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##### © 2001, 2002, 2003 #####

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## 2.1. #####

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## 2.2. #####

#####  
## ##

### 2.2.1. #####

##### alice **##(1)** ## root.

```
% whoami  
alice  
% ls -l `which su`  
-r-sr-xr-x 1 root wheel 10744 Dec 6 19:06 /usr/bin/su  
% su --  
Password: xi3kiune  
# whoami  
root
```

- ##### alice.
- ##### root.
- ##### **##(1)** #####
- ##### xi3kiune.
- ##### root, ##### **##(1)** ##### root.

### 2.2.2. #####

##### eve ## **##(1)** ##### login.example.com,  
##### bob, #####

```
% whoami
```

#####

```
eve
% ssh bob@login.example.com
bob@login.example.com's password: god
Last login: Thu Oct 11 09:52:57 2001 from 192.168.0.1
Copyright (c) 1980, 1983, 1986, 1988, 1990, 1991, 1993, 1994
The Regents of the University of California. All rights reserved.
FreeBSD 4.4-STABLE (LOGIN) #4: Tue Nov 27 18:10:34 PST 2001

Welcome to FreeBSD!
%
```

- ### ##### ## eve.
- ### ##### ## ##### **###(1)** #####.
- ### ##### ## ### **###(8)** ##### ## login.example.com
- ### ##### ## bob.
- ### ##### ##### ## god.
- ##### ##### ## ### ##### ## ##### #####, ### ##### ## root.

### 2.2.3. #####

### ##### ##### ##### ### sshd:

```
sshd auth required pam_nologin.so no_warn
sshd auth required pam_unix.so no_warn try_first_pass
sshd account required pam_login_access.so
sshd account required pam_unix.so
sshd session required pam_lastlog.so no_fail
sshd password required pam_permit.so
```

- ##### ##### ## ### sshd ##### (##### ## ##### #####)
 ## ### **###(8)** #####.)
- auth, account, session ### password ### #####.
- pam\_nologin.so, pam\_unix.so, pam\_login\_access.so, pam\_lastlog.so ### pam\_permit.so ### #####. ##
 ## ##### ##### ##### ##### pam\_unix.so ##### ## ##### ## #####
 (##### ##### #####.)

## 3. ### #####

### 3.1. #####

### ## ##### ##### ##### ##### ##### ## ##### #-
#####, ##### ##### #####.

## auth

*Authentication.* #####  
#####

- **###\_#####(3)** #####, #####  
#####
- **###\_#####(3)** #####, #####  
#####

## account

*Account management.* #####  
#####

- **###\_###\_(3)** #####

## session

*Session management.* #####  
#####

- **###\_###\_(3)** #####: ###  
### utmp ### wtmp #####, #####
- **###\_###\_(3)** #####: ###  
### utmp ### wtmp #####, #####

## password

*Password management.* #####  
#####

- **###\_#####(3)** #####, #####

## 3.2. #####

#####; #####, #####  
#####  
#####  
#####  
#####

## 3.2.1. #####

##### pam\_mechanism.so (###  
##### pam\_unix.so #####  
#####)

#####

---

#####  
#####  
#####  
# pam\_dial\_auth.so.1 #####

### 3.2.2. #####

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#####  
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### 3.3. #####

#####  
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#####  
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binding

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#####  
#####

#####

required

```
## ## ## ##### #####, ## ## ## ## ## ## ## ## ## ## ## ## ## ## ##  
##### ##### ##### #####. ## ## ## ## ## ## ## ## ## ## ## ##  
##### ## ## ## ## ## ## ## ## ## ## ## ## ## ## ##.
```

requisite

```
## ## #####, ## ## ## ## ##, ## ##  
## ##### ## ## ## ##. ## ## ## ##, ## ## ##  
##### ## ## ## ##.
```

sufficient

#####  
#####  
#####

```
##### ##### ##### ## ##### #####, ##### ##
## ## ##### ## ## ##### ## # #####, ## ## ##### ##### ## binding
##### ## ## ##### ## #####
##### ##.
```

optional

```
### ##### # #####, ### ## #####. ## ## ##### # # #####
### ##### optional, ### ##### ##### ## #####.
```

#####  
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### 3.4. #####

```
##### # # ##### # ##### # ##### #. ##### # #
##### #, ##### # # # # # # # # # #
##### # # # # # # # # # #.
```

1. `## #####, ## ##### ##### ##### ##### # #####  
##### ## ##### ##### ## ##### ## ##### ## root, ##  
## ##### root.`





### #####

### #####, ## #####: #####, #####, #####, #####, #####, #####  
#####. ##### ##### ##### ##### #####  
#####.

# ##### ## ##### / #####, ## #####  
##### ## ##### ##### ##### ##### #####  
##### ## ##### ##### ##### ##### #####  
##### ## #####, ##  
#####<sup>TM</sup> ##### pam.conf #####, ## #####  
##### #####. #####; #####  
#####.

