Title: DATA TRANSMISSION MANAGEMENT SYSTEM

Abstract: A data transmission management system comprising a data transmission system of the kind in which an Internet Service Provider (ISP) facilitates access to a database via connection through the Internet, a data transmission management device, said data transmission management device being provided to select the path for transmission of requested data from said database to said user, having regard to the physical characteristics of said data.
Data Transmission Management System

This invention relates to the field of database access and data transmission systems, and more particularly, but not exclusively to such systems which utilise the Internet as the primary means for accessing said database.

The use of the Internet has provided a means for accessing and interrogating databases held at locations virtually anywhere in the world with a telecommunications infrastructure. This has in turn provided for a revolution in the availability of data and information to both individuals and companies alike.

In order to facilitate the required access to data and information, numerous local Internet Service Providers (ISP's) have become established. The function of local ISP's is to provide the connectivity required from the user to other Internet Service Providers via the Internet, who in turn host databases for clients. Such databases held by ISP's are more commonly referred to as websites, and are most commonly accessed by users using the World Wide Web (WWW) protocol.

ISP's commonly offer clients data storage areas (known in the art as webspace), which are linked by ISP's to the Internet and thus made searchable and accessible to users by use of browsers and search engines which utilise the WWW protocol. In some instances, persons wishing to hold data and information in a format accessible to users of the Internet but not managed by an ISP may provide their own
means of data storage. To facilitate user access to such third party storage a dedicated telecommunications link is required from a chosen ISP to the third party storage, thereby providing the required accessibility to the Internet.

The problem associated with access to websites comprising data and information is the speed of access to the website and, more importantly, the download speed from the website. Transmission speed is ultimately governed by the slowest component of the communications route adopted by the user. Typically, state of the art conventional home telecommunications modems have a maximum data transmission speed of 56kbs (kilobytes per second), with up to 128kbs being provided by International Standard Data Network (ISDN) connections. The limitation on data transfer speed is typically compounded by the characteristics of the telecommunications network connecting the user to the chosen local ISP, the connection from the local ISP to the Internet, the connection from the Internet to a selected ISP hosting a web page etc with the data return path from the database back to the user being subject to the same path constraints.

The problems associated with data transmission speeds through the connectivity provided by the ISP's are being further compounded by the increasing complexity of data types that are required to be transmitted to users. Increasingly the use of moving images and audio data is
being provided by website owners, but the current data transmission paths adopted by the ISP's cannot provide the required data transmission speeds to support the user requirements.

Our invention provides a system which can manage both the content and transmission speed of data held on a database which can be accessed via an Internet connection. The invention provides a database manager which can be used to customise the data to be made available to a user whilst optimising the data transmission path to meet the requirements of the user.

According to a first aspect of the present invention there is provided a system for managing data transfer between a data store and one or more network nodes over a communications network, the system including:

a plurality of data routes capable of transferring data between the data store and the node, and

a route selection component for selecting at least one of the data routes to be used for transferring the data, the route selection being dependent upon one or more physical characteristics of the data.

Preferably, the data selection is dependent upon the amount of the data to be transferred, such that the greater the amount, the higher the bandwidth of the data route selected. The amount of data normally corresponds to the size of a file to be transferred.

Preferably, the system is capable of transferring a
relatively large amount of data over one route and substantially simultaneously transferring a relatively small amount of data over another route. The relatively large amount of data may include image data transferred over a relatively high bandwidth route and the relatively small amount of data may include data describing user selectable icons or text transferred over a relatively low bandwidth route.

The relatively large amount of data may include encrypted data and the relatively small data may include data relating to decryption of the encrypted data.

In one embodiment the relatively larger data relates to a quiz and the relatively smaller data relates to answers to the quiz questions. In another embodiment the relatively large data relates to an advertisement and the relatively small data relates to sales of a product promoted in the advertisement. The system can include an electronic display device for receiving and displaying the advertisement data, and one or more electronic payment registers for creating the sales data, wherein the sales data is transferred in response to the display of the advertisement.

