

Inetlab.SMPP

.NET implementation of SMPP protocol for two-way SMS messaging

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Introduction

The Inetlab SMPP library implements SMPP protocol for two-way SMS messaging over TCP/IP. It allows to communicate with the SMSC (Short Message Service Center) or SMS provider. Using the library, you can send SMS messages to customers, receive messages from mobile devices and process delivery receipts. It supports long text messages in any encoding.

This is a robust SMPP framework for building production-grade solutions. Inetlab SMPP is helpful in such tasks as:

- notifying users
- command receiving from mobile subscribers (i.e. accounts balance requests)
- creation of SMS Gateway for SMS traffic reselling
- and many other applications.

The Inetlab SMPP library is fully compliant with SMPP specifications v3.3, v3.4, v5.0 and comes with a comprehensive set of code samples. Enjoy exploring our demo applications, knowledge base and best support from our development team. Inetlab developers will review your code and even analyze your Wireshark network SMPP data logs!

SMPP Client Features

- Sending long Text messages as concatenated segments
- Sending Binary messages
- Sending Flash SMS
- Sending WAP Push
- Receiving SMS messages from mobile phones
- Intuitive SMS building with fluent interface
- Keeping connection to SMPP server alive
- Working with any language including Arabic, Chinese, Hebrew, Russian, Greek and Unicode messages support
- Reliable bulk SMS-sending at up to 500 messages per second rate
- SSL/TLS support
- and many more

SMPP Server Features

- Multiple concurrent client connections support
- Receiving SMS messages from connected clients
- Sending Concatenated Text messages
- Sending Delivery receipts
- Message status query support
- Message rate limit and throttling
- Ability to forward received messages to next SMPP server
- SSL/TLS support
- Tests availability of client with enquiry_link command
- Proxy Protocol for load-balancing support
- and many more



How to try the library

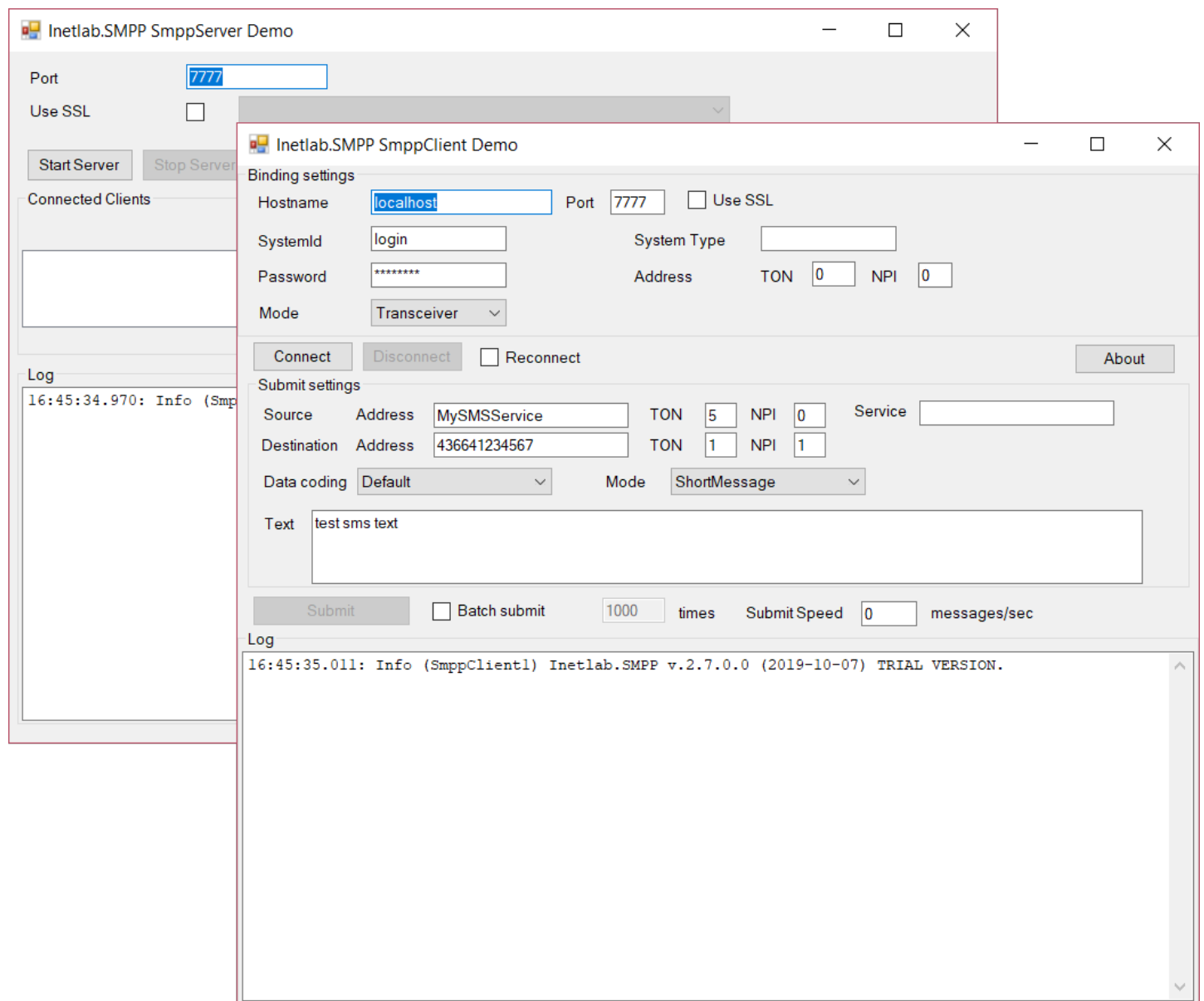
Get samples

Latest source code of the samples for Inetlab.SMPP library you can find on the [link](#). Or you can [download zip archive](#) with all samples.

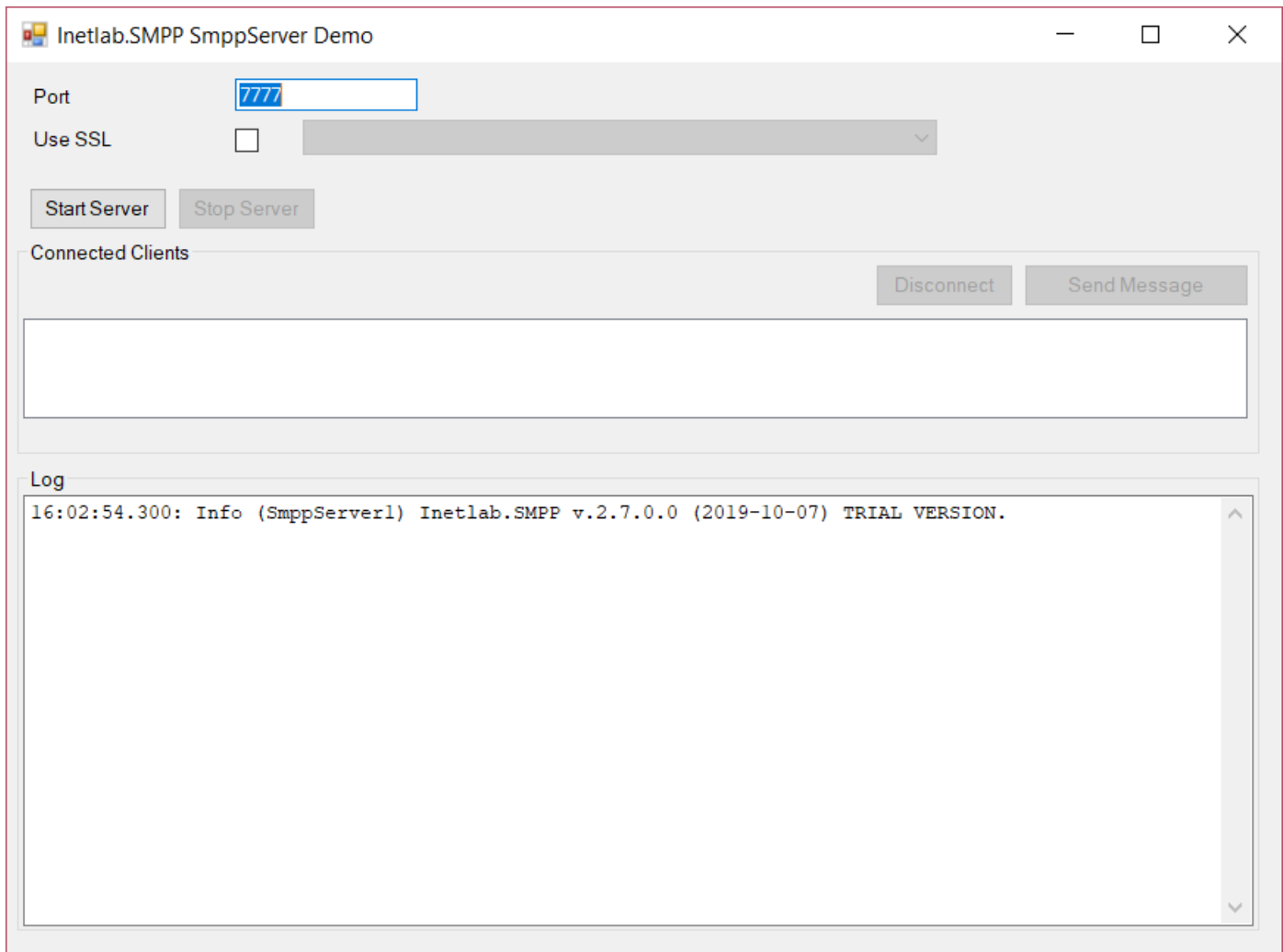
Start Demo Apps

Install Visual Studio 2017 or Visual Studio 2019 on your PC before starting the following .bat file.