#### 4.1.2. ### /etc/pam.d #####

##### ## #####, #####  
#####. ## #####, #####  
# ##### ##### ##### #####. #####  
##### ## /etc/pam.d/.

##### pam.conf## ####:  
#####. ####, ##### pam.conf ####  
##### ## /etc/pam.d/login:

```
auth required pam_nologin.so no_warn
```

## # #####, ## #  
#####  
#####  
#####, ## # su ## sudo, ## #

```
# cd /etc/pam.d  
# ln -s su sudo
```

#####  
#####  
#####.

##### pam.d #####  
#####  
#####.

#### 4.1.3. ### #####

## # #####, ## #  
#####?

## # #####  
#####.

#####

## 4.2. #####

## ##### 4.1, #####, ##### /etc/pam.conf #####  
## #####: #####, #####, #####, #####, #####  
#####.

## ##### (#) #####  
#####. ## ##, #####  
#####.

#### /etc/pam.d/ ##### /etc/pam.conf, #####  
## ##, #####  
#####.

## ##### 3.1, ##-  
#####.

##### 3.3,  
#####, #####  
###. #####  
##, ##  
##  
#####  
#####  
#####  
#####.

## 4.3. #####

## #####, ## #####  
#####.

#### (3), #####  
#####  
##  
### other #####.

#####  
#####  
#####  
#####  
#####  
#####  
#####:

##### 1. #####

	PAM_SUCCESS	PAM_IGNORE	other
#####	## (!####) #####;	#	#### = ####;

#####

	PAM_SUCCESS	PAM_IGNORE	other
#####	#	#	#### = ####;
#####	#	#	#### = ####; #####;
#####	## (!####) #####;	#	#
#####	#	#	#

```
## fail ## ##### ## ### ### # #####, ## ##### # ##### ## #####, ## #####
##### ## ##### ##### ##### ## ## ##### ##### #####. #####, ##
##### PAM SUCCESS.
```

```
#### ##### ##### ## #### ## #### ### ##### ##### PAM_NEW_AUTHTOK_REQD
## ##### ##### # #####, ##### #### ## ## ##### #####, ### ## #####
### ##### ##### PAM_NEW_AUTHTOK_REQD, ### ##### ##### #####
PAM_NEW_AUTHTOK_REQD.
```

```
### ##### ##### ## ##### ###_#####(3) ##### binding ### sufficient ##### ##
## ##### ## required.
```

### ##### ### ##### ##### ## #### ###\_#####(3) #### ## ##### #####  
##### (#### ## ##### ##### ##### ## ##### ## #####), ####  
##### binding #### sufficient ##### ## ## #### required.

5. #####

5.1. ### ####(8)

```
#####(8) ##### ## ## ## ## #####; ## ##### ##
##### PAM_AUTH_ERR. ## ## ##### ##### ## (##
## ## ## ## ## #####), ## ## ##### sufficient #####.
```

5.2. ### ####(8)

```
### ##_####(8) #####  
## # PAM_TEXT_INFO #####. ## ## #####  
## #####  
#####
```

5.3. ### ####(8)

```
####_###(8) ##### ## ### #### # # # ##### #  
##### ,## ### ##### ## ##### # ##### #  
##### .## ##### # # # # # # # #  
#####
```



###\_#####(8)

## # ##### ##### ## ## ##### ## # #####, ## ## ##### ## ##  
##### ##### ## ## ## ##### ##### ## #####, #####  
## ## ## ##### ##. #####, ##### [###\(4\)](#) ##### # #####  
#### ## ## #####, ## ## ##### ## #####.

5.13. ###\_#####(8)

### [###\\_#####\(8\)](#) ##### ## # ##### ## [###\\_###\(8\)](#). ### #####  
## ## ##### ## ##### ## [#####\(5\)](#), ##### ##  
##### ## ## # ## ## ##### #####  
[###\(4\)](#) ## ##### ## ## #####. ## ## ## ## ##  
## ## ## ##### ##.

