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Installing and Securing Kerberos Key Distribution Center Server on HP-UX 11.11

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1 Introduction

Our current environment utilizes UNIX systems utilizing Kerberos V5 authentication to a Windows 2000 Active Directory environment. This allowed a relatively painless methodology of increasing security for authentication by removing the passwords from NIS maps, while adding little cost to the infrastructure.

Changes in company infrastructure promote further analysis as to the proper hardware platform for the Kerberos KDC (Key Distribution Center). This analysis must include a security component along with an interoperability component.

The platform we are analyzing is the HP-UX 11i. HP recently released a version of a MIT Kerberos V5 KDC. This document will define a step-by-step procedure for installing, configuring, and securing a HP Kerberos KDC.

1.1 Architecture

1.1.1 Hardware

For our hardware we are utilizing a HP 3650 workstation with a single RISC process, 2.1 G of RAM and two 18 GB internal hard disk. Systems backups are an incremental dump to a 10 M tape drive

1.1.2 Software

The system software is HP-UX 11.11, September 2002 release.
The Kerberos KDC software is based on MIT's Systems 5 software.
The SSH and Basilica are both Hp's version.

1.1.3 Network Environment

The assumption is that the Kerberos KDC is on a company wide Wan. The network has a variety of routers and switches with access from the outside only through a firewall.

During the install, the server is connected to an internal network. The Kerberos KDC is not functional without network access.

1.2 Controls Review

1.2.1 Physical Security

The master KDC for each domain will be in a Class A computer room. The Master KDCs for each realm are the only systems that are allowed administration updates.

The class A computer rooms have very limited access. Only mainframe and server administrators with a valid hardware maintenance need are allowed access to the class A compute room. Access is picture ID card controlled with a scanner at the gate.

Fire safety for the systems is provided by Halogen Fire Suppression system. The fire detection alarms detect the presence of fire, sound an alarm, and trigger the halogen system. The halogen system damps down the fire by the replacement of oxygen with halogen.

Class A computer rooms are very tightly monitored for proper cooling. All equipment is on a raised floor with power and wiring running underneath the systems. The class A computer room can stand extremely high wind velocities.

This class A computer room has a disaster recovery Class A computer room in another building. If a backup server is provided it is placed in the other Class A computer room. If not, the tape backups are placed in the other class A room.

1.2.2 Risk Analysis

The Kerberos KDC is a very high-risk system. This system contains all the names and passwords for your Kerberos realm. Failover is to a Slave KDC, so the users will still be able to login if the Master KDC. But if hacked all user ids are now available.

For this reason this is a single application system. It is only a Kerberos KDC. It handles key distribution and authentication and that is all. The only logins that need to be allowed onto the system are the system administrators and the Kerberos administrators.

2 Step-by-Step

2.1 Operating System

The HP operating system is installed from either HP distributed media or from a HP-UX Ignite Server. In our environment the servers are installed from CDROM to meet the unique needs of the server environments. So, the HP-UX 11i base operating system disk 1 of 2 is placed in the CDROM drive.

The HP-UX 11i installation disk group the filesets into "operating environment" bundles The bundle for the base Operating system is "HP-UX 11i MTOE", a 64 bit minimal technical operating environment.

2.1.1. Installation - Step-by-Step

When booting the system "hit any key", at the prompt run ">sea" to find your cdrom, then boot the path or path number. On these systems boot P0, which is the SCSI 2.0 device. When it asks to "Interact with the IPL" answer N. The system then proceeds to the first install screen questions the language, enter 26 for English.

The next screen is a "Welcome to the HP-UX Installation".

Select the first option [Install HP-UX] and return.

Next is "User Interface and Media Options"

Select "Media with Network Enabled"

Select "Guided"

It is quicker to configure the system with Network enabled then at the end of the Media enabled installation without networking. The Guided is adequate since our partitioning is not unique.

Network Configuration

The network configuration options required the installer to be prepared with the system hostname, IP, gateway, and subnet.

Install HP-UX Wizard: Select an Overall System Configuration

Select HP-UX B.11.11

Install HP-UX Wizard: Select a System Environment:

Select HP-UX 11i MTOE – 64 bit

The Minimal Technical Operating Environment includes the network item. To install the Base Operating system, additional software would be needed; neither CDE nor Xwindows is included in the Base Operating system install. If the system supports 64 bit, that is the options given. If it is an older system than a 32 bit option for each is also given.

Install HP-UX Wizard: Select a Root disk
Select the highlighted disk. In this Case it is a HP18g.2 10/0/15/1.5.0
Install HP-UX Wizard; specify the amount of Root Swap
Hit return, so root swap is now 4096 while physical memory is 2048.
Install HP-UX Wizard: Select a File System Type
Select the default Logical Volume Manager (Manager) with VxFs
Install HP-UX Wizard: Specify Root disk
Number available 2, number of disk 1
Use Striping <N>
Install HP-UX Wizard: Select Language
Yes, select English C
If you utilized set_NULL_Locale the Language variable will return NULL instead of English.
Install HP-UX Wizard: Select Additional Software
Tab, Tab, return to accept
Looking at All software installs. They cannot be deselected due to dependencies. They are:
Bundle 11i required patch Bundle Feb 2002
Base VxVM Required due to volume manager selection
Feature 11-11 Feature enabled for HP-UX 11i Sept 2002
FDDI-00
Fiber-Channel-00
GigEth-00
GigEth-01
HP-UX Base Aux
HW Enable 11i–Hardware Enable patch for HP-UX11i for Sept 02
Online Diagnostic: HP-UX 11.11. Support
Raid-00 PCI Raid
The only exception is the General Patches, they can be deselected.
Install HP-UX Wizard: Preinstall Disk Info
Tab, Tab, next
Install HP-UX Wizard: System Summary
Tab, Tab, Return

When the system responds to install cdrom 2, swap Install cdrom 1 for cdrom 2.

The first disk on the server is now the root disk. Appendix A shows step-by-step directions for mirroring disk 1 to disk 2 with 2-18 gig disks. I will then mirror disk1 to disk2. This allows a bootable disk with my most recent updates for the KDC.

Note, it we did a minimal install we would not have our Xwindows and CDE system. We are leaving those on the system for ease of use for the Kerberos administrators. The remote Kerberos administration tool utilizes a GUI interface.

2.1.2 Partitions

There are many methodologies for determining the disk partitioning. Root requires enough space for the base operating system plus updates. Var is frequently setup as a stand alond partition. This way if it grows past its bounds due to excessive logging or poor log maintenance it will not take down your system by filling root. If you want to save your core files, you need root to be twice the size of memory.

The standard partitioning for the servers is the same across all applications. Disk1 is a dedicated root partition. This allows for a consistent installation on any system with a root disk greater than 4 Gig.

The Standard partitions with the Guided installation are listed below. If a different partition table is preferred, an advanced installation is recommended so the partitions may be modified at installation. Some of the 18Gig disk is not portioned, but it can be as needed at a later date.

bdf

Filesystem	kbytes	used	avail	%used	Mounted on
/dev/vg00/lvol3	204800	75776	128040	37%	/
/dev/vg00/lvol1	295024	27680	237840	10%	/stand
/dev/vg00/lvol8	4706304	145368	4525856	3%	/var
/dev/vg00/lvol7	1736704	1137896	594136	66%	/usr
/dev/vg00/lvol4	204800	2416	200872	1%	/tmp
/dev/vg00/lvol6	839680	538462	298904	64%	/opt
/dev/vg00/lvol5	20480	2280	18072	11%	/home

2.1.3 Removal of any unnecessary Software

NFS has had many security issues. All of the NFS filesets can be removed except for NFS-CORE NFS-KRN and NFS-SHLIBS.

Run swremove interactively: swremove –i NFS

```
#  swlist -l product | grep NFS
  NFS              B.11.11       ONC/NFS; Network-File System, Information Services ,Utilities
```

Nothing to remove, running swremove –I NFS results in dependency error s from the NFS-CORE .