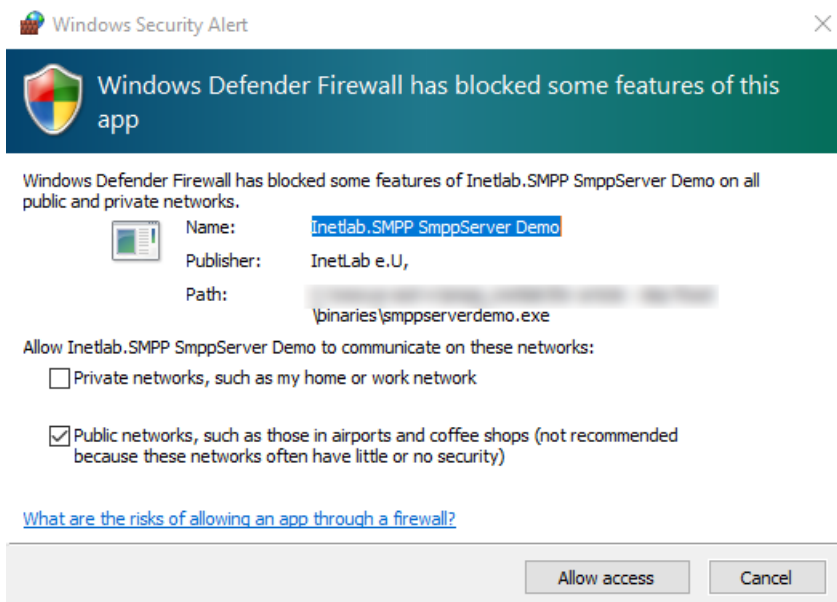
Unpack ZIP and run file run_demo.bat in "smpp-samples-master" folder. In a console window appeared you might see the question – respond with "Y" for starting samples compilation. After this (and further launches) of run_demo.bat you should see two demo-applications started: "Inetlab.SMPP SmppServer Demo" and "Inetlab.SMPP SmppClient Demo".



Press button "Start Server" in the "Inetlab.SMPP SmppServer Demo" application



You might see firewall warning "Windows Security Alert" after button "Start Server" is pressed.



For the application SmppServerDemo.exe to work correctly, you need to accept this Windows Defender Firewall request by pressing "Allow access" button.

After starting SMPP-server, the "Start Server" button will be disabled and the "Stop Server" button will become clickable. Since that moment your computer acts as an SMPP-server reachable at addresses: localhost:7777, 127.0.0.1:7777 as well as via IP-address of your PC in the local network (Ethernet or Wi-Fi) at port 7777.

Demo-program starts SMPP-server on port 7777 by default. Of course, you can type in any port number you prefer before

getting server started. Mind the server port when connecting with SMPP-client on the next steps.

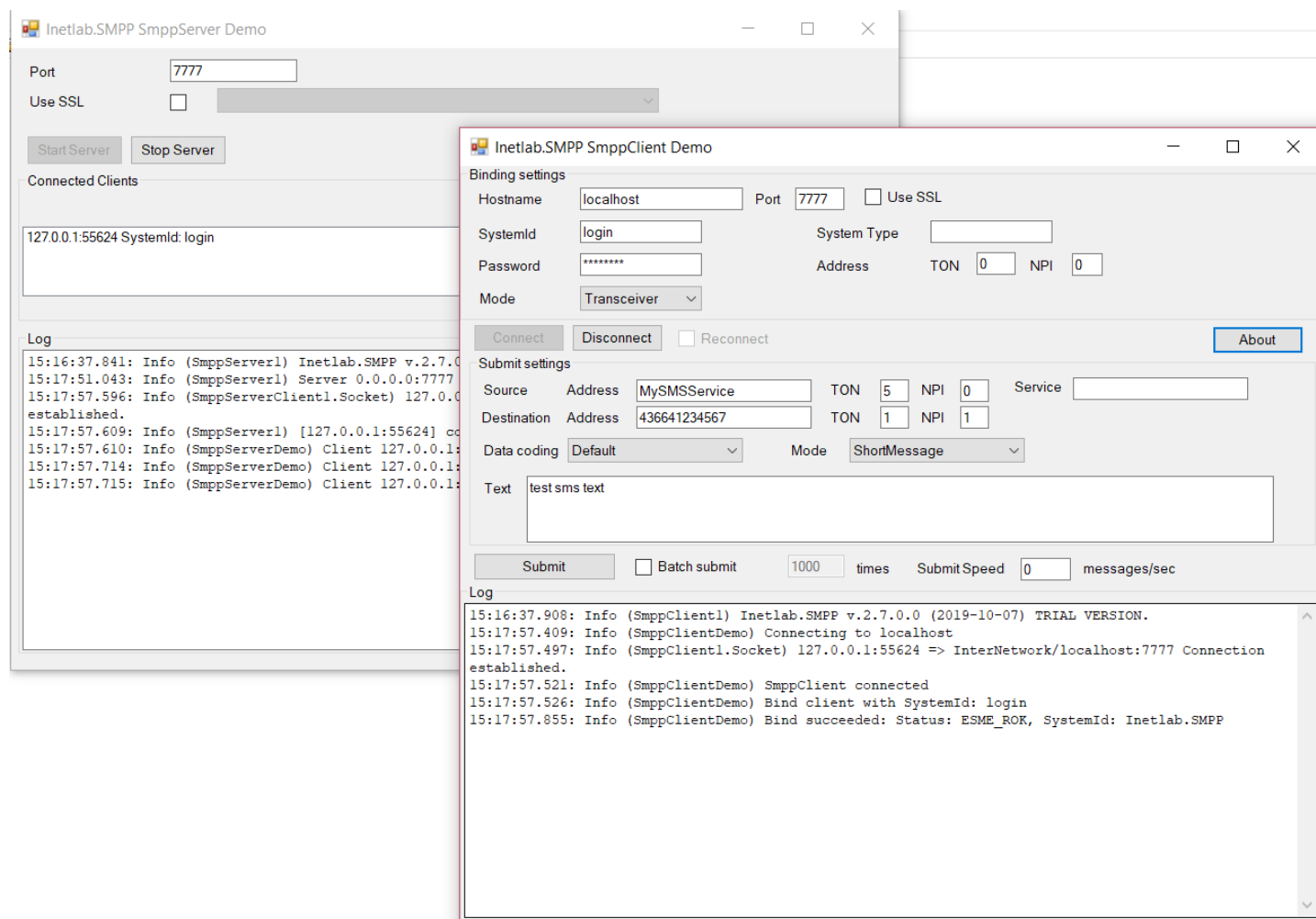
Showcases

Connect "Inetlab.SMPP SmppClient Demo" to "Inetlab.SMPP SmppServer Demo"

Demo-application "Inetlab.SMPP SmppClient Demo" already set with default server address (localhost) and port (7777) values matching default demo-server application settings. Press "Connect", to get SMPP-client connected to the SMPP-server implemented by "Inetlab.SMPP SmppServer Demo".

Application "Inetlab.SMPP SmppServer Demo" now should have a line of text in the field "Connected Clients" showing "SystemId" of the SMPP-client connected. In our case, it should be "SystemId: login".

Now Log-fields of both applications should contain some lines of debug information related to the connection established.



There should be a record "Bind succeeded: Status: ESME_ROK, SystemId: Inetlab.SMPP" in the Log-field of "Inetlab.SMPP SmppClient Demo" window.

Submit batch messages from client to server

Let's make a batch sending of messages from client to server. Check the checkbox "Batch submit" next to "Submit" button in "Inetlab.SMPP SmppClient Demo" window. There is a preset value of 1000 for sending 1000 test messages in a batch. Default Submit speed is "0" – which means there is no delay performed between each message submission. Press "Submit" button to start.

The new record saying "Submit message batch. Count: 1000. Text: test sms text." should appear in the LOG-field of "Inetlab.SMPP SmppClient Demo" window. It should be followed by records "Batch sending completed. Submitted: 1000, Elapsed: 147 ms, Performance: 6802.721 m/s" (your digits may vary). It means the SMPP-client have just sent 1000 messages to the server.

In Log-field of server application window you will see plenty of similar records (a thousand in fact):

... [timestamp]: Info (SmppServerDemo) Client 127.0.0.1:55624 sends message From:MySMSService, To:436641234567, Text: test sms text[TRIAL] [timestamp]: Info (SmppServerDemo) SMS Received: test sms text[TRIAL] ...

This example does not use any kind of looping in a code. It just prepares the collection of messages (1000 of identical messages in this example) and sends to the server with a single command. The code performs sending with single asynchronous operation. Collection may contain messages with varying recipient numbers and message bodies. The software automatically collects all related server responses and returns them as a single collection. "Message speed" parameter sets the delay between messages. It is useful to avoid "throttling" (throttling error) – special kind of an SMPP-server restriction applied to an SMPP-clients sending messages too fast. You can read more about throttling in the article [Throttling error](#).

Submit Cyrillic text message in UCS2 encoding from client to server

Let's put some text containing Cyrillic symbols into "Text" field of "Inetlab.SMPP SmppClient Demo" – for example "это тестовое sms". Choose UCS2 in dropdown menu "Data coding". Press "Submit". There should be a new record in the Log-field of "Inetlab.SMPP SmppServer Demo" window:

[timestamp]: Info (SmppServerDemo) Client 127.0.0.1:53233 sends message From:MySMSService, To:436641234567, Text: это тестовое sms[TRIAL] [timestamp]: Info (SmppServerDemo) SMS Received: это тестовое sms[TRIAL]

Message successfully delivered to the SMPP-server. Please note, if you keep the default value in "Data coding" dropdown, you will see all Cyrillic symbols arrived to server as question marks.

You can read more about text encoding in the article [Map Encoding](#).

What detailed log looks like?

Log-fields of client and server are populated with new information thanks to a Logger embedded in the Inetlab.SMPP library. The embedded logger creates text records reflecting the meaning of current operations automatically. The default logging level is "Info". For example, this is how Log-field of SMPP-client looks like when launched and connected to an SMPP-server (log level "Info").

Inetlab.SMPP SmppClient Demo

Binding settings

Hostname Port ☐ Use SSL

SystemId System Type

Password Address TON NPI

Mode

☐ Reconnect

Submit settings

Source Address TON NPI Service

Destination Address TON NPI

Data coding Mode

Text

☐ Batch submit times SubmitSpeed messages/sec

Log

```
15:54:29.797: Info (SmppClient1) Inetlab.SMPP v.2.7.0.0 (2019-10-07) TRIAL VERSION.
15:54:33.658: Info (SmppClientDemo) Connecting to localhost
15:54:33.705: Info (SmppClient1.Socket) 127.0.0.1:64867 => InterNetwork/localhost:7777 Connection
established.
15:54:33.718: Info (SmppClientDemo) SmppClient connected
15:54:33.721: Info (SmppClientDemo) Bind client with SystemId: login
15:54:33.989: Info (SmppClientDemo) Bind succeeded: Status: ESME_ROK, SystemId: Inetlab.SMPP
```

To change logging level it is necessary to change logging settings in the source code of SMPP-client and compile the project again. For example, by setting "Verbose" level in logger settings (showing much more technical details when "Info") you will get more information in the logger output. Log-field will have additional records marked as "Verbose" and "Debug".

