HARDCOPY DEVICE DATA AGGREGATOR AND METHOD

FIELD OF THE INVENTION

The invention relates to printers and other hard copy output engines. More particularly, the invention relates to aggregating data from a diverse collection of hard copy output engines.

BACKGROUND OF THE INVENTION

As computer systems and data communications systems have developed, the number and variety of hard copy output engines employed in a typical office or factory setting has grown. Examples include photo copiers, facsimile machines, printers and devices including more than one of these capabilities. In turn, this has led to a greater number of controlling devices for originating and/or coordinating jobs to be printed by hard copy output engines, such as computers, word processors, spoolers, servers and the like.

As need for these types of hard copy output engines has grown, a number of different manufacturers have developed different hard copy output engines providing different operational characteristics and capabilities. While some aspects of these devices are common to most or all such devices (e.g., standardized paper sizes), other aspects, such as command and signal structures and controller feedback signals, tend to be unique to a specific manufacturer. Additionally, different hard copy output engines may have different paper capacities, capabilities for accepting more or fewer paper sizes, different toner requirements and capacities, as well as different throughput capabilities. Examples of controller feedback signals include indication of malfunctions, such as jams, paper outages, toner low or exhausted and the like. Controller feedback signals may also include indications of hard copy output engine loading, as represented by number and size of currently active and currently pending print jobs.

It is generally helpful to have a mechanism for keeping track of usage of consumable commodities, such as toner and paper, in keeping computer systems functional. For example, it is extremely helpful to ensure that adequate supplies of replacement paper and toner are available when needed. Coordination of orders for supplies can be very helpful to avoid over- or under-stocking of these consumable

commodities, while still achieving the benefits of economies of scale by pooling orders to service multiple hard copy output engines, especially those using at least some of the same consumable commodities. However, in many business settings, the sheer number of diverse hard copy output engines being used in different aspects or divisions of the business may lead to inefficiencies in maintaining adequate supplies of these consumable commodities.

Further, it may be very desirable to allocate costs for printing services to the business unit or client that required the printing to be performed. In an environment where print engines are dynamically allocated, it can be extremely difficult to keep track of what was printed for each business unit or client and to bill back for these incurred expenses as they are accrued.

Additionally, periodic and aperiodic maintenance needs may be addressed differently in different portions of a business, with the possible result that some of the hard copy output engines are not properly maintained, or that service personnel are not notified of a need in a timely fashion. As a result, the network may be operating significantly below expected system capacity.

A further problem that may occur stems from the fact that different hard copy output engines have different print capacities and different print speeds. For example, some types of hard copy output engines are capable of printing large jobs or large numbers of jobs much more rapidly than other types of hard copy output engines. As a result, print jobs may be preferentially routed to these higher capacity/throughput types of hard copy output engines. At the same time, a smaller print job may be delayed, relative to capabilities within the system. This can arise because the volume of printing that is being routed to a particular high capacity hard copy output engine loads the hard copy output engine to a degree that will result in delay for that smaller print job relative to what could be achieved using another, lower capacity hard copy output engine that is not heavily loaded at that time. Alternatively, this may arise because the particular high capacity hard copy output engine is experiencing some form of malfunction.

What is needed is a way to aggregate data describing current service needs, as well as consumable commodity status and hard copy output engine loading status, for a network including multiple and diverse hard copy output engines.

SUMMARY OF THE INVENTION

In accordance with an aspect of the present invention, a method of aggregating data from multiple hard copy output engines includes obtaining first data from a first of the multiple hard copy output engines and obtaining second data from a second of the multiple hard copy output engines. The method also includes transforming the first and second data to first and second normalized data and storing the first and second normalized data in a database.

In accordance with another aspect of the present invention an article of manufacture comprising a computer usable medium, such as RAM, ROM, floppy disk, hard drive, compact disk, tape, etc. having computer readable code embodied therein configured to cause a processor to obtain first data from a first of the multiple hard copy output engines and to obtain second data from a second of the multiple hard copy output engines. The computer readable code is further configured to transform the first and second data to first and second normalized data and to store the first and second normalized data in a database. In accordance with yet another aspect of the present invention, a computer implemented printer control system for aggregating data from multiple hard copy output engines includes memory configured to provide an operating system and operative to store files representing data from multiple hard copy output engines. The computer implemented printer control system also includes processing circuitry. The processing circuitry is configured to obtain first data from a first of the multiple hard copy output engines and to obtain second data from a second of the multiple hard copy output engines. The processing circuitry is also configured to transform the first and second data to first and second normalized data and to store the first and second normalized data in a database.

