

## **Pitfalls of Offloading Applications to PCs**

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And on the eighth day, Hewlett-Packard said "Let there be no graphics, spreadsheets or word processing to slow down business transaction processing on the HP3000" and lo, the users heard these words and they believed.

Consider the HP3000. For years, it has served as the central work horse in numerous companies. The general-purpose machine embraced every kind of application people could dream of. It has served well as a file repository, a point-of-sale processor, information storage and retrieval, sales tracking, business forecasting and even process control and monitoring.

It's processed transactions, statistics, documents, results, budgets, financial statements, labels, graphs and reports. It contains one of the most efficient, reliable and stable arithmetic logic units available in the market. It's output capacity outstrips all but the fastest impact and laser printers. It facilitates central control of data in a dynamic business environment.

For many businesses, whether for profit or non-profit, it was (and still is) the stepping-stone into the future of computing. It obeyed their every wish while serving as an all-purpose business computer, meeting all comers with enthusiasm. HP even pushed their own word processing, graphics and spreadsheet software for years (must have been to sell more hardware), saying that this was the best solution. And now, they tell us we can't do that any more. These applications will not be supported starting with the new spectrum line.

We must remove all vestiges of centralized office automation and relegate any perceived CPU intensive applications to their younger brother PC's. Thus ends an era of one vendor, one machine, total solution.

This 'HP way' of things is being touted by many influential users and a plethora of papers, presentations, seminars and propaganda have surfaced promoting it. Before moving all these "CPU intensive" applications off the HP3000, consideration should be given to the long-term effects. The philosophies involved require carefully planned and thought out decisions.

This paper exposes the flaws inherent in this 'HP way' of one-sided thinking by pointing out the issues of centralized versus offloaded applications. Further, it discusses the different aspects of permanently moving all of these applications to PC's. Finally, some of the myths involving 'CPU intensive' applications will be dispelled and guidelines for determining which applications to keep and which ones to offload will be included.

## **The HP Way of Things**

As an immediate response to the 'HP Way' of thinking, I must say that this had to be a regression from their earlier stance and that they are ignoring a certain segment of their current users. This blanket approach is an insensitive and ignorant way to support these users. I'm talking about those companies that depend solely on the HP3000 to meet all their Data Processing needs.

On the HP3000, it is the activities, not the applications, that need to be monitored, quantified and justified on an individual user usage basis. This is the key to determining which activities need to be offloaded to PCs.

If all user activity is individually oriented and not vital to business operations, all this activity would probably be best offloaded to the single user oriented PCs. Upon close examination, however, most companies will find that much of the activity is vital to business operations. If this activity gets offloaded, loss of control over that information occurs.

You may ask why I so vehemently state these things when it is so painfully obvious that the future of computing will include PCs and distributed processing. It is because of the sheer simplicity of the concept that the HP3000 can be all things to a small or even medium size company. Additionally, not all companies believe that they must remain 'state-of-the-art' by installing PCs and implementing distributed processing.

For purposes of discussion, I will be limiting this talk to HP3000s and IBM PC, XT, AT and compatibles. The PC operating system mentioned is PC-DOS/MS-DOS version 2.0 and up without any special add-on hardware or software. The reason this paper is limited to these machines and operating systems is because these are the predominant PCs already installed in most HP3000 shops.

I am acutely aware of the multi-tasking capabilities of Windows and Wave-Mate, however, these packages are not yet

in wide-spread use. The same is true for the PS-2 and compatible machines, OS-2 (not available yet), Unix operating systems and high-powered workstations. These are rarely found in the same environment as the HP3000.

Here, I will show you some reasons not to offload applications:

## **10 Reasons Not to Offload Applications**

### **1. Wholesale Output Power**

The HP3000 has more output power than any PC sold today. This output can be with a large variety of output devices including plotters, printers of all types, punch cards (what?), magnetic tape, serial communications, display terminals and many others. This power, coupled with spooling, allow tremendous output in relatively short time frames.

Because of the limited output of a PC, the user is often faced with the challenge of finding a way to print a report or plot a graph. Some software packages are now emerging that allow spooling to the HP3000 and networked PC's usually have a shared output device. This limitation, however, can cause delays and frustration among users.