Also remove /etc/auto_home, /etc/auto_master,autopush, /etc/dfs/dfstab. Check for any other /etc/auto* files, frequently there are sit specific files called from the master. NFS will not be run on this server.

```
# more /etc/auto_parms.log
Jun 21 07:18:26: DHCP is disabled for: lan0
# ls -l /etc/auto
/etc/auto not found
# ls -l /etc/aut*
-rw-r--r--   1 root       root          49 Jun 21 09:08 /etc/auto_master
-rw-r--r--   1 root       root          44 Jun 21 09:18 /etc/auto_parms.log
# rm /etc/auto_master
# cat /etc/dfs/dfstab

cat: Cannot open /etc/dfs/dfstab: No such file or directory

#
```

There are a number of other **startup scripts** that may be removed from the system. They are unnecessary at best and a potential security risk.
In startup directory /sbin/rc2.d remove the following Startups:

S006hpfc	K100dtlogin.rc
S30ptydaemon	K200tpc.rc
S370named	K900nfs.serve

S400 nfs.core
S406nisplus.server
S408nis plus.client
S410 nis.server
S420nis.client
S430nfs.client
S440comsec
S490mrouted
S510gated
S522ppp
S530rwhod
S540sendmail
S560Snmpmaster
S565SnmpHPunixh
S565SnmpMib2
S565SnmpTrpDst
S570dce
S590Rpcd
S600iforls
S620xfs
S630vt
S710hparray
S7201p
S740supportinfo
S770audio
S780slsd
S870swagentd
S900hpfcms

```
# ls S4*
S400nfs.core        S410nis.server      S440comsec
S406nisplus.server  S420nis.client      S462maclan
S408nisplus.client  S430nfs.client      S490mrouted
# pwd
/sbin/rc2.d
# mv S462maclan temp
# rm S4*
# mv temp S462mclan
# ls S5*
S500inetd       S525rarpd       S550ddfa        S565SnmpMib2    S590Rpcd
S510gated       S530rwhod       S560SnmpMaster  S565SnmpTrpDst
S520rdpd        S535inetsvcs    S565OspfMib     S570dce
S522ppp         S540sendmail    S565SnmpHpunix  S576SnmpFddi4
# rm S510*
# rm S522*
# rm S530*
# rm S540*
# rm S560*
# rm S565*
# rm S570
rm: S570 non-existent
# rm S590
…. Continue removal till through above list.
```

Remove the software-programming environment, start swremove interactively and un-select **ProgSupport.C-INC**. This fileset is necessary for kernel rebuilds, with its removal a kernel recreation is not possible.

```
Swremove –I CPS Perl5 ProgSupport SourceControl Jul-lib \
KernDevKit Networking.NET-PRG InternetSrvcs.INETSVCS-INC \
Networking.LAN-PRG
```

example: swremove –I ProgSupport.C-INC
Watch for depencies, to remove ProgSupport.C, it was necessary to remove GraphisSbaseDK If you can't resolve dependencies, may want to unselect enforce dependencies under options for certain packages.

Many of the **serial data communication** products may be removed

```
Swremove UUCP SystemComm Terminal Mngr NonHP-Terminfo KeyShell \
Curses-Color
```

Remove the **Mail utility** since this is not a system for reading or sending mail and it is frequently a security hole: Swremove Mail Utilities

```
swlist -l product | grep Mail
  MailUtilities          B.11.11        User mail agents and related tools
# swremove MailUtilities

=======  06/24/03 07:39:24 EDT  BEGIN swremove SESSION
        (non-interactive) (jobid=sic76048.fsic.ford.com-0012)

      * Session started for user "root@sic76048.fsic.ford.com".

      * Beginning Selection
      * Target connection succeeded for "sic76048.fsic.ford.com:/".
      * Software selections:
          MailUtilities.MAIL-ENG-A-MAN,l=/,r=B.11.11,a=HP-
UX_B.11.11_32/64,v=HP,fr=B.11.11,fa=HP-UX_B.11.11_32/64
.
```

2.2 File Permissions

Remove unneeded **Set-ID** Programs.
Many programs have Set-ID programs there are not needed. Most servers do not have end users running applications, if so they are not needed.

To obtain a list of all files with the set-uid or set-gid bit execute
find / -perm -4000 -o -perm -2000 –print

```
/etc/wall  /etc/sysdef  /etc/lanscan  /usr/bin/iostat  /usr/bin/netstat  /usr/bin/vmstat
/usr/bin/ipcs  /usr/bin/top  /usr/bin/uptime  /usr/bin/w  /usr/bin/strdb  /usr/bin/X11/xfs
/usr/bin/elm /usr/bin/stmkfont /usr/sbin/wall  /usr/sbin/lanscan  /usr/sbin/sysdef
/usr/lbin/fs/vxfs/diskusg /usr/lbin/fs/hfs/diskusg /usr/lbin/rmmail
/usr/contrib/bin/X11/xload/usr/dt/bin/dtmail   /usr/dt/bin/dtmailpr etc
# ls -l /usr/bin/w
-r-xr-sr-x   2 bin        sys          16384 Nov 14  2000 /usr/bin/w
#So remove the set-uid and set-gid and add the bit back to the files that require it.

#  find / -perm -4000 -type f -exec chmod u-s {} \;
# find /  -perm -2000 -type f -exec chmod g-s {} \;[1]
ls # -l /usr/bin/w
-r-xr-xr-x   2 bin        sys          16384 Nov 14  2000 /usr/bin/w
# ls -l /usr/bin/su
-r-xr-xr-x   1 root       bin          24576 Nov 14  2000 /usr/bin/su

# chmod u+s /usr/bin/su
# chmod u+s /usr/bin/passwd
# ls -l /usr/bin/su
-r-sr-xr-x   1 root       bin          24576 Nov 14  2000
```

[1] Pipkin, page 270

2.3 Account Security

2.3.1 Remove unused system accounts.

This can be a potential login for a hacker. Default users could include uucp,lp, nuuccp, hpdb,www, and daemon. Default groups can include lp, nuucp, and daemon.
Utilize SAM to cleanly remove the accounts or edit /etc/passwd and run pwconv if it is a trusted host or if the shadow password package is installed.

2.3.2 Remove unused user accounts.

Utilize SAM to remove the unused user accounts. The only users that will login to this server is a system administrator or a Kerberos administrator. No end user will login to this server.

2.3.3 Disable pseudo-accounts

They should be configured so no user can gain access with the account, so disable them. The NP in the password field guarantees no password will HASH fro login. They should also have an invalid shell program and invalid home directory. This will disable remote connections.

Only HP the needed pseudo-accounts are: bin, sys, and adm
Bin:*2:2: NP:/bin/false:/dev/null
Sys:*:2:2:NP:/bin/false:/dev/null
Adm:*:2:2:NP:/bin/false:/dev/null[2]

2.3.4 Root's Home

Move root's home from root and build a new home directory, this will prevent root accidentally placing files in the root directory.
Mkdir /root
Chown root:root /root
Chmod 700 /root
Mv /.profile /root
Pwconv(Only needed if in trusted mode)

```
# cat /etc/passwd
root:qqlSWA3/aNuRY:0:3::/root:/sbin/sh
bin:*:2:2:NO LOGIN:/usr/bin:/sbin/sh
sys:*:3:3:NO LOGIN:/:
adm:*:4:4:NO LOGIN:/var/adm:/sbin/sh
nuucp:*:11:11::/var/spool/uucppublic:/usr/lbin/uucp/uucico
nobody:*:-2:-2::/:
webadmin:*:40:1::/usr/obam/server/nologindir:/usr/bin/false
user1:NP:101:20:,,,:/home/user1:/usr/bin/sh
user2:7NP:,,,:/home/user2:/usr/bin/sh
user3:8qjllROWJ5BCU:103:20:,,,:/home/user3:/usr/bin/sh
+:*:-2:-2::/:
#
```

[2] Pipkin, Page 274

2.4 System Access

2.4.1 Console Root Login

Restrict root login to the console. So the entry in /etc/securetty place console, and set the permissions

Echo console > /etc/securetty
chown bin:bin /etc/securetty
Chmod 400 /etc/securetty

2.4.2 Hosts.equiv and .rhost

Remove hosts.equiv and rhosts. No system is trusted enough to be allowd access without a password. In our Kerberos environment if the user already has a credential from a previous login, no password is required after the initial authentication.

2.5 Internet Services

As a Kerberos server only the administrators will be logging onto the system. They will utilize the local password file for their uid, gid, etc, but NP will be in place of their password. They will utilize their Kerberos password stored in the KDC database. They must do a kerberized login as themselves from a remote location or they may login as root from the console.

