

89 使用QUdpSocket实现UDP通信

89.1 创建项目

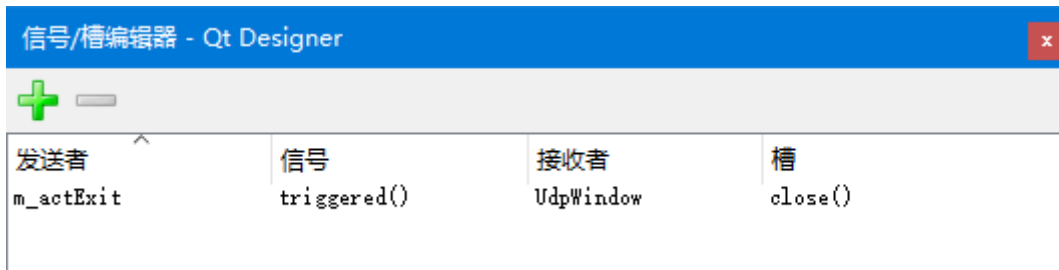
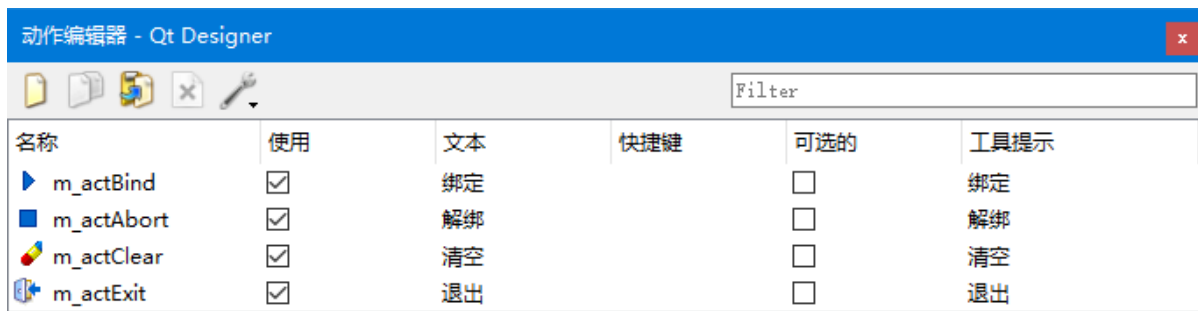
通过QtCreator, 在C:\Users\Minwei\Projects\Qt路径下, 创建名为Udp的项目。