Other features and advantages of the invention will become apparent to those of ordinary skill in the art upon review of the following detailed description, claims and drawings.

DESCRIPTION OF THE DRAWINGS

Fig. 1 is a simplified block diagram of a computer network including multiple hard copy output engines and a data aggregator, in accordance with an embodiment of the present invention.

Fig. 2 is a simplified block diagram of a computer network including multiple hard copy output engines and a data aggregator, in accordance with an embodiment of the present invention.

Fig. 3 is a simplified block diagram of an embodiment of the data aggregator of Figs. 1 and 2, in accordance with an embodiment of the present invention.

Fig. 4 is a simplified flowchart illustrating a process, in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Fig. 1 is a simplified block diagram of a computer network or system 10 including multiple hard copy output engines 12, such as printers, copiers, mopiers, facsimile machines, multifunction devices etc., and a data aggregator 14, in accordance with an embodiment of the present invention. In one embodiment, the data aggregator 14 includes a data filter 16 and a database 18, and is defined by a computer. In one embodiment, a bus 20 couples the multiple hard copy output engines 12 to the data aggregator 14. In one embodiment, the bus 20 is configured for bidirectional data flow. In one embodiment, the bus 20 allows data to be collected via the data aggregator 14, where the data provides information indicative of the status of consumable commodities, such as paper, toner and the like. In one embodiment, the data aggregator 14 polls the hard copy output engines 12, periodically or aperiodically, to obtain data. In one embodiment, the data may include a total number of pages that have been printed, a breakdown of print options that were employed for the pages that have been printed, such as duplex printing, binding options, stapling, color printing, and identifying applications and/or users from which hard copy requests originated and quantifying usage for each of these applications and/or users. In one embodiment, the hard copy output engines 12 may provide service requests to the data aggregator 14. In one embodiment, the data aggregator 14 may respond to service requests by determining the type of service needed and then notifying appropriate service personnel. For example, a printer jam or a need for toner may be locally serviced by an operator, while malfunction of a hard copy output engine 12 may require specialized service personnel or technicians. In one embodiment, the data aggregator 14 provides service requests via computer,

such as by email. In one embodiment, the data aggregator 14 provides service requests using telephone signaling. This can allow service personnel to be notified prior to the beginning of a business day, for example, when a hard copy output engine 12 becomes disabled outside of normal business hours in response to an electrical disturbance or other phenomenon, and can permit more timely service orders to be placed.

In one embodiment, the data filter 16 collects data from diverse types of hard copy output engines 12. For example, hard copy output engines 12 may include laserjet, ink jet and other types of printers, including high speed printers, and may include other types of hard copy output engines or hard copy output functions, such as facsimile and photocopy devices or capabilities, or postage printing. Hard copy output engines 12 may also include label and envelope printing capabilities and may include postage capabilities. In one embodiment, the data filter 16 may include capabilities for tracking usage data to facilitate internal bill back functions, allowing hard copy output costs to be allocated to specific portions of a corporation or business or to specific client tasks. In one embodiment, the data filter 16 includes a capability for normalizing data from hard copy output engines 12 that provide data in manufacturer-specific formats or model-specific formats.

Some types of data from hard copy output engines 12 do not usually require normalization. For example, total page count data are generally provided from all printer types in SNMP (simple networking management protocol) and in the same format. Accordingly, total page count data do not usually require normalization. However, SNMP data include other MIBs (management information blocks) that also include OIDs (object identification) where specific data types often do not follow industry standards, and a case-by-case analysis is required, not only as to printer manufacturer, but also as to specific model. Accordingly, it is first necessary to determine the make and model of the hard copy output engine 12 in order to meaningfully access some types of data.

For example, when requesting toner level data, a response may be yes or no, or may be a percentage, such as 50%, 75% or 100%, may be a continuous percentage, or may be expressed as a negative number or over a range such as 0-500. These types of data do require normalization in order to be able to be compiled into a meaningful master list.