2.5.1 Cleanup Inetd.conf

Remove all unnecessary entries. For the server only we will just retain the kerberized SSH. The other kerberized services are secure, but for the KDC we want to minimize access point. Utilizing kerberized SSH provides both authentication security through Kerberos and encryption.

Run either "kill –HUP #inetd" on the inetd service or reboot the system. This is necessary for inetd.conf to be reread.

2.5.2 Configure Pam.conf

Remove all unnecessary entries. In our scenario, end user authentication will only be through the Kerberos module. The user will still need to be in /etc/passwd for authorization, the user's uid/gid is in /etc/passwd, but no authentications will be done through the password file. All user passwords will be NP.

The exception is root. Root must retain a local password on the system for system administration. The other negative feature of root in a Kerberos KDC is root is then the effectively the same login across all systems within the Kerberos Realm.

With sufficient on the Pam-Kerberos module , the Kerberos login will always be tried first. If it fails it will fall through to the standard Pam-unix module. If it succeeds it will be sufficient with no other authentication required.

The default pam.conf authentication sections of pam.conf is below:

```
# vi /etc/pam.conf
# PAM configuration
# Authentication management
#
login    auth required        /usr/lib/security/libpam_unix.1
su       auth required        /usr/lib/security/libpam_unix.1
dtlogin  auth required        /usr/lib/security/libpam_unix.1
dtaction auth required        /usr/lib/security/libpam_unix.1
ftp      auth required        /usr/lib/security/libpam_unix.1
OTHER        auth required        /usr/lib/security/libpam_unix.1
#
```

Note that the standard pam.conf utilized the standard pam_unix module, which utilizes passwd, NIS, or NIS+ for UNIX authentication. OTHER is also an available access utilizing standard UNIX authentication.

With our new pam.conf authentication module below. Rlogin and ftp have been removed since we have a kerberized SSH on the system. Login and dtlogin are still available in pam.conf for console logins.

The libpam_krb5 module is listed as sufficient so access to the system will attempt a kerberized authentication, if this fails it will fall through to the required UNIX login. The backup UNIX login is for system accounts that cannot be kerberized. Some local system accounts cannot be placed in the Kerberos KDC.

...

Pam.conf auth section

```
login          auth sufficient /usr/lib/security/libpam_krb5.1 forwardable renewable=7d krb_prompt
login          auth required   /usr/lib/security/libpam_unix.1 use_first_pass
#
dtlogin        auth sufficient /usr/lib/security/libpam_krb5.1 forwardable renewable=7d krb_prompt
dtlogin        auth required   /usr/lib/security/libpam_unix.1 use_first_pass
#
dtsession      auth sufficient /usr/lib/security/libpam_krb5.1 forwardable renewable=7d
krb_prompt
dtsession      auth required   /usr/lib/security/libpam_unix.1 use_first_pass
#
su             auth sufficient /usr/lib/security/libpam_krb5.1 forwardable renewable=7d krb_prompt
su             auth required   /usr/lib/security/libpam_unix.1 use_first_pass
#
ssh            auth sufficient /usr/lib/security/libpam_krb5.1 forwardable renewable=7d krb_prompt
ssh            auth required   /usr/lib/security/libpam_unix.1 use_first_pass
#
```

Pam_updb.conf

A rather unique Hp configuration file. This file says to ignore the particular user for that module. This works great when you have a user, such as root, that cannot be in the Kerberos KDC and must stay local on the system. The pam_updb module allows root to ignore the Kerberos authentication module and drop to the next authentication module, the pam_unix module, which will rely on /etc/passwd.

2.6 Miscellaneous Daemons

2.6.1 Disable SNMP daemons

Due to the potential of a hacker accessing system information through SNMP, SNMP(Simple Network Management Protocol) is a potential hole.
On HP-UX many of the filesets are dependent on SNMP, therefore you can only disable the service, not remove it.
In /etc/rc.config.d/SnmpMaster

SNMP_HPUNIX_START=0
IN /etc/rc.clonfi.d/SnmpMaster
SNMP_MASTER_START=0
In /etc/rc.config.d/SnmpMib2
SNMP_MIB2_START=0
In /etc/rc.config.d/SnmpTrpDst
SNMP_TRAPDEST_START=0[3]

2.6.2 Disable swagentd Daemon

The swagentd script does need to run as part of the boot-up start sequence. When it is run from S120swconfig it will complete any cleanup work from an install which required a reboot, such as remove the files listed in /var/adm/sw/cleanupfile.

But the startup file, /etc/rc2.d/S870 swagentd should be removed to keep the daemon from running. [4]

2.6.3 Disable Password and group caching daemon.

HP_UX had introduced a password and group-caching daemon, pwgrd, to improve the performance of accessing user and group IDS. It utilized a UNIX domain socket for client request, the daemons should be disabled. Edit the following line in the file /etc/rc.config.d/pwgr: PWGR=0

The sockets used by the password and group-caching daemon should be removed
Rm /var/spool/pwgr/*
Rm /var/spool/sockets/pwgr/*[5]

[3] Pipkin, Page 273
[4] Pipkin, Page 274

2.6.4 Disable pty Daemon

The ptydaemon is a carry-over from the proprietary networking days at HP. It supports vt and dscopy commands. Vt is for a MAC level terminal connection and dscopy is no longer supported. So change PTYDAEMON_START=0 [6]

2.6.5 Disable RPC services

RPC services are the basis for NIS and NFS. On our Kerberos KDC server there is no reason to run either NIS or NFS. ON HP-UX 11i rpcbind provide the RPC services. Rpcbind is started from the nfs.core script. Setting their permission to 0 will assure no accidental startups.

```
Chmod - /sbin/rc1.d/K600nfs.core
Chmod 0 /sbin/rc2.d/S400nfs.core
Chmod 0 /usr/sbin/rpcbind
```

2.7 Log files

The majority of the log files are in the /var/adm directory. Log files for a specific product are stored in /var/adm/$product.

Any errors from the installs will be in /var/adm/sw/swagent.log. Verify that all installations went smoothly.

The btmp logfile contains bad login attempts. The login process, rather than syslogd writes to the btmp file. Only root can read and write it. The bmp file contains two entries for every bad login attempt(327,wong)

The /var/adm/sulog log file records all successful and unsuccessful use of su

The syslog daemon,syslogd accepts messages from programs and determines where to log the informations based on syslog.conf.

```
cat /etc/syslog.conf
# @(#)B.11.11_LR
#
# syslogd configuration file.
#
# See syslogd(1M) for information about the format of this file.
#
mail.debug              /var/adm/syslog/mail.log
*.info;mail.none        /var/adm/syslog/syslog.log
*.alert                 /dev/console
*.alert                 root
*.emerg                 *
#
```

[5] Pipkin, Page 276
[6] Pipkin, Page 274

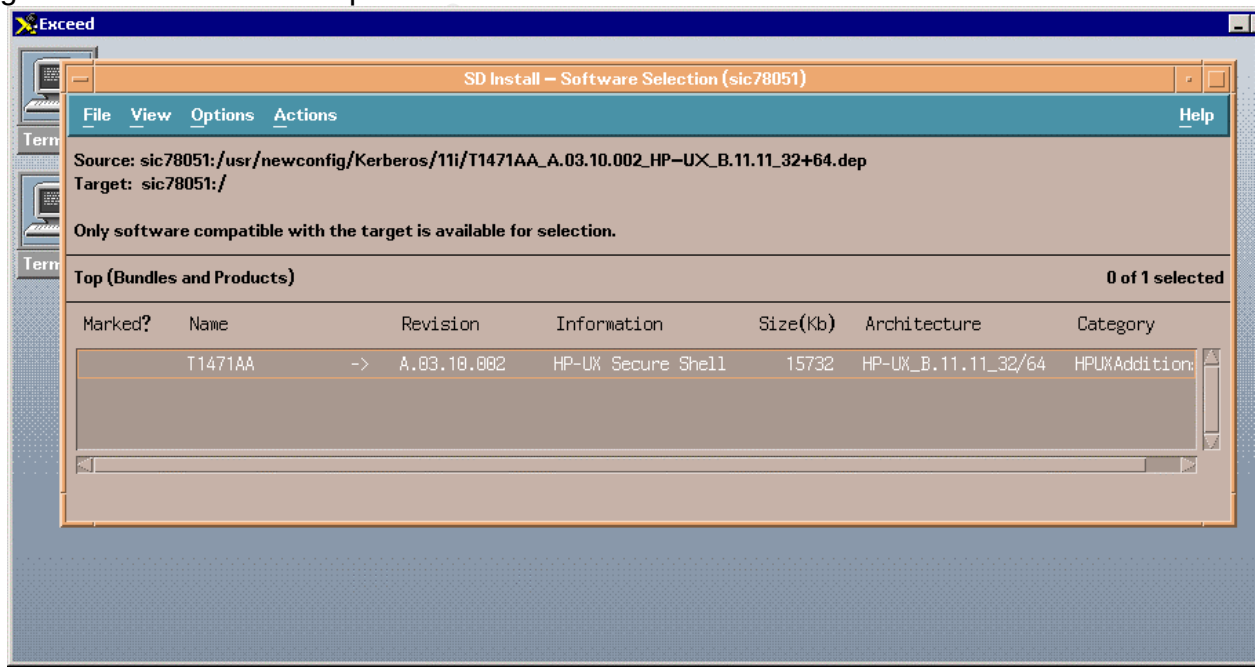
The system logger, syslog, records kernel, system, and application log messages. It also will accept messages from other systems on the network. This feature should be disable so that other systems cannot utilize allocated resources. Change syslogd startups to include the –D option to avoid this, /usr/bin/syslogd -DN

