

# Sistem Berkas GNU/Linux

`http://rms46.vlsm.org/2/153.pdf`  
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# Agenda

- Konsep Umum Sistem Operasi
- Konsep Sistem Operasi GNU/Linux
- Distro GNU/Linux
- Beberapa Perintah GNU/Linux
- Manajemen Sistem Berkas
- Filesystem Hierarchy Standard

# Sistem Operasi (1)

- “Sistem” (program) yang meng-”operasikan” komputer
  - mengoperasikan *keyboard*.
  - mengoperasikan *mouse*.
  - mengoperasikan *CDROM drive*.
  - menjalankan program lain seperti: *games, browser*.
  - menyimpan berkas ke *disket* dan *harddisk*.
  - menampilkan informasi ke layar *monitor*.
  - menampilkan suara ke *speaker*.

# Sistem Operasi (2)

- Setiap Komputer Menggunakan Sistem Operasi
  - Microsoft: Windows 98, Windows/NT, Windows 2000, Windows XP.
  - UNIX: AIX, BSD, HP-UX, IRIX, SCO Unix, Solaris.
  - GNU/Linux.
  - FreeBSD, NetBSD, OpenBSD.

# Komponen Sistem Operasi

- Manajemen Proses
- Manajemen Memori Utama
- **Manajemen Berkas**
- Manajemen I/O
- Manajemen Penyimpanan Sekunder
- Manajemen Jaringan
- Manajemen Sistem Proteksi

# Lisensi Perangkat Lunak

- Ketentuan dari "Pemilik" Perangkat Lunak
  - Biaya Menggunakan
    - Per Satuan Waktu
    - Per Jumlah Komputer
    - Per Jumlah Pengguna
  - Ketentuan Menggunakan
    - Siapa yang boleh menggunakan?
    - Apakah boleh digandakan?
    - Apakah ada komisi produk?

# Konsep DISTRO

- Distribusi (Distro) Sistem Operasi Lengkap
  - kernel (umpama Linux)
  - utilitas perangkat lunak (bebas)
  - utilitas lainnya
- Contoh
  - Debian/Ubuntu
  - De2 (DeDe) -- Debian Depok
  - Knoppix (live)
  - RedHat/Fedora
  - Mandriva

# Apakah Semua "Distro" Baik?

- **Jumlah** variasi lebih merupakan masalah
- "**Azaz Tunggal**" memudahkan pemeliharaan
- JANGAN memilih yang "**KATANYA BAGUS**"
- Samakan dengan teman anda
- Mudah bertanya/konsultasi
- Punya akses *upgrade*?
- Merasa cocok?



# Distro GNU/Linux

- DISTRO: hasil kompilasi sistem operasi yang tinggal diinstall
- Format Defacto: CD-ROM
- Fanatisme?!
- **Pilihlah DISTRO seperti yang digunakan teman/ tetangga anda!**
- URL: <http://kambing.vLSM.org/>

# Beberapa Informasi DISTRO

- Slackware: paling senior
- Redhat: paling populer
- SuSE: Bernuansa Eropa
- Gentoo: compile sendiri
- Mandriva: Mudah diinstall
- Knoppix: Boot dari CDRROM tanpa install
- Debian: Mudah dipelihara
- DeAl: Debian Alternatif (dan De2: DeDe)

# Distro Pilihan

- Ubuntu dan Knoppix: Pemula
  - sangat bersahabat
- Debian GNU/Linux dan DeAl: Pro
  - sangat stabil untuk sistem produksi
  - sulit diinstall

# Debian GNU/Linux

- Didukung hampir 10000 paket siap install
- Didukung hampir 1000 pengembang
- Kematangan: stable, testing, unstable
- Lisensi: free, contrib, non-free, non-US
- Memiliki kebijaksanaan yang ketat dan kaku
- Tanpa *Deadline* Komersial
- URL: <http://www.id.debian.org/>