The system may further include a user-profiling component for recording data relating to information requested by a user at a said node. The user-profiling component may include apparatus for transferring the recorded data to interested parties.
Preferably, the system further includes a data optimisation component capable of compressing the data for transfer.

In a specific embodiment, the node is a terminal onboard a vehicle.

The data route may be implemented using a connection selected from the following set:

Public Switch Telephone Network; Asynchronous Digital Subscriber Line; a cable link; an electricity provider mains distribution network; Coded (or "Wider") Orthogonal Frequency Digital Modulation; broadband mobile communications network.

According to a second aspect of the present invention there is provided data route selection apparatus for selecting one or more data routes in a communications network for transferring data between a data store and one or more network nodes, the route selection being dependent upon one or more physical characteristics of the data to be transferred.

According to a further aspect of the present invention there is provided a method of managing data transfer between a data store and one or more network nodes over a communications network, the method including steps of:

providing a plurality of data routes capable of transferring the data between the data store and the node, and

selecting one or more of the data routes to be used
for transferring the data, the route selection being dependent upon one or more physical characteristics of the data.

Embodiments of the invention can provide a data transmission management system comprising a data transmission system of the kind in which an Internet Service Provider (ISP) facilitates access by a user to a database via a connection through the Internet, there being provided data transmission management apparatus, said data transmission management apparatus being provided to select the path for transmission of requested data from said database to said user, having regard to the one or more physical characteristics of said data.

Preferably the user interface with the database is via a display with a data entry facility which incorporates a connection to the Internet.

In a preferred embodiment of the invention said display comprises a data storage and playback apparatus to provide local playback of stored data.

Whilst the invention has been described above, it extends to any inventive combination of the features set out above or in the following description.

The invention may be performed in various ways, and, by way of example only, embodiments thereof will now be described, reference being made to the accompanying drawings in which:-

Figure 1 illustrates schematically a first embodiment
of the invention;

Figure 2 illustrates schematically an embodiment of the invention suitable for use in an establishment such as a public house, and

Figure 3 illustrates schematically an embodiment of the invention involving communication with a terminals on board vehicles.

Figure 1 shows a user interface 2 provided with a display 4 and a data entry device 6 such as a touch screen monitor or keyboard. The elements 2 and 4 may be integral, for example a plasma screen with a built-in processor. Additionally, the user interface 2 may comprise a data storage device 8 such as a hard-drive or a data cache or the like. The user interface 2 may also be connected to further terminals using, for example, a Local Area Network. The data storage device 8 provides the ability for the user interface 2 to present local playback of data either whilst the user interface 2 is not in use, or to respond to requests by a user to types of information which could reasonably be expected to be held locally.

When a user requests information from the user interface 2 which is not stored locally, an automatic connection is made via a telecommunications link 10 to an ISP 12, who provides access to the Internet 16 via a link 14. The reason for utilising the services of an ISP 16 as opposed to providing a dedicated connection to the Internet 16 from the user interface 2, is that currently the call
charges to ISP's are typically charged at local rate, and therefore there is a cost saving.

Once the user interface 2 is connected to the Internet 16, the request for data held in the database 24 is made using the WWW protocol, thereby initiating contact via link 18 through the Internet 16 to the data management system server 20. The request for data from the database 24 is routed via the data management system server 20 so that issues such as controlled access to the database via user access verification and security checking may be provided. Once the user's right to access the database 24 has been established, the required data is transferred from the database 24 to the data management system server 20 ready for transmission to the user interface 2. The data management system server 20 includes known interface hardware, such as that provided by CISCO Systems, to communicate over the Internet.

The database 24 may be physically located with or be integral to the data management system, or can alternatively be held in a different location and connected by a communications link 22. Additionally, the database may actually be made up of several separate databases co-located or distributed.

