OS 161 Installation:

OS 161 is a primary level Linux based operating system. To install OS 161 for kernel development and testing we have to install - GCC (GNU Compiler Collection), GDB (GNU Debugger), SYS-161(Virtual Machine for OS 161) and OS-161 Binutils in a medium level Linux operating system. Best suitable Linux operating system for OS 161 is Red Hat Linux 5. We can also install all components of OS 161 in UBUNTU-9.04 and its earlier version with some system modification. Latest version of Ubuntu doesn't support lower version of GCC, but OS 161 need lower version of GCC. OS 161 can tolerate maximum GCC-4.1

Red Hat Linux - 5 is best suitable for OS 161. No problem to install OS 161 and no need of system modification.

Red Hat Linux -5 (OS 161 installation):

DOWNLOAD:

cs161-binutils-1.4.tgz

cs161-gcc-1.4-2.tgz

cs161-gdb-1.4-2.tgz

sys161-1.12-2.tgz

os161-1.11.tar.gz

Or download those packages all together as **ASST0.tar.gz**

(ASST**0** - A S S T **ZERO** it is not A S S T O). Just search on Google.

After downloading ASST0, place it on the desktop of Red Hat Linux-5, or any of your suitable drive or folder.

 # After placing on desktop, open the Linux terminal and follow this command sequentially:-

```
tar xzvf ASST0.tar.gz

tar xzvf cs161-binutils-1.4.tgz

tar xzvf cs161-gcc-1.4-2.tgz

tar xzvf cs161-gdb-1.4-2.tgz

tar xzvf sys161-1.12-2.tgz

tar xzvf os161-1.11.tar.gz

cd cs161-binutils-1.4

./toolbuild.sh

export PATH=$PATH:$HOME/cs161/bin

echo "PATH=$PATH:$HOME/cs161/bin" >> .bashrc

echo "export PATH" >> .bashrc

cd ../cs161-gcc-1.4-2

./toolbuild.sh

cd ../cs161-gdb-1.4-2

./toolbuild.sh

cd ../sys161-1.12-2

./configure mipseb

make

make install

cd ../os161-1.11

./configure

make
```

