

# HP-UX Patch Management: A Best Practice Approach

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# Agenda

- Discuss different patch approaches.
- Problems with Reactive approach.
- Benefits of Proactive approach.
- Case Studies.
- Process Improvements.
- Minimizing Reboots.
- Making the Business Case.

# Patch Strategies

- Reactive - apply patches only when recommended by vendor support.
- Extension Media - apply on an annual or biannual basis.
- Proactive - apply patches on a scheduled, periodic basis to avoid encountering faults already corrected by the vendor.

# Problems with Reactive Approach

- Slows the support process, since the first step to any resolution will be to check for and install latest vendor patches.
- Vendors, especially third-party ones, are not always able to identify all patches applicable to a problem.
- You're only as good as the researcher you're working with.

# Challenges in Implementing Proactive Approach

- Limitations of reactive patching may have left a “patching is bad” attitude among management.
- Vendor recommendations are Laodicean at best.
- Need to collect statistics and data to build the business case!!!

# Case Study 1: FDDI Problem

- 98/6/19, HP T-600 running HP-UX 10.20.
- Purely reactive patching model, no patches applied unless explicitly instructed from HP
- FDDI card loses its network configuration, must have IP number and netmask reset by Operations.
- Each interruption leaves the Business Department unable to process financials.

# CS 1: FDDI Problem (continued)

- Open call with HP ITRC.
- At their recommendation, replace FDDI cable and move connection to a different port.
- Two weeks later, problem reappears and Operations corrects.
- HP replaces FDDI card during next scheduled maintenance, one week later.

# CS 1: FDDI Problem (continued)

- One week later, problem reoccurs.
- Contact HP.
  - ITRC recommends applying a specific set of FDDI patches.
  - Patches are scheduled and applied during next maintenance window, 1 week delay.
- Problem reoccurs 1.5 weeks later.



## CS 1: FDDI Problem (continued)

- Issue now in escalation to internal top-level management and with HP.
- ITRC continues searching Technical Knowledge Base with no new results.
- Two more occurrences, impacting Business Department during working hours each time.

## CS 1: FDDI Problem (continued)

- In brainstorming session to compare what might be common across incidents, a SAM probing of disks and file systems was recalled in almost half the occurrences.
- Admins use new information to continue searching ITRC Technical Knowledge Base
- Most similar Problem Description detailed a SAM hang with Nike arrays.

# CS 1: FDDI Problem (continued)

## HP-UX 10.20 SAM hangs executing dg\_status for NIKE arrays

Current Path [Home](#)

Score

Document Type EN

Date 1997 Nov 19

Description HP-UX 10.20 SAM hangs executing dg\_status for NIKE arrays

Document Id A4884172

Search String nike hang minor number

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### Problem Description

I have a disk array on a machine that was cold installed with HP-UX 10.20 and now when I try to go into the disk area in SAM, it **hangs** retrieving information about the HP disk array at 16.0.

After loading some patches the disk array asked to configure the tty ports to get to the array, I indicated now. Why does SAM **hang** in the disk devices area, with the message?:

```
Retrieving information about the HP Disk Array at 16.0
```

# CS 1: FDDI Problem (continued)

## Configuration Info

Operating System - HP-UX  
Version -10.20  
Hardware System - HP 9000  
Series -K400

## Solution

This is a known problem that dg\_status will **hang** interrogating the C1300/C2300 **NIKE** arrays. This has to do with io\_search, duplicate **minor numbers** and the spt0 driver. The workaround is to make sure the **NIKE** array has a unique **minor** number. On your system, the **NIKE** is at 16.0.0, /dev/dsk/c0t0d0, **minor number** 0x000000.

You also have the MUX at address 4, with two device files with 0x000000 - /dev/tty and /dev/ttyp0 are the culprits. To workaround this, you will need to change the SCSI address of the **NIKE** to something other than 0, preferably change the array to 6. There is no patch.

# CS 1: FDDI Problem (continued)

- Admins confirm there is a Nike array on T600 with same minor number as FDDI card.
- Admins append previous information to open call and ask ITRC if this is the problem and the workaround.

## CS1- FDDI Problem (continued)

- ITRC responds back within two hours.
- This is the problem.
- **This problem was corrected by PHKL\_13044, released 97/11/19.**
- PHKL\_13044 requires PHKL\_11938.
- PHKL\_13044 et. al installed and tested on 98/8/13.
- Problem resolved after nearly 2 months.

# CS1 - Lessons Learned

- Problem was consistently reproducible once understood.
- Despite escalation to vendor, ITRC was unable to identify proper patch until problem was internally identified.
- Disruption of the Business Department over the span of two months would have been avoided by a proactive patch strategy.

## Case Study 2: Oracle Shell

- 98/9/12, K-460's running HP-UX 10.20.
- Extension media patch model, media applied twice annually.
- Autosys, a critical third-party application, requires PHCO\_15643 or higher to support new version of application.
- New version is required to deploy 4,000 new batch processes to meet business needs.