Inetlab.SMPP SmppClient Demo
— □ ×

Binding settings

Hostname
Port
☐ Use SSL

SystemId
System Type

Password
Address
TON
NPI

Mode

Transceiver ▾

Connect

Disconnect

☐ Reconnect

About

Submit settings

Source
Address
TON
NPI
Service

Destination
Address
TON
NPI

Data coding

Default ▾

Mode

ShortMessage ▾

Text

Submit

☐ Batch submit

times

SubmitSpeed

messages/sec

Log

```

15:53:37.945: Info (SmppClient1) Inetlab.SMPP v.2.7.0.0 (2019-10-07) TRIAL VERSION.
15:53:42.664: Info (SmppClientDemo) Connecting to localhost
15:53:42.687: Debug (SmppClient1.Socket) Establish connection to InterNetwork/localhost:7777
15:53:42.705: Info (SmppClient1.Socket) 127.0.0.1:64854 => InterNetwork/localhost:7777 Connection established.
15:53:42.718: Info (SmppClientDemo) SmppClient connected
15:53:42.720: Info (SmppClientDemo) Bind client with SystemId: login
15:53:42.768: Debug (SmppClient1) Send PDU: BindTransceiver, Sequence: 1
15:53:42.782: Verbose (SmppClient1.Socket) Sending data: Length=36,
0000002400000009000000000000000016c6f67696e0070617373776f7264000034000000
15:53:42.862: Verbose (SmppClient1.Socket) Received data: Length=29,
0000001d8000000900000000000000001496e65746c61622e534d505000
15:53:42.890: Debug (SmppClient1) PDU Received: BindTransceiverResp, Status: ESME_ROK, Sequence: 1,
SystemId: Inetlab.SMPP
15:53:42.905: Info (SmppClientDemo) Bind succeeded: Status: ESME_ROK, SystemId: Inetlab.SMPP

```

You can read more logging and logging levels in the article [Creating local and global Logger](#).

Send a message from server to client selected

There is a list of all SMPP-clients connected and their respective logins in the "Connected Clients" field of "Inetlab.SMPP SmppServer Demo" window.

Inetlab.SMPP SmppServer Demo

Port

Use SSL ☐ ▼

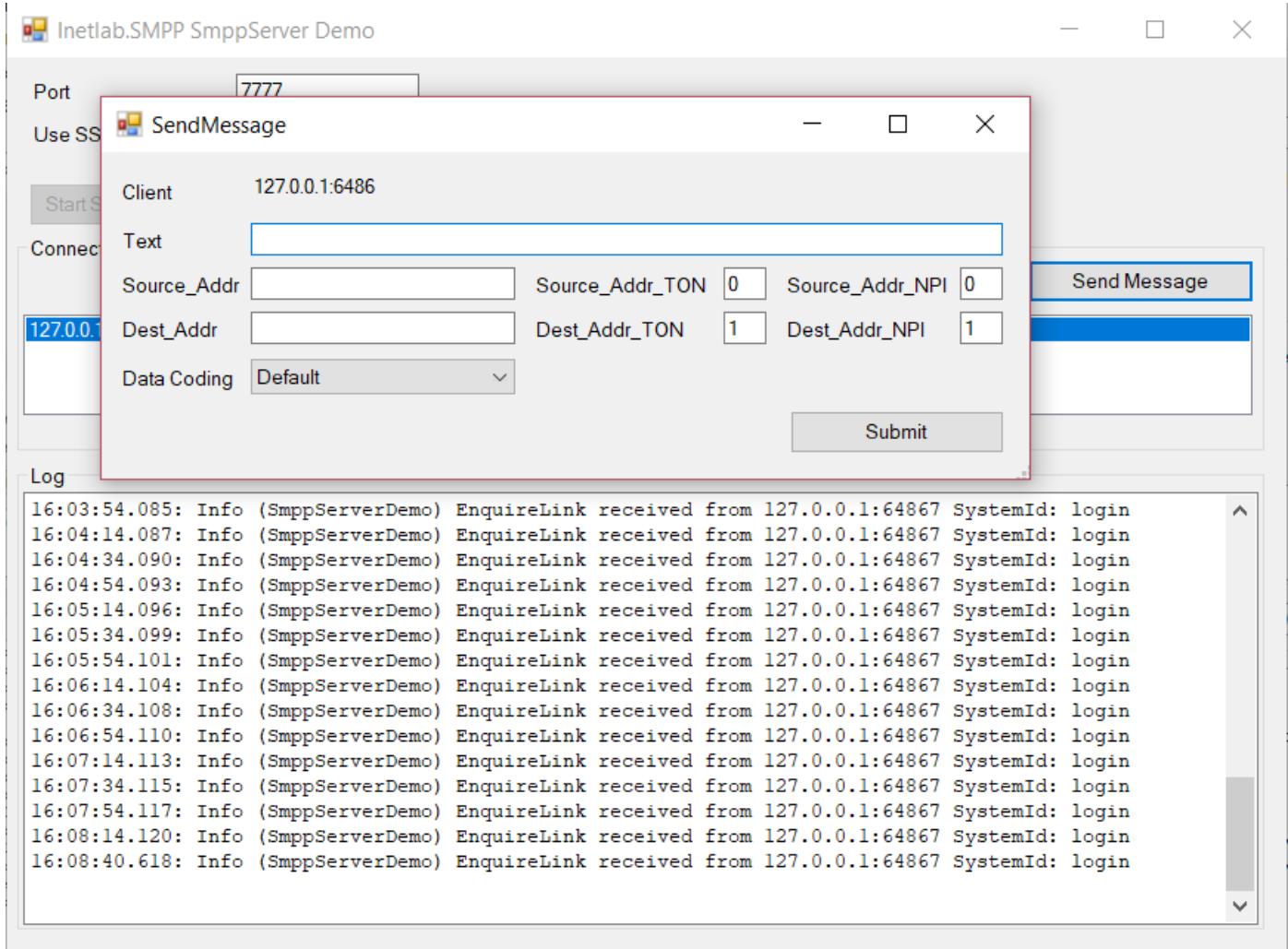
Connected Clients

127.0.0.1:64867 SystemId: login
127.0.0.1:58283 SystemId: login2
127.0.0.1:58284 SystemId: login3

Log

```
16:12:00.642: Info (SmppServerDemo) EnquireLink received from 127.0.0.1:64867 SystemId: login
16:12:20.644: Info (SmppServerDemo) EnquireLink received from 127.0.0.1:64867 SystemId: login
16:12:40.646: Info (SmppServerDemo) EnquireLink received from 127.0.0.1:64867 SystemId: login
16:12:47.344: Info (SmppServerClient2.Socket) 127.0.0.1:7777 => 127.0.0.1:58283 Connection
established.
16:12:47.345: Info (SmppServer1) [127.0.0.1:58283] connected.
16:12:47.345: Info (SmppServerDemo) Client 127.0.0.1:58283 connected.
16:12:47.401: Info (SmppServerDemo) Client 127.0.0.1:58283 bind as login2:password
16:12:47.401: Info (SmppServerDemo) Client 127.0.0.1:58283 has been bound.
16:12:49.085: Info (SmppServerClient3.Socket) 127.0.0.1:7777 => 127.0.0.1:58284 Connection
established.
16:12:49.086: Info (SmppServer1) [127.0.0.1:58284] connected.
16:12:49.086: Info (SmppServerDemo) Client 127.0.0.1:58284 connected.
16:12:49.148: Info (SmppServerDemo) Client 127.0.0.1:58284 bind as login3:password
16:12:49.149: Info (SmppServerDemo) Client 127.0.0.1:58284 has been bound.
```

If you click a line containing client login (for example, "SystemId: login") and the press "Send Message" button at the right side of the window, you will be able to message the SMPP-client by filling a form.



Let's fill the form with arbitrary information:

After filling all fields and pressing "Submit" button the message will be sent to the SMPP-client. By having a look at the Log-field of SMPP-client application, we can confirm if the message received. The similar record should appear:

... [timestamp]: Info (SmppClientDemo) DeliverSm received : Sequence: 1, SourceAddress: 123, Coding: Default, Text: test back[TRIAL] ...

As next step you can begin to create your own [SMPP Client](#) or [SMPP Server](#) application.

SMPP Client

Creation of SMPP-client and Connect

Authentication (Bind)

Connection recovery

Create and send messages

Receive messages

Track message sending and delivery

Creating SMPP-client and Connect

You need to know the address and port of SMPP-server to establish connection to it. Let us create an instance of an SMPP-client and proceed with asynchronous method [ConnectAsync](#) using server data as arguments.

```
SmppClient _client = new SmppClient();  
bool connected = await _client.ConnectAsync("localhost", 7777);
```

This example illustrates how an SMPP-client connects local SMPP-server available at "localhost", port 7777. It is described in according article [how to create local SMPP-server](#).

Run the code inside the asynchronous method. After execution, the **connected** variable will receive information about operation result (Boolean true/false).

In most cases the successful connect is followed by [bind operation](#).

Authentication (Bind)

The login and password issued by an SMPP-provider is required to pass authentication at SMPP-server.

Authentication to be performed after [connection established](#) successfully. Login and password transmitted to server with asynchronous method [BindAsync](#). In [BindAsync](#) method you can also specify [ConnectionMode](#). When calling [BindAsync](#) the third parameter (Connection Mode) is optional and, if not specified, by default it is [Transceiver](#).

```
if (await _client.ConnectAsync("localhost", 7777))
{
    BindResp bindResp = await _client.BindAsync("Login", "Password", ConnectionMode.Transceiver);
}
```

Calls to methods [ConnectAsync](#) and [BindAsync](#) are to be accompanied with "await" operator. It guarantees getting to **Bind** operation only after **Connect** was successful.

In the following example, variable **bindResp** contains the result of [BindAsync](#) execution, in particular the server response and status.

```
if (bindResp.Header.Status == CommandStatus.ESME_ROK)
{
    _log.Info("Bound with SMPP server");
}
```

[ESME_ROK](#) status confirms successful execution of authentication command and means you can proceed with sending and/or receiving messages. The [SmppClient](#) object will change its [Status](#) to [Bound](#).

Read more about statuses in the article [Sending Commands and Getting Responses](#).

Connection recovery

Connection recovery can be activated with [ConnectionRecovery](#) property.

```
SmppClient _client = new SmppClient();
_client.ConnectionRecovery = true;
```

This works only after first successful [bind](#). [SmppClient](#) triggers following events by connection recovery:

- event [evRecoverySucceeded](#) - when bind was successful.
- event [evDisconnected](#) - when bind was failed.

