A Method of Selectively Extending Data Processing Functions of a Host Computer System to a Mobile Device

Background and Field of the Invention

This invention relates to a method of selectively extending data processing functions of a host computer system to a mobile electronic device.

Global competition and customers are forcing businesses to work beyond the four walls of their offices and factories. Work has become more of a mobile enterprise. Information technology is moving towards wireless applications and users are increasingly relying on wireless applications to enable them to be mobile.

At the same time, businesses are also transforming how they operate, such as the way in which they manage customers and deliver the final product to the end consumer. Traditionally, a company has been sub-divided into different departments according to the work functions and each of these departments has its own computer system and software application optimised to support how each department does its work. However, business departments are increasingly using integration software to combine or link all the individual software applications together into a single computer system and database so that information can be more easily shared and communicated with each other. It is not uncommon to find companies embarking on projects or replacing antiquated systems with new integrated systems such as Enterprise Resource

Planning (ERP), Material Resource Planning or other advance planning and scheduling systems (APS).

Take, for example, an APS system which automatically plans and manages a business's supply chain, material planning and production to achieve their profit goals. In order to generate an accurate and feasible plan and schedule, such an APS system uses information from a variety of sources, for example forecast, customer orders, product "bill-of-material", cost, inventory, engineering and master production schedule. The APS system receives and processes these inputs and produces plans and schedules in an efficient manner to meet the customer's order while optimising available resources.

The number of data and data processing functions provided by such an integrated system can be large and thus it is a challenge to provide users with the means to access such a large amount of data and data processing functions in an efficient manner.

There have been proposed methods of remote retrieval of information, for example in US patent 5,185,857. In this prior art document, a method and apparatus for rapid search and co-display of graphics and data on a mobile station located in a mobile system is disclosed. The mobile system which is a plane, car or train, contains a central processing unit connected to a plurality of mobile stations which may comprise personal computers or laptop computers. A user then uses one of the mobile stations to query or access his desired data pre-stored in the central processing unit. If the desired data is not available in

the central processing system, then the user's query is transmitted using wireless means to a stationary regional centre and the desired data uploaded to the central processing unit of the mobile system while on the move. However, a disadvantage is that the mobile station must be located on the mobile system which is a plane, car or train. A further disadvantage is that true mobility is not achieved since the user is still required to be "hooked" up to a stationary central processing unit of the mobile system. The mobile stations used are personal computers and laptops which are portable but may not be classified as mobile.

It is an object of the invention to provide a method for selectively extending data processing functions from a host computer system to a mobile device which alleviates at least one of these disadvantages.

Summary of the Invention

In a first aspect of the invention, there is provided a method of selectively extending data processing functions of a host computer system to a mobile device of a user, the host computer system including a software program having a number of components providing a plurality of data processing functions used by the user to process associated data, the method comprising the steps of:

i. analysing a historical record of the user using the plurality of data processing functions to process the data;

ii. selecting a data processing function from the analysis; and

iii. arranging the software component which provides the selected data processing function for download to the mobile device.

Preferably, the method further comprises the step of arranging the associated data processed by the data processing function for download to the mobile device.

Typically, the analysis comprises the step of monitoring which of the said plurality of data processing functions is associated with the user. The analysis may further comprise the step of determining how frequently the user uses each one of the said plurality of data processing functions. Preferably, the method selects the function which is the most frequently used by the user.

Typically, the user uses more than one data processing function at a time and thus the method may determine which other associated function or functions and associated data to transfer to the mobile device. To perform this, the method may determine a degree of association between the selected data processing function and each of the remaining plurality of data processing functions.

Preferably, the degree of association between the selected data processing function and each one of the remaining plurality of data processing functions is derived from a historical record of the user using the selected data processing function in conjunction with a corresponding one of the remaining plurality of data processing functions to process the associated data.

Preferably, a reference numeral is assigned to represent the degree of association between the selected data processing function and each one of the

remaining plurality of data processing functions. Typically, a data processing function having higher degree of association with the selected data processing function has a higher priority compared to a data processing function having a lower degree of association. Therefore, to facilitate the transfer to the mobile device, the selected data processing function and associated data processing functions are typically arranged in order of priority according to their degree of association.

