GUI Programming in Embedded Linux

■

✓   GUI

✓

✓   1:1

Qt

■ QT   trolltech   cross   GUI

■ QT   (   ),   , Mac, Linux, *nix

■ C++

■ Qt   X11   C++   GUI   .

■   (,   )   .

■ Qt   .

Qt/Embedded

■ Qt   GUI

■ X-   Frame Buffer

■

  1. CPU –   300   2. RAM – 128

  3. HDD – 8G(linux-2G)   4. Serial Port

  5. internet

  6. Embeded   – 16bit color   (iPAQ)

  7.   (X ->   )

QT /Embedded   (1)

- QT /Embedded
  ftp://ftp.trolltech.com/qt/source/qt-embedded-free-3.3.4.tar.bz2   root

- (host)

```
# tar xvjf qt-embedded-free-3.3.4.tar.bz2          //
# ln –s qt-embedded-free-3.3.4 qte     //                    qte
```

- QT/ Embedded   (host)
  - QTDIR : QT
  - LD_LIBRARY_PATH : QT

```
/* ~/.bash_profile                  */
export QTDIR=/root/qte
export LD_LIBRARY_PATH=/root/qte/lib:$ LD_LIBRARY_PATH
```

QT /Embedded   (2)

- (host)

```
# source ~/.bash_profile     //.bash_profile
```

- QT/Emdedded Configuration(host)


```
[root@localhost qte]# ./configure -embedded ipaq -shared -depths 16 -thread -no-
cups -qt-mouse-linuxtp

This is the Qt/Embedded Open Source Edition.

You are licensed to use this software under the terms of
the GNU General Public License (GPL).

Type 'G' to view the GNU General Public License.
Type 'yes' to accept this license offer.
Type 'no' to decline this license offer.

Do you accept the terms of the license?     yes
```

```
# ./configure -embedded ipaq -shared -depths 8,16,24,32 -thread
   -no-cups -qt-mouse-linuxtp
```

QT /Embedded   (3)

- libstdc++.a   (host)
  - ✓   libstdc++.a
          libstdc++   lib
          .
  - ✓ /usr/lib/gcc-lib/i386-redhat-linux/3.2.2/libstdc++.a (   )

```
# cd /usr/lib/gcc-lib/i386-redhat-linux/3.2.2
# cp libstdc++.a /usr/local/huins-arm-linux-R1.1/lib/libstdc++.a
```

- Uic   (host)
  - ✓   QT/Embedded   qt-x11   uic   .
  - ✓   /usr/lib/qt-3.1/bin/uic (   )

```
# cd /usr/lib/qt-3.1/bin/uic
# cp uic $QTDIR/bin
```

QT /Embedded   (4)

- (host)

```
# cd $QTDIR
# make
```

  - ✓   QT/Embedded


```
lrwxrwxrwx   1 root      root          18 7월   7 15:52 libqte-mt.so -> libqte-
mt.so.3.3.4
lrwxrwxrwx   1 root      root          18 7월   7 15:52 libqte-mt.so.3 -> libqt
e-mt.so.3.3.4
lrwxrwxrwx   1 root      root          18 7월   7 15:52 libqte-mt.so.3.3 -> lib
qte-mt.so.3.3.4
-rwxr-xr-x   1 root      root     8472361 7월   7 15:52 libqte-mt.so.3.3.4
```

```
[root@localhost lib]# file *
README:              ASCII English text
fonts:               directory
libdesignercore.prl: ASCII text
libeditor.prl:       ASCII text
libqassistantclient.a:  current ar archive
libqassistantclient.prl: ASCII text
libqnp.prl:          ASCII text, with very long lines
libqte-mt.la:        ASCII English text
libqte-mt.prl:       ASCII text, with very long lines
libqte-mt.so:        symbolic link to libqte-mt.so.3.3.4
libqte-mt.so.3:      symbolic link to libqte-mt.so.3.3.4
libqte-mt.so.3.3:    symbolic link to libqte-mt.so.3.3.4
libqte-mt.so.3.3.4:  ELF 32-bit LSB shared object, ARM, ve
[영어 ][완성 ][두벌식 ]
```

ARM   library
.

