Environment Variable and Set-UID Program Lab

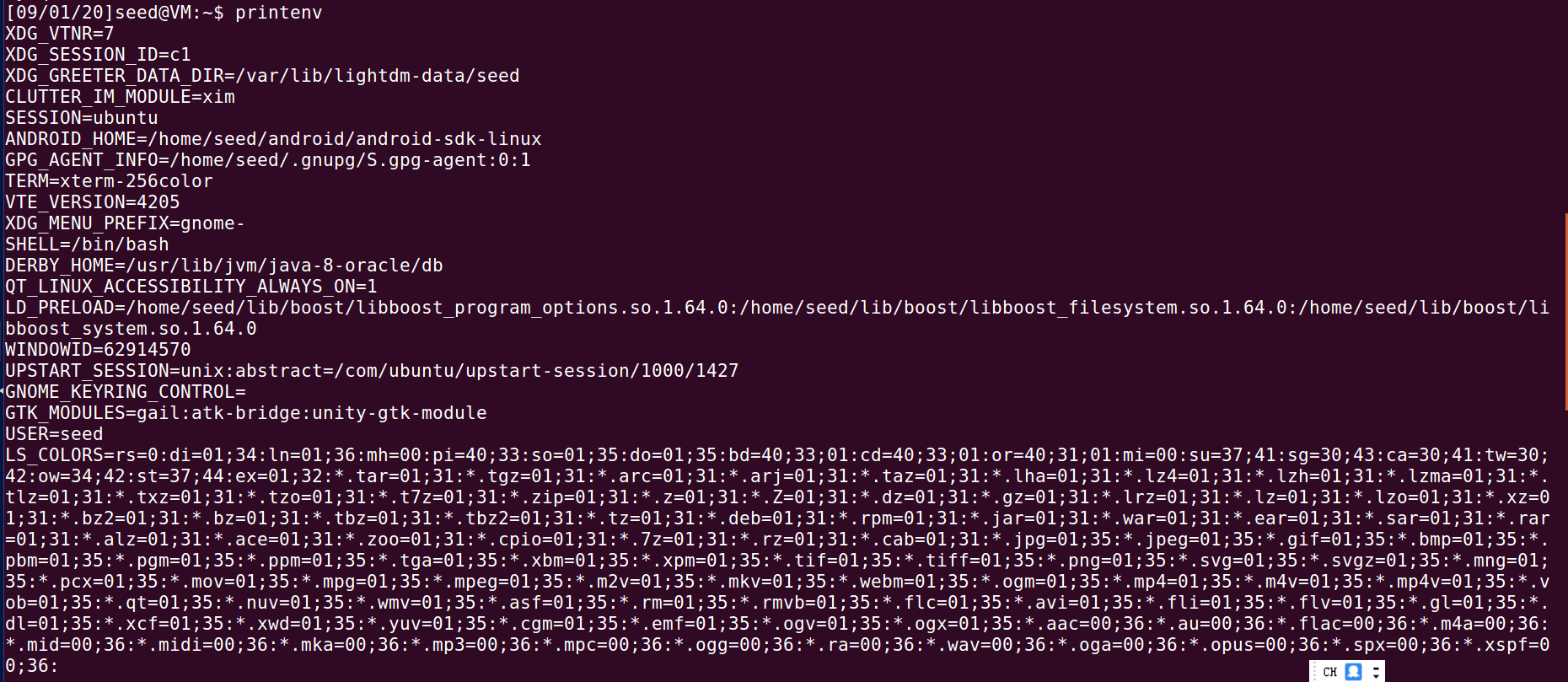
实验报告

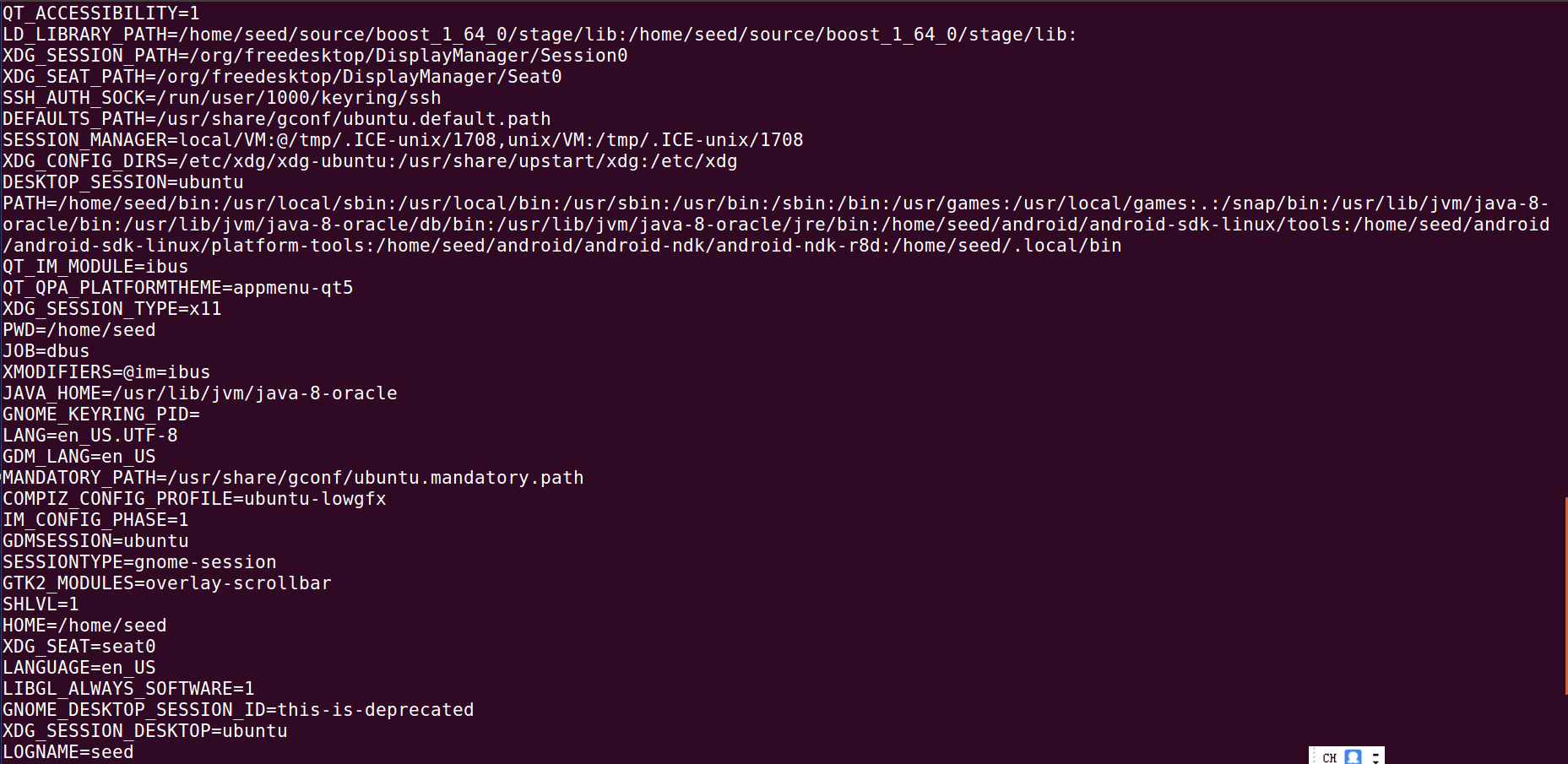
（57117105 杨哲君）

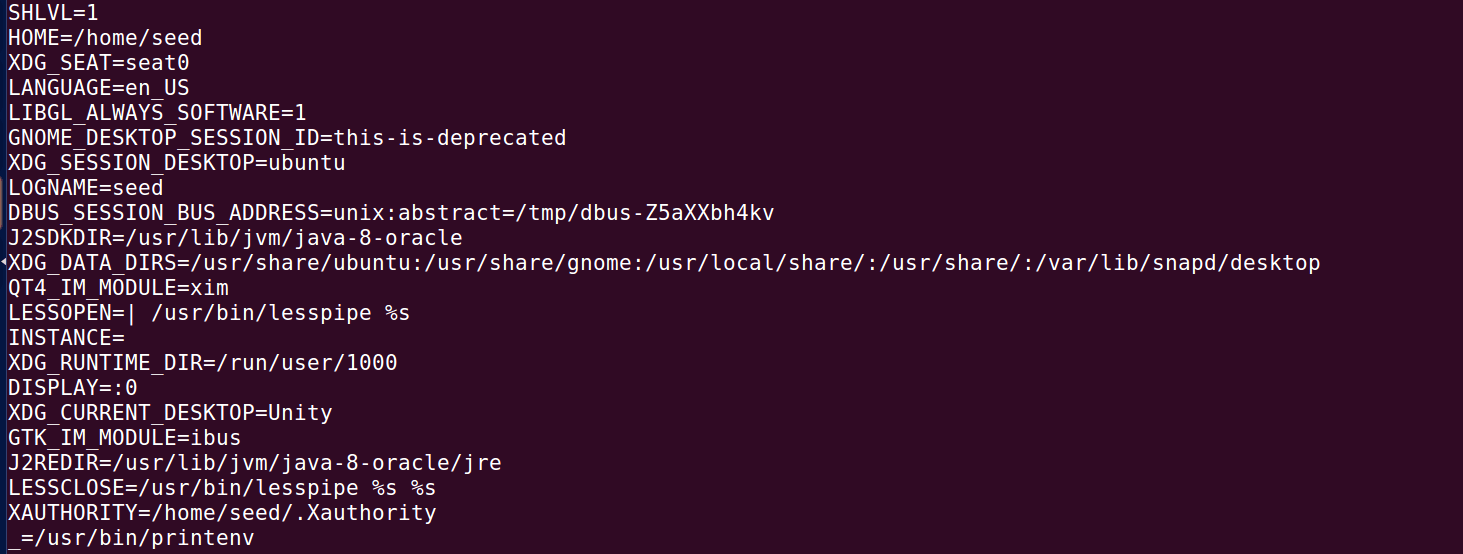
**Task 1: Manipulating Environment Variables**

* Use printenv or env command to print out the environment variables. If you are interested in some particular environment variables, such as PWD, you can use "printenv PWD" or "env |grep PWD".

使用printenv命令打印出环境变量。

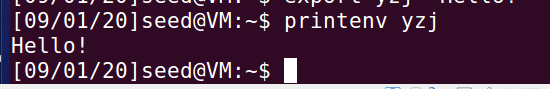




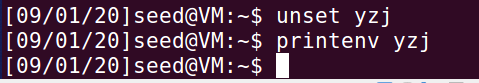


* Use export and unset to set or unset environment variables. It should be noted that these two commands are not seperate programs; they are two of the Bash’s internal commands (you will not be able to find them outside of Bash).

使用export添加环境变量：



使用unset删除环境变量：



**Task 2: Passing Environment Variables from Parent Process to Child Process**

**Step1：**运行结果

[09/01/20]seed@VM:~/Desktop$ ./task2

XDG\_VTNR=7

XDG\_SESSION\_ID=c1

XDG\_GREETER\_DATA\_DIR=/var/lib/lightdm-data/seed

CLUTTER\_IM\_MODULE=xim

SESSION=ubuntu

ANDROID\_HOME=/home/seed/android/android-sdk-linux

GPG\_AGENT\_INFO=/home/seed/.gnupg/S.gpg-agent:0:1

TERM=xterm-256color

VTE\_VERSION=4205

XDG\_MENU\_PREFIX=gnome-

SHELL=/bin/bash

DERBY\_HOME=/usr/lib/jvm/java-8-oracle/db

QT\_LINUX\_ACCESSIBILITY\_ALWAYS\_ON=1

LD\_PRELOAD=/home/seed/lib/boost/libboost\_program\_options.so.1.64.0:/home/seed/lib/boost/libboost\_filesystem.so.1.64.0:/home/seed/lib/boost/libboost\_system.so.1.64.0

WINDOWID=62914570

UPSTART\_SESSION=unix:abstract=/com/ubuntu/upstart-session/1000/1427