cd kern/conf

./config ASST0

cd ../compile/ASST0

make depend

make

make install

cd ~/cs161/root

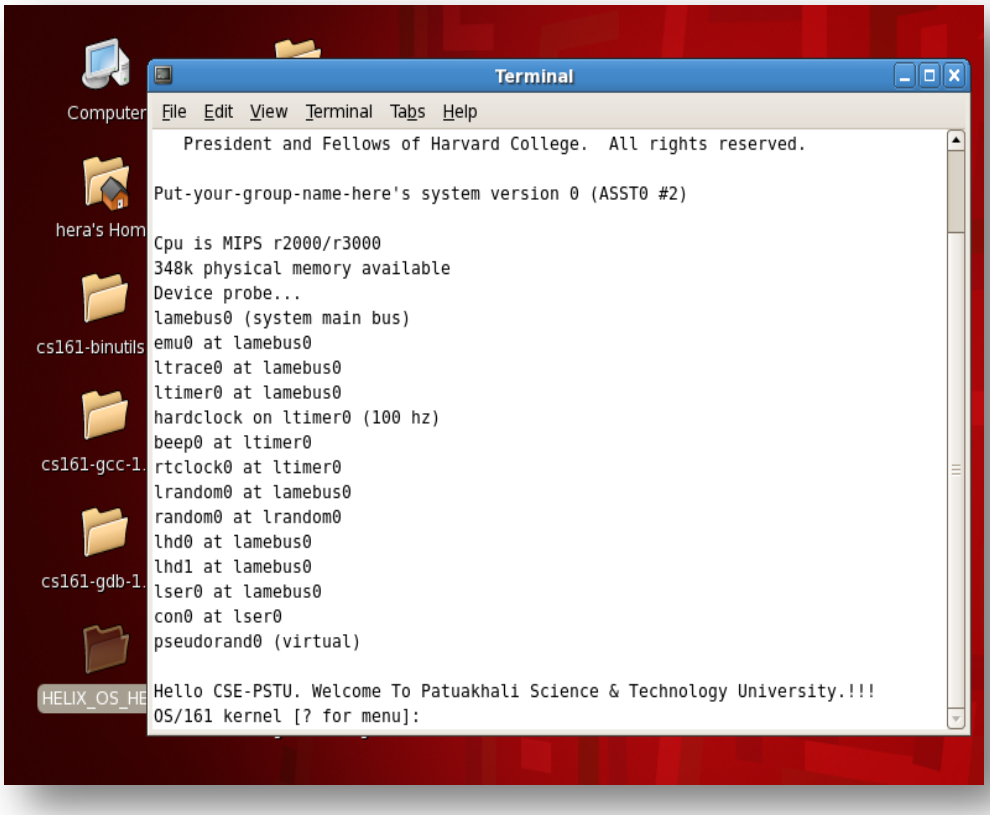
cp sys161.conf.sample sys161.conf

./sys161 kernel-ASST0

After finishing all of the terminal command if everything is OK then we will see the terminal as:

It indicates that our OS-161 is successfully installed and OS-161 Kernel is still running.

Type ? and press Enter for OS-161 menu option.



 # Now set up is complete but when we have to run OS-161 then just open the Linux terminal and type following two commands:

```
cd ~/cs161/root

./sys161 kernel-ASST0
```

 # OS-161 Kernel Modification with a C program "hello.c" :

What to do: Error correction & Welcome message in OS-161.

 # File Name: hello.c

 # Source Code:

```
#include <types.h>
#include <kern/errno.h>
#include <kern/unistd.h>
#include <lib.h>

static char *my_kstrdup(const char *buf)
{
    char *ptr, *ret;

    ret = ptr = kmalloc(strlen(buf));
    if(ptr =NULL)//←--Correct the ERROR……1st Assignment.
     panic("kmalloc returned NULL");

    for(; *buf != '\0'; ++ptr, ++buf)
     *ptr = *buf;

    *ptr = '\0';

    return ret;
}

static int my_toupper(int c)
{
    if(c >= 'a' && c <= 'z')
     return c - 'a' + 'A';
```

```
    return c;
}

void complex_hello(void)
{
const char *msg = "Hello CSE-PSTU. Welcome To Patuakhali Science & Technology University.!!!";//← Write your message here.
    char *copy;

    /* my_kstrdup never returns a NULL pointer, no need to check */
    copy = my_kstrdup(msg);

    /* We want 'Hello World!!!', need to capitalise the first letter */
    copy[0] = my_toupper(copy[0]);

    kprintf("%s\n", copy);

    /* Free the allocated memory */
    kfree(copy);
}
```

Correction of the error:

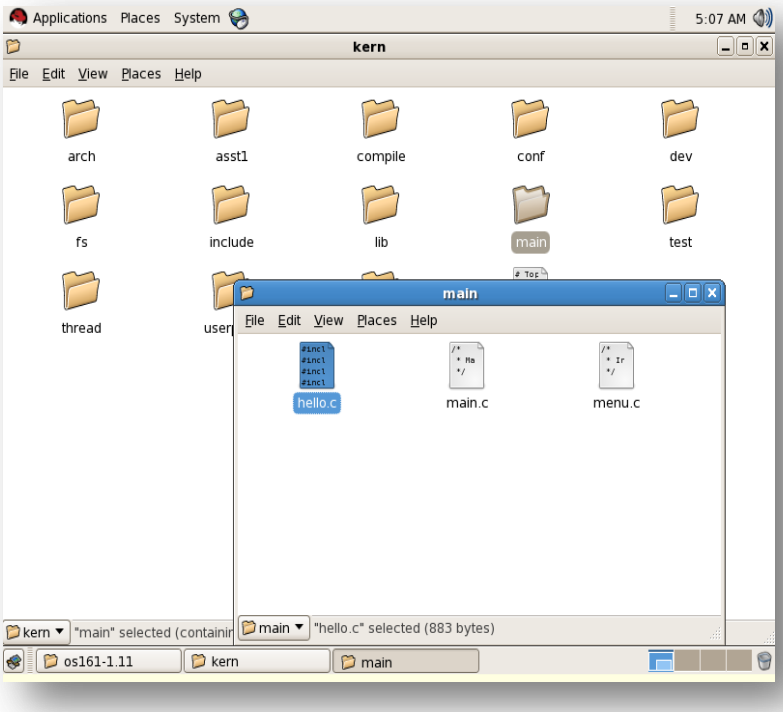
`if(ptr =NULL)` **ERROR.**

`if(ptr==NULL)` **CORRECT.**

File Placement and Kernel Configuration:

Place the **hello.c** after modification in **os161-1.11/kern/main/**

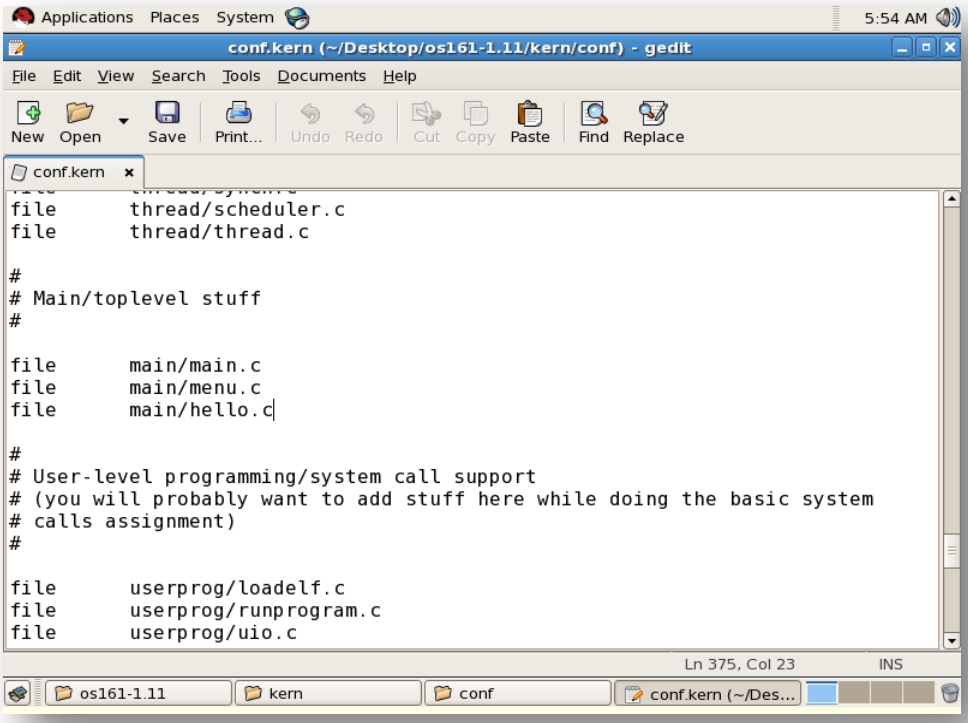
os161-1.11 is the setup directory of OS-161 and currently located on Desktop.