Once the physical characteristics of the data to be transmitted have been established by the data management system 20, a data routing selection is made by a route selection component 21, taking into account which
transmission medium would best suit the type of data to be supplied to the user, and the connectivity status of the user interface 2.

The physical characteristic which is preferably taken into account by the route selection component 21 is the amount of data to be transmitted. This is normally the size of a data file to be transferred, and the route selection is such that the greater the file size, the faster (i.e. the greater the amount of data which can be transmitted per second) the route which is selected. It will be appreciated by those skilled in the art that the route selection component 21 can be implemented in various ways, such as having file sizes within certain ranges corresponding to certain routes, e.g. up to 1 megabyte (MB) to be transferred by a 56 kb/s link; 1 to 50 MB to be transferred by a 1 MB/s link and files over 50 MB to be transferred by a 5 MB/s link. If there is a plurality of routes available with substantially equal transmission bandwidths then a menu may be displayed on the display 4 to allow the user to select which one of the routes is to be used.

The transmission path for the data can include a data link 26 to a satellite up-link 28, whereby the data can be handed up to a satellite 30 and re-transmitted to a local satellite receiving station 32. The satellite link can provide a data transmission route with a bandwidth of 34 MB/s. The satellite receiving station may serve more than
one client via a redistribution network, or may be an individual receiver dedicated to the user interface 2 being used. The satellite communications system may include known V-Sat, GE1E or Astra systems. If more than one of these systems is available for use then the user may select one of them via user interface 2. Known additional hardware is fitted to the user interface 2, such as a satellite card interface/decoder, to allow satellite communications. Such an interface can identify the user interface 2 to the satellite system using a unique IP address assigned to the interface. The data can then be available for viewing by the user via the display 4, and could readily be stored by storage device 8 for replay locally.

Other paths which the data management system 20 may select for the data may include (but are not limited to) the use of an Asynchronous Digital Subscriber Line (ADSL) 34, a cable link 36 as supplied by a cable services provider such as NTL (trademark) or via an electricity provider's mains data distribution network 38. It should be appreciated that any other method of data transfer which would provide the connectivity required to supply requested data to the user is also encompassed by the invention, for example Coded Orthogonal Frequency Digital Modulation (COFDM) (also called Wider Orthogonal Frequency Digital Modulation (WOFDM)), or a broadband G3 mobile communications network.
Examples of the types of transmission requiring high bandwidth routes which could be employed by the data management system 20 are large digital moving image files (50 GB+), large audio files, large image files, live continuous broadcast data and the like.

Additionally, the data management system 20 may well supply the data to the user by transmission back through the connection established by the request via the Internet 16 and the ISP 12 if the content would adequately be supported by that path, i.e. the size of the content file is small.

Furthermore, the data management system 20 may include a data optimising component 23 having the ability to manage the content of data stored on the database 24 such that its physical characteristics are optimised for transmission. Such optimisation techniques include known data compression algorithms. For example, MPEG4 may be used for ADSL routes; MPEG2 for satellite links, with the system 20 being capable of selecting the most appropriate form of compression for a particular route. Preferably, a "padding" technique such as the one provided by "Scavenger" software supplied by IDC Technology of Canada is applied. Such software can detect "gaps" in packets and strip them so that the data can be transmitted using fewer packets.

As is common in packet transmission, a header packet including information relating to the size of the file to be transferred is transmitted. This can be used for
detection of transmission errors by the user interface 2. If the size of the file at the user interface 2 after all the packets have been received does not correspond to the file size in the header then an error is detected and the interface 2 can request re-transmission of either the entire file or specific packets. The data management system may accommodate errors which can occur when the communications network is unstable by automatically resending (e.g. three times) small (e.g. 1 MB or less) files.

The selection of alternative routes for data transmission other than that provided by the established practice of routing via the same telecommunications line from which the data request was made to an ISP can enable the transmission of substantially larger volumes of information in reduced timescales. Additionally, the system can provide for the transmission of broadband and wideband data which is currently not possible using the established ISP telecommunications routings.