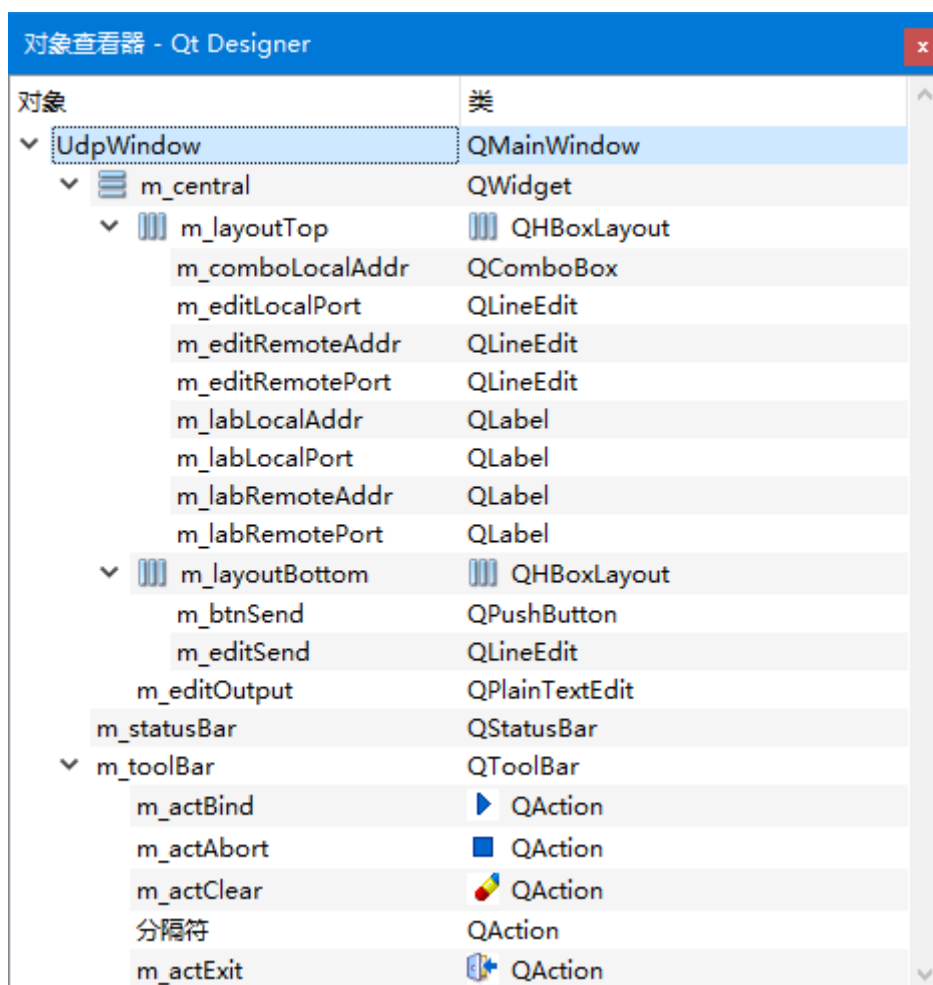
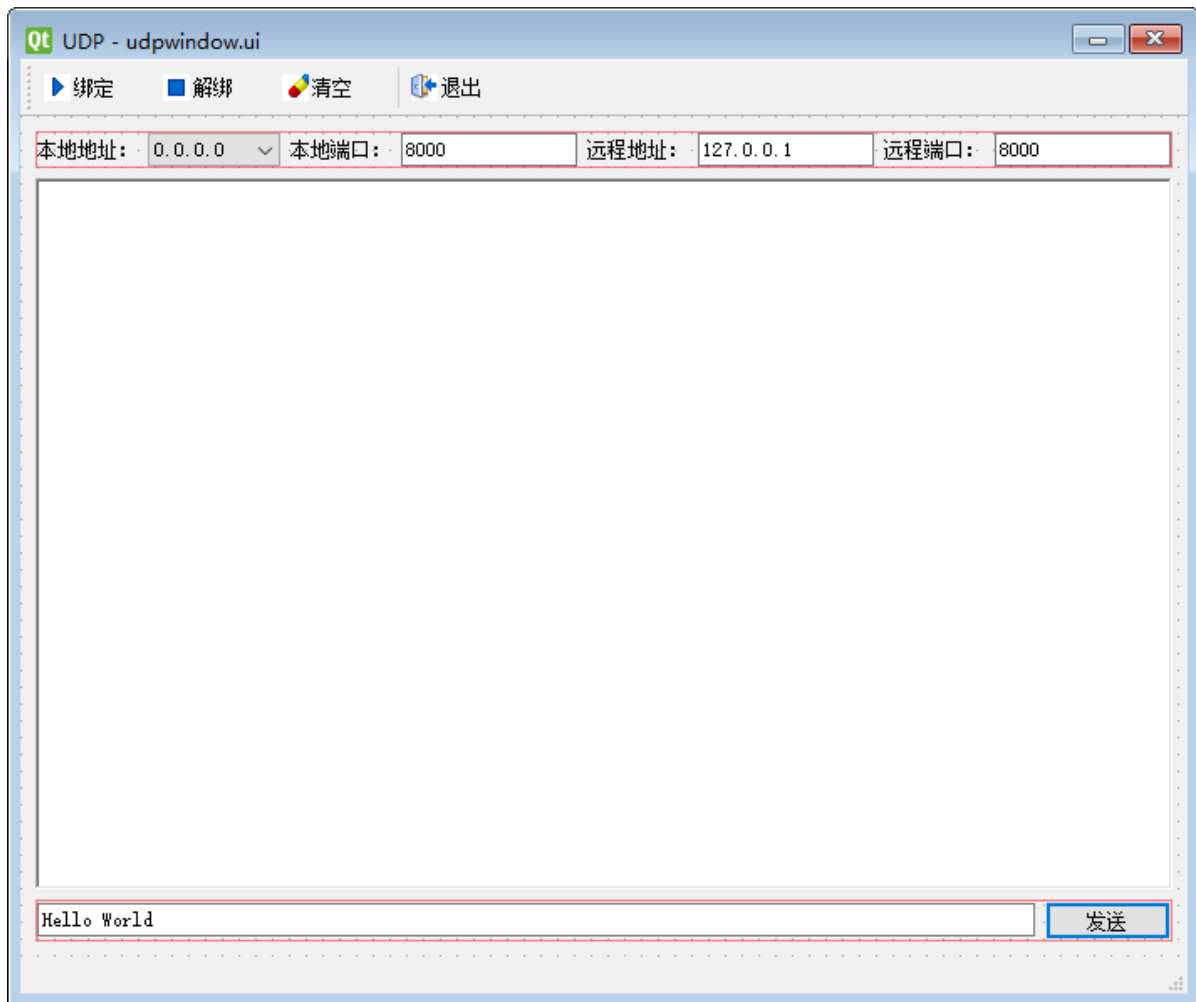
89.2 添加资源