## CS 2: Oracle Shell (continued)

- Latest extension media is applied to servers successfully.
- System test scripts are executed successfully.
- Days later, in course of normal operations, DBAs discover that Oracle installer (orainst) no longer successfully completes Oracle relinks (Oracle 7.x.x and 8.x).

## CS 2: Oracle Shell (continued)

- DBAs perform days of in-house testing with different versions of Oracle on different systems to isolate problem.
- DBAs notify IT of the problem.
- DBAs and Admins trace potential problem to new release of Posix shell, /usr/bin/sh.
- Oracle recreates problem in their lab to confirm.

# CS 2: Oracle Shell (continued)

- Extension media version
  - PHCO\_16370 - 98/09/11, /usr/bin/sh Revision: 78.16.1.41
- Autosys required version
  - PHCO\_15643 - 98/06/22, /usr/bin/sh Revision: 78.16.1.34
- Current version before patching
  - PHCO\_13661 - 98/01/16, /usr/bin/sh Revision: 78.16.1.26
- Internal Oracle development version
  - PHCO\_10718 - 97/04/24, /usr/bin/sh Revision: 78.16.1.23

# CS 2: Oracle Shell (continued)

- /usr/bin/sh revision history
  - PHCO\_16370 - 98/09/11, /usr/bin/sh Revision: 78.16.1.41
  - PHCO\_16063 - 98/08/04, /usr/bin/sh Revision: 78.16.1.39
  - PHCO\_15643 - 98/06/22, /usr/bin/sh Revision: 78.16.1.34
  - PHCO\_14180 - 98/02/27, /usr/bin/sh Revision: 78.16.1.30
  - PHCO\_13661 - 98/01/16, /usr/bin/sh Revision: 78.16.1.26
  - PHCO\_13359 - 98/01/15, /usr/bin/sh Revision: 78.16.1.25
  - PHCO\_10718 - 97/04/24, /usr/bin/sh Revision: 78.16.1.23

## CS 2: Oracle Shell (continued)

- Admins find workaround by copying old sh from patch save directory, then restoring current shell, when orainst execution is needed.
- TAR is opened with Oracle support.
- HP ITRC support call is opened.
- DBAs express dissatisfaction with workaround, as it requires IT intervention.

## CS 2: Oracle Shell (continued)

- 3 weeks later, HP releases patch to correct problem.
- Root cause: Posix shell dumps core when non-interpreter scripts (i.e., scripts without a `#!` line in the beginning) are executed through “`sh -c`”.
- PHCO\_16734 tested and deployed on 98/11/08.

## CS 2: Lessons Learned

- Third party software (in this case, Autosys) may require prerequisite installation of HP-UX patches.
- The required patches may effect the behavior of other software packages (in this case, Oracle).

## CS 2: Lessons Learned (continued)

- If all Posix shell patches had been installed as released, incremental backout may have resolved the issue.
- If smaller bundles of patches were installed in more frequent intervals, problem isolation would have been much more expeditious!!!



## Case Study 3: Autosys

- K- and T- class servers running HP-UX 10.20.
- Mixture of extension media and reactive patching. Extension media applied 1-2 times annually on rotating schedule.
- New version of Autosys is required to deploy 4,000 new batch processes to meet business needs.

## CS 3: Autosys (continued)

- Pre-release binaries of Autosys binaries dump core on most but not all systems.
- All systems have prerequisite HP-UX patches, as dictated by Autosys vendor, Platinum Technologies.
- Issue resides in support for two months, with new builds of binaries tested as they are produced by Platinum.

## CS 3: Autosys (continued)

- Binaries of latest version, Build 41, continue to dump core.
- Platinum unable to reproduce problem internally.
- Issue goes into escalation. Platinum acknowledges this is their issue.
- Daily conference calls with Platinum to resolve the “Platinum binary issue”.

## CS 3: Autosys (continued)

- Admins renew suggestion to recore a test system with HP-UX 10.20 and all latest patches, via Custom Patch Manager.
- With nothing to lose, IT Management approves the allocation of resources.
- Platinum binaries work perfectly on test system!

## CS 3: Lessons Learned

- Third party software (in this case, Autosys) may require prerequisite installation of HP-UX patches.
- Third party vendors cannot be relied upon to accurately elucidate all their products' HP-UX OS and patch level dependencies!!!

# Case Study 4: Firewall-1

- D-370 running HP-UX 10.20.
- Biannual Extension Media patching model.
- Internal firewall running Checkpoint Firewall-1 version 3.0.
- Latest Extension Media applied successfully.
- Firewall-1 now dumps core on startup.

