

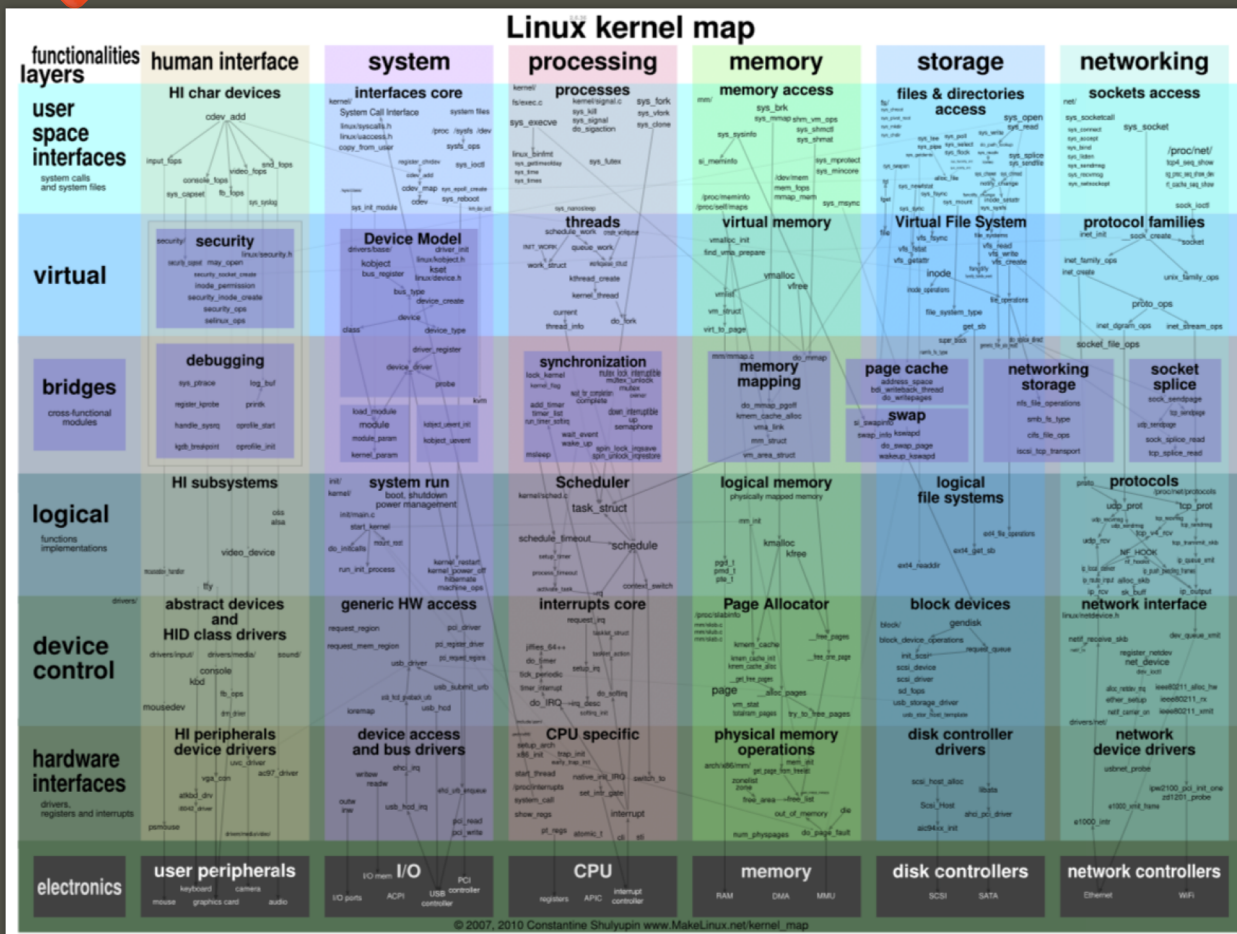
Digging into Linux File Systems

Not a goal of this presentation

- Rise interest in FS part of the Linux
- Make people more aware
- Have more fun with your favorite distro
- Hopefully learning something new

Trying to convince you to any specific FS!!

Why interest in FS?