Since it may not possible to download or transfer all the software components and data, an advantage of the described embodiment of the invention is that only the software component providing the data processing function which is associated with the user is downloaded to the mobile device thereby optimising the resources of the mobile device. The transfer may be performed automatically so that the process is transparent to the user. Alternatively, the process may be initiated manually by the user.

A further advantage of the described embodiment is that the invention is compatible with any off-the-shelf mobile devices such as PDAs, Pocket PCs or Palmtops running on operating systems such as PalmOS or WinCe. Such devices may use wireless access means to connect to the host computer system to achieve true mobility.

Brief Description of the Drawings

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

Figure 1 is an example of the various inputs required by an advance planning and scheduling system;

Figure 1a is a pictorial representation of a host computing system communicating with a mobile device to selectively extend data processing functions thereto;

Figure 1b is a block diagram depicting the modular architecture of a PC-APS system;

Figure 2 is a flow diagram illustrating the functions of an Intelligent Selector and Adapter module;

Figure 3 is an example of how the users of a PC version of an advance planning and scheduling system are categorised into different functional groups;

Figure 4 is an example of how the software components of the advance planning and scheduling system of Figure 3 are categorised into different functions;

Figure 5a and 5b are activity frequency profiles for a production planner and production manager, respectively;

Figure 6 illustrates sub-level functions under the Report Generation function of Figure 5b.

Figure 7 is an activity frequency profile for the different sub-level functions under the Report Generation function;

Figure 8 illustrates the degrees of association between the different sub-level functions and the selected function, which is the "Capacity" report;

Figure 9 is a table depicting the arrangement of the selected function "Capacity" report and the rest of the functions in order of priority;

Figure 10 illustrates how the ISA monitors when a user uses the selected function to know what other functions to transfer to the mobile device; and

Figure 11 is a flow diagram illustrating the functions of a mobile Selector and Adapter Module.

Detailed Description of the Preferred Embodiment

A preferred embodiment of the invention will be described with reference to a conventional advance planning and scheduling (APS) system, as an example of an integrated software system.

As explained earlier, in a conventional APS system, data is required from numerous sources and Figure 1 shows an example of the different types of data required when APS is used to plan a production schedule. Each type of data is normally input to the APS system by a respective functional group or user. For example, a customer order would be input by a sales manager, forecast data by a marketing executive and an update on inventory by an inventory controller. All this data is typically stored in a database or a server.

The APS system would typically comprise a software program having a number of software application components installed in a host computer system, which

is used by a user to input, access or modify the data stored in the database. Each software component is being used to provide data processing functions to process the data. This means that when a user makes a specific query, the APS program automatically "pulls" the required pre-defined data from the various sources, collates or processes the data and presents the data for viewing or manipulation by the user. As the data can be quite large in addition to the software components, such a computer system needs to have the necessary processing power. Typically, this is not an issue for computer systems like laptops or personal computers, which are generally not constrained by size or processing power.

With changing times, the users of such a system are increasingly mobile and a need arises to process data at any time and almost anywhere. The described embodiment discloses a method to extend a user's access of the APS system to a normal mobile electronic device such as a palmtop, a personal digital assistant (PDA) or a pocket PC running on operating systems such as PalmOS or WinCE.

Such mobile handheld devices have their limitations. For example, a processor used in such a device is typically a scaled down version of that used in a PC or laptop. In addition, due to space constraints, the mobile device does not have a hard drive and stores the built-in or basic programs in the read-only memory (ROM) whereas application programs and data that users add in are stored in the random-access memory (RAM). Therefore, there is a limit to the amount and type of applications that a mobile device can process locally.

Due to these limitations, it would not be possible to download all the data from a conventional APS system to a mobile electronic device. For the same reason, it may not be possible to install all the necessary APS software components which provide the data processing functions into the mobile device.

To adapt the APS data and software components for download to a mobile device, only the components which provides the desired data processing function and related data in the computer system is transferred or downloaded to the mobile device. To achieve this, the embodiment requires five major components:

- PC Version of APS (PC-APS)

PC-APS is similar to a conventional APS except that the software components forming the APS is written in modular form. Typically, this modularity is achieved through object-oriented programming (OOP) using for example JAVA language. In an OOP system, "objects" are created which communicate with each other to accomplish the functions of the software program. For example, a class CUSTOMER_ORDER can be created to represent a customer's order and which may consist of attributes such as Order-Number, Order_Quantity, and Customer_Name. By grouping a set of classes together, an object or module is thus formed. Essentially, the modular system allows a module or component to be added or removed without affecting the functioning of the program.

