CS 447/647

Pluggable Authentication Modules

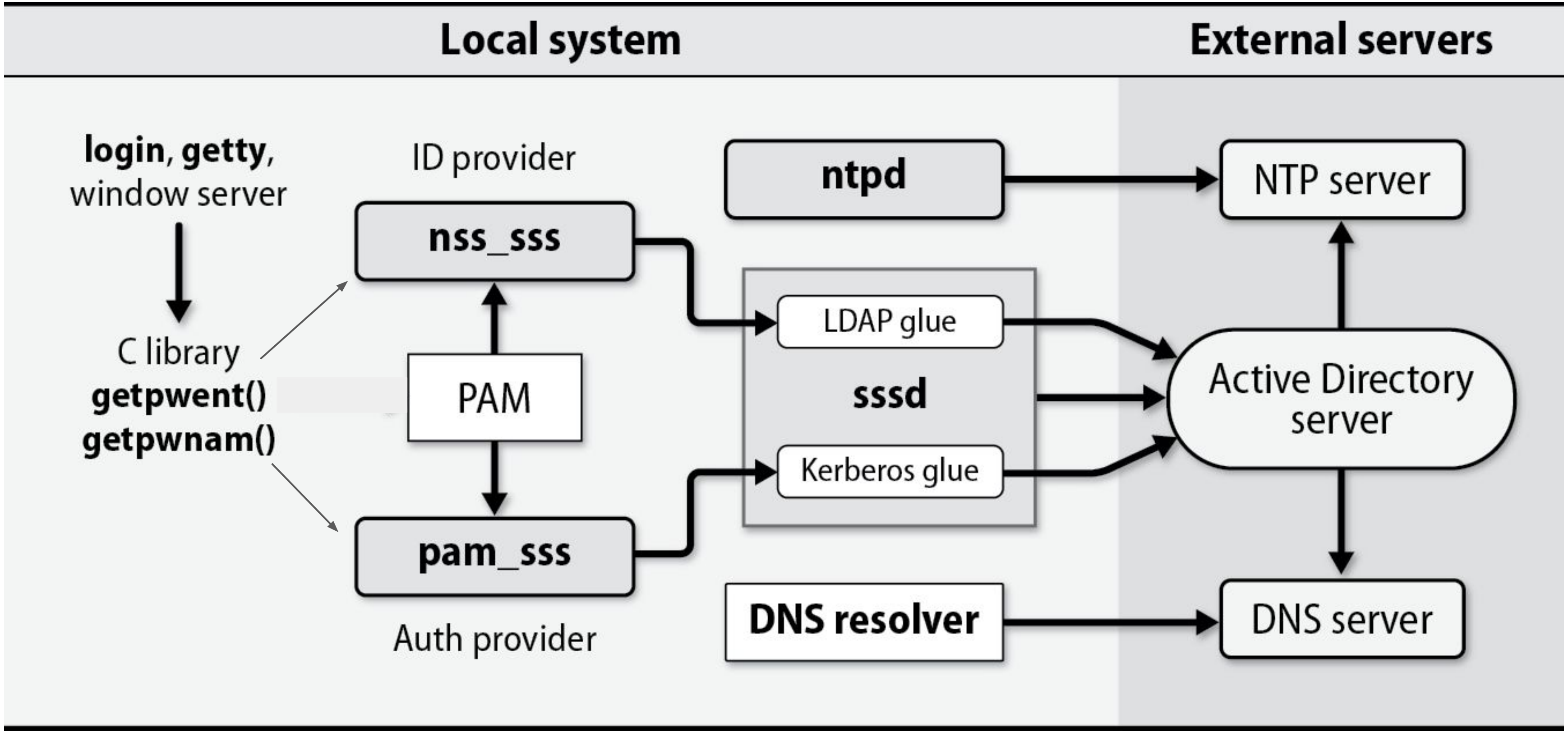
Goals

What is the purpose of PAM?

What are the four PAM control types?

How are PAM variables passed into libpam-script scripts?

What is the data structure used by PAM modules?


Local system
External servers
login, getty, window server
C library
getpwent()
getpwnam()
ID provider
nss_sss
PAM
pam_sss
Auth provider
ntpd
LDAP glue
sssd
Kerberos glue
DNS resolver
NTP server
Active Directory server
DNS server

Pluggable Authentication Modules (PAM)

- Provides an interface for authentication
    - login(1) utility calls the PAM libraries
    - Iterates over a stack composed of modules
- Configurations in /etc/pam.d/*
- “You can choose to have no security or absolute security (no access permitted).”
    - Errs toward the latter
- Configuration errors will lock you out.

Pluggable Authentication Modules (PAM)

- Four separate types of (management) module-type
  - Authentication
  - Account
  - Session
  - Password
- man pam.conf

Authentication

- Instructs application to prompt for username and password
  - Verifies access credentials
  - pam_unix.so checks /etc/passwd and /etc/shadow

Account

- Non-authentication based account management
- Restrict/permit access to a service based on
  - Time of day
  - Resources available
  - Location of a user

Session

- “Does things” before/after a user can be given service
  - Logging
  - Mounting filesystems

Password

- Used for changing and manipulating passwords.

