openEuler操作系统运维经验总结

江苏润和软件股份有限公司

赵磊

OpenEuler

- See PANIC
- How to PANIC
- What is PANIC
- Why PANIC
- Shoot PANIC

PANIC篇

Panic篇

- See PANIC
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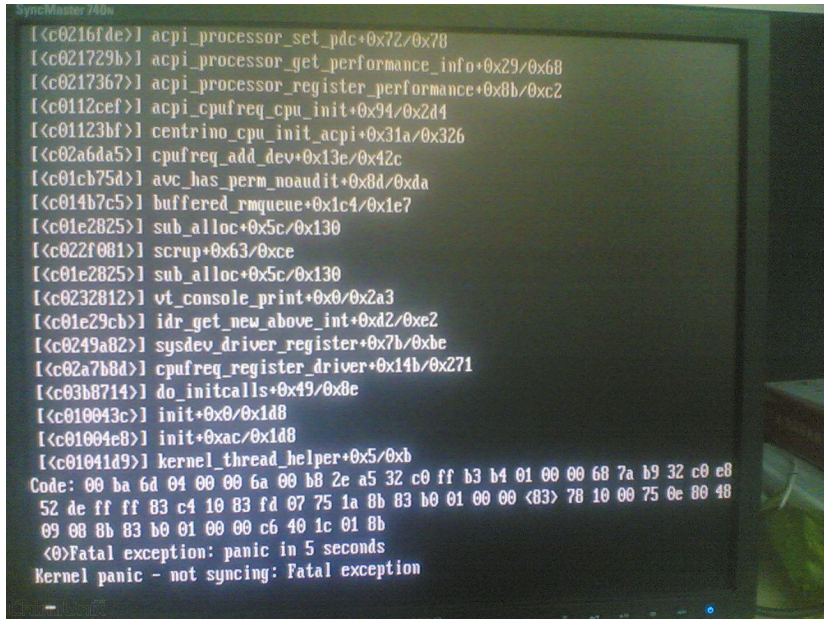
- Shoot PANIC



Panic篇

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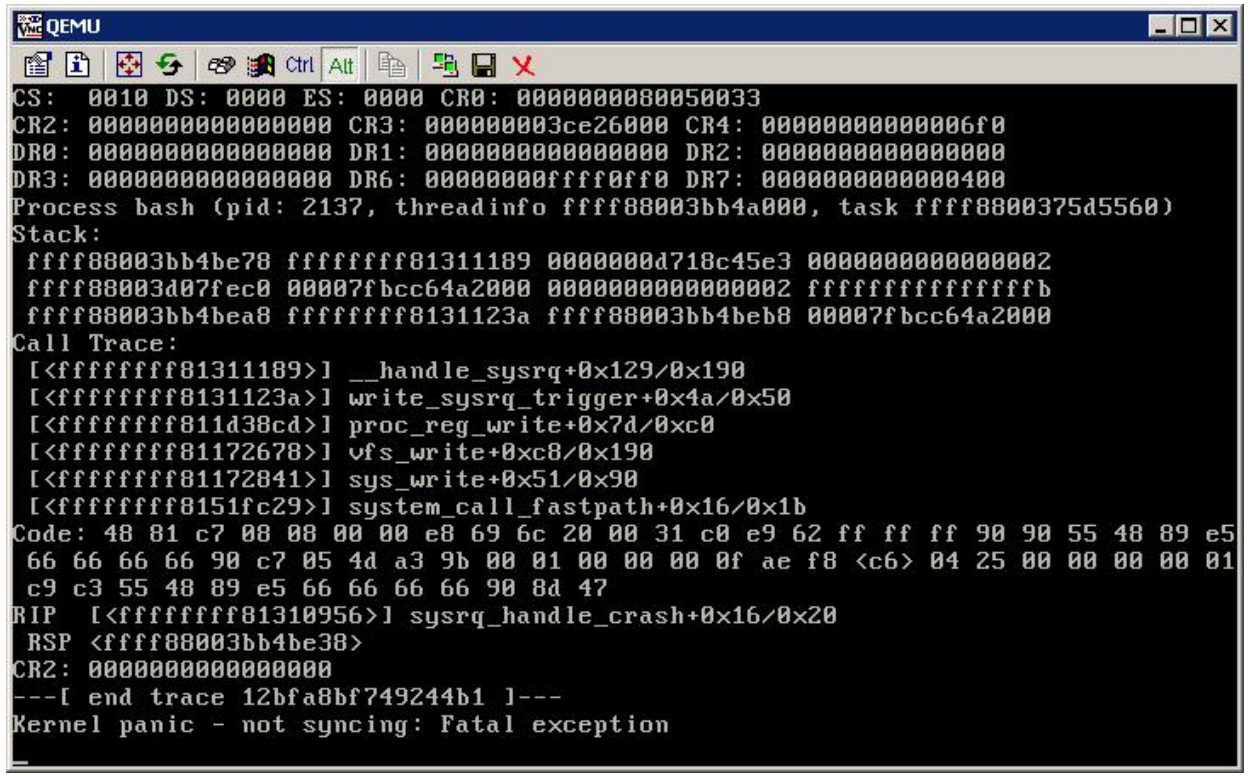

echo c > /proc/sysrq-trigger

Panic篇

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```
static void _die_header(const char *str, struct pt_regs *regs, long err)
{
        const char *pr = "";

        /* Save the regs of the first oops for the executive summary later. */
        if (!die_counter)
                exec_summary_regs = *regs;

        if (IS_ENABLED(CONFIG_PREEMPTION))
                pr = IS_ENABLED(CONFIG_PREEMPT_RT) ? " PREEMPT_RT" : " PREEMPT";

        printk(KERN_DEFAULT
                "%s: %04lx [#%d]%s%s%s%s%s¥n", str, err & 0xffff, ++die_counter,
                pr,
                IS_ENABLED(CONFIG_SMP)     ? " SMP"             : "",
                debug_pagealloc_enabled()  ? " DEBUG_PAGEALLOC" : "",
                IS_ENABLED(CONFIG_KASAN)   ? " KASAN"           : "",
                IS_ENABLED(CONFIG_PAGE_TABLE_ISOLATION) ?
                (boot_cpu_has(X86_FEATURE_PTI) ? " PTI" : " NOPTI") : "");
}
NOKPROBE_SYMBOL(_die_header);

static int _die_body(const char *str, struct pt_regs *regs, long err)
{
        show_regs(regs);
        print_modules();

        if (notify_die(DIE_OOPS, str, regs, err,
                        current->thread.trap_nr, SIGSEGV) == NOTIFY_STOP)
                return 1;