# Beberapa Perintah GNU/Linux

- w (who)
- top
- df

# w (who)

## w: siapa yang login (20 Mei 2003)?

```
13:21:05 up 50 days, 20:39, 35 users,  
load average: 0.09, 0.21, 0.33
```

USER	TTY	FROM	LOGIN@	IDLE	JCPU	PCPU	WHAT
rms46	pts/6	ws-28-150 ..	13:20	0.00s	0.42s	0.30s	w
ronal100	pts/1	lab1103-25..	13:18	2:54	0.09s	0.09s	-bash
indah101	pts/5	lab1107-25..	13:04	15:05	0.20s	0.12s	rtin
firma100	pts/7	lab1109-25..	13:14	3:14	1.12s	1.03s	pine
diah20	pts/32	lab1105-25..	12:57	0.00s	4.39s	4.31s	rtin
alde20	pts/33	lab1109-25..	12:17	3.00s	0.55s	0.45s	rtin
zidni101	pts/38	lab1107-25..	12:45	17:14	1.76s	0.40s	pine
reaz20	pts/48	lab1106-25..	12:38	27.00s	1.81s	1.68s	rtin
iman20	pts/57	lab1101-25..	12:38	22:21	0.23s	0.23s	-bash
bayu100	pts/59	lab1103-25..	12:38	38:32	0.39s	0.28s	rtin
siti100	pts/63	lab1109-25..	12:46	2.00s	1.92s	1.79s	rtin

# top (bunga 20 Mei 2003 - a)

## • top: proses apa yang sedang berjalan?

```
11:48:20 up 50 days, 19:07, 15 users
```

```
load average: 0.71, 0.74, 0.57
```

```
93 processes: 91 sleeping, 1 running, 0 zombie, 1 stopped
```

```
CPU states: 16.4% user, 2.7% system, 0.0% nice, 80.9% idle
```

```
Mem: 127236K total, 98164K used, 29072K free, 2756K buffers
```

```
Swap: 263160K total, 10928K used, 252232K free, 16304K cached
```

# top (bunga 20 Mei 2003 - b)

PID	USER	PRI	NI	SIZE	RSS	SHARE	STAT	%CPU	%MEM	TIME	COMMAND
1	root	0	0	148	120	96	S	0.0	0.0	0:09	init
2	root	0	0	0	0	0	SW	0.0	0.0	0:02	kflushd
3	root	0	0	0	0	0	SW	0.0	0.0	0:19	kupdate
4	root	0	0	0	0	0	SW	0.0	0.0	90:50	kswapd
5	root	0	0	0	0	0	SW	0.0	0.0	0:00	keventd
<b>20240</b>	rms46	0	<b>0</b>	2540	2488	2136	S	0.0	1.9	0:00	<b>sshd</b>
20245	<b>rms46</b>	4	0	<b>2476</b>	2476	2028	S	0.0	1.9	0:00	<b>bash</b>
20281	rms46	<b>11</b>	0	2196	<b>2196</b>	1752	R	14.3	1.7	0:00	<b>top</b>
20238	atmo199	0	0	2516	2456	2068	S	0.0	1.9	0:00	sshd
17936	didik100	0	0	744	236	124	S	0.0	0.1	0:01	sshd
19954	edwin100	0	0	2516	2460	2072	S	0.0	1.9	0:00	sshd
20268	para101	0	0	2516	2460	2072	S	0.0	1.9	0:00	sshd
20271	roy101	0	0	2512	2452	2064	S	0.8	1.9	0:00	sshd
18194	rudil100	0	0	2304	2176	1824	S	0.0	1.7	0:00	sshd
20230	sari199	0	0	2504	2448	2076	S	0.0	1.9	0:00	sshd
20251	sen199	0	0	2488	2432	2060	S	0.0	1.9	0:00	sshd
17932	sherl100	0	0	912	608	492	S	0.0	0.4	0:00	sshd
18223	yudha100	0	0	2304	2176	1824	S	0.0	1.7	0:00	sshd



\$ df

- df

Filesystems	1K-blocks	Used	Available	Use%	Mounted on
/dev/hda3	27561176	10571116	15589996	41%	/
/dev/hda6	2931732	219772	2711960	8%	/knoppix
/dev/hda7	2931732	268432	2663300	10%	/de2
/dev/hdb2	19807532	8182092	11625440	42%	/var/work1
/dev/hdc2	19815564	8167316	11648248	42%	/var/www
/dev/hda1	4192752	3500728	692024	84%	/win98

