilled in the art. Such changes and modifications are encompassed within the spirit of this invention.

What is claimed is:

1. A method for managing data including the steps of:

(a) creating a questionnaire comprising a series of questions;

(b) tokenizing said questionnaire; thereby producing a plurality of tokens representing said questionnaire;

(c) establishing a first wireless modem or wireless LAN network connection with a remote computing device;

(d) transmitting said plurality of tokens to a remote computing device via said first wireless modem or wireless LAN network connection;

(e) terminating said first wireless modem or wireless LAN network connection with said remote computing device;

(f) after said first wireless modem or wireless LAN network connection is terminated, executing at least a portion of said plurality of tokens representing said questionnaire at said remote computing device to collect a response from a user;

(g) establishing a second wireless modem or wireless LAN network connection between said remote computing device and a server;

(h) after said second wireless modem or wireless LAN network connection is established, transmitting at least a portion of said response from the user to said server via said second wireless modem or wireless LAN network connection; and

(i) storing said transmitted response at said server.

2. The method for managing data of claim **1** further comprising the step of:

(j) translating said response to a format recognizable by a particular computer program; and

(k) accessing the translated response from a computer executing said particular computer program.

3. The method for managing data of claim **1** wherein step (a) includes the substeps of:

(a) creating a questionnaire by:

(i) entering a series of questions into a questionnaire design computer program;

(ii) identifying within said questionnaire design computer program the type of response allowed for each question of said series of questions; and

(iii) identifying within said questionnaire design computer program a branching path in said questionnaire for each possible response to each question of said series of questions.

4. The method for managing data of claim **1** wherein step (b) includes the substeps of:

(b) tokenizing said questionnaire thereby producing a plurality of tokens representing said questionnaire by:

(i) assigning at least one token to each question of said series of questions;

(ii) assigning at least one token to each response called for in said series of questions to identify the type of response required; and

(iii) assigning at least one token to each branch in said questionnaire to identify the required program control associated with said branch.

5. A method for modifying a questionnaire used in data management according to the method of claim **1** including the steps of:

(a) making at least one incremental change to a portion of the questionnaire;

(b) tokenizing said at least one incremental change to said questionnaire;

(c) transmitting at least a portion of said tokens resulting from step (b) to a remote loosely networked computing device, said transmitted tokens comprising less than the entire tokenized questionnaire; and,

(d) incorporating said transmitted tokens into said questionnaire at said loosely networked remote computing device, thereby modifying said questionnaire.

6. A method for managing data according to claim **1**, wherein said first wireless modem or wireless LAN network connection and said second wireless modem or wireless LAN network connection are a same wireless modem or wireless LAN network connection.

7. The method of claim **1** further including performing at least the steps (c)-(k) for at least two different remote computing device types using the same tokens.

8. A method for managing data transfers between computers including the steps of:

(a) creating a questionnaire at a first site in a first computer;

(b) tokenizing said questionnaire, thereby producing a tokenized questionnaire;

(c) bringing a remote computer into electronic communication with said first computer;

(d) transmitting said tokenized questionnaire to said remote computer;

(e) removing said remote computer from electronic communication with said first computer;

(f) within said remote computer, using said transmitted tokenized questionnaire to obtain at least one user response;

(g) storing said at least one user response within said remote computer;

(h) modifying said questionnaire with incremental changes at a second computer located at a second site;

(i) placing said remote computer into electrical communication with said second computer;

(j) transmitting said incremental changes from said second computer to said remote computer;

(k) modifying said transmitted tokenized questionnaire in said remote computer with said incremental changes, thereby creating a modified tokenized questionnaire;

(1) removing said remote computer from electronic communication with said second computer;

(m) within said remote computer, using said modified tokenized questionnaire to obtain at least one additional user response;

(n) placing said remote computer into electronic communication with a server;

(o) transmitting said at least one user response to said server;

(p) transmitting said at least one additional user response to said server;

(q) storing said transmitted at least one user response and said at least one additional user response at said server;

(r) preparing a report using any of said at least one user response and said at least one additional user response; and,

(s) displaying at least a portion of said report on a visually perceptible medium;

(t) performing at least steps (d)-(p) using at least two different remote computing device types using the same tokens.

9. The method for managing data transfers between computers according to claim **8** wherein said first computer and said second computer are a same computer.

10. The method for managing data transfers between computers according to claim **9** wherein said server and said first computer are said same computer.