Figure 1b shows a block diagram of a typical modular APS system architecture. At a top level, the architecture is divided into three main sections – the data system 10 section, logic section 11 and Graphical User Interface (GUI) section 12. The data system section 10 is essentially a database containing the data required by the PC-APS. Any conventional data structure can be used. The logic section 11 processes the data for presentation by the GUI 12 to a user of the system. With this modular architecture, changes performed in one section, for example the GUI 12, would not affect the other two main sections 10,11.

At the next level, objects or modules are used to provide corresponding data processing functions of the PC-APS. In this example, the GUI 12 and the logic section 11 are made up of seven and eleven modules respectively. Each module as explained earlier is defined by a collection of classes. The user interacts with the PC-APS using a keyboard or pointing device 13 via the GUI 12 to use one or more data processing function(s) provided by the various software components or modules to process the data. For example, to edit the bill-of material of a product, the user would access the "Main Menu" 14, the "Bill-of-Material" 15 and then finally the "Edit Bill-of-Material" 16, which is the module carrying out the actual processing or modification of the data. When new data is added or changes made to existing data, the "Edit Bill-of-Material" module then updates the data system 10 with the changes as indicated by the arrow X. An advantage of such modularity is that when one of the module is removed, the rest of the modules is able to function as per normal. Similarly, when a specific function is required by the mobile device, only the corresponding software

component or module is required to be extended or downloaded to the mobile device.

The PC-APS version is installed in the host computer system and similar to a regular APS program, the PC-APS contains all the necessary production and manufacturing data that APS requires (as shown in Figure 1). The data is stored in the data system 10. The PC-APS also maintains the necessary links between the software components or modules so that all these software components are integrated.

- Intelligent Selector and Adapter (ISA)

This module is part of the PC-APS. This is the module that makes "mobile" APS work and will be the focus of this description. The ISA is the one that monitors how a user interacts with the various modules as shown in Figure 1b.

- Mobile version of APS (M-APS).

This compact version of the PC-APS is installed in the mobile device. It is able to extract the right information to display to the user. To achieve this, OPP is used to achieve a modular architecture similar to the concept of the PC-APS. However, a scaled-down or mobile version of the programming language is preferred for example, JAVA 2 Micro Edition (J2ME) or WinCE eMbedded Visual Tools of Microsoft. In this way, "palm-size" or mobile applications can be developed to work on the mobile device to interact with the PC-APS.

- Mobile Selector and Adapter (MSA)

This module is part of M-APS. This module functions as a communicator between the M-APS and PC-APS for mobile communications. The same programming language used to develop M-APS can similarly be applied here.

- Predefined level of user memory (mobile device):

The user can select the amount of memory to set aside in the mobile device for the purpose of downloading or storing the information generated from the APS.

Figure 1a is a pictorial representation of the invention in which PC-APS, with the ISA, is installed in the host computer 100 and then linked to the rest of the software functions so that ISA can track and learn the user's usage pattern of the different functions of the PC-APS. The M-APS and the MSA are installed in the mobile device 101 so that the desired data and function can be transferred to the mobile device 101 for processing by the user.

Figure 2 is a flow chart illustrating detailed steps of achieving mobile APS using the ISA. In a typical PC-APS system, although users have access to a wide range of data processing services or functions provided by the APS software program, each user may not use all of them. Thus, the ISA analyses the user's past historical records of using the PC-APS system and learns which function and related data is associated with each user.

At step 2.01, the ISA categorises users of the PC-APS system for example by function, which is how a company is typically structured or departmentalised. In this example, the users are categorised into seven categories, namely Finance, Sales, Production, Purchasing/Receiving, Engineering, Human Resources, and Quality, as illustrated in Figure 3. Therefore, each user of the PC-APS system will fall into one of these categories.

At step 2.02, the ISA classifies the PC-APS software application into different functions. The PC-APS application comprises a plurality of software components and each component allows the user to achieve a particular function and Figure 4 shows the different data processing functions provided by the PC-APS system of this example.