Non-privilege users are not allowed to change the ownership of files. HP-UX restricts the access to changing ownership through the privileged group mechanism. By default the "CHOWN" privilege is a global privilege and applies to all groups. The file /etc/privgroup should be created with permissions set at 400 and containing –n. This will disable any privileged group[7].

More verbage can be associated with the pam.conf logging. Simply add
In /etc/pam_debug, put "1" through "4" as the only character in the file. "1" for basic logging, "4" for extensive verbage. Add "debug.* /var/adm/messages" to /etc/syslog.conf, and restart syslogd. Once you've done that, all PAM logins will be generating traces into syslog

2.8 SSH

HP-SSH is Open SSH Secure Shell. HP made it available in their Sept 2002 release. This is a compiled, supported version with no other packages required. It provides a ssh_keyen for manually generating keys. It also can utilize KerberosV5 authentication, utilizing the KDC for the user's password.



[7] Pipkin, Page 276:

hostname

sic78051

ssh sic78051

The authenticity of host 'host (11.11.78.51)' can't be established.

RSA key fingerprint is 0e:e9:04:ce:a6:33:55:ae:46:66:4d:24:af:1a:90:c8.

Are you sure you want to continue connecting (yes/no)? yes

Warning: Permanently added 'sic78051' (RSA) to the list of known hosts.

root@sic78051's password:

Last login: Sun Jun 22 17:58:04 2003 from sic78051

(c)Copyright 1983-2000 Hewlett-Packard Co., All Rights Reserved.

Value of TERM has been set to "dtterm".
WARNING: YOU ARE SUPERUSER !
ssh sic76048

2.9 Security Patches

Check the vendor patch list. Only apply the patches necessary for your hardware or software. The Support Plus CD contains the General Release patches. This is the accumulation of the patches that have been released since the last release. Mount the support plus CD and use swinstall.

One advantage of patches versus the code as part of the images is the ability to remove the patches. Rollback copies of the patch files are saved in /var/adm/sw/save. Once you are satisfied with the patch you can commit the patches or patches with swmodify –x patch_commit=true '*.*'. Once they are committed they are no longer removable with swremove..

If you have a good Perl installation and want a complete security patch check run the patch check script available for HP-UX. "security_patch_check: must have access to a catalog of patches. To download the patch catalog from HP security_patch_check –r (Once security_patch_check has access to a security patch catalog, it will create a list of the patches, which are applicable to your file system and not install.

Appendix B has a trace from running security_patch_check. Some of the patches are not on the system, due to the fact that we already removed the service. With the application of any kernel patch, communications service, DCE or Kerberos file your Kerberos test matrix should be rerun

The latest security patches are available from ftp://ftp.itrc.hp.com/hp-ux patches.
To track known the know vulnerabilities and solutions use the HP Security Archive on the IT Resource Center Web site.

2.10 Convert to a trusted system

This implements "C2" level security. This includes password shadowing and system auditing. Run:

/usr/lbin/tsconvert
password root

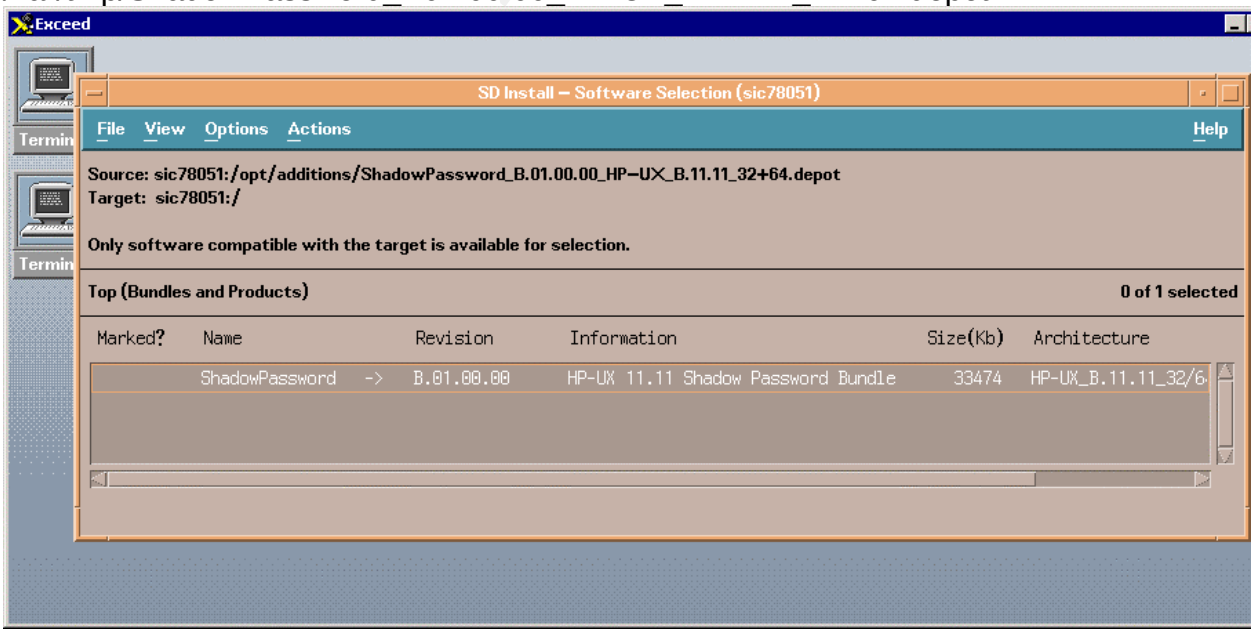
When a trusted system is implemented, the passwords are removed from /etc/passwd and placed in a password shadow file. This file is readable only by root.

Other pluses of the trusted systems are:

- Auditing
- Terminal restrictions
- Serial port restrictions
- Access time restrictions
- Password generation
- Password aging

One of the negatives of the trusted systems is the login restrictions. If you fail to login as root 3 x, due to a bad password, the administrator is now locked out of the system as toot. Recovery must be done by booting to single user mode.

If the system cannot be converted to a trusted system, the administrator should at minimal install HP's shadow password package, this will pull the passwd from /etc/passwd.. To install this package swinstall –s /var/tmp/ShadowPassword_B01.00.00_HP-UX_B.11.11_21+64.depot



2.11 System Hardening Tool - Bastille

HP-UX Bastille is a security hardening/lockdown tool. It provides customized lockdown on ad system by systems. Hp is participating with the open source community by providing HP-UX Bastille.

HP-UX Bastille configures daemons and system setting to increase security, turns off unneeded services, creates chroot jails, configures Security PatchCheck to run automatically, configures an IPFilter-based firewall. The "revert features" returns the security configuration to the state before Bastille was run.

Bastille can be ran interactively through the user interface as seen in Appendix C. It performs the actions in can perform and produces a "to do" list of the manual steps that are needed.

This configuration can be saved to be used non-interactively on other systems.