C:\Users\Minwei\Projects\Qt\Udp\Udp.qrc:

```
1 <RCC>
2     <qresource prefix="/">
3         <file>images/abort.bmp</file>
4         <file>images/bind.bmp</file>
5         <file>images/clear.bmp</file>
6         <file>images/exit.bmp</file>
7     </qresource>
8 </RCC>
```

89.3 设计界面





C:\Users\Minwei\Projects\Qt\Udp\udpwindow.ui:

```
1 <?xml version="1.0" encoding="UTF-8"?>
2 <ui version="4.0">
3   <class>Udpwindow</class>
4   <widget class="QMainWindow" name="Udpwindow">
5     <property name="geometry">
6       <rect>
7         <x>0</x>
8         <y>0</y>
9         <width>696</width>
10        <height>557</height>
11      </rect>
12    </property>
13    <property name="windowTitle">
14      <string>UDP</string>
15    </property>
16    <widget class="QWidget" name="m_central">
17      <layout class="QVBoxLayout" name="m_layoutVer">
18        <item>
19          <layout class="QHBoxLayout" name="m_layoutTop">
20            <item>
21              <widget class="QLabel" name="m_labLocalAddr">
22                <property name="sizePolicy">
23                  <sizepolicy hstretch="Fixed" vsizetype="Preferred">
24                    <horstretch>0</horstretch>
25                    <verstretch>0</verstretch>
26                  </sizepolicy>
27                </property>
28                <property name="text">
29                  <string>本地地址: </string>
30                </property>
31              </widget>
32            </item>
33            <item>
34              <widget class="QComboBox" name="m_comboLocalAddr">
35                <item>
36                  <property name="text">
37                    <string>0.0.0.0</string>
38                  </property>
39                </item>
40                <item>
41                  <property name="text">
42                    <string>127.0.0.1</string>
43                  </property>
44                </item>
45              </widget>
46            </item>
47            <item>
48              <widget class="QLabel" name="m_labLocalPort">
49                <property name="sizePolicy">
50                  <sizepolicy hstretch="Fixed" vsizetype="Preferred">
51                    <horstretch>0</horstretch>
52                    <verstretch>0</verstretch>
53                  </sizepolicy>
54                </property>
55                <property name="text">
```

```
56     <string>本地端口: </string>
57     </property>
58 </widget>
59 </item>
60 <item>
61     <widget class="QLineEdit" name="m_editLocalPort">
62         <property name="sizePolicy">
63             <sizepolicy hsizeType="Preferred" vsizeType="Fixed">
64                 <horstretch>0</horstretch>
65                 <verstretch>0</verstretch>
66             </sizepolicy>
67         </property>
68         <property name="text">
69             <string>8000</string>
70         </property>
71     </widget>
72 </item>
73 <item>
74     <widget class="QLabel" name="m_labRemoteAddr">
75         <property name="sizePolicy">
76             <sizepolicy hsizeType="Fixed" vsizeType="Preferred">
77                 <horstretch>0</horstretch>
78                 <verstretch>0</verstretch>
79             </sizepolicy>
80         </property>
81         <property name="text">
82             <string>远程地址: </string>
83         </property>
84     </widget>
85 </item>
86 <item>
87     <widget class="QLineEdit" name="m_editRemoteAddr">
88         <property name="sizePolicy">
89             <sizepolicy hsizeType="Preferred" vsizeType="Fixed">
90                 <horstretch>0</horstretch>
91                 <verstretch>0</verstretch>
92             </sizepolicy>
93         </property>
94         <property name="text">
95             <string>127.0.0.1</string>
96         </property>
97     </widget>
98 </item>
99 <item>
100     <widget class="QLabel" name="m_labRemotePort">
101         <property name="sizePolicy">
102             <sizepolicy hsizeType="Fixed" vsizeType="Preferred">
103                 <horstretch>0</horstretch>
104                 <verstretch>0</verstretch>
105             </sizepolicy>
106         </property>
107         <property name="text">
108             <string>远程端口: </string>
109         </property>
110     </widget>
111 </item>
```

```
112     <item>
113         <widget class="QLineEdit" name="m_editRemotePort">
114             <property name="sizePolicy">