Then go to, **os161-1.11/kern/conf/**

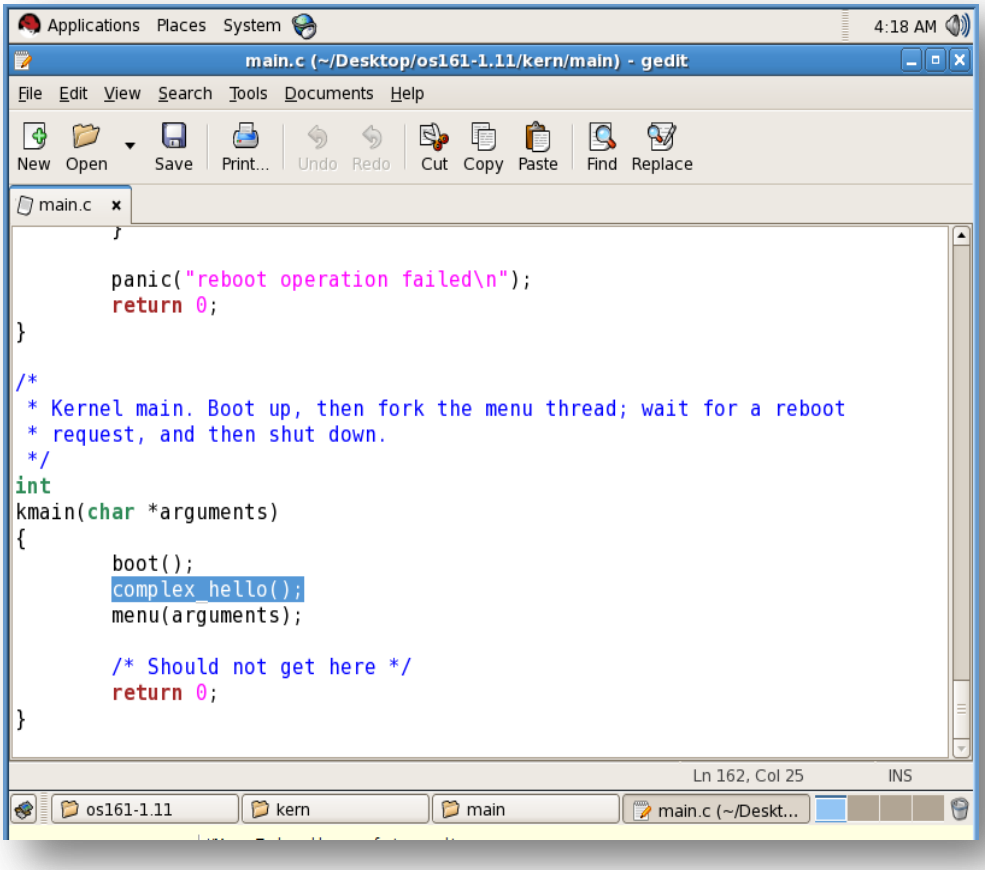
And open "**conf.kern**" file

Modify the file as given below:



 # Calling " hello.c " in main function of OS-161:

Now open **main.c** again and call the function name of hello.c (**complex_hello()**) between boot() and menu (arguments).

