Migration Made Easy

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So you have purchased a Hewlett-Packard Precision Architechture machine (HPPA/Spectrum/Series 900). Congratulations! So you are going to migrate. What does migration mean, exactly? How does one migrate anyhow? Oh...you haven't thought that all the way through yet. Hmm, maybe you should start planning your migration now.

This paper will take you through the steps you will need to take to make your migration effort to the HPPA machines complete and successful. There are seven steps:

- Education
- Analysis of Existing Applications
- Developing of a Migration Plan
- MPE/V Conversions
- Installation of HPPA machines
- Compatibility Mode Operation
- Migration to Native Mode Operation

Each of these steps will be discussed in detail.

Education

The HPPA machine is completely different from the classic HP3000. There are very few similarities in their hardware architectures. HP has gone to great pains to ensure that old job streams and programs will run on the HPPA machines, but all of the classic HP3000 hardware emulation is done via software on the HPPA machine. Underneath the software are two different machines. For all of the differences between the two computers, they might have been put out by two different manufacturers.

The point I am trying to make, is that what makes the classic HP3000 hum, does not make the HPPA machine hum. In order to take advantage of the performance gains projected by HP, you are going to have to migrate your software to native mode. All the knowledge you have gained about stacks, PCBs, MPE tables and such are of little help. You must learn about this new machine from scratch. So, step one, get educated.

There are a number of different ways to learn about the HPPA machines: user groups, manuals, FASTLANE consulting, HP classes and books. Some of the topics you are going to want to make yourself familiar with are as follows:

- Native Mode vs Compatibility Mode. Actually this is a very simple lesson. Native mode operation means that it is using the native instruction set (RISC) of the HPPA machine. Compatibility mode means that software is emulating the native mode operation of a classic or MPE/V based machine. In order to take advantage of the performance gains of the HPPA machines over the classic HP3000s, you are going to have to convert your applications to native mode.

- System Management. The HPPA machines don't use SYSDUMP. They have a new configuration manager called SYSGEN. It is very different from SYSDUMP. The HPPA machines don't use OPT or any of the other performance monitoring tools you are used to. The HPPA machines handle terminal connection differently than you are used to.

- Operational Changes. From the simplest thing, bringing up the machine to private volumes, the HPPA machine is different. You are going to have to learn how to do everything over again.

- New/Changed Commands. There a number of new commands in MPE which is now called MPE XL. The command resolution and syntax have changed dramatically. All the changes are very positive. You are going to want to take advantages of the positive changes immediately.

- Data Migration. The classic HP3000 is a 16 bit machine. The HPPA machine is a 32 bit machine. This spells data migration. You need to know how this will affect your data files and program's internal data structures.

- **Programming Environment.** There are a number of new programming tools available including a symbolic debugger. You are going to want familiarize yourself with its features before you begin conversion to native mode.

- **Programming Languages Issues.** Each programming language has its own set of challenges when moving to native mode that you are going to have to be familiar with before you begin. We will discuss some of those issues later in this paper.

- **New/Changed Intrinsics.** A number of intrinsics have changed. In addition, a number of new intrinsics have been added to take advantage of some of the new features in MPE XL. I am sure that you are going to want to take advantage of these when converting to native mode.

As you can see the list is fairly impressive of some of the basic things you are going to need to know before you begin your migration. So, how do you go about this? Easy, there are number of different ways, some even free!

1. **User's Groups.** There are a number of different speakers talking at this conference alone about migration issues. Attend their talks. Read their papers. Ask questions. Some of the users have already gone through migration experiences. Learn from their successes and mistakes. HP has released early bird sites and FASTSTART companies from their confidentiality agreements. These companies are a wealth of knowledge.

2. **Manuals.** HP has published a number of manuals to help companies have a successful migration experience. Some of the titles are as follows: *Migration Process Guide, Programmer's Skills Migration Guide,* and *COBOL Migration Guide.* I found the first two listed very helpful in getting an overall picture of what is involved in migration. Remember when you read these manuals, read them as Alfredo Rego recommends, like love letters.

3. **Consulting.** Both HP and independent consultants are offering migration assistance. I have not used either one. HP's consulting is called FASTLANE consulting. It includes a one day class taught at your site and a migration planning meeting. Independent consulting seems to be varied. As with any consulting, make sure you are dealing with experts.

4. **Classes.** HP offers two classes to help you in migration: system management, and programmer's class. The system management class is three days long and deals with the new SYSGEN and other system utility software. The programmer's class is seven days long and is for programmers who plan to assist in the migration effort. It covers language specific information and the symbolic debugger.

5. **Books.** There is a book covering Spectrum issues called *Beyond RISC! An Essential Guide To Hewlett-Packard Precision Architecture.* I am sure it is

worth reading. It is available through Software Research Northwest, Inc.