### **2. Production Power**

Many companies close their books monthly to allow analysis of financial status on a more timely basis. The vast quantities of numbers to be crunched can easily overwhelm a PC. The HP3000, however, is able to perform complete jobs of number crunching, reporting and graph plotting. These outputs are generally reviewed to aid in decision making for the business.

This is known as Production Graphics and Production Spreading. These jobs would take days to complete on a PC, whereas, the HP3000 handles them in hours. Control of the process is completely taken care of on the HP3000, whereas, if split over many PC's could cause confusion and possible loss of data, results or precision.

### **3. Application Droning**

The HP3000, after fifteen years, has developed quite a third party hardware sales sector. As a result of this, older model HP3000s are available for less than ever before. Consider a dedicated HP3000 for a single application that is causing bottlenecks. This could free up considerable computing, input

and output power for your primary machine. This type of distribution of applications is known as droning.

As the company grows, more drones may be implemented to distribute the load. This can even include more than one application. These HP3000's may also be networked with data and programs residing on different machines. With this scenario, the company could grow infinitely without ever needing mainframes.

## 5. End-user Communications

As more people use the computer, communications becomes more and more important. The electronic mail systems on the minis are excellent communications devices for those who used to play telephone tag all the time. The messages may even be forwarded in a network of HP3000s.

The management and administration may wish to use these mail systems to disseminate information, company policies, memos, etc. In any case, the quality of communications is higher with electronic mail than without it. Better communications means better productivity.

The ease at which data may be passed to other users is also a factor in productivity. On the HP3000, this is a simple and straightforward task. Even in a network of HP3000s, this is still relatively simple. If this is tried between the HP3000 and the PC it becomes a trying task at best. With terminal emulation software, it is easier, but the difficulty remains in assuring correct file sizes, data types, and special characters.

## 6. Data and File Differences

Binary data located on the PCs and the HP3000s are not the same. Care must be taken in transferring this data and loading it into the new PC application. At times, the data must also be re-organized and possibly require some decisions concerning 'excess' data from the HP3000 applications.

In the case of graphics, it may require massaging and possible re-organizing of data from raster to vector or vice-versa.

## 7. Lack of Features and Operational Differences

Much of the PC software available today lacks many of the features available on mini software. These features, while seeming very unimportant, may make the difference in how the company operates because they don't exist in the PC application. This can prove to be very frustrating to end

users and management alike. This can translate to loss of productivity and profits.

Very few applications on the PC operate in the same manner as on the HP3000. These differences will cost in terms of re-training, loss of productivity and error corrections during the implementation. This loss will eventually pay for itself, unless the data transfers are awkward or untimely. Re-evaluating the usage of the application may change the companies needs and require scrapping whole systems because they are 'canned' or not worth adapting.

In any case, changes will be necessary to the data if downloaded to the PC. For spreadsheets, this may require changing commands, macros, use-files, etc. to correspond with the PC spreadsheet because they are incompatible. For word processors, it may require changes of commands, removal of imbedded commands and adding new imbedded commands or converting all text files to a new format.

## 8. Costs and Investments

Before you discard your HP3000 applications, consider the investment that you are throwing away. Not just the software costs, but user productivity and experience, data files, use files, worksheets, etc., and any 'systems' created. After all, you don't throw away your 4GL just because it produces slow reports from time to time. Remember, prototyping, testing theories and experimenting bring advances in processing and business.

This investment has been built over years and does not easily die. Gradual migration to similar PC products should be implemented to avoid alienation of users and loss of valued activities.

## 9. Back-up and Data Control

For many shops, no solid back-up procedures have been identified for PCs, much less implemented. This lends itself to loss of data integrity and control for any data that is passed through or to PCs. This condition, while repairable, could cause many headaches or loss of critical data.

## 10. Data Transfer

Any data needed from the HP3000 will need to be extracted and placed into a file, transferred to the PC and then imported into the application. This requires time and resources. Resources include HP3000 processor time, file access, transfer

processing on both the HP3000 and PC, and PC processor time to import the data into the application.

Because this can quickly add up to more than it would take to finish the process on the HP3000, it could be a reason not to offload the application. If this is for ad-hoc or what-if types of applications, it may be justifiable. However, if it is a set process that never or seldom changes, it may be better off on the HP3000 than offloading.