11. A method for collecting survey data from a user comprising the steps of:

(a) creating a questionnaire comprising a series of questions;

(b) tokenizing said questionnaire; thereby producing a plurality of tokens representing said questionnaire;

(c) storing said plurality of tokens on a computer readable medium on a first computer;

(d) placing a handheld remote computing device into electronic communication with said first computer;

(e) transmitting said plurality of tokens to said handheld remote computing device;

(f) taking said handheld remote computing device out of electronic communication with said first computer;

(g) after said handheld remote computing device has been taken out of electronic communication with said first computer,

(g1) executing at least a portion of said plurality of tokens representing said questionnaire on said handheld remote computing device to collect a response from a user, and,

(g2) storing within said remote computing device said response from the user;

(h) placing said handheld remote computing device into electronic communication with a second computer;

(i) transmitting at least a portion of said response stored within said handheld remote computing device to said second computer; and,

(j) forming a visually perceptible report from any of said at least a portion of said response so transmitted.

12. A method for collecting survey data from a user according to claim **11**, wherein step (j) comprises the step of printing a report from any of said response to transmitted.

13. A method for collecting survey data from a user according to claim **11**, wherein said first computer and said second computer are a same computer.

14. A method for modifying a questionnaire used in data management according to the method of claim **11**, further comprising the steps of:

(k) making at least one incremental change to a portion of said questionnaire;

(1) tokenizing said at least one incremental change to said questionnaire;

(m) transmitting at least a portion of said tokens resulting from step (k) to said remote handheld computing device, said transmitted tokens comprising less than the entire tokenized questionnaire; and,

(n) incorporating said transmitted tokens into said questionnaire at said remote computing device, thereby incrementally changing said questionnaire.

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(54) SYSTEM AND METHOD FOR DATA MANAGEMENT

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None
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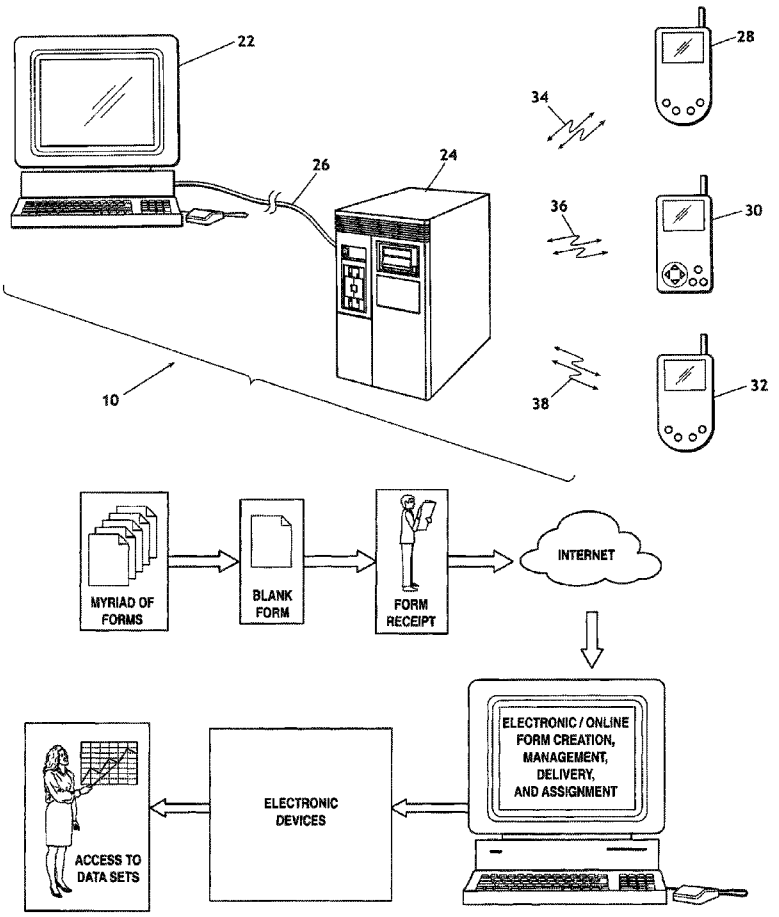
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To view the complete listing of prior art documents cited during the proceeding for Reexamination Control Number 90/012,829, please refer to the USPTO's public Patent Application Information Retrieval (PAIR) system under the Display References tab.

Primary Examiner — Zoila Cabrera

(57) **ABSTRACT**

A method for the management of data collected from a remote computing device including the steps of: creating a questionnaire; transmitting the questionnaire to a remote computer; executing the questionnaire in the remote computer to prompt a user for responses to questions of the questionnaire; transmitting the responses to a sever via a network; making the responses available on the Web. Preferably, computers used in connection with the inventive method are loosely networked in that network connections between computers are not always available and, when a connection is not available, data is stored at a node of the network and transmitted at the earliest time when a connection is available. In one preferred embodiment, the inventive method is used to collect survey data and to make the responses to the survey available to a client in virtually real time over the Internet.



EX PARTE REEXAMINATION CERTIFICATE ISSUED UNDER 35 U.S.C. 307

THE PATENT IS HEREBY AMENDED AS INDICATED BELOW.

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

Claims **1-14** are cancelled.

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