Appendix D Extended

# KnightOS Basic Development Process

*Shows basic development process on Linux*

**tliggett@TJ-LIGGETT-AUGUSTANA:~$ cd KnightOS**

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS$ ls**

KnightOS-master KnightOSTest2 bed calctest3 castle init k11 k14 k7 kcc kpack mktiupgrade-master scas settings z80e-master

KnightOSCopy KnightOSTest3 calctest calculator corelib iofsd k12 k5 k8 kdemo libc patchrom scas-master threadlist zips

KnightOSTest KnightOSTest4 calctest2 calendar fileman k10 k13 k6 k9 kimg-master mkrom sass-master sdk tkernel

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS$ cp -avr KnightOSCopy k15**

'KnightOSCopy' -> 'k15'

'KnightOSCopy/package.config' -> 'k15/package.config'

'KnightOSCopy/.gitmodules' -> 'k15/.gitmodules'

'KnightOSCopy/LICENSE' -> 'k15/LICENSE'

'KnightOSCopy/exploit' -> 'k15/exploit'

'KnightOSCopy/exploit/exploit.asm' -> 'k15/exploit/exploit.asm'

'KnightOSCopy/exploit/pageF4\_exploit.bin' -> 'k15/exploit/pageF4\_exploit.bin'

'KnightOSCopy/exploit/pageF3\_exploit.bin' -> 'k15/exploit/pageF3\_exploit.bin'

'KnightOSCopy/exploit/signature.bin' -> 'k15/exploit/signature.bin'

'KnightOSCopy/.gitignore' -> 'k15/.gitignore'

'KnightOSCopy/THANKS' -> 'k15/THANKS'

'KnightOSCopy/.gitattributes' -> 'k15/.gitattributes'

'KnightOSCopy/keys' -> 'k15/keys'

'KnightOSCopy/keys/04.key' -> 'k15/keys/04.key'

'KnightOSCopy/keys/02.key' -> 'k15/keys/02.key'

'KnightOSCopy/keys/0F.key' -> 'k15/keys/0F.key'

'KnightOSCopy/keys/0A.key' -> 'k15/keys/0A.key'

'KnightOSCopy/README.md' -> 'k15/README.md'

'KnightOSCopy/config' -> 'k15/config'

'KnightOSCopy/config/copyright.png' -> 'k15/config/copyright.png'

'KnightOSCopy/Makefile' -> 'k15/Makefile'

tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS$ cd k15

tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS/k15$ ls

LICENSE Makefile README.md THANKS config exploit keys package.config

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS/k15$ knightos init --platform TI83p**

Found existing project: KnightOS

Installing SDK...

/home/tliggett/KnightOS/k15/.knightos/kernel-TI83p.rom

Installing kernel 0.6.11

Installing template...

Installing packages...

Installing core/init...

Installing core/kernel-headers...

Installing core/corelib...

Installing core/castle...

Installing core/threadlist...

Installing core/settings...

Installing core/textview...

Installing ports/phoenix...

Installing extra/fileman...

Installing extra/periodic...

Installing extra/bed...

Installing community/calendar...

Installing extra/calcsys...

Installing core/init...

Installing core/kernel-headers...

Installing core/configlib...

Initializing new git repository...

All done! You can use `make help` to find out what to do next.

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS/k15$ sudo make upgrade**

[sudo] password for tliggett:

mkdir -p bin/root/share/icons

kimg -c config/copyright.png bin/root/share/icons/copyright.img

mkdir -p bin/root/etc/

cp LICENSE bin/root/etc/LICENSE

mkdir -p bin/root/etc/

cp THANKS bin/root/etc/THANKS

mkdir -p bin/root/share/

mkdir -p bin/root/bin/

mkdir -p bin/root/home

rm -rf bin/root/var/castle

mkdir -p bin/root/var/castle

ln -s /var/applications/fileman.app bin/root/var/castle/pin-0

ln -s /var/applications/bed.app bin/root/var/castle/pin-1

ln -s /var/applications/calendar.app bin/root/var/castle/pin-2

ln -s /var/applications/calcsys.app bin/root/var/castle/pin-3

ln -s /var/applications/settings.app bin/root/var/castle/pin-4

ln -s /var/applications/phoenix.app bin/root/var/castle/pin-5

ln -s /var/applications/periodic.app bin/root/var/castle/pin-6

echo -ne "icon=/share/icons/copyright.img\nname=License\nexec=/etc/LICENSE" > bin/root/var/castle/pin-9

rm -rf bin/root/bin/launcher

ln -s /bin/castle bin/root/bin/launcher

rm -rf bin/root/bin/switcher

ln -s /bin/threadlist bin/root/bin/switcher

rm -rf bin/root/bin/browser

ln -s /bin/fileman bin/root/bin/browser

rm -rf bin/root/bin/editor

ln -s /bin/bed bin/root/bin/editor

cp .knightos/debug.rom bin/KnightOS-TI83p.rom

sass --encoding "Windows-1252" --include ".knightos/include/;.knightos/" --define TI83p exploit/exploit.asm bin/exploit.bin