Application Analysis

Once you are educated, you are now ready to review your applications for any known migration issues. Some obvious gotchas are:

• FORTRAN. There is no FORTRAN/66 native mode compiler on the HPPA machines. You must first convert your FORTRAN/66 to FORTRAN/77. I don't code in FORTRAN, but from what I understand this is not a trivial task.

• COBOL. All COBOL/66 programs need to be converted to COBOL/II.

• BASIC. There is no BASIC/3000 native mode compiler on the HPPA machines. Business Basic has a native mode compiler.

• SPL. There is no SPL native mode compiler on HPPA. A third-party compiler, SPLASH compiles SPL to native mode.

• Privilege Mode. Remember when HP said "Don't use privilege mode." Well now you know why. MPE XL is a completely different operating system internally from MPE/V. This means there is 50-50 chance that your privileged mode programs will need to be changed before they will run in native mode.

• Floating Point. The HPPA machines uses IEEE floating point arithmetic. The classic HP3000s used their own brand of floating point arithmetic. If you use real numbers this could be an issue for you. For your information, COBOL does not use floating point, PASCAL and SPL have floating point facilities, and FORTRAN uses floating point extensively.

Other than these obvious issues, there a number of specific language and intrinsic related issues. Luckily for you, HP has put together a migration tool package. The price is right, $100. The package includes two programs: RTM and OCA.

RTM (Run Time Monitor) is a utility program designed to help you identify areas within your MPE/V programs that could be a problem when ported to MPE XL. It logs calls to MPE/V intrinsics which have been changed or are not supported on MPE XL as they happen. The logging is controlled by RTMSYS.PUB.SYS. The logging reports are printed using RTMREP.PUB.SYS.

OCA (Object Code Analyzer) is a utility program which scans program and SL files for potential problems. OCA scans a program for "problem" intrinsic calls. The advantage to using OCA is that you are able to obtain immediate results without the need for logging. OCA may not be as accurate as RTM because it cannot always tell what parameters an intrinsic is called with.

Both of these migration tools run on MPE/V based systems. You can run them before beginning migration. Don't forget to analyze both internally written applications and third-party solutions. Your migration effort will be affected by both types of applications.

At the end of this phase of migration, you should have a list of applications and any potential migration problems. With this list, you will be able to begin the next phase of migration, planning.

Planning

Planning is the single most important element of your migration. Regardless of how many applications run in your shop, how many machines you have, how much third party software you run – your migration's success depends on how well you have planned it out. Spend the time to plan. It will pay off.

The first thing you will need to decide is which of your applications are worth migrating to native mode operation. Some factors that may enter into your decision are:

- How often does this application run? If the application only runs once a year, does it really need the performance gains provided by converting it to native mode?

- How much trouble will it be to convert this application to native mode? If you have a frequently called FORTRAN/66 routine, is it really worth converting it first to FORTRAN/77 and then to native mode?

- Do you have the source code for this application? Obviously for third-party solutions, you probably are going to have rely on the vendor for native mode solutions. For contributed routines, you may have to let them run in compatibility mode for lack of a better solution.

- Is this a high volume application? If the application processes a great deal of transactions, it may be worth converting for the increase in transaction throughput.

- Do you have to maintain compatibility with MPE/V based machines? If this is true, then you may not want to take advantage of the native mode compilers. Native mode object code will not run on MPE/V based machines. There is a middle ground for such applications. OCT (Object Code Translator) converts an MPE/V object module and adds native mode instructions to the end of the program file. This way the program can run on both MPE/V and MPE XL programs. OCTed programs do not run quite as fast as native mode programs, but it is a good compromise for programs which need to run on both types of systems.

Once you have determined which of your applications will be migrated to native mode, you must develop a migration plan for each application. HP can help with the development of this plan through their FASTLANE consulting.

Along with your application specific plans, you will need an overall strategy for handling privilege mode programs/routines. Some of your privilege mode programs and routines will have to be rewritten entirely. Some of the functions can easily be replaced with complimentary functions on the HPPA machines.

Regardless of the situation, you must decide if you wish to migrate privilege mode programs to native mode or let them run in compatibility mode.

The last consideration is site planning. During your migration, there will be a time during which both your classic and HPPA machine will share the same room. This means you need to prepare your computer room for two scenarios: parallel operation (HPPA and classic) and HPPA. During parallel operations, you will need power, air conditioning, and peripherals for two machines. You must plan the additional strains on your computer room. To help in your planning, if you were to just move your existing applications directly onto a HPPA machines, you would need an additional 20% disc space. Make sure you have enough disc ordered for your machine.