Before installing Bastille you must have a good version of Perl. The HP package of Bastille, B6849AA version 2.01, requires Perl 5.6.1 e or higher. It is also available for download from HP's software depot, www.software.hp.com. Verify your current version with Perl –v.

When running Bastille, my configuration is "no" for "running the security patch check" . We do not allow automated scripts through the firewall. Patch check will be manually ran, after downloading the most recent catalogue file to another systems. Also, the configuration does not disable the Xwindows ability, since the system administrator may have to login through his/her portable with Exceeds.

```
# swlist -l product | grep Sec
 Bastille                B.02.00.05     HP-UX Security Hardening Tool
SecPatchChk                 B.01.01        HP-UX Security Check Tools
```

```
# /opt/sec_mgmt/bastille/bin/bastille

/opt/sec_mgmt/bastille/bin/bastille
Using Tk user interface module.
Only displaying questions relevant to the current configuration.
Could not open config: /etc/opt/sec_mgmt/bastille/config, defaults used.
Entering Critical Code Execution.
Bastille has disabled keyboard interrupts.
Bastille is now locking down your system in accordance with your
answers in the "config" file.  Please be patient as some modules
may take a number of minutes, depending on the speed of your machine.
Executing File Permissions Specific Configuration
Executing Account Security Specific Configuration
Executing Inetd Specific Configuration
Executing Daemon Specific Configuration
Executing Sendmail Specific Configuration
Executing DNS Specific Configuration
Executing FTP Specific Configuration
Executing HP-UX Specific Configuration


Executing HP-UX's Security Patch Check Configuration

Please check
/var/opt/sec_mgmt/bastille/TODO.txt
for further instructions on how to secure yoursystem
```

2.12 Kerberos Key Distribution Center

2.12.1 Configure NTP

The Network Time Protocol(NTP) package is bundled with HP_UX. The xntpd daemon is responsible for synchronization of time. The daemon utilized the configuration file /etc/ntp.conf

NTP keeps track of any drift in the local systems clock and synchronized itself. This is necessary for Kerberos, since the packets have a maximum of 5 minutes skew allowed to avoid spoofing.

Check that xntpd is running and that /etc/ntp.conf points to a local router/switch. It then syncs up with the primary DNS server.
()Copyright 1983-1997 Hewlett-Packard Co., All Rights Reserved.

```
# ps -elf | grep ntp
 41 S     root  1000     1  0 120 20        48d5b500   95 400003ffffff0000  Jun 18  ?         0:12
/usr/sbin/xntpd

# cat /etc/ntp.conf
server sic.example.com
```

2.12.2 Installation

The Kerberos server installation is a stand HP-UX 11.11 package, and can be installed with swinstall. All four Kerberos packages must be installed including the Kerberos client package.

They are:

KRB-Support	B.11.11	Kerberos Support for HP-UX and DCE
KRB5-Client	B.11.11	Kerberos V5 Client Version 1.0
KRB5-Server	B.11.11.02	Kerberos Server Daemons Version 2.0
KRB5-Srv-Admin	B.11.11.02	Kerberos V5 Server Admin Utilities Version 2.0

2.1.3 Configure with krbsetup

Hp now provides its own configuration script.

To configure the master server you must have the following information:

Realm name = ?? (KERBEROS.COM)
DNS domain name = ?? (central.com)
Master KDC = ?? (This server.central.com)
Admin principal = kws/admin

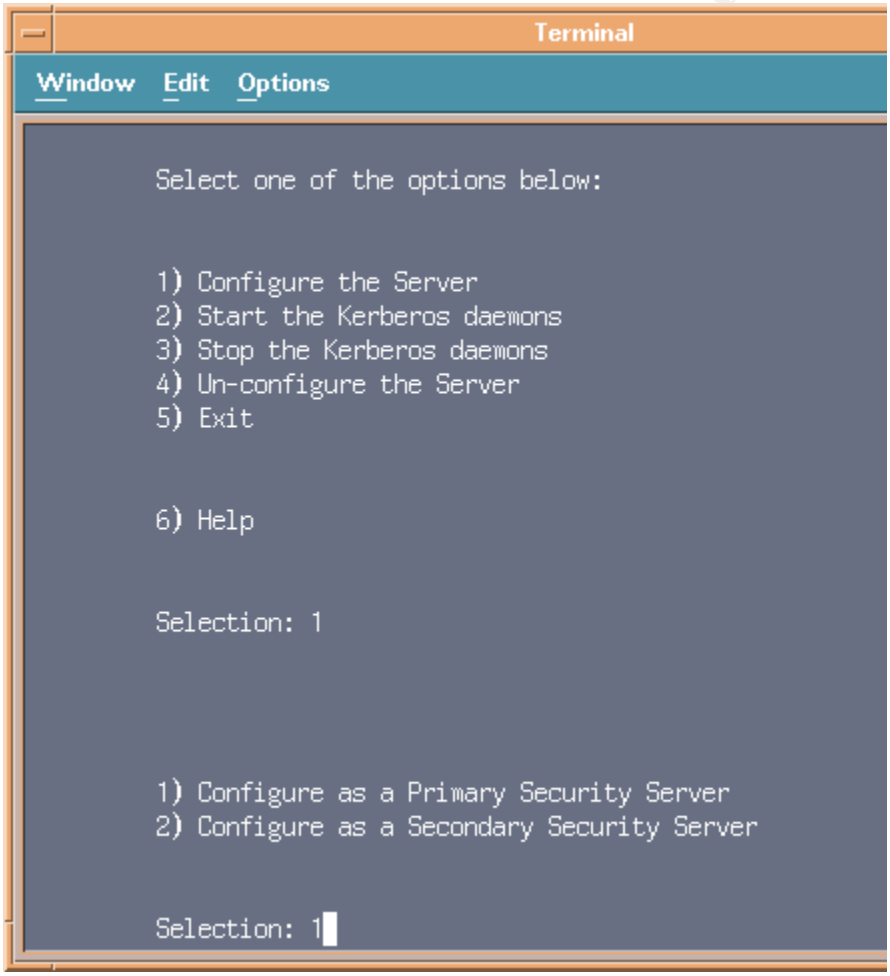
The server must have its own fully qualified domain name in /etc/hosts.

The Security Sever files that require Configuration are:

Krb.conf: Describes the default realm of the primary server and the tools of each server for that realm.
Krb.realms: provides a map for the domain name to the realm name
Admin_acl_file: Controls the administrative permissions for administrators
Password.policy Controls password policy for the entire secure network
Kpropd.ini: Contain the propogation information.

A tool name krbsetup has been provided by HP to auto configure the Kerberos Server. Using this tool you can configure, unconfigure, start, and stop the Kerberos Key Distribution Center(KDC) and the kadmind daemons. This tool is ran from /opt/krb5/sbin..

Krbsetup will create your krb.conf and krb.realms files and placed then in the /opt/krb5 directory. This tool allow you to specify whether the Kerberos server is a Primary or secondary server, customize your realm name, allows the creation of a stash file, and allows you to specify the encryption type.



```
# cd /etc/rc.config.d
#
# cat krbsrv
#!/sbin/sh -p
#           The Kerberos server maintains this file
#           to reflect the current Kerberos configuration of this system.
# Config Flags for Kerberos Server
# KDC == 1 Indicates that the kdcd has to be started
# ADMD == 1 Indicates that the kadmind has to be started
KDC=1
ADMD=1
#
```

The Kerberos daemons may be started with /stin/init.d/krbsrv start or by typing /opt/krb5/sbin/kdcd and /opt/krb5/sbin/kadmid. The configurations script has placed a Kerberos startup script in /etc/rc.config.d so Kerberos restarts at boot up.

```
ls -l *kr*
lrwxr-xr-x   1 bin        bin           19 May 21 18:54 S395krbsrv -> /sbin/init.d/krbsrv
# pwd
/sbin/rc2.d
#
```

2.13.3 Manual Configuration

Looking at the files after running krbsetup, it configured the system cleanly. This is a walk through as to what the configuration was, skip over if this is uneccessary informations, since krbsetup already configured cleanly.