        return 0;
}
```

Panic篇

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PANIC
n. 恐慌，惊慌；
vt. 使恐慌
vi. 十分惊慌
adj. 恐慌的，惊慌失措的

一种强烈的突然性的感觉。恐慌的出现会支配人的正常思维和逻辑，取而代之的是焦虑感和本能的战斗或逃跑的行动。恐慌很可能在大型团体聚会或人群中出现，从而造成大规模恐慌。

WIKI
Panic is a sudden sensation of fear which is so strong as to dominate or prevent reason and logical thinking, replacing it with overwhelming feelings of anxiety and frantic agitation consistent with an animalistic fight-or-flight reaction. Panic may occur singularly in individuals or manifest suddenly in large groups as mass panic (closely related to herd behavior).

Panic篇

- See PANIC
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A kernel panic is an action taken by an operating system upon detecting an internal fatal error from which it cannot safely recover.

A failure in the operating system kernel that causes the OS to abend (crash).

操作系统在监测到内部的致命错误，并无法安全处理此错误时采取的动作。

Panic篇

OpenEuler

- See PANIC
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NO WAY

in

Kernel Space

Panic篇

OpenEuler

- See PANIC
- How to PANIC
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1: No next step

2: Error can’t handle

Panic篇

OpenEuler

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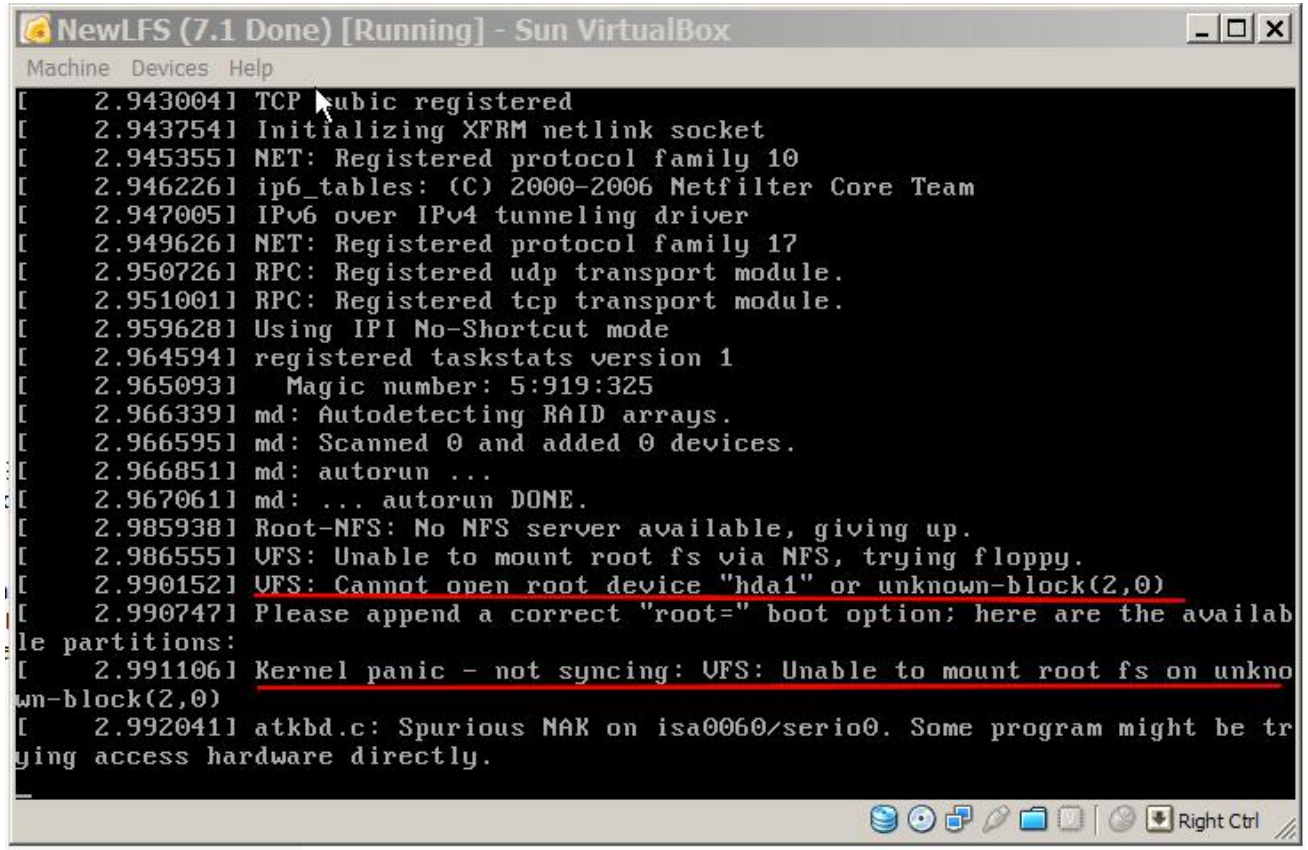
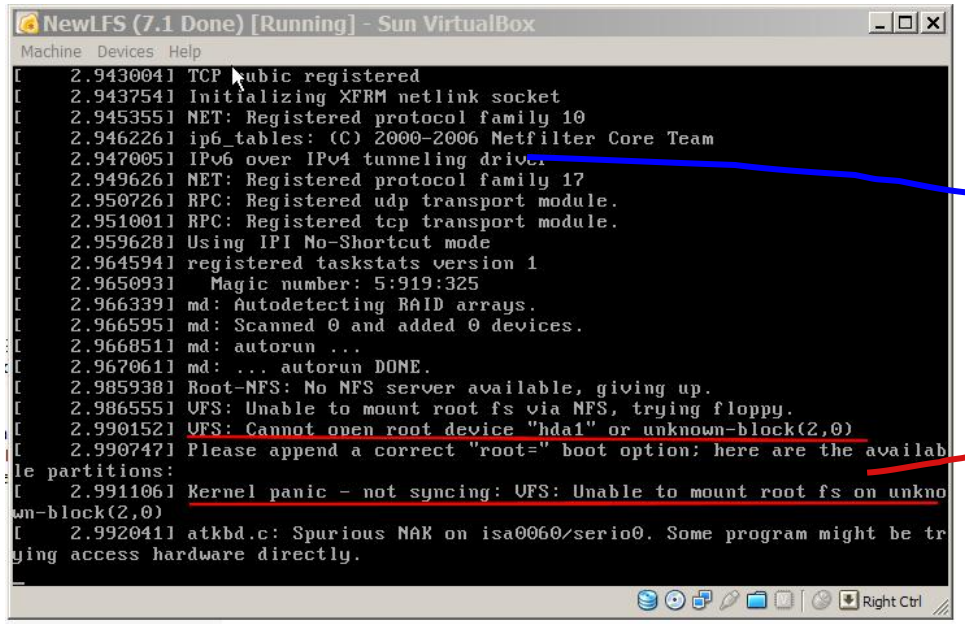


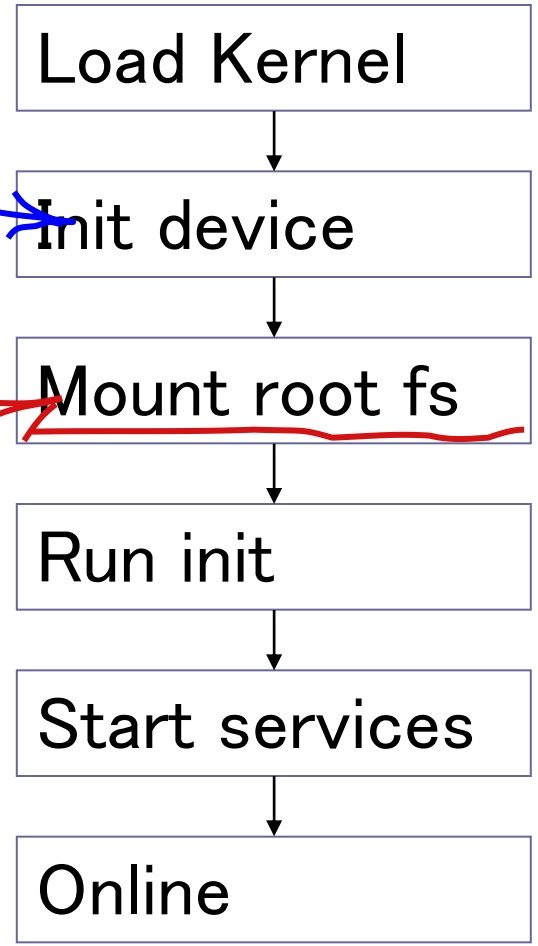
1: No next step

2: Error can’t handle

Panic篇

OpenEuler

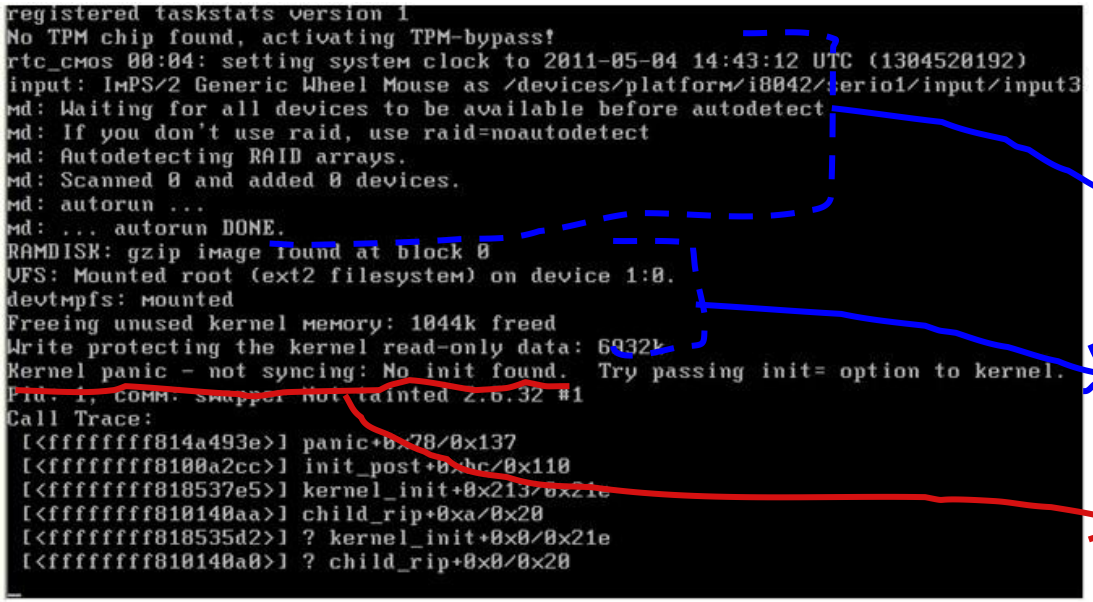




Can’t mount root fs

Panic篇

OpenEuler



Load Kernel

Init device

Mount root fs

Run init

Start services

Online

Can’t run init

Panic篇

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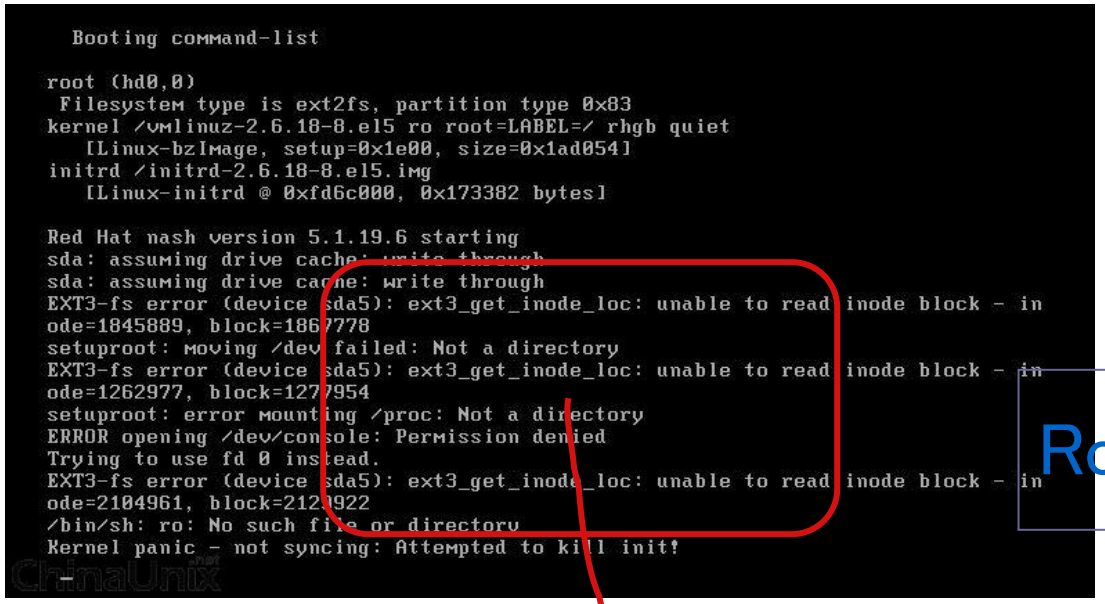
```
  Booting command-list