Assembly done: 55 ms

# Applies exploit on models that require it

if [[ "TI83p" == "TI84pCSE" ]]; then\

cp bin//KnightOS-TI83p.rom temp.rom;\

dd bs=1 if=temp.rom of=bin/KnightOS-TI83p.rom skip=4046848 seek=3850240 conv=notrunc;\

dd bs=1 if=exploit/pageF3\_exploit.bin of=bin/KnightOS-TI83p.rom seek=3981312 conv=notrunc;\

dd bs=1 if=exploit/pageF4\_exploit.bin of=bin/KnightOS-TI83p.rom seek=3997696 conv=notrunc;\

dd bs=1 if=bin/exploit.bin of=bin/KnightOS-TI83p.rom seek=3988095 conv=notrunc;\

echo -ne "\xFF" | dd bs=1 of=bin/KnightOS-TI83p.rom seek=38 conv=notrunc;\

echo -ne "\xFF" | dd bs=1 of=bin/KnightOS-TI83p.rom seek=86 conv=notrunc;\

mktiupgrade -p -s exploit/signature.bin -d TI83p -n 04 bin/KnightOS-TI83p.rom \

bin/KnightOS-TI83p.8xu 00 01 02 03 04 05 06 07 08 1C F3 F4 EB;\

rm temp.rom;\

else\

mktiupgrade -p -d TI83p -k keys/04.key -n 04 bin/KnightOS-TI83p.rom \

bin/KnightOS-TI83p.8xu 00 01 02 03 04 05 06 07 08 17 1C;\

fi

Upgrade info:

- Version: 1.0

- Key: 04

- Hardware revision: 5

- Device type: TI-83+

- Pages: 00 01 02 03 04 05 06 07 08 14 17 1C

- Key file: keys/04.key

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS/k15$ ls bin**

KnightOS-TI83p.8xu KnightOS-TI83p.rom exploit.bin root

# KnightOS Create Runnable C Program

*Shows basic c development on KnightOS*

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS/k15$ mkdir hello**

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS/k15$ cd hello**

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS/k15/hello$ knightos init hello --template='c'**

Installing SDK...

/home/tliggett/KnightOS/k15/hello/.knightos/kernel-TI84pSE.rom

Installing kernel 0.6.11

Installing template...

Installing packages...

Installing core/init...

Installing core/kernel-headers...

Installing extra/libc...

Initializing new git repository...

All done! You can use `make help` to find out what to do next.

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS/k15/hello$ sudo make**

mkdir -p bin

kcc -I .knightos/include/ -I .knightos/ -I ./ -S --std-c99 main.c -o bin/main.asm

mkdir -p bin

scas -I .knightos/include/ -I .knightos/ -I ./ -c -o bin/main.o bin/main.asm

mkdir -p bin

scas -I .knightos/include/ -I .knightos/ -I ./ -c -o bin/crt0.o crt0.asm

mkdir -p bin/root/bin/

scas -fauto-relocation bin/crt0.o .knightos/pkgroot/slib/\* bin/main.o -o bin/root/bin/hello

rm bin/main.asm

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS/k15/hello$ ls**

Makefile bin crt0.asm main.c package.config

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS/k15/hello$ sudo make package**

kpack hello-0.1.0.pkg bin/root/

Packaging community/hello:0.1.0 as hello-0.1.0.pkg...

Adding /bin/hello...

Successfully wrote community/hello:0.1.0 to hello-0.1.0.pkg.

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS/k15/hello$ cd ..**

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS/k15$ knightos install --local-path hello community/hello**

Installing community/hello...

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS/k15$ sudo make**

Building local community/hello

make -C "/home/tliggett/KnightOS/k15/hello" package

make[1]: Entering directory '/home/tliggett/KnightOS/k15/hello'

make[1]: Nothing to be done for 'package'.

make[1]: Leaving directory '/home/tliggett/KnightOS/k15/hello'

mkdir -p bin/root/share/

mkdir -p bin/root/bin/

mkdir -p bin/root/home

rm -rf bin/root/var/castle

mkdir -p bin/root/var/castle

ln -s /var/applications/fileman.app bin/root/var/castle/pin-0

ln -s /var/applications/bed.app bin/root/var/castle/pin-1

ln -s /var/applications/calendar.app bin/root/var/castle/pin-2

ln -s /var/applications/calcsys.app bin/root/var/castle/pin-3

ln -s /var/applications/settings.app bin/root/var/castle/pin-4

ln -s /var/applications/phoenix.app bin/root/var/castle/pin-5

ln -s /var/applications/periodic.app bin/root/var/castle/pin-6

echo -ne "icon=/share/icons/copyright.img\nname=License\nexec=/etc/LICENSE" > bin/root/var/castle/pin-9

rm -rf bin/root/bin/launcher

ln -s /bin/castle bin/root/bin/launcher

rm -rf bin/root/bin/switcher

ln -s /bin/threadlist bin/root/bin/switcher

rm -rf bin/root/bin/browser

ln -s /bin/fileman bin/root/bin/browser

rm -rf bin/root/bin/editor

ln -s /bin/bed bin/root/bin/editor

# KnightOS Modify Default Package

*Shows basic modification of core/castle package*

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS$ ls**

KnightOS-master KnightOSTest2 bed calctest3 castle init k11 k14 k6 k9 kimg-master mkrom sass-master sdk tkernel

