Subject: Convert struct to string and reconstruct a struct from string
Posted by sinpeople on Fri, 30 Oct 2020 01:35:52 GMT
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Hi folks,

I have a client and server which communicates via UDP. Ideally, the client converts one struct to strings and sent it to server with its client id and a command id. The message would be like "ClientID, MessageID, Strings converted from a struct". The server side picks up the message and from the messageID, it knows which struct to be used to recover its content from the remaining portion of the message, at the server side.

In case that I have roughly about 100+ such structs, how do I construct this portion to avoid a huge switch case to make the program lean with current available resources in U++?

Please point me to the right direction. I am very new to U++.

Thank you very much!

Best Regards
David

Subject: Re: Convert struct to string and reconstruct a struct from string
Posted by mirek on Fri, 30 Oct 2020 08:33:02 GMT
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sinpeople wrote on Fri, 30 October 2020 02:35Hi folks,

I have a client and server which communicates via UDP. Ideally, the client converts one struct to strings and sent it to server with its client id and a command id. The message would be like "ClientID, MessageID, Strings converted from a struct". The server side picks up the message and from the messageID, it knows which struct to be used to recover its content from the remaining portion of the message, at the server side.

In case that I have roughly about 100+ such structs, how do I construct this portion to avoid a huge switch case to make the program lean with current available resources in U++?

Please point me to the right direction. I am very new to U++.

Thank you very much!

Best Regards
David

As this sounds like you have both server and clinet under your control, I would say that binary serialization here makes the sense.

One question that remains is about what you are going to do with that struct then...

Either way, I think where this leads is that you will have Serialize method in all of your structs. While it is probably not only way how to do things, I think that in this case it will be reasonable to have some base class for your structs and Serialize will then be virtual.

```
struct AMessage {
   virtual void Serialize(Stream& s) = 0;
};

struct TemperatureMessage {
   double altitude, temperature;

   virtual void Serialize(Stream& s) {
       s % altitude % temperature;
   }
}
```

Then I can imagine you will have a map somewhere to create the specific struct on demand:

```
VectorMap<int, void (*make)(One<AMessage>& m)> message_maker;

template <class T>
void RegisterMessage(int messageid)
{
    message_maker.Add(messageid, [](One<AMessage>& m) { m.Create<T>(); });
}

INITBLOCK {
   RegisterMessage<TemperatureMessage>(); // do that for all of your messages
};
```

then when processing the intput

```
void ProcessRequest(const String& data)
{
   StringStream ss(data); // error handling for now omitted
   int client_id = ss.GetInt32();
   int message_id = ss.GetInt32();
   One<AMessage> m;
   int q = message_maker.Find(message_id);
```

```
  if(q < 0)
    return;
  (*message_maker[q])(m); // create the required concrete message
  ss % *m; // load data to struct
}
```

Of course, this all is based on very little info that you have provided...

Mirek

Subject: Re: Convert struct to string and reconstruct a struct from string
Posted by Didier on Fri, 30 Oct 2020 11:51:58 GMT

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I don't know if this simple example is in tutorial, but I think it has it's place
The use of One<> (for creation and ownership) makes code very small.

I'm not sure so many Upp users would rapidly think about using One<> (At least i woudn't since I rarely use it and tend to forget about it :d)

Subject: Re: Convert struct to string and reconstruct a struct from string
Posted by Didier on Fri, 30 Oct 2020 12:14:33 GMT

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After trying it out,

here is the same exmaple with small compilation corrections (compiles on Clang linux)

```
#include <Core/Core.h>



namespace Upp {

struct AMessage {
  virtual void Serialize(Stream& s) = 0;
  virtual ~AMessage() {}
};

typedef Function< void (One<AMessage>&) > MessageMake;

VectorMap<int, MessageMake> message_maker;

template <class T>
```

```
void RegisterMessage(int messageid)
{
    message_maker.Add(messageid, [](One<AMessage>& m) { m.Create<T>(); });
}


// =============================
//     Messages definition
// =============================
struct TemperatureMessage : AMessage {
   double altitude, temperature;

   virtual void Serialize(Stream& s) {
       s % altitude % temperature;
   }
};


struct WarningMessage : AMessage {
   String text;

   virtual void Serialize(Stream& s) {
       s % text;
   }
};



// =============================
//     Message registeration
// =============================


INITBLOCK {
   RegisterMessage<TemperatureMessage>(1); // do that for all of your messages
   RegisterMessage<WarningMessage>(2); // do that for all of your messages
};




void ProcessRequest(const String& data)
{
   StringStream ss(data); // error handling for now omitted
   int client_id = ss.Get32();
   int message_id = ss.Get32();
   One<AMessage> m;
   int q = message_maker.Find(message_id);
   if(q < 0)
      return;
   (message_maker[q])(m); // create the required concrete message
   ss % *m; // load data to struct
}

}
using namespace Upp;

CONSOLE_APP_MAIN
{
}
```

Subject: Re: Convert struct to string and reconstruct a struct from string
Posted by sinpeople on Sat, 31 Oct 2020 15:43:07 GMT
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+Mirek

Thank you very much for this great example. It did really broaden my horizon in terms of C++ knowledge as a newbie.