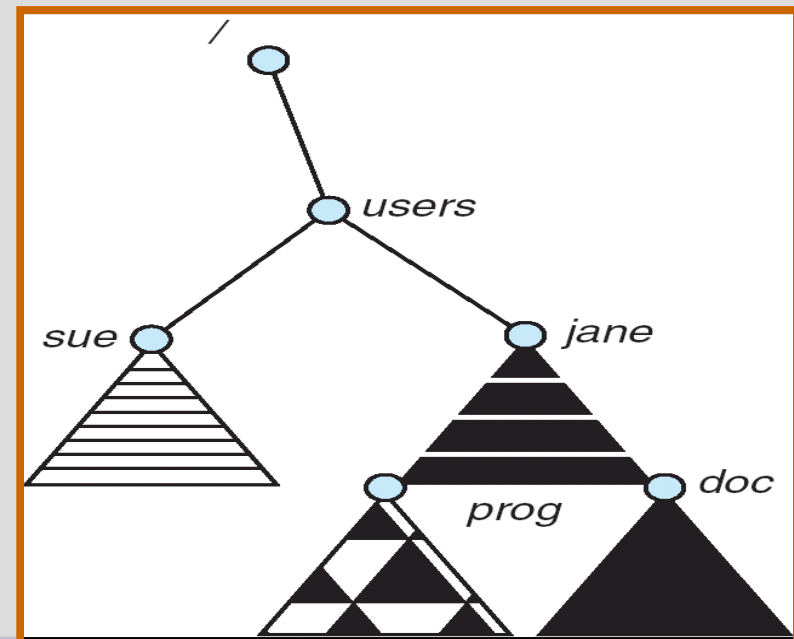
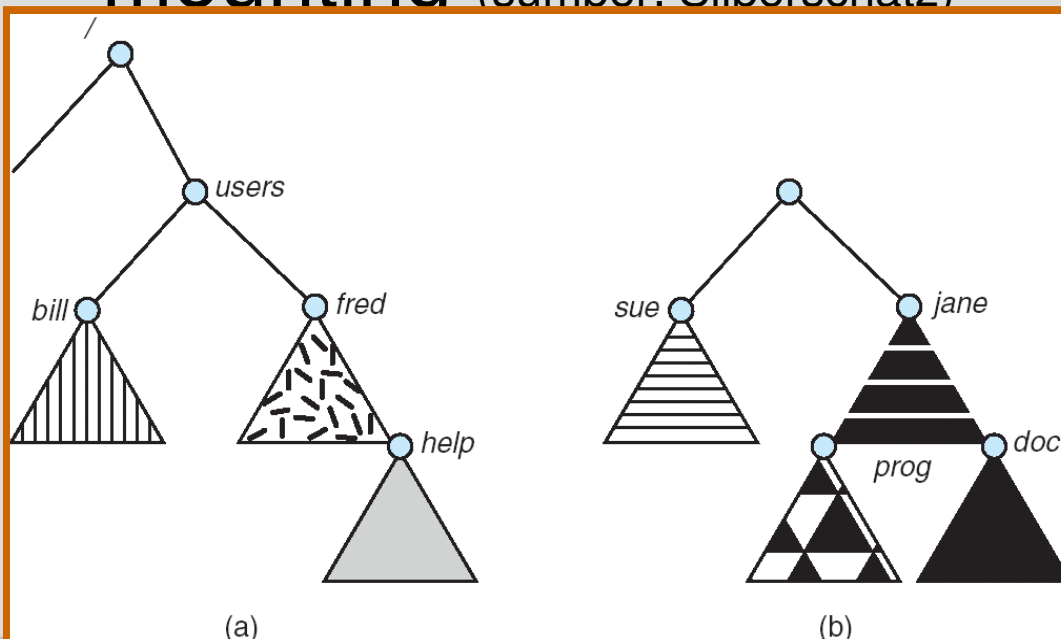
- df: pendaya-gunaan sistem berkas