In other words, the data filter 16 collects diverse data types from the hard copy output engines 12 and converts those data to a common format or language to facilitate data collection and aggregation. For example, the data aggregator 14 may collate total paper usage data from a variety of different hard copy output engines to determine a total paper usage for a predetermined number of hard copy output engines 12. In turn, the total paper usage data may be employed to predict and order the amount of paper that is likely to be needed for the overall network 10.

The data aggregator 14 may also estimate when it is appropriate to order additional consumable commodities, such as toner, paper, envelopes, labels and the like. In one embodiment, the data aggregator 14 communicates with hard copy output engines 12 such as printers using SNMP.

In one embodiment, the data filter 16 translates data from hard copy output engines 12 from these different data formats to a common format and then stores the data in the database 18. In one embodiment, the data filter 16 and database 18 comprise a processor, such as a computer, configured to carry out these tasks.

In one embodiment, the data aggregator 14 includes capabilities for analyzing the loads being provided to the different hard copy output engines 12 and adjusting task delegation amongst the multiple hard copy output engines 12 in response to dynamic variables.

For example, the network 10 may include high speed, high capacity hard copy output engines 12 such as a Mopier 320, available from Hewlett-Packard, along with other hard copy output engines12, such as laserjet printers, also available from Hewlett-Packard. Due to presence of very large print jobs, large numbers of print jobs or due to inoperability of the higher speed hard copy output engines12, it may be temporarily advantageous to route a job to one of the lower speed hard copy output engines12, instead of to the high speed hard copy output engine12, to enable the completed print job to be available in a more timely fashion. The data aggregator 14 may provide this capability and may also provide the requestor of the print job with information indicative of hard copy output engine availability or to describe the hard copy output engine 12 to which the print job has been sent.

Fig. 2 is a simplified block diagram of a computer network or system 30 including multiple hard copy output engines 12 and a data aggregator 14, in accordance with an embodiment of the present invention. The network 30 of Fig. 2 includes a link 32, which may include a firewall 34, to an internal or external central

database 36. The network 30 also may include print clients 40, such as Microsoft 42 and/or Unix 44, as well as others. The network 30 may further include print spoolers 46, such as NT 48, Unix 50 and/or Netware 52, as well as others. The network 30 may also include a plurality of hard copy output engines 12, which may include printers as well as facsimile/copier 60 and track console 62.

The track console 62 normally tracks usage of the facsimile/copier unit 60 and records data pertinent thereto. Track consoles 62 are manufactured by a variety of corporations including Equitrack of Coral Gables, Florida.

In one embodiment, the print clients 40 and the print spoolers 46 are coupled via a link 21 configured for data communication using HTTP (hyper text transfer protocol) to the data filter 16, although other protocols may be used. In one embodiment, individual hard copy output engines 12, such as printers, are also coupled to the data aggregator 14, using a different protocol, such as SNMP, although other protocols may be used.

In general, it is desirable to obtain data directly from a hard copy output engine 12 because this does not require modification of the network software. Alternatively, obtaining data from the spoolers 46 may provide more data than it is possible to obtain directly from the hard copy output engines. For example, it may not be possible to determine which user programs or which users are providing jobs from the hard copy output engines. However, in some circumstances, neither of these options is possible.

For example, a high level executive may generate documents that, for security reasons, are not to be transmitted over the network and for which access to hard copies is to be strictly limited. Therefore, a hard copy output engine 12 may be coupled directly to a parallel port on the user computer. In this scenario, it is necessary to access the specific print client computer 40 in order to obtain hard copy output engine 12 data.

In one embodiment, the link 32 comprises an intranet. In one embodiment, the link 32 accommodates HTTP for data communication. In one embodiment, the central database 36 may be associated with a vendor of hard copy output engines 12, such as Hewlett-Packard, and may permit the vendor to offer a more complete package of services to the user of the hard copy output engines 12. The network 30 may include a broader range of hard copy output engines 12 than the network 10 of

Fig. 1, as exemplified in Fig. 2 by print clients 40, by print spoolers 46 and facsimile and/or copy functions 60.

