Resource Sharing: A Decentralized Processing Solution for Un-tapped Office Productivity

Tracy Crowe/Ann Pirrone
Hewlett-Packard Co.
Office Systems Division
8000 Foothills Blvd.
Roseville, CA 95678

I. OVERVIEW

Traditionally, one of the main factors affecting the productivity of an office workgroup is the availability of resources. The phrase 'availability of resources' can include anything from the number of people in the workgroup, to the number of letter-quality printers. For this paper, the term 'resources' refers to the parts that make up the office computing environment. Examples of these are: personal computers (PCs), host computers, terminals, datacommunications, disc drives, tape drives, software (program and data files), printers, plotters, and systems operations personnel. Any office having these resources has taken a major step to improve their productivity. This paper addresses these offices, and should bring to light additional steps that can be taken to further increase productivity through the sharing of resources.

II. THREE VARIETIES OF OFFICE COMPUTING ENVIRONMENTS

Resource sharing is not a new idea. It has been around for years. Many computer users have used it, although not always to their knowledge. Before discussing how a system's resources are shared, let's examine how they are connected to form the system. Here are three schemes for setting up office workgroups.

1. The first figure shows the most traditional workgroup setup.

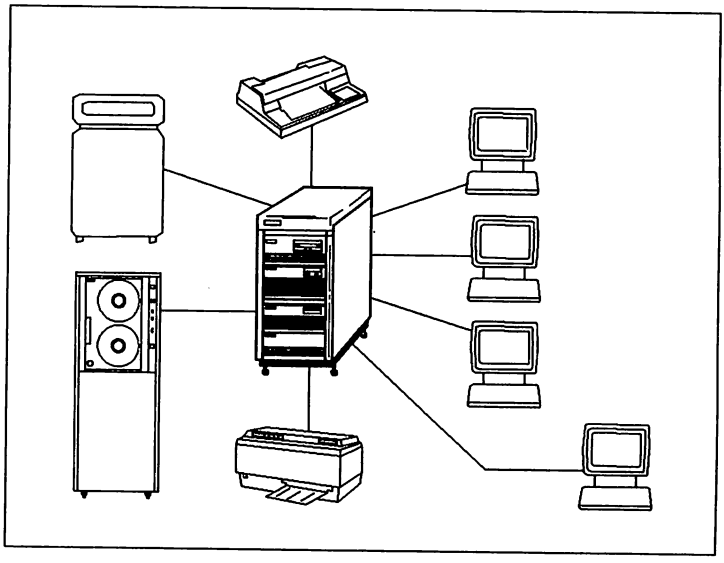

Figure 1. Terminal-Based Workgroup

This is a collection of terminals (or PCs with terminal emulation software) and peripherals connected to a host computer in a central location. Typically, the mainframe is in a special room, called a data center. Specific people, the Management Information Systems (MIS) group, are responsible for its control and operation. In this environment, users are only given access to and control over information they require. This scenario highlights a very centralized solution to a workgroup's computing needs. It allows for easy control and management of the system. Another advantage of this type of workgroup configuration is the accessibility to a very wide variety of peripherals and applications.

The problems with this type of solution are that bottlenecks can occur either with the system itself or the MIS team. For example, the performance and throughput of the system is inversely proportional to the number of users logged on and the type of applications they are running. Another example is that anytime a special operation must be done (e.g., restoration of an old file from a tape archive), the user must go through the operations staff. Occasional special requests are tolerable and not too costly to productivity. But, if they are frequent and there is only one operator to handle them, they can get be very time consuming and resource intensive. This potential for bottlenecks that eat up resources constitute one of the key disadvantages of this configuration.