## ##### ## ## #####, ## [###\\_#####\(8\)](#) ##### ## ## ## requisite  
##### ## ## sufficient ##### [###\\_###\(8\)](#), ## ## ## ## ##,  
## ## auth #####.

5.14. ###\_#####(8)

### [###\\_#####\(8\)](#) #####

5.15. ###\_#####(8)

### [###\\_#####\(8\)](#) ##### ## ## ## #####; ## ##### ##  
### ##### ## PAM\_SUCCESS. ## ## ## ## ##  
## ## ## ## ##.

5.16. ###\_#####(8)

### [###\\_#####\(8\)](#) #####

5.17. ###\_#####(8)

### [###\\_#####\(8\)](#) #####

5.18. ###\_#####(8)

### [###\\_#####\(8\)](#) ##### ##### ## ## ## ## ## ## ## ##  
##### ## (##### ## ## ## ## ##) ## 0. ## ##  
##### ## ##### ## [##\(1\)](#) ## [#####\(1\)](#), ## ## ## root  
##### ##.

5.19. ###\_#####(8)

### [###\\_#####\(8\)](#) #####

#####

---

## 5.20. ###\_###(8)

###\_###(8) #####  
#####. ##  
###(1), #####.

## 5.21. ###\_###(8)

###\_###(8) #####  
#####  
##### ~./ssh  
#####(1) #####  
#####  
#####(1) #####

## 5.22. ###\_#####(8)

###\_#####(8) #####

## 5.23. ###\_###(8)

###\_###(8) #####  
#####(3) #####  
#####  
#####  
#####

## 6. #####

#####.

## 7. #####

#####.

## #. #####

#####(1) #####  
#####(3) #####  
##### security/openpan.h. #####  
#####

#####

```
#####. # #####  
##### # ##### # #####;  
### ## #, Sample PAM Conversation Function ### ##-  
#####. ### ## ## ##.
```

```
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 *
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 *
 * $P4: -//depot/projects/openpam/bin/su/su.c#10 $
 * $FreeBSD: head/en_US.ISO8859-1/articles/pam/su.c 38826 2012-05-17 19:12:14Z hrs $
 */

#include <sys/param.h>
#include <sys/wait.h>

#include <err.h>
#include <pwd.h>
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
```



#####

---

```
#include <syslog.h>
#include <unistd.h>

#include <security/pam_appl.h>
#include <security/openpam.h> /* for openpam_ttyconv() */

extern char **environ;

static pam_handle_t *pamh;
static struct pam_conv pamc;

static void
usage(void)
{
    fprintf(stderr, "-Usage: su [login [args]]\n");
    exit(1);
}

int
main(int argc, char *argv[])
{
    char hostname[MAXHOSTNAMELEN];
    const char *user, *tty;
    char **args, **pam_envlist, **pam_env;
    struct passwd *pwd;
    int o, pam_err, status;
    pid_t pid;

    while ((o = getopt(argc, argv, "-h")) != -1)
        switch (o) {
            case -h:
            default:
                usage();
        }

    argc -= optind;
    argv += optind;

    if (argc > 0) {
        user = *argv;
        --argc;
        ++argv;
    } else {
        user = "-root";
    }

    /* initialize PAM */
    pamc.conv = &openpam_ttyconv;
    pam_start("su", user, &pamc, &pamh);

    /* set some items */
    gethostname(hostname, sizeof(hostname));
```

```
if ((pam_err = pam_set_item(pamh, PAM_RHOST, hostname)) != PAM_SUCCESS)
    goto pamerr;
user = getlogin();
if ((pam_err = pam_set_item(pamh, PAM_RUSER, user)) != PAM_SUCCESS)
    goto pamerr;
tty = ttyname(STDERR_FILENO);
if ((pam_err = pam_set_item(pamh, PAM_TTY, tty)) != PAM_SUCCESS)
    goto pamerr;

/* authenticate the applicant */
if ((pam_err = pam_authenticate(pamh, 0)) != PAM_SUCCESS)
    goto pamerr;
if ((pam_err = pam_acct_mgmt(pamh, 0)) == PAM_NEW_AUTHTOK_REQD)
    pam_err = pam_chauthtok(pamh, PAM_CHANGE_EXPIRED_AUTHTOK);
if (pam_err != PAM_SUCCESS)
    goto pamerr;

/* establish the requested credentials */
if ((pam_err = pam_setcred(pamh, PAM_ESTABLISH_CRED)) != PAM_SUCCESS)
    goto pamerr;

/* authentication succeeded; open a session */
if ((pam_err = pam_open_session(pamh, 0)) != PAM_SUCCESS)
    goto pamerr;

/* get mapped user name; PAM may have changed it */
pam_err = pam_get_item(pamh, PAM_USER, (const void **)&user);
if (pam_err != PAM_SUCCESS || (pwd = getpwnam(user)) == NULL)
    goto pamerr;

/* export PAM environment */
if ((pam_envlist = pam_getenvlist(pamh)) != NULL) {
    for (pam_env = pam_envlist; *pam_env != NULL; ++pam_env) {
        putenv(*pam_env);
        free(*pam_env);
    }
    free(pam_envlist);
}

/* build argument list */
if ((args = calloc(argc + 2, sizeof *args)) == NULL) {
    warn("calloc()");
    goto err;
}
*args = pwd->pw_shell;
memcpy(args + 1, argv, argc * sizeof *args);

/* fork and exec */
switch ((pid = fork())) {
case --1:
    warn("fork()");
    goto err;
case 0:
```