### **Central Repository of Information**

In many installations, the HP3000 serves as a repository of information. This usage is common for businesses because the idea of having centralized locale of information is appealing. If all information is located on one computer, the relationships of this information is simpler to envision and easier to manipulate into comprehensive analysis and reporting. This concept has prevailed since the first businesses used computers to organize massive volumes of data.

This is not to say that all information and its' processing must be continued in this environment, but merely a testimony to the solidity of the concept of centralized information. Today, that concept is expanded to include various other types of processing, including the use of personal computers as well as other types of computers for specialized processing needs. The HP3000 is not perfectly adapted for many of these unique needs, but rather becomes complementary to fulfilling them.

### **Data Security and Control**

If the users are allowed free reign over data, control and security will be virtually non-existent. It becomes simple to introduce many copies of sensitive data on relatively unsecured PCs. While data must be accessible, it must be controlled enough to prevent loss or damage. Effort must be made to prevent carelessness with data (especially sensitive data).

In general, data is captured through various means, collated, categorized, massaged, 'transacted' and placed into any of a variety of file structures. Once this data is captured, the company must decide what the value of this information is. If it is of value in steering the business into profitable markets or possibly more of a share in the current markets, then it must be identified as such and given the same protections and care that any other corporate asset.

Determining the value of this type of data is no simple task and not the purpose of this paper, so I will not discuss it here. Once a value is placed on it, however, ensuring that the data is exploited sufficiently to justify its' capture becomes the most important task at hand. After all, dead data is useless to any company. By using the HP3000 as a central repository for important information, the company may take complete advantage of it through any of various processing steps, regardless of the means used to accomplish these goals.

Data can be monitored, controlled, secured and tracked, just like any other asset. This may include issuing data like a company vehicle may be issued to an executive. It is expected to be returned in good condition and intact when the user is finished with it. This concept could very well protect this asset and insure its' integrity without possible compromise. Since a 'virgin' copy remains in the central repository, it is safe and assuming the employee who checked it out is honest, the copy will not be lost or allowed to be abused in any way.

### **Offload Decision-Making**

There are, indeed, applications that should or could be offloaded to PCs. As previously mentioned, individual or ad-hoc oriented activities are best offloaded. But, what about that huge financial report we produce every night with that spreadsheet on the HP3000? Would it take less 3000 resources if we downloaded it to the PC or would we be better off leaving it where it is? In order to better understand the questions raised, we must examine the dynamics involved.

### **Architectural Considerations**

First, we must understand the architecture of each machine, and what it was designed for. The HP3000 was designed as a multi-tasking, multi-user system using the time-slice/q-priority method of time sharing user (and system) processes. In theory, it can handle over 200 interactive user sessions and 50 or more batch jobs, each capable of tasking up to 63 programs. However, rarely will each user be running this many programs at the same time, all of the time.

Because of the nature of an interactive session, much of the time, the session is idle. During these idle times, other processes get serviced, and efficient use of the CPU resources is accomplished. When the session is not idle, the process monitor ensures that the user process gets served a reasonable number of times per second to allow a smooth flow of activity

to the user.

The PC was originally designed as a single-task, single-user system using no time sharing concept. However, since the user is the only process to worry about, the user is always served instantly. While this concept is powerful, it can also be said to be wasteful when it is idle. Thus the un-used CPU resources remain un-usable because no other processes can access the CPU while the user is occupying the keyboard (of the PC). This is known as serial computing. One user, one process at a time.

In order to get a handle on using this idle resource during off hours, we can use them for completing processes previously accomplished on the HP3000. This is called distributed processing.

Assume for one moment that we are working with a production machine and that we want to offload this single process to a PC to finish the number crunching. We must decide whether or not to offload.

### Formula Calculations

We need a method for determining the feasibility of offloading a process. To do this, we want to calculate a time index for each process technique desired. This first formula is designed to calculate the index for time to process the data on a PC with downloaded information from the HP3000, and then, upload the data for file update or for output.

$$I1 = E + T1 + A + P1 + O1 + T2 + O2$$

This next formula is for computing a time index for leaving the process on the HP3000.

$$I2 = E + P2 + O2$$

### Variable Definitions:

I1 - Index of PC processing time.