Example

`module-type control-flag module-path [arguments]`

Add:

```
auth     optional      pam_warn.so
```

To:

```
/etc/pam.d/common-auth
```

Exit and log back-in

```
tail -n20 /var/log/auth.log
```

Absolute security

```
#
# default; deny access
#

other   auth     required       pam_deny.so
other   account  required       pam_deny.so
other   password required       pam_deny.so
other   session  required       pam_deny.so
```

¯_(ツ)_/¯

```
#
# default; any access
#

other   auth     required        pam_permit.so
other   account  required        pam_permit.so
other   password required        pam_permit.so
other   session  required        pam_permit.so

#This module is very dangerous. It should be used with extreme
caution. man 8 pam_permit
```

Modules

pam_access - Provides access management

pam_unix - Authenticate against /etc files

pam_env - Control environmental variables

pam_systemd - Registers sessions in systemd hierarchy

pam_ldap - LDAP authentication

pam_sss - SSS authentication

pam_permit - Always allows access

pam_listfile - Allows you to authenticate based on lines in a file

module-type control-flag module-path [arguments]

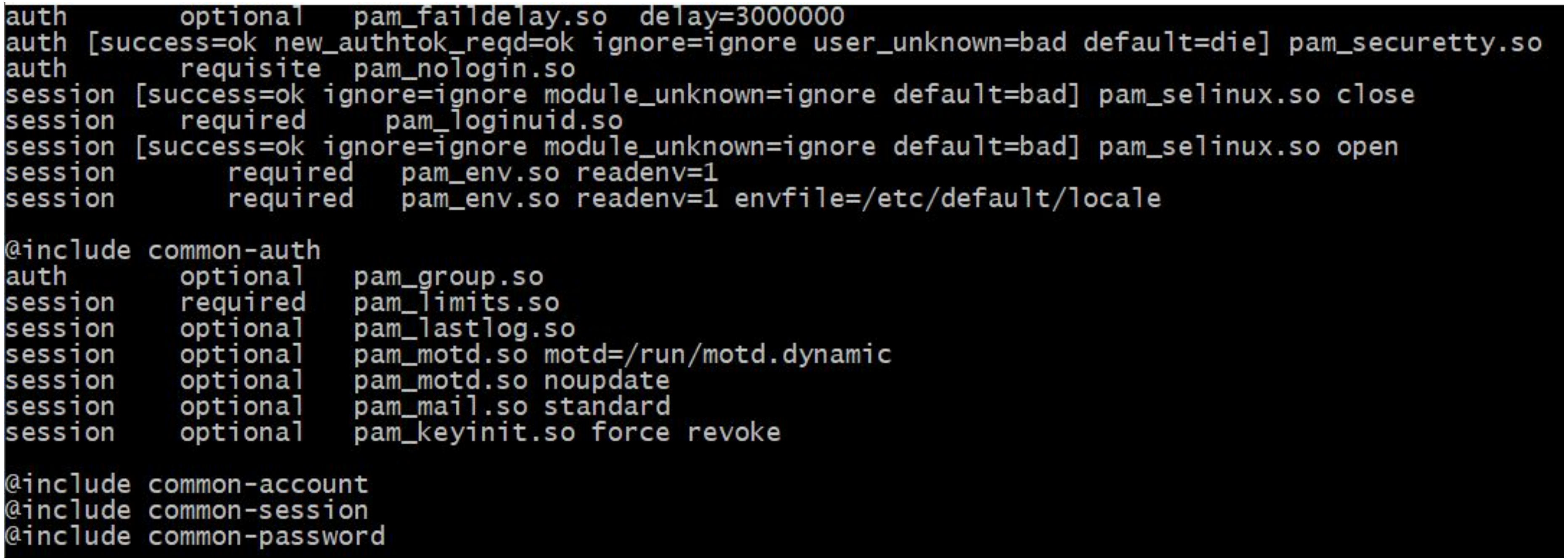
```
module-type
auth     - Identify user and grant permissions
account  - enforces restrictions
session  - tasks before login
password - changing a password



control-flag
include    - Includes another file
optional   - Only important if the only module
required   - Failure eventually causes stack to fail
requisite  - Same as required but stack fails immediately
sufficient - Exits upon success but does not override



module-path (/lib/x86_64-linux-gnu/security)
pam_unix.so - Unix file authentication    Local
pam_ldap.so - LDAP authentication         Network
pam_krb5.so - Kerberos Authentication     Network
pam_sss.so  - SSSD authentication         Network
```


```
auth       optional   pam_faildelay.so  delay=3000000
auth [success=ok new_authtok_reqd=ok ignore=ignore user_unknown=bad default=die] pam_securetty.so
auth       requisite  pam_nologin.so
session [success=ok ignore=ignore module_unknown=ignore default=bad] pam_selinux.so close
session    required     pam_loginuid.so
session [success=ok ignore=ignore module_unknown=ignore default=bad] pam_selinux.so open
session       required   pam_env.so readenv=1
session       required   pam_env.so readenv=1 envfile=/etc/default/locale

@include common-auth
auth       optional   pam_group.so
session    required   pam_limits.so
session    optional   pam_lastlog.so
session    optional   pam_motd.so motd=/run/motd.dynamic
session    optional   pam_motd.so noupdate
session    optional   pam_mail.so standard
session    optional   pam_keyinit.so force revoke

@include common-account
@include common-session
@include common-password
```

Syntax [value1=action1 value2=action2 ...]