#####

---

```
/* child: give up privs and start a shell */

/* set uid and groups */
if (initgroups(pwd->pw_name, pwd->pw_gid) == -1) {
    warn("initgroups()");
    _exit(1);
}
if (setgid(pwd->pw_gid) == -1) {
    warn("setgid()");
    _exit(1);
}
if (setuid(pwd->pw_uid) == -1) {
    warn("setuid()");
    _exit(1);
}
execve(*args, args, environ);
warn("execve()");
_exit(1);
default:
/* parent: wait for child to exit */
waitpid(pid, &status, 0);

/* close the session and release PAM resources */
pam_err = pam_close_session(pamh, 0);
pam_end(pamh, pam_err);

exit(WEXITSTATUS(status));
}

pamerr:
fprintf(stderr, -"Sorry\n");
err:
pam_end(pamh, pam_err);
exit(1);
}
```

#. #####

### ##### ## # ##### ##### ## ### \_###(8), ##### ##-  
#####. ## ##### ## ## ## ## ## ## ##-  
#####, ## ##### ## ##### ## #####: #### ## ## ##  
### \_#####(3), ##### ##### ## ## ## ## ##-  
####.

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```

```

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*
* $P4: -//depot/projects/openpam/modules/pam_unix/pam_unix.c#3 $
* $FreeBSD: head/en_US.ISO8859-1/articles/pam/pam_unix.c 38826 2012-05-17 19:12:14Z hrs $
*/

#include <sys/param.h>

#include <pwd.h>
#include <stdlib.h>
#include <stdio.h>
#include <string.h>
#include <unistd.h>

#include <security/pam_modules.h>
#include <security/pam_appl.h>

#ifdef _OPENPAM
static char password_prompt[] = "-Password:";
#endif

#ifdef PAM_EXTERN
#define PAM_EXTERN
#endif