Krb.conf defines the realm and the Master KDC; while krb.realm associates the DNS domain to a Kerberos Realm.

```
# cd /opt/krb

# cat krb.conf
KERBEROS.COM
KERBEROS.COM sic78051.central.com admin server

# cat krb.realms
Central.com KERBEROS.COM
```

Krbsetup adds the Kerberos services to the /etc/services files. These entry allows client application to establish socket connections to the KDC.

 # grep Ker /etc/services

.

```
klogin       543/tcp              # Kerberos rlogin -kfall
kshell       544/tcp  krcmd       # Kerberos remote shell -kfall
ekshell      545/tcp  krcmd       # Kerberos encrypted remote shell -kfall
krbupdate    760/tcp  kreg        # Kerberos registration -kfall
kpasswd      761/tcp  kpwd        # Kerberos "passwd" -kfall
eklogin      2105/tcp             # Kerberos encrypted rlogin -kfall
# HP Kerberos ADDITIONS START HERE
kerberos5      88/udp      kdc          # Kerberos authentication
kerberos5      88/tcp      kdc          # Kerberos authentication
kerberos-adm   749/tcp     kerberos_adm    # Kerberos admin/changepw
kerberos-cpw   751/tcp     kerberos_master # Kerberos changepw
krb5_prop      754/tcp                  # Kerberos slave propagation
# HP Kerberos ADDITIONS END HERE
#
```

The four basic tasks after the confiruation file are setup:

1) Create the Principal Database
2) Add an administrative principal
3) Create a host principal and extract its service
4) Start the Kerberos daemon

It runs **krb_create -s to create the Kerberos Distribution Center(KDC) database.** The script edits the Kerberos Access file /etc/krb5/kadm5.acl, the default Kerberos admin is kws/admin@CENTRAL.COM. This user is the only user that can modify the Kerberos database, until other administrative users are added.

Lastly, it creates administration principals(a principal can be a user or a service).

```
/usr/krb5/ssbin/kadmin.local
kadmin.local: addprinc kwd/admin
Enter password for principal kws/admin@CENTRAL.COM
Reenter password for principal
                kws/admin@CENTRAL.COM
Principal kws/admin@CENTRAL.COM created.
Kadmin.local: ktadd –k /etc/krb5/kadm5.keytab
        Kadmin/central.com
Entry for principal kadmin/central.com
Kadmin.local: ktadd –k /etc/krb5/kadm5.keytab
        Changepw/central.com
Entry for principal changempw/central.com
Kadmin.local:quit
```

Kadmin and kdcd are both running. The administrative principal is kws/admin with full privileged. A host principal was created and extracted.

```
 # ps -elf | grep kdcd
  1 S     root  3636     1  0 158 20        42ed50c0   88         42f88040  Jun 22  ?        0:00
/opt/krb5/sbin/kdcd
  1 S     root  3645  3636  0 154 20        42f16940  316          aaa280  Jun 22  ?        0:00
/opt/krb5/sbin/kdcd
# ps -elf | grep kadmin
  1 S     root  3647     1  0 154 20        42f166c0  475          aaa280  Jun 22  ?        0:15
/opt/krb5/sbin/kadmind
#
```

2.1.5 Securing the Kerberos Installation

Krb.conf must reside in the /opt/krb5 directory and must have -rw-r—r—root 3 for permissions. The krb.conf file allowed the clients to locate servers on the network for authentication requests.

Security Policies

There are two files that are directly related to the security for the network of your organization. Namely password policy file and admin_acl_file.

Password Policy File

This file controls password rules such as password length, number of character types, and the lifetime of a password. This file is locate on each Primary and all the Secondary security Servers. Using the password policy file you can specify rules that force users to build good pass

/opt/krb5/password.policy

*.MaxRepeatChars	3
*.MaxRepeatClasses	4
*.Maximum Match	4,
*.MinimumLength	6
*.MinimumClasses	2
*.Expiration	90d
*.MinimuAge	None
*.NotifyTime	7d
*.dictionaries	None
*.MaxFailAuthCnt	10
*.NoReqChangePwd	0
*.MaximumHistory	3

User principals must provide their passwords during authentication to create their secret keys. For security users should be required to periodically change their passwords. If the system administrator enable the "Password Change Required attribute", the user principal must change their passwords at next login.

The password expiration date is exceeded. If the password has expired, the user principal must change its passwords. The user can change their password with utilizing kpasswd. The administrator can also change a usr principal's password The "change password required" attribute is automatically enable.

Admin_acl file

The admin_acl file lists the various administrators along with their respective administrative permissions. It also lists the principals whose attributes cannot be changed without explicit privileges. It must be protected with appropriate read write privileges and must be accessible only by a root user.

It must be protected with the appropriate read-write privileges and must be accessible only by the root user.

Kadmind checks for the principal's permissions in the admin_acl_file. The admin_acl_file can be edited directly on the primary servers, or can be edited remotely used the "administrative Permissions" window of the Administrator.

By restricting the permissions setting, various administrators can have different privileges. The are broke into a, c, d, l, m for add, change, delete, list, and delete principals. The X option allows extracting Keys. R is the restricted administrator, used in combination with the others it allow only the listed privilege

You can add any principal name to the admin_acl_File as an entry with or without assigned administrative permissions.

Reserved Principals

These principals are required on the Kerberos server. They are added when the database Is created.

Reserved special principal K/M@REalm The K/M@REALM principal contain the secret key of the principal database. When the database is created, this principal is added to the server's default realm to store the database secret key. All records in the principal database are encrypted using this key. The key for the principal is store in a file named. K5.realm .

The default@REALM principal contains the default group principals attributes for REALM. This principal is required in each realm. This principal is locked by default eliminating the security risk of an attacker attempting to authenticate using this principal account.

krbtgt@ERALM@REALM the krbtgt principal's secret key is used to encrypt and decrypt TGTs issued by the issued by the security server for principals in the realm

The kadmin/changepw@REALM is required for the Kerberos v5 standard password protocol.

The kcpwd/REALM@REALM is change passwd services for Kerberos.

2.1.6 Kerberos Administration

The Kerberos database utility can be used to globally manage the principals and their utilized with the Administrator or Command-Line-Administrator. The Administrator is the graphical-user interface that can be used to manage your principals and realms

The GUI Administrator can be used with the remote administrator, kadmind, or the local administrator, kadmin_ui. The remote kadmin must utilized Kerberos authentication before hand.

3. CONCLUSIONS

At this point the server should be secure and functional.

The patches on the system are up-to-date. Many unneeded services are either removed, turned off, or disabled. NFS, NIS, and sendmail all with major security issues are disabled. Most serial communications are shutdown an Kernel rebuilds are not possible.

Root can only login directly to the console, all other access will be through a kerberized ssh and then su to root on the system. The only users on the system are either Kerberos or system administrators.

System Verification

- Running kinit from a kerberized client that points to this KDC should return a reusable credential

```
# kinit aadams1/sic78051@KTEST.EXAMPLE.COM
Password for aadams1/sic78051@EXAMPLE.COM:
```

```
# klist
Ticket cache: /tmp/krb5cc_102
Default principal: aadams1/sic78051@EXAMPLE.COM

Valid starting                    Expires                    Service
principal
Wed May 27 16:20:33 2000  Wed May 27 16:49:37 2000
krbtgt/EXAMPLE.COM@EXAMPLE.COM
```

- Attempt to connect with a disabled service
  Try rlogin
  rlogin sic78051
  rcmd: connect: sic78051: Connection refused

- Verify that NIS is disabled
  # domainname kerb.com
  # ypcat passwd
  ypcat: can't bind to an NIS server for domain kerb.com.
  Reason: can't communicate with ypbind

- Check services with netstat
  Netstat will show the services that are running on the system
  One uniqueness in this one is the kshell and klogin, those are kerberized services that were left in inetd, since they are secure. They will run on the Kerberos clients, but will disalb ethem from the server.