2. The next figure illustrates a more decentralized workgroup setup.

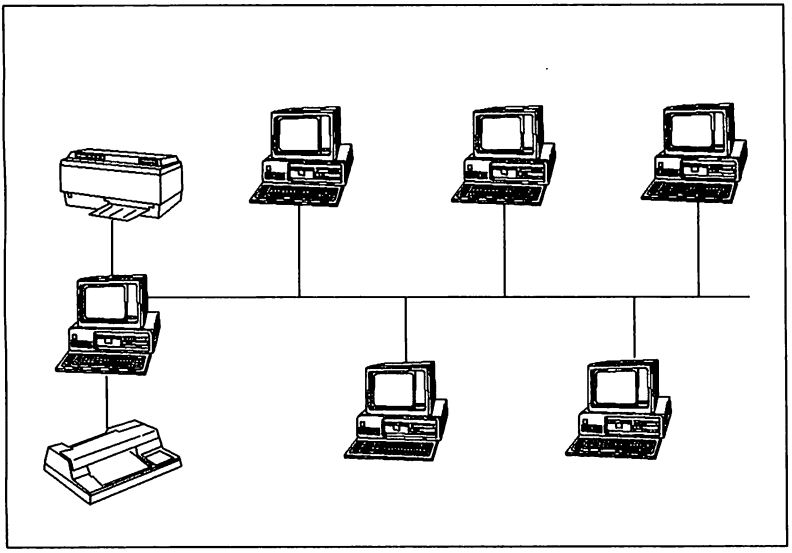

Figure 2. PC LAN-Based Workgroup

This configuration is a group of PCs connected via a Local Area Network (LAN) with one of the PCs dedicated as the server on the network. Each PC has access not only to its own software and peripherals, but also those configured on the server PC. Unless otherwise defined, each user is responsible for his/her own PC. A very decentralized solution like this alleviates many of the bottlenecks experienced in a centralized workgroup computing environment. In smaller companies or companies with limited data processing needs, a PC network is fine. As the company's processing needs grow, so does the size and number of PC networks. As these networks expand, it becomes more and more difficult for an MIS group to ensure the compatibility, integrity, and security of the software on them. The MIS group must then assume the roll of "LAN monitors" to verify that these points are not overlooked or forgotten. The key advantages of this configuration are performance and independence. Since most of the resources are localized to each PC, bottlenecks do not often occur. Disadvantages are the loss of control and the limited variety of peripherals that are supported on PCs.

3. This figure shows a combination of the first two configurations.

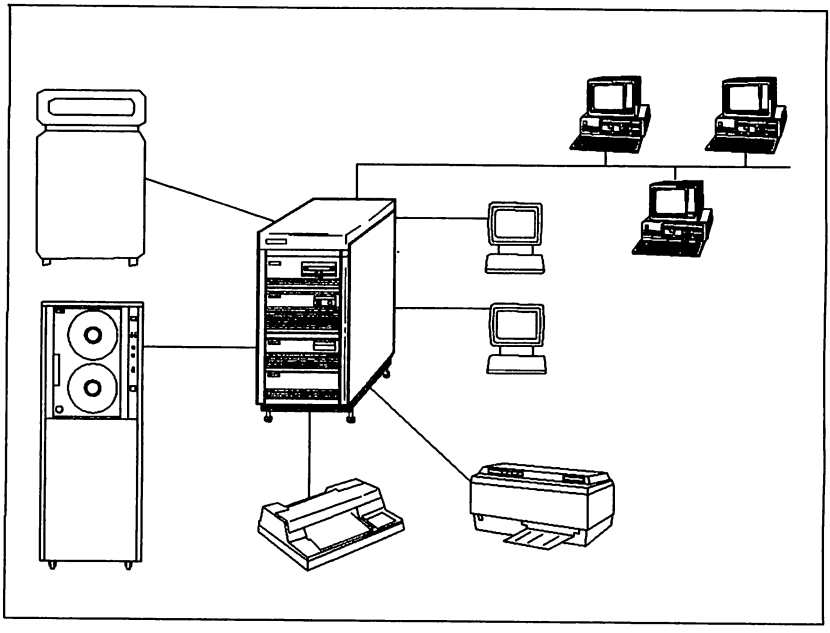

Figure 3. LAN-Based Workgroup with an HP 3000 server.

In this setup, both worlds are combined for maximum benefit. Most of the individual user's processing is still done locally on the PCs. The results can then be output via the host. (Note, 'output' refers to anything from sending a file to a printer to distributing it via electronic mail.) Be aware that the benefits realized are a function of the compatibility of the host-based server software and the PC-based server software. If the two co-exist well, the users can take advantage of both servers. This is the ideal solution in most cases. It takes advantages of the localized processing power of the PC, the connectability and processing power of the host.