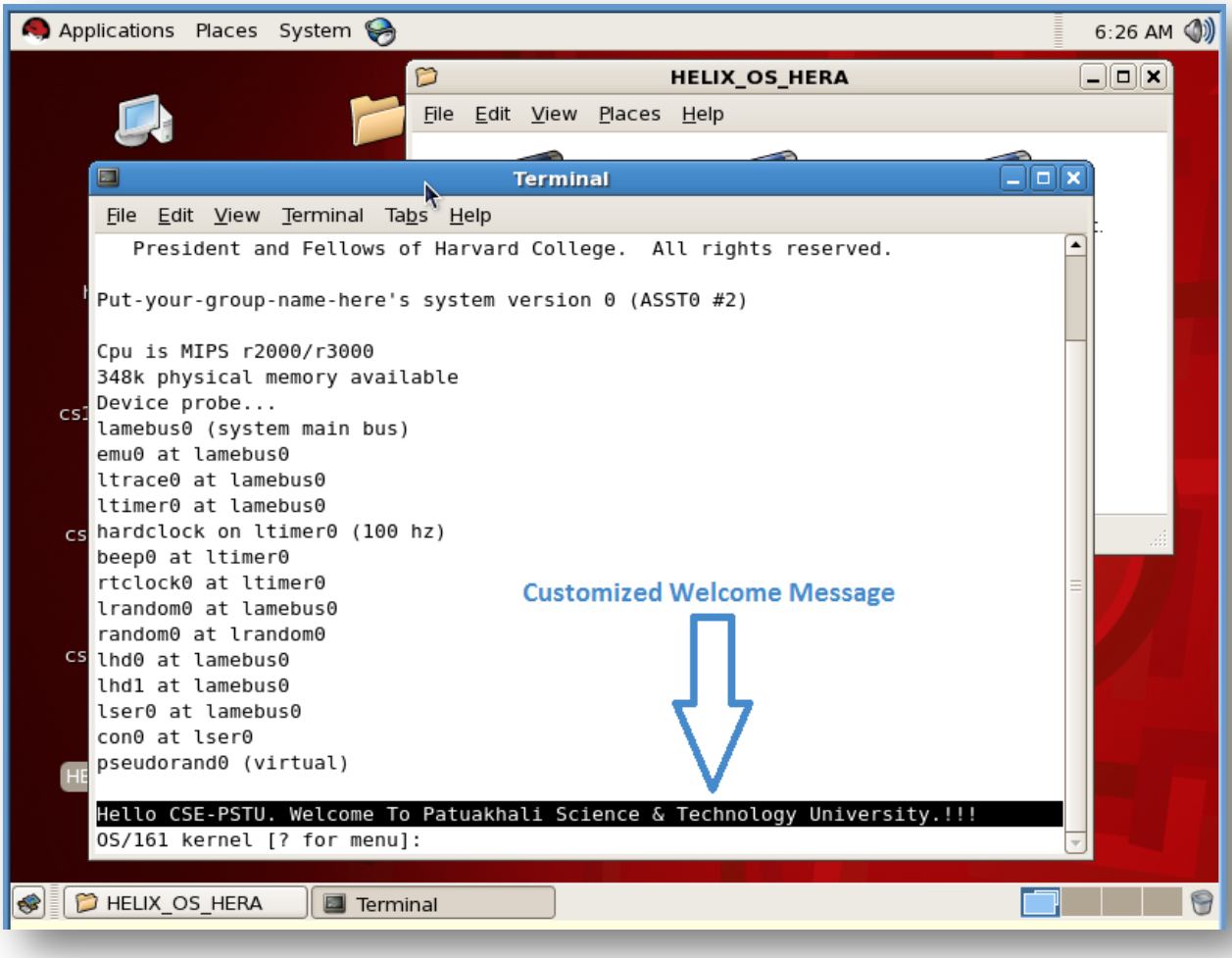


 # Now we have to rebuild the OS-161 kernel .

 # <u>Open a new Linux Terminal and follow the given instruction</u>:

```
cd Desktop

cd cs161-binutils-1.4

export PATH=$PATH:$HOME/cs161/bin

echo "PATH=$PATH:$HOME/cs161/bin" >> .bashrc

echo "export PATH" >> .bashrc

cd ../os161-1.11

./configure

Make

cd kern/conf

./config ASST0

cd ../compile/ASST0

make depend

make

make install

cd ~/cs161/root

cp sys161.conf.sample sys161.conf

./sys161 kernel-ASST0
```

 # Output:



 # For Laptop Users:

Today's high configured laptop doesn't support earlier versions of Linux. So laptop users are not able to directly set up Red Hat Linux 5 on their laptop. One alternative for laptop user to use a virtual machine and install Red Hat 5.

Download a **VMware Player**. Make an **ISO of Red Hat Linux 5**. Load the ISO on VMware Player. Install the Red Hat Linux 5. **Then install OS-161 using previously described instruction.**

VMware Player can execute on **Windows XP, Vista, Windows 7, Linux**.