© 2007, 2010 Constantine Shulyupin www.MakeLinux.net/kernel_map

Source: [http://www.makelinux.net/kernel map/](http://www.makelinux.net/kernelmap/)

Standard Stack

EXT3, EXT4, XFS, ReiserFS

System Calls

VFS

File System

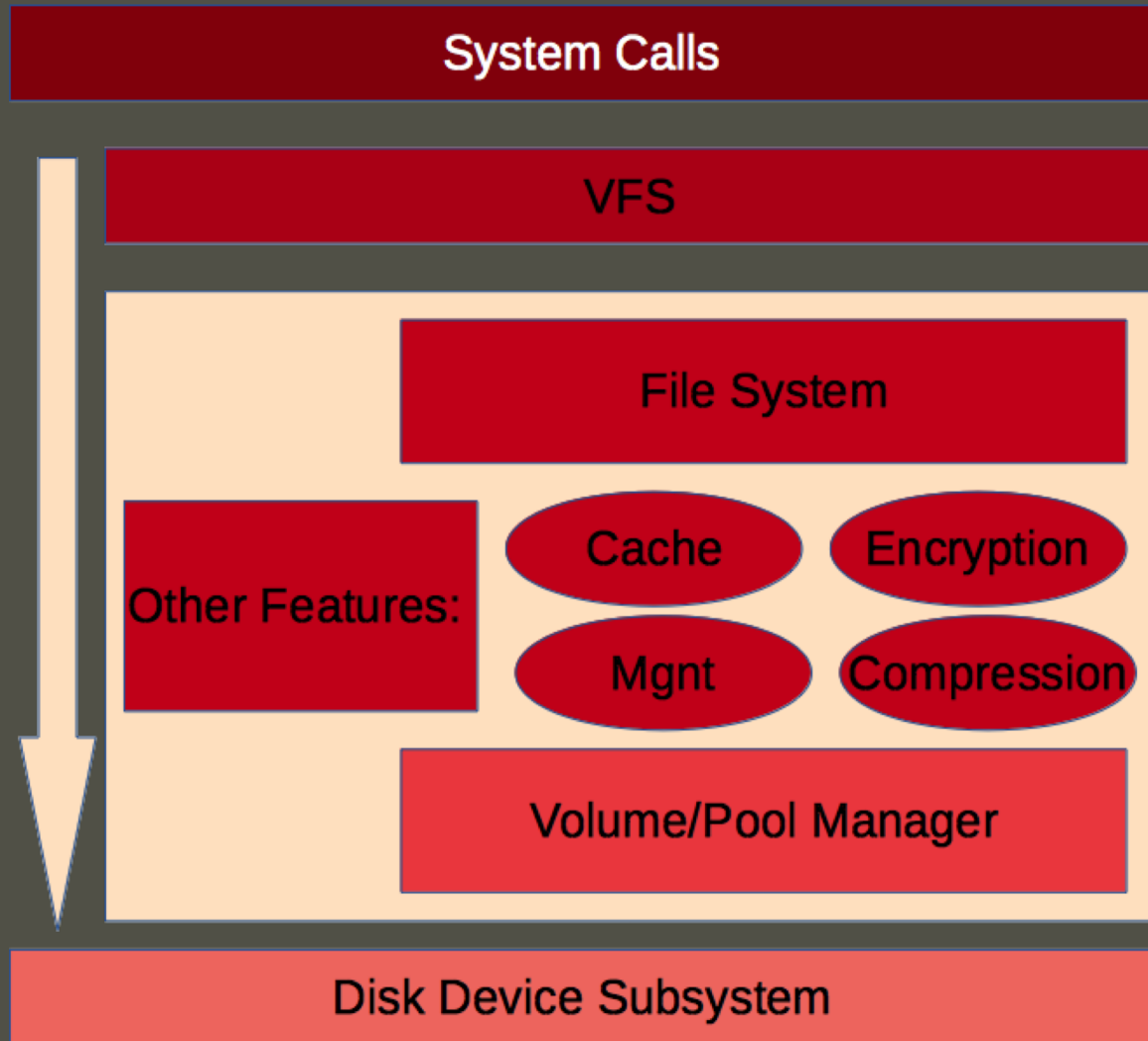
Volume Manager

Disk Device Subsystem



More modern approach

Examples: ZFS, BTRFS



Difference in practice: separate VM

```
# LVM stuff
vgcreate lvm_vol /dev/sdb
lvcreate --name rootdg lvm_vol
```

```
#FS stuff
mkfs -t xfs /dev/mapper/lvm_vol-rootdg
mount -t xfs /dev/mapper/lvm_vol-rootdg /mnt
```

```
: /mnt# df -h
```