III. METHODS FOR SHARING RESOURCES

Having reviewed some of the different configurations for an office computing environment, let's look at some of the methods for sharing resources. There are two primary areas where computing resources are shared. They are discs/files and printers. In either case, there are instances where it makes more sense to have several users share the same resource. One example is a very

large data file containing a list of employee names and their extensions, where everyone needs to have easy on-line access to it. Having several copies of a file like this would be a nightmare to try to keep all copies up to date. Hence, there is a need for a single copy on a disc where everyone can access it and make changes as necessary. A different example is a marketing department that only has one letter-quality printer that also prints graphics. Everyone has a need to occasionally print to it, but this is hardly justification to buy several more. If the printer is centrally located and everyone can send their output to it, the problem is solved.

DISC/FILE SHARING

For a closer look at disc/file sharing, refer to Figure 4. Figure 4 illustrates two of the less automated methods for disc/file sharing.

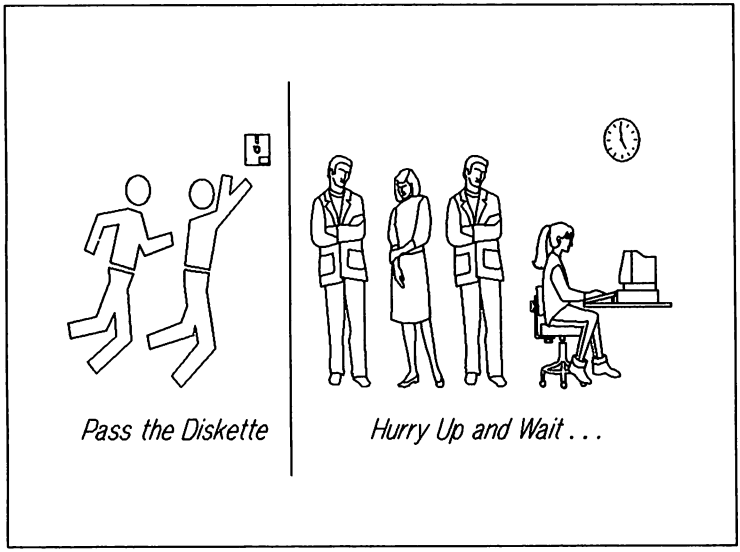

Figure 4. Manual Disc/File Sharing

In one instance, the file is stored on flexible disc and the disc is passed from user to user. In the other, the file is kept on a single PC and everyone goes to that PC to access it. In both of these cases, there are several opportunities for disaster to strike. One example of a disaster would be if the flexible disc got lost or damaged. Although Figure 4 shows two of the simpler forms of file sharing, Figure 5 illustrates three of the electronic techniques for disc/file sharing.

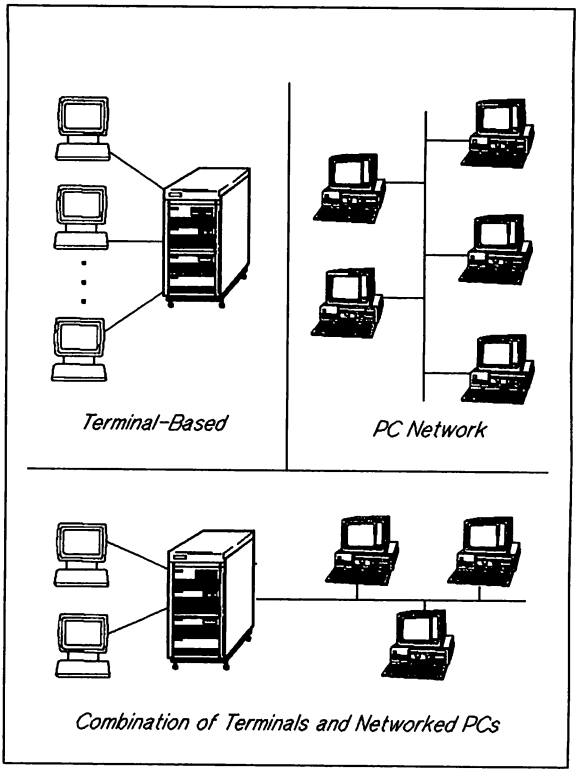

Figure 5. Electronic Sharing of Discs/Files

In the terminal/host based solution, files that several users may need are stored in a public group and account on the system. Depending on the level of security installed, users can display, copy or edit the files.