## CS 4: Firewall-1 (continued)

- Reinstall HP-UX 10.20 and Extension Media from new CDs to new disk
- Firewall-1 still core dumps
- Reinstall HP-UX 10.20 with no patches
- Firewall-1 starts as normal
- Entire process took over 24 hours, Saturday morning to Sunday morning!

## CS 4: Firewall-1 (continued)

- HP ITRC responds Monday morning.
- Problem is a known issue, with an adb script workaround.
- One month later, workaround is deployed and tested.
- Issue resolved.



## CS 4: Lessons Learned

- Biannual application of Extension Media results in simultaneous installation of hundreds of patches.
- Isolating which patches cause a behavior change is difficult in this scenario.
- Applying smaller sets of patches more frequently would allow better diagnostics and immediate backout.

# New Patch Approach

- Apply patches on a monthly basis.
- Use Custom Patch Manager to build patch depots each month.
- Take a patch unless there is a specific reason to reject it.
- Month by month, average number of patches is on the order of two dozen.

# Custom Patch Manager

- Encapsulates all information from
  - `ftp://us-ffs.external.hp.com/hp-ux_patches/catalog`
  - `ftp://us-ffs.external.hp.com/export/patches/hp-ux_obs_patch_list`
- Performs dependency analysis!!!
- Performs conflict analysis.
- Run `cpm_collect.sh` script, upload \*.fs file, and download result script to download patches and build depot.

# Dependency Analysis

- PHCO\_16734 requires PHCO\_10719
- PHCO\_10719 requires PHCO\_10718
- PHCO\_10718 requires PHCO\_10719
- Complete set = {PHCO\_10718, PHCO\_10719, PHCO\_16734}
- Never remove a patch without knowing what other patches depend upon it!!!

# ITRC Main Menu



## maintenance and support





### IT resource center

- search
- online help
- contact hp





- IT resource center home
- my profile
- logout

- maintenance and support
- technical knowledge base
- hot docs
- support info by product
- knowledge trees
- individual patches
- more...



### self-solve tools

- search technical knowledge base 
- review hot docs 
- browse support information by product 
- navigate knowledge trees and response center FAQ's 

### patching

- individual patches 
- standard patch bundles (support plus) 
- customized patch bundles (custom patch manager) 
- custom patch notification 

### legend

-  requires additional authorization like a certain level of support agreement or online purchase.
-  can be purchased online if you are not already entitled to it.

### in the news: OpenView

- advances to OpenView
- report from OpenView 2001
- upcoming u.s. events
- european events

### in the news: Itanium

# CPM Main Screen



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## custom patch manager

Custom Patch Manager is a tool for configuration based patching of systems. You must download and run a collect script to gather information about what patches and filesets are installed on your target system or depot.

After you have uploaded the resulting configuration file to CPM, you will be able to run a Patch Analysis for that system or depot. Custom Patch Manager generates a Candidate Patch List from which you may choose the patches you would like to install.

Custom Patch Manager will give you the opportunity to run an analysis to check for conflicts between the patches in your Selected Patch List as well as those currently installed on your system.

When you are satisfied with your patch list, you can download a Patch Package to your system.

## useful links

- [software depot](#)
- [software product index](#)
- [vintage software](#)
- [multi-OS foundation](#)
- [software news, events](#)

# CPM Main Menu Options

## **to start using cpm, select:**

1. [Collect Configurations](#)  
Provide up to date configuration data to CPM
2. [Perform Patch Analysis](#)  
Find the most recent set of patches available for your system or depot to select for packaging and download
3. [Custom Patch Notification](#)  
Have HP notify you when new patches applicable to your system are available.

