

HP-UX 11i Knowledge-on-Demand:

performance optimization best-practices from our labs to you

Developer series



How to upgrade to HP-UX 11i v3 -- Webcast topic transcript

Welcome to "How to upgrade to HP-UX 11i v3." My name is Bruce Henderson.

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My name is Bruce Henderson. I am the manager of the software deployment section in the Unix System Enablement Lab in Fort Collins, Colorado. We're responsible for supplying the software deployment products, such as Software Distributor, Ignite UX, Update UX, and several others.

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What I'm going to talk to you about today is two different things. One is a generic understanding of how to migrate your operating system from one release of HP-UX to another. And, specifically, how to migrate your operating system from wherever you are today on HP-UX to HP-UX [11i V3]. This presentation is specifically from the perspective of a developer of software, and I'll be including material that is pertinent to that, as well as generic material for anyone migrating to P3.

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This particular slide contains a lot of information about HP-UX 11i V3. I'm just going to give you a quick overview of this. This is covered elsewhere in detail in another presentation. But I think there are a couple of key things to keep in mind when you are thinking about your decision to migrate to V3 and what your customers will be thinking about in terms of their decision to migrate to V3. Specifically, flexible capacity is what provides agility to customers. This is a mission-critical virtualization environment that really gives HP a leadership edge in the industry, and this is something that we're delivering for HP-UX 11i V3. A real highlight here is dynamic memory migration, for both [VPAR]s and HPVMs, which allows customers to move their memory between different integrity virtual machine[guests]. In the performance area, there is a really good story here. Generically, if you move to 11i V3, you should expect 30% performance, or better, on an average. And you don't actually recompile your application to get this performance, which is really a neat thing. In addition to that, there is some great benchmark information that's available.



Specifically, one of the ones that I really like – there's a new integrity system, running HP-UX 11i V3, the fastest single system, 10 [terabyte] TPCB benchmark ever was over 58% faster than the previous leadership benchmark, which happened to be on a sun E-25K and it [used] 144 core machines. So, just some outstanding performance to look forward to here.

For the mass storage stack, we're actually delivering a much simpler mass storage solution. You could configure one name for one. Fewer device files to manage. We have automatic device discovery and configuration. You can add storage devices, you can add paths to storage devices. We have self-configuring multi-pathing, which includes automatic load balancing and fail-over. We have dynamic handling of [SAN] changes, including self-healing of failed paths, and extensive [SAN] trouble-shooting tools, as well.

Secured availability is something that really encompasses everything you or your customer needs to provide the highest up time in your data center. Our security offering, coupled with our service guard portfolio, really provides the best value for customers in the enterprise computing space. There are some specific things I want to point out, here. Transparency is now available, which will protect from lost or stolen data at rest situations. We're providing safe harbor, which avoids the need for a breach disclosure, which provides for some breach disclosure laws. We're providing simplified user management with approved provisioning on a one-by-one or a one-on-many basis. We're easing deployment of secure systems by automating the configuration of key security features in an application context. In addition to that, we are now supporting the new [DRD - Dynamic Root Disk] product for the first time on V3 or 11i V3. This provides a deferred reboot capability to maximize your availability of your applications to your customers during the updating process. We've added in PCI error handling and recovery. PCI error recovery provides the ability to detect, isolate, and, automatically for the PCI error, you could basically avoid a system crash. We have PCI error unlike deletion that we're providing as well. This is a PCI OL* feature that's been enhanced to now allow you delete PCI cards and their associated drivers without requiring a reboot of your system. In addition to that, there's a lot of simplified management that will empower you and empower your customers to reduce complexity in the data center – such things as system insight manager, system management home page, which is a replacement for the SAM tool, has become much easier to use in the 11i V3 operating system release. And System Insight Manager can be extended with plug-ins to meet a lot of different needs.

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I am now going to talk about, in this next section of the presentation, the general good practices for migrating from one version of an operating system to another.

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I'm going to cover three different areas: hardware deployment, software, and then OS and operating system migration methods. This whole section of the presentation is going to focus on the role of planning for your migration and best practices that you should be following in that area.