E - average time to extract data (HP3000)

T1 - average time to transfer data down

A - average time to import data into PC application

P1 - average time to process data (PC)

O1 - average time to output data (PC)

T2 - average time to transfer data up

O2 - average time to import/output data (HP3000)

I2 - Index of HP3000 processing time.

P2 - average time to process data (HP3000)

These time indexes represent the average time it takes for each of the methods to complete the process. Note that these also represent single-tasking, head-to-head competition between the HP3000 and the PC. When the multi-tasking aspect of the HP3000 is taken into consideration, the time indexes for the PC must be multiplied for each additional task able to be processed on the HP3000. Using this methodology, fairly accurate indexes are produced and the real advantages of multi-tasking begin to show up.

Of course, these formulas are not usable with complete applications that are being offloaded. Offloaded applications derive pure and simple cost/benefit ratios and only HP3000 extract and download times (if any) need be considered. The formula (using above variable definitions) would look something like:

$$I1 = E + T1 + A + P1 + O1$$

In any case, this index is likely to be less than the HP3000 index, unless uploading becomes necessary. Additionally, the import, process, output cycle may be repeated as many times as desired with the same data without affecting HP3000 resources. If no HP3000 extract and download are necessary, the time index will always be better than that of the HP3000.

Of course, calculating E, T1, T2, O2 and P2 requires some analysis and testing since some factors may vary including quantity of data, system activity load, file availability (fragmenting), file record size and quantity of data manipulation (transformations, calculations, translations, formatting, etc.).

If the two indexes (I1 and I2) are equal, chances are, no benefits are achieved by offloading the process. If I1 is less than I2, the benefits are realizable. If the cost of developing the PC application/programs is not tremendous, the benefits would outweigh the costs. If, however, the costs are approaching the extreme, the benefits would not outweigh the costs. If I1 is larger than I2, forget about offloading the

process at this time.

Naturally, there are ways to improve this cost/benefit ratio, however, that subject is not the purpose of this paper.

Ideas for obtaining these values include recording job wall time for one month for this process. Determining PC processing time for the import, process, export and transfers could be obtained by prototyping them. These figures are averages and not absolute since different numbers take different times to crunch.

### **Strategic Planning**

Planning these moves is just as important as making them. By outlining them and studying them ahead of time, you can avoid critical mistakes. If you buy HP3000/PC compatible software (spreadsheets, graphics, word processing, 4GLs for prototyping, etc.), most of your job is done. Because these applications can easily use the same files, no translation/modification is necessary. Feasibility testing is simple and straight-forward.

If the software is incompatible, however, your job has just begun. Programs will be needed to manipulate the data into usable formats for the PC and the HP3000. If you share your plans with your end-users as well as management, you will most probably find out ahead of time whether or not any unforeseen obstacles exist.

### **Issues of Concern**

There are some obvious areas that need attention before offloading any applications permanently.

#### **PC Purchasing and Maintenance Costs**

Consider that a copy of each software package must be purchased for every PC needing that application. Consider also, that you may need to expand memory, disk space or I/O boards to use the new application efficiently.

#### **Oversized Applications**

Some applications may be larger than the PC is designed for. One of our customers built a PC spreadsheet so complicated that it took over 5 hours to re-calculate (goal seeking). In two hours, he converted the spreadsheet to run on the HP3000 where it took less than 50 minutes to compute during a busy time frame.

It's fine to tie up a PC during off hours, when it is not needed. But, if this stretches into the day when an engineer or manager needs the PC, you are encroaching on end-user time. The moral: Don't offload extremely complex applications/activities to PCs.

### Learning Curve for Applications

If the end user will be utilizing the application, they will have a learning curve. This will work fine if the application is used only on PCs after that. If the user must constantly switch from PC to HP3000 and back, it may be better off left on the HP3000. This also goes for learning to interact in general with the PC.

### Productivity Improvements

Some productivity improvements are never realized because the gains are imperceivable. This is usually the result of poor planning and feasibility testing. The biggest problem involved here is usually data control (who's got what, where).

### Home-Grown Software

If your end-users like to create their own applications and want to use company data in them, watch out! Most end-users do not sufficiently test their programs and this could result in contaminated data. If this data is then used to update company data, the contamination spreads. Encourage high standards and avoid contaminated data.