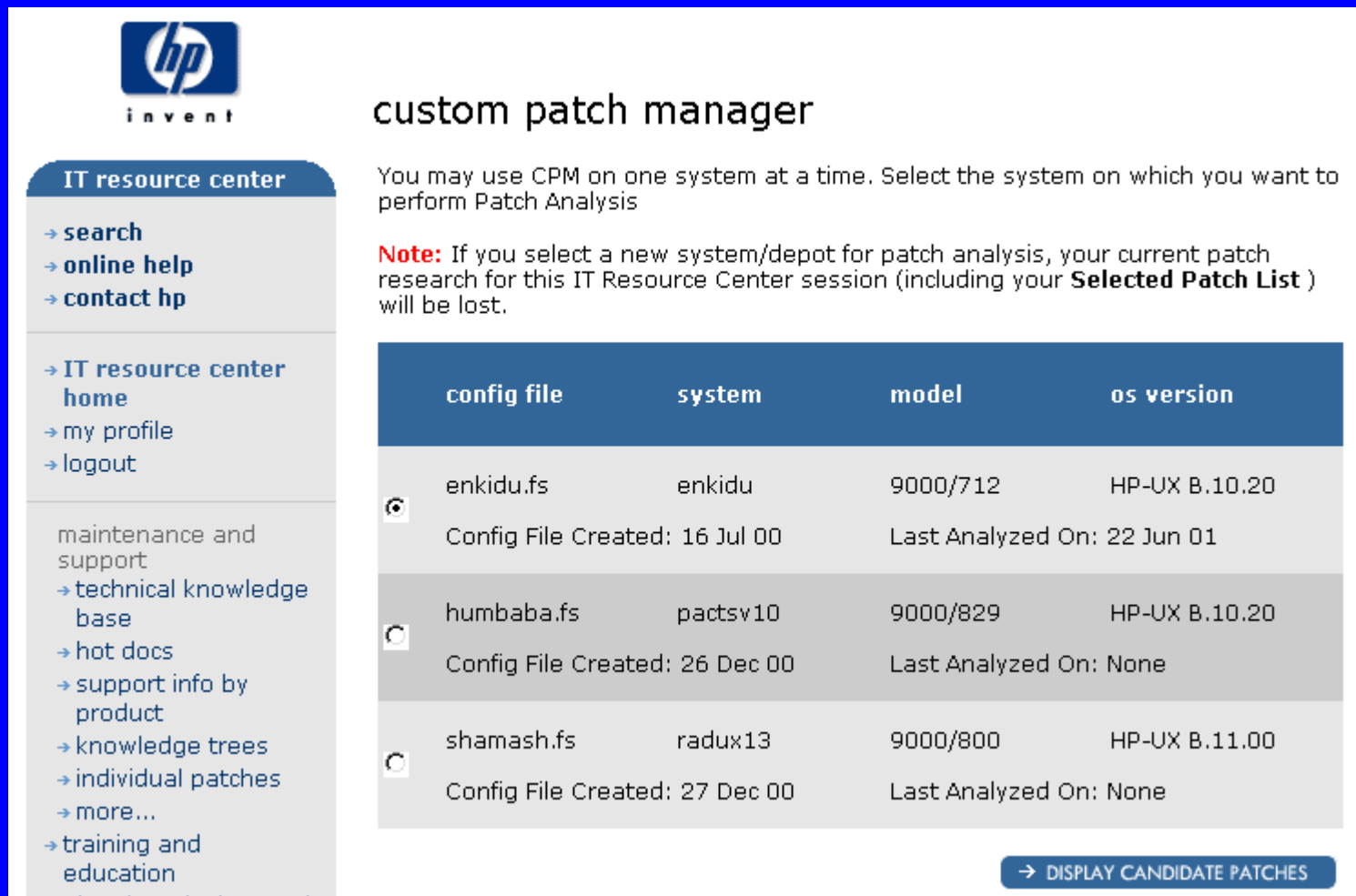
## **to learn how to use cpm, select:**

[Overview](#)

[FAQs](#)

[Detailed Instructions](#)

# CPM Patch Analysis Menu



The screenshot shows the HP Invent Custom Patch Manager interface. On the left is a navigation menu for the IT resource center. The main content area is titled 'custom patch manager' and includes a brief description, a note about session changes, and a table of active configurations. A button at the bottom right allows displaying candidate patches.

**hp invent**

**IT resource center**

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- more...
- training and education

## custom patch manager

You may use CPM on one system at a time. Select the system on which you want to perform Patch Analysis

**Note:** If you select a new system/depot for patch analysis, your current patch research for this IT Resource Center session (including your **Selected Patch List**) will be lost.

	config file	system	model	os version
<input checked="" type="radio"/>	enkidu.fs Config File Created: 16 Jul 00	enkidu	9000/712 Last Analyzed On: 22 Jun 01	HP-UX B.10.20
<input type="radio"/>	humbaba.fs Config File Created: 26 Dec 00	pactsv10	9000/829 Last Analyzed On: None	HP-UX B.10.20
<input type="radio"/>	shamash.fs Config File Created: 27 Dec 00	radux13	9000/800 Last Analyzed On: None	HP-UX B.11.00

→ DISPLAY CANDIDATE PATCHES



# CPM Default Options

## candidate patch filters and category options

All candidate patches applicable to your configuration will be displayed unless you restrict the displayed patch list according to the parameters below. [Tips for setting filters and searching](#) are available.

### patches containing these keywords

Search Mode:

Descriptive Search  Boolean Search

(Please use US ASCII encoding with your Search String)

- Critical patches only**
- Fileset filtering** ( [Fileset Filter Selection](#) )

Include the following Patch Categories:

- Command patches** ( PHCO\_nnnn : *vi(1)* , *ls(1)* , etc.)
- Kernel patches** ( PHKL\_nnnn : OS internals)
- Network patches** ( PHNE\_nnnn : NFS, NIS, etc.)
- Subsystem patches** ( PHSS\_nnnn : VUE, Softbench, etc.)

