Services & Settings

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? (1996-2018)

交大資工系資訊中心
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Handbook and Manual pages

- Official guide and be found at
  - Configuring Starting Services
    - https://www.freebsd.org/doc/en/books/handbook/configtuning-starting-services.html
    - https://www.freebsd.org/doc/zh_TW/books/handbook/configtuning-starting-services.html
  - Configuring RC
    - https://www.freebsd.org/doc/en/books/handbook/configtuning-rcd.html
    - https://www.freebsd.org/doc/zh_TW/books/handbook/configtuning-rcd.html
  - rc(8), service(8)

Basic Knowledge about Services

For FreeBSD

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The Service

- Background processes that provide services
  - A.k.a daemon process (usually with name xxx**d**)
  - Automatically started during boot
- Example
  - Standard services
    - NTP (ntpd)
    - Secure Shell (sshd)
  - Commonly known services
    - Web (httpd)
    - DNS (named)

Common Flow of Running a Service

1. Installation
   - Through ports, packages, or source tarballs
     - pkg install kde4
2. Configuration
   - Service specific configuration file(s)
   - Make it start on boot
     - Manually update /etc/rc.conf
       - kdm4_enable="YES"
   - Or using service(8) command
     - service kdm4 enable

Common Flow of Running a Service

3. Start the service now
   - Calling script under rc.d/*
     - /usr/local/etc/rc.d/kdm4 start
   - Or using "service"
     - service kdm4 start
4. Maintenance
   - Updating、Restarting

Configuration Files

- /usr/local/etc
  - Configuration files of local installed programs are located there.

Daemon	User Program
/usr/local/etc/pure-ftpd.conf	/usr/local/etc/vim/vimrc
/usr/local/etc/apache24/httpd.conf	/usr/local/etc/screenrc

- Default config file usually installed with .sample suffix, .default suffix, or different suffix for different purpose. (**Copy and rename before using.**)
  - pure-ftpd.conf.sample
  - php.ini-dist
  - php.ini-recommended

Configuration Files

- A program with multiple config files are usually located in /usr/local/etc/program-name/
  - apache*
  - postfix
- Most configuration files have clear comment at the beginning or before each description

```
# pure-ftpd.conf

# IP address/port to listen to (default=all IP and port 21)
Bind                            127.0.0.1,21

# Fork in background
Daemonize                       yes
```

Configuration Files

- Most popular styles
  - key <space> value
  - key = value
- Some with local effectiveness (e.g. http server)
  - Markup language-like:

```
<directory /path>
      setting  - for - this  - path…
</directory>
```

  - Samba、rsync、devfs…

```
[xxxx]
settings…
[yyyy]
settings…
```

```
<VirtualHost _default_:443>
ServerAdmin lctseng@cs.nctu.edu.tw
DocumentRoot "/usr/local/www/nic2015/"
ServerName nic2015.nctucs.tw:443
ErrorLog "/var/log/www.nic2015.error"
CustomLog "/var/log/www.nic2015.common" common
TransferLog "/var/log/www.nic2015.access"
    <Directory "/usr/local/www/nic2015/">
       AllowOverride All
       Require all granted
    </Directory>
```

```
[system=10]
add path 'usb/*' mode 0660 group operator
```

RC Script

Scripts for starting / stopping a service

What does RC means?