KnightOSCopy KnightOSTest3 calctest calculator corelib iofsd k12 k15 k7 kcc kpack mktiupgrade-master scas settings z80e-master

KnightOSTest KnightOSTest4 calctest2 calendar fileman k10 k13 k5 k8 kdemo libc patchrom scas-master threadlist zips

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS$ cp -avr castle/castle-master k15**

'castle/castle-master' -> 'k15/castle-master'

'castle/castle-master/Makefile' -> 'k15/castle-master/Makefile'

'castle/castle-master/pinned.asm' -> 'k15/castle-master/pinned.asm'

'castle/castle-master/.gitignore' -> 'k15/castle-master/.gitignore'

'castle/castle-master/LICENSE' -> 'k15/castle-master/LICENSE'

'castle/castle-master/README.md' -> 'k15/castle-master/README.md'

'castle/castle-master/applist.asm' -> 'k15/castle-master/applist.asm'

'castle/castle-master/graphics.asm' -> 'k15/castle-master/graphics.asm'

'castle/castle-master/main.asm' -> 'k15/castle-master/main.asm'

'castle/castle-master/package.config' -> 'k15/castle-master/package.config'

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS$ cd k15**

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS/k15$ ls**

LICENSE Makefile README.md THANKS bin castle-master config exploit hello keys package.config

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS/k15$ cd castle-master**

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS/k15/castle-master$ ls**

LICENSE Makefile README.md applist.asm graphics.asm main.asm package.config pinned.asm

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS/k15/castle-master$ vi graphics.asm** *(modified graphics.asm as described in paper)*

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS/k15/castle-master$ knightos init castle**

Installing SDK...

/home/tliggett/KnightOS/k15/castle-master/.knightos/kernel-TI84pSE.rom

Installing kernel 0.6.11

Installing template...

Installing packages...

Installing core/init...

Installing core/kernel-headers...

Installing core/corelib...

Installing core/configlib...

Installing core/init...

Installing core/kernel-headers...

Installing core/threadlist...

Initializing new git repository...

All done! You can use `make help` to find out what to do next.

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS/k15/castle-master$ sudo make**

mkdir -p bin/root/bin/

sass --encoding "Windows-1252" --include ".knightos/include/;.knightos/" --listing bin/main.list main.asm bin/root/bin/castle

Assembly done: 729 ms

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS/k15/castle-master$ sudo make package**

kpack castle-0.5.3.pkg bin/root/

Packaging core/castle:0.5.3 as castle-0.5.3.pkg...

Adding /bin/castle...

Successfully wrote core/castle:0.5.3 to castle-0.5.3.pkg.

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS/k15/castle-master$ cd ..**

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS/k15$ knightos install --local-path castle-master core/castle**

Overriding remote package...

Installing core/castle...

**tliggett@TJ-LIGGETT-AUGUSTANA:~/KnightOS/k15$ sudo make**

Building local community/hello

make -C "/home/tliggett/KnightOS/k15/hello" package

make[1]: Entering directory '/home/tliggett/KnightOS/k15/hello'

make[1]: Nothing to be done for 'package'.

make[1]: Leaving directory '/home/tliggett/KnightOS/k15/hello'

Building local core/castle

make -C "/home/tliggett/KnightOS/k15/castle-master" package

make[1]: Entering directory '/home/tliggett/KnightOS/k15/castle-master'

kpack castle-0.5.3.pkg bin/root/

Packaging core/castle:0.5.3 as castle-0.5.3.pkg...

Adding /bin/castle...

Successfully wrote core/castle:0.5.3 to castle-0.5.3.pkg.

make[1]: Leaving directory '/home/tliggett/KnightOS/k15/castle-master'

mkdir -p bin/root/share/

mkdir -p bin/root/bin/

mkdir -p bin/root/home

rm -rf bin/root/var/castle

mkdir -p bin/root/var/castle

ln -s /var/applications/fileman.app bin/root/var/castle/pin-0

ln -s /var/applications/bed.app bin/root/var/castle/pin-1

ln -s /var/applications/calendar.app bin/root/var/castle/pin-2

ln -s /var/applications/calcsys.app bin/root/var/castle/pin-3

ln -s /var/applications/settings.app bin/root/var/castle/pin-4

ln -s /var/applications/phoenix.app bin/root/var/castle/pin-5

ln -s /var/applications/periodic.app bin/root/var/castle/pin-6

echo -ne "icon=/share/icons/copyright.img\nname=License\nexec=/etc/LICENSE" > bin/root/var/castle/pin-9

rm -rf bin/root/bin/launcher

ln -s /bin/castle bin/root/bin/launcher

rm -rf bin/root/bin/switcher

ln -s /bin/threadlist bin/root/bin/switcher

rm -rf bin/root/bin/browser

ln -s /bin/fileman bin/root/bin/browser

rm -rf bin/root/bin/editor

ln -s /bin/bed bin/root/bin/editor