  Nestat –af inet

Proto	Recv-Q	Send-Q	Local Address	Foreign Address	(state)
tcp	0	0	*.portmap	*.*	LISTEN
tcp	0	0	*.ident	*.*	LISTEN
tcp	0	0	*.time	*.*	LISTEN
tcp	0	0	*.discard	*.*	LISTEN
tcp	0	0	*.echo	*.*	LISTEN
tcp	0	0	*.2121	*.*	LISTEN
tcp	0	0	*.kshell	*.*	LISTEN
tcp	0	0	*.klogin	*.*	LISTEN
tcp	0	0	*.49194	*.*	LISTEN
tcp	0	0	*.53357	*.*	LISTEN
tcp	0	0	*.49196	*.*	LISTEN

```
udp        0      0  *.*                *.*
udp        0      0  *.*                *.*
udp        0      0  *.syslog             *.*
udp        0      0  *.echo               *.*
udp        0      0  *.discard            *.*
udp        0      0  *.daytime            *.*
udp        0      0  *.chargen            *.*
udp        0      0  *.egb-daemon           *.*
udp          0        0        *.portmap      *.*
```

- Check processes with system versionof ps..
  Ps –ef

  Another look at the processes table. Note the getty console is for the dtlogins from the console for root

```
root     0     0  0  Jun 21  ?         0:22 swapper
   root     9     0  0  Jun 21  ?         0:00 strmem
   root    10     0  0  Jun 21  ?         0:00 strweld
   root    11     0  0  Jun 21  ?         0:00 strfreebd
   root     3     0  0  Jun 21  ?         2:12 statdaemon
   root     4     0  0  Jun 21  ?         0:01 unhashdaemon
   root    12     0  0  Jun 21  ?         0:00 ttisr
   root     1     0  0  Jun 21  ?         0:00 init
   root    19     0  0  Jun 21  ?         0:00 lvmkd
   root    20     0  0  Jun 21  ?         0:00 lvmkd
   root    21     0  0  Jun 21  ?         0:00 lvmkd
   root    22     0  0  Jun 21  ?         0:00 lvmkd
   root    23     0  0  Jun 21  ?         0:00 lvmkd
   root    24     0  0  Jun 21  ?         0:00 lvmkd
   root  2972     1  0  Jun 21  console   0:00 /usr/sbin/getty console console
   root   855     1  0  Jun 21  ?         0:11 /usr/sbin/syncer
   root 10265 10263  0 07:04:12 pts/6     0:00 /sbin/sh
   root    31     0  0  Jun 21  ?         1:55 vxfsd
   root  1017     1  0  Jun 21  ?         0:00 /usr/sbin/syslogd -D
   root  1237     1  0  Jun 21  ?         0:00 /usr/sbin/rpcbind
   root  1060     1  0  Jun 21  ?         0:00 /usr/lbin/nktl_daemon 0 0 0 0 0 1
-2
   root  1064     1  0  Jun 21  ?         0:00 /usr/lbin/ntl_reader 0 1 1 1 1000
2 /var/adm/nettl /var/adm/con
   root  6298  6287  0  Jun 22  ttyp1     0:03 /opt/perl/bin/perl
/opt/sec_mgmt/bastille/bin/InteractiveBastil
   root  2139     1  0  Jun 21  ?         0:00 /var/dmi/bin/hpuxci
   root  1414     1  0  Jun 21  ?         0:02 /usr/sbin/inetd
   r
```

3 ONGOING MAINTENANCE

Hp's security bulletin digest will send a update of new vulnerabilities as they arrive. Monthly, download the newest patch catalogue and rerun Patch Check to check for new vulnerabilities. Add patches as needed.

Since this is a Kerberos server, signup with MIT for their MIT updates also the Cert Advisory Mailing list http://www.cert.org/contact_cert/certmaillist.html, scan for any updates to Kerberos V(krb5). Also, sign up for Hp's atch update, that also is released monthly.

Continue to run Bastille on a weekly basis. Changes to file ownership or flagrant modifications in secure files should be detected though changes in what Bastille is flagging.

Run netstat and ps nightly, checking for changes in the morning.

Maintain the log files, choose one of many rolling routines. Two in the morning is optimal, since that is the quiet time. The KDC realms are broke up geographically, so Europe would not have U.S. users authentications. System maintenance and full backups can be done monthly when there is a Sunday morning maintenance window.

The KDC is propagated to a Slave KDC so there is a continous backup. Nightly a Kerberos database should be done and backed off to its own tape, Save off one tape a month for a long term snapshot. The others can be on a monthly rotation schedule.

Example—Backing Up the Kerberos Database
In the following example, the Kerberos database is backed up to a file called dumpfile. Because the -verbose option is specified, each principal is printed as it is backed up.

```
# kdb5_util dump –f dump.dtatbase.txt
kadmin/kdc1.eng.example.com@ENG.EXAMPLE.COM
krbtgt/eng.example.com@ENG.EXAMPLE.COM
kadmin/history@ENG.EXAMPLE.COM
pak/admin@ENG.EXAMPLE.COM
pak@ENG.EXAMPLE.COM
changepw/kdc1.eng.example.com@ENG.EXAMPLE.COM
```

Make sure you have copies of admin_acl_file, password.policy, principal database files, and krb.conf. Do not make copies of .k5.REALM,instead recreate with master password, or v5srvtab, since they are the systems keytab just recreate them if needed.

Document any system changes both on the system an offloaded onto another system. Retain a binder hard copy.