# Manajemen Berkas

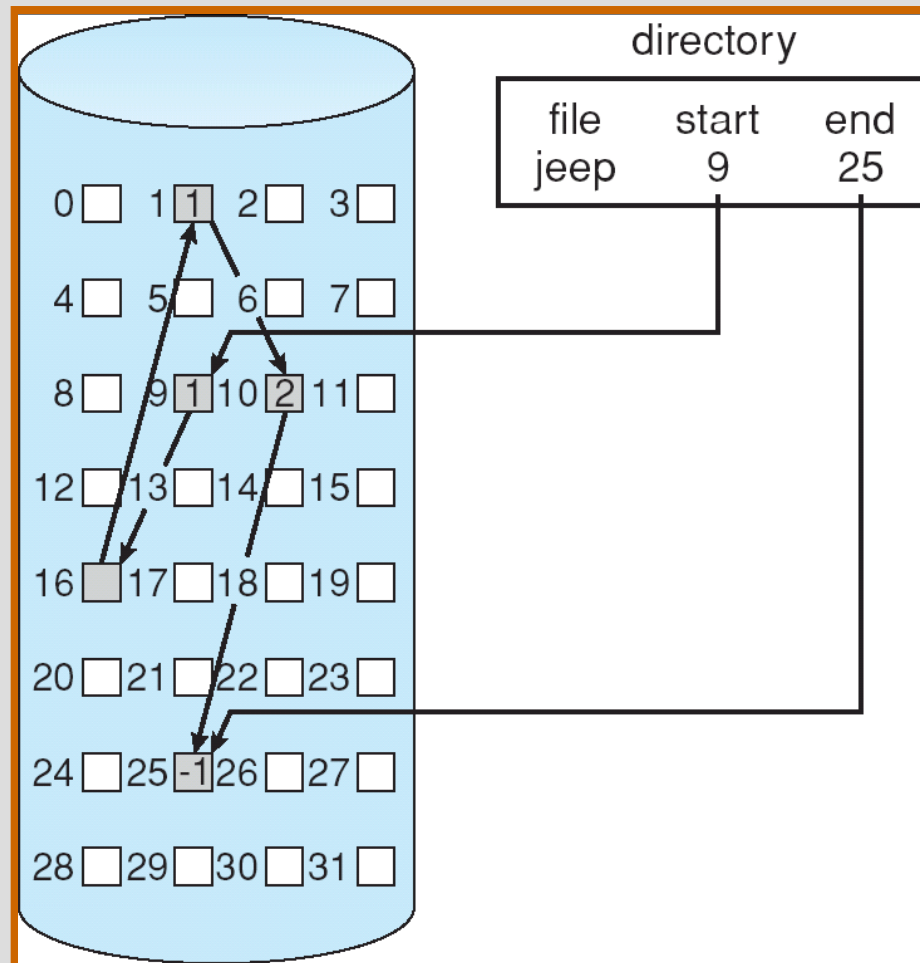
- Buat/Hapus
- Buka/Tutup
- Baca/Tulis
- Pencarian Blok Kosong
- Alokasi Blok
- Penjadwalan Tulis/Baca

# Volume vs. Mounting

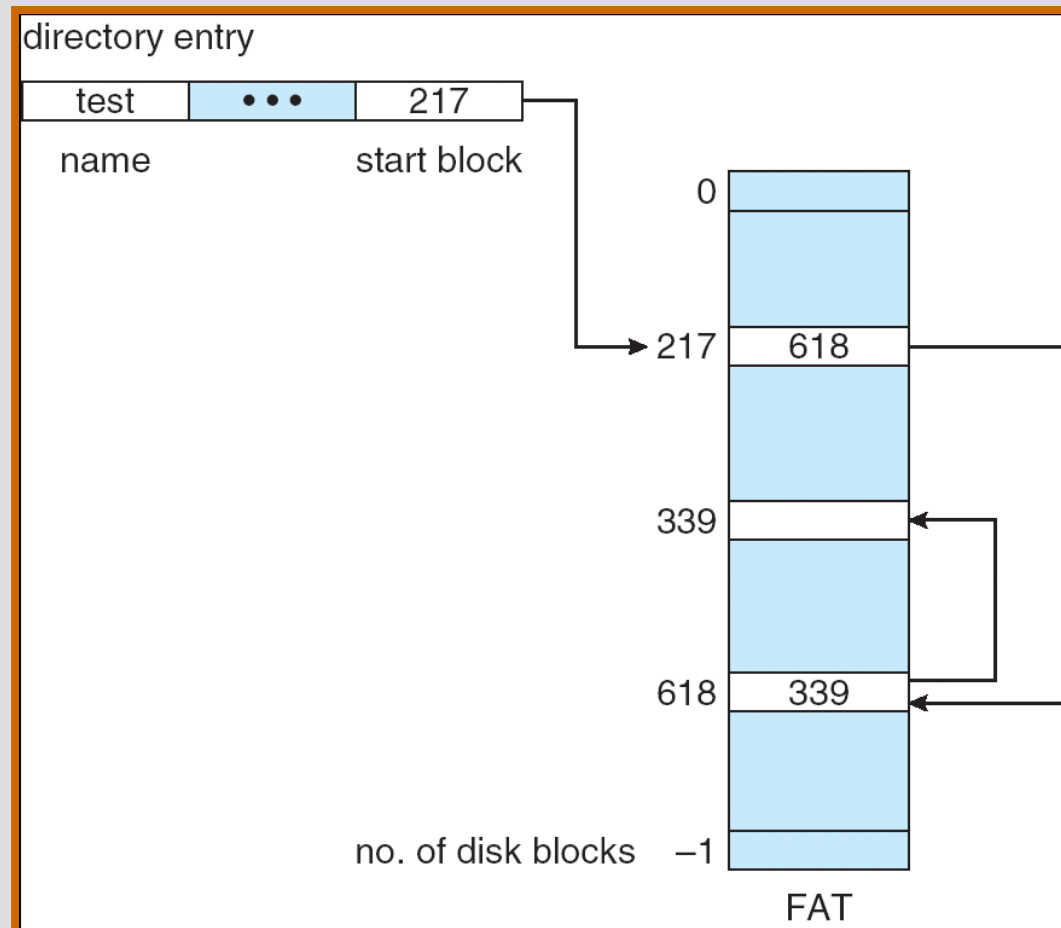
- MS Windows, Vax VMS, IBM VM/SP terpisah.  
Contoh: "C:", "D:"
- Unix, GNU/Linux menggabungkan volume dengan mounting (sumber: Silberschatz)