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Hardware is one of the two key areas that we like everyone to look at initially in their migration planning focus. And really, there are two parts of this. The first part I'm not going to talk about in this section, which is, is your hardware product supported on the operating system release? We'll get to that in the next section. But the generic part of this is, do you really have the hardware capacity you need? This starts with planning your disk space needs and really what we're talking about here is developing a clear configuration plan. Make sure that you can account for your file system size requirements, your SWAP space size requirements, your dump device, disk and file system parameters. Root volume redundancy, which, basically, SANBoot and [Raid] are both options there. If you use, even temporarily, a SAN, it can provide a way to perform some advanced operations or commands without loss of redundancy, even if you're booting from an internal environment. And then listing your mirrors is another important thing to do. If there are other applications that you're going to be using, you need to make sure that those applications don't have specific hardware requirements, or if they do, you need to

be able to account for those hardware requirements as well. A couple references that are important to this area. The HP-UX system administrator guide, which is available on the website, docs.hp.com, can be either downloaded or viewed in and HTML format. That's a great source of reference for specific details in this area. And then there's also a book that's available – “Disk and File System Management Tasks on HP-UX” that's published by Prentice Hall, HP. That's another good source of detailed information in this space.

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Software deployment planning for software is the second major focus area. And there are really three types of software that you need to think about here. One, of course, HP products. And the HP products for 11i V3 are ready. They are the products that were released in the initial release of 11i V3 this last February. In addition to that, we do update and provide more content on an ongoing basis for our software products, and you'll see later on in this presentation, how we're actually doing that, or how we're going to be doing that in the future for the 11i V3 release. Third-party vendor software products, your software products as a developer, is really what this session is all about. It's really to help you get your products ready so that your customers can begin their migration to 11i V3. And it is important to realize that we have customers coming to us already, asking, gee, when is my application going to be ready and going to be supported on the new operating system release of HP-UX. And we are telling customers to contact their software suppliers, or their ICs directly in those situations. And then, internal software packages, or maybe additional software packages are another category that's important to not ignore when you're really replicating the software stack that you're going to use to either certify or at least minimally check out the 11i V3 operating system. Compatibility is a great story for version 3, and you're going to see that there's really little effort required in getting any application you want in V3. In fact, it's actually one of the strongest stories in this release. Qualification itself, if it's really required, 11i V3 is binary and compatible 11i V2. So if that's where you're coming from, you really don't have to requalify, or you certainly don't have to fully requalify your application. And you certainly don't have to recompile an application, either.

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Selecting your software base, or, in other words, the software that you're going to build your software stack on, which is either to certify an application to support customers, to running your own applications, is one of the other key decisions that needs to be made. HP, as I mentioned before, has a regular software release model, where we deliver functionality over time. We do this, really, to provide and continue to preserve the value of migrating to any particular operating system release. The decision that needs to be made here is really considered the version of an application that you want to use. For example, you may find over time that there are three different versions of Service Guard that you can select. Do you automatically select the newest one to add into your software stack, or do you select one that's been released for a longer period of time? Those are some of the decisions that you want to make in selecting your software base?

Patches are another piece of the puzzle here. Certainly, patches are used to deliver fixes for defects. Patches are used for much more on HP-UX. And in the next section, I'll talk a little bit in more detail about that. I think the important part here to realize is that we've been recommending for some time to our software developers or our ISVs that they qualify their products on the Quality Pack, which is one of our software bundles. That provides a nice base for certification of your software. It provides a nice base for customers to then install your software on top of [a new] base, for a much easier, much more usable solution for customers than taking a group – I'll say, maybe 50 to 100 to 200 individual patches – and trying to install those and work with those on the system. In addition to the Quality Pack, most likely you'll have another patch or two that you need to install, but probably not more than that. I'll talk more about that later, as I said. I think the main message here is with patches, make sure than you use the HP standard bundles. They contain stable patches, they've been tested together. Operationally, they'll work as a single unit.

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To help you maintain your systems, once you've moved to V3, it's good to give some consideration to – this is to administration tools, commands that you might be using. And this is a quick survey of your choices in this space.



So the HP Systems Insight Manager, or SIM, as it's also abbreviated, provides a web-based, multiple-system management package. So in this case, it's not just about managing HP-UX systems, you can manage your Linux, your Windows, and as you can see here, it does not have to be Windows and Linux on HP systems necessarily. This provides a lot more variety, and a lot more value to being able to manage your systems with a system inside manager. It uses the system management home page interface and some other tools. There is a manual, or a document that you can download from the docs.hp.com website, titled "HP Systems Inside Manager 5.0 Installation and User Guide," that provides information not only on downloading SIM, but on setting it up, and on how to use it as well and some of the features that you'll find in it.