root (hd0,0)
 Filesystem type is ext2fs, partition type 0x83
kernel /vmlinuz-2.6.18-8.el5 ro root=LABEL=/ rhgb quiet
   [Linux-bzImage, setup=0x1e00, size=0x1ad054]
initrd /initrd-2.6.18-8.el5.img
   [Linux-initrd @ 0xfd6c000, 0x173382 bytes]

Red Hat nash version 5.1.19.6 starting
sda: assuming drive cache: write through
sda: assuming drive cache: write through
EXT3-fs error (device sda5): ext3_get_inode_loc: unable to read inode block - in
ode=1845889, block=1867778
setuproot: moving /dev failed: Not a directory
EXT3-fs error (device sda5): ext3_get_inode_loc: unable to read inode block - in
ode=1262977, block=1277954
setuproot: error mounting /proc: Not a directory
ERROR opening /dev/console: Permission denied
Trying to use fd 0 instead.
EXT3-fs error (device sda5): ext3_get_inode_loc: unable to read inode block - in
ode=2104961, block=2129922
/bin/sh: ro: No such file or directory
Kernel panic - not syncing: Attempted to kill init!
```

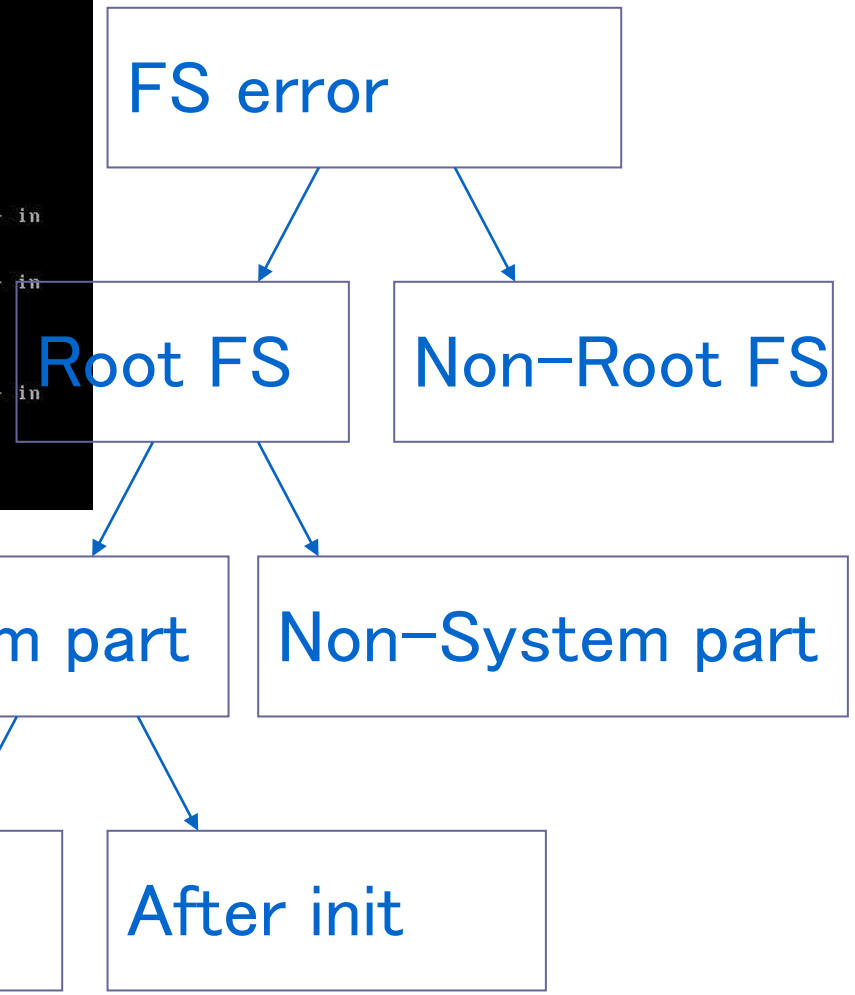

1: No next step

2: Error can’t handle

Panic篇

OpenEuler

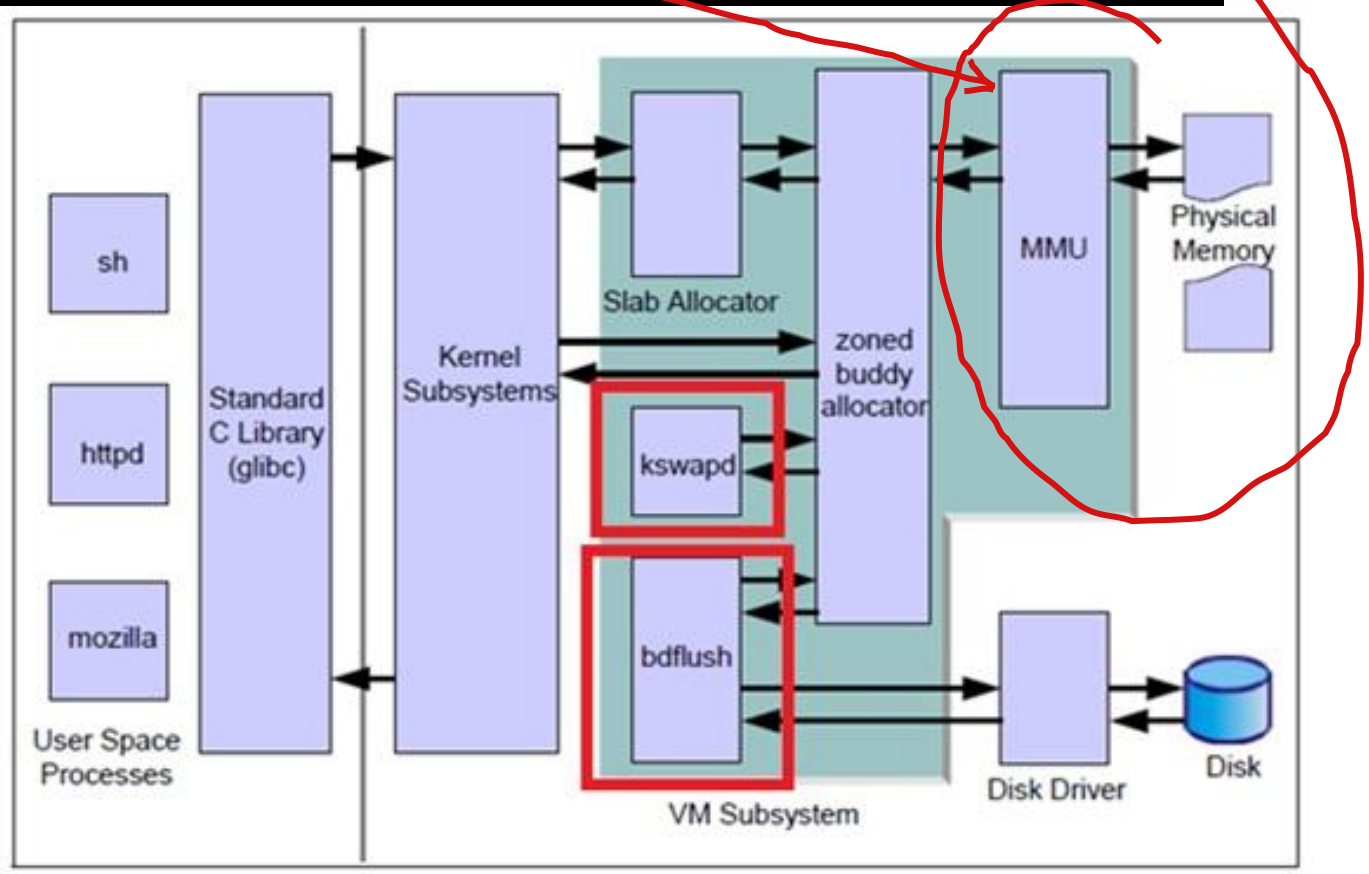




Panic篇

OpenEuler