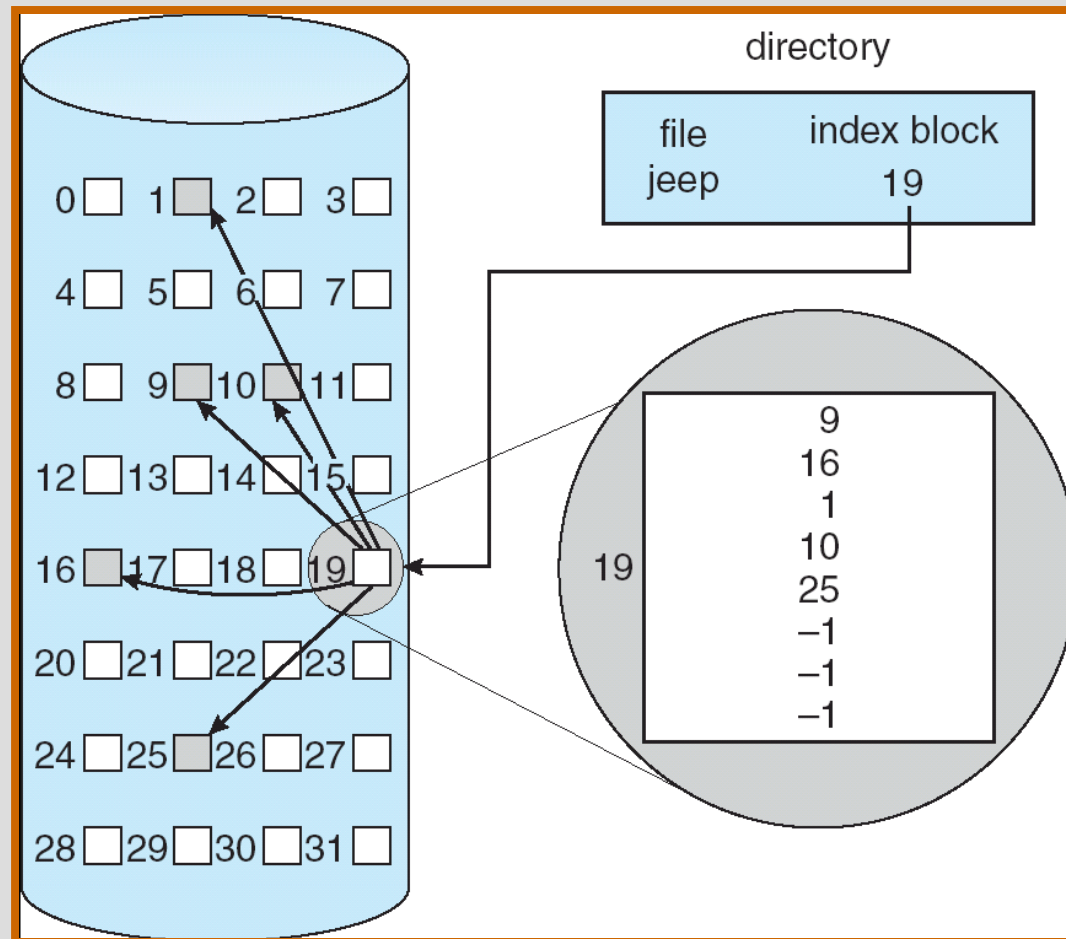
# Alokasi Blok Berkait



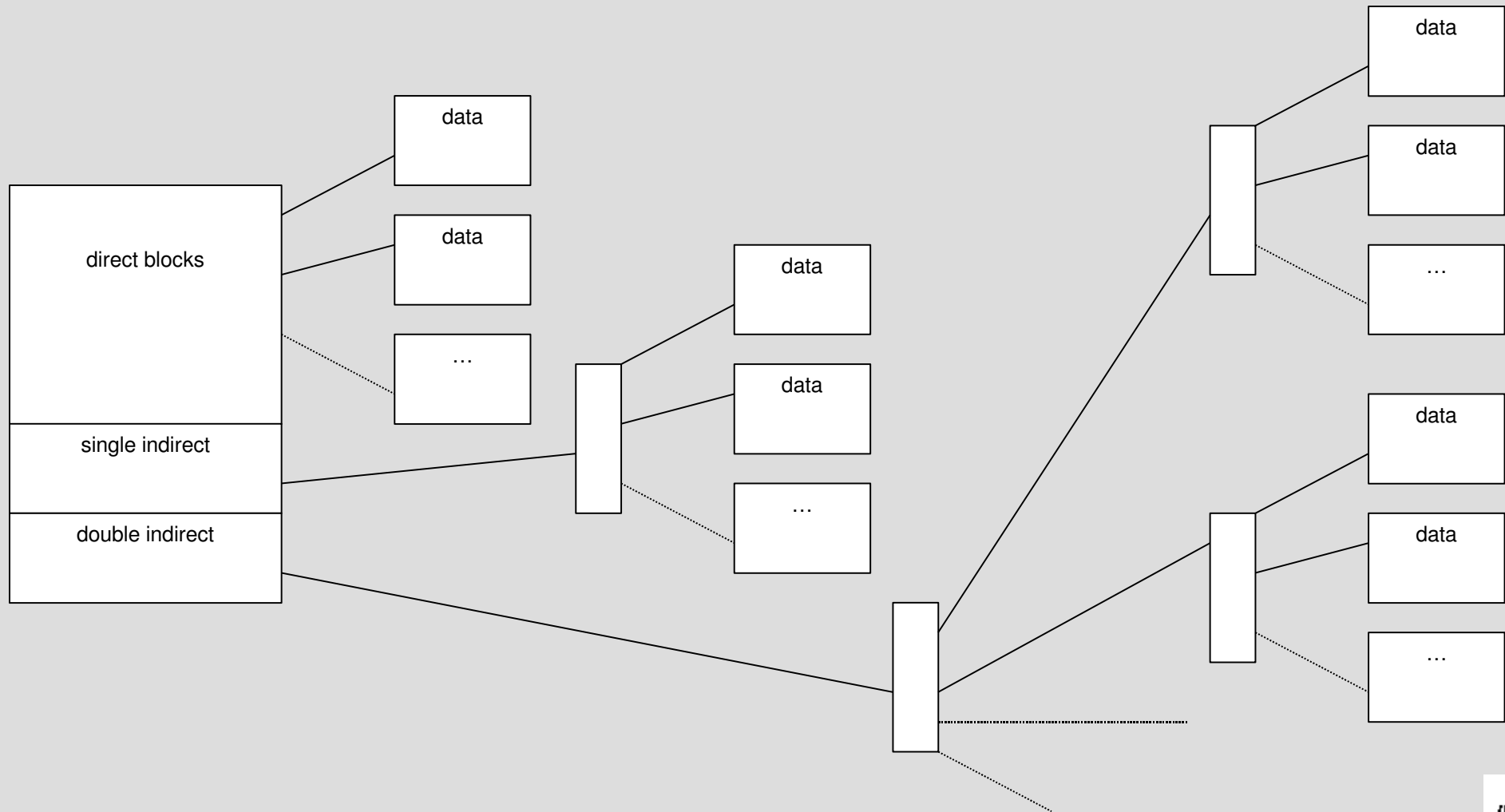
# FAT: File-Allocation Table



# Sistem Alokasi Berindeks



# Sistem Berkas (ext2fs)



# KABAR BURUK:

- Berkas yang sudah dihapus, sulit ditemukan dalam keadaan utuh.
- BACKUP-BACKUP-BACKUP (!)
- Tanya Kenapa?



# FHS: Filesystem Hierarchy Standard

- URL Versi 3.0: **`http://www.pathname.com/fhs/`**
- FHS:
  - Perangkat Lunak dan Para Pengguna:
    - pembakuan nama berkas dan direktori
    - pembakuan spesifikasi minimum
    - petunjuk dan pelaksanaan penamaan berkas dan direktori
    - berlaku umum untuk semua sistem serupa Unix (dan Linux)

# Jenis Direktori

	shareable	unshareable
static	/usr /opt	/etc /boot
variable	/var/mail /var/spool/news	/var/run /var/lock

# /ROOT

- bin
- dev
- lib
- mnt
- sbin
- tmp
- var
- (extra) /root
- boot
- etc
- media
- opt
- srv
- usr
- (extra) /home
- (extra) /lib<qual>

# Struktur Direktori

- /proc -- sistem berkas khusus kernel
- /home -- Home Para Pengguna (users)
- /etc -- tempat konfigurasi
- /bin, /usr/bin -- standard binaries
- /sbin, /usr/sbin -- standard system binaries
- /var -- data variabel
- /boot -- kernel
- /usr/local -- keperluan lokal

