How to debug kernel with KGDB on two virtual machines

version 1.0

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- Overview
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- Rebuild kernel with Kgdb patch
- Setting& Connect 2 virtual machines
- Debug Kernel use GDB

Overview

- KGDB is a source level debugger for linux kernel. It is used along with gdb to debug kernel.Current KGDB release is 2.4.Here is list of downloads for current release.

The kgdb patch: linux-2.6.15.5-kgdb-2.4.tar.bz2.
GDB for i386: gdbmod-2.4.bz2
GDB for x86_64: x86_64-pc-linux-gdbmod-2.4.tar.bz2

(*http://kgdb.linsyssoft.com/getting.htm*)

- Two machines(development & target machine) are required for using KGDB.The kernel_debug runs on target machine,GDB runs on development machine.The machines are connected through a serial line.In this case,we use two virtual machines which created by Vmware WorkStation 8

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Downloads

- List of downloads

Kernel: linux-2.6.15.5.tar.bz2

http://mirror.anl.gov/pub/linux/kernel/v2.6/

Kgdb version 2.4 & gdbmod

http://kgdb.linsyssoft.com/getting.htm

Vmware WorkStation 8

http://downloads.vmware.com/d/

Ubuntu10.10 ISO image to creat Virtual machines

http://releases.ubuntu.com/10.10/

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Rebuild Kernel with Kgdb patch(1/3)

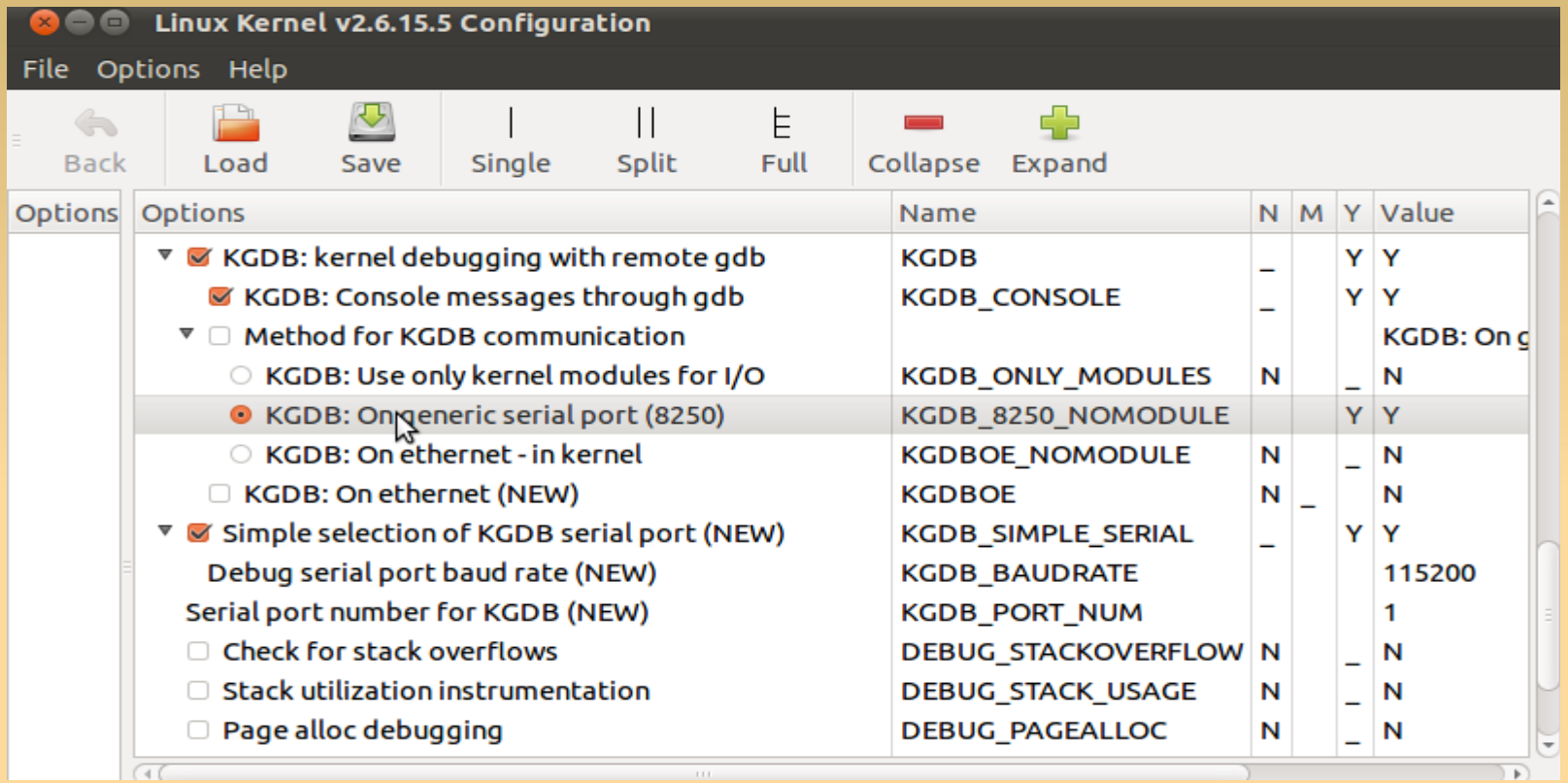
Creat a virtual machine name”Ubuntu10.10_debug_target”
Copy all downloads(kernel,kgdb,gdb) into folder '/mnt'
Here is commands to rebuild kernel with kgdb patch

```
$ cd  /mnt
$ tar -xvf linux-2.6.15.5.tar.bz2
$ cd linux-2.6.15.5
$ tar -xvf ../linux-2.6.15.5-kgdb-2.4.tar.bz2

$ patch -p1 linux-2.6.15.5-kgdb-2.4/core-lite.patch
$ patch -p1 linux-2.6.15.5-kgdb-2.4/8250.patch
$ patch -p1 linux-2.6.15.5-kgdb-2.4/netpoll_pass_skb_to_rx_hook.patch
$ patch -p1 linux-2.6.15.5-kgdb-2.4/eth.patch
$ patch -p1 linux-2.6.15.5-kgdb-2.4/i386-lite.patch
$ patch -p1 linux-2.6.15.5-kgdb-2.4/core.patch
$ patch -p1 linux-2.6.15.5-kgdb-2.4/i386.patch

$ make mrproper
$ make gconfig   (or: make menuconfig)
```