Providing usage and status information relative to the print clients 40, the print spoolers 46 and the individual hard copy output engines 12 can permit the vendor to tailor system configuration for individual system 30 needs more effectively by matching observed needs for hard copy output engines 12 to capabilities that the vendor is aware of or can develop but that the network 30 of Fig. 2 or the network 10 of Fig. 1 does not presently incorporate.

Fig. 3 is a simplified block diagram of an embodiment of the data aggregator 14 of Figs. 1 and 2, in accordance with an embodiment of the present invention. The embodiment of the data aggregator 14 of Fig. 3 includes a processor or CPU 70 and one or more ports 72 coupled to the processor 70. In one embodiment, one of the ports 72 is coupled to the bus 20 of Figs. 1 and 2 and is configured to support data exchange using SNMP. In one embodiment, one of the ports 72 is coupled to the bus 21 of Fig. 2 and is configured to support data exchange using HTTP.

The embodiment of the data aggregator 14 of Fig. 3 also includes operating memory 77 and nonvolatile memory 79. In one embodiment, operating memory 77 comprises random access memory configured to support an operating system and to store files representing hard copy output engine data. In one embodiment, nonvolatile memory 79 comprises ROM, floppy disk, hard drive, compact disk, tape, etc. having computer readable code embodied therein configured to cause the processor 70 to obtain first data from a first of the multiple hard copy output engines 12 via one of the ports 72 and to obtain second data from a second of the multiple hard copy output engines 12 via one of the ports 72. The computer readable code is further configured to transform the first and second data to first and second normalized data and to store the first and second normalized data in the database 18, as described below in more detail with reference to Fig. 4.

Fig. 4 is a simplified flowchart illustrating a process P1, in accordance with an embodiment of the present invention. The process P1 begins with a step S1.

In the step S1, the process P1 collects data from the ensemble of hard copy output engines 12 of Fig. 1 or Fig. 2. In one embodiment, the hard copy output engines 12 provide data periodically or aperiodically as the hard copy output engines

12 operate. In one embodiment, the data aggregator 14 periodically or aperiodically polls the hard copy output engines 12 for data.

In a step S2, the data filter 16 of Fig. 1 or Fig. 2 transforms the data collected from the ensemble of hard copy output engines 12 to a common data format. In one embodiment, some of the data are collected in an HTTP format, and some of the data are collected in an SNMP format, both of which are translated to normalized data in any common format for further analysis, comparison, processing or transmission.

In a step S3, the normalized data are stored in a database. In one embodiment, the data are stored in the database 18 in the data aggregator 14 of Fig. 1 or Fig. 2. In one embodiment, the normalized data are transmitted to the central database 36 of Fig. 2 and are stored therein. In one embodiment, the normalized data are stored and/or transmitted using HTTP.

A great deal of post-storage processing may be performed on the data that were stored in the step S3. Several examples are discussed below with reference to steps S4 through S9.

In one embodiment, in a query task S4, the process P1 determines from the normalized data if service is required for any of the ensemble of hard copy output engines 12.

In response to the query task S4 determining that service is required, the type of service that is required is determined and appropriate service personnel are notified in a step S5.

For example, if all that is required is to clear a printer jam or to change a toner cartridge, suitable error messages may be sent to local operators or service personnel, while malfunction of a hard copy output engine 12 may require service personnel or technicians to be notified by email or telephone. In one embodiment, the supplier of at least some of the hard copy output engines 12 carries out the steps S4 and S5 and notifies appropriate personnel.

In one embodiment, in a query task S6, the process P1 determines from the normalized data if consumable commodities, such as paper or toner cartridges, need to be ordered.

In response to the query task S6 determining that consumable commodities need to be ordered, the needs for these are combined and consumable commodities are ordered in a step S7. In one embodiment, the consumable commodities are

ordered electronically in the step S7, for example, an email is sent to a commodity supplier to order the needed consumable commodities.

In one embodiment, a hard copy order is generated and mailed to a commodity supplier in the step S7. In one embodiment, a signal is sent via a telephone network in the step S7, such as a digital signal or facsimile signal, to order commodities from the commodity supplier.

In one embodiment, a query task S8 determines what hard copy output needs were met and provides a breakdown that identifies specific clients or business units that provided hard copy output requests.