It will be apparent to those skilled in the art that the system described offers many advantages. High bandwidth data, e.g. video data, can be transferred using a high bandwidth route, whilst relatively small amounts of data, e.g. web pages, menu data, etc, can be transmitted using lower bandwidth routes. As both types of data can be transferred via the appropriate routes using the IP Protocol this means that IP-compatible software running on
the user interface 2 requires no or minimal modification to receive and display the data in the appropriate manner.

The system also offers security benefits. The use of two different routes for transmitting data means that it is difficult for all the transmissions to be captured and read by unauthorised persons. Thus, encrypted data may be transmitted along one route with a key for decrypting the data being substantially sent simultaneously over another route. For example, a large encrypted file may be transmitted using the satellite route and a key or other code for decrypting the data being transmitted using a route of capable of transmitting SMS (Short Message Service) text messages.

Additional security can be useful in situations such as online voting. A Smartcard can be provided to each voter, which is presented to user interface to identify the user and to allow him/her to select a candidate. A certain number of votes (e.g. 500) at the user interface located in a voting station may be stored temporarily in the data store 8 of the user interface 2 before being transmitted to the database management system 20 located in a central polling office. The additional security provided by having two different transmission routes could be used for sending the encrypted vote data via one route and the encryption key via another route. The data at the central polling station could also be monitored to provide predictions of the outcome of the election.
The system is also suitable for forward and store methods of data transfer, for example, if the user interface 2 is a terminal in a hotel room (for use with a system such as "Guest Channel" produced by E-Vision of the Netherlands) then a user in the room can request data, e.g. a film, which can be delivered and stored in the data store 8 and later displayed on the screen 4.

As a person uses the system a profile of his/her usage can be created and stored by a user profiling component 25 of the data management system 20. The system allows the user to access various network services which can include Internet access (including browsing the WWW), video-on-demand, streamed data, audio-visual data such as television channels or programmes, file download, etc. Records of the data requested, for example, addresses of websites visited can be used to provide (possibly in exchange for payment) details of users who have visited the sites to the operators of the sites so that they can send the user further information on particular subject matter in which the user has shown an interest, e.g. details of a particular model viewed on a car manufacturer's website. If the user interface 2 is a terminal fitted in a hotel room then details of room service requests made by the user may also be stored in the profile. This allows producers of the type of food and drink ordered by the user to obtain details of their customers and target them for advertising. Also it allows a lot of widely different information to the
collected, e.g. the types of websites browsed, the channels and programmes viewed, the usage of hotel facilities such as gyms, the customer's taste in food and wine, and their itinerary over an extended period. From this a detailed profile can be built up, and also the content provider may use this information to target certain elements of programme content accordingly, e.g. advertising.

Data associated with the user's profile can be stored on a Smartcard allowing the user to access the system at another location so that the profile can continue to be built, as well as allowing the user's preferences or configurations of certain features, e.g. desktop and web browser set up, installation of special software, etc to be retrieved. If the user has access to online banking facilities then data relating to the bank account can be stored on the Smartcard, allowing the user to pay for usage of certain features of the system, e.g. paying for access to TV channels at a hotel.

A further use relating to advertising is the addition of user-selectable icons to advertisements, the selection of which allows a request for further details from the advertiser to be made. The user's request is transmitted to the data management system and the advertiser may be charged a sum of money to receive the request and other details regarding the user stored in profile. Furthermore, such information requests need not be limited to advertisements only, for example, data for icons relating
to a film may be transferred along with the actual video data of the film, allowing information relating to onscreen images or sounds to be requested by the user. For example, an icon may appear on screen associated with a watch a character in the film is wearing and clicking upon the icon could take the user directly to the website of the watch manufacturer, or an information request similar to that described above is made so that the manufacturer may be charged a sum of money to receive details of the user who has requested information about its products.