On the PC network, the file is kept on the server and then anyone on the network can access it. A drawback to this scenario is the physical limit on the amount of disc space that is available on PCs.

In the third exaple, the files are stored on the host system. Depending on the type of software that the server is running, these files may be in DOS format or that of the host's file system.

Another area of concern that is not directly linked to the sharing of discs/files is the protection and recoverability of data. This refers to the backing up and restoring of a user's PC disc. As for independent workstations or even those on a PC-based LAN, there is no simple solution to this problem. The two basic alternatives are to backup a PC's hard disc to flexible discs, or if available, to a tape drive. The latter solution usually requires additional hardware and drivers for the

PC to be able to communicate with the tape drive. This can be an expensive alternative to using flexible discs. On the other hand, the thought of backing up a 40 MB hard disc to a box of 360 KB flexible discs is also not very appealing.

PRINTER SHARING

Over the years several different methods have been developed for shared printing. In Figure 6, the two of the more basic techniques are shown.

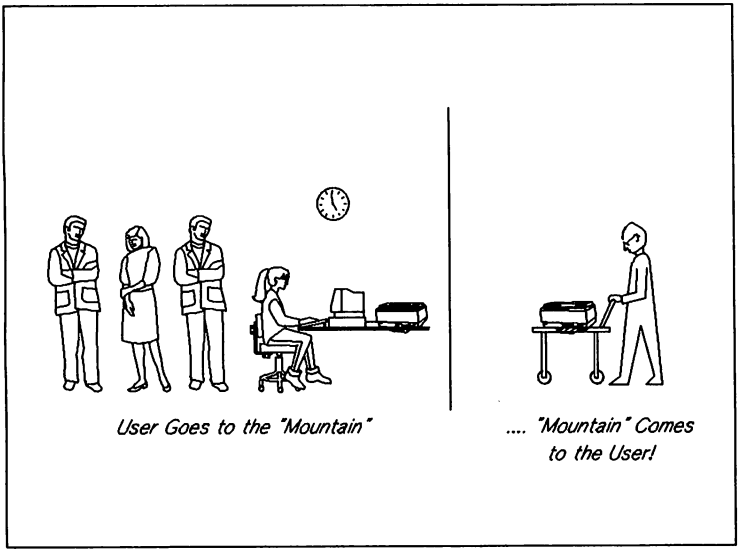

Figure 6. Early Shared Printing

In the first example, there is one printer attached to a PC. The users must bring their files to the printing workstation to get hardcopies. Although this is very cost effective from the standpoints of hardware and initial cost to implement, this can be quite slow and result in a queue of impatient users. This in turn translates into wasted resources and hence, a reduction in the return on investment over the long run. The other method involves rolling the printer from one workstation to the next and connecting it to the PC. Both alternatives can cause bottlenecks which means a loss of productivity.

Another print sharing alternative is shown in Figure 7.