### Duplication of Efforts, Systems and Results

Many times, without good communications, users may duplicate the efforts of others sometimes creating the same systems with differing means. Establish a good communication base and encourage sharing of applications.

### Equipment Types and Compatibility

If no precautions have been taken, users may get incompatible equipment and forego decisions concerning sharing and communicating. Establish company guidelines to avoid this possibility.

### Software Compatibility

If the software packages on the different PCs are incompatible, sharing data and ideas becomes difficult. The same is true of software between the PCs and the HP3000. Any

time a new upgrade is received, be sure it is installed on all equipment, including operating systems.

### Operating Systems

The DOS operating system is barely adequate at best. It requires excess typing and is filled with traps and holes. It may do well to leave the PC to the tasks it does best. At least, obtain a good menu facility to ease the end-user burdens.

### Data Duplication

With many users downloading data, there is a big risk of data duplication. A timing problem could also occur. Consider the scenario where one user downloads a set of data; another user, not knowing this, does the same. Each does calculations and manipulations to get final results for updating the HP3000 data. One reloads and updates the data on the HP3000, soon followed by the other. What is the integrity of these updates? Questionable, at best.

### Future Needs

Consider an application that is completely offloaded to a PC. The old software on the HP3000 is laid to rest. Six months later, the results of this activity are determined necessary to another application on the HP3000. You must now reverse the roles and upload data to the HP3000. Moral: Run your HP3000 applications until there are no more perceived needs for it for at least one year.

### Data Base Dependent Applications

Some applications depend on data in a data base to complete certain tasks such as validation, inventory checks, etc. If this data is static and rarely changes, it is easy to justify offloading it. If the data changes regularly, however, your I/O involved in the transfer may easily outweigh the benefits. Graphics production and real-time budgeting are two activities that readily come to mind to remain on the HP3000.

### Summary Data Bases

In every organization, there are certain key numbers that play an important role in decision-making. These might include inventory levels, revenues, cost of product, depreciation and/or sales. These figures are often needed in a summary form to be used in spreadsheets, graphics and/or word processing.

If this data was researched and identified, it could become standardized for the company. Further, it could be extracted, calculated and deposited into a summary data base by a standard job at standard time intervals. By having each application use this data whenever possible, a large reduction in processing can be achieved.

This 'summary' data base could then be reviewed periodically to determine if any changes are needed. This accomplishes two things: 1. a reduction in processing and 2. a reduction in the need for constant access to production data by user activities.

### Communications and File/Data Transfer

When you begin to use distributed processing with the HP3000 and PCs, a word about communications must be said. Since time is of key importance, good communications are necessary to facilitate efficient processing and timely results. There are three basic types of connections available: direct or hardwired, phone (with modems) and networked.

The direct connection is as fast as your HP3000 can communicate (2400, 9600, or 19200 baud rate depending on the CPU and port types). The quality depends on the type of cable and distance from the CPU.

The phone connection is as fast as the CPU, but limited by the modem speed. The quality depends on the modem and the phone line type.

The network connection is the fastest of all. Speeds of up to 1 MByte are available now and speeds of up to 10 MByte are promised in the near future. The quality depends on the quantity of traffic and errors encountered during the transfer. Of the three types of connections, this is the most sensible.

Don't skimp on the connections. After all, the communication speed and quality are an integral part of the processing load and can greatly limit timely throughput. Any good terminal emulation software package will do for the interface. Be sure you have options for alternate protocols since they may be needed for tricky transfers.

### **Myths About 'CPU Intensive' Applications**

Over the years, many people have talked about system 'HOGS' and their nature. Fingers have often pointed towards these applications with anger, disgust and ridicule. Here, I will dispel some of these myths.

## Spreadsheets

The spreadsheet began its life on a PC. It was a tool for manipulating numbers quickly and displaying (or printing) them in a desired format and order. Soon, the spreadsheet was available on the mini, and now, even on mainframes. Many people point to them as CPU hogs.

First, the only time this is true is when a re-calculation is taking place. Since re-calculations are done only occasionally, the overall CPU usage, while significant, is spread over a period of minutes or hours. Much of this CPU activity is done when the CPU may otherwise have not been busy.

Second, the quantity of calculations is solely dependent on the size of the spreadsheet. By keeping spreadsheet size down and combining tasks, this problem can be reduced.