The ISA will keep track of how each user group uses each function of the APS system for a period of time and translates such activity into an Activity Frequency Profile (AFP), at steps 2.03 and 2.04 of Figure 2. The ISA will learn what data processing function and thus the associated data each user uses in the PC-APS program and records the frequency of each use. For example, in the case of a production planner and a production manager, the ISA may record different AFPs such as those shown in figure 5a and 5b, respectively. Due to different job functions and responsibilities, the production planner uses different functions of the APS program when compared with the production manager. In this particular case, the production planner uses the "Operations Scheduling" function more than any other function. On the other hand, the production manager makes use of the "Report Generation" function more frequently since

he may be more concerned with the progress or performance data of the production lines. Therefore, the "Report Generation" function would be accessed more frequently in the case of the production manager as compared to the rest of the data processing functions.

With each use, the ISA dynamically learns and updates the AFP and thus, the more frequent the user uses the PC-APS, the more accurate is the analysis by the ISA. The ISA can stop at this level if the amount of information generated using this function is within the memory storage capacity of the mobile device 101. Alternatively, the ISA can narrow down its analysis to the next functional level.

In this case, the amount of data under the "Report Generation" and the "Operations Scheduling" function is still large and it is not possible to fit all this information into the mobile device 101. Thus, the ISA needs to analyse the next level.

Taking the "Report Generation" function as an example, Figure 6 illustrates that under this function, the production manager can further choose from a list of functions such as "Cycle Time" report, "Schedule by Job" report, "Capacity" report and "Machine Utilisation" report etc.

An AFP is similarly plotted as shown in Figure 7, at this sub-level so that the ISA can analyse the data.

In the example shown in Figure 7, the ISA learns that the production manager has been using the "Capacity" report most frequently when compared with the rest of the reports under the "Report Generation" function. Therefore, the ISA concludes that the probability of the production manager using this report again is very high after analysing the AFP at step 2.06 of Figure 2.

Under some circumstances, the production manager may only require this report but normally, the production manager may need to view other related information in conjunction with the "Capacity" report in order to make an informed decision. For example, the production manager may need to view the "Machine Utilisation Report along with the "Capacity Report" to determine which machine is over or under capacity.

Therefore, at step 2.07, the ISA will use the historical records gathered so far to establish how the rest of the functions are associated with the selected report. Based on the frequency of use, the ISA then determines a reference numeral or a "Closeness Index" (CI) for each function to represent how this function has been used by the user with reference to the selected function, which generates the "Capacity" report. The CI may range from, for example 0.0 to 1.0, with 0.0 being totally unrelated and 1.0 being the most related. The CI is derived when the production manager runs the "Capacity" report and at the same time uses the other functions in tandem. Figure 8 illustrates the degree of association between the "Capacity Report" function and the other functions obtained after analysing the production manager's historical record. In other words, the

"closeness" is with reference to the selected report and in this case it is the "Capacity" report.

With reference to Figure 8, according to historical trends, when the production manager runs the "Capacity" report, he has a higher probability to use the function that generates the "Machine Utilisation" report than the function which generates the "Cycle Time" or the "Schedule by Job" report. With the "Capacity" report assigned a CI of "1.0" by the ISA according to the AFP, the ISA assigns a CI of 0.7 to the "Machine Utilisation" report in relation to the "Capacity" report whereas the "Cycle Time" and the "Schedule by Job" reports is assigned a CI of 0.4 and 0.5 respectively.

On the other hand, when the production manager runs the machine utilisation report, ISA learns that he is more likely to require both the "Schedule by Machine" report and the "Capacity" report rather than the "Late Job" report and thus the latter report is assigned a lower CI than the former two reports. From the type of reports, the data processing functions and thus the corresponding software component which provides these functions can be obtained by the ISA.

Using the example of the "Capacity" report, a CI table can be formed as shown in Figure 9, in descending order of the value of CI.

As mentioned earlier, it may not be possible to download all the software components and associated data to a mobile device 101 and thus the ISA will

use the CI to derive a transfer priority as presented in the CI table of Figure 9 to determine which function and data to transfer first to the mobile device 101. Typically, the software component which provides the desired function and data will be downloaded in order of priority with the highest CI downloaded first, as described in steps 2.08 and 2.09 of Figure 2.

When each function and data is downloaded into the mobile electronic device 101, the memory, or the storage space as the case may be, is always checked before and after downloading each function. Once the allocated RAM storage reaches 95% of the allocated memory or storage, any remaining information will not be downloaded. However, the graphics user interface (GUI) is downloaded to provide the user with Input/Output capability to interact with the downloaded modules. These are presented as steps 2.10 to 2.13 of Figure 2.