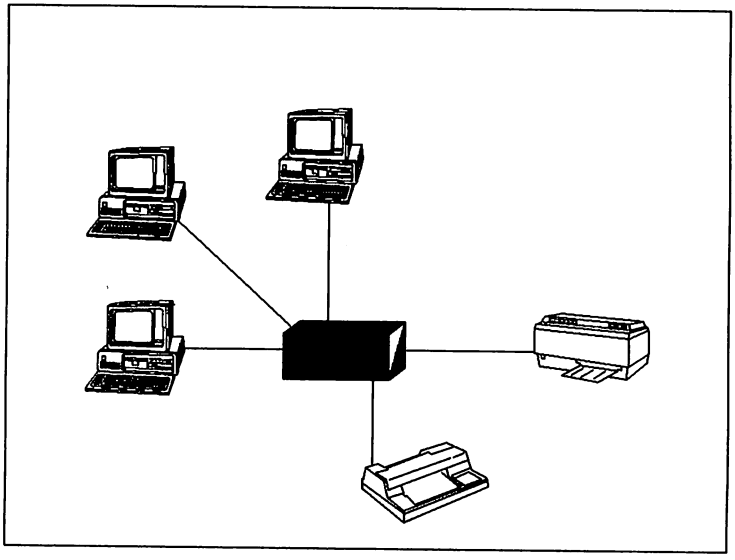

Figure 7. "Black box"/Switch Box

In this configuration, multiple workstations are connected to a printer via either a switch box or a "black box." Using a switch box, the users must manually switch the connection between the workstations and the printer. A "black box" is a more sophisticated switch box in that the switching is done electronically. In some configurations, the "black box" also allows spooling of output files. This feature is not available with switch boxes. Both are low cost solutions with the switch box being the least expensive.

Another approach to shared printing is illustrated in Figure 8.

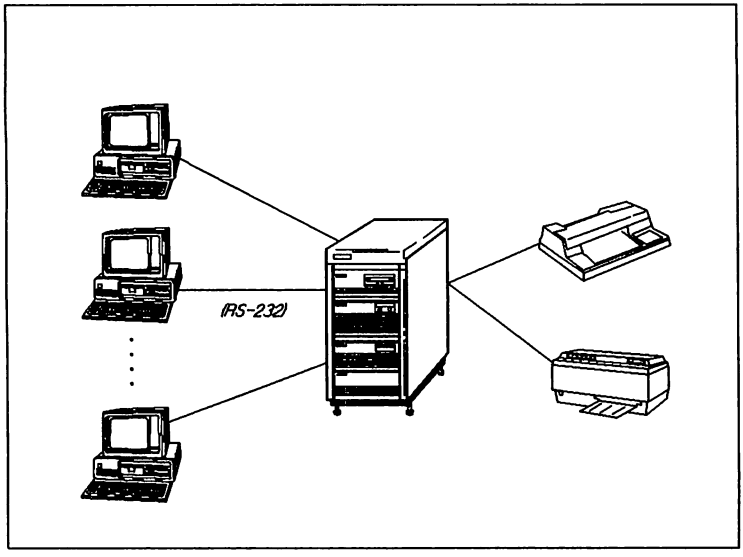

Figure 8. AdvancePrint

This scenario uses software that runs on the host system and the PC. The software provides a low cost interface for shared printing over a serial/RS-232 connection. Print files from the PC are transparently sent to the host system for output on one of the host printers. Using this software allows the PC user to send their output to the host taking advantage of the host's print spooling capability. Once their output is transferred to the spooler, their workstation is freed up for other tasks.

If a user does not have a serial connection to the host computer, but is connected to a PC server via a LAN, they can use the printers that are configured on the server. This also provides them with spooling, so their workstation is not chained to their printout. One limitation in this environment is the limited variety of printers supported on PCs.

IV. ONE EXAMPLE OF A POSSIBLE SOLUTION

For this example, let's look at the situation where the workgroup needs the performance and independence of a PC network but does not want to sacrifice the flexibility and control of a host-based solution. Referring to the second section of this paper, where three different office system configurations were given, the best solution for these users appears to be the combination of a PC network with a mainframe host as a server. Remember, the degree to which the combination is the best solution is dependent on the compatibility of the host-based networking software and the PC-based networking software. If the two co-exist well, then the

users truly realize the maximum benefit of both environments. An example of this type of package for an HP 3000 host system is a product called Resource Sharing.

Resource Sharing runs on the HP 3000 and is designed to co-exist with PC servers on a network. It adheres to the AdvanceNet and MS-NET specifications. This means that an HP 3000 server running Resource Sharing can be added to an exising PC-based network without any problems. Figure 9 illustrates this environment.