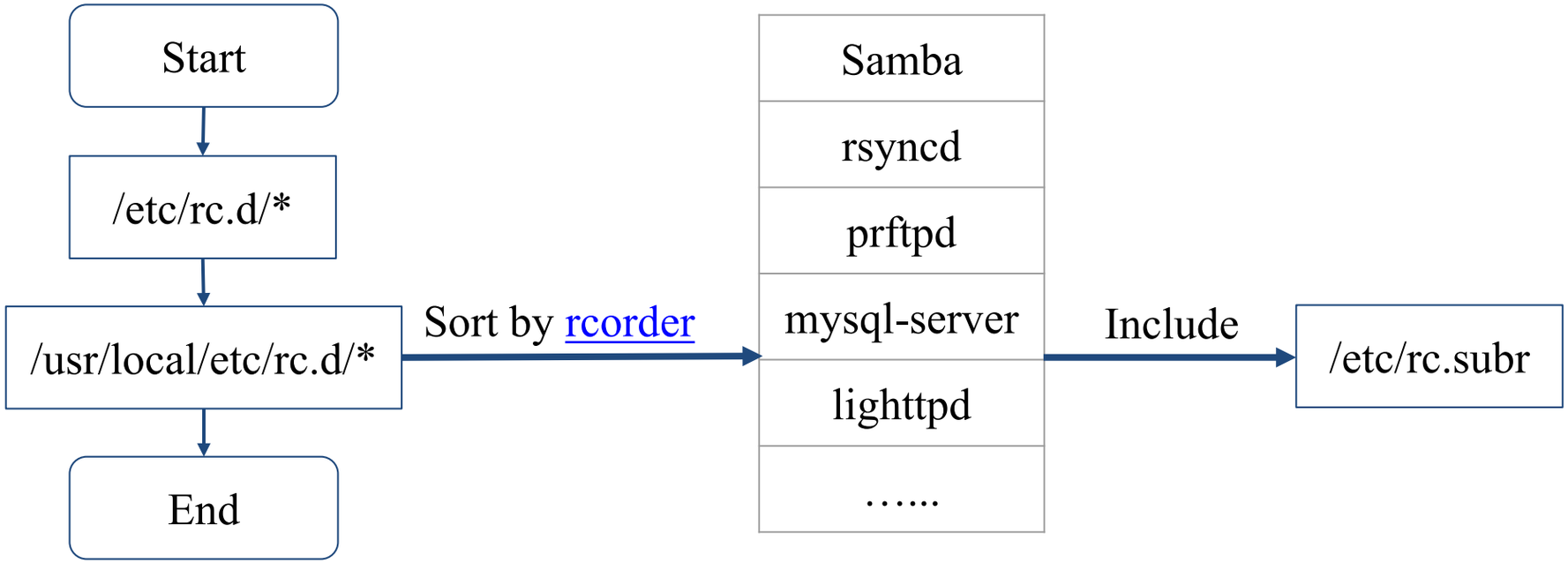
- Run Commands (RunCom)
- Command scripts for auto-reboot and daemon startup
- rc(8)
- https://www.freebsd.org/doc/handbook/configtuning-rcd.html

Why do we need RC Script?

- Start services on system startup
- Starting and stopping services in a standard way
- Write configuration in the rc script for easy launch

with RC script	$ service pure -ftpd start
without RC script	$ /usr/local/sbin/pure -ftpd -g /var/run/pure -ftpd.pid -A -c50 -B -C8 -D -fftp -H -I15 -lpam -lunix -L10000:8 -m4 -s -U133:022 -u100 -k99 -Z

RC Script



- Dependency between each service is described in header of the script
- rcorder(8) is used to find out dependency ordering of each script
- Each rc script defines what to do when start / stop …
- /etc/rc.subr defines what to do & check before / after start stop ….
  - rc.subr(8)

Components to launch daemon processes

- To launch a daemon process in background, we need:
- Launch command
  - Path to the executable binary/script
  - /usr/sbin/inetd
- Path to configuration file
  - Program-specified configuration (ports to use, files to read/write, …)
  - /etc/inetd.conf
- Pidfile
  - Records (master) process id of the service
  - Other process (like “service" tool) can know what PID to show/kill
  - /var/run/inetd.pid

Inside the RC Script

- Example: /etc/rc.d/inetd

```
#!/bin/sh
#
# $FreeBSD: release/9.1.0/etc/rc.d/inetd 231653 2012-02-14
#

# PROVIDE: inetd
# REQUIRE: DAEMON LOGIN cleanvar
# KEYWORD: shutdown

. /etc/rc.subr

name="inetd"
rcvar="inetd_enable"
command="/usr/sbin/${name}"
pidfile="/var/run/${name}.pid"
required_files="/etc/${name}.conf"
extra_commands="reload"

load_rc_config $name
run_rc_command "$1"
```

for rcorder(8) to sort.

need to be included by every RC script.

what to do with start/stop/....