```
Unable to handle kernel NULL pointer dereference at virtual address 00000004
 printing eip:
c014b300
*pde = 040b0067
Oops: 0002 [#1]
Modules linked in: msg(U) filter(U) md5 ipv6 dm_mod button battery ac snd_ens1371 snd_rawmidi snd_seq_device snd_pcm_oss snd_
er_oss snd_pcm snd_timer snd_page_alloc snd_ac97_codec snd soundcore pcnet32 mii floppy ext3 jbd mptscsih mptbase sd_mod scs
d
CPU:    0
EIP:    0060:[<c014b300>]
EFLAGS: 00010006   (2.6.9-11
EIP is at free_block+0x3a/0x
eax: 00000000   ebx: c3d398e
esi: c4eefe80   edi: 0000000
ds: 007b   es: 007b   ss: 00
Process events/0 (pid: 3, th
Stack: c4e62090 c4e62090 000
       00000003 c03fe900 c01
       c01337cc c014bc3a fff
Call Trace:
 [<c014bc1e>] drain_array_lo
 [<c014bce8>] cache_reap+0xa
 [<c01337cc>] worker_thread+
 [<c014bc3a>] cache_reap+0x0
 [<c011c856>] default_wake_f
 [<c03015e7>] schedule+0x43f
 [<c011c856>] default_wake_f
 [<c01335e1>] worker_thread+
 [<c01385a9>] kthread+0x69/0
 [<c0138540>] kthread+0x0/0x
 [<c01041d9>] kernel_thread_
Code: 48 24 39 fd 0f 8d 99 0
 8b 03 <89> 50 04 89 02 31 d
 <0>Fatal exception: panic i
Kernel panic - not syncing:
```



Panic篇

OpenEuler

- See PANIC
- How to PANIC
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- *Shoot*  PANIC

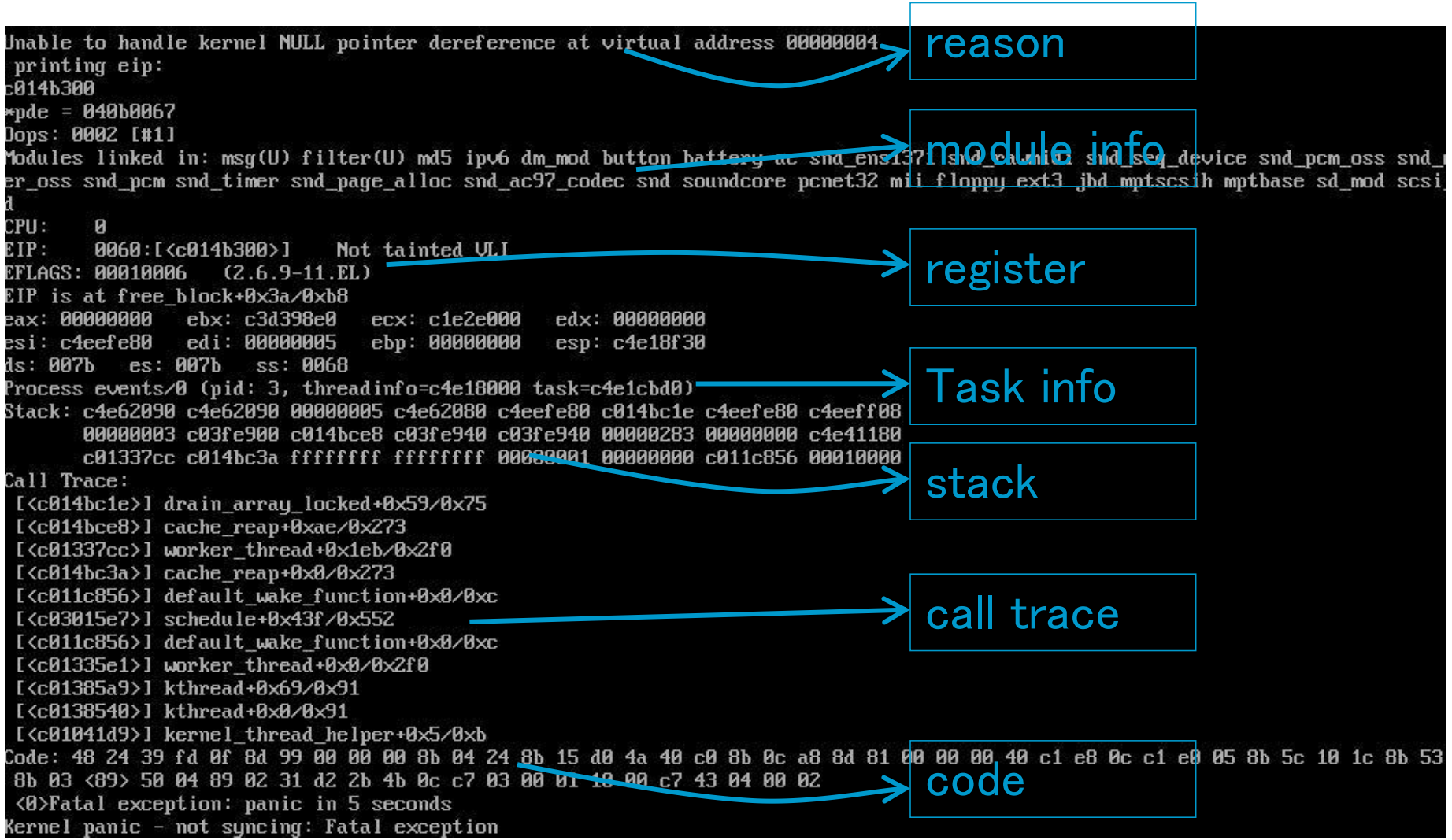
1: Screen output

2: Log file

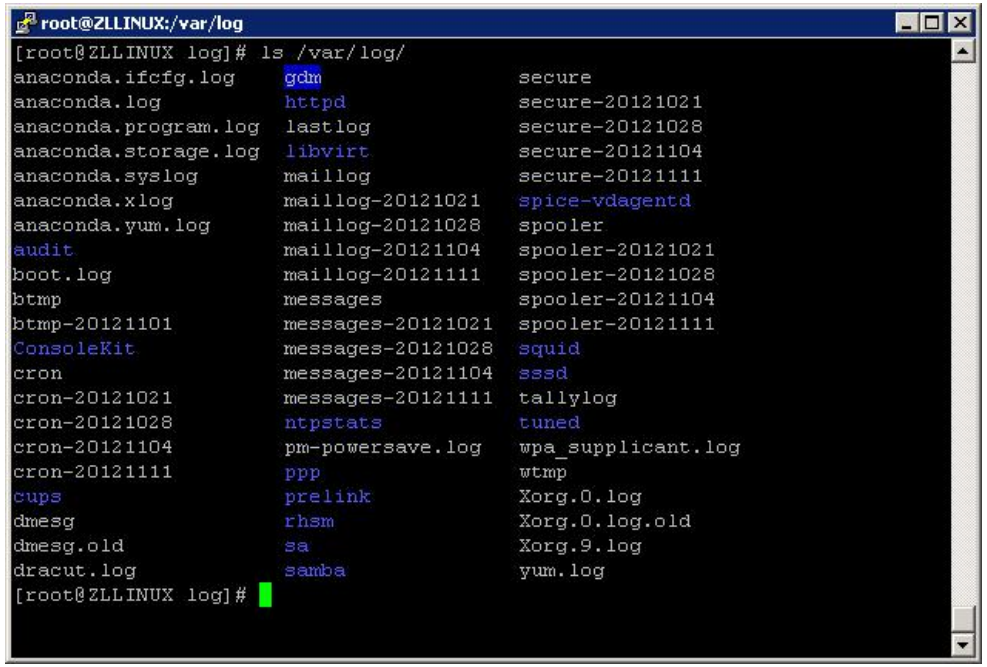
3: Tools

Panic篇

OpenEuler



Panic篇



/var/log/message: General message and system related stuff
/var/log/auth.log: Authenication logs
/var/log/kern.log: Kernel logs
/var/log/cron.log: Crond logs (cron job)
/var/log/maillog: Mail server logs
/var/log/qmail/ : Qmail log directory (more files inside this directory)
/var/log/httpd/: Apache access and error logs directory
/var/log/lighttpd: Lighttpd access and error logs directory
/var/log/boot.log : System boot log
/var/log/mysqld.log: MySQL database server log file
/var/log/secure: Authentication log
/var/log/utmp or /var/log/wtmp : Login records file
/var/log/yum.log: Yum log files

Panic篇

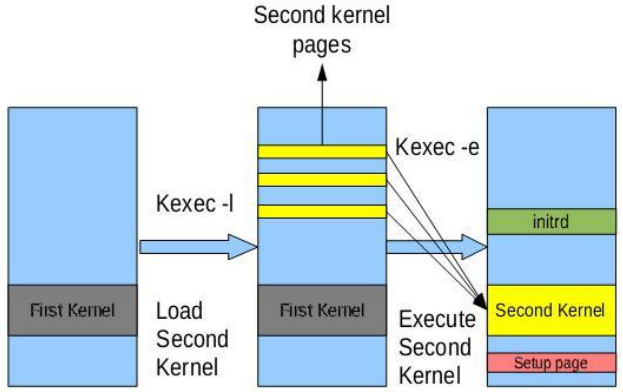
OpenEuler

Jun 13 04:39:51 luke kernel: ACPI: Critical trip point
Jun 13 04:39:51 luke kernel: Critical temperature reached (3342 C), shutting down.
Jun 13 04:39:51 luke shutdown[5858]: shutting down for system halt
Jun 13 04:39:56 luke mountd[2148]: Caught signal 15, un-registering and exiting.
Jun 13 04:40:00 luke kernel: nfsd: last server has exited
Jun 13 04:40:00 luke kernel: nfsd: unexporting all filesystems
Jun 13 04:40:04 luke smartd[2031]: smartd received signal 15: Terminated
Jun 13 04:40:04 luke smartd[2031]: smartd is exiting (exit status 0)
Jun 13 04:40:05 luke xinetd[2079]: Exiting...
Jun 13 04:40:06 luke kernel: Critical temperature reached (63 C), shutting down.
Jun 13 04:40:09 luke kernel: md: stopping all md devices.
Jun 13 04:40:09 luke kernel: md: md0 still in use.
Jun 13 04:40:09 luke kernel: md: md1 still in use.
Jun 13 04:40:10 luke kernel: Synchronizing SCSI cache for disk sdb:
Jun 13 04:40:10 luke kernel: Synchronizing SCSI cache for disk sda:
Jun 13 04:40:10 luke ntpd[2098]: ntpd exiting on signal 15
Jun 13 04:40:11 luke kernel: ACPI: PCI interrupt for device 0000:02:02.0 disabled

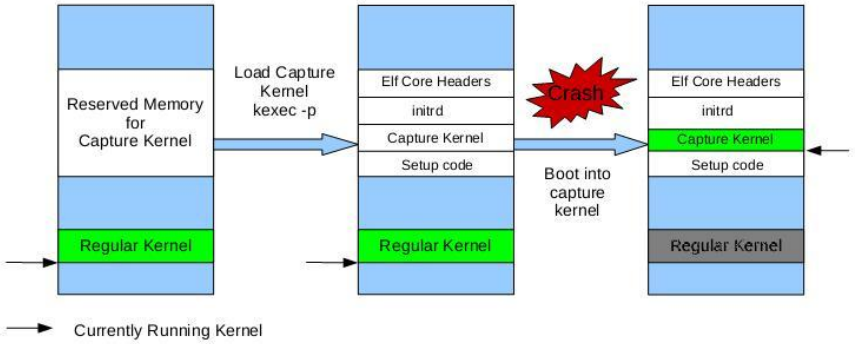
Panic篇

KDump

Kexec design



Kdump design



The Pict From Vivek Goyal's Presentation's Slides