Values	Actions
success	ignore - will not contribute to return
open_err	bad - module failed
symbol_err	die - same as bad but immediately exits
service_err	ok - PAM_SUCCESS
system_err	done - Terminate the stack and return
buf_err	N - Same as OK but skips N modules
perm_denied	reset - clear all memory and start with next module
abort	
default	
...	

Handling authentication

```
apt install libpam-script libpam-mkhomedir

pam-auth-update #Friendly

vim|emacs|nano /etc/pam.d/common-auth
```

libpam-script

- Invoke scripts within the PAM stack
  - Authentication
  - Passwd changes
  - Session opening
  - Session closing
- Scripts stored in /usr/share/libpam-script

libpam-script scripts

- **pam_script_auth - Authentication**
- pam_script_acct - Account
- pam_script_passwd - Password changes
- **pam_script_ses_open - Session open**
- pam_script_ses_close - Session close

pam_script_auth

/usr/share/libpam-script/pam_script_auth

```
#!/usr/bin/env python3
import os
import sys

print(“PAM Script Start”)
for k, v in os.environ.items():
  print(“{0}, {1}”.format(k, v))

print(“PAM Script End”)

sys.exit(0)
```

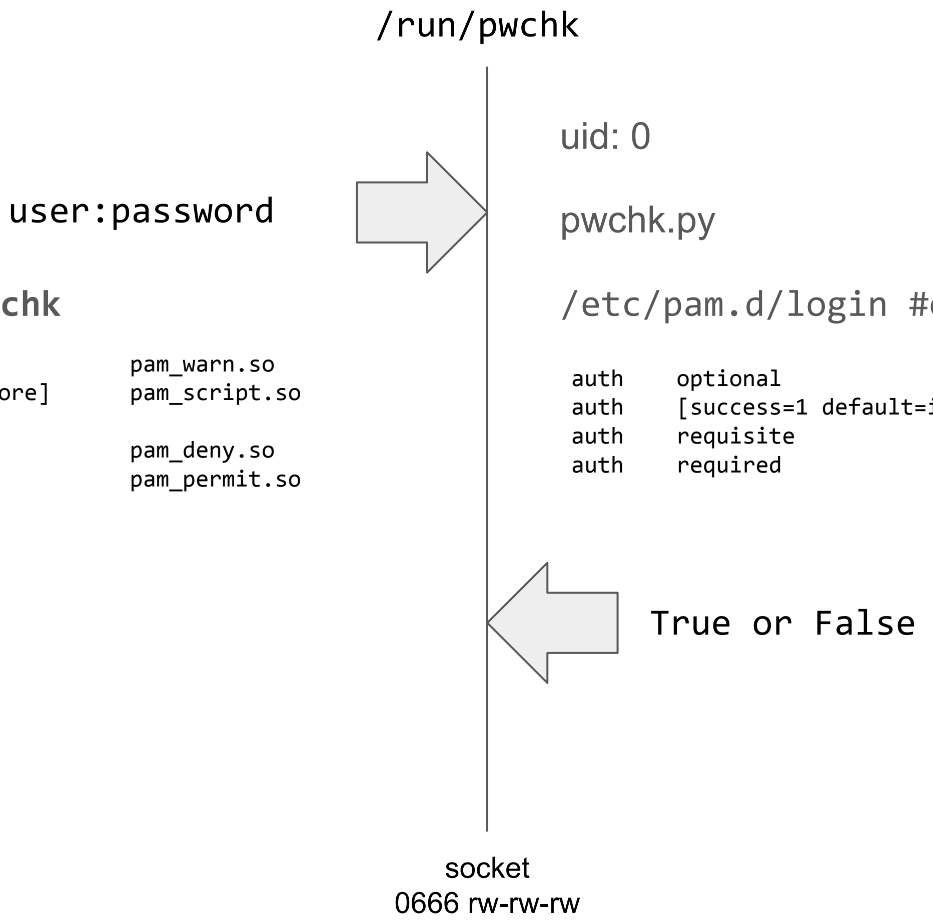
PAM

uid: greater than 0

pam_script_auth

/etc/pam.d/nginx_pwchk

```
auth    optional                            pam_warn.so
auth    [success=1 default=ignore]      pam_script.so
dir=/usr/local/pam
auth    requisite                           pam_deny.so
auth    required                            pam_permit.so
```



uid: 0

pwchk.py

/etc/pam.d/login #or

```
auth    optional                            pam_warn.so
auth    [success=1 default=ignore]      pam_unix.so
auth    requisite                           pam_deny.so
auth    required                            pam_permit.so
```