The user can still access the other information in the CI table which are not downloaded. To do this, the user through the M-APS selects the specific information that he requires and the mobile device 101 sends the request through the Internet to the remote PC-APS in the host computer system 100. The PC-APS then processes the request, and sends the required information back to the mobile electronic device 101 for the user's review.

In addition to the information described above, the ISA may also track and analyse other trends for example the period in which the user requires the information or data. For example, in the case of the production manager, from the past records, as shown in Figure 10, the ISA may learn that he always

views the "Capacity" report of the current month (October 2000) and the projected or forecasted "Capacity" report for next two months (November and December 2000). The ISA may thus establish that, for this particular user, it is not enough just to download the data to generate the "Capacity" report for the current month but also for the next two months. Therefore, the ISA uses what it learns from the historical trends to determine which data should be downloaded and in this case, the ISA determines that all the three months (January, February and March 2001) worth of data is to be downloaded from the database (or data system 10) to the mobile device 101.

The ISA, thus, automatically monitors the user's association with the various data processing functions and selects which are the ones to download to the mobile device 101. With the desired function and data downloaded to the mobile device 101, there is no need to be connected continuously through the Internet to view or modify the data thereby reducing costs.

Having described how the functionality of the ISA in the PC-APS, the description now focuses on the components in the mobile electronic device 101.

For the mobile device 101 to communicate with the PC-APS, the M-APS needs to be installed. However, before installing the M-APS, the M-APS has to be configured using the PC-APS. Essentially, the configuration is focused on the RAM allocation of the mobile device 101 which is performed through the GUI in the PC-APS prior to download of any function or data. The configuration is

similar to that which is performed on a commercially available mobile device 101.

Once the configuration is complete, M-APS (and the MSA) is then installed in the mobile device 101 and synchronised with the PC-APS, in a fashion similar to the way an operating system of a normal mobile device 101 is synchronised to a corresponding software application running on a PC. The synchronisation may be performed by, for example, placing the mobile device 101 on a cradle connected to a serial or USB port of the host computer system 100 containing the PC-APS.

During the synchronisation process, the ISA selects the information to be downloaded into the mobile electronic device 101 based on the configuration performed. The selection would be based on the CI table described earlier and depending on the RAM space, information of a higher priority will be downloaded first.

Upon completion, both the M-APS and the PC-APS are synchronised and the M-APS is ready for use.

The function of the M-APS is mainly supported by the MSA whose function is illustrated in the flow chart of Figure 11. An action performed by the user on the mobile electronic device 101 will be detected by the MSA and the first step at 11.01 is to identify what is the user's action. If the data processing function and associated data are available on the mobile device 101, the MSA proceeds to

execute the function at step 11.03. The function may require further data and similarly the MSA checks to see if the data is available locally. If so, the MSA processes the data and the result displayed for viewing or modification by the user. If the required function at step 11.02 or the requested data at step 11.04, is not available on the mobile device 101, then the MSA establishes connection at step 11.07 to the PC-APS through conventional wireless means.

The PC-APS receives and processes the query and sends the required information or data back to the mobile device 101 for further processing. If any of the data is modified either at the host computer 100 or the mobile device 101, the PC-APS and M-APS will need to be re-synchronised to capture the changes done at either end to ensure both sets of data are updated.

When a user requires mobile access, prior to leaving his work desk, he synchronises his mobile device 101 with the PC-APS in his PC and this allows him to locally process the information he requires on the move as if he is connected to the PC. A further advantage is that the ISA manages the user's requirements in a transparent way such that the user does not need to monitor which are the functions he requires for download into the mobile device 101. This means that there is no need for the user to select or decide which are the functions and data he may require since these will be taken care of by the ISA.

The described embodiment should not be construed as limitative. In the described embodiment, the ISA analysed the "Report Generation" function and its associated functions. However, the ISA may proceed to analyse the next

function in the AFP of the production manager which would be "Capacity Planning" and/or "Production Planning" functions since both functions are used the same number of times by the production manager. This is because, if the mobile device 101 has sufficient memory or storage to receive more function and data, then the ISA can also transfer the next selected function and associated data to the mobile device 101.