Connection won't be recovered when you call directly the method `client.Disconnect()`.

For the first successful **bind** you need to write a Connect method so that it repeats Connect and Bind until it receives status [ESME_ROK](#) in [BindResp](#).

The delay time between recovery attempts can be changed with the property [ConnectionRecoveryDelay](#). Default is 2 minutes.

Create and send messages

There are several ways to create a message. The most convenient way is by using helper class [SMS](#):

```
IList<SubmitSm> pduList = SMS.ForSubmit().From("111").To("79171234567").Text("Hello World!").Create(_client);
```

This example will produce a collection **pduList** containing single short message. If the message is longer when 140 octets, it will be automatically [split to parts](#). All message parts are also placed into a collection **IList<SubmitSm>**. The mobile phone automatically concatenates received message parts into a single longer message.

The library also provides a way to create `SubmitSm PDU` manually:

```
public SubmitSm CreateSubmitSm()
{
    SubmitSm sm = new SubmitSm();
    sm.UserData.ShortMessage = _client.EncodingMapper.GetMessageBytes("Test Test Test Test Test Test Test Test Test Test", DataCodings.Default);
    sm.SourceAddress = new SmeAddress("1111", AddressTON.NetworkSpecific, AddressNPI.Unknown);
    sm.DestinationAddress = new SmeAddress("79171234567", AddressTON.Unknown, AddressNPI.ISDN);
    sm.DataCoding = DataCodings.UCS2;
    sm.SMSCReceipt = SMSCDeliveryReceipt.SuccessOrFailure;

    return sm;
}
```

This method does not have support for long messages and splitting. However, when you need to create [Inetlab.SMPP.PDU](#) messages and set properties not supported by [SMS](#) class this method is very useful.

Actual message transmission is performed by calling method [SubmitAsync](#) and passing either an argument of `SubmitSm PDU` either arrays/collections using method overloads.

```
IEnumerable<SubmitSmResp> responses = await _client.SubmitAsync(pduList);
```

The [SubmitAsync](#) method supports batch sending. It is possible to send **pduList** containing thousands of PDUs by a single call to [SubmitAsync](#) method. The method will return results after [SmppClient](#) have received server responses for all [Inetlab.SMPP.PDU](#)'s sent.

Please note, the order of [SubmitSmResp](#) in **response** collection may not match the order of PDUs in **pduList** collection. The relation between commands sent and server responses may be established by `resp.Header.Sequence` property.

Successful processing of [SubmitSm](#) on server side produces server response containing status

```
response.Header.Status = ESME_ROK.
```

It is possible that several [SubmitSmResp](#) will produce a response with error status:

- [SMPPCLIENT_NOCONN](#) - connection failed during sending attempt.
- [SMPPCLIENT_UNBOUND](#) - you are probably trying to send commands via [SmppClient](#) without authentication (Bind).
- [SMPPCLIENT_RCVTIMEOUT](#) - response to request is not arrived during certain time.

Receive messages

An SMPP-server sends SMS to SMPP-client by using command [DeliverSm](#). It may contain inbound SMS as well as delivery report.

There is an event [evDeliverSm](#) in class [SmppClient](#). The event rises on [DeliverSm](#) command arrival. Any method subscribed to that event will receive information about inbound messages.

...

```
_client.evDeliverSm += OnDeliverSm;
```

...

```
private void OnDeliverSm(object o, DeliverSm deliverSm)
{
    if (deliverSm.MessageType == MessageTypes.SMSCDeliveryReceipt)
    {
        _log.Info("Delivery Receipt received");
    }
    else
    {
        _log.Info("Incoming SMS received");
    }
}
```

The InetLab.SMPP library allows to [concatenate received parts](#) of the long message into a single message the same way as mobile phone does. The class [MessageComposer](#) is used for that.

If you do not receive inbound messages you may need to look for an answer in according [Troubleshooting](#) article.

Track message sending and delivery

Track sending

The SMPP-server generates unique `MessageId` for each `SubmitSm PDU` received from SMPP-client. In case of a multipart message (long message split into parts) each part is assigned with unique `MessageId` generated by the server.

The client receives information about `MessageId` as `PDU SubmitSmResp` response from SMPP-server. The fact of issuing `MessageId` for message/part means server accepted it for further processing. You can read more about ways of collecting server responses `SubmitSmResp` in the article [Create and send message](#).

Track delivery

During message creation it is necessary to set property "registered delivery" in order to get delivery reports after sending. The field `MessageId` is present in each delivery report and matches `MessageId` of the original message/part send before. Matching of delivery reports to original messages is possible by using `MessageId` and looking for identical values. This way is possible to track delivery progress.

There is a simple handler for `evDeliverSm` event in the following example. It extracts `MessageId` and status from received delivery report `DeliverSm`. The next thing to do is to search this `MessageId` in messages sent before.

...

```
_client.evDeliverSm += OnDeliverSmTracking;
```

...

```
private void OnDeliverSmTracking(object o, DeliverSm deliverSm)
{
    if (deliverSm.MessageType == MessageTypes.SMSCDeliveryReceipt)
    {
        _log.Info("Delivery Receipt received");

        string messageId = deliverSm.Receipt.MessageId;
        MessageState deliveryStatus = deliverSm.Receipt.State;
    }
}
```

Read more details about tracking [message delivery status](#)

SMPP Server

Create an SMPP-server and Connect (with sample app)

Client authentication (Bind)

Keeping connection active (InactivityTimeout and EnquireLink)

Receive messages

Send messages

Deliver messages from sender to recipient

Implementing SMPP Gateway

Control SMPP responses

Create SMPP-server and Connect (with sample app)

The following minimal code structure creates SMPP-server:

```
SmppServer _server = new SmppServer(new IPEndPoint(IPAddress.Any, 7777));  
_server.Start();
```

First line prepares SMPP-server to be started at the port 7777. The second line actually starts the server and getting server ready to accept connection requests from TCP/IP clients. The SMPP-server creates instance of [SmppServerClient](#) class and raises the event [evClientConnected](#) for each TCP/IP client connected.

All clients connected are added automatically to the collection [ConnectedClients](#) of [SmppServer](#) object.

You may implement any preliminary checks in the event-handler subscribed to [evClientConnected](#) event. For example, you may perform an IP-address check and disconnect "wrong" clients immediately.

Please explore the sample SMPP Server program at the [link](#).

Client authentication (Bind)

Each SMPP-client has to send **Bind** command to start working with SMPP-servers. Bind stands for authentication according to the SMPP protocol. There must be an event-handler attached to [evClientBind](#) event to enable to bind-request processing by SMPP-server. The event is raised each time SMPP-server receives Bind command:

```
_server.evClientBind += (sender, client, bindPdu) => {  
    //process Bind PDU  
};
```

By using an empty event-handler as in the example above you allow any SMPP-client authenticate on your server. If there is no event-handler attached, the authentication will not succeed. Consequently, the SMPP-server will return response [BindResp](#) to the SMPP-client containing [ESME_RBINDFAIL](#) status.

It is common to implement various authentication rules, login checks and other security checks in the event-handler subscribed to [evClientBind](#).

Keeping connection active (InactivityTimeout and EnquireLink)

InactivityTimeout

To save server resources, it is useful to disconnect inactive clients. In general, inactive client is the one who neither sends neither receives commands (messages).

There is a parameter [InactivityTimeout](#) with default value of 2 minutes for [SmppServerClient](#) instances. The [SmppServer](#) closes connection to clients based on this timer. It is possible to disable [InactivityTimeout](#) by assigning it value **TimeSpan.Zero**.

Example of setting [InactivityTimeout](#) for 15 seconds once an SMPP-client is connected:

```
SmppServer _server = new SmppServer(new IPEndPoint(IPAddress.Any, 7777));

_server.evClientConnected += (s, client) => {
    client.InactivityTimeout = TimeSpan.FromSeconds(15);
};

_server.Start();
```

[InactivityTimeout](#) is possible to set inside event-handler for [evClientConnected](#) event only.

EnquireLink

When there is no messages to send/receive but the connection has to be kept the [EnquireLink command](#) is engaged.

It is possible to perform an automatic connection check for [SmppServerClient](#) or [SmppClient](#) using property [EnquireLinkInterval](#). The [EnquireLinkInterval](#) is the inactivity time interval after which the command EnquireLink is sent automatically.

EnquireLink example:

```
SmppServer _server = new SmppServer(new IPEndPoint(IPAddress.Any, 7777));
_server.Start();
_server.evClientBind += (s, client, bind) => {
    client.EnquireLinkInterval = TimeSpan.FromSeconds(15);
};
```

In that example, we configure the [SmppServerClient](#) instance to check connection each 15 seconds of SMPP-client inactivity. It is possible to set [EnquireLinkInterval](#) in event-handlers for [evClientConnected](#) event or [evClientBind](#) event.

An automatic connection check is started only after successful **Bind**. Client without **Bind** considered inactive and will be disconnected if [InactivityTimeout](#) was set.

Please note, values [InactivityTimeout](#) and [EnquireLinkInterval](#) are to be set for each instance of [SmppServerClient](#) created i.e. for each client connected.

The event handler for event [evClientDisconnected](#) is called when client disconnects.

Receive messages

To receive messages it is necessary to create an event handler for [evClientSubmitSm](#) event. The [evClientSubmitSm](#) event is raised each time packet with [SubmitSm](#) command arrives. The remote SMPP-client uses this command to send SMS to SMPP-server (SMS Center).

```
_server.evClientSubmitSm += (sender, client, submitSm) => {  
    // process SubmitSm PDU here  
};
```

Even with an empty event handler attached, the `SmppServerClient` will automatically generate [SubmitSmResp](#) packet and put the [ESME_ROK](#) status in **`submitSm.Response`** field. In addition, the unique identifier "MessageId" for each message/part received will be created and placed into response packet. The event handler allows you to change **`submitSm.Response.MessageId`** or any other property of [SubmitSmResp](#) object.

```
submitSm.Response.MessageId = "myUnuqueID";
```

If there is no event handler attached to [evClientSubmitSm](#) event, the server sends to client the response [SubmitSmResp](#) containing status [ESME_RSUBMITFAIL](#).

It is common to implement various rules for inbound messages (such as processing, saving, sending, storing, parts collecting, etc.) inside the event handler attached to [evClientSubmitSm](#) event.