Rebuild Kernel with Kgdb patch(2/3)



##Save your config then edit Makefile: EXTRAVERSION = -kgdb
$ make bzImage && make modules && make modules_install && make install

Rebuild Kernel with Kgdb patch(3/3)

Error :"__stack_chk_fail"

```
  LD      .tmp_vmlinux1
init/built-in.o: In function `try_name':
/root/Downloads/linux-2.6.15.5/init/do_mounts.c:116: undefined reference to `__stack_chk_fail'
init/built-in.o: In function `name_to_dev_t':
/root/Downloads/linux-2.6.15.5/init/do_mounts.c:207: undefined reference to `__stack_chk_fail'
init/built-in.o: In function `mount_block_root':
/root/Downloads/linux-2.6.15.5/init/do_mounts.c:317: undefined reference to `__stack_chk_fail'
init/built-in.o: In function `change_floppy':
/root/Downloads/linux-2.6.15.5/init/do_mounts.c:359: undefined reference to `__stack_chk_fail'
init/built-in.o: In function `md_setup_drive':
/root/Downloads/linux-2.6.15.5/init/do_mounts_md.c:247: undefined reference to `__stack_chk_fail'
init/built-in.o:/root/Downloads/linux-2.6.15.5/init/initramfs.c:206: more undefined references to `__stack_chk_fail' follow
make: *** [.tmp_vmlinux1] Error 1
```

Solution: Edit Makefile → add '-fno-stack-protector'

```
# Use LINUXINCLUDE when you must reference the include/ directory.
# Needed to be compatible with the O= option
LINUXINCLUDE    := -Iinclude \
                   $(if $(KBUILD_SRC),-Iinclude2 -I$(srctree)/include) \
                   -include include/linux/autoconf.h

CPPFLAGS        := -D__KERNEL__ $(LINUXINCLUDE)

CFLAGS          := -Wall -Wundef -Wstrict-prototypes -Wno-trigraphs \
                   -fno-strict-aliasing -fno-common \
                   -fno-stack-protector \
                   -ffreestanding
AFLAGS          := -D__ASSEMBLY__
```

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Setting & Connect 2 Virtual Machines(1/3)