```
root@jynode1:~
[root@jynode1 ~]# ls -l /var/crash/
total 24
drwxr-xr-x 2 root root 4096 Feb  5  2012 127.0.0.1-2012-02-05-22:01:26
drwxr-xr-x 2 root root 4096 Feb  5  2012 127.0.0.1-2012-02-05-22:44:11
drwxr-xr-x 2 root root 4096 Mar 15  2012 127.0.0.1-2012-03-15-17:19:26
drwxr-xr-x 2 root root 4096 Mar 15  2012 127.0.0.1-2012-03-15-17:44:19
drwxr-xr-x 2 root root 4096 Mar 23  2012 127.0.0.1-2012-03-23-14:24:06
drwx------ 2 root root 4096 Mar 15  2012 lost+found
[root@jynode1 ~]# ls -l /var/crash/127.0.0.1-2012-02-05-22\:01\:26/
total 21034368
-rw------- 1 root root       87539 Feb  5  2012 summary
-rw------- 1 root root 21457866528 Feb  5  2012 vmcore
-rwxr-xr-x 1 root root    60184798 Feb  5  2012 vmlinux
[root@jynode1 ~]#
```

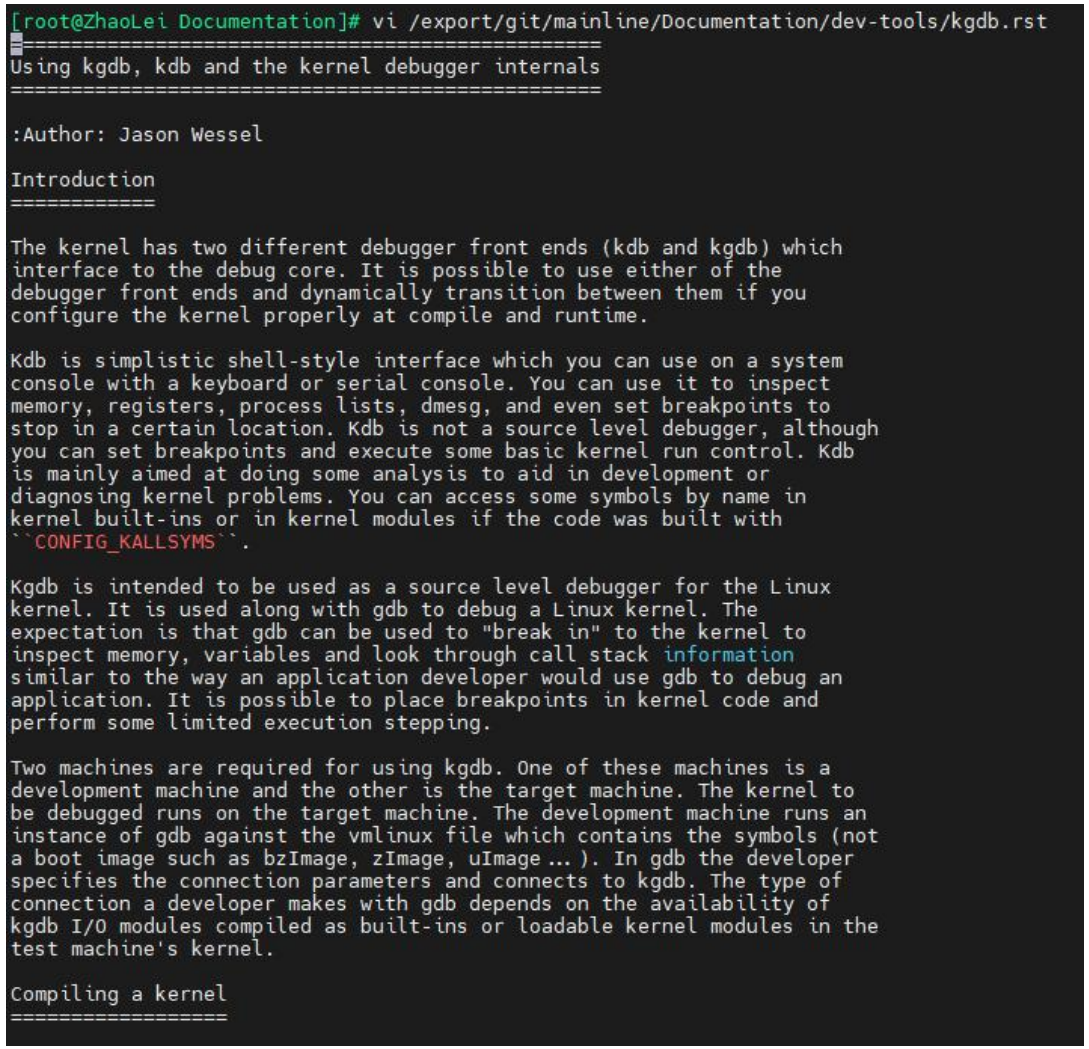
```
crash> bt -f
PID: 0      TASK: 1011000e030       CPU: 1   COMMAND: "sw
 #0 [101118b9e70] schedule at ffffffff8030bc9d
    101118b9e78: ffffffff8030bcf5
 #1 [101118b9e78] thread_return at ffffffff8030bcf5
    101118b9e80: 0000010208f317f0 0000000000000073
    101118b9e90: 000001011005e760 0000000000000000
    101118b9ea0: 0000000000000000 0000000000000000
    101118b9eb0: 0000000000000000 0000000000000001
    101118b9ec0: 0000000000000407 0000000000000002
    101118b9ed0: 0000000000000000 0000000000000008
    101118b9ee0: 00000101118b8000 0000000000000000
    101118b9ef0: 0000000000000018 ffffffff8010e749
    101118b9f00: 000001011000e030 000001011005e760
    101118b9f10: ffffffffffffffa9 ffffffff8010e769
 #2 [101118b9f18] default_idle at ffffffff8010e769
    101118b9f20: 0000000000000010 0000000000000246
    101118b9f30: 00000101118b9f48 0000000000000018
    101118b9f40: 0000000000000001 ffffffff8010e7dc
 #3 [101118b9f48] cpu_idle at ffffffff8010e7dc
```

Panic篇

OpenEuler

KGDB

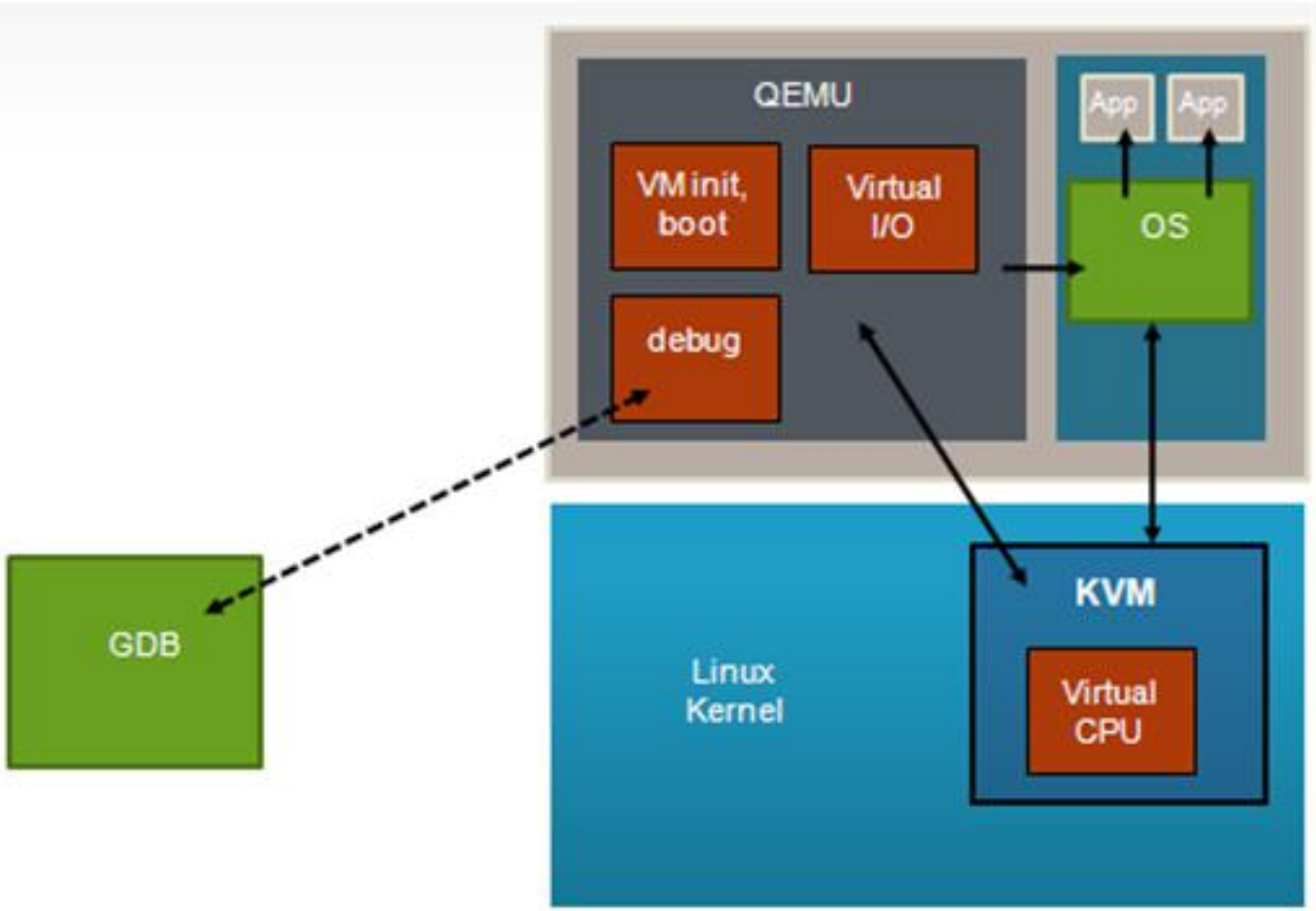
```
[root@openEuler-22 var]# grep CONFIG_KGDB /boot/config-5.10.0-136.12.0.86.oe2203sp1.x86_64
CONFIG_KGDB=y
CONFIG_KGDB_HONOUR_BLOCKLIST=y
CONFIG_KGDB_SERIAL_CONSOLE=y
CONFIG_KGDB_TESTS=y
# CONFIG_KGDB_TESTS_ON_BOOT is not set
CONFIG_KGDB_LOW_LEVEL_TRAP=y
CONFIG_KGDB_KDB=y
[root@openEuler-22 var]#
```



