Periodic Processes

CRON – Schedule Commands (1)

- What we want?
  - Do things at right time automatically
- cron daemon
  - The daemon that handles periodic execution
  - cron daemon reads configuration file and executes commands on time

cron(8), crontab(1), crontab(5)

CRON – Schedule Commands (2)

❑ Configuration file

- So called: crontab (cron table)
- Location of user cron configuration file
  - Every user can have at most one crontab file and this file will be named the user's login ID
  - Edit using crontab(1) command

System	Cron Dir
FreeBSD	/var/cron/tabs
Red Hat	/var/spool/cron
Solaris	/var/spool/cron/crontabs
SunOS	/var/spool/cron/crontabs

- Location of System Cron Configuration file
  - /etc/crontab

CRON – Schedule Commands (3)

❑ Configuration File Format

1. Ignored
   - Blank lines or leading spaces and tabs
2. Comments
   - pound-sign Lines whose first non-space character is a #
3. environment setting
   - name = value
   - Default environment variables
     - LOGNAME, SHELL, PATH, HOME, MAILTO

```
SHELL=/bin/sh
PATH=/etc:/bin:/sbin:/usr/bin:/usr/sbin:/usr/local/bin
```

4. cron command

   Format:

```
# minute hour day  month weekday command
  33      7     *    *       *       /usr/local/bin/rsync -al -delete /home/ backup:/raid/home/
```

CRON – Schedule Commands (4)

- cron command format – *minute hour day month weekday command*

Field	Description	Range
minute	Minute of the hour	0 ~ 59
hour	Hour of the day	0 ~ 23
day	Day of the month	1 ~ 31
month	Month of the year	1 ~ 12
weekday	Day of the week	0 ~ 6 (0 = Sunday)

- Rule Matching
  - * matches everything
  - Single character matches exactly
  - Dash(-) matches range
  - Comma(,) matches any listed value
  - Slash(/) matches skips of the number's value through the range.

CRON – Schedule Commands (5)

- crontab time format example

45 10 * * 1-5	➔ AM 10:45, from Mon. to Fri.
10 * * * *	➔ On 10 minutes of each hour
*/3 * * * *	➔ Every three minutes
30 15 5 * *	➔ PM 3:30 of each 5-th day
0 0 14 2 *	➔ On the Midnight of Valentine's day
5 0-6 * * *	➔ On 5 minutes, from 0 to 6 o'clock.
0,30 * 13 * 5	➔ every half-hour on Fri. and every half-hour on the 13-th day

periodic

e.g. 1-59/2 = 1, 3, 5, 7, 9, …, 59

- crontab example

```
20 1 * * *      find /tmp -atime +3 -exec rm -f {} ';'
55 23 * * 0-3,6 /home/chwong/cputemp-check.sh
```

CRON – Schedule Commands (6)

- Special strings to specify the time

string	meaning	in 5 fields format
@reboot	Run once, at startup.	N/A
@yearly	Run once a year	0 0 1 1 *
@annually	(same as @yearly)	
@monthly	Run once a month	0 0 1 * *
@weekly	Run once a week	0 0 * * 0
@daily	Run once a day	0 0 * * *
@midnight	(same as @daily)	
@hourly	Run once an hour	0 * * * *
@every_minute	Run once a minute	*/1 * * * *
@every_second	Run once a second	

crontab command

- crontab(1)

% crontab -e [-u user]

- Edit the [user's] crontab using editor

% crontab -l

- List the content of the crontab

% crontab -r

- Remove the current crontab

% crontab *filename*

- Install *filename* as your crontab

crontab management

- To Allow or deny user from using cron daemon
  - By default, all users can have their own crontab
  - allow file
    - A list of users that may use crontab, any other not in the list can not use it
  - deny file
    - Reverse meaning
- log

System	Allow or deny file	Log file
FreeBSD	/var/cron/{allow,deny}	By syslogd
Red Hat	/etc/cron.{allow,deny}	/var/log/cron
Solaris	/etc/cron.d/cron.{allow,deny}	/var/cron/log
SunOS	/var/spool/cron/cron.{allow,deny}	By syslogd