115                 <sizepolicy hsizeType="Preferred" vsizeType="Fixed">
116                     <horstretch>0</horstretch>
117                     <verstretch>0</verstretch>
118                 </sizepolicy>
119             </property>
120             <property name="text">
121                 <string>8000</string>
122             </property>
123         </widget>
124     </item>
125 </layout>
126 </item>
127 <item>
128     <widget class="QPlainTextEdit" name="m_editOutput">
129         <property name="frameShape">
130             <enum>QFrame::WinPanel</enum>
131         </property>
132         <property name="readOnly">
133             <bool>true</bool>
134         </property>
135     </widget>
136 </item>
137 <item>
138     <layout class="QHBoxLayout" name="m_layoutBottom">
139         <item>
140             <widget class="QLineEdit" name="m_editSend">
141                 <property name="text">
142                     <string>Hello world</string>
143                 </property>
144             </widget>
145         </item>
146         <item>
147             <widget class="QPushButton" name="m_btnSend">
148                 <property name="text">
149                     <string>发送</string>
150                 </property>
151                 <property name="default">
152                     <bool>true</bool>
153                 </property>
154             </widget>
155         </item>
156     </layout>
157 </item>
158 </layout>
159 </widget>
160 <widget class="QStatusBar" name="m_statusBar"/>
161 <widget class="QToolBar" name="m_toolBar">
162     <property name="windowTitle">
163         <string>工具栏</string>
164     </property>
165     <property name="toolButtonStyle">
166         <enum>Qt::ToolButtonTextBesideIcon</enum>
167     </property>
```

```
168 <attribute name="toolBarArea">
169 <enum>TopToolBarArea</enum>
170 </attribute>
171 <attribute name="toolBarBreak">
172 <bool>>false</bool>
173 </attribute>
174 <addaction name="m_actBind"/>
175 <addaction name="m_actAbort"/>
176 <addaction name="m_actClear"/>
177 <addaction name="separator"/>
178 <addaction name="m_actExit"/>
179 </widget>
180 <action name="m_actBind">
181 <property name="icon">
182 <iconset resource="Udp.qrc">
183 <normaloff>:/images/bind.bmp</normaloff>:/images/bind.bmp</iconset>
184 </property>
185 <property name="text">
186 <string>绑定</string>
187 </property>
188 </action>
189 <action name="m_actAbort">
190 <property name="icon">
191 <iconset resource="Udp.qrc">
192 <normaloff>:/images/abort.bmp</normaloff>:/images/abort.bmp</iconset>
193 </property>
194 <property name="text">
195 <string>解绑</string>
196 </property>
197 <property name="toolTip">
198 <string>解绑</string>
199 </property>
200 </action>
201 <action name="m_actClear">
202 <property name="icon">
203 <iconset resource="Udp.qrc">
204 <normaloff>:/images/clear.bmp</normaloff>:/images/clear.bmp</iconset>
205 </property>
206 <property name="text">
207 <string>清空</string>
208 </property>
209 <property name="toolTip">
210 <string>清空</string>
211 </property>
212 </action>
213 <action name="m_actExit">
214 <property name="icon">
215 <iconset resource="Udp.qrc">
216 <normaloff>:/images/exit.bmp</normaloff>:/images/exit.bmp</iconset>
217 </property>
218 <property name="text">
219 <string>退出</string>
220 </property>
221 <property name="toolTip">
222 <string>退出</string>
223 </property>
```

```

224     </action>
225 </widget>
226 <tabstops>
227     <tabstop>m_comboLocalAddr</tabstop>
228     <tabstop>m_editLocalPort</tabstop>
229     <tabstop>m_editRemoteAddr</tabstop>
230     <tabstop>m_editRemotePort</tabstop>
231     <tabstop>m_editOutput</tabstop>
232     <tabstop>m_editSend</tabstop>
233     <tabstop>m_btnSend</tabstop>
234 </tabstops>
235 <resources>
236     <include location="udp.qrc"/>
237 </resources>
238 <connections>
239     <connection>
240         <sender>m_actExit</sender>
241         <signal>triggered()</signal>
242         <receiver>Udpwindow</receiver>
243         <slot>close()</slot>
244         <hints>
245             <hint type="sourcelabel">
246                 <x>-1</x>
247                 <y>-1</y>
248             </hint>
249             <hint type="destinationlabel">
250                 <x>399</x>
251                 <y>299</y>
252             </hint>
253         </hints>
254     </connection>
255 </connections>
256 </ui>