Vitual machine 1 “Ubuntu10.10_debug_target”

Setting */boot/grub/grup.cfg*

```
### BEGIN /etc/grub.d/10_linux ###
menuentry 'Debug kernel 2.6.15.5' --class ubuntu --class gnu-linux --class gnu --class os {
        recordfail
        insmod part_msdos
        insmod ext2
        set root='(hd0,msdos1)'
        search --no-floppy --fs-uuid --set 38178e6f-44e7-486f-b8f4-da24a6480f5f
        linux   /boot/vmlinuz-2.6.15-kgdb  root=UUID=38178e6f-44e7-486f-b8f4-da24a6480f5f
ro quiet splash  kgdbwait kgdb8250=1,115200
       # initrd  /boot/initrd.img-2.6.35-28-generic
}
```

Simple selection of KGDB serial port (NEW)	KGDB_SIMPLE_SERIAL	-		Y	Y
Debug serial port baud rate (NEW)	KGDB_BAUDRATE				115200
Serial port number for KGDB (NEW)	KGDB_PORT_NUM				1

Kgdb8250=1,115200

“115200”: serial port baudrate

“1”: Serial port number for KGDB

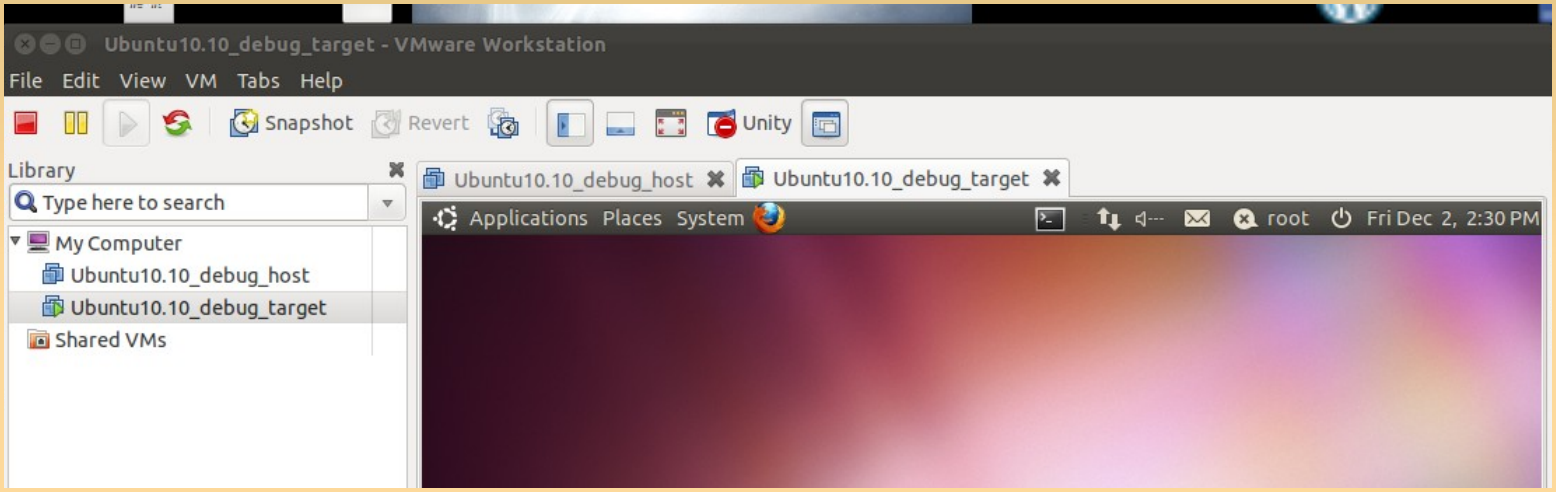
You can choose “0” when you Rebuild kernel

Setting & Connect 2 Virtual Machines(2/3)

Vitual machine 2 “Ubuntu10.10_debug_host”