```
[root@ZhaoLei Documentation]# vi /export/git/mainline/Documentation/dev-tools/kgdb.rst
==================================================
Using kgdb, kdb and the kernel debugger internals
==================================================

:Author: Jason Wessel

Introduction
============

The kernel has two different debugger front ends (kdb and kgdb) which
interface to the debug core. It is possible to use either of the
debugger front ends and dynamically transition between them if you
configure the kernel properly at compile and runtime.

Kdb is simplistic shell-style interface which you can use on a system
console with a keyboard or serial console. You can use it to inspect
memory, registers, process lists, dmesg, and even set breakpoints to
stop in a certain location. Kdb is not a source level debugger, although
you can set breakpoints and execute some basic kernel run control. Kdb
is mainly aimed at doing some analysis to aid in development or
diagnosing kernel problems. You can access some symbols by name in
kernel built-ins or in kernel modules if the code was built with
``CONFIG_KALLSYMS``.

Kgdb is intended to be used as a source level debugger for the Linux
kernel. It is used along with gdb to debug a Linux kernel. The
expectation is that gdb can be used to "break in" to the kernel to
inspect memory, variables and look through call stack information
similar to the way an application developer would use gdb to debug an
application. It is possible to place breakpoints in kernel code and
perform some limited execution stepping.

Two machines are required for using kgdb. One of these machines is a
development machine and the other is the target machine. The kernel to
be debugged runs on the target machine. The development machine runs an
instance of gdb against the vmlinux file which contains the symbols (not
a boot image such as bzImage, zImage, uImage ...). In gdb the developer
specifies the connection parameters and connects to kgdb. The type of
connection a developer makes with gdb depends on the availability of
kgdb I/O modules compiled as built-ins or loadable kernel modules in the
test machine's kernel.

Compiling a kernel
==================
```

Panic篇

- qemu


QEMU
VM init, boot
Virtual I/O
debug
App
App
OS
GDB
Linux Kernel
KVM
Virtual CPU

OpenEuler

- See what
- Do what
- Need what

Error篇

- See what
- Do what
- Need what

```
[root@ZLLINUX ~]# httpd -e debug -X
[Fri Nov 16 17:53:56 2012] [debug] mod_so.c(246): loaded module auth_basic_module
[Fri Nov 16 17:53:56 2012] [debug] mod_so.c(246): loaded module auth_digest_module
[Fri Nov 16 17:53:56 2012] [debug] mod_so.c(246): loaded module authn_file_module
[Fri Nov 16 17:53:56 2012] [debug] mod_so.c(246): loaded module authz_alias_module
. . .
httpd: Could not reliably determine the server's fully qualified domain name, using 10.167.225.19 for ServerName
```

Output

```
[root@ZLLINUX /]# ls -l /var/log/httpd/
total 28
-rw-r--r--. 1 root root  1400 Nov 16 17:54 access_log
-rw-r--r--. 1 root root   850 Jul 27 11:48 access_log-20120729
-rw-r--r--. 1 root root 12932 Nov 16 17:54 error_log
-rw-r--r--. 1 root root  1114 Jul 27 19:05 error_log-20120729