Send messages

The SMPP-server creates [SmppServerClient](#) object automatically for each SMPP-client connected. Calling method [DeliverAsync](#) of the [SmppServerClient](#) object sends a message to the respective SMPP-client.

To start, it is necessary to choose [SmppServerClient](#) instance from the list available at [ConnectedClients](#) property. You may use any [SmppServerClient](#) properties as criteria for choosing the recipient/SMPP-client.

For example, let us create arbitrary message at SMPP-server and send it to the SMPP-client. To choose a recipient SMPP-client from the list we will use SystemID value (SMPP-client login). The message will be sent to the first client having SystemID matching field "To" value of the message.

Assuming the SMPP-server already created, minimally [configured and started](#) and the server parameter will be passed to the method, the sending method will be as follows:

```
public async Task SendSms(SmppServer _server)
{
    //prepare message data
    string sender = "123";
    string recipient = "456";
    string text = "hello!";

    //searching recipient by criteria
    SmppServerClient clientReceipient = _server.ConnectedClients.FirstOrDefault(c => c.SystemID == recipient);

    //creating message and sending
    if (clientReceipient != null)
    {
        IList<DeliverSm> textMessage =
        SMS.ForDeliver().From(sender).To(recipient).Text(text).Create(clientReceipient);
        IEnumerable<DeliverSmResp> response = await clientReceipient.DeliverAsync(textMessage);
    }
}
```

To have a message sent in the example above, the SMPP-server must have an SMPP-client with SystemId "456" already connected when method SendSms is called.

Deliver messages from sender to recipient

By combining [receive message](#) and [send message](#) examples we can implement basic way to deliver messages from sender to recipient via SMPP-server. Let's make a method for receiving inbound messages from an SMPP-client, searching suitable recipient among SMPP-clients connected and sending the message to it. For the sake of example, let us consider any SMPP-client having SystemID (login) equal to message "To" field as "suitable".

```
static void Main(string[] args)
{
    LogManager.SetLoggerFactory(new ConsoleLogFactory(LogLevel.Verbose));

    SmppServer _server = new SmppServer(new IPEndPoint(IPAddress.Any, 7777));

    _server.evClientBind += (s, c, p) => { }; //allow all to authenticate on the server
    _server.evClientSubmitSm += async (smppServer, smppServerClient, submitSm) => await
ForwardSms(smppServer, smppServerClient, submitSm);

    _server.Start();

    Console.ReadLine();
}

static async Task ForwardSms(object smppServer, SmppServerClient smppServerClient, SubmitSm submitSm)
{
    SmppServer _server = (SmppServer)smppServer;

    //prepare message
    string fromField = submitSm.SourceAddress.ToString();
    string toField = submitSm.DestinationAddress.ToString();
    string textField = submitSm.GetMessageText(smppServerClient.EncodingMapper);

    //search receipient
    SmppServerClient clientReceipient = _server.ConnectedClients.FirstOrDefault(c => c.SystemID == toField);

    //send
    if (clientReceipient != null)
    {
        IList<DeliverSm> textMessage =
SMS.ForDeliver().From(fromField).To(toField).Text(textField).Create(clientReceipient);
        var result = await clientReceipient.DeliverAsync(textMessage);
    }
}
```

There is an event handler created and named "ForwardSms". It is subscribed to [evClientSubmitSm](#) event, responsible for inbound messages. The event handler is getting the inbound message as a third argument (submitSm) and prepares it for sending further. In addition, it picks the suitable recipient out of the list of SMPP-clients connected ([ConnectedClients](#) property) and forwards message to it.

To test the setup, connect two SMPP-clients (sender and recipient) to this SMPP-server. Sender login is not important, but for recipient login use "client002". Now send a message from the first SMPP-client and put "client002" in the "Destination (To)" field. The message should arrive to client with login "client002". It will work even if you have only one SMPP-client connected but "To" field contains its login. Of course, the way of choosing the recipient is totally up to the developer.

Using a similar approach it is possible to implement the [SMPP Gateway](#) for forwarding messages via SMPP-client connected to another SMPP-server.

Implementing SMPP Gateway (with sample app)

When you resell SMPP traffic you need to implement SMPP Gateway or SMPP Proxy.

Please note the SMPP Gateway sample program is available at the [link](#).

Such application should start at least one [SmppServer](#) to be able to receive SMPP commands on a TCP port and several [SmppClient](#) instances to send message to other SMPP servers (SMSC, Provider).

When a customer sends [SubmitSm](#) command to your server, you need to send back a response [SubmitSmResp](#) with assigned [Messageld](#). Later, when you forward this message to another server, you will receive another [Messageld](#) from SMSC.

This SMSC [Messageld](#) should also be replaced in [DeliverSm](#) ([Receipt](#)) for the target client.

You might want to implement smart routing for incoming messages. F.i. when you are going to forward SMS message you can estimate which [SmppClient](#) connection accepts destination phone number and costs less.

When you need only forward [SubmitSm](#) messages I suggest following steps:

- Receive [SubmitSm](#) from the client.
- Save client's [Sequence](#) number to the database. Possible good idea to save entire PDU.
- Send [SubmitSmResp](#) to client with his [Sequence](#) number and [Messageld](#) generated on your server side.
- In another process/thread send this [SubmitSm](#) PDU to some SMPP provider.
- Change [SubmitSm Sequence](#) number to the next sequence number for the [SmppClient](#) that connected to that SMPP provider.
- Receive Provider's [Messageld](#) in [SubmitSmResp](#)
- Store Provider's [Messageld](#) and [Sequence](#) number to the same database table as for client's [Sequence](#) number.

These four values help later to find a corresponding client that should receive a delivery receipt from the provider:

- Client's sequence number
- Client's [Messageld](#)
- Provider's sequence number
- Provider's [Messageld](#)

When [DeliverSm](#) comes from the provider and contains "[DeliveryReceipt](#)", you should do the following steps:

- Get Provider's [Messageld](#) from delivery [Receipt](#).
- Find client's [Messageld](#) and corresponding SMPP user.
- Replace Provider's [Messageld](#) in [DeliverSm](#) PDU with client's [Messageld](#)
- Send "[DeliveryReceipt](#)" to the [SmppServerClient](#) that belongs to SMPP user.
- If there is no active connection with the client, place [DeliverSm](#) PDU to the outgoing persistent queue (another database table) and send it when the client connects.

Example of forwarding message from one client to another is on the page "[Message delivery from sender to recipient](#)"

Control SMPP responses

By default, the InetLab SMPP-server dispatches [SubmitSmResp](#) commands automatically one by one after each [evClientSubmitSm](#) event handled. You may want to override this flow in order to process, save or prepare responses in a more controllable way. For example, you may like saving data to SQL in bulk instead of single "per message" transactions. Also, you may like to control the moment when responses are sent to the client.

Automatic response sending can be prevented in an event handler by changing Response field to **null**:

```
void onSubmitSm(object sender, SmppServerClient client, SubmitSm submitSm)
{
    SubmitSmResp generatedResp = submitSm.Response;

    //preventing response automated return
    submitSm.Response = null;

    //custom routine for the response
    Task handleTask = HandleRequestAsync(submitSm);
}

private async Task HandleRequestAsync(SubmitSm submitSm)
{
    //Generating and sending response manually
    SmppServerClient client = submitSm.Client as SmppServerClient;
    var response = new SubmitSmResp(submitSm);
    await client.SendResponseAsync(response);
}
```

In the example above, we prevent auto-response by setting submitSm.Response field to **null**. Then we call a method and supply it with [SubmitSm](#) data. The method generates and submits a response to the client.

Troubleshooting

[Common Mistakes](#)

[Connection Lost](#)

[Throttling Error](#)

[Built-in Logging](#)

[Tuning](#)

[Diagnostic](#)

[Wireshark](#)

Common Mistakes

Incoming messages not received

Possible reasons why you don't receive incoming messages

- SMPP account doesn't have right to receive SMS messages.
- Wrong SMS routing configuration on SMPP server.
- SMPP client has been bound as Transmitter.
- SMPP client was not attached to `evDeliverSm` event handler.
- SMPP account is used in two or more applications. SMSC sends messages to application where `DeliverSm` is not expected.

Wrong message text encoding

Please clarify with SMPP provider which encoding (character set) is expected for [DataCodings](#) value.

Read more about encoding on page "[Mapping DataCodings to .NET Encoding](#)".

Message concatenation does not work

Please ask your SMPP provider which type of concatenation is supported.

Read more about concatenation on page "[Concatenation](#)".

Library version was changed

If you observe plenty of syntax errors or command syntax changes, probably you are using outdated library version. Otherwise you might have library updated but using older version codebase.

Read more on page "[Migration from v1.x to 2.x](#)".

Lost of Connection

General Case

Lost of connection can be caused by :

- Router crash/reboot. Any of the routers along the route from one side to the other may crash or be rebooted; this causes a loss of connection if data is being sent at that time. If no data is being sent at that exact time, then the connection is not lost.
- Network cable is unplugged. Any network cables unplugged along the route from one side to the other will cause a loss of connection without any notification.

Lost of connection in Inetlab.SMPP library is detected within [ENQUIRE_LINK request](#) or when any other SMPP PDU is being sent. It can happen that a client detects disconnection earlier than a server. If the server is configured to allow only one connection for an SMPP account it may reject the subsequent bind requests by responding with BIND_RESP and status ESME_RALYBND. Once the server detects connection staled, it accepts the bind request again.

If you face such situation in your application you need to reconnect to the SMPP provider in 1-5 Minutes. Inetlab.SMPP library also provides [connection recovery feature](#) for SmppClient.

Also please be aware of SmppServer [timeout settings](#).

SMPPCLIENT_NOCONN Status

The SmppResponse with status [SMPPCLIENT_NOCONN](#) comes after an unsuccessful attempt to send SMPP-command. Basically, it means there is no connection to the server. This may happen for the number of reasons (for example, if TLS versions do not match) and at various stages (before/after Connect, before/after Bind, during sending). If this is happening constantly and often, you should try to find what causes it in the first instance.

To continue normal operation, you should reestablish connection with the server and resend all SubmitSm with a new sequence number. The sequence number can be generated automatically when you set **submitSm.Header.Sequence = 0** or you can generate it manually with the code:

```
submitSm.Header.Sequence = _client.SequenceGenerator.NextSequenceNumber();
```


Throttling error

SMSC can limit number of submitted PDU for SMPP account. When allowed message limit is exceeded, server returns status [ESME_RTHROTTLED](#).