The next two products that are listed on the System Manager home page, in both the web-based and the text-based versions, are single-system management products. So, where, with SIM you can manage a multitude of systems from a single station, with System Management Home Page, you're really managing single or individual systems. SIM replaces the old System Administration Manager, or SAM, which is a product that's been around for many years for performing system administration tasks for HP-UX. System Management Homepage, or SMH, provides a real simple terminal-based interface, which is the text-based version of it, or there is also a web-based version of it that is an incorporation of some of the earlier features, such as KCWeb, PDWeb, Par Manager, that had been released on the web. They were instances of specific capabilities in SAM that were released with a web-based interface. Now, with the release of System Management Homepage, the web-based version, on HP-UX 11i V3, all of the features of SAM have been migrated into this version, so you get a complete web-based tool to manage your systems by. For those who want more granularity in accessing your system configuration, then you have the HP-UX commands that you can use directly. The only caution there is, you need to be very careful. They are more for the expert system administrators. And there will be easier ways to manage your system than using the individual commands. But together, SIM and System Homepage reduce the complexity of most of your administration tasks. They minimize, or eliminate the need for a lot of the detailed knowledge that you would have to maintain if you did use the administration commands. It will wind up saving you time in the end as well.

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In this next section, we're going to talk about the decisions that you need to make in terms of the how, or what process are you going to use to migrate to 11i V3. One thing I'll mention before I get started on this, the install update guide, which is another document that HP makes available, and is available on the docs.hp.com website, does a very detailed job of explaining what I'm going to cover in the next few slides in talking about this decision-making process for migration methods. But this section is intended to summarize that, and go through it at a higher level.

So first of all, there are two basic choices that you have. Cold Install or Update. Cold Install overwrites everything that's on the target disk. And it's very fast and very predictable. So a couple of instances where you actually not only are recommended to use to use Cold install, you need to use Cold Install. If your system configuration as a supported update path, the way that you get there is with Cold Install. Or, if your disk space needs to be reconfigured, you're going to have to use Cold Install. There are some other instances. If you're going from the PA to the IPF architectures, for example, you would need to cold install your system. Other instances where you might want to, you just want the speed. You don't want to have to sort through some different log files to determine, gee, did this work, did that or this thing work? You can go through this all quicker, more straight forward with a cold install. In terms of the tasks before you start a cold install, or things that you could do in preparation for this, make sure that you - if you're on an Itanium based system, select your HP-UX console. With all systems, back up your configuration files. If you have to go back and re-install, you always want to have a safe place to go back to. If you're going to be using Ignite UX to cold-install your system, in other words, you're probably going to be cold-installing more than one system at one time, you want to make sure that you update your Ignite UX server with the latest version of Ignite UX software. And then finally, you're going to want to locate your source media and your code words that you're going to have to use.

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The other method, as I mentioned, that you could use, or your other choice is, Update. Now, as it shows here in the parenthesis, Update is used 26 percent of the time. This is based on a survey we did last year. The data we have on Update varies. The point is, it's used less frequently than Cold Install, probably something like 25-30 percent of the time Update is used. Update has a distinct advantage of not overwriting your root volume group. So, where you don't want to lose your configuration information that you've got out there. If you had some other application-related information out there that was unique to your root volume group and how you had it configured, Update will preserve that, and you don't have to worry about not losing that if you perform the update as opposed to the cold-install. Where each system has a unique configuration, and you want to really save yourself re-creating that unique configuration, especially if it's very complex – another value for Update. As it says here, with either method, whether it's Cold-Install or Update, I'll reiterate it again, make sure you start by backing up your system.

Now, I did include some internal results from our HP-UX test teams that they recorded as they were qualifying 11i V3 release. And I thought this would be an interesting data point for people to look at. We get questions from time to time, is Update quicker than Cold Install, and vice versa? So here's the comparison. The answer is, yeah, definitely Cold Install is faster. These comparisons were done using the same operating environment, the same hardware, the same configuration, so they're apples to apples comparisons here. Those factors I just mentioned – the operating system, the differences in the hardware, the configuration – can make these results vary a lot, as well. And you can see in some instances, the time for an update will stretch out and be much greater than the time for a cold install, proportionally, if you're in a situation where maybe your configuration does vary wildly.