```

89.4 实现功能

C:\Users\Minwei\Projects\Qt\Udp\udpwindow.h:

```

1  #ifndef UDPWINDOW_H
2  #define UDPWINDOW_H
3
4  #include <QMainWindow>
5  #include <QLabel>
6  #include <QUdpSocket>
7
8  QT_BEGIN_NAMESPACE
9  namespace Ui { class Udpwindow; }
10 QT_END_NAMESPACE
11
12 class Udpwindow : public QMainWindow
13 {
14     Q_OBJECT
15
16 public:
17     Udpwindow(QWidget *parent = nullptr);

```

```

18     ~Udpwindow();
19
20 private slots:
21     void on_m_actBind_triggered();
22     void on_m_actAbort_triggered();
23     void on_m_actClear_triggered();
24
25     void on_m_btnSend_clicked();
26
27     void on_m_socket_readyRead();
28
29     void on_m_socket_stateChanged(
30         QAbstractSocket::SocketState socketState);
31     void on_m_socket_error(
32         QAbstractSocket::SocketError socketError);
33
34 private:
35     Ui::Udpwindow *ui;
36     QLabel* m_labSocketState;
37     QLabel* m_labSocketError;
38     QUdpSocket* m_socket;
39 };
40
41 #endif // UDPWINDOW_H

```

C:\Users\Minwei\Projects\Qt\Udp\udpwindow.cpp:

```

1  #include <QHostInfo>
2  #include <QMetaEnum>
3
4  #include "udpwindow.h"
5  #include "ui_udpwindow.h"
6
7  Udpwindow::Udpwindow(QWidget *parent)
8      : QMainWindow(parent)
9      , ui(new Ui::Udpwindow)
10     , m_labSocketState(new QLabel("套接字状态: "))
11     , m_labSocketError(new QLabel("套接字错误: "))
12     , m_socket(new QUdpSocket(this))
13 {
14     ui->setupUi(this);
15
16     for (QHostAddress address : QHostInfo::fromName(
17         QHostInfo::localHostName()).addresses())
18         if(address.protocol() == QAbstractSocket::IPv4Protocol)
19             ui->m_comboLocalAddr->addItem(address.toString());
20
21     m_labSocketState->setMinimumWidth(298);
22     ui->m_statusBar->addWidget(m_labSocketState);
23     m_labSocketError->setMinimumWidth(298);
24     ui->m_statusBar->addWidget(m_labSocketError);
25
26     connect(m_socket, SIGNAL(readyRead()),
27         this, SLOT(on_m_socket_readyRead()));
28