To avoid throttling error you can specify a number of messages per second in [SmppClient](#). For this purpose you can define [SendSpeedLimit](#) property.

```
//Send 10 messages per second
_client.SendSpeedLimit = 10;

//Send 1 message every 5 seconds
_client.SendSpeedLimit = 1f / 5f;

//Send 100 message every 1 minute
_client.SendSpeedLimit = new LimitRate(100, TimeSpan.FromMinutes(1));

//Disable send speed limit
_client.SendSpeedLimit = LimitRate.NoLimit;
```

Please note that speed limit works properly only on release version without attached debugger.

Built-in Logging

Logging is a universal approach to detecting problems and debugging your software.

Inetlab.SMPP library provides build-in logging functionality based on [ILog](#) and [ILogFactory](#) interfaces. You can implement this interface with any kind of logging framework for your solution.

For example:

- [NLog](#)
- [Log4Net](#)

The library provides [ConsoleLogFactory](#) and [FileLogFactory](#) classes.

When the application starts you need to register global [ILogFactory](#) for the library.

```
LogManager.SetLoggerFactory(new ConsoleLogFactory(LogLevel.Info));
```

or you can set [Logger](#) property when you create instances of [SmppClient](#), [SmppServerClient](#) or [SmppServer](#)

```
LogManager.SetLoggerFactory(new ConsoleLogFactory(LogLevel.Info));
```

The library writes received and sent packet bytes in the log when you enable Verbose log level. It can help us to analyze SMPP packets transferred between client and server.

Implementation example for [ILog](#) and [ILogFactory](#) interfaces:

```
public class ConsoleLogFactory : ILogFactory
{
    private LogLevel _minLevel;

    public ConsoleLogFactory( LogLevel minLevel)
    {
        _minLevel = minLevel;
    }

    public ILog GetLogger(string loggerName)
    {
        return new ConsoleLogger(loggerName, _minLevel);
    }
}

public class ConsoleLogger : ILog
{
    private readonly LogLevel _minLevel;

    public string Name { get; private set; }

    public ConsoleLogger(string loggerName, LogLevel minLevel)
    {
        Name = loggerName;
        _minLevel = minLevel;
    }

    public bool IsEnabled(LogLevel level)
    {
        return level >= _minLevel;
    }

    public void Write(LogLevel level, string message, Exception ex, params object[] args)
    {
        if (level < _minLevel) return;
    }
}
```

```

        int threadId = Environment.CurrentManagedThreadId;

        string text = message;

        StringBuilder sb = new StringBuilder();
        sb.AppendFormat("{0:dd.MM.yyyy HH:mm:ss}:{1}:{2,3}: ({3}) ", DateTime.Now, GetLevelString(level),
threadId, Name);
        sb.AppendFormat(message, args);
        if (ex != null)
        {
            sb.Append(" Exception: ");
            sb.Append(ex.ToString());
        }

        Console.WriteLine(sb.ToString());
    }

    private string GetLevelString(LogLevel level)
    {
        switch (level)
        {
            case LogLevel.Fatal:
                return "FATAL";

            case LogLevel.Error:
                return "ERROR";

            case LogLevel.Warning:
                return "WARN ";

            case LogLevel.Info:
                return "INFO ";

            case LogLevel.Debug:
                return "DEBUG";

            case LogLevel.Verbose:
                return "TRACE";

        }

        return "";
    }
}

```

Read more about Logging at page ["Creating global and local logger"](#).

Diagnostic

Metrics

To monitor [SmppClient](#) or [SmppServerClient](#) performance you can use [Metrics](#) property. It contains many useful values calculated automatically.

The [ISmppClientMetrics](#) type of the [Metrics](#) property has the following structure:

- Sent - Gets the metrics for messages sent.
 - InQueue - Number of messages stored in the queue (awaiting to be sent).
 - Total - Total number of messages sent.
 - Requests
 - Total - Total number of requests sent.
 - PerSecond - Transferring speed for the last second. Messages per second.
 - AvgPerSecond - Average speed since last Reset. Messages per second.
 - WaitingForResponse - Gets number of request PDUs that didn't receive a response with the same sequence number.
 - Responses
 - Total - Total number of responses sent.
 - PerSecond - Transferring speed for the last second. Messages per second.
 - AvgPerSecond - Average speed since last Reset. Messages per second.
- Received - Gets the metrics for messages received.
 - InQueue - Number of messages stored in the queue (received but not processed in the worker threads).
 - Total - Total number of messages received.
 - Requests
 - Total - Total number of requests received.
 - PerSecond - Transferring speed for the last second. Messages per second.
 - AvgPerSecond - Average speed since last Reset. Messages per second.
 - WaitingForResponse - Number of received requests that didn't processed by the application.
 - Responses
 - Total - Total number of responses received.
 - PerSecond - Transferring speed for the last second. Messages per second.
 - AvgPerSecond - Average speed since last Reset. Messages per second.

All properties in the metrics objects are constantly changed during message transferring. If you want to fix the metric's value for further analysis, you can use the method `Snapshot()`.

```
var clientMetrics = _client.Metrics.Snapshot();
```

This method copies all current values to new metrics object where the values won't change anymore. The same `Snapshot` method is also available for child properties, for example:

```
var requestMetrics = clientMetrics.Sent.Requests.Snapshot();
```

or

```
var responseMetrics = clientMetrics.Received.Responses.Snapshot();
```

You can also use `Reset()` method for the cases when you need to analyze some part of the process and begin to watch values from zero. The `Reset()` method is also available for each child metric object.

```
// start sent requests metrics from zero
_client.Metrics.Sent.Requests.Reset();

//send a batch of messages
var responses = await _client.SubmitAsync(batch);

//take snapshot of metrics values
var sentRequests = _client.Metrics.Sent.Requests.Snapshot();

// display metrics values as string
string performance = sentRequests.ToString();
```

Special events

You can use special events in base class [SmppClientBase](#) for tracking PDUs:

- with the event [evPduReceiving](#) you can monitor all incoming PDUs.
- event [evPduSending](#) is invoked before sending the PDU to network.

Tuning

Threading

Library creates for each connected client 3 worker threads that handle received request PDUs and call corresponding event handlers, f.i. `evSubmitSm`, `evDeliverSm`.

You can increase the number of worker threads for each client.

```
var scheduler = _client.ReceiveTaskScheduler as WorkersTaskScheduler;
if (scheduler != null)
    scheduler.WorkerCount = 10;
```

When your application establishes a lot of SMPP sessions, you may want to create a global task scheduler and set required number of worker threads for the process.

```
var scheduler = new WorkersTaskScheduler(100);
```

You need then assign this scheduler to the client. It is your responsibility to dispose the scheduler instance.

Before `SmppClient` connects to remote host.

```
client.ReceiveTaskScheduler = scheduler;
```

For the `SmppServer` when client connects.

```
public void server_evClientConnected(object sender, SmppServerClient client)
{
    client.ReceiveTaskScheduler = _scheduler;
}
```

`TaskScheduler.Default` can be used as well. In this case all event handlers for received requests will be scheduled to `ThreadPool`.

```
_client.ReceiveTaskScheduler = TaskScheduler.Default;
```

Networking

To reduce number of calls to network adapter and increase transferring speed, you can change receive or send buffer size for the TCP socket:

```
_client.ReceiveBufferSize = 32 * 1024 * 1024;
_client.SendBufferSize = 32 * 1024 * 1024;
```

A larger buffer size might delay the recognition of connection difficulties. Consider increasing the buffer size if you are using a high bandwidth, high latency connection (such as a satellite broadband provider).

Memory

Memory consumption for a client can be reduced if you limit the number of requests received from the client but not processed by the application.

```
_client.ReceivedRequestQueueLimit = 1000;
```

If a client sends PDUs too fast, the library stops reading from network until a free slot is available in the receive queue. This is

commonly referred to as "flow control" or "back pressure". This also affects the responses sent by the client. They won't be read from network because of reading delay.

The number of request waiting for response from remote side can be also limited with the code

```
_client.SendQueueLimit = 1000;
```

The incomplete request objects consume memory of the running process. This property helps to reduce memory consumption and prevent unsuccessful responses. When remote side cannot process messages fast enough, number of sent messages may exceed queue limit (ESME_RMSGQFUL). When this property is defined the sending to network will be delayed until the queue has a free slot (remote side has sent a response).

Wireshark

The best way to analyze SMPP Protocol is to capture network traffic with [Wireshark](#) tool.

SMPP related Wiki article is [here](#).

FAQ

[SMPP Client](#)

[Sending Commands and Getting Responses](#)

[Concatenation](#)

[SMPP Connection Mode](#)

[Deivery Receipt](#)

[EnquireLink](#)

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[Performance \(with sample app\)](#)

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[SSL/TLS Connection](#)

[SubmitMulti. Send message to multiple destinations](#)

[MMS notifications](#)

[WAP Push](#)

[Implementing USSD \(Unstructured Supplementary Service Data\)](#)

SMPP Client FAQ

Can library split text into multiple concatenated SMS-parts?

Text will be split automatically when you use SMS builders. Following example covers most of usage scenarios

```
public static async Task SendLongText(SmppClient client)
{
    string longText = new string('A', 300);

    var resp = await client.SubmitAsync(
        SMS.ForSubmit()
            .From("short_code")
            .To("436641234567")
            .Coding(DataCodings.UCS2)
            .Text(longText)
    );
}
```

How can I send Flash SMS?

In order to send Flash SMS you need to specify one of the following data coding in the [SubmitSm](#) class: [UnicodeFlashSMS](#), [DefaultFlashSMS](#)

How can I set sequence number before sending PDU

[SMS](#) Builder has [Create](#) method that returns [SubmitSm](#) list with sequence numbers set to 0.