QT /Embedded (5)

- ■
  - ✓ ARM   qt-embedded-free-3.3.4   qte   NFS
        .(target)
  - ✓   qt   NFS
      .(host) –

    ```
    /* /etc/exports                    */
    /root/qte  192.168.1.253(rw, no_root_squash)
    ```

    ```
    # service nfs restart              //       restart
    ```

  - ✓ ~/.profile   (target)

    ```
    target# mount –t nfs 192.168.1.252:/root/qte /mnt/nfs/qte  //nfs mount
    ```

    ```
    /* ~/.profile              */
    export QTDIR=/mnt/nfs/qte
    export LD_LIBRARY_PATH=/mnt/nfs/qte/lib:$LD_LIBRARY_PATH
    export QWS_MOUSE_PROTO=linuxtp:/dev/ts
    ```

    ```
    target# source ~/.profile              //
    ```

QT /Embedded (6)

- ✓ libstdc++   (target)

  ```
  target# cp libstdc++.a /lib    //host        libstdc++   target
  target# cd /lib                //'/lib'
  target# ln –s /lib/libstdc++.a libstdc++-libc6.1-2.so.3 //
  ```

- Host   target   –

      ~/.profile

    ~/.profile

QT /Embedded (7)

- ■

Host   Qt/Embedded
               .

Qt
Xindow   .
        , ps   xwindow
'kill -9 75'   xwindow   .

QT /Embedded (8)

- ✓   (target)

  ```
  # ./hello –qws        //
  ```
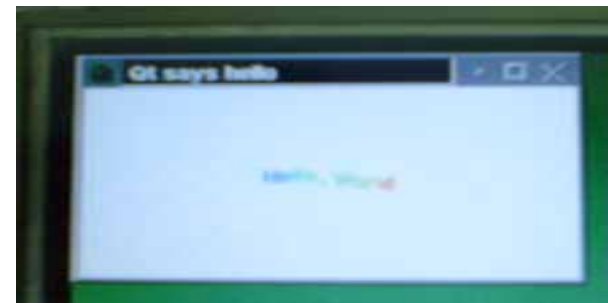

- ✓ X

QT /Embedded Application(1)

- ✓ Qt/E 1:1
- ✓

QT /Embedded Application(2)

■ -

( )
. Connect
. Disconnect
. IP information

Black Dol
black count 0

White Dol
white count 0

/

Your turn

QT /Embedded Application(3)

■ –

1. Connect → 2. → 3. OK

IP

Port

IP number

Your machine's name: localhost.localdomain
IP number: 127.0.0.1
Port number: 32776

OK

QT /Embedded Application(4)

■

□ CSocklo :
(UDP)
□ CConnectDlg :

□ CGameBoard :

□ MainWindow :
MainWindow

QT /Embedded Application(5)