How to use rc script

- Example: ntpd

```
nctucs [~]  - lctseng -  /etc/rc.d/ntpd
Usage: /etc/rc.d/ntpd
[fast|force|one|quiet](      start  | stop | restart  | rcvar | enable| disable |delete|enabled
|describe|extracommands|fetch|needfetch|    status |poll
```

- After booting… (rc.conf)

```
nctucs [~]  - lctseng -  cat /var/db/ntp/ntpd.pid
4239
nctucs [~]  - lctseng -  ps aux | grep ntp
ntpd  4239   0.0  0.8 16488 16580    -    Ss   08:45      0:00.02 /usr/sbin/ntpd          -
p /var/db/ntp/ntpd.pid      - c /etc/ntp.conf      - f /var/db/
```

- An easy way to access: "service"
  - $ service ntpd start/stop/restart/reload/ …
    - Search /etc/rc.d and /usr/local/etc/rc.d

How to use rc script

- Start
  - Start the service and write PID files now
- Stop
  - Terminates the service by killing the process with PID recorded in pidfile
- Restart
  - Restart the service (or just start a new one if not running)
  - Some services implement 'restart' by ‘stop + start'
- Enable/Disable
  - Edit /etc/rc.conf with XXX_enable=“YES" or “NO"
  - Whether to automatically launch when booting

How to use rc script

- Status
  - Check the service is running or not
- Reload
  - Reload configuration file if the service support
- Rcvar
  - Show the variables used in rc.conf

```
nctucs [~]    - lctseng -  service pure  - ftpd rcvar
# pureftpd
#
pureftpd_enable ="no"
#   (default: "")
```

How to use rc script

- [one | fast | force]
  - One
    - Skip the check of rcvar="YES"
    - Start the service even if XXXX_enable="NO"
  - Force
    - Force start the service
    - Ignore any error it encountered (no prerequisite test)
    - ignore rcvar="YES" and set rc_force="YES"
  - Fast
    - Skip the check for an existing running process (pid check)
    - Set rc_fast="YES"

Local installed service

- More about how to use rc.conf for an installed service, read comments from that script
  - /usr/local/etc/rc.d/pure-ftpd

```
# Add the following lines to /etc/rc.conf to enable pure-ftpd:
#
# pureftpd_enable="yes"
# pureftpd_flags="<set as needed>"
#
# Add the following lines to /etc/rc.conf to enable pure-authd daemon:
#
# pureftpd_authd_enable="yes"
# pureftpd_authdscript="/full/path/to/auth_script"
# pureftpd_authsocket="/var/run/ftpd.sock"
#
# Add the following lines to /etc/rc.conf to enable uploadscript daemon:
#
# pureftpd_upload_enable="yes"
# pureftpd_uploadscript="/full/path/to/upload_script"
```

System-V

Startup Scripts

- SystemV-style startup scripts
  - Sun
  - /etc/init.d/
  - /etc/rc.d/rcn.d/
  - Each script is responsible for one daemon or one aspect of system.

Example: sshd in SunOS

```
case "$1" in
'start')
        if [     -x /usr/local/sbin/sshd ]; then
                echo "Starting the secure shell daemon"
                /usr/local/sbin/sshd &
        fi
        ;;

'stop')
        echo "Stopping the secure shell daemon "
        pkill     -TERM sshd
        ;;
*)
        echo "Usage: /etc/init.d/sshd { start | stop }"
        ;;
esac
exit 0
```

Startup Scripts – SystemV-style startup scripts (1)

- /etc/rc.d/rcn.d/
  - When init transitions from lower run level to higher one,
    - It runs all the scripts that start with "S" in ascending order with "start" argument
  - When init transitions from high run level to lower one,
    - It runs all the scripts that start with "K" in descending order with "stop" argument

```
linux4 fyli … rc.d cd /etc/rc.d/
linux4 fyli … rc.d ls
init.d  rc0.d  rc1.d  rc2.d  rc3.d  rc4.d  rc5.d  rc6.d  rc.local
linux4 fyli … rc.d cd rc0.d/
linux4 fyli … rc0.d ls
K50netconsole  K90network
linux4 fyli … rc0.d
```

Startup Scripts – SystemV-style startup scripts (2)

- If you write a daemon and want init to start/stop it,
  - write a script and put in /etc/init.d
  - make suitable symbolic link in rcn.d
    - ln -s /etc/init.d/initiald /etc/rc2.d/S61initiald
    - ln -s /etc/init.d/initiald /etc/rc0.d/K33initiald