Prior to starting an update, the same as prior to starting a cold-install, there are tasks that you want to perform. So you want to identify all your software products and bundles that are on your system. You want to rebuild your HP-UX kernel. You want to make sure that you rename your log files. You want it to be easier to find those, if you have problems that you encounter during your update. And then, of course, backing up your system. Our recommendation for backing your (root volume group is to use Ignite UX and make tape recovery and then locate your local media.

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In this next section, we're going to talk about the next layer down of your decision-making process. And that, even in spite of the fact that this particular title says Cold-Install, software sources, it really applies to Update as well. What this will do is it will allow you to take your source, in this case your media, and install one system at a time. It installs directly from DVDs in the media kit. What you get, typically, when you get an HP-UX media kit – you'll get two DVDs that contain an OE media. And this is the OE media that you have ordered, or this is appropriate for your level of service contract. You're going to boot-install a new system from that media. There will be a second DVD – well, in addition to the first two OE DVDs, a third DVD in the media kit that will contain the applications. And you should go back and install any applications that you want to install that were not on the OE media kit from there. There is an additional piece of media in the kit, called Instant Information DVD that provides all of the documents associated with the release. It's important to know they're there.

There are two documents that you always want to look at before you start a disk install process. One is Release Notes. That's contained on the Instant Information DVD, and this is new features, new functions, changes, and things like that. There is also a document known as an RBI – Read Before Installing. I recommend this document you download from the docs.hp.com website. The reason for that is, this is a last-minute, need-to-know information set. And you really want to go with the very, very latest information there. So downloading from the website will get you that very latest information.

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The next option for either cold installing or updating is using depots. They can be called software depots, network depots, both terms are pretty widespread in use. The idea here is, you're updating many systems in your enterprise, as opposed to one if you're going from media. Here, you consolidate your sources into one or



more network depots. Your sources being your OE media, your application media, etc. You use the SD commands, swcopy, for example, to create your depot, move different data from your data sources across there. The advantages of using this is, you're down to a single reboot. So you can, where if you were using the media, have to reboot after your OE media, after your application media, for example, you can coordinate all of this information or all of this data into a single depot, and you can perform one operation, one installation operation with one single reboot. The other one, and just as important, I think, for a lot of people who use this, is you get a common, centrally-controlled image for your HP-UX enterprise, single version of this, by consolidating all of this into a single depot.

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The next level and the next decision or choice that you get to make here is using Golden Images. So, similarly to using depots, with Golden Images, you're working on many systems at one time. Here, Golden Images implies the use of Ignite. Golden Images work with Ignite UX to provide a little bit faster software deployment operation than with depots. You can, if you're using Ignite and using Golden Images and installing similar systems in your configuration, use Ignite for doing that configuration operation for you. Creating a golden image is something that you use specifically for Cold-Install. Again, your operating system, your operating environment, your applications, your patches, are all included in that Golden Image.

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We're going to go to the next section of this presentation.

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And in this section, we're going to talk specifically about what's unique to V3, and the planning decisions that you need to make in getting here, and a little bit about what's going to be happening in the future there.

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As I mentioned in the previous section, hardware is one of the key considerations in determining your migration strategy and how you're going to execute that strategy. This particular page talks about —Itanium based integrity systems. This is really a good support story for V2 customers or 11i V2 customers. And in fact, this list of supported hardware, I would expect over time is going to continue to grow. There are two columns on here, one for the actual system name, and then one for the firmware level that's supported. This particular matrix, or this particular table is available on the docs.hp website. So this will be updated every time there's a new release of 11i V3, and it's good to download a new version of this, because, as I said, we will be adding hardware to this.

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There is an additional page of PA-RISC systems. This is a little bit different story here. If you look down the column of systems that are supported and down the firmware column, you'll notice a lot of these systems are actually listed as not supported on 11i V3, and for people who are migrating from older versions of the operating system like the HP-UX 11i V1, for example, because we're moving strategically to integrity, there aren't as many PA-RISC systems that are supported, and therefore the migration picture going from V1 to V3 is a little more restrictive than it is for people who are already migrated to 11i V2.