■

| | |
| Client First |

Start		**Start ok**
Game		**Game**

Server   Client

| |
| |
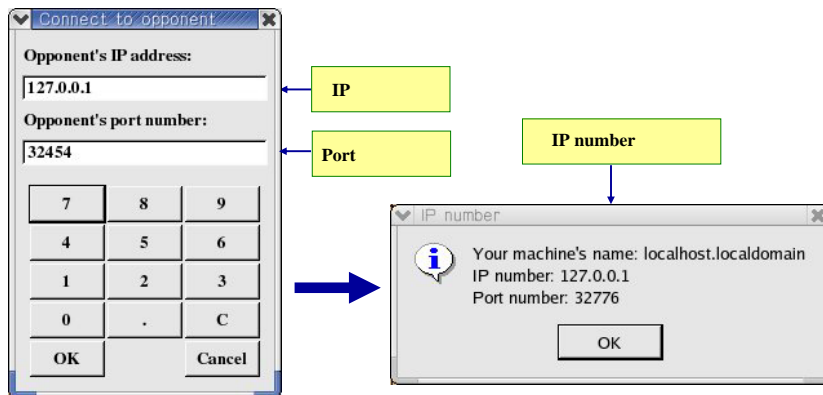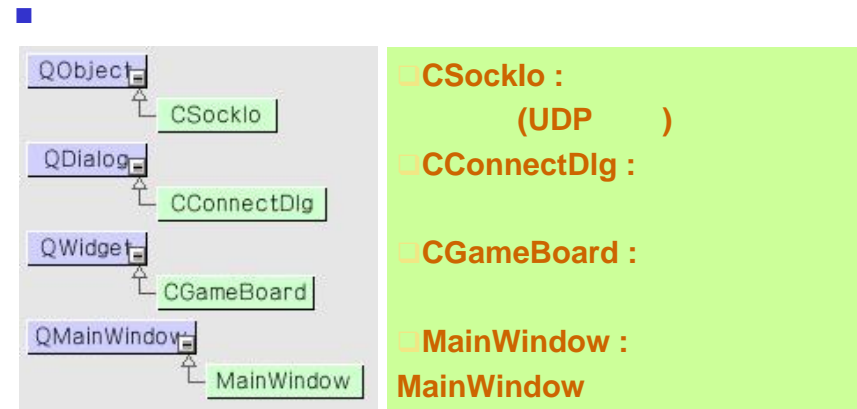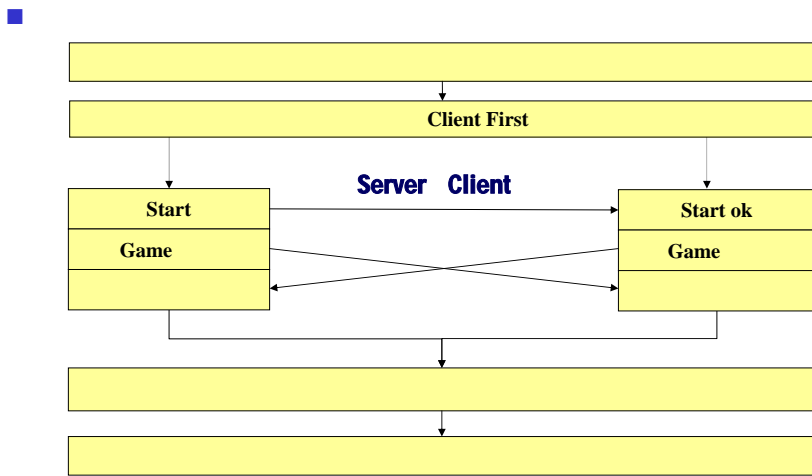
QT /Embedded Application(6)

■

✓   14*14   2
.

✓   5
.

✓

✓   Vertical, Horizontal,
✓   LeftDown, RightDown
✓   5
✓   .
✓
✓
✓

QT /Embedded Application(7)

■

✓   .
✓   /   ,
.
✓   .
✓   .

■

| socket | **udp packet** | socket |
| Client | | Client |
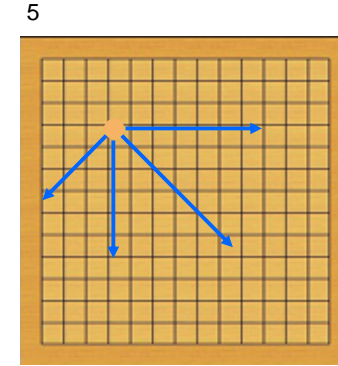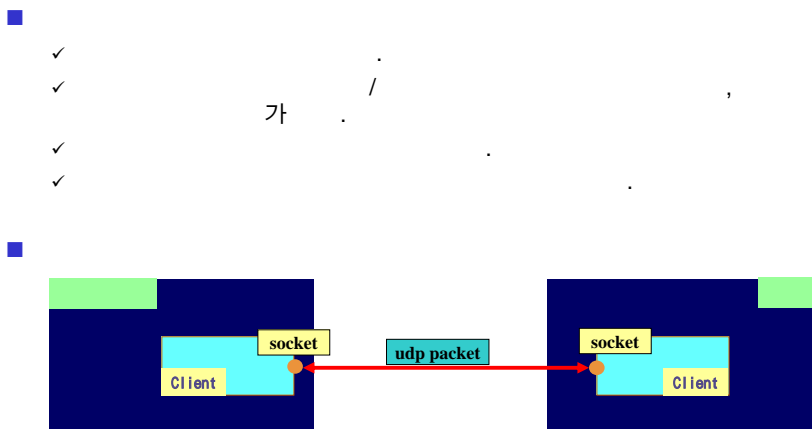
QT /Embedded Application(8)