Third, the quantity of work accomplished in comparison with hand-made calculations is overwhelming. The HP3000 can do more calculations in one minute than most people can do in an hour. Such a versatile tool could not be replaced with 100 COBOL programs.

## Graphics

Another victim of prejudice are graphics programs. Consider the quantity of data that must be crunched to produce a set of charts. Of course, to collect, prepare and compile the data, the HP3000 must be used anyway. The PC cannot accomplish this task alone. Since most of the overall CPU time is used up in these tasks, offloading the results to a PC for visual or print output barely makes sense.

Production graphics require a mini, since the PC is incapable of crunching this much data in a reasonable amount of time. Since this type of graphing is necessary to make meaningful decisions in business, why wait for the PC to finish?

## Word Processing

Another perceived culprit of excess CPU theft is word processing. The only way this could be true would be by typesetting documents regularly. If the text is not automatically re-formatted, the word processor takes up no more resources than any text editor currently running on the HP3000.

If, indeed, documents are typeset on the HP3000 as a part of

production, chances are that this is the best place to continue to perform these tasks. It becomes especially so when form letters are being produced with information from a data base. This high quantity output could not be accomplished on a PC in a timely manner.

Centralized word processing is still in demand and only recently several software packages became available on minis. This is positive proof that some companies still want to keep tight control over text production.

### **Which Ones Go?**

According to a 1987 survey made by Datamation, planned PC purchases were up three percent and planned mini purchases were down thirteen percent compared to 1986. It also stated that users are using their PCs an average of 5.6 hours a day. This indicates a trend towards new distributed applications on PCs.

We can't simply ignore these machines. They must be used more to aid in data processing. Let's look at what activities are best suited for each machine.

#### **PC Oriented Activities**

what-if games	to pre-test decisions based on various possible scenarios and outcomes
project budgeting	to create/change the budget for a project
ad hoc letters	that don't rely on data from the HP3000
desk top publishing	for presentations, literature, documents
cost justification studies	discover economics of cost/benefits
proposal development	proposals that don't affect others
presentation graphics	for ad-hoc presentations

personal budgeting

for a small department or a person

In general, anything that does not directly affect the whole company or whole departments. Any application that does not require constant access to the HP3000 for data, files, or other resources. Less complex financial spreadsheets, graphics, word-processing or statistical analysis. Stand-alone type applications. Data collection and verifying applications.

### HP3000 Oriented Activities

production graphics

month-end, administrative or management charts

production letters

form letters, personalized mass production, statements of accounts, etc.

whole company/division dependent

information critical to or directly affecting them

multi-user dependent

data needing sharing, memo distribution

real-time budgeting/allocation

same-day re-structuring of budgets, allocations of personnel/resources

data base dependent

requires access to kinetic on-line information

production spreading

month-end financials, statements, special financial reports, goal seeking

information dependent activities

depends on changing information

sensitive/confidential info.

information that needs guarding from potential leaks

high-precision calculations

requiring at least sixteen significant digits

financials & extrapolations

production financials and reports

In general, applications/activities that are too complex, data dependent, sensitive or bulky to be accomplished on a PC. Any application that is multi-user and/or multi-tasking. Activities that require vast information resources, gathering, compiling and/or sorting. Activities that need to be shared among a group of people for the purpose of splitting responsibilities and later re-combination.

**So, what does it all add up to?**

In this paper, we discussed the pros and cons of offloading HP3000 applications to PCs and reasons not to offload an application or activity. Suggestions were given concerning decision issues, what to offload and how to decide what to offload. Additionally, we dispelled some of the myths about CPU intensive applications and their proper place among software on the HP3000. Finally, we covered some of the related issues concerning offloading and gave ideas about avoiding pitfalls when deciding to offload an activity.

In conclusion, let me state that the PC can play an important role in your data processing strategy if you take the time to properly plan for it. Do not just offload an application before considering the implications involved. How you accomplish this migration is as important as the resulting configuration and the affect it has on your company may cause you trouble if you don't look ahead.

Keeping all these issues in mind, you may not ever hit a snag, or you may discover that the best laid plans weren't considerate enough. In any case, you have the choice of acting intelligently or blindly following the HP rhetoric. You may win, but it could be at a cost higher than you wanted to pay.

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