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APPENDIX A: Step by Step mirroring of the root disk

```
# script /tmp/mkboot.out
#
# lvlnboot -v
Boot Definitions for Volume Group /dev/vg00:
Physical Volumes belonging in Root Volume Group:
      /dev/dsk/c3t5d0 (10/0/15/1.5.0) -- Boot Disk
Boot: lvol1 on:   /dev/dsk/c3t5d0
Root: lvol3 on:   /dev/dsk/c3t5d0
Swap: lvol2 on:   /dev/dsk/c3t5d0
Dump: lvol2 on:   /dev/dsk/c3t5d0, 0


# pvcreate -Bf /dev/rdsk/c3t6d0
# pvcreate -Bf
Physical volume "/dev/rdsk/c3t6d0" has been successfully created.


#
# vgextend /dev/vg00 /dev/dsk/c3t6d0
Volume group "/dev/vg00" has been successfully extended.
Volume Group configuration for /dev/vg00 has been saved in
/etc/lvmconf/vg00.conf


# mkboot -a "hpux" /dev/dsk/c3t6d0

# lvlnboot -v
Boot Definitions for Volume Group /dev/vg00:
Physical Volumes belonging in Root Volume Group:
      /dev/dsk/c3t5d0 (10/0/15/1.5.0) -- Boot Disk
      /dev/dsk/c3t6d0 (10/0/15/1.6.0) -- Boot Disk
Boot: lvol1 on:   /dev/dsk/c3t5d0
Root: lvol3 on:   /dev/dsk/c3t5d0
Swap: lvol2 on:   /dev/dsk/c3t5d0
Dump: lvol2 on:   /dev/dsk/c3t5d0, 0

#
# vgdisplay -v | more
--- Volume groups ---
VG Name                     /dev/vg00
VG Write Access             read/write
VG Status                   available
Max LV                      255
Cur LV                      7
Open LV                     7
Max PV                      16
Cur PV                      2
Act PV                      2
Max PE per PV               4350
VGDA                        4
PE Size (Mbytes)            4
```

```
Total PE                  8680
Alloc PE                  1892
Free PE                   6788
Total PVG                 0
Total Spare PVs           0
Total Spare PVs in use    0

   --- Logical volumes ---
   LV Name                     /dev/vg00/lvol1
   LV Status                   available/syncd
   LV Size (Mbytes)            200
   Current LE                  50
    Allocated PE                50
    Used PV                     1

    LV Name                     /dev/vg00/lvol2
    LV Status                   available/syncd
    LV Size (Mbytes)            1024
    Current LE                  256
    Allocated PE                256
    Used PV                     1

    LV Name                     /dev/vg00/lvol3
    LV Status                   available/syncd
    LV Size (Mbytes)            200
    Current LE                  50
    Allocated PE                50
    Used PV                     1

    LV Name                     /dev/vg00/lvol4
    LV Status                   available/syncd
    LV Size (Mbytes)            1024
    Current LE                  256
    Allocated PE                256
    Used PV                     1

    LV Name                     /dev/vg00/lvol5
    LV Status                   available/syncd
    LV Size (Mbytes)            1024
    Current LE                  256
    Allocated PE                256
    Used PV                     1

    LV Name                     /dev/vg00/lvol6
    LV Status                   available/syncd
    LV Size (Mbytes)            2048
    Current LE                  512
    Allocated PE                512
    Used PV                     1

    LV Name                     /dev/vg00/lvol7
    LV Status                   available/syncd
    LV Size (Mbytes)            2048
    Current LE                  512
    Allocated PE                512
    Used PV                     1
```

```
    --- Physical volumes ---
    PV Name                     /dev/dsk/c3t5d0
    PV Status                   available


# for i in 1 2 3 4 5 6 7
> do
>   lvextend -m 1 /dev/vg00/lvol$i /dev/dsk/c3t6d0
> done
The newly allocated mirrors are now being synchronized. This operation will
t e some time. Please wait ....
Logical volume "/dev/vg00/lvol1" has been successfully extended.
Volume Group configuration for /dev/vg00 has been saved in
/etc/lvmconf/vg00.conf
The newly allocated mirrors are now being synchronized. This operation will
t e some time. Please wait ....
Logical volume "/dev/vg00/lvol2" has been successfully extended.
Volume Group configuration for /dev/vg00 has been saved in
/etc/lvmconf/vg00.conf
The newly allocated mirrors are now being synchronized. This operation will
t e some time. Please wait ....
Logical volume "/dev/vg00/lvol3" has been successfully extended.
Volume Group configuration for /dev/vg00 has been saved in
/etc/lvmconf/vg00.conf
The newly allocated mirrors are now being synchronized. This operation will
t e some time. Please wait ....
Logical volume "/dev/vg00/lvol4" has been successfully extended.
Volume Group configuration for /dev/vg00 has been saved in
/etc/lvmconf/vg00.conf
The newly allocated mirrors are now being synchronized. This operation will
t e some time. Please wait ....
Logical volume "/dev/vg00/lvol5" has been successfully extended.
Volume Group configuration for /dev/vg00 has been saved in
/etc/lvmconf/vg00.conf
The newly allocated mirrors are now being synchronized. This operation will
t e some time. Please wait ....
Logical volume "/dev/vg00/lvol6" has been successfully extended.
Volume Group configuration for /dev/vg00 has been saved in
/etc/lvmconf/vg00.conf
The newly allocated mirrors are now being synchronized. This operation will
t e some time. Please wait ....
Logical volume "/dev/vg00/lvol7" has been successfully extended.
Volume Group configuration for /dev/vg00 has been saved in
/etc/lvmconf/vg00.conf
#
#
#
# lvlnboot -v

Boot Definitions for Volume Group /dev/vg00:
Physical Volumes belonging in Root Volume Group:
      /dev/dsk/c3t5d0 (10/0/15/1.5.0) -- Boot Disk
      /dev/dsk/c3t6d0 (10/0/15/1.6.0) -- Boot Disk
Boot: lvol1 on:   /dev/dsk/c3t5d0
                  /dev/dsk/c3t6d0
Root: lvol3 on:   /dev/dsk/c3t5d0
```

```
                  /dev/dsk/c3t6d0
Swap: lvol2 on:   /dev/dsk/c3t5d0
                  /dev/dsk/c3t6d0
Dump: lvol2 on:   /dev/dsk/c3t5d0, 0

# setboot
Primary bootpath : 10/0/15/1.5.0
Alternate bootpath : 10/0/15/0.6.0

Autoboot is ON (enabled)
Autosearch is ON (enabled)

#
#
# ioscan -funC disk
Class     I  H/W Path       Driver S/W State   H/W Type     Description
===================================================================
disk      0  10/0/15/0.2.0  sdisk CLAIMED     DEVICE       TOSHIBA CD-ROM XM-
5401TA
                           /dev/dsk/c2t2d0   /dev/rdsk/c2t2d0
disk      1  10/0/15/1.5.0  sdisk CLAIMED     DEVICE       HP 18.2GST318406LC
                           /dev/dsk/c3t5d0   /dev/rdsk/c3t5d0
disk      2  10/0/15/1.6.0  sdisk CLAIMED     DEVICE       HP 18.2GST318406LC
                           /dev/dsk/c3t6d0   /dev/rdsk/c3t6d0
# setboot -a 10/0/15/1.6.0
# setboot
Primary bootpath : 10/0/15/1.5.0
Alternate bootpath : 10/0/15/1.6.0

Autoboot is ON (enabled)
Autosearch is ON (enabled)
```

Appendix B

```
# ./security_patch_check -c /usr/11i/11i/security_catalog

WARNING: There are group- and world-writable directories in your path
         to perl and/or your PATH environment variable.  This represents a
         security vulnerability (especially if running as root) that may
         compromise the effective use of this tool.  Please use the command:
         chmod og-w <directory name>
         to ensure this tool can be used safely in the future.  A list of the
         vulnerable directories follows:
            /usr/local
            /usr/local/bin


HP SECURITY PATCH CHECK (SPC) SOFTWARE TOOL DISCLAIMER.

Use of the SPC software tool can help efficiently optimize system security,
but

does not guarantee system security. Information about security patches
obtained

through use of the SPC software tool is provided on an "AS-IS" basis only and

is subject to change without notice.  HP DISCLAIMS ALL WARRANTIES, EXPRESS OR

IMPLIED, INCLUDING WITHOUT LIMITATION THE IMPLIED WARRANTIES OF
MERCHANTABILITY

AND FITNESS FOR A PARTICULAR PURPOSE.  Customer acknowledges that the
customer

is responsible for their system's security.

You must accept the terms of this disclaimer to use security_patch_check.
Type

"accept" (without quotes) within 2 minutes to accept the terms of the above

disclaimer

> accept

This disclaimer will not appear again for users on localhost whose home
```

```
directory is /. To suppress the disclaimer on other machines, use
security_patch_check's -d flag (example: security_patch_check -d -r).
WARNING: /usr/11i/11i/ is group/world writable and the sticky bit is not on.

WARNING: /usr/11i/ is group/world writable and the sticky bit is not on.

WARNING: /usr/11i/11i/security_catalog is over 2 days old and should be
       updated. To get the latest catalog, run "security_patch_check -r", or
       if running security_patch_check from within ServiceControl Manager,
       run the "Get Patch Catalog" tool.

WARNING: Recalled patch PHCO_27099 is active on the target system. Its
record,
       including the Warn field, is available from
       /usr/11i/11i/security_catalog, through the Patch Database area of the
       ITRC or by using the -m flag (security_patch_check -m ...).

WARNING: No patch is currently on the target system to address the issues
       described in security bulletin(s) 264 . No General Release patch or
       replacement is currently available. The patch PHNE_28895 is listed as
       being the best available patch, but has been recalled and is not
       generally recommended by Hewlett-Packard.
       The security bulletin and recall notice information should be
       reviewed. Each customer should respond in a manner appropriate to
       their environment.
       Security bulletins can be found by number at
       http://itrc.hp.com/cki/bin/doc.pl/screen=ckiSecurityBulletin
       Patch recall notices can be seen using the security_patch_check -m
       option, through the Patch Database area of the ITRC, or from within
```

```
       /usr/11i/11i/security_catalog.



*** BEGINNING OF SECURITY PATCH CHECK REPORT ***

Report generated by: /opt/sec_mgmt/spc/bin/security_patch_check.pl, run as
root

Analyzed localhost (HP-UX 11.11) from sic76048.fsic.ford.com

Security catalog: /usr/11i/11i/security_catalog

Security catalog created on: Sat Jun 21 22:59:15 2003

Time of analysis: Tue Jun 24 10:31:17 2003


List of recommended patches for most secure system:


#  Recommended  Bull(s) Spec? Reboot? PDep? Description

-------------------------------------------------------------------------
---

1  PHCO_27020   213     Yes   No     No    lpspool subsystem cumulative

2  PHCO_28719   258     No    No     No    wall(1M)


3 PHNE_25184   179     Yes   No      No    sendmail(1m) 8.9.3

4 PHNE_27765   162     No    No      No    ftpd(1M)


5 PHNE_28103   215 242 Yes   Yes     Yes   ONC/NFS General
Release/Performance

6 PHNE_28450   209     No    No      No    Bind 8.1.2

7 PHSS_27258   196     Yes   No      Yes   HP DCE/9000 1.8 DCE Client IPv6


-------------------------------------------------------------------------
---

*** END OF REPORT ***
```

```
NOTE: Security bulletins can be found ordered by number at

       http://itrc.hp.com/cki/bin/doc.pl/screen=ckiSecurityBulletin


# exit
```

Appendix C: Bastille Interactive Configuration