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Another piece of hardware that's important to, or another part of hardware that's important to look at, is the I/O cards, drivers, storage devices. In some ways, these are actually more difficult to track than the systems themselves. For migrating to 11i V3, there actually is a tool – it's a new tool – that's provided. This V2 to V3 check-script, and this will provide you with a lot of the information that you need. It should set you up for success

from a planning perspective. It will go through the list of installed devices that you've got on your system that are supported on V3, and in this case, devices are I/O cards, storage devices, drivers, reports on supported devices in the same context, and to provide you with minimal firmware information. So basically, the information that is provided you on the previous table is provided here as well. And there's information at the bottom of this page, where you can download it. This download site is called Software Depot, and it's a common download site that HP uses to distribute free software products.

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HP, as I mentioned before, adds to our base of software products over time. And there's a couple of different things that this page is attempting to convey to you. Let me just talk about our practice of doing that, first of all. When HP releases a new operating system strain, like HP-UX 11i V3, we release it with a comprehensive set of new features. The features that are comprised of the core part of the operating system are not ever updated or added to after we release them initially with the first release of, in this case, 11i V3. So the reason we do this, is we protect you from any initial work that you may have done to support your product on this operating system. But we do, as we release on a regular basis, new updates to the operating systems stream itself, we do release some additional features outside of the core, as additional file sets. The point is, they never change the original core. The name of a release never changes. These additional file sets that we release outside the core are released as layered applications. We do this, really, as I said, to protect your investment. HP does release new products. We don't want you to have to requalify every time HP releases a new product. You don't have to do that. On a regular basis, typically twice a year, you'll see HP release updates to a release stream. V3 will be no exception to that. But we will not go in and change the core operating system in the context of adding new features to it. There are patches that will provide fixes to the core operating system, but those are just granular fixes on a point-by-point basis.

What you see in this particular slide, on the rectangle on the upper left of the V3 functionality, is a list of functionality that's available today in V2 functionality. Below that, are the enhancements that we released – some of the enhancements we released in V3. So you'll see those when you install, if you take the version of V3 that we released last February, for example, if you install that on a system. You'll see these new enhancements on your system. What you won't see is a set of enhancements labeled 3Q, calendar year 2007. That's a set of enhancements that is releasing in our first update to the V3 stream. That's going to be releasing in September. And these are additional enhancements, like I described just a second ago, and will be released in the form of applications. They won't impact the basic core, but they do provide a lot of value. Generally, the reason this is important is we're trying to make a decision on what software base you want to start with to install. My recommendation is, go out and find the latest of the regular updates that we've provided, again, as I said, there would be probably two of these a year. You provide the latest of the updates or select the latest of the updates, and we provide it. And you'll get the most rich and complete set of features for the system.

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The other part of the decision, in terms of a software base, which you need to make, are patches. I mentioned patches a little bit earlier. Basically, there are three standard patch bundles that HP makes available. One is called feature11i. And that contains patches that our layered products depended on to enable it. So, if Service Guard, for example, were to depend on a specific non-Service Guard patch, it would be a feature11i. Feature11i, just as a safeguard, is always good to install. You won't find that bundle very active. Once we initially release a set of products, we'll see quite a bit of content in the first feature11i bundle. For example that's coming out in this September release I referenced earlier. That's because there were a lot of additional products that were shipped in that release. But I would not expect to see much activity in this bundle going forward in the future.

Hardware Enablement is a set of patches designed to enable new hardware or new hardware capabilities. And example is the PCI backplane for PCI express, being enabled in this release. The Quality Pack is a bundle that contains high-quality defect fixes. In other words, they are defect fixes that have been available in the form of a patch for some time. They, in all of these cases have been very, very well tested. And that's one of the reasons



that we always recommend you pick up the standard patch bundles. In addition to that, the standard patch bundles, as you can tell from my description, all contain patches that have been specifically selected for a purpose. Working at the patch bundle level allows you to execute your commands on a bundle, rather than on individual patches. So, where you can imagine with management of individual patches, you're talking about hundreds of patches. It can get to be a nightmare. Looking at the bundle level really gets around all that. So, minimally, my recommendation is I'd take at least feature 11i and the Quality Pack. You're end customers, people who consume your products that you develop, will also be installing these same bundles. And they like your applications suppliers to use these same bundles when they're supporting and, if they need to, qualifying their products.

