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Printing to Network LaserWriter: The Process

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TOPIC ----------

What is the process taking place when a user prints to an AppleShare Print Server (from the user to the server and from the server to the LaserWriter)?

Where does the QuickDraw-to-PostScript process taking place?

DISCUSSION ----------

I will be addressing your question as a single process. The process you are asking for is the printing of graphics and text (the same thing on the Macintosh) to a PostScript printer using a network and print spooler, like the AppleShare Print Server.

The first step takes place when the user selects the Print option provided from within an application. The application has been programmed by its developer to print its documents to a PostScript printer. It provides this by using the Macintosh Print Manager Routines, which are a standard part of the Macintosh Operating System.

The application uses QuickDraw and Font Manager calls to draw to a GrafPort (display data structure). These calls create QuickDraw opcodes, which are stored in the GrafPort and converted to actual pixel information through QuickDraw low-level routines. Typically, the GrafPort controls an image displayed on a screen. The Print Manager uses a special form of GrafPort called the TPPrPort.

The TPPrPort is essentially a GrafPort that includes special data structures and drawing routines for a print driver, like the Apple LaserWriter PostScript driver. This enables QuickDraw to draw to a printer rather than a display device. QuickDraw high-level draw commands generated from the application now pass data to the selected driver. This is handled by the new low-level drawing routines, which route the data to a print driver and is generally transparent

to the application programmer and the high-level QuickDraw commands being used to draw to the TPPrPort.

The application, having been directed by the user to print a document, redraws the selected document to a TPPrPort. The Print Manager, once directed to print the document, activates the currently-selected print driver. The print driver, previously selected through the Chooser, has its name stored in Parameter RAM and an access identifier stored in the Device Manager's unit table. The Print Manager uses the Device Manager to load the chosen print driver.

After the print driver loading process is completed, the driver tries to use the AppleTalk Manager to contact the LaserWriter. In the case of an AppleShare Print Server, where the desired LaserWriter has been "captured", the print server answers back to the driver that it is ready.

When the Macintosh Print Server bypass option is selected, the real LaserWriter does not appear as an option in the Chooser because during the capture phase of the print server, the LaserWriter device type has been changed to answer only to a special name. Essentially, the LaserWriter doesn't know it's a LaserWriter and calls itself something else. When searching for LaserWriters, the Chooser displays the names of network entities that answer back, when it searches for network devices of the type "LaserWriter." A print server with a captured LaserWriter answers the Chooser's AppleTalk lookup with the name of the captured LaserWriter.

The print driver within the user's Macintosh receives an answer from the print server that it is the selected LaserWriter and is ready to receive a print job. The print driver passes this information to the Print Manager, which passes on this information as a "No Error" to the application. After receiving a "No Error", the application creates the document for printing. The application draws each page to the printer document using QuickDraw commands.

The print driver receives each of the pages as QuickDraw-generated opcodes and converts these opcodes to PostScript language commands and passes the data to the driver. The driver passes the information through its Printer Access Protocol routines to the AppleTalk Manager, which, in turn, delivers the data across whatever physical AppleTalk network is connected to the user's Macintosh to the print server.

The print server receives the PostScript commands through the AppleTalk Manager and the governing Printer Access Protocols. The PostScript commands are stored to disk, and the document is placed in a print queue. The print driver in the System Folder of the print server is accessed through the Print Manager routines on the print server.

The print server acts as an application that directly passes the PostScript code received from the user's Macintosh to the driver. The driver contacts the "real" LaserWriter and sends the PostScript data through the AppleTalk Manager, adding a set of its own Special PostScript routines prior to printing the job. These special routines let the print server keep track of the document name, number of pages, and any errors generated by the LaserWriter.

This is an overview of the process involved when printing to a print server and

captured LaserWriter. Of course, the AppleTalk phase itself can be greatly complicated when routers are involved, and many parts of the process have been simplified here.

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