```



```

29     connect(m_socket, SIGNAL(stateChanged(QAbstractSocket::SocketState)),
30            this,
31            SLOT(on_m_socket_stateChanged(QAbstractSocket::SocketState)));
32     connect(m_socket, SIGNAL(error(QAbstractSocket::SocketError)),
33            this, SLOT(on_m_socket_error(QAbstractSocket::SocketError)));
34 }
35 Udpwindow::~Udpwindow()
36 {
37     delete ui;
38 }
39
40 void Udpwindow::on_m_actBind_triggered()
41 {
42     QHostAddress address(ui->m_comboLocalAddr->currentText());
43     quint16 port = ui->m_editLocalPort->text().toUShort();
44
45     if (m_socket->bind(address, port))
46         ui->m_editOutput->appendPlainText(QString("绑定%1:%2成功").
47         arg(address.toString()).arg(port));
48     else
49         ui->m_editOutput->appendPlainText(QString("绑定%1:%2失败").
50         arg(address.toString()).arg(port));
51 }
52
53 void Udpwindow::on_m_actAbort_triggered()
54 {
55     m_socket->abort();
56
57     ui->m_editOutput->appendPlainText("解除绑定");
58 }
59
60 void Udpwindow::on_m_actClear_triggered()
61 {
62     ui->m_editOutput->clear();
63 }
64
65 void Udpwindow::on_m_btnSend_clicked()
66 {
67     QByteArray datagram(ui->m_editSend->text().toUtf8());
68     QHostAddress address(ui->m_editRemoteAddr->text());
69     quint16 port = ui->m_editRemotePort->text().toUShort();
70
71     qint64 nbytes = m_socket->writeDatagram(datagram, address, port);
72
73     if (nbytes == -1)
74         ui->m_editOutput->appendPlainText("发送失败");
75     else
76         ui->m_editOutput->appendPlainText(QString("向%1:%2发送%3字节: %4").
77         arg(address.toString()).arg(port).
78         arg(nbytes).arg(QString(datagram)));
79 }
80
81 void Udpwindow::on_m_socket_readyRead()
82 {
83     while (m_socket->hasPendingDatagrams())

```

```

84     {
85         QByteArray datagram(m_socket->pendingDatagramSize(), 0);
86         QHostAddress address;
87         quint16 port;
88
89         qint64 nbytes = m_socket->readDatagram(
90             datagram.data(), datagram.size(), &address, &port);
91
92         if (nbytes == -1)
93             ui->m_editOutput->appendPlainText("接收失败");
94         else
95             ui->m_editOutput->appendPlainText(QString("从%1:%2接收%3字节:
96             %4").
97                 arg(QHostAddress(address.toIPv4Address()).toString()).
98                 arg(port).arg(nbytes).arg(QString(datagram)));
99     }
100
101 void Udpwindow::on_m_socket_stateChanged(
102     QAbstractSocket::SocketState socketState)
103 {
104     m_labSocketState->setText(QString("套接字状态: %1").arg(
105         QMetaEnum::fromType<QAbstractSocket::SocketState>().
106         valueToKey(socketState)));
107 }
108
109 void Udpwindow::on_m_socket_error(
110     QAbstractSocket::SocketError socketError)
111 {
112     m_labSocketError->setText(QString("套接字错误: %1").arg(
113         QMetaEnum::fromType<QAbstractSocket::SocketError>().
114         valueToKey(socketError)));
115 }

```

89.5 测试验证

运行效果如图所示：

UDP

绑定 解绑 清空 退出

本地地址: 172.31.144.1 本地端口: 8001 远程地址: 172.31.144.1 远程端口: 8001

```
绑定0.0.0.0:8000成功
向127.0.0.1:8000发送11字节: Hello World
从127.0.0.1:8000接收11字节: Hello World
解除绑定
向127.0.0.1:8000发送11字节: Hello World
接收失败
解除绑定
绑定0.0.0.0:8000成功
向127.0.0.1:8000发送11字节: Hello World
从127.0.0.1:8000接收11字节: Hello World
解除绑定
绑定172.31.144.1:8000成功
向172.31.144.1:8000发送11字节: Hello World
从172.31.144.1:8000接收11字节: Hello World
向255.255.255.255:8000发送11字节: Hello World
从172.31.144.1:8000接收11字节: Hello World
解除绑定
向255.255.255.255:8000发送11字节: Hello World
解除绑定
绑定172.31.144.1:8000成功
向255.255.255.255:8000发送11字节: Hello World
从172.31.144.1:8000接收11字节: Hello World
向172.31.144.1:8001发送11字节: Hello World
接收失败
解除绑定
绑定172.31.144.1:8001成功
向172.31.144.1:8001发送11字节: Hello World
从172.31.144.1:8001接收11字节: Hello World
```

Hello World 发送

套接字状态: BoundState 套接字错误: ConnectionRefusedError