Systemd

Systemd

- Evolved from System-V
  - Backward compatibility
- Goal: provide a faster booting process
  - Less processes
  - Parallel launching
- Use "targets" replace run-levels
  - Easier to use
- Tool
  - systemctl (1)
  - Similar to "service" tool in FreeBSD

Flow of Running a Service with Systemd

Example with Ubuntu

- Installation
  - Through packages, or source tarballs
    - apt install apache2
- Configuration
  - Service specific configuration file(s)
    - /etc/apache2/*
  - systemctl enable apache2
- Start
  - systemctl start apache2
- Maintenance
  - Updating、Restarting

How to use systemctl

- Usage
  - systemctl [OPTIONS…] {COMMAND} …
- Common commands
  - enable / disable
    - Enable/disable launch when booting
  - start / stop / reload / restart / status
  - condrestart
    - Restart only if service is running

Unit files

- Define services
  - /lib/systemd/system/*
  - Similar to /etc/rc.d/* in FreeBSD
- systemd.service (5)
- Example 1: (simple service)
  - Type
    - Simple: main process keeps running
    - Forking: main process forks and exits
  - ExecStart
    - Command to launch the service
  - WantedBy
    - Run this service at which target

```
[Unit]
Description=Some simple daemon

[Service]
Type=forking
ExecStart=/usr/sbin/my-simple-daemon -d
PIDFile=/var/run/my-daemon.pid

[Install]
WantedBy=multi-user.target
```

Unit files

- apache2.service
  - After
    - Dependency. Start service after dependency is fulfilled
  - ExecStop / ExecReload
    - Custom command to stop / reload the service

```
[Unit]
Description=The Apache HTTP Server
After=network.target remote-fs.target nss-lookup.target

[Service]
Type=forking
Environment=APACHE_STARTED_BY_SYSTEMD=true
ExecStart=/usr/sbin/apachectl start
ExecStop=/usr/sbin/apachectl stop
ExecReload=/usr/sbin/apachectl graceful
PrivateTmp=true
Restart=on-abort

[Install]
WantedBy=multi-user.target
```

Unit files

- When enable a service, it will create links from "lib/systemd/system/*.service" to "etc/systemd/system/XXX.target.wants/*"
- /etc/systemd/system/multi-user.target.wants/apache2.service -> /lib/systemd/system/apache2.service

```
13:18 lctseng@lctseng-sa-ubuntu(10.0.2.15)[/etc/systemd/system/multi-user.target.wants]
[XD] % ll
total 8
drwxr-xr-x  2 root root 4096 Sep 30 12:21 .
drwxr-xr-x 15 root root 4096 Sep 28 23:25 ..
lrwxrwxrwx  1 root root   35 Sep 30 12:21 apache2.service -> /lib/systemd/system/apache2
lrwxrwxrwx  1 root root   31 Aug  5 19:24 atd.service -> /lib/systemd/system/atd.service
lrwxrwxrwx  1 root root   41 Aug  5 19:23 console-setup.service -> /lib/systemd/system/c
lrwxrwxrwx  1 root root   32 Aug  5 19:23 cron.service -> /lib/systemd/system/cron.servi
lrwxrwxrwx  1 root root   36 Aug  5 19:24 ebtables.service -> /lib/systemd/system/ebtabl
lrwxrwxrwx  1 root root   38 Aug  5 19:24 irqbalance.service -> /lib/systemd/system/irqb
lrwxrwxrwx  1 root root   33 Aug  5 19:24 lxcfs.service -> /lib/systemd/system/lxcfs.ser
lrwxrwxrwx  1 root root   42 Aug  5 19:24 lxd-containers.service -> /lib/systemd/system/
```

Appendix: Other init systems

Different Init Systems

	BSD rc	sysvinit (System V)	systemd	launchd	OpenRC
Operating Systems	NetBSD, FreeBSD, OpenBSD	Debian (< 8.0)	Ubuntu, Debian (>= 8.0)	Mac OS X	Gentoo Linux, FreeBSD, NetBSD
Example commands	service	init, telinit, runlevel	systemctl	launchctl	rc-service, rc-update
Service config files	/etc/rc.d	/etc/init.d/	/lib/systemd/system/	/System/Library/LaunchDaemons	/etc/init.d/