So to review, you are going to need plans for the following:

• Application specific migration

• Privilege mode strategy

• Site planning.

MPE/V Migration

Prior to receiving your HPPA machine, there are a number of tasks that can and should be completed on the MPE/V base machine. A checklist of these tasks follows.

1. **Upgrade to the latest release of MPE/V.** MPE XL's base release was UBdelta4. This is the starting point for MPE XL. It is best it you get on this release of MPE/V before migrating.

2. **Get on the latest release of your programming languages.** If you are using BASIC/3000 convert your programs to Business BASIC. If you are using FORTRAN/66 convert your programs to FORTRAN/77. If you are using COBOL/66 convert your programs to COBOL/II. If you are using SPL, either convert your programs to another language or buy SPLASH. For all compilers, get to the current version of the compiler.

3. **Call INTRINSIC.** For all system intrinsics, the new format of the call on MPE XL is CALL INTRINSIC. Change all COBOL programs to use this format.

4. **Block Mode.** If you developed your own block mode terminal routines, convert them to use the new standard block mode routines: VTURNON/OFF, VPRINTSCREEN, and VBLOCKREAD/WRITE.

5. **FOPENs of LDEVs are not supported.** The DTC does not assigned a fixed LDEV numbers for devices. Opening a specific LDEV may not produce the same result on MPE XL as it does on MPE/V. It is possible to assign fixed LDEV numbers, but this is not the default configuration.

6. **UDC Conversion.** You will want to change UDCs which have the same name as the new MPE XL commands. You will also be able to omit 70% of your system-wide logon UDCs which run programs in PUB.SYS because of the new implied run and HPPATH variable.

7. **SYSDUMP does not exist.** You will want to convert your job streams which use SYSDUMP to use STORE. The commands FULLBACKUP and PARTBACKUP are not supported on MPE XL.

8. **Peripherals.** Not all the peripherals that are supported on MPE/V based machines are supported on HPPA machines including paper tape, and cartridge tape drives. Get a list from your HP CE.

Installation

The awaited day finally arrives! Your HPPA machine finally arrives! Well, here is the bad news, you are probably going to need some help getting everything configured and setup. As you recall, SYSDUMP does not exist on the HPPA machines. It has been replaced by SYSGEN.

When migrating from MPE/V to MPE XL you will use DIRMIG to create your directory, accounting structure, user logging parameters, RIN table, and private volume information. SYSGEN is the device configuration dialogue. In addition, there is another utility, NMCONFIG, used to configure your LAN and DTCs.

Well, if you are like me, these are all new and it would be nice if someone was there to help you.

Now the good news, once your accounting structure and other internal structures are in place, you can just restore your applications and they will just run! Compatibility mode operation just works! So let's look at our next step compatibility mode operation.

Compatibility Mode

As you recall compatibility mode is the term HP has chosen to mean running a program that contains instructions for the classic HP3000. When a compatibility mode program runs on MPE XL, the instructions are actually emulated by the emulation software.

The purpose of running your programs in compatibility mode is to ensure that the operation of these programs on MPE XL produces the exact same results as it did on MPE/V. Almost all of programs work exactly the same.

Typically compatibility mode testing continues through one complete accounting cycle. During this testing, your programmers can begin familiarizing themselves with the new features of MPE XL and the feel of the HPPA machines.

Migration to Native Mode Operation

During this phase of your migration, you are going to implement the application migration plans. This is an appropriate time for your programmers to attend the programmer training course and to learn the new debugger. They will also need to familiarize themselves with switch-stubs, which is a technique for switching between native mode and compatibility mode within a program.

Once the conversion to native mode is complete. You can address yourself to optimizing the performance of your programs. There are several things which can affect performance of your applications:

- Mixed mode applications. Mixed mode applications run slower than native mode applications because of time required to go through switch-stubs.

- OCT applications. Programs which have been run through OCT will not run as fast as those which have been recompiled using a native mode compiler. This is due to the literal translation of MPE/V instructions.

- Extra data segments. Extra data segments are an MPE/V data structure and should be converted to mapped files for extra performance.

- Use of KSAM/RIO/CIR/MSG files. These file structures are supported using compatibility mode file intrinsics only. Because the intrinsics are supported in compatibility mode only, they will be inherently slower than other file structures.

- Word alignment. You can expect increased performance for programs that align their internal data structures to 32 bit word boundaries.

As with the classic HP3000, we are going to have to experiment with what exactly makes this machine perform. I am sure that over the next few years we will all be learning about the performance tuning techniques for the HPPA machines.

Summary

The most important lesson from this paper is two-fold: get educated and plan your migration. I believe that if you learn as much as you can before you get started and then plan your migration, you cannot have anything but a successful migration. Good luck to you!