# /bin

- Esensial:

- cat
- chgrp
- chmod
- chown
- cp
- date
- dd
- df
- dmesg
- echo, false, hostname

- 
- kill, ln, login, ls, mkdir
- mknod, more, mount
- mv, ps, pwd, rm
- rmdir, sed, sh, stty
- su
- sync
- true
- umount
- uname

# **/etc : Host-specific system**

- csh.login, export, fstab, ftpusers, gateways, gettydefs, group, host.conf, hosts, hosts.allow, hosts.deny, hosts.equiv, hosts.lpd, inetd.conf, inittab, issue, ld.so.conf, motd, mtab, mtools.conf, networks, passwd, printcap, profile, protocols, resolv.conf, rpc, securetty, services, shells, syslog.conf.

# fdisk (hdb dan hdc)

```
rmsbase:~# fdisk /dev/hdb  
Command (m for help): p
```

```
Disk /dev/hdb: 20.5 GB, 20547841536 bytes  
255 heads, 63 sectors/track, 2498 cylinders  
Units = cylinders of 16065 * 512 = 8225280 bytes  
Device Boot Start      End      Blocks      Id  System  
/dev/hdb1          1         32      257008+    82  Linux swap  
/dev/hdb2          33      2498    19808145    83  Linux
```

```
rmsbase:~# fdisk /dev/hdc  
Command (m for help): p
```

```
Disk /dev/hdc: 20.5 GB, 20547841536 bytes  
255 heads, 63 sectors/track, 2498 cylinders  
Units = cylinders of 16065 * 512 = 8225280 bytes  
Device Boot      Start      End      Blocks      Id  System  
/dev/hdc1          1         31      248976    82  Linux swap  
/dev/hdc2          32      2498    19816177+  83  Linux
```

# /etc/fstab

- `rmsbase:~# cat /etc/fstab`

```
# /etc/fstab: static file system information.
#
# <fs>          <mt point> <type>      <options>          <dmp><pss>
proc           /proc      proc        defaults            0 0
/dev/hda8      none       swap        sw                  0 0
/dev/hdb1      none       swap        sw                  0 0
/dev/hdc1      none       swap        sw                  0 0
/dev/hda3      /          ext3        errors=remount-ro  0 1
/dev/hda1      /win98     auto        rw,user,noauto     3 1
/dev/hda6      /knoppix   reiserfs    defaults            2 2
/dev/hda7      /de2       reiserfs    defaults            2 2
/dev/hdb2      /var/work1 reiserfs    defaults            3 3
/dev/hdc2      /var/www   reiserfs    defaults            3 3
/dev/cdrom     /cdrom     iso9660     ro,user,noauto     0 0
/dev/fd0       /floppy    auto        user,noauto         0 0
/var/iso/test.iso /var/iso/test iso9660     noauto,user,ro,loop=/dev/loop0 0 0
```

- **fstab: informasi statik sistem berkas**



# /proc/

```
rms46@bunga:~/ $ cd /proc  
rms46@bunga:/proc$ ls -la
```

```
dr-xr-xr-x    3 root      root          0 May 20 13:53 1  
  
dr-xr-xr-x    3 rms46     pps_00        0 May 20 13:53 25570  
dr-xr-xr-x    3 rms46     pps_00        0 May 20 13:53 25571  
dr-xr-xr-x    3 rms46     pps_00        0 May 20 13:53 25595  
dr-xr-xr-x    3 rms46     pps_00        0 May 20 13:53 25596  
dr-xr-xr-x    3 rms46     pps_00        0 May 20 13:53 25597  
dr-xr-xr-x    3 rms46     pps_00        0 May 20 13:53 25618  
  
-r-----    1 root      root          134221824 May 20 13:53 kcore  
-r--r--r--    1 root      root          0 May 20 13:53 meminfo  
-r--r--r--    1 root      root          0 May 20 13:53 swaps  
-r--r--r--    1 root      root          0 May 20 13:53 uptime  
-r--r--r--    1 root      root          0 May 20 13:53 version
```