→ DISPLAY CANDIDATE PATCHES

# CPM Candidate Patch Summary



## custom patch manager

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For the system, **enkidu 9000/712 HP-UX B.10.20** , there are **50** installed, **316** recommended, and **320** latest patches applicable to your configuration. Read [About the Candidate Patch List](#) if you have questions on which patches to use.

The number of applicable patches may seem quite large, but remember your operating system is a complex, integrated system consisting of many parts, including applications, subsystems, network protocols, and system internals. You can select Candidate Patch Filters to reduce the size of your list.

# CPM Display of Candidate Patches (abbreviated)

description	date installed	installed	recommended	latest
s700_800 10.X white paper for year2000 libc changes			<input type="checkbox"/> <a href="#">PHCO_10175(3)</a>	<input type="checkbox"/> <a href="#">PHCO_10175(3)</a>
s700_800 10.X vipw(1M) cumulative patch			<input type="checkbox"/> <a href="#">PHCO_10272(3)</a>	<input type="checkbox"/> <a href="#">PHCO_10272(3)</a>
s700_800 10.20 allow umount(1M) a disabled vxfs snapshot FS			<input type="checkbox"/> <a href="#">PHCO_10295(3)</a>	<input type="checkbox"/> <a href="#">PHCO_10295(3)</a>
s700_800 10.20 cut(1) cumulative patch			<input type="checkbox"/> <a href="#">PHCO_10663(3)</a>	<input type="checkbox"/> <a href="#">PHCO_10663(3)</a>
s700_800 10.20 libHcurses cumulative patch			<input type="checkbox"/> <a href="#">PHCO_10947(3)</a>	<input type="checkbox"/> <a href="#">PHCO_10947(3)</a>

# CPM Select All Options

s700 10.20 Enable MP on systems faster than 214 MHz

000212

[PHKL\\_12513\(3\)](#)

s700 10.20 hpux(1m) boot loader can not boot over PCI LAN

000212

[PHKL\\_10759\(3\)](#)

→ SELECT ALL RECOMMENDED

→ SELECT ALL LATEST

→ DESELECT ALL RECOMMENDED

→ DESELECT ALL LATEST

→ ADD TO SELECTED PATCH LIST

# CPM Selected Patch List

selected patch list enkidu 9000/712 HP-UX B.10.20

	patch name	reboot required	dependencies	size (kbytes)	date posted
<input checked="" type="checkbox"/>	<a href="#">PHCO_7892(3)</a>	No	No	102	960714
<input checked="" type="checkbox"/>	<a href="#">PHCO_8009(3)</a>	No	No	72	960725
<input checked="" type="checkbox"/>	<a href="#">PHCO_8246(3)</a>	No	No	72	960813
<input checked="" type="checkbox"/>	<a href="#">PHCO_8247(3)</a>	No	No	72	960813
<input checked="" type="checkbox"/>	<a href="#">PHCO_8621(3)</a>	No	No	72	960923
<input checked="" type="checkbox"/>	<a href="#">PHCO_8696(3)</a>	No	No	72	960926

# CPM Analyze Option

<input checked="" type="checkbox"/>	<a href="#">PHSS_24104(1)</a>	Yes	No	1157	010612
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→ DESELECT ALL

→ REMOVE

Enter the name of a patch (or multiple patches separated by spaces) and press the *Add* button to have it added to the **Selected Patch List**.

Patch Name:

→ ADD

You currently have 316 patches with a total size of 358662 kbytes.

→ ANALYZE

the **Selected Patch List** for possible conflicts.

Download the patch cleanup utility if it is not currently on your system. For 10.X systems, the file is called [PHCO\\_20824](#) and is 60396 bytes in length. For 11.X systems, the file is called [PHCO\\_22044](#) and is 118380 bytes in length.

[More information on the patch cleanup utility](#) is available.

→ PACKAGE

my **Selected Patch List** for download.

# CPM Patch Conflict Report

→ ANALYZE

the **Selected Patch List** for possible conflicts.

[Tips on conflict resolution](#) are available.

**Structural Conflicts:** [PHKL\\_16897](#)(Selected) and [PHKL\\_14568](#)(Installed) have the following common modules: `/usr/conf/lib/libhp-ux.a`, `/usr/conf/lib/libhp-ux.a`,

[PHKL\\_16928](#)(Selected) and [PHKL\\_14568](#)(Installed) have the following common modules: `/usr/conf/lib/libhp-ux.a`,

[PHKL\\_16959](#)(Selected) and [PHKL\\_14568](#)(Installed) have the following common modules: `/usr/conf/lib/libhp-ux.a`,

[PHKL\\_17109](#)(Selected) and [PHKL\\_14568](#)(Installed) have the following common modules: `/usr/conf/lib/libvxfs_base.a`,

[PHKL\\_17193](#)(Selected) and [PHKL\\_14568](#)(Installed) have the following common modules: `/usr/conf/lib/libhp-ux.a`,