Filesystem	Size	Used	Avail	Use%	Mounted on
/dev/mapper/lvm_vol-rootdg	3.7T	3.8G	3.7T	1%	/mnt

: / # vgs

VG	#PV	#LV	#SN	Attr	VSize	VFree
lvm vol	4	1	0	wz--n-	3.64t	0

: / # lvs

LV	VG	Attr	LSize	Pool	Origin	Data%	Meta%	Move	Log
Cpy%Sync	Convert								
rootdg	lvm vol	-wi-ao----	3.64t						

Difference in practice: VM inside FS

```
zpool create -f pool /dev/sdb
zfs set mountpoint=/mnt pool
zfs create pool/fs1
```

```
:~# zfs list
```

NAME	USED	AVAIL	REFER	MOUNTPOINT
pool	457K	3.84G	291K	/mnt
pool/fs1	19K	3.84G	19K	/mnt/fs1

```
:/mnt# df -T
```

Filesystem	Type	1K-blocks	Used
pool	zfs	4031104	256
4030848 1% /mnt			
pool/fs1	zfs	4030976	128
4030848 1% /mnt/fs1			

Managing Snapshots

- ZFS
- Create pool
- Create Data set (FS)

```
:/# cd /mnt/fs1
wget... - 'alice30.txt' saved [159332/159332]
:/mnt/fs1# zfs snapshot pool/fs1@testsnap1
:/mnt/fs1# zfs list -t snapshot
NAME                                USED  AVAIL  REFER  MOUNTPOINT
poolik/fs1@testsnap1               28K    -    116K   -

:/mnt/fs1# mv alice30.txt wonderland.txt
:/mnt/fs1# ls
wonderland.txt
:/mnt/fs1# echo "Hello Alice" >> wonderland.txt

:/mnt/fs1# mount -t zfs pool/fs1@testsnap1 /mnt1
:/mnt/fs1# ls /mnt1/
alice30.txt

:/mnt/fs1# mount | grep fs1
pool/fs1 on /mnt/fs1 type zfs (rw,relatime,xattr,noacl)
pool/fs1@testsnap1 on /mnt1 type zfs (ro,relatime,xattr,noacl)

:/mnt/fs1# diff /mnt1/alice30.txt ./wonderland.txt
3852a3853
> Hello Alice
```

Managing Snapshots

○ LVM

```
/mnt# lvcreate -L 1M -s -n vol_snap /dev/mapper/lvm_vol-rootdg
```

```
Rounding up size to full physical extent 4.00 MiB
```

```
Volume group "lvm_vol" has insufficient free space  
(0 extents): 1 required.
```

```
# Fix the issue
```

```
lvdisplay lvm_vol
```

```
lvreduce -L 200G /dev/lvm_vol/rootdg
```

```
Resize2fs /dev/lvm_vol/rootdg 100G
```

```
lvcreate -L 1M -s -n vol_snap /dev/mapper/lvm_vol-rootdg
```

```
mount /dev/mapper/lvm_vol-vol_snap-cow /mnt1
```

Compression

- Use ZFS
(OpenZFS for Ubuntu)
- BTRFS also can be used here

```
zfs set compresssion=lz4 pool
```

```
zfs set compression=on pool
```

```
zfs get compressratio /mnt
```

NAME	PROPERTY	VALUE	SOURCE
poolik	compressratio	1.00x	-

```
wget alice-table.html
```

```
for i in `seq 1 1000`; do cat alice >> alice;  
done
```

```
ls -lahtri alice
```

```
13 -rw-r--r-- 1 u u 3.0M Apr 25 00:51 alice
```

```
zfs get used,logicalused poolik
```

NAME	PROPERTY	VALUE	SOURCE
poolik	used	435K	-
poolik	logicalused	3.40M	-

```
zfs get compressratio /mnt
```

NAME	PROPERTY	VALUE	SOURCE
poolik	compressratio	10.77x	-

What is showing your mount command?

Thank you for attention