GNOME\_KEYRING\_CONTROL=

GTK\_MODULES=gail:atk-bridge:unity-gtk-module

USER=seed

LS\_COLORS=rs=0:di=01;34:ln=01;36:mh=00:pi=40;33:so=01;35:do=01;35:bd=40;33;01:cd=40;33;01:or=40;31;01:mi=00:su=37;41:sg=30;43:ca=30;41:tw=30;42:ow=34;42:st=37;44:ex=01;32:\*.tar=01;31:\*.tgz=01;31:\*.arc=01;31:\*.arj=01;31:\*.taz=01;31:\*.lha=01;31:\*.lz4=01;31:\*.lzh=01;31:\*.lzma=01;31:\*.tlz=01;31:\*.txz=01;31:\*.tzo=01;31:\*.t7z=01;31:\*.zip=01;31:\*.z=01;31:\*.Z=01;31:\*.dz=01;31:\*.gz=01;31:\*.lrz=01;31:\*.lz=01;31:\*.lzo=01;31:\*.xz=01;31:\*.bz2=01;31:\*.bz=01;31:\*.tbz=01;31:\*.tbz2=01;31:\*.tz=01;31:\*.deb=01;31:\*.rpm=01;31:\*.jar=01;31:\*.war=01;31:\*.ear=01;31:\*.sar=01;31:\*.rar=01;31:\*.alz=01;31:\*.ace=01;31:\*.zoo=01;31:\*.cpio=01;31:\*.7z=01;31:\*.rz=01;31:\*.cab=01;31:\*.jpg=01;35:\*.jpeg=01;35:\*.gif=01;35:\*.bmp=01;35:\*.pbm=01;35:\*.pgm=01;35:\*.ppm=01;35:\*.tga=01;35:\*.xbm=01;35:\*.xpm=01;35:\*.tif=01;35:\*.tiff=01;35:\*.png=01;35:\*.svg=01;35:\*.svgz=01;35:\*.mng=01;35:\*.pcx=01;35:\*.mov=01;35:\*.mpg=01;35:\*.mpeg=01;35:\*.m2v=01;35:\*.mkv=01;35:\*.webm=01;35:\*.ogm=01;35:\*.mp4=01;35:\*.m4v=01;35:\*.mp4v=01;35:\*.vob=01;35:\*.qt=01;35:\*.nuv=01;35:\*.wmv=01;35:\*.asf=01;35:\*.rm=01;35:\*.rmvb=01;35:\*.flc=01;35:\*.avi=01;35:\*.fli=01;35:\*.flv=01;35:\*.gl=01;35:\*.dl=01;35:\*.xcf=01;35:\*.xwd=01;35:\*.yuv=01;35:\*.cgm=01;35:\*.emf=01;35:\*.ogv=01;35:\*.ogx=01;35:\*.aac=00;36:\*.au=00;36:\*.flac=00;36:\*.m4a=00;36:\*.mid=00;36:\*.midi=00;36:\*.mka=00;36:\*.mp3=00;36:\*.mpc=00;36:\*.ogg=00;36:\*.ra=00;36:\*.wav=00;36:\*.oga=00;36:\*.opus=00;36:\*.spx=00;36:\*.xspf=00;36:

QT\_ACCESSIBILITY=1

LD\_LIBRARY\_PATH=/home/seed/source/boost\_1\_64\_0/stage/lib:/home/seed/source/boost\_1\_64\_0/stage/lib:

XDG\_SESSION\_PATH=/org/freedesktop/DisplayManager/Session0

XDG\_SEAT\_PATH=/org/freedesktop/DisplayManager/Seat0

SSH\_AUTH\_SOCK=/run/user/1000/keyring/ssh

DEFAULTS\_PATH=/usr/share/gconf/ubuntu.default.path

SESSION\_MANAGER=local/VM:@/tmp/.ICE-unix/1708,unix/VM:/tmp/.ICE-unix/1708

XDG\_CONFIG\_DIRS=/etc/xdg/xdg-ubuntu:/usr/share/upstart/xdg:/etc/xdg

DESKTOP\_SESSION=ubuntu

PATH=/home/seed/bin:/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:.:/snap/bin:/usr/lib/jvm/java-8-oracle/bin:/usr/lib/jvm/java-8-oracle/db/bin:/usr/lib/jvm/java-8-oracle/jre/bin:/home/seed/android/android-sdk-linux/tools:/home/seed/android/android-sdk-linux/platform-tools:/home/seed/android/android-ndk/android-ndk-r8d:/home/seed/.local/bin

QT\_IM\_MODULE=ibus

QT\_QPA\_PLATFORMTHEME=appmenu-qt5

XDG\_SESSION\_TYPE=x11

PWD=/home/seed/Desktop

JOB=dbus

XMODIFIERS=@im=ibus

JAVA\_HOME=/usr/lib/jvm/java-8-oracle

GNOME\_KEYRING\_PID=

LANG=en\_US.UTF-8

GDM\_LANG=en\_US

MANDATORY\_PATH=/usr/share/gconf/ubuntu.mandatory.path

COMPIZ\_CONFIG\_PROFILE=ubuntu-lowgfx

IM\_CONFIG\_PHASE=1

GDMSESSION=ubuntu

SESSIONTYPE=gnome-session

GTK2\_MODULES=overlay-scrollbar

SHLVL=1

HOME=/home/seed

XDG\_SEAT=seat0

LANGUAGE=en\_US

LIBGL\_ALWAYS\_SOFTWARE=1

GNOME\_DESKTOP\_SESSION\_ID=this-is-deprecated

XDG\_SESSION\_DESKTOP=ubuntu

LOGNAME=seed

DBUS\_SESSION\_BUS\_ADDRESS=unix:abstract=/tmp/dbus-Z5aXXbh4kv

J2SDKDIR=/usr/lib/jvm/java-8-oracle

XDG\_DATA\_DIRS=/usr/share/ubuntu:/usr/share/gnome:/usr/local/share/:/usr/share/:/var/lib/snapd/desktop

QT4\_IM\_MODULE=xim

LESSOPEN=| /usr/bin/lesspipe %s

INSTANCE=

XDG\_RUNTIME\_DIR=/run/user/1000

DISPLAY=:0

XDG\_CURRENT\_DESKTOP=Unity

GTK\_IM\_MODULE=ibus

J2REDIR=/usr/lib/jvm/java-8-oracle/jre

LESSCLOSE=/usr/bin/lesspipe %s %s

XAUTHORITY=/home/seed/.Xauthority

\_=./task2

OLDPWD=/home/seed

**Step2：**运行结果

[09/01/20]seed@VM:~/Desktop$ ./task2

XDG\_VTNR=7

XDG\_SESSION\_ID=c1

XDG\_GREETER\_DATA\_DIR=/var/lib/lightdm-data/seed

CLUTTER\_IM\_MODULE=xim

SESSION=ubuntu

ANDROID\_HOME=/home/seed/android/android-sdk-linux

GPG\_AGENT\_INFO=/home/seed/.gnupg/S.gpg-agent:0:1

TERM=xterm-256color

VTE\_VERSION=4205

XDG\_MENU\_PREFIX=gnome-

SHELL=/bin/bash

DERBY\_HOME=/usr/lib/jvm/java-8-oracle/db

QT\_LINUX\_ACCESSIBILITY\_ALWAYS\_ON=1

LD\_PRELOAD=/home/seed/lib/boost/libboost\_program\_options.so.1.64.0:/home/seed/lib/boost/libboost\_filesystem.so.1.64.0:/home/seed/lib/boost/libboost\_system.so.1.64.0

WINDOWID=62914570

UPSTART\_SESSION=unix:abstract=/com/ubuntu/upstart-session/1000/1427

GNOME\_KEYRING\_CONTROL=

GTK\_MODULES=gail:atk-bridge:unity-gtk-module

USER=seed

LS\_COLORS=rs=0:di=01;34:ln=01;36:mh=00:pi=40;33:so=01;35:do=01;35:bd=40;33;01:cd=40;33;01:or=40;31;01:mi=00:su=37;41:sg=30;43:ca=30;41:tw=30;42:ow=34;42:st=37;44:ex=01;32:\*.tar=01;31:\*.tgz=01;31:\*.arc=01;31:\*.arj=01;31:\*.taz=01;31:\*.lha=01;31:\*.lz4=01;31:\*.lzh=01;31:\*.lzma=01;31:\*.tlz=01;31:\*.txz=01;31:\*.tzo=01;31:\*.t7z=01;31:\*.zip=01;31:\*.z=01;31:\*.Z=01;31:\*.dz=01;31:\*.gz=01;31:\*.lrz=01;31:\*.lz=01;31:\*.lzo=01;31:\*.xz=01;31:\*.bz2=01;31:\*.bz=01;31:\*.tbz=01;31:\*.tbz2=01;31:\*.tz=01;31:\*.deb=01;31:\*.rpm=01;31:\*.jar=01;31:\*.war=01;31:\*.ear=01;31:\*.sar=01;31:\*.rar=01;31:\*.alz=01;31:\*.ace=01;31:\*.zoo=01;31:\*.cpio=01;31:\*.7z=01;31:\*.rz=01;31:\*.cab=01;31:\*.jpg=01;35:\*.jpeg=01;35:\*.gif=01;35:\*.bmp=01;35:\*.pbm=01;35:\*.pgm=01;35:\*.ppm=01;35:\*.tga=01;35:\*.xbm=01;35:\*.xpm=01;35:\*.tif=01;35:\*.tiff=01;35:\*.png=01;35:\*.svg=01;35:\*.svgz=01;35:\*.mng=01;35:\*.pcx=01;35:\*.mov=01;35:\*.mpg=01;35:\*.mpeg=01;35:\*.m2v=01;35:\*.mkv=01;35:\*.webm=01;35:\*.ogm=01;35:\*.mp4=01;35:\*.m4v=01;35:\*.mp4v=01;35:\*.vob=01;35:\*.qt=01;35:\*.nuv=01;35:\*.wmv=01;35:\*.asf=01;35:\*.rm=01;35:\*.rmvb=01;35:\*.flc=01;35:\*.avi=01;35:\*.fli=01;35:\*.flv=01;35:\*.gl=01;35:\*.dl=01;35:\*.xcf=01;35:\*.xwd=01;35:\*.yuv=01;35:\*.cgm=01;35:\*.emf=01;35:\*.ogv=01;35:\*.ogx=01;35:\*.aac=00;36:\*.au=00;36:\*.flac=00;36:\*.m4a=00;36:\*.mid=00;36:\*.midi=00;36:\*.mka=00;36:\*.mp3=00;36:\*.mpc=00;36:\*.ogg=00;36:\*.ra=00;36:\*.wav=00;36:\*.oga=00;36:\*.opus=00;36:\*.spx=00;36:\*.xspf=00;36:

QT\_ACCESSIBILITY=1

LD\_LIBRARY\_PATH=/home/seed/source/boost\_1\_64\_0/stage/lib:/home/seed/source/boost\_1\_64\_0/stage/lib:

XDG\_SESSION\_PATH=/org/freedesktop/DisplayManager/Session0

XDG\_SEAT\_PATH=/org/freedesktop/DisplayManager/Seat0

SSH\_AUTH\_SOCK=/run/user/1000/keyring/ssh

DEFAULTS\_PATH=/usr/share/gconf/ubuntu.default.path

SESSION\_MANAGER=local/VM:@/tmp/.ICE-unix/1708,unix/VM:/tmp/.ICE-unix/1708

XDG\_CONFIG\_DIRS=/etc/xdg/xdg-ubuntu:/usr/share/upstart/xdg:/etc/xdg

DESKTOP\_SESSION=ubuntu

PATH=/home/seed/bin:/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:.:/snap/bin:/usr/lib/jvm/java-8-oracle/bin:/usr/lib/jvm/java-8-oracle/db/bin:/usr/lib/jvm/java-8-oracle/jre/bin:/home/seed/android/android-sdk-linux/tools:/home/seed/android/android-sdk-linux/platform-tools:/home/seed/android/android-ndk/android-ndk-r8d:/home/seed/.local/bin

QT\_IM\_MODULE=ibus

QT\_QPA\_PLATFORMTHEME=appmenu-qt5

XDG\_SESSION\_TYPE=x11

PWD=/home/seed/Desktop

JOB=dbus

XMODIFIERS=@im=ibus

JAVA\_HOME=/usr/lib/jvm/java-8-oracle

GNOME\_KEYRING\_PID=

LANG=en\_US.UTF-8

GDM\_LANG=en\_US

MANDATORY\_PATH=/usr/share/gconf/ubuntu.mandatory.path

COMPIZ\_CONFIG\_PROFILE=ubuntu-lowgfx

IM\_CONFIG\_PHASE=1

GDMSESSION=ubuntu

SESSIONTYPE=gnome-session

GTK2\_MODULES=overlay-scrollbar

SHLVL=1

HOME=/home/seed

XDG\_SEAT=seat0

LANGUAGE=en\_US

LIBGL\_ALWAYS\_SOFTWARE=1

GNOME\_DESKTOP\_SESSION\_ID=this-is-deprecated

XDG\_SESSION\_DESKTOP=ubuntu

LOGNAME=seed

DBUS\_SESSION\_BUS\_ADDRESS=unix:abstract=/tmp/dbus-Z5aXXbh4kv

J2SDKDIR=/usr/lib/jvm/java-8-oracle

XDG\_DATA\_DIRS=/usr/share/ubuntu:/usr/share/gnome:/usr/local/share/:/usr/share/:/var/lib/snapd/desktop

QT4\_IM\_MODULE=xim

LESSOPEN=| /usr/bin/lesspipe %s

INSTANCE=

XDG\_RUNTIME\_DIR=/run/user/1000

DISPLAY=:0

XDG\_CURRENT\_DESKTOP=Unity

GTK\_IM\_MODULE=ibus

J2REDIR=/usr/lib/jvm/java-8-oracle/jre

LESSCLOSE=/usr/bin/lesspipe %s %s

XAUTHORITY=/home/seed/.Xauthority

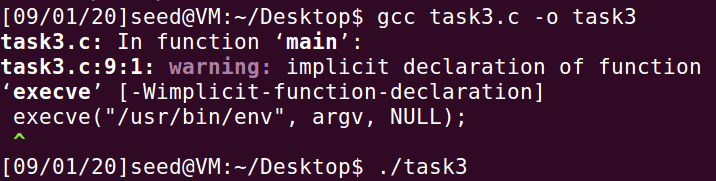
\_=./task2

OLDPWD=/home/seed

**Step3：**通过观察比较，发现原来的环境变量已经被子进程完全继承，可得出结论：通过fork（）系统调用生成的子进程继承了父进程的环境变量。通过man fork可以了解到，父进程的某些特性不会被子进程继承，如父进程号，文件描述符，在tms结构中的系统时间，资源使用，异步输入和输出等。

**Task 3: Environment Variables and execve()**

**Step1：**



**Step2：**运行结果：

XDG\_VTNR=7

XDG\_SESSION\_ID=c1

XDG\_GREETER\_DATA\_DIR=/var/lib/lightdm-data/seed

CLUTTER\_IM\_MODULE=xim

SESSION=ubuntu

ANDROID\_HOME=/home/seed/android/android-sdk-linux

GPG\_AGENT\_INFO=/home/seed/.gnupg/S.gpg-agent:0:1

TERM=xterm-256color

VTE\_VERSION=4205

XDG\_MENU\_PREFIX=gnome-

SHELL=/bin/bash

DERBY\_HOME=/usr/lib/jvm/java-8-oracle/db

QT\_LINUX\_ACCESSIBILITY\_ALWAYS\_ON=1

LD\_PRELOAD=/home/seed/lib/boost/libboost\_program\_options.so.1.64.0:/home/seed/lib/boost/libboost\_filesystem.so.1.64.0:/home/seed/lib/boost/libboost\_system.so.1.64.0

WINDOWID=62914570

UPSTART\_SESSION=unix:abstract=/com/ubuntu/upstart-session/1000/1427

GNOME\_KEYRING\_CONTROL=

GTK\_MODULES=gail:atk-bridge:unity-gtk-module

USER=seed

LS\_COLORS=rs=0:di=01;34:ln=01;36:mh=00:pi=40;33:so=01;35:do=01;35:bd=40;33;01:cd=40;33;01:or=40;31;01:mi=00:su=37;41:sg=30;43:ca=30;41:tw=30;42:ow=34;42:st=37;44:ex=01;32:\*.tar=01;31:\*.tgz=01;31:\*.arc=01;31:\*.arj=01;31:\*.taz=01;31:\*.lha=01;31:\*.lz4=01;31:\*.lzh=01;31:\*.lzma=01;31:\*.tlz=01;31:\*.txz=01;31:\*.tzo=01;31:\*.t7z=01;31:\*.zip=01;31:\*.z=01;31:\*.Z=01;31:\*.dz=01;31:\*.gz=01;31:\*.lrz=01;31:\*.lz=01;31:\*.lzo=01;31:\*.xz=01;31:\*.bz2=01;31:\*.bz=01;31:\*.tbz=01;31:\*.tbz2=01;31:\*.tz=01;31:\*.deb=01;31:\*.rpm=01;31:\*.jar=01;31:\*.war=01;31:\*.ear=01;31:\*.sar=01;31:\*.rar=01;31:\*.alz=01;31:\*.ace=01;31:\*.zoo=01;31:\*.cpio=01;31:\*.7z=01;31:\*.rz=01;31:\*.cab=01;31:\*.jpg=01;35:\*.jpeg=01;35:\*.gif=01;35:\*.bmp=01;35:\*.pbm=01;35:\*.pgm=01;35:\*.ppm=01;35:\*.tga=01;35:\*.xbm=01;35:\*.xpm=01;35:\*.tif=01;35:\*.tiff=01;35:\*.png=01;35:\*.svg=01;35:\*.svgz=01;35:\*.mng=01;35:\*.pcx=01;35:\*.mov=01;35:\*.mpg=01;35:\*.mpeg=01;35:\*.m2v=01;35:\*.mkv=01;35:\*.webm=01;35:\*.ogm=01;35:\*.mp4=01;35:\*.m4v=01;35:\*.mp4v=01;35:\*.vob=01;35:\*.qt=01;35:\*.nuv=01;35:\*.wmv=01;35:\*.asf=01;35:\*.rm=01;35:\*.rmvb=01;35:\*.flc=01;35:\*.avi=01;35:\*.fli=01;35:\*.flv=01;35:\*.gl=01;35:\*.dl=01;35:\*.xcf=01;35:\*.xwd=01;35:\*.yuv=01;35:\*.cgm=01;35:\*.emf=01;35:\*.ogv=01;35:\*.ogx=01;35:\*.aac=00;36:\*.au=00;36:\*.flac=00;36:\*.m4a=00;36:\*.mid=00;36:\*.midi=00;36:\*.mka=00;36:\*.mp3=00;36:\*.mpc=00;36:\*.ogg=00;36:\*.ra=00;36:\*.wav=00;36:\*.oga=00;36:\*.opus=00;36:\*.spx=00;36:\*.xspf=00;36:

QT\_ACCESSIBILITY=1

LD\_LIBRARY\_PATH=/home/seed/source/boost\_1\_64\_0/stage/lib:/home/seed/source/boost\_1\_64\_0/stage/lib:

XDG\_SESSION\_PATH=/org/freedesktop/DisplayManager/Session0

XDG\_SEAT\_PATH=/org/freedesktop/DisplayManager/Seat0

SSH\_AUTH\_SOCK=/run/user/1000/keyring/ssh

DEFAULTS\_PATH=/usr/share/gconf/ubuntu.default.path

SESSION\_MANAGER=local/VM:@/tmp/.ICE-unix/1708,unix/VM:/tmp/.ICE-unix/1708

XDG\_CONFIG\_DIRS=/etc/xdg/xdg-ubuntu:/usr/share/upstart/xdg:/etc/xdg

DESKTOP\_SESSION=ubuntu

PATH=/home/seed/bin:/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:.:/snap/bin:/usr/lib/jvm/java-8-oracle/bin:/usr/lib/jvm/java-8-oracle/db/bin:/usr/lib/jvm/java-8-oracle/jre/bin:/home/seed/android/android-sdk-linux/tools:/home/seed/android/android-sdk-linux/platform-tools:/home/seed/android/android-ndk/android-ndk-r8d:/home/seed/.local/bin

QT\_IM\_MODULE=ibus

QT\_QPA\_PLATFORMTHEME=appmenu-qt5

XDG\_SESSION\_TYPE=x11

PWD=/home/seed/Desktop

JOB=dbus

XMODIFIERS=@im=ibus

JAVA\_HOME=/usr/lib/jvm/java-8-oracle

GNOME\_KEYRING\_PID=

LANG=en\_US.UTF-8

GDM\_LANG=en\_US

MANDATORY\_PATH=/usr/share/gconf/ubuntu.mandatory.path

COMPIZ\_CONFIG\_PROFILE=ubuntu-lowgfx

IM\_CONFIG\_PHASE=1

GDMSESSION=ubuntu

SESSIONTYPE=gnome-session

GTK2\_MODULES=overlay-scrollbar

SHLVL=1

HOME=/home/seed

XDG\_SEAT=seat0

LANGUAGE=en\_US

LIBGL\_ALWAYS\_SOFTWARE=1

GNOME\_DESKTOP\_SESSION\_ID=this-is-deprecated

XDG\_SESSION\_DESKTOP=ubuntu

LOGNAME=seed

DBUS\_SESSION\_BUS\_ADDRESS=unix:abstract=/tmp/dbus-Z5aXXbh4kv

J2SDKDIR=/usr/lib/jvm/java-8-oracle

XDG\_DATA\_DIRS=/usr/share/ubuntu:/usr/share/gnome:/usr/local/share/:/usr/share/:/var/lib/snapd/desktop

QT4\_IM\_MODULE=xim

LESSOPEN=| /usr/bin/lesspipe %s

INSTANCE=

XDG\_RUNTIME\_DIR=/run/user/1000

DISPLAY=:0

XDG\_CURRENT\_DESKTOP=Unity

GTK\_IM\_MODULE=ibus

J2REDIR=/usr/lib/jvm/java-8-oracle/jre

LESSCLOSE=/usr/bin/lesspipe %s %s

XAUTHORITY=/home/seed/.Xauthority

\_=./task3

OLDPWD=/home/seed

**Step3：**当envp参数为NULL时，输出结果为空。Envp是传递给执行文件的新环境变量数组，是参数序列。使用fork（）生成新进程时，子进程会默认继承父进程的环境变量，但是使用execve（）时，新进程会根据参数的情况调整环境变量。

**Task4: Environment Variables and system()**

输出结果：

[09/01/20]seed@VM:~/Desktop$ ./task4

LESSOPEN=| /usr/bin/lesspipe %s

GNOME\_KEYRING\_PID=

USER=seed

LANGUAGE=en\_US

J2SDKDIR=/usr/lib/jvm/java-8-oracle

XDG\_SEAT=seat0

SESSION=ubuntu

XDG\_SESSION\_TYPE=x11

COMPIZ\_CONFIG\_PROFILE=ubuntu-lowgfx

LD\_LIBRARY\_PATH=/home/seed/source/boost\_1\_64\_0/stage/lib:/home/seed/source/boost\_1\_64\_0/stage/lib:

SHLVL=1

LIBGL\_ALWAYS\_SOFTWARE=1

J2REDIR=/usr/lib/jvm/java-8-oracle/jre

HOME=/home/seed

QT4\_IM\_MODULE=xim

OLDPWD=/home/seed

DESKTOP\_SESSION=ubuntu

QT\_LINUX\_ACCESSIBILITY\_ALWAYS\_ON=1

GTK\_MODULES=gail:atk-bridge:unity-gtk-module

XDG\_SEAT\_PATH=/org/freedesktop/DisplayManager/Seat0

INSTANCE=

DBUS\_SESSION\_BUS\_ADDRESS=unix:abstract=/tmp/dbus-Z5aXXbh4kv

GNOME\_KEYRING\_CONTROL=

QT\_QPA\_PLATFORMTHEME=appmenu-qt5

MANDATORY\_PATH=/usr/share/gconf/ubuntu.mandatory.path

IM\_CONFIG\_PHASE=1

SESSIONTYPE=gnome-session

LOGNAME=seed

GTK\_IM\_MODULE=ibus

WINDOWID=62914570

\_=./task4

DEFAULTS\_PATH=/usr/share/gconf/ubuntu.default.path

XDG\_SESSION\_ID=c1

TERM=xterm-256color

GNOME\_DESKTOP\_SESSION\_ID=this-is-deprecated

GTK2\_MODULES=overlay-scrollbar

PATH=/home/seed/bin:/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:.:/snap/bin:/usr/lib/jvm/java-8-oracle/bin:/usr/lib/jvm/java-8-oracle/db/bin:/usr/lib/jvm/java-8-oracle/jre/bin:/home/seed/android/android-sdk-linux/tools:/home/seed/android/android-sdk-linux/platform-tools:/home/seed/android/android-ndk/android-ndk-r8d:/home/seed/.local/bin