[PHKL\\_17206](#)(Selected) and [PHKL\\_14568](#)(Installed) have the following common modules: `/usr/conf/lib/libvxfs_base.a`,

[PHKL\\_17655](#)(Selected) and [PHKL\\_13868](#)(Installed) have the following common modules: `/usr/conf/lib/libpci.a`,

[PHKL\\_17657](#)(Selected) and [PHKL\\_14568](#)(Installed) have the following common modules: `/usr/conf/lib/libhp-ux.a`,

# CPM Package Patches



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## custom patch manager

### download patch bundle

#### Notes! For this Patch Package

1. You have until **Fri Jul 6 2:45:50 EDT 2001** to download the Patch Package before Custom Patch Manager will remove it.
2. You will need about 253452 kbytes of disk space when the retrieval script downloads these patches. This reflects the amount of space needed for the compressed patches. When they are uncompressed, the size will closely match what is listed in the **Selected Patch List**.

#### download

Your patch retrieval information has been placed into `/outgoing/enkidu.sh` on `us-support2.external.hp.com`. This is a `shar(1)` file. [More information on package format](#) is available. You may **download** the Patch Package now through your browser. Or you may follow the instructions below to download the Patch Package using any `ftp(1)` client.

1. With your local `ftp(1)` client, connect to **us-support2.external.hp.com**
2. login using your IT Resource Center User ID and Password
3. `cd` to `/outgoing/`.
4. `get` `enkidu.sh` (be sure to use binary transfer).



# Conditions to Check Pre- and Post-Patching

- All patches are installed and configured
  - `swlist -l fileset -a state | egrep -v '^#|configured'`
- A kernel can be successfully built
  - `/usr/sbin/sysadm/system_prep -s system`
  - `/usr/sbin/mk_kernel -s system`
- Backup `/var/adm/sw` and run cleanup if additional space is required (pre-patch only)

# Minimize Reboots

- Normally, the swremove of kernel patches will force a reboot.
- Since we are about to install a depot with kernel patches, we would have two reboots, one for swremove and one for swinstall.
- On K- and T-class servers, a reboot can take 45 minutes or more!!!

# Minimize Reboots (continued)

- swremove behavior is controlled by two IPD fileset attributes
  - is\_kernel=true
  - is\_reboot=true
- Query attributes using swlist
  - /usr/sbin/swlist -v PHKL\_20327 \  
| egrep 'is\_kernel|is\_reboot'

## Minimize Reboots (continued)

- Use `swmodify` to set both attributes to false
  - `swmodify -a is_kernel=false \  
-a is_reboot=false PHKL_20327`
- `swremove` will now remove kernel patch filesets without forcing a reboot.

# Minimize Reboots (continued)

- Patch will still exist in currently running kernel
  - `what /stand/vmunix | grep PHKL_20327`
- `swinstall` will build new kernel after depot installation, without removed patches!!!
- Same process applies to any filesets requiring reboot, including Predictive/UX.

# Process Improvements

- Mirror the HP-UX patch depot with wget
  - `ftp://ftp.gnu.org/pub/gnu/wget/`
- Complete mirror will take approximately 12 GB disk space.
- Copying patches from local mirror is many orders of magnitude faster than ftp over the Internet!!!

## Process Improvements (cont'd)

- Build local depots for each server.
- Test each depot before installation and remove any patches that will fail pre-install.
- Keeps depot size smaller for faster installation, especially on older machines.
- Allows all team members to look for consistent report, i.e. “23 of 23 Ready”.