■

command	x	y	message

COMMAND	
CONNECT	
CONNECT_ACK	
CLOSE	
SHOOT	
SHOOT_ACK	
MESSAGE	

QT /Embedded Application(9)

■

```
         client                              server
           |                                   |
  ┌──────────────────┐      connect            |
  │ OnNewPacketConnect() │─────────────────────►|
  └──────────────────┘                          |
           |         connect_ack      ┌──────────────────────┐
           |◄─────────────────────────│ OnNewPacketConnectAck() │
           |                          └──────────────────────┘
  ━━━━━━━━━━━━━━━━━━━━━ game start ━━━━━━━━━━━━━━━━━━━━━
  ┌──────────────────┐      shoot            |
  │ OnNewPacketShoot() │────────────────────►|
  └──────────────────┘                          |
           |         shoot_ack        ┌──────────────────────┐
           |◄─────────────────────────│ OnNewPacketShootAck() │
           |              ⋮           └──────────────────────┘
  ┌──────────────────┐      close            |
  │ OnNewPacketClose() │────────────────────►|
  └──────────────────┘                          |
  ━━━━━━━━━━━━━━━━━━━━━ game quit ━━━━━━━━━━━━━━━━━━━━━
```

QT /Embedded Application(10)

■

QT /Embedded Application(11)

■ Makefile

Makefile

**#qmake –spec /root/qt-embedded-free-3.3.4/mkspecs/qws/linux-ipag-g++
 -o Makfile omol_arm.pro**

➜**qmake**   **'$QTDIR/example'**
                    Makefile   .

■ Makefile

Makefile   .
Gcc   arm-linux-gcc
              .

QT /Embedded Application(12)

■

■   QT
   ✓   QT app

nfs

QT /Embedded Application(13)

- ■


```
LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/usr/X11R6/lib
DISPLAY=:0.0
export PATH LD_LIBRARY_PATH DISPLAY
export QTDIR=/qte
export LD_LIBRARY_PATH=/qte/lib:$LD_LIBRARY_PATH
export QWS_MOUSE_PROTO=linuxtp:/dev/ts
export VISUAL=ae
export EDITOR=ae
```

~/.profile   host   QT   ,

.

source ~/.profile   .

- ■   .

```
#cd /qte/lib
#ln –s libqte-mt.so.3.3.4 libqte-mt.so.3
```

.

QT /Embedded Application(14)

- ■
  - ✓   app   ip   .

1

```
[root@Xhyper255 /root]$ifconfig eth0 192.168.0.2
[root@Xhyper255 /root]$ifconfig
eth0      Link encap:Ethernet  HWaddr 00:12:34:56:78:9A
          inet addr:192.168.0.2  Bcast:192.168.0.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
```

2

```
[root@Xhyper255 /root]$ifconfig eth0 192.168.0.3
[root@Xhyper255 /root]$ifconfig
eth0      Link encap:Ethernet  HWaddr 00:12:34:56:78:9A
          inet addr:192.168.0.3  Bcast:192.168.0.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
```

.

```
#ps
#kill -9 75                    xwindow
#./omok-qws                    app            .
```

QT /Embedded Application(15)

- ■   1

QT /Embedded Application(16)

- ■   2

KIT 2