DERBY\_HOME=/usr/lib/jvm/java-8-oracle/db

SESSION\_MANAGER=local/VM:@/tmp/.ICE-unix/1708,unix/VM:/tmp/.ICE-unix/1708

GDM\_LANG=en\_US

XDG\_MENU\_PREFIX=gnome-

XDG\_SESSION\_PATH=/org/freedesktop/DisplayManager/Session0

XDG\_RUNTIME\_DIR=/run/user/1000

DISPLAY=:0

LD\_PRELOAD=/home/seed/lib/boost/libboost\_program\_options.so.1.64.0:/home/seed/lib/boost/libboost\_filesystem.so.1.64.0:/home/seed/lib/boost/libboost\_system.so.1.64.0

LANG=en\_US.UTF-8

XDG\_CURRENT\_DESKTOP=Unity

LS\_COLORS=rs=0:di=01;34:ln=01;36:mh=00:pi=40;33:so=01;35:do=01;35:bd=40;33;01:cd=40;33;01:or=40;31;01:mi=00:su=37;41:sg=30;43:ca=30;41:tw=30;42:ow=34;42:st=37;44:ex=01;32:\*.tar=01;31:\*.tgz=01;31:\*.arc=01;31:\*.arj=01;31:\*.taz=01;31:\*.lha=01;31:\*.lz4=01;31:\*.lzh=01;31:\*.lzma=01;31:\*.tlz=01;31:\*.txz=01;31:\*.tzo=01;31:\*.t7z=01;31:\*.zip=01;31:\*.z=01;31:\*.Z=01;31:\*.dz=01;31:\*.gz=01;31:\*.lrz=01;31:\*.lz=01;31:\*.lzo=01;31:\*.xz=01;31:\*.bz2=01;31:\*.bz=01;31:\*.tbz=01;31:\*.tbz2=01;31:\*.tz=01;31:\*.deb=01;31:\*.rpm=01;31:\*.jar=01;31:\*.war=01;31:\*.ear=01;31:\*.sar=01;31:\*.rar=01;31:\*.alz=01;31:\*.ace=01;31:\*.zoo=01;31:\*.cpio=01;31:\*.7z=01;31:\*.rz=01;31:\*.cab=01;31:\*.jpg=01;35:\*.jpeg=01;35:\*.gif=01;35:\*.bmp=01;35:\*.pbm=01;35:\*.pgm=01;35:\*.ppm=01;35:\*.tga=01;35:\*.xbm=01;35:\*.xpm=01;35:\*.tif=01;35:\*.tiff=01;35:\*.png=01;35:\*.svg=01;35:\*.svgz=01;35:\*.mng=01;35:\*.pcx=01;35:\*.mov=01;35:\*.mpg=01;35:\*.mpeg=01;35:\*.m2v=01;35:\*.mkv=01;35:\*.webm=01;35:\*.ogm=01;35:\*.mp4=01;35:\*.m4v=01;35:\*.mp4v=01;35:\*.vob=01;35:\*.qt=01;35:\*.nuv=01;35:\*.wmv=01;35:\*.asf=01;35:\*.rm=01;35:\*.rmvb=01;35:\*.flc=01;35:\*.avi=01;35:\*.fli=01;35:\*.flv=01;35:\*.gl=01;35:\*.dl=01;35:\*.xcf=01;35:\*.xwd=01;35:\*.yuv=01;35:\*.cgm=01;35:\*.emf=01;35:\*.ogv=01;35:\*.ogx=01;35:\*.aac=00;36:\*.au=00;36:\*.flac=00;36:\*.m4a=00;36:\*.mid=00;36:\*.midi=00;36:\*.mka=00;36:\*.mp3=00;36:\*.mpc=00;36:\*.ogg=00;36:\*.ra=00;36:\*.wav=00;36:\*.oga=00;36:\*.opus=00;36:\*.spx=00;36:\*.xspf=00;36:

XMODIFIERS=@im=ibus

XDG\_SESSION\_DESKTOP=ubuntu

XAUTHORITY=/home/seed/.Xauthority

XDG\_GREETER\_DATA\_DIR=/var/lib/lightdm-data/seed

SSH\_AUTH\_SOCK=/run/user/1000/keyring/ssh

SHELL=/bin/bash

QT\_ACCESSIBILITY=1

GDMSESSION=ubuntu

LESSCLOSE=/usr/bin/lesspipe %s %s

GPG\_AGENT\_INFO=/home/seed/.gnupg/S.gpg-agent:0:1

UPSTART\_SESSION=unix:abstract=/com/ubuntu/upstart-session/1000/1427

XDG\_VTNR=7

QT\_IM\_MODULE=ibus

PWD=/home/seed/Desktop

JAVA\_HOME=/usr/lib/jvm/java-8-oracle

CLUTTER\_IM\_MODULE=xim

ANDROID\_HOME=/home/seed/android/android-sdk-linux

XDG\_CONFIG\_DIRS=/etc/xdg/xdg-ubuntu:/usr/share/upstart/xdg:/etc/xdg

XDG\_DATA\_DIRS=/usr/share/ubuntu:/usr/share/gnome:/usr/local/share/:/usr/share/:/var/lib/snapd/desktop

VTE\_VERSION=4205

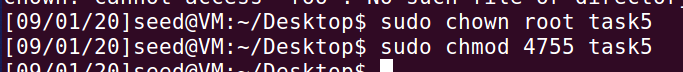
JOB=dbus

**实验结论：**通过与直接输入env得到的环境变量与输出结果比对，可以发现通过system（）执行的新程序环境变量与调用进程的环境变量相同。

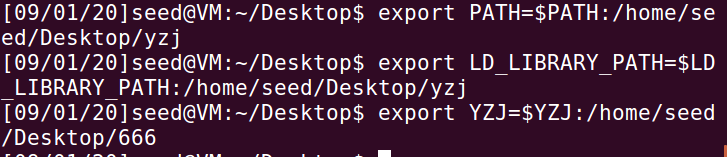
**Task5: Environment Variable and Set-UID Programs**