You can assign the next number from the [SequenceGenerator](#) and pass this PDU list to [Submit\(SubmitSm\[\]\)](#) method.

```
IList<SubmitSm> pduList = SMS.ForSubmit()
    .From("5555")
    .To("436641234567")
    .Text("test text")
    .Create(client);

foreach (SubmitSm pdu in pduList)
{
    pdu.Header.Sequence = client.SequenceGenerator.NextSequenceNumber();
}

var resp = await client.SubmitAsync(pduList);
```

Example: Read messages from a database and send them as fast as possible

```

public class SMSMessage
{
    public string PhoneNumber { get; set; }
    public string Text { get; set; }
}

public static async Task SendMessageBatchAsFastAsPossible(SmppClient client)
{
    var messageList = GetNext100UnsentMessages();

    List<SubmitSm> pduList = new List<SubmitSm>();
    foreach (var message in messageList)
    {
        var pduBuilder = SMS.ForSubmit()
            .From("5555")
            .To(message.PhoneNumber)
            .Text(message.Text);

        pduList.AddRange(pduBuilder.Create(client));
    }

    SubmitSmResp[] resp = await client.SubmitAsync(pduList.ToArray());
}

private static IEnumerable<SMSMessage> GetNext100UnsentMessages()
{
    for (int i = 0; i < 100; i++)
    {
        yield return new SMSMessage
        {
            PhoneNumber = (436641234567+i).ToString(),
            Text = $"Test {i}"
        };
    }
}

```

How to create SubmitMulti PDUs for multiply recipients

```

var pduBuilder = SMS.ForSubmitMulti()
    .ServiceType("test")
    .Text("Test Test")
    .From("MyService");

foreach (string phoneNumber in phoneNumbers)
{
    pduBuilder.To(phoneNumber);
}

```

Sending Commands and Getting Responses

SMPP is based on the exchange of request and response protocol data units (PDUs) between the SMPP-client (ESME) and the SMPP-server (SMSC) over an underlying TCP/IP network connection.

The SMPP protocol defines:

- a set of operations and associated Protocol Data Units (PDUs) for the exchange of short messages between an SMPP-client and an SMPP-server
- the data that an SMPP-client application can exchange with an SMPP-server during SMPP operations

Sending Commands

The SMPP-client is ready to exchange commands with SMPP-server right after establishing connection and successful bind (authentication).

All commands and responses are transmitted as PDUs. The command name is specified in the PDU header.

For example, the command `SubmitSm` serves for sending messages from SMPP-client to an SMPP-server and `DeliverSm` command serves for sending messages from SMPP-server to SMPP-client. There are commands for authentication, binary data transmission and many more described in the SMPP protocol specification.

When you call a method, the `Inetlab.SMPP` library automatically forms PDUs with respective SMPP-commands and other data inside. If needed, developers can form any PDU manually.

Getting Responses

Command responses contain important information. By analyzing responses you can figure out if SMPP-server accepted the message for delivery, is there a connection active, was authentication successful and other.

Please note: Every SMPP operation must consist of a request PDU and associated response PDU. The receiving entity must return the associated SMPP response to an SMPP PDU request.

Concatenation

The GSM standard defines a maximum of 140 octets for a single short message and thus does not support the transmission of more than these 140 octets per message. Therefore, a receiving SMSC will usually not accept a submit operation which will result in a short message of >140 octets, unless it has implemented an automatic concatenation mechanism, which divides a long message in multiple parts of 140 octets.

Various SMPP providers support various concatenation ways. Inetlab.SMPP library supports 3 ways:

1) message text in the field **short_message** and concatenation parameters in **user data header**

SMS Builder class uses this type of concatenation by default. Example how to submit SubmitSm PDUs:

```
public async Task SendConcatenatedMessageInUDH(TextMessage message)
{
    var builder = SMS.ForSubmit()
        .From(_config.ShortCode, AddressTON.NetworkSpecific, AddressNPI.Unknown)
        .To(message.PhoneNumber)
        .Text(message.Text);

    var resp = await _client.SubmitAsync(builder);
}
```

Example how to get concatenation parameters from PDU user data header:

```
public Concatenation GetConcatenationFromUDH(SubmitSm data)
{
    ConcatenatedShortMessages8bit udh8 = data.UserData.Headers.Of<ConcatenatedShortMessages8bit>
().FirstOrDefault();

    if (udh8 == null) return null;

    return new Concatenation(udh8.ReferenceNumber, udh8.Total, udh8.SequenceNumber);
}
```

Example how you can manually create SubmitSm instance, that contains only one message part with concatenation parameters in the user data header:

```
public SubmitSm CreateSubmitSmWithConcatenationInUDH(ushort referenceNumber, byte totalParts, byte
partNumber, string textSegment)
{
    SubmitSm sm = new SubmitSm();
    sm.SourceAddress = new SmeAddress("1111");
    sm.DestinationAddress = new SmeAddress("79171234567");
    sm.DataCoding = DataCodings.Default;
    sm.RegisteredDelivery = 1;
    sm.UserData.ShortMessage = _client.EncodingMapper.GetMessageBytes(textSegment, sm.DataCoding);

    sm.UserData.Headers.Add(new ConcatenatedShortMessage16bit(referenceNumber, totalParts, partNumber));

    return sm;
}
```

2) message text in the field **short_message** and concatenation parameters in **SAR TLV parameters** (sar_msg_ref_num, sar_total_segments, sar_segment_seqnum, more_messages_to_send)

Example how to create SubmitSm instances with SMS Builder:

```

var builder = SMS.ForSubmit()
    .From(_config.ShortCode, AddressTON.NetworkSpecific, AddressNPI.Unknown)
    .To(message.PhoneNumber)
    .Text(message.Text);

builder.Concatenation(ConcatenationType.SAR);

var resp = await _client.SubmitAsync(builder);

```

Example how to get concatenation parameters from TLV Parameters:

```

public Concatenation GetConcatenationFromTLVOptions(SubmitSm data)
{
    ushort refNumber = 0;
    byte total = 0;
    byte seqNum = 0;

    var referenceNumber = data.Parameters.Of<SARReferenceNumberParamter>().FirstOrDefault();
    if (referenceNumber != null)
    {
        refNumber = referenceNumber.ReferenceNumber;
    }
    var totalSegments = data.Parameters.Of<SARTotalSegmentsParameter>().FirstOrDefault();
    if (totalSegments != null)
    {
        total = totalSegments.TotalSegments;
    }
    var sequenceNumber = data.Parameters.Of<SARSequenceNumberParameter>().FirstOrDefault();
    if (sequenceNumber != null)
    {
        seqNum = sequenceNumber.SequenceNumber;
    }

    return new Concatenation(refNumber, total, seqNum);
}

```

3) message text in the TLV parameter **message_payload** and concatenation parameters in **SAR TLV parameters**

Example how to create SubmitSm instances with SMS Builder:

```

var builder = SMS.ForSubmit()
    .From(_config.ShortCode, AddressTON.NetworkSpecific, AddressNPI.Unknown)
    .To(message.PhoneNumber)
    .Text(message.Text);

builder.MessageInPayload();

var resp = await _client.SubmitAsync(builder);

```

SMPP Connection Mode

The SMPP connection mode is to be specified by an SMPP-client when attempting to authenticate at SMPP-server i.e. when performing bind. It defines basic data exchange rule between client and server.

There are 3 SMPP connection modes available:

- Transmitter - allows only to send SMPP commands to the SMSC and receive corresponding SMPP responses from the SMSC.
- Receiver - allows only to receive SMPP commands from SMSC and send corresponding SMPP responses.
- Transceiver - allows to send and receive SMPP commands in SMSC.

Example of specifying the [connection type](#) by SMPP-client.

Delivery Receipt

Receipt format

Often you want to get delivery status for an SMS message. SMPP protocol provides the ability to request a delivery receipt in PDU submitted. There are two ways how you can do it with the InetLab.SMPP library.

```
submitSm.RegisteredDelivery = 1;  
// or  
submitSm.SMSCReceipt = SMSCDeliveryReceipt.SuccessOrFailure;
```

or

```
var resp = await client.SubmitAsync(  
    SMS.ForSubmit()  
        .From("short_code")  
        .To("436641234567")  
        .DeliveryReceipt()  
        .Text("test text")  
);
```

As a result the SMPP-server will deliver the receipt to the client application. On the client side it can be received using [evDeliverSm](#) event. Delivery receipt format is SMSC vendor specific, but typical format is

id:IIIIIIII sub:SSS dlvr:DDD submit date:YYMMDDhhmm done date:YYMMDDhhmm stat:DDDDDDD err:E Text:
...

This text format is represented in the library as [Receipt](#) class.

It has the following properties:

MessageId - The message ID allocated to the message by the SMSC when originally submitted. You can get it from [SubmitSmResp](#) or [SubmitMultiResp](#).

Submitted - Number of short messages originally submitted. This is only relevant when the original message was submitted to a distribution list within [SubmitMulti](#).

Delivered - Number of short messages delivered to a distribution list with [SubmitMulti](#).

SubmitDate - The time and date at which the short message was submitted.

DoneDate - The time and date at which the short message reached its final state.

ErrorCode - Network specific error code or an SMSC error code for the attempted delivery of the message.

Text - The first 20 characters of the short message.

State - The final status of the message. The value could be one of the following:

STATE	DESCRIPTION
Delivered	Message is delivered to the destination
Expired	Message validity period has expired
Deleted	Message has been deleted

STATE	DESCRIPTION
Undeliverable	Message is undeliverable
Accepted	Message is in accepted state (i.e. has been manually read on behalf of the subscriber by customer service)
Unknown	Message is in invalid state
Rejected	Message is in a rejected state

Note

Library sends [DeliverSmResp](#) with status [ESME_RX_T_APPN](#) to SMPP server when [evDeliverSm](#) event handler method throws an exception.

How to tie submitted message with delivery receipt

SMS message in SMPP protocol is actually represented as one or many PDUs. When text is longer than 140 octets library sends text as concatenated SMS parts (PDU). One part can be represented as [SubmitSm](#) class or [SubmitMulti](#) class.

Before sending [SubmitSm](#) or [SubmitMulti](#) PDU you need to assign [Sequence](#) number to it.

```
public async Task SendMessage(TextMessage message)
{
    IList<SubmitSm> list = SMS.ForSubmit()
        .From(_config.ShortCode)
        .To(message.PhoneNumber)
        .Text(message.Text)
        .DeliveryReceipt()
        .Create(_client);

    foreach (SubmitSm sm in list)
    {
        sm.Header.Sequence = _client.SequenceGenerator.NextSequenceNumber();
        _clientMessageStore.SaveSequence(message.Id, sm.Header.Sequence);
    }

    var responses = await _client.SubmitAsync(list);

    foreach (SubmitSmResp resp in responses)
    {
        _clientMessageStore.SaveMessageId(message.Id, resp.MessageId);
    }
}
```

At the same time you need to store [Sequence](#) in the database. For one *message.Id* you need to store several [Sequence](#).

In response to [SubmitSm](#) PDU your application receives [SubmitSmResp](#) PDU. This response has the same [Sequence](#) number and [MessageId](#) generated by the server.