# /proc/<process\_id>

```
rms46@bunga:/proc$ cd 25597
rms46@bunga:/proc/25597$ ls -la
total 0
-r--r--r-- 1 rms46 pps_00 0 May 20 13:55 cmdline
lrwx----- 1 rms46 pps_00 0 May 20 13:55 cwd -> /proc/25597
-r----- 1 rms46 pps_00 0 May 20 13:55 environ
lrwx----- 1 rms46 pps_00 0 May 20 13:55 exe -> /bin/bash
dr-x----- 2 rms46 pps_00 0 May 20 13:55 fd
pr--r--r-- 1 rms46 pps_00 0 May 20 13:55 maps
-rw----- 1 rms46 pps_00 0 May 20 13:55 mem
lrwx----- 1 rms46 pps_00 0 May 20 13:55 root -> /
-r--r--r-- 1 rms46 pps_00 0 May 20 13:55 stat
-r--r--r-- 1 rms46 pps_00 0 May 20 13:55 statm
-r--r--r-- 1 rms46 pps_00 0 May 20 13:55 status
```

# /proc/cpuinfo

```
rms46@bunga:/proc$ cat cpuinfo
```

```
processor      : 0
vendor_id     : GenuineIntel
cpu family    : 6
model         : 3
model name    : Pentium II (Klamath)
stepping      : 4
cpu MHz       : 300.016
cache size   : 512 KB
fdiv_bug     : no
hlt_bug      : no
sep_bug      : no
f00f_bug     : no
coma_bug     : no
fpu          : yes
fpu_exception: yes
cpuid level  : 2
wp           : yes
flags        : fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge
              mca cmov mmx
bogomips     : 598.01
```

# /proc/meminfo

```
rms46@bunga:/proc$ cat meminfo
```

```
          total:       used:       free:    shared: buffers:    cached:
Mem:    130289664 127205376  3084288 203042816  2682880  8622080
Swap:   269475840 46206976 223268864
```

```
MemTotal:      127236 kB
MemFree:        3012 kB
MemShared:     198284 kB
Buffers:        2620 kB
Cached:         8420 kB
SwapTotal:     263160 kB
SwapFree:      218036 kB
```

# /etc/version

```
rms46@bunga:/proc$ cat version
```

```
Linux version 2.2.20 (herbert@gondolin) (gcc version 2.7.2.3) #1
Sat Apr 20 11:45:28 EST 2002
```

# /etc/passwd -- /etc/shadow

```
/etc/passwd (rw - r - - r - - )
root:x:0:0:root:/root:/bin/bash
daemon:x:1:1:daemon:/usr/sbin:/bin/sh
bin:x:2:2:bin:/bin:/bin/sh
sys:x:3:3:sys:/dev:/bin/sh
sync:x:4:100:sync:/bin:/bin/sync
games:x:5:100:games:/usr/games:/bin/sh
rms46:x:1000:1000:Rahmat M. Samik-Ibrahim:/home/rms46:/bin/bash
```

```
/etc/shadow (rw - r - - - - - )
rms46:xsderfjkljslkjlsjlkjllkjls:1:1:11111:1:::
```

# /etc/inittab (1)

```
# The default runlevel --> '2' = /etc/rc2.d
```

```
id:2:initdefault:
```

```
# Boot-time system configuration/initialization script.
```

```
# This is run first except in emergency (-b) mode.
```

```
si::sysinit:/etc/init.d/rcS
```

```
# Runlevel: 0 (halt) -- 1 (single-user) --
```

```
#           2-5 (multi-user) -- 6 (reboot).
```

```
l0:0:wait:/etc/init.d/rc 0
```

```
l1:1:wait:/etc/init.d/rc 1
```

```
l2:2:wait:/etc/init.d/rc 2
```

```
l3:3:wait:/etc/init.d/rc 3
```

```
l4:4:wait:/etc/init.d/rc 4
```

```
l5:5:wait:/etc/init.d/rc 5
```

```
l6:6:wait:/etc/init.d/rc 6
```

## /etc/inittab (2)

```
# What to do when CTRL-ALT-DEL is pressed.  
ca:12345:ctrlaltdel:/sbin/shutdown -t1 -a -r now
```

```
1:2345:respawn:/sbin/getty 38400 tty1  
2:23:respawn:/sbin/getty 38400 tty2  
3:23:respawn:/sbin/getty 38400 tty3  
4:23:respawn:/sbin/getty 38400 tty4  
5:23:respawn:/sbin/getty 38400 tty5  
6:23:respawn:/sbin/getty 38400 tty6
```

# /etc/rc2.d -- /etc/init.d

S10syslogd	S11klogd	S14ppp
S19nfs-common	S20cupsys	S20exim
S20gpm	S20inetd	S20klisa
S20logoutd	S20lpd-ppd	S20lprng
S20makedev	S20nfs-kernel-server	
S20slpd	S20ssh	S30squid
S89atd	S89cron	S91apache
S99fetchmail	S99gdm	S99kdm
S99rmnologin		

- **SNNxxxx**

- S = START
- NN = sequence
- xxxxx = script name



# Terimakasih