System crontab: /etc/crontab

- System crontab
  - /etc/crontab

```
SHELL=/bin/sh
PATH=/etc:/bin:/sbin:/usr/bin:/usr/sbin
HOME=/var/log
#minute hour   mday   month wday   who      command
*/5     *      *      *     *      root     /usr/libexec/atrun
*/11    *      *      *     *      operator /usr/libexec/save-entropy
0       *      *      *     *      root     newsyslog
1       3      *      *     *      root     periodic daily
15      4      *      *     6      root     periodic weekly
30      5      1      *     *      root     periodic monthly
1,31    0-5    *      *     *      root     adjkerntz -a
```

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periodic utility (1)

- periodic utility
  - Run periodic system function under /etc/periodic

```
sabsd [/home/chwong] -chwong- ls -ld /etc/periodic/*
drwxr-xr-x  2 root  wheel  1024 Sep 26 21:43 /etc/periodic/daily
drwxr-xr-x  2 root  wheel   512 Sep 27 03:49 /etc/periodic/monthly
drwxr-xr-x  2 root  wheel   512 Sep 27 03:49 /etc/periodic/security
drwxr-xr-x  2 root  wheel   512 Sep 27 03:49 /etc/periodic/weekly
```

```
sabsd [/home/chwong] -chwong- ls /etc/periodic/daily
100.clean-disks         200.backup-passwd       405.status-ata-raid     430.status-rwho
110.clean-tmps          210.backup-aliases      406.status-gmirror      440.status-mailq
120.clean-preserve      300.calendar            407.status-graid3       450.status-security
130.clean-msgs          310.accounting          408.status-gstripe      470.status-named
140.clean-rwho          330.news                409.status-gconcat      500.queuerun
150.clean-hoststat      400.status-disks        420.status-network      999.local
```

  - /etc/periodic.conf
  - /etc/defaults/periodic.conf

```
nctucs [~] -wangth- ls -al /usr/local/etc/periodic/security
total 18
drwxr-xr-x  2 root  wheel     4 Apr 12  2017 .
drwxr-xr-x  8 root  wheel     8 Aug 20  2016 ..
-r-xr-xr-x  1 root  wheel  4944 Apr  2  2017 410.pkg-audit
-r-xr-xr-x  1 root  wheel  1686 Apr  2  2017 460.pkg-checksum
```

periodic utility (2)

- periodic utility
  - For custom system programs: /usr/local/etc/periodic

```
nctucs [~] -wangth- ls -l /usr/local/etc/periodic/
total 19
drwxr-xr-x  2 root  wheel  6 Apr 12  2017 daily
drwxr-xr-x  2 root  wheel  4 Aug 20  2016 hourly
drwxr-xr-x  2 root  wheel  4 Aug 20  2016 monthly
drwxr-xr-x  2 root  wheel  3 Aug 20  2016 reboot
drwxr-xr-x  2 root  wheel  4 Apr 12  2017 security
drwxr-xr-x  2 root  wheel  6 Apr 12  2017 weekly
```

```
nctucs [~] -wangth- ls -l /usr/local/etc/periodic/daily/
total 18
-r-xr-xr-x  1 root  wheel  1512 Jul 29  2016 402.zfSnap
-r-xr-xr-x  1 root  wheel  1073 Jul 29  2016 403.zfSnap_delete
-r-xr-xr-x  1 root  wheel  2746 Apr  2  2017 411.pkg-backup
-r-xr-xr-x  1 root  wheel  2506 Apr  2  2017 490.status-pkg-changes
```

periodic utility (3)

- Execution order depends on filenames
  - Use number as prefix to control the order
- All scripts under that directory will be executed
  - Unlike /etc/rc.conf
  - Even though there is no “YES” in /etc/periodic.conf
- /etc/periodic.conf

```
nctucs [~] -wangth- cat /etc/periodic.conf
daily_clean_tmps_enable="YES"                   # Delete stuff daily
daily_clean_tmps_dirs="/tmp /var/tmp"           # Delete under here
daily_clean_tmps_days="3"                       # If not accessed for
daily_status_zfs_enable="YES"                   # Check ZFS
daily_status_ntpd_enable="YES"                  # Check NTP status
weekly_dehydrated_enable="YES“
...
```

- Driven by crontab(1)

at command

- at command
  - executes commands at a specified time

    at [-q queue] [-f file] [-mldbv] time

    or at [-q queue] [-f file] [-mldbv] -t [[CC]YY]MMDDhhmm[.SS]
- at management
  - atq: View job queue
  - atrm: Remove jobs
  - /var/at/at.{allow,deny}
    - By default, only root can execute “at” command
- Driven by crontab(1)
  - Invoked every 5 minutes

at(1), atrun(8)