[root@ZLLINUX /]# cat /var/log/httpd/error_log
[Fri Nov 16 17:30:36 2012] [notice] suEXEC mechanism enabled (wrapper: /usr/sbin/suexec)
httpd: Could not reliably determine the server's fully qualified domain name, using 10.167.225.19 for ServerName
[Fri Nov 16 17:30:36 2012] [notice] Digest: generating secret for digest authentication ...
[Fri Nov 16 17:30:36 2012] [notice] Digest: done
[Fri Nov 16 17:30:36 2012] [warn] ./mod_dnssd.c: No services found to register
[Fri Nov 16 17:30:50 2012] [error] [client 127.0.0.1] Directory index forbidden by Options directive: /var/www/html/
[Fri Nov 16 17:30:50 2012] [error] [client 127.0.0.1] File does not exist: /var/www/html/favicon.ico
[Fri Nov 16 17:30:50 2012] [error] [client 127.0.0.1] File does not exist: /var/www/html/favicon.ico
[Fri Nov 16 17:31:02 2012] [error] [client 127.0.0.1] Directory index forbidden by Options directive: /var/www/html/
[Fri Nov 16 17:31:07 2012] [error] [client 127.0.0.1] File does not exist: /var/www/html/hello
[Fri Nov 16 17:51:22 2012] [notice] suEXEC mechanism enabled (wrapper: /usr/sbin/suexec)
...
```

LOG

Error篇

OpenEuler

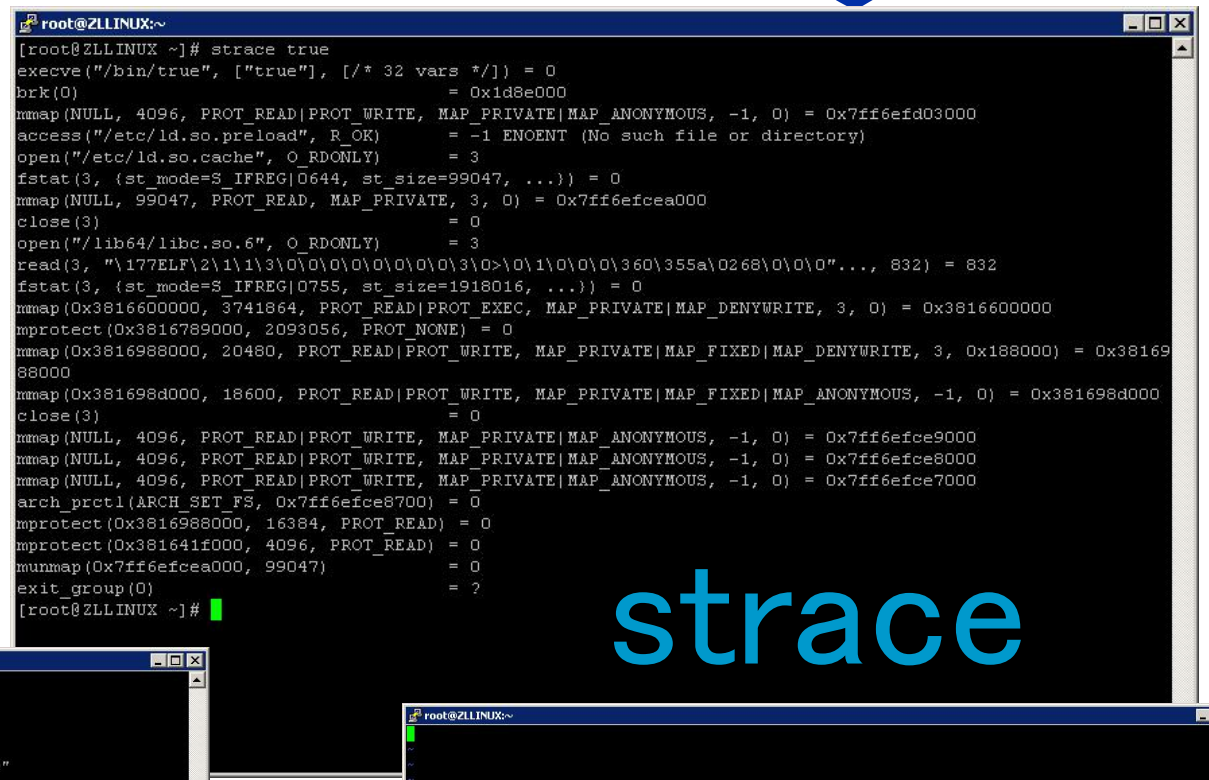
- See what
- Do what
- Need what

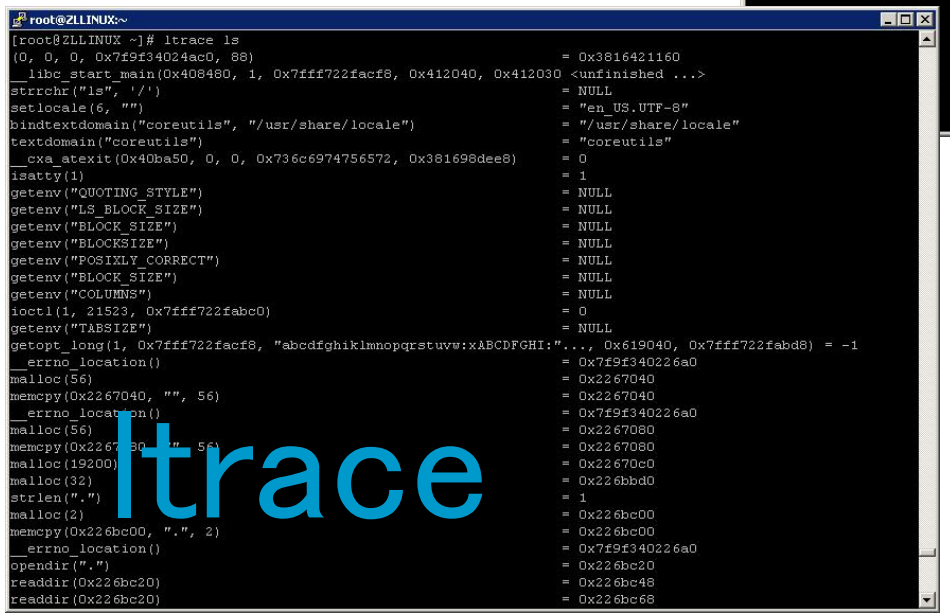