**Step1：**将指导手册中的代码写入task5.c中

**Step2：**



然后修改环境变量PATH,LD\_LIBRARY\_PATH的值，并添加



然后运行test5.c，运行结果如下：

[09/01/20]seed@VM:~/Desktop$ ./task5XDG\_VTNR=7

XDG\_SESSION\_ID=c1

XDG\_GREETER\_DATA\_DIR=/var/lib/lightdm-data/seed

CLUTTER\_IM\_MODULE=xim

SESSION=ubuntu

ANDROID\_HOME=/home/seed/android/android-sdk-linux

GPG\_AGENT\_INFO=/home/seed/.gnupg/S.gpg-agent:0:1

TERM=xterm-256color

VTE\_VERSION=4205

XDG\_MENU\_PREFIX=gnome-

SHELL=/bin/bash

DERBY\_HOME=/usr/lib/jvm/java-8-oracle/db

QT\_LINUX\_ACCESSIBILITY\_ALWAYS\_ON=1

WINDOWID=62914570

OLDPWD=/home/seed

UPSTART\_SESSION=unix:abstract=/com/ubuntu/upstart-session/1000/1427

GNOME\_KEYRING\_CONTROL=

GTK\_MODULES=gail:atk-bridge:unity-gtk-module

USER=seed

LS\_COLORS=rs=0:di=01;34:ln=01;36:mh=00:pi=40;33:so=01;35:do=01;35:bd=40;33;01:cd=40;33;01:or=40;31;01:mi=00:su=37;41:sg=30;43:ca=30;41:tw=30;42:ow=34;42:st=37;44:ex=01;32:\*.tar=01;31:\*.tgz=01;31:\*.arc=01;31:\*.arj=01;31:\*.taz=01;31:\*.lha=01;31:\*.lz4=01;31:\*.lzh=01;31:\*.lzma=01;31:\*.tlz=01;31:\*.txz=01;31:\*.tzo=01;31:\*.t7z=01;31:\*.zip=01;31:\*.z=01;31:\*.Z=01;31:\*.dz=01;31:\*.gz=01;31:\*.lrz=01;31:\*.lz=01;31:\*.lzo=01;31:\*.xz=01;31:\*.bz2=01;31:\*.bz=01;31:\*.tbz=01;31:\*.tbz2=01;31:\*.tz=01;31:\*.deb=01;31:\*.rpm=01;31:\*.jar=01;31:\*.war=01;31:\*.ear=01;31:\*.sar=01;31:\*.rar=01;31:\*.alz=01;31:\*.ace=01;31:\*.zoo=01;31:\*.cpio=01;31:\*.7z=01;31:\*.rz=01;31:\*.cab=01;31:\*.jpg=01;35:\*.jpeg=01;35:\*.gif=01;35:\*.bmp=01;35:\*.pbm=01;35:\*.pgm=01;35:\*.ppm=01;35:\*.tga=01;35:\*.xbm=01;35:\*.xpm=01;35:\*.tif=01;35:\*.tiff=01;35:\*.png=01;35:\*.svg=01;35:\*.svgz=01;35:\*.mng=01;35:\*.pcx=01;35:\*.mov=01;35:\*.mpg=01;35:\*.mpeg=01;35:\*.m2v=01;35:\*.mkv=01;35:\*.webm=01;35:\*.ogm=01;35:\*.mp4=01;35:\*.m4v=01;35:\*.mp4v=01;35:\*.vob=01;35:\*.qt=01;35:\*.nuv=01;35:\*.wmv=01;35:\*.asf=01;35:\*.rm=01;35:\*.rmvb=01;35:\*.flc=01;35:\*.avi=01;35:\*.fli=01;35:\*.flv=01;35:\*.gl=01;35:\*.dl=01;35:\*.xcf=01;35:\*.xwd=01;35:\*.yuv=01;35:\*.cgm=01;35:\*.emf=01;35:\*.ogv=01;35:\*.ogx=01;35:\*.aac=00;36:\*.au=00;36:\*.flac=00;36:\*.m4a=00;36:\*.mid=00;36:\*.midi=00;36:\*.mka=00;36:\*.mp3=00;36:\*.mpc=00;36:\*.ogg=00;36:\*.ra=00;36:\*.wav=00;36:\*.oga=00;36:\*.opus=00;36:\*.spx=00;36:\*.xspf=00;36:

QT\_ACCESSIBILITY=1

XDG\_SESSION\_PATH=/org/freedesktop/DisplayManager/Session0

XDG\_SEAT\_PATH=/org/freedesktop/DisplayManager/Seat0

SSH\_AUTH\_SOCK=/run/user/1000/keyring/ssh

DEFAULTS\_PATH=/usr/share/gconf/ubuntu.default.path

SESSION\_MANAGER=local/VM:@/tmp/.ICE-unix/1708,unix/VM:/tmp/.ICE-unix/1708

YZJ=:/home/seed/Desktop/666

XDG\_CONFIG\_DIRS=/etc/xdg/xdg-ubuntu:/usr/share/upstart/xdg:/etc/xdg

DESKTOP\_SESSION=ubuntu

PATH=/home/seed/bin:/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:.:/snap/bin:/usr/lib/jvm/java-8-oracle/bin:/usr/lib/jvm/java-8-oracle/db/bin:/usr/lib/jvm/java-8-oracle/jre/bin:/home/seed/android/android-sdk-linux/tools:/home/seed/android/android-sdk-linux/platform-tools:/home/seed/android/android-ndk/android-ndk-r8d:/home/seed/.local/bin:/home/seed/Desktop/yzj

QT\_IM\_MODULE=ibus

QT\_QPA\_PLATFORMTHEME=appmenu-qt5

XDG\_SESSION\_TYPE=x11

PWD=/home/seed/Desktop

JOB=dbus

XMODIFIERS=@im=ibus

JAVA\_HOME=/usr/lib/jvm/java-8-oracle

GNOME\_KEYRING\_PID=

LANG=en\_US.UTF-8

GDM\_LANG=en\_US

MANDATORY\_PATH=/usr/share/gconf/ubuntu.mandatory.path

COMPIZ\_CONFIG\_PROFILE=ubuntu-lowgfx

IM\_CONFIG\_PHASE=1

GDMSESSION=ubuntu

SESSIONTYPE=gnome-session

GTK2\_MODULES=overlay-scrollbar

SHLVL=1

HOME=/home/seed

XDG\_SEAT=seat0

LANGUAGE=en\_US

LIBGL\_ALWAYS\_SOFTWARE=1

GNOME\_DESKTOP\_SESSION\_ID=this-is-deprecated

XDG\_SESSION\_DESKTOP=ubuntu

LOGNAME=seed

DBUS\_SESSION\_BUS\_ADDRESS=unix:abstract=/tmp/dbus-Z5aXXbh4kv

J2SDKDIR=/usr/lib/jvm/java-8-oracle

XDG\_DATA\_DIRS=/usr/share/ubuntu:/usr/share/gnome:/usr/local/share/:/usr/share/:/var/lib/snapd/desktop

QT4\_IM\_MODULE=xim

LESSOPEN=| /usr/bin/lesspipe %s

INSTANCE=

XDG\_RUNTIME\_DIR=/run/user/1000

DISPLAY=:0

XDG\_CURRENT\_DESKTOP=Unity

GTK\_IM\_MODULE=ibus

J2REDIR=/usr/lib/jvm/java-8-oracle/jre

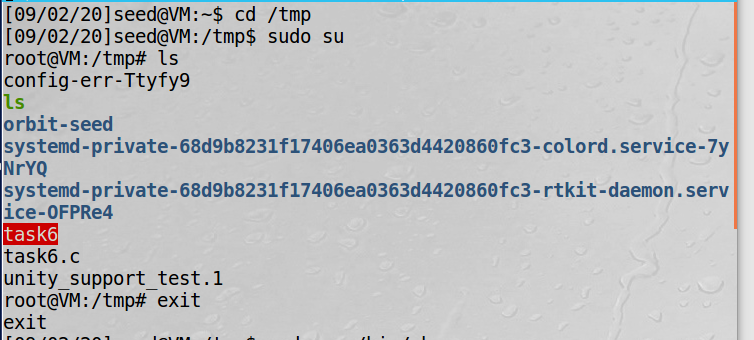
LESSCLOSE=/usr/bin/lesspipe %s %s

XAUTHORITY=/home/seed/.Xauthority

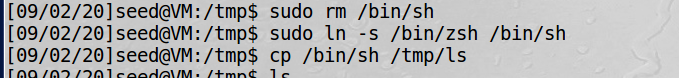
\_=./task5

**实验结论：**定义的PATH和YZJ在输出结果中（标红），但是LD\_LIBRARY\_PATH不在其中。用户自身定义的环境变量可能不一定成为set-uid程序使用的环境变量。

**Task 6: The PATH Environment Variable and Set-UID Programs**



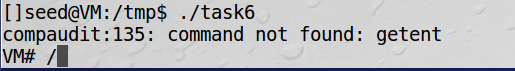
依据指导手册的步骤，先编译test6.c，将其设置为set-uid程序，将命令/bin/sh链接到zsh，并将其拷贝为ls放到当前目录下。