Another application of the system is where is the user interface 2 is located in an establishment, e.g. a public house, for playing a quiz game. An example of such an embodiment is shown in Figure 2, wherein elements common with Figure 1 have identical reference numbers. In this case, the user interface comprises a personal computer 40 with a wireless interface for communicating with a plurality of wireless handsets 42, which are rented by players/teams. Each handset is assigned an identifier to communicate with the user interface.

Programme content in which a host asks questions is transmitted via the satellite communications system to a digital television 44 fitted in the establishment and the players can indicate their answers to multiple choice questions using the handsets. Data representing the answers is transferred from the PC 40 via the lower bandwidth Internet connection back to the data management
system 20, where the scores of each player are stored and if the programme is live then the Quiz Master can congratulate the winning team for example. As an extension to this a film crew can be sent to one or more establishments where there are competing players, and the satellite link can be used to transfer images back to the data management system 20 for relaying back to the other establishments so that players in different locations can see each other.

Another situation where video data can be transmitted from the user interface is news reporting. Video footage can be transmitted to the data management system 20 where it can be compiled into a news report and scheduled for playback at other user interfaces.

A further use of the system in establishments such as public houses is the ability to instantly monitor sales in response to advertisements. If the system is being used to show advertisements on the screen 44 then electronic tills 46 can also be connected to the system, possibly via the PC 40, and sales data supplied by tills can be transferred to the data management system 20 via the low bandwidth Internet link. This allows advertisers to monitor changes in sales of a product in the period immediately after an advertisement has been screened.

It is also possible for the system to be used where the user interface is mobile or fitted onboard a vehicle. In a simple case, the user interface may comprise a
wireless application protocol (WAP) communications device capable of accessing the Internet. Alternatively, the user interface 2 may include a terminal fitted onboard an airborne, road or rail vehicle, as shown in Figure 3.

In the case of a rail vehicle 60, transmitters 62 can be located at intervals alongside the track, e.g. every 1.5 to 10 kilometres. Such transmitters may be capable of communicating over the Internet via a wireless link to the ISP 12 or using the satellite communications system. Terminals 64 provided at seats onboard the rail vehicle 60 can each have a unique IP address to allow communication with the data management system 20.

It is often the case that a major road route, e.g. a motorway, runs substantially parallel for a considerable distance with a rail route. The system can take advantage of this by making the transmitters 62 alongside the rail route capable of communicating with terminals both on rail vehicles 60 and onboard road vehicles. A road vehicle 66 can be fitted with a flexible rubber aerial 68 to allow an onboard terminal 69 for wireless communication with the data management system 20 via ISP 12. As each vehicle terminal 69 has an associated IP address the system can also act as a tracking system as it is possible to detect which roadside transmitter a road vehicle is using to communicate. Furthermore, if the car includes a self tracking satellite dish 70 then the satellite communications link of the system can be used, allowing
communications at high speed. This has advantages over current GSM mobile communications methods which can experience packet break up at speeds of over around 120 kilometres an hour.

Further embodiments and alternative configurations of the invention which will be readily apparent to those skilled in the art are deemed to be within the scope of the invention, and the embodiments as detailed hereinbefore may be adapted, varied or modified.
Claims

1. A system for managing data transfer between a data store and one or more network nodes over a communications network, the system including:
   a plurality of data routes capable of transferring data between the data store and the node, and
   a route selection component for selecting at least one of the data routes to be used for transferring the data, the route selection being dependent upon one or more physical characteristics of the data.

2. A system according to Claim 1, wherein the data selection is dependent upon the amount of data to be transferred, such that the greater the amount, the higher the bandwidth of the data route selected.

3. A system according to Claim 1 or Claim 2, wherein the system is capable of transferring a relatively large amount of data over one route and substantially simultaneously transferring a relatively small amount of data over another route.

4. A system according to Claim 3, wherein the relatively large amount of data includes image data transferred over a relatively high bandwidth route and the relatively small amount of data includes data describing user selectable icons or text transferred over a relatively lower bandwidth route.