```

#####

---

```
PAM_EXTERN int
pam_sm_authenticate(pam_handle_t *pamh, int flags,
    int argc, const char *argv[])
{
#ifdef _OPENPAM
    struct pam_conv *conv;
    struct pam_message msg;
    const struct pam_message *msgp;
    struct pam_response *resp;
#endif
    struct passwd *pwd;
    const char *user;
    char *crypt_password, *password;
    int pam_err, retry;

    /* identify user */
    if ((pam_err = pam_get_user(pamh, &user, NULL)) != PAM_SUCCESS)
        return (pam_err);
    if ((pwd = getpwnam(user)) == NULL)
        return (PAM_USER_UNKNOWN);

    /* get password */
#ifdef _OPENPAM
    pam_err = pam_get_item(pamh, PAM_CONV, (const void **)&conv);
    if (pam_err != PAM_SUCCESS)
        return (PAM_SYSTEM_ERR);
    msg.msg_style = PAM_PROMPT_ECHO_OFF;
    msg.msg = password_prompt;
    msgp = &msg;
#endif
    for (retry = 0; retry < 3; ++retry) {
#ifdef _OPENPAM
        pam_err = pam_get_authtok(pamh, PAM_AUTHTOK,
            (const char **)&password, NULL);
#else
        resp = NULL;
        pam_err = (*conv->conv)(1, &msgp, &resp, conv->appdata_ptr);
        if (resp != NULL) {
            if (pam_err == PAM_SUCCESS)
                password = resp->resp;
            else
                free(resp->resp);
            free(resp);
        }
#endif
        if (pam_err == PAM_SUCCESS)
            break;
    }
    if (pam_err == PAM_CONV_ERR)
        return (pam_err);
    if (pam_err != PAM_SUCCESS)
        return (PAM_AUTH_ERR);
}
```

```
/* compare passwords */
if ((!pwd->pw_passwd[0] && (flags & PAM_DISALLOW_NULL_AUTHTOK)) -||
    (crypt_password = crypt(password, pwd->pw_passwd)) == NULL -||
    strcmp(crypt_password, pwd->pw_passwd) != 0)
    pam_err = PAM_AUTH_ERR;
else
    pam_err = PAM_SUCCESS;
#ifdef _OPENPAM
free(password);
#endif
return (pam_err);
}

PAM_EXTERN int
pam_sm_setcred(pam_handle_t *pamh, int flags,
int argc, const char *argv[])
{

return (PAM_SUCCESS);
}

PAM_EXTERN int
pam_sm_acct_mgmt(pam_handle_t *pamh, int flags,
int argc, const char *argv[])
{

return (PAM_SUCCESS);
}

PAM_EXTERN int
pam_sm_open_session(pam_handle_t *pamh, int flags,
int argc, const char *argv[])
{

return (PAM_SUCCESS);
}

PAM_EXTERN int
pam_sm_close_session(pam_handle_t *pamh, int flags,
int argc, const char *argv[])
{

return (PAM_SUCCESS);
}

PAM_EXTERN int
pam_sm_chauthtok(pam_handle_t *pamh, int flags,
int argc, const char *argv[])
{

return (PAM_SERVICE_ERR);
}
```

```
#ifdef PAM_MODULE_ENTRY
PAM_MODULE_ENTRY("pam_unix");
#endif
```

#####  
#####(3).#####  
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```
*/

#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <unistd.h>

#include <security/pam_appl.h>

int
converse(int n, const struct pam_message **msg,
struct pam_response **resp, void *data)
{
    struct pam_response *aresp;
    char buf[PAM_MAX_RESP_SIZE];
    int i;

    data = data;
    if (n <= 0 -|| n > PAM_MAX_NUM_MSG)
        return (PAM_CONV_ERR);
    if ((aresp = calloc(n, sizeof *aresp)) == NULL)
        return (PAM_BUF_ERR);
    for (i = 0; i < n; ++i) {
        aresp[i].resp_retcode = 0;
        aresp[i].resp = NULL;
        switch (msg[i]->msg_style) {
            case PAM_PROMPT_ECHO_OFF:
                aresp[i].resp = strdup(getpass(msg[i]->msg));
                if (aresp[i].resp == NULL)
                    goto fail;
                break;
            case PAM_PROMPT_ECHO_ON:
                fputs(msg[i]->msg, stderr);
                if (fgets(buf, sizeof buf, stdin) == NULL)
                    goto fail;
                aresp[i].resp = strdup(buf);
                if (aresp[i].resp == NULL)
                    goto fail;
                break;
            case PAM_ERROR_MSG:
                fputs(msg[i]->msg, stderr);
                if (strlen(msg[i]->msg) > 0 &&
                    msg[i]->msg[strlen(msg[i]->msg) - 1] != '\n')
                    fputc('\n', stderr);
                break;
            case PAM_TEXT_INFO:
                fputs(msg[i]->msg, stdout);
                if (strlen(msg[i]->msg) > 0 &&
                    msg[i]->msg[strlen(msg[i]->msg) - 1] != '\n')
                    fputc('\n', stdout);
                break;
            default:
                goto fail;
        }
    }
}
```



#####

---

```
    }
  }
  *resp = aresp;
  return (PAM_SUCCESS);
fail:
  for (i = 0; i < n; ++i) {
    if (aresp[i].resp != NULL) {
      memset(aresp[i].resp, 0, strlen(aresp[i].resp));
      free(aresp[i].resp);
    }
  }
  memset(aresp, 0, n * sizeof *aresp);
  *resp = NULL;
  return (PAM_CONV_ERR);
}
```

#####

#####

- [1] [Making Login Services Independent of Authentication Technologies](#). #####  
#####.
- [2] [X/Open Single Sign-on Preliminary Specification](#). ### 1#85912#144#6.  
#### 1997.
- [3] [Pluggable Authentication Modules](#). #####. 1999#10#06.

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- [4] [PAM Administration](#). ####.

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- [5] [OpenPAM homepage](#). #####.
- [6] [Linux-PAM homepage](#). #####.
- [7] [Solaris PAM homepage](#). ####.