In response to the query task S8 determining the hard copy output needs that were met for specific clients or business units, a step S9 bills back to the specific clients or business units the costs for the hard copy output services associated with that client or business unit. This allows printing costs for different types of print jobs to be efficiently collected from a variety of different hard copy output engines 12 into a single record or any other desired format and to be made available to the specific client or business unit that incurred these costs.

It will be appreciated that the query task S6 (and step S7) may precede the query task S4 (and step S5), and similarly that the query task S8 (and step S9) may precede either the query task S4 or S6. The process P1 ends after the specific clients or business units are billed back for services in the step S9.

The aggregated data from the central database 36 may be accessed in a variety of ways. These data may be provided upon request, automatically via the link 32 or by accessing a web site created to form a client portal for this purpose. Additionally, because the central database 36 is able to include information regarding the hard copy output engines 12 and the printer drivers that the user has in the network 30, printer driver update availability may be provided along with the aggregated data. In turn, this can allow the software in the network 30 to be updated more readily, for example, by downloading the updated drivers from the web site.

The protection sought is not to be limited to the disclosed embodiments, which are given by way of example only, but instead is to be limited only by the scope of the appended claims.

CLAIMS

What is claimed is:

1. A method of aggregating data from multiple hard copy output engines (12) comprising:

obtaining (S1) first data from a first of the multiple hard copy output engines (12);

obtaining (S1) second data from a second of the multiple hard copy output engines (12);

transforming (S2) the first and second data to first and second normalized data; and

storing (S3) the first and second normalized data in a database (18, 36).

2. The method of claim 1, wherein obtaining (S1) first data comprises obtaining (S1) first data describing loading of the first hard copy output engine (12), obtaining (S1) second data comprises obtaining (S1) second data describing loading of the second hard copy output engine (12) and wherein the method further comprises directing requests for additional print jobs to a one of the multiple hard copy output engines (12) that is selected in response to the first and second normalized data.

3. The method of claim 1, wherein obtaining (S1) first data includes obtaining (S1) first data describing an operative status of the first hard copy output engine (12), the method further comprising:

determining (S4) when the first hard copy output engine (12) is in need of service;

notifying (S5) a service provider that the first hard copy output engine (12) is in need of service; and

notifying (S5) the service provider of a type of service required for the first hard copy output engine (12).

4. The method of claim 1, further comprising transmitting (S3) normalized data from the database (18) to a central database (36).

5. The method of claim 1, further comprising transmitting (S3) normalized data from the database (18) to a central database (36) via an intranet (32).

6. The method of claim 1, wherein obtaining (S1) first data comprises obtaining (S1) first data from a hard copy output engine (12) chosen from a group consisting of: facsimile machines (60), photocopiers (60) and printers.

7. The method of claim 1, further comprising ordering (S7) consumable commodities in response to analysis (S6) of the stored normalized data.

8. An article of manufacture comprising a computer usable medium having computer readable code embodied therein to cause a processor to:

obtain (S1) first data from a first of the multiple hard copy output engines (12);

obtain (S1) second data from a second of the multiple hard copy output engines (12);

transform (S2) the first and second data to first and second normalized data; and

store (S3) the first and second normalized data in a database (18, 36).

9. The article of manufacture of claim 8, wherein:

the computer readable program code configured to obtain (S1) first data comprises computer readable program code configured to obtain (S1) first data describing loading of the first hard copy output engine (12);

the computer readable program code configured to obtain (S1) second data comprises computer readable program code configured to obtain (S1) second data describing loading of the second hard copy output engine (12); and

the computer readable program code is further configured to direct requests for additional print jobs to a one of the multiple hard copy output engines (12) that is selected in response to the first and second normalized data.

10. The article of manufacture of claim 8, wherein the computer readable program code configured to obtain (S1) first data includes computer readable

program code configured to obtain (S1) first data describing an operative status of the first hard copy output engine (12), the computer readable program code being further configured to:

determine (S4) when the first hard copy output engine (12) is in need of service;

notify (S5) a service provider that the first hard copy output engine (12) is in need of service; and

notify (S5) the service provider of a type of service required for the first hard copy output engine (12).