```
[root@ZLLINUX /]# httpd
httpd: Could not reliably determine the server's fully qualified dom
(98)Address already in use: make_sock: could not bind to address
(98)Address already in use: make_sock: could not bind to address 0.0.0.0:80
no listening sockets available, shutting down
Unable to open logs
[root@ZLLINUX /]# echo $?
1
[root@ZLLINUX /]# sshd
sshd re-exec requires execution with an absolute path
[root@ZLLINUX /]# echo $?
255
[root@ZLLINUX /]# iscsid
[root@ZLLINUX /]# echo $?
1
[root@ZLLINUX /]#
```

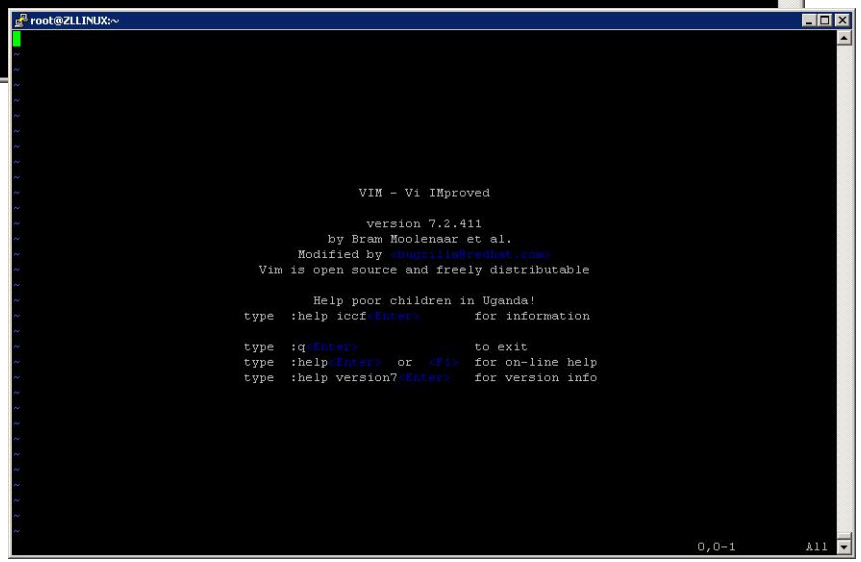
return value

Error篇

- See what
- Do what
- Need what

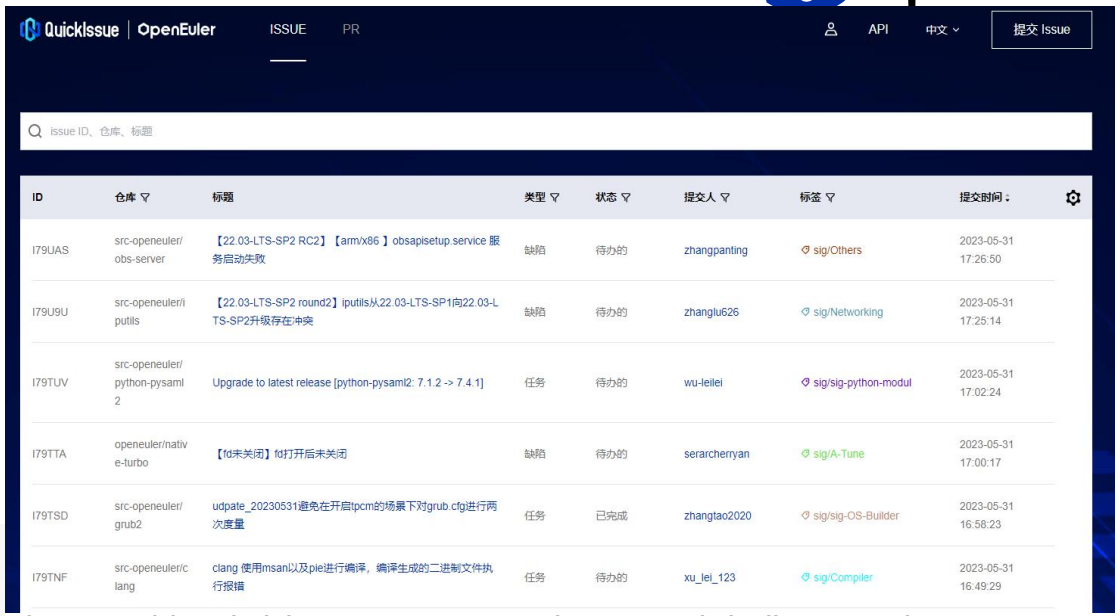






Error篇

- See what
- Do what
- Need what



https://quickissue.openeuler.org/zh/issues/

https://gitee.com/src-openeuler

https://forum.openeuler.org/

Error篇

OpenEuler

- See what
- Do what
- Need what

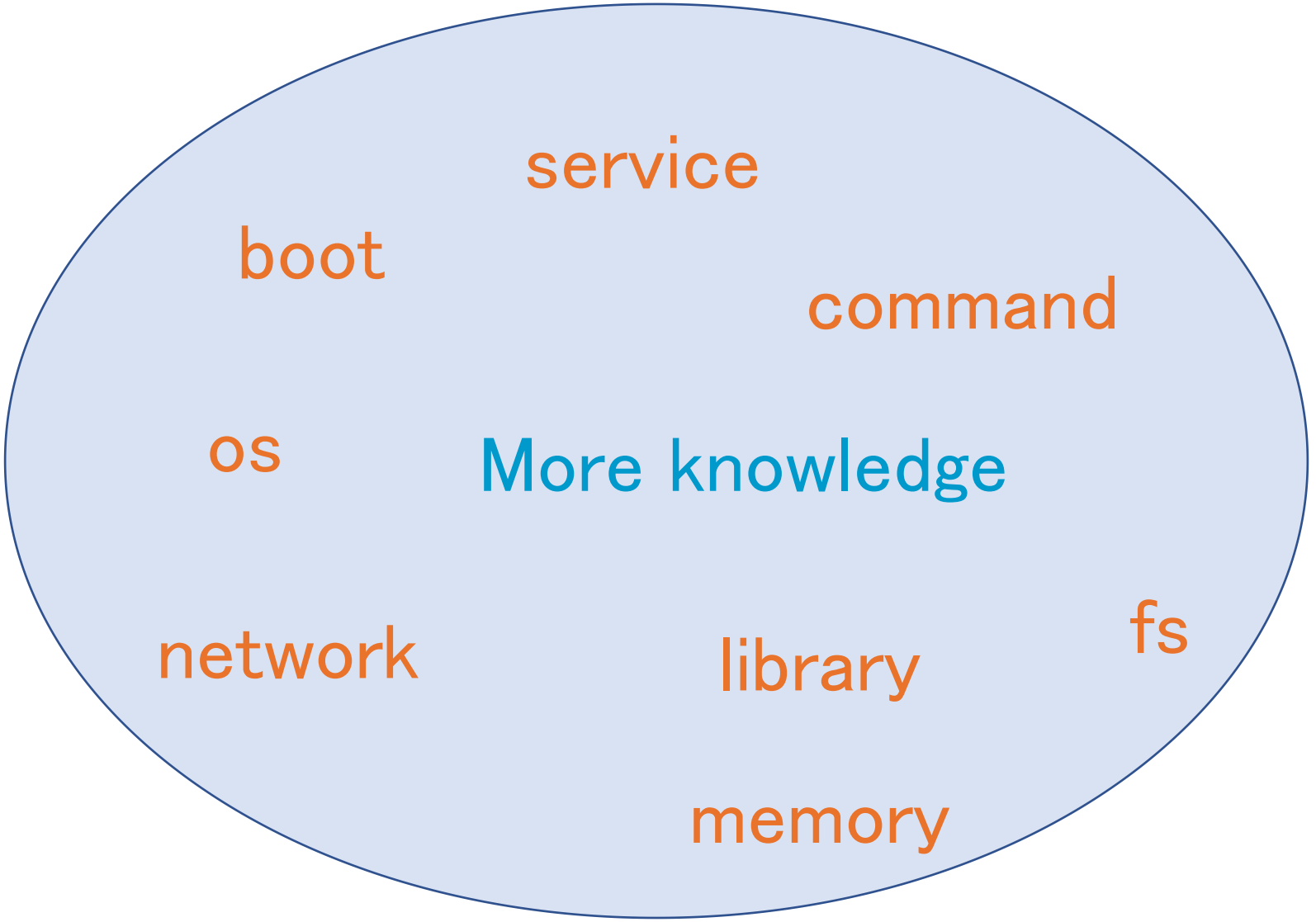
whoami

whoami: cannot find username for UID 0

```
# strace whoami
...
open("/lib/libnss_files.so.2", O_RDONLY) = -1 ENOENT (No such file or directory)
open("/lib/i686/mmx/libnss_files.so.2", O_RDONLY) = -1 ENOENT (No such file or
directory)
...

对策：
恢复libnss_files.so.2
```

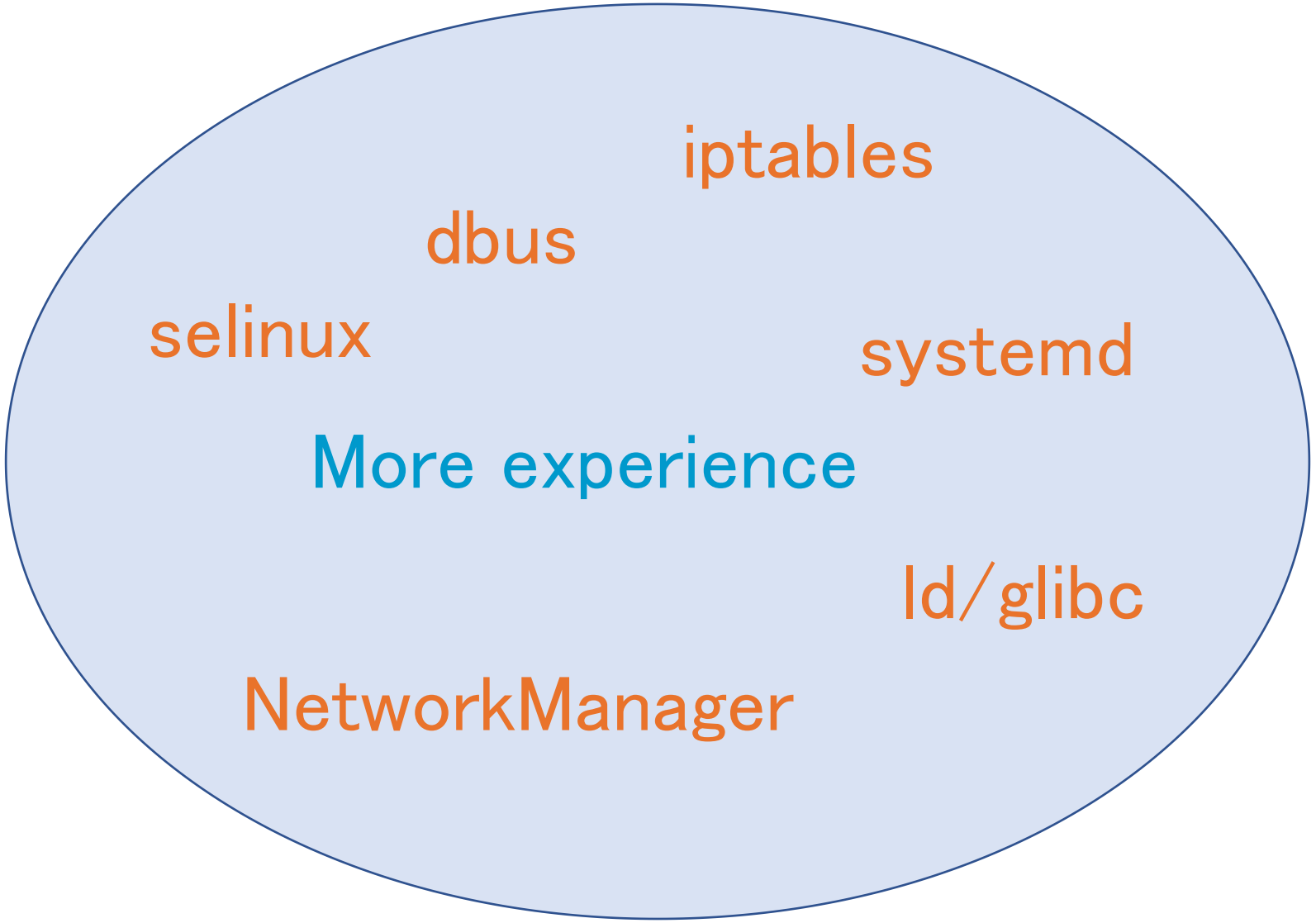
Error篇

- See what
- Do what
- Need what



Error篇

- See what
- Do what
- Need what



No silver Bullet
—Frederick P. Brooks, Jr.