# Configuration Management

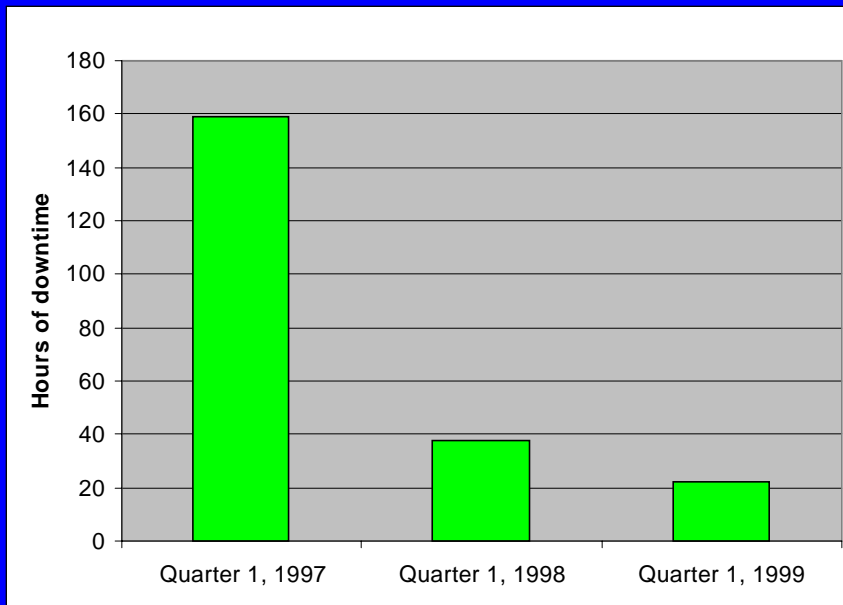
	ts01	ts02	ts03	ts09
PHCO_18269:Patch Description: s700_800 10.20 libc locale methods cumulative patch	PHCO_18269	PHCO_18269	PHCO_18269	PHCO_18269
PHCO_19534:Patch Description: s700_800 10.20 HPDPS cumulative w/ new printer support	PHCO_19534	PHCO_19534	PHCO_19534	PHCO_19534
PHCO_20018:Patch Description: s700_800 10.20 ksh(1) cumulative patch	PHCO_20018	PHCO_20018	PHCO_20018	PHCO_20018
PHCO_20060:Patch Description: s800 10.01-[12]0 envd(1M) cumulative patch	PHCO_20060	PHCO_20060	PHCO_20060	PHCO_20060
PHCO_20098:Patch Description: s700_800 10.20 libc cumulative patch	PHCO_20098	PHCO_20098	PHCO_20098	PHCO_20098
PHCO_20220:Patch Description: s700_800 10.X Year 2000 HP-UX Application Patch Tool	PHCO_20220	PHCO_20220	PHCO_20220	PHCO_20220
PHKL_19167:Patch Description: s800 10.20 LVM cumulative patch	PHKL_19167	PHKL_19167	PHKL_19167	PHKL_19167
PHKL_20063:Patch Description: s800 10.20 stape and tape2 cumulative patch	PHKL_20063	PHKL_20063	PHKL_20063	PHKL_20063
PHKL_20069:Patch Description: s800 10.20 Correction for 4-way MP	PHKL_20069	PHKL_20069	PHKL_20069	PHKL_20069
PHKL_20118:Patch Description: s800 10.20 VxFS FS hang and file I/O performance fix	PHKL_20118	PHKL_20118	PHKL_20118	PHKL_20118
PHKL_20327:Patch Description: s800 10.20 Handle more devices, fixes system hang	PHKL_20327	PHKL_20327	PHKL_20327	PHKL_20327
PHNE_20091:Patch Description: s700_800 10.20 NFS/NIS cumulative megapatch	PHNE_20091	PHNE_20091	PHNE_20091	PHNE_20091
PHSS_14980:Patch Description: s800 10.20 PDCINFO patch version A.02.24	PHSS_14980	PHSS_14980	PHSS_14980	PHSS_14980
PHSS_18695:Patch Description: s700_800 10.X OV OB3.00 patch - CC packet	PHSS_18695	PHSS_18695	PHSS_18695	PHSS_18695
PHSS_18699:Patch Description: s700_800 10.X OV OB3.00 patch - SAP packet	PHSS_18699	PHSS_18699	PHSS_18699	PHSS_18699
PHSS_19009:Patch Description: s700_800 10.X OV OB3.00 patch - EMC packet	PHSS_19009	PHSS_19009	PHSS_19009	PHSS_19009
PHSS_19256:Patch Description: s700_800 10.20 Xserver cumulative patch (ACE 199912)	PHSS_19256	PHSS_19256	PHSS_19256	PHSS_19256
PHSS_19257:Patch Description: s700_800 10.20 3D Common Runtime patch (ACE 199912)	PHSS_19257	PHSS_19257	PHSS_19257	PHSS_19257
PHSS_19258:Patch Description: s700_800 10.20 PEX 5.1/Starbase/Hardcopy Runtime patch	PHSS_19258	PHSS_19258	PHSS_19258	PHSS_19258
PHSS_19259:Patch Description: s700_800 10.20 Starbase Development, Hardcopy Dev patch	PHSS_19259	PHSS_19259	PHSS_19259	PHSS_19259
PHSS_19260:Patch Description: s700_800 10.20 PEX 5.1 Development patch	PHSS_19260	PHSS_19260	PHSS_19260	PHSS_19260
PHSS_19264:Patch Description: s700_800 10.20 OpenGL 1.1 Developers patch	PHSS_19264	PHSS_19264	PHSS_19264	PHSS_19264
PHSS_20006:Patch Description: s800 10.20 STM panic, disk_em,diagmond,tlscsidev	PHSS_20006	PHSS_20006	PHSS_20006	PHSS_20006
PHSS_20083:Patch Description: s700_800 10.X OV OB3.00 patch - CS packet	PHSS_20083	PHSS_20083	PHSS_20083	PHSS_20083
PHSS_20085:Patch Description: s700_800 10.X OV OB3.00 patch - CORE packet	PHSS_20085	PHSS_20085	PHSS_20085	PHSS_20085