In the described embodiment, the data and the software component providing the desired data processing function is downloaded together. This may not be the case since for example, the user only requires the data processing function since he is inputting the data manually. The data received by the M-APS may then be uploaded to the PC-APS when both systems are synchronised.

It should be apparent that the AFPs may change from time to time due to changes in the resources or inputs to the APS. Therefore, the ISA is dynamic to respond to the changes and ensure that the function and data in the mobile device 101 is updated in the same way as the PC-APS. Alternatively, the user may have added new data using the mobile device 101 and this added information must similarly be updated to the PC-APS so that both systems are current. The ISA or MSA performs the updating of data each time the mobile device 101 is synchronised with the host computer system 100.

The synchronisation procedure described uses a cradle connected to serial or USB port of the host computer system 100. However, for true mobility, synchronisation may be performed using wireless means for example, by

attaching a wireless modem to the mobile device 101 and remotely connecting to the host computer system 100 as depicted in Figure 1a.

The user may also download manually predefined function(s) and data that is not in the priority list as shown in steps 2.05 and 2.14 of Figure 2. The PC-APS may provide an option for users to manually select which function and data to download since for certain key manufacturing personnel, it is almost impossible to be able to define what functions and data they need the most. Thus, in such cases manual function/data selection is recommended. The main advantage of this flexibility is that the user can minimise the download requirements.

Having now fully described the invention, it should be apparent to one of ordinary skill in the art that many modifications can be made hereto without departing from the scope as claimed.

CLAIMS

1. A method of selectively extending data processing functions of a host computer system to a mobile device of a user, the host computer system including a software program having a number of components providing a plurality of data processing functions used by the user to process associated data, the method comprising the steps of:

i. analysing a historical record of the user using the plurality of data processing functions to process the data;

ii. selecting a data processing function from the analysis; and

iii. arranging the software component which provides the selected data processing function for download to the mobile device.

2. A method according to claim 1, further comprising the step of arranging the associated data processed by the data processing function for download to the mobile device.

3. A method according to claim 2, wherein the associated data is downloaded to the mobile device when the mobile device is synchronised with the host computer system.

4. A method according to any one of the preceding claims, wherein the said analysis comprises the step of monitoring which of the said plurality of data processing functions is associated with the user.

5. A method according to claim 4, wherein the said analysis further comprises the step of determining how frequently the user uses each one of the said plurality of data processing functions.

6. A method according to claim 5, wherein the said selected data processing function is the one which the user used most frequently.

7. A method according to claim 6, further comprising the step of determining a degree of association between the selected data processing function and each of the other plurality of data processing functions.

8. A method according to claim 7, wherein the degree of association between the selected data processing function and each one of the other plurality of data processing functions is derived from a historical record of the user using the selected data processing function in conjunction with a corresponding one of the other plurality of data processing functions to process said associated data.

9. A method according to claim 8, wherein a reference numeral is assigned to represent the degree of association between the selected data processing function and each one of the other plurality of data processing functions.

10. A method according to claim 9, wherein a data processing function having a higher degree of association with the selected data processing function has a higher priority compared to a data processing function having a lower degree of association.

11. A method according to claim 10, further comprising the step of arranging the selected data processing function and associated data processing functions in order of priority according to their degree of association.

12. A method according to claim 11, wherein the software components providing the selected data processing function and associated data processing function are downloaded to the mobile device in order of priority.

13. A method according to claim 12, further comprising the step of downloading the data associated with the selected data processing functions to the mobile device.

14. A method according to any one of the preceding claims, further comprising the step of monitoring when the user uses the selected data processing function and associated data.

15. A method according to any one of the preceding claims, wherein one of the plurality of data processing functions processes associated data to generate a representation for viewing by the user.

16. A method according to any one of the preceding claims, wherein the mobile device comprises a memory.

17. A method according to claim 16, wherein the software component providing the selected function is downloaded to the memory space of the mobile device.

18. A method according to claim 17, further comprising the step of checking the capacity of the memory space before and after said transfer.

19. A method according to claim 1, wherein the selection step comprises the step of selecting more than one data processing function from the analysis.

20. A method according to any one of the preceding claims, wherein the host computer system is a personal computer or a server.

21. A method according to any one of the preceding claims, wherein the mobile device is a handheld computer.

22. A method according to claim 21, wherein the handheld computer is a PDA, pocket PC or a palmtop.

23. A computer program operable to perform the method according to any one of the preceding claims.