5. A system according to Claim 3, wherein the relatively large amount of data includes encrypted data and the
relatively small amount of data includes data relating to decryption of the encrypted data.

6. A system according to Claim 3, wherein the relatively large amount of data relates to a quiz and the relatively small amount of data relates to answers to the quiz questions.

7. A system according to Claim 3, wherein the relatively large amount of data relates to an advertisement and the relatively small amount of data relates to sales of a product promoted in the advertisement.

8. A system according to Claim 7, including an electronic display device for receiving and displaying the advertisement data, and one or more electronic payment registers for creating the sales data, wherein the sales data is transferred in response to the display of the advertisement.

9. A system according to any one of the preceding Claims further including a user profiling component for recording data relating to information requested by a user at the node.

10. A system according to Claim 9, wherein the user profiling component includes apparatus for transferring the recorded data to interested parties.

11. A system according to any one of the preceding Claims, further including a data optimisation component capable of compressing the data for transfer.

12. A system according to any one of the preceding Claims,
wherein the node includes a terminal onboard a vehicle.

13. A system according to any one of the preceding Claims, wherein the data route is implemented using a connection selected from the following set:

- Public Switched Telephone Network;
- Asynchronous Digital Subscriber Line;
- a cable link;
- an electricity provider mains distribution network;
- Coded Orthogonal Frequency Digital Modulation Network;
- broadband mobile communications network.

14. Data route selection apparatus for selecting one or more data routes in a communications network for transferring data between a data store and one or more network nodes, the route selection being dependent upon one or more physical characteristics of the data to be transferred.

15. A method of managing data transfer between a data store and one or more network nodes over a communications network, the method including steps of:

- providing a plurality of data routes capable of transferring the data between the data store and the node, and
- selecting one or more of the data routes to be used for transferring the data, the route selection being dependent upon one or more physical characteristics of the data.

16. A data transmission management system comprising a
data transmission system of the kind in which an Internet Service Provider (ISP) facilitates access by a user to a database via connection through the Internet, and data transmission management apparatus, said data transmission management apparatus being provided to select the path for transmission of requested data from said database to said user, having regard to one or more physical characteristics of said data.

17. A data transmission management system according to Claim 16 wherein said system includes a data optimising component, said data optimising component having the ability to manage the content of data stored on said database such that its physical characteristics are optimised for transmission.

18. A data transmission management system according to Claim 16 or Claim 17 wherein said data is held on a database in the form of a website accessible through the Internet.

19. A data transmission management system according to any one of Claims 16, 17 or 18 wherein said data transmission management system comprises a user access verification and security component to assess the validity of a request to access data stored on a database.

20. A data transmission management system according to any one of Claims 16 to 19 wherein said database is located in close proximity to or integral with said data transmission management device.
21. A data transmission management system according to any one of Claims 16 to 20 wherein said database is located remote from said data transmission management device.

22. A data transmission management system according to any one of Claims 16 to 21 wherein said database comprises more than one database.

23. A data transmission management system according to any one of Claims 16 to 22 wherein said data transmission management device comprises a user interface comprising local storage and playback apparatus.

24. A data transmission management system according to Claim 23 wherein said user interface comprises apparatus to automatically initiate a communications connection to said database when a user requests data not held in said local storage and playback apparatus.

25. A data transmission management system according to any one of Claims 16 to 24 wherein said data transmission management system comprises a satellite link for the transmission of and receiving of data.

26. A data transmission management system according to any one of Claims 16 to 25 wherein said data transmission management system comprises an ADSL link for the transmission of data.

27. A data transmission management system according to any one of Claims 16 to 26 wherein said data transmission management system comprises a cable link of the type provided by a cable service provider for the transmission
of data.

28. A data transmission management system according to any one of Claims 16 to 27 wherein said data transmission management system comprises a mains based data distribution network link for the transmission of data.

29. A data transmission management system substantially as hereinbefore described with reference to the accompanying drawings.