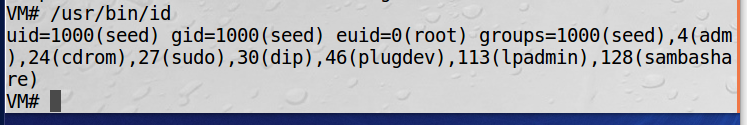


更改环境变量：



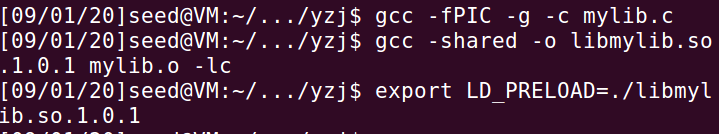
使用普通用户身份运行task6.c，发现开启了新的shell，且拥有root权限。这说明set-uid程序运行的子程序也具有root权限。

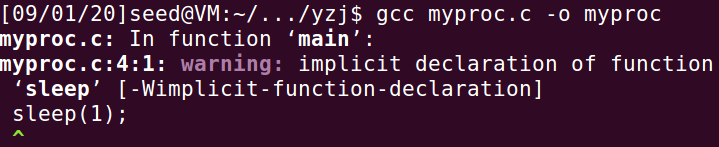




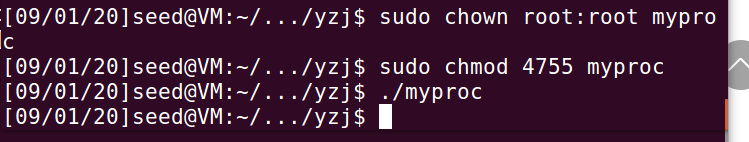
**Task 7: The LD PRELOAD Environment Variable and Set-UID Programs**

创建自己的动态链接库：

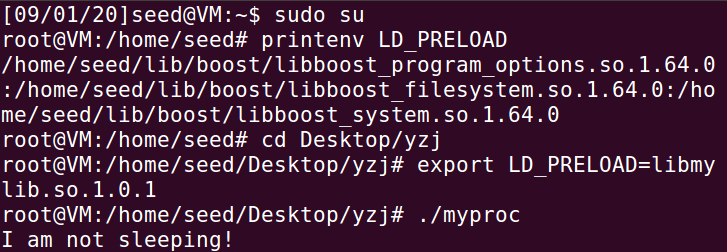




再将myproc可执行程序变为set-uid程序并运行

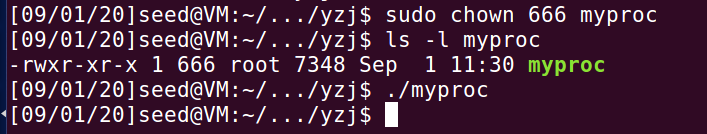


并无输出，此时我们来看一下root权限下，修改LD\_PROLOAD值，再运行。



此时sleep函数的运行结果是动态链接库里面的。

把程序的所有者改为新建的666用户，运行myproc，输出为空。



由此得出，当ruid和euid相同时，LD\_PRELOAD变量的值才会起作用。

**Task 8: Invoking External Programs Using system() versus execve()**

**Step1：**

将指导手册中的代码写入task8.c并编译。

在当前目录下创建一个普通文件test8.c，设置其权限为000

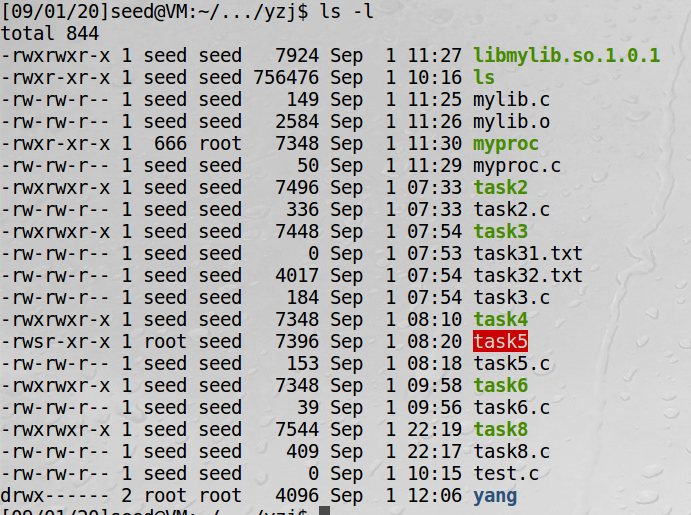




将task8.c代码中的v[0] = "/bin/cat"改为v[0] = "rm",即删除命令。执行命令：



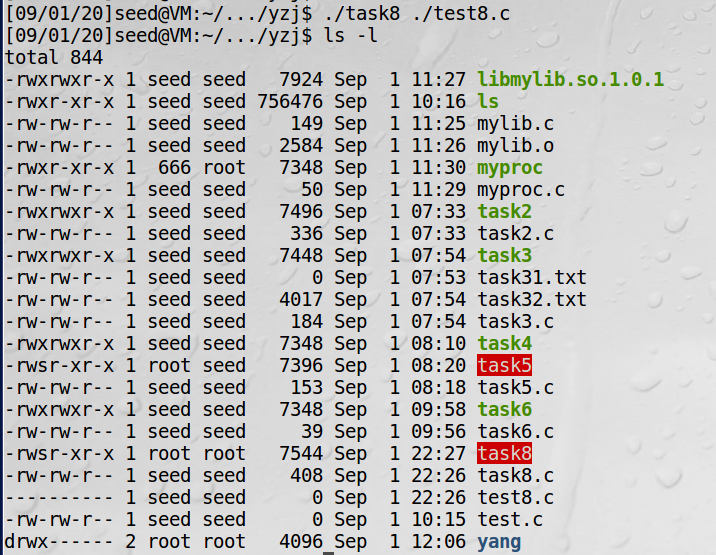
可以发现，test8.c文件被成功删除



本来test8.c对seed用户是不可写的，但却可以被删除。说明set-uid程序是非常危险的。

**Step2：**

将 task8.c 中的 execve 语句注释取消，同时注释掉 sysytem 语句，重新编译，设为set-uid程序，再执行上述操作，发现test8.c无法被删除，说明此时普通用户已经无法进行越权操作了。



实验结论：execve比system更加安全，system的方法会开启新的shell，在set-uid程序中被调用具有很高的风险。

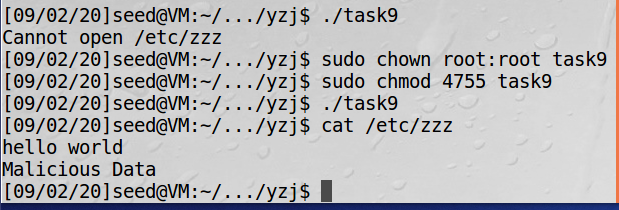
**Task 9: Capability Leaking**

Zzz文件的权限如下，只有root用户能对其进行写操作。



将指导手册中的代码写入task9.c，编译运行，发现无法打开zzz文件。

接下来我们将task9设置成set-uid程序，再次运行task9程序。运行过后打印zzz文件内容，发现文件被注入了“Malicious Data”的恶意语句。



Zzz文件内容被修改的原因可能是task9程序在执行完成后，文件描述符fd没有及时更改，导致了特权泄露。