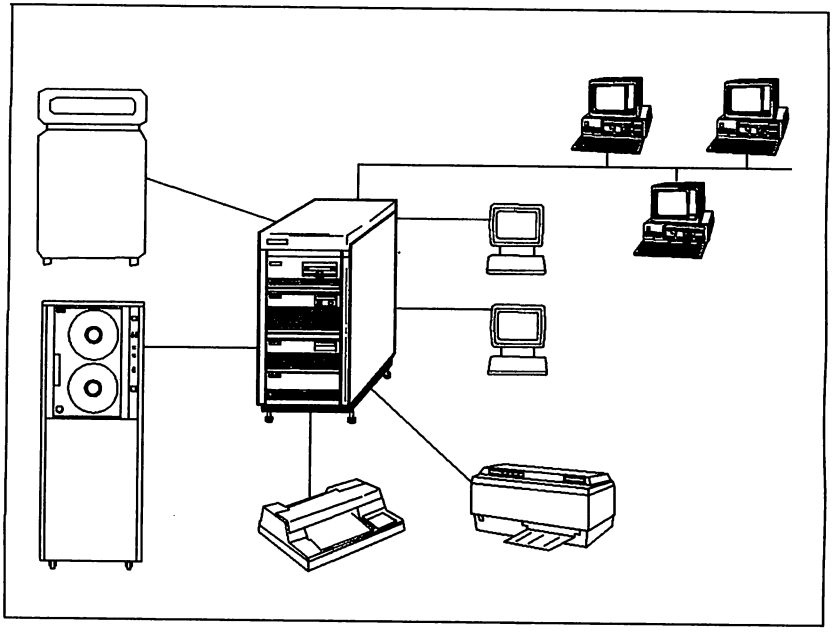

Figure 9. Network of PCs with an HP 3000 Server

In this configuration, Resource Sharing allows terminals to continue to function as though it was a stand-alone system. PC users can connect to the HP 3000 and log on as terminals for running HP 3000 applications. But, more realistically, the PC user can do all processing on the PC and if necessary, can easily move the results to the host. Once on the host, the information can be distributed by any number of means, including electronic mail.

From a PC workstation, a user can create a shared disc on the host. A shared disc appears to DOS like any other PC disc, except that it is created on an HP 3000 disc drive. In brief, it overlays the MPE file structure with the DOS structure. This results in one shared disc being created in one MPE group. As a result of this, the limit on the number of files that can be stored in a shared disc is a function of the maximum number of files that can be stored in an MPE group. On the same note, the maximum size a shared disc can be is determined by the disc space allocation for that

MPE group. As long as a user can log on to a group they can create a shared disc in that group. The user can also allow other users to access their shared disc, making file sharing much more convenient. The user can also put a password on the shared disc preventing unauthorized access to it. Connections to shared discs can be done either dynamically or when the user reboots their PC as part of the network software loading process. There is also a utility that allows the user to backup and recover shared disc files. This is an added safeguard, since the shared disc files are backed up as part of a normal MPE SYSDUMP/STORE operation. This utility also has the added flexibility to recover shared disc files from standard MPE SYSDUMP/STORE format backup tapes.

Aside from the utility to backup and recover shared disc files, a PC user can also backup and recover their local hard discs to/from a tape drive on the HP 3000. The PC BACKUP utility also allows the system manager to schedule backups, so as to not create bottlenecks in the input/output subsystem of the HP 3000.

Another feature of Resource Sharing is shared printing. A user can redirect the output from their PC to almost any printer on the HP 3000 (as long as it's configured in Resource Sharing). This includes printing text and graphics. It is also possible to plot from a PC to a spooled plotter on the host. Once in the MPE spooler, the output can be manipulated in the same way as any other HP 3000 spooler file. In Resource Sharing, the system manager can customize the printer configuration to maximize the effeciency of printing. This significantly helps to eliminate bottlenecks when printing documents.

Resource Sharing also has a utility that allows the user to do file conversions from DOS files on a shared disc to MPE files. This allows the users much greater flexibility in manipulating data if a PC is not always available. In other words, a user could be working on a file in the office on their PC and store it on one of their shared discs. Then later that evening while at home, they could dial in over a modem with a terminal, convert the file to MPE format and edit it using an MPE editor. Then, once they are complete, they could convert the file back again to DOS format.

V. CONCLUSION

In closing, it was not and is not the intention of this paper to intentionally convince you that one configuration is better than another. Hopefully, you are now aware that there are still steps that you can take to optimize the productivity of your system and its users. As with just about everything else, balance is necessary in designing, implementing, and/or upgrading a computer workgroup. Achieving good balance between a centralized and decentralized solution will afford you good control and maintainability without significantly sacrificing performance. The purpose of this paper is to create an awareness of some of the opportunities available to you to increase productivity through resource sharing!