Now I am having difficulties in handing the binary message for sending and receiving; The sending/receiving has been verified. Only the data format seems not very correct.

```
void LocalCtrl::RpcRequest()
{
 TrafficMessage m;
 m.traffic = "Lots of Traffic";
 String data = StoreAsString(m);
 SendCmd(Traffic, data);
}

void LocalCtrl::SendCmd(enum MessageIDs msgID, String data)
{
 ClientUDPHead udpHead(local_cfg.nID, regional_cfg.strIP, regional_cfg.nPort);

 UdpRpcCmd(udpHead, msgID, data);
}
```

The "UdpRpcCmd" will eventually calls the following function to send message to server side

```
 void UdpCmd(ClientUDPHead head, enum MessageIDs msgID, String data)
 {
  UrrClient urr;
  urr.SetServer(head.strDestIP, head.nDestPort);

  int tm = GetTickCount();
  String strCmd = Format("%d%d%s", head.clientID, msgID, data);

  strCmd = urr.Call(strCmd);
  int tm2 = GetTickCount();

  String strMsg;
  if(strCmd.GetCount())
  {
   strMsg = Format("Request: %s, Response: %s in %d ms", data, strCmd, tm2-tm);
  }
  else
  {
   strMsg = Format("Request: %s, Time out!", data);
  }

  //Do something account to RpcCmd request;
  notify->OnReplyUdpRpcCmd(strMsg, (int) Random(500), Format(GetSysTime())); //notify result
 }
```

I need to combine three things together before sending it out. Initially I used this one to combine the strings together.

```
     String strCmd = Format("%d%d%s", head.clientID, msgID, data);
```

The server side can pick up the messages correctly. But I failed to extract them properly with the sample code below

```
 for(;;)
 {
  UrrRequest r;
  if(urr.Accept(r))
  {
   StringStream ss(~r); // error handling for now omitted
      int client_id = ss.Get32();
      int message_id = ss.Get32();
      One<AMessage> m;
      int q = message_maker.Find(message_id);
      if(q < 0)
         return;
      (message_maker[q])(m); // create the required concrete message
      ss % *m; // load data to struct
/*
   Vector<String> tokens = Split(~r, [](int c) { return c == ':' || c == '\t' || c == ' ' || c == ',' || c == '.' ? 1
: 0; });

   if(tokens.GetCount()>=2) // local_ctrl.nID + Command ID;
   {
    int nFind = ctrl.Find(tokens[0]);
    if(nFind != -1)
    {
     ctrl[nFind]->UdpRpcCmd(r);
    }
   }
   */
  }
 }
```

Both the client_id and message_id are very big numbers. In fact, the clicen_id is an int and message_id is an enum which starts from 1;

How to combine 2 or more strings and separate them properly after network transmission in this case?

Thank you so much!

David WANG

Subject: Re: Convert struct to string and reconstruct a struct from string
Posted by mirek on Sun, 01 Nov 2020 14:39:58 GMT

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sinpeople wrote on Sat, 31 October 2020 16:43+Mirek

Thank you very much for this great example. It did really broaden my horizon in terms of C++ knowledge as a newbie.

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 m.traffic = "Lots of Traffic";
 String data = StoreAsString(m);
 SendCmd(Traffic, data);
}

void LocalCtrl::SendCmd(enum MessageIDs msgID, String data)
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```
{
 ClientUDPHead udpHead(local_cfg.nID, regional_cfg.strIP, regional_cfg.nPort);

 UdpRpcCmd(udpHead, msgID, data);
}
```

The "UdpRpcCmd" will eventually calls the following function to send message to server side

```
 void UdpCmd(ClientUDPHead head, enum MessageIDs msgID, String data)
 {
  UrrClient urr;
  urr.SetServer(head.strDestIP, head.nDestPort);

  int tm = GetTickCount();
  String strCmd = Format("%d%d%s", head.clientID, msgID, data);

  strCmd = urr.Call(strCmd);
  int tm2 = GetTickCount();

  String strMsg;
  if(strCmd.GetCount())
  {
   strMsg = Format("Request: %s, Response: %s in %d ms", data, strCmd, tm2-tm);
  }
  else
  {
   strMsg = Format("Request: %s, Time out!", data);
  }

  //Do something account to RpcCmd request;
  notify->OnReplyUdpRpcCmd(strMsg, (int) Random(500), Format(GetSysTime())); //notify result
 }
```

I need to combine three things together before sending it out. Initially I used this one to combine the strings together.

```
    String strCmd = Format("%d%d%s", head.clientID, msgID, data);
```

The server side can pick up the messages correctly. But I failed to extract them properly with the sample code below

```
 for(;;)
 {
  UrrRequest r;
  if(urr.Accept(r))
  {
```

```
  StringStream ss(~r); // error handling for now omitted
    int client_id = ss.Get32();
    int message_id = ss.Get32();
    One<AMessage> m;
    int q = message_maker.Find(message_id);
    if(q < 0)
      return;
    (message_maker[q])(m); // create the required concrete message
    ss % *m; // load data to struct
/*
  Vector<String> tokens = Split(~r, [](int c) { return c == ':' || c == '\t' || c == ' ' || c == ',' || c == '.' ? 1
: 0; });

  if(tokens.GetCount()>=2) // local_ctrl.nID + Command ID;
  {
   int nFind = ctrl.Find(tokens[0]);
   if(nFind != -1)
   {
    ctrl[nFind]->UdpRpcCmd(r);
   }
  }
  */
 }
}
```

Both the client_id and message_id are very big numbers. In fact, the clicen_id is an int and message_id is an enum which starts from 1;

How to combine 2 or more strings and separate them properly after network transmission in this case?

Thank you so much!

David WANG

I think you are mixing text interpretation (Format) and binary one (ss.Get32). Use StringStream on both sides..

Mirek