Use *vmware-vdiskmanager to* to creat VM2 from VM1

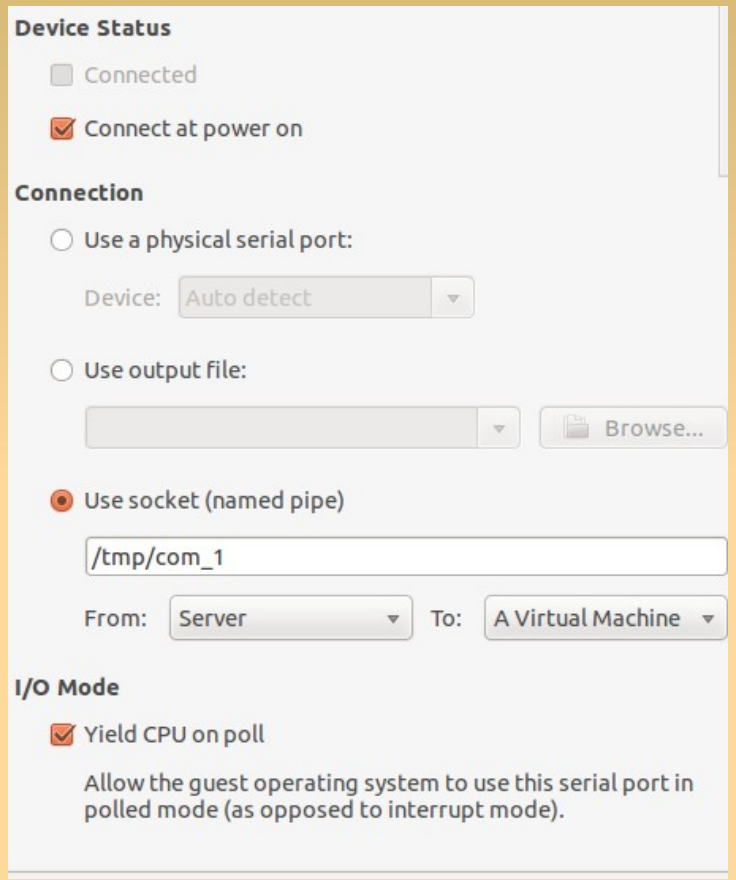
$vmware-vdiskmanager -r *Ubuntu10.10_debug_target.vmdk* -t 0 *Ubuntu10.10_debug_host.vmdk*



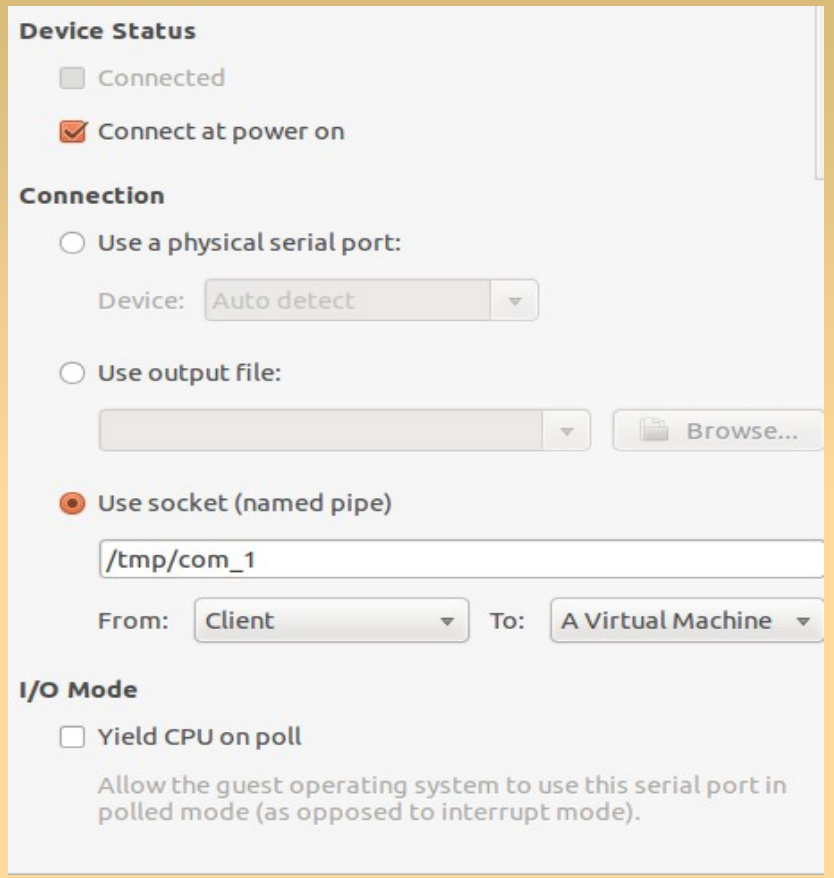
Add Serial port:

Edit virtual machine settings → Add... → Serial Port -->Output to socket

Setting & Connect 2 Virtual Machines(3/3)



Virtual machine 2
Ubuntu10.10_debug_host



Virtual machine 1
Ubuntu10.10_debug_target

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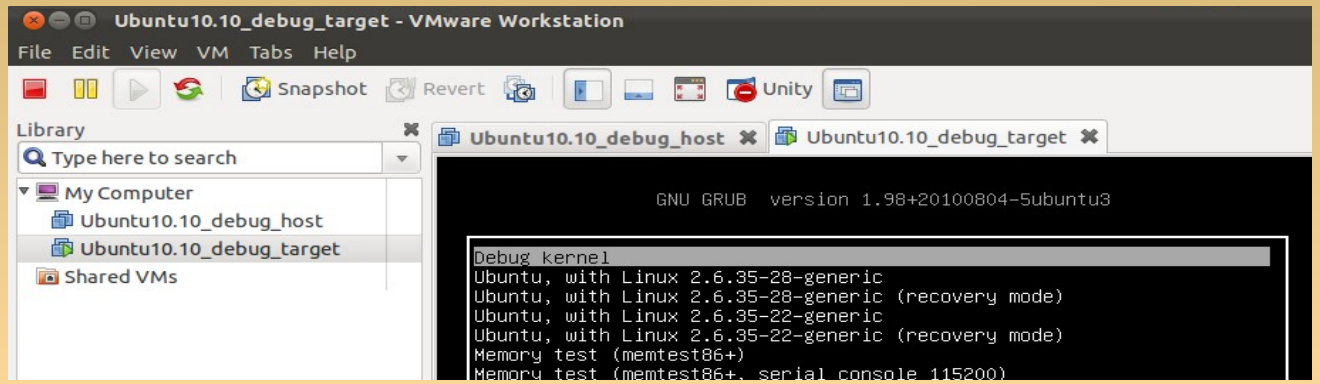
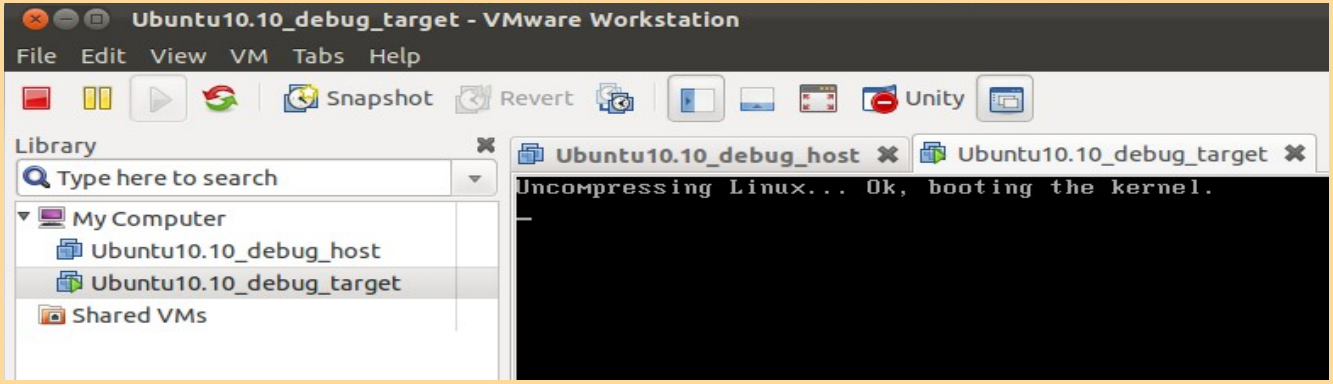
Debug Kernel use GDB(1/2)

VM1: Turn on → choose “Debug Kernel”



Watting Screen



Debug Kernel use GDB(2/2)

VM2: Turn on → choose “Ubuntu.with Linux 2.6.35-28-generic”

Extract “gdbmod-2.4.bz2” to /mnt

Open Terninal

```
$cd /mnt/linux-2.6.15.5
$/mnt/gdbmod-2.4 ./vmlinux
$set remotebaud 115200
$target remote /dev/ttyS1
```

Now creat breakpoint with “break ” then “c” to running