Equivalent patches are something that not all customers actually track. It's not a requirement. Some do. It really answers the question, "gee, I've got this patch that's installed on my system on V2, is there an equivalent patch on I need to worry about on V3". In general, HP takes care of all that for you automatically, but if you're curious, that information is available there. You don't have to use it. Custom patch bundles are available with the proper level of support contract. You'll get a custom patch bundle that's delivered to you that will generally include, much of the same content that's in the Quality Pack, but it will be customized for you. It will include some additional patches for your particular environment.

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So this is, I like to call it, the bottom-line slide for software developers. It's really what should you, as a software developer do to make sure that your products can be safely used on V3. The big news here is - this is the nice aspect of this whole thing - that 11i V3 is completely binary compatible with applications already available on IPF architecture. I mentioned earlier that migrating from a PA to IPF architecture does require Cold-Install, so that's not what this is talking about. If you're already on this architecture, and you're on V2, you're going to be binary-compatible. HP considers V3 application compatibility problems to be defects, and we do have a significant set of resources that we have continued to dedicate to helping ISVs get their applications available on integrity servers. So there's a lot of investment that's going into this. What you really have to do is make a decision on what your strategy is for declaring 11i V3 support. The basic choices are, you can notify HP you're supporting it. It's not necessary that you actually do anything other than notify HP that, yeah, I've looked at this, I'm comfortable with just going ahead and saying, yeah, my version of my application or my applications I'm willing support on V3. For those people that want to do a little bit more than that, you could install your product on V3. Make sure that it comes up after installation. It would kind of be what I would describe as a minimal test there. If you think you're going to want to do more than that, the recommendation is to go to HP's developer and solution-partner program website and ask specific questions about the recommendations that HP makes for your application. I do want to reiterate, no need to recompile. I mentioned that the performance gains that you could get on this release, the 30 percent performance gains, don't require recompiling, so you should be fine without doing that. There are ISVs you'll see listed out on the DSPP, or the Development Solution Partner Program website, who have declared their support. Once you've completed your statement of support and contact HP, HP will post your statement to this DHPP website. So you'll be listed there, along with the other application.

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A little bit about migration specifically to V3. There are two options. We talked about those already. Cold-Install gives you the most flexibility here. You can go directly from V2 to V3, cold-installing it. You can go directly from V1 to V3 cold-installing your system. You just manually configure it as needed, and you're ready to go.

The second option in the Update UX supports updating from V2 to V3, and from V1 to V2, does to support updating V1 to V3. If you need to go on that path, you actually do need to cold-install your system. In addition, as it says there in the footnote, if you're moving from a PA to an IA, or an IPF architecture, that requires Cold-Install as well.



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One more piece of the puzzle: operating environments. The big summary here is, if you are updating from V2 to V3, with operating environments, you can always update up – up being to a more inclusive operating environment – but you can never update down, or to a less inclusive operating environment. So, for example, the mission-critical operating environment is the most inclusive operating environment. And if you are updating to a mission-critical operating environment, you can update from any of the operating environments to get there. However, if you are updating to an Enterprise OE operating environment, you can certainly update to the mission-critical operating environment because it's more inclusive, and you can do a level update to Enterprise. But you cannot do an update to the Foundation operating environment, because it contains less software, and there's really no mechanism in the update process. It will automatically take away software products that you wouldn't be entitled to in that update.

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In summary, what this presentation is all about is really to help you determine your process for declaring support for V3 and really talk about it in a planning perspective, the things that you need to consider. Really, the key here is, you want to be ready to support your customers, as they begin to work on their migration plans for getting to V3. In way of review for setting up your V3 environment, make sure your hardware is supported. Make sure that everything that you use in your application stack is supported. And then, look at the methods. Cold-Install versus Update, and below each of those, whether you're going to work from the media, whether you're going to work from a network depot or a Golden Image. You want to determine what software release base to use. As I said in here, the software base that will be labeled in September 2007 for forward is a minimal I would recommend starting with. Certainly, there will be newer bases coming out next year. You may want to move forward to one of those. You want to identify required patch bundles, plus any additional patches you might need. And before starting, always back up your system.

The final two points here, are, as I mentioned in the beginning, all of this documentation, and a lot more detail is available on the docs.hp.com website. And actually, there's no "www" in there, it's just docs.hp.com. And contacting your service representative. Go to the DSPP website. There's a reference to a previous page. A lot of good information.

Thank you very much.

For more information:

www.hp.com/go/knowledgeondemand