# Configuration Management

	ts01	ts02	ts03	ts09	
s700_800 10.20 Cumulative SAM/ObAM Patch	PHCO_19046	PHCO_19046	PHCO_19046	PHCO_19046	PHCO_19046
s700_800 10.20 Euro EBCDIC/PC converter tables (ACE 199912)	PHCO_19780	PHCO_19780	PHCO_19780	PHCO_19780	PHCO_19780
s700_800 10.20 ISO8859-15 converter tables (ACE 199912)	PHCO_19781	PHCO_19781	PHCO_19781	PHCO_19781	PHCO_19781
s700_800 10.20 mksf/insf(1M) cumulative patch (ACE 199912)	PHCO_19783	PHCO_19783	PHCO_19783	PHCO_19783	PHCO_19783
s700_800 10.20 ioinitrc cumulative patch (ACE 199912)	PHCO_19784	PHCO_19784	PHCO_19784	PHCO_19784	PHCO_19784
s700_800 10.20 Year 2000 cumulative cron/at/crontab patch	PHCO_19985	PHCO_19985	PHCO_19985	PHCO_19985	PHCO_19985
s700_800 10.20 ITE_* terminfo files patch	PHCO_20023	PHCO_20023	PHCO_20023	PHCO_20023	PHCO_20023
s700_800 10.20 /sbin/init.d/savecore patch (ACE 199912)	PHCO_20099	PHCO_20099	PHCO_20099	PHCO_20099	PHCO_20099
s700_800 10.X q4 patch version A.11.10c	PHCO_20261	PHCO_20261	PHCO_20261	PHCO_20261	PHCO_20261
s700_800 10.20 fsck_hfs(1M) cumulative patch	PHCO_20330	PHCO_20330	PHCO_20330	PHCO_20330	PHCO_20330
s700_800 10.20 pax(1) cumulative patch	PHCO_20388	PHCO_20388	PHCO_20388	PHCO_20388	PHCO_20388
s700_800 10.20 quota(1) cumulative patch	PHCO_20429	PHCO_20429	PHCO_20429	PHCO_20429	PHCO_20429
s700_800 10.20 libc cumulative patch	PHCO_20441	PHCO_20441	PHCO_20441	PHCO_20441	PHCO_20441
s700_800 10.20 NFS diskless client kernel patch (ACE199912)	PHKL_20126	PHKL_20126	PHKL_20126	PHKL_20126	PHKL_20126
s800 10.20 Advanced VxFS B.10.20 cumulative patch	PHKL_20356	PHKL_20356	PHKL_20356	PHKL_20356	PHKL_20356
s800 10.20 Advanced VxFS B.10.20 cumulative patch	PHKL_20358	PHKL_20358	PHKL_20358	PHKL_20358	PHKL_20358
s800 10.20 VxFS: fix for FS hang and file I/O enhancement	PHKL_20360	PHKL_20360	PHKL_20360	PHKL_20360	PHKL_20360
s800 10.20 LOFS cumulative patch	PHKL_20483	PHKL_20483	PHKL_20483	PHKL_20483	PHKL_20483
s800 10.20 stape and tape2 cumulative patch	PHKL_20509	PHKL_20509	PHKL_20509	PHKL_20509	PHKL_20509
s700_800 10.X NTP timeservices upgrade plus utilities	PHNE_19710	PHNE_19710	PHNE_19710	PHNE_19710	PHNE_19710
s700_800 10.20 HSC 100BT lan cumulative patch			PHNE_19946	PHNE_19946	PHNE_19946
s700_800 10.20 NFS Kernel General Rel & Perf Patch	PHNE_20021	PHNE_20021	PHNE_20021	PHNE_20021	PHNE_20021
s700_800 10.20 HP-VUE to CDE Migration Tools Nov97 Patch				PHSS_12887	PHSS_12887
s700_800 10.20 sched.models cumulative patch (ACE 199912)	PHSS_19789	PHSS_19789	PHSS_19789	PHSS_19789	PHSS_19789
s700_800 10.20 X11R5/Motif1.2 DevKit OCT99 Periodic Patch	PHSS_19961	PHSS_19961	PHSS_19961	PHSS_19961	PHSS_19961
s700_800 10.20 X11R6/Motif1.2 DevKit OCT99 Periodic Patch	PHSS_19962	PHSS_19962	PHSS_19962	PHSS_19962	PHSS_19962
s700_800 10.20 X/Motif Runtime OCT99 Periodic Patch	PHSS_19963	PHSS_19963	PHSS_19963	PHSS_19963	PHSS_19963
s700_800 10.X ld(1) and som tools cumulative patch	PHSS_20058	PHSS_20058	PHSS_20058	PHSS_20058	PHSS_20058

# Making the Business Case



- Document case studies
- Establish metrics
- Keep accurate uptime statistics
- Track change over time
- Persevere!!!