When you receive a delivery receipt in the event [evDeliverSm](#), the server sends same [MessageId](#) which you can use for updating status of the submitted SMS text.

```
private void ClientOnEvDeliverSm(object sender, DeliverSm data)
{
    if (data.MessageType == MessageTypes.SMSCDeliveryReceipt)
    {
        _clientMessageStore.UpdateMessageStatus(data.Receipt.MessageId, data.Receipt.State);
    }
}
```

SMS Text considered as delivered when all sms parts are in [Delivered](#) state.

For this purpose you can create 2 tables in the database.

1) **outgoing_messages** for all outgoing SMS messages

NAME	DESCRIPTION
<i>messageId</i>	id of the message
<i>messageText</i>	long message text

2) **outgoing_message_parts** for all PDUs generated for each message

NAME	DESCRIPTION
<i>messageId</i>	reference to messageId field in the <i>outgoing_messages</i>
<i>sessionId</i>	any unique id generated when SmppClient connects to the server. sequenceNumber is unique only in one SMPP session.
<i>sequenceNumber</i>	number generated before sending PDU
<i>serverMessageId</i>	message id received from the server.
<i>status</i>	status received in the delivery receipt

Reade more on page ["Track message sending and delivery"](#)

Enquire Link

[EnquireLink](#) is SMPP command allowing to check communication between ESME and SMSC.

The command can be sent by both client and server.

The EnquireLink mechanism assumes sending special SMPP-request by one of the peers obtaining the proper response. When proper response is received with [ESME_ROK](#) status, the connection is considered active. Otherwise, if there is wrong response or no response at all - the connection is to be closed.

To enable periodical connecton check, you need to set the following property:

```
client.EnquireLinkInterval = TimeSpan.FromSeconds(30);
```

[EnquireLinkInterval](#) specifies the time to wait after the last PDU exchange before sending the command. [EnquireLink](#) request won't be sent when client and server are sending PDUs.

Read more on page [Keeping connection active \(InactivityTimeout and EnquireLink\)](#)

How to install the license file

After purchase of developer license you should receive Inetlab.SMPP.license file per E-Mail. Also, you can always generate a license file with your [InetLab Account](#). It allows for Source Code license owners to add and update [NuGet package](#) in their projects.

From Embedded Resources

Add this file into the root of a project where you have a reference on Inetlab.SMPP.dll. Change "Build Action" of the file to "Embedded Resource".

Set license before using Inetlab.SMPP classes in your code:

```
Inetlab.SMPP.LicenseManager.SetLicense(this.GetType().Assembly.GetManifestResourceStream(this.GetType(),
    "Inetlab.SMPP.license"));
```

From string variable

Open your license file with any text editor and copy and paste the content into the string variable in your code. Set license before using Inetlab.SMPP classes in your code:

```
        string licenseContent = @"
-----BEGIN INETLAB LICENSE-----
EBAXG23F04BR23LJMNAGCZLMFZQXG23F
GY4DEMJTG43DGBMAQFD4DPHQ2UEANACB
BY5I4D6XBCAACRUJXKZKI7K2N76CTXSC
NDJP2CIM4KHV5V7VCXT75R4XRDSLZZQS
2NKD6JHCIG4PNPUN5A7G4KRZQSZSNL44
NB2LTYP5FATRVKCHD26FC64E2TSQFX5
Q6GWNF3HVVQIE2YK0074C4FVR6HDUGD6
FY04DHCPCPQ2GY3WQRM0FOX0ZQ=====
-----END INETLAB LICENSE-----";

        Inetlab.SMPP.LicenseManager.SetLicense(licenseContent);
```

Creating a global and local logger

You can turn on global logging to analyze operations performed by the InetLab.SMPP library.

```
LogManager.SetLoggerFactory(new ConsoleLogFactory(LogLevel.Debug));
```

It creates the global (available to other instances) logger and specifies logging mode at the **Debug** level. After that operation, all logging records associated with logging level **Debug** and less, will be echoed into the console.

Logging depth is defined by the following [LogLevel](#) values (by decreasing of outputted information amount):

- LogLevel.All
- LogLevel.Verbose
- LogLevel.Debug
- LogLevel.Info
- LogLevel.Warning
- LogLevel.Error
- LogLevel.Fatal
- LogLevel.Off

You can get a logger instance from any method and output your own records into it as well:

```
ILog log = LogManager.GetLogger("MyLogger");  
log.Info("Connected to SMPP server");
```

As a result, it will output "Connected to SMPP server" into the log/console and mark it as LogLevel.[Info](#).

To log a single instance you need to create logger and specify it as an instance parameter. For example, you can specify an individual (local) logger for [SmppClient](#) instance:

```
ConsoleLogger _log = new ConsoleLogger("MyClientLogger", LogLevel.Info);  
SmppClient smppClient = new SmppClient();  
smppClient.Logger = _log;
```

This makes logger _log to output data from the related instance only.

Read more about logging on "[Common Tools: Built-in Logging](#)" page.

Mapping DataCodings to .NET Encoding

For each [SmppClient](#) instance, you can define which [Encoding](#) will be used for specified [DataCodings](#).

```
//Set GSM Packed Encoding for data_coding Latin1 (0x3)
client.EncodingMapper.MapEncoding(DataCodings.Latin1, new Inetlab.SMPP.Encodings.GSMPackedEncoding());
```

By default [SmppClient](#) has the following [DataCodings](#) to [Encoding](#) mappings:

```
mapper.MapEncoding(DataCodings.Default, new Inetlab.SMPP.Encodings.GSMEncoding());

mapper.MapEncoding(DataCodings.Class0FlashMessage, new Inetlab.SMPP.Encodings.GSMEncoding());
mapper.MapEncoding(DataCodings.Class1MESSAGE, new Inetlab.SMPP.Encodings.GSMEncoding());
mapper.MapEncoding(DataCodings.Class2SIMMessage, new Inetlab.SMPP.Encodings.GSMEncoding());
mapper.MapEncoding(DataCodings.Class3TEMessage, new Inetlab.SMPP.Encodings.GSMEncoding());

mapper.MapEncoding(DataCodings.Class0, new Inetlab.SMPP.Encodings.GSMEncoding());
mapper.MapEncoding(DataCodings.Class1, new Inetlab.SMPP.Encodings.GSMEncoding());
mapper.MapEncoding(DataCodings.Class2, new Inetlab.SMPP.Encodings.GSMEncoding());
mapper.MapEncoding(DataCodings.Class3, new Inetlab.SMPP.Encodings.GSMEncoding());

mapper.MapEncoding(DataCodings.UCS2, Encoding.BigEndianUnicode);
mapper.MapEncoding(DataCodings.Class1MESSAGEUCS2, Encoding.BigEndianUnicode);
mapper.MapEncoding(DataCodings.Class2SIMMessageUCS2, Encoding.BigEndianUnicode);
mapper.MapEncoding(DataCodings.Class3TEMessageUCS2, Encoding.BigEndianUnicode);
mapper.MapEncoding(DataCodings.UnicodeFlashSMS, Encoding.BigEndianUnicode);
```

Note

Before changing mapping settings, please clarify with your SMPP provider the encoding expected (character set for [DataCodings](#) value).

National Language tables

These tables allow to use different character sets in SMS messages. You can choose a language by adding User Data Header. There is an ability to replace standard GSM 7 bit default alphabet table for the whole text (*Locking shift table*) or only extension table (*Single shift table*).

Code bellow shows abilities how you can specify desired character set:

```
await client.SubmitAsync(SMS.ForSubmit()
    .Text(text).From("5555").To(phone)
    .NationalLanguageLockingShift(NationalLanguage.Spanish)
);
```

or

```
submitSm.UserData.Headers.Add(new NationalLanguageLockingShift(NationalLanguage.Spanish));
```

The library is also able to detect national language User Data Header in the received PDU and to show text with the correct character set in property [MessageText](#).

Links

- [GSM 03.38](#)
- [National language shift tables](#)
- [Data Coding Scheme](#)

Message Composer: How to combine concatenated messages

SMS message with long text must be split into small parts (segments). In GSM Standard maximal length of the one short message is 140 bytes.

Inetlab.SMPP library provides an ability to combine all parts back into full message text. This can be done with [MessageComposer](#) class.

[MessageComposer](#) supports all types of PDUs: [SubmitSm](#), [SubmitMulti](#), [DeliverSm](#).

You should invoke [AddMessage<TSmppMessage>\(TSmppMessage\)](#) method in each event handler for PDU received.

[MessageComposer](#) saves PDU in memory and waits for the last segment of the message text and raises [evFullMessageReceived](#) event.

When PDU has no concatenation parameters this event will be raised right after calling [AddMessage<TSmppMessage>\(TSmppMessage\)](#) method.

When [MessageComposer](#) didn't receive last segment for a long time it raises [evFullMessageTimeout](#) event. Default timeout is 60 seconds.

```
private readonly SmppClient _client = new SmppClient();
private readonly MessageComposer _composer = new MessageComposer();

public MessageComposerSample()
{
    _client.evDeliverSm += client_evDeliverSm;

    _composer.evFullMessageReceived += OnFullMessageReceived;
    _composer.evFullMessageTimeout += OnFullMessageTimedout;
}

private void client_evDeliverSm(object sender, DeliverSm data)
{
    _composer.AddMessage(data);
}

private void OnFullMessageTimedout(object sender, MessageEventArgs args)
{
    DeliverSm pdu = args.GetFirst<DeliverSm>();
    _log.Info(string.Format("Incomplete message received from {0}", pdu.SourceAddress));
}

private void OnFullMessageReceived(object sender, MessageEventArgs args)
{
    DeliverSm pdu = args.GetFirst<DeliverSm>();
    _log.Info(string.Format("Full message received from {0}: {1}", pdu.SourceAddress, args.Text));
}
```

[MessageComposer](#) also provides methods for detecting last segment and getting full message:

```
private void client_evDeliverSmInline(object sender, DeliverSm data)
{
    _composer.AddMessage(data);
    if (_composer.IsLastSegment(data))
    {
        string receivedText = _composer.GetFullMessage(data);
    }
}
```


Performance (with sample app)

Production

The speed ultimately is determined by:

- how fast you can prepare the messages
- network bandwidth
- performance on the remote side (SMPP Server)
- how fast you can process responses

With well tuned system you can reach approximately 500 messages per second.

Local Test

Inetlab.SMPP performance check on the local machine with logging disabled shows the following result:

```
Performance: 20356 m/s
```

Following code demonstrates this:

```
using System;
using System.Collections.Generic;
using System.Diagnostics;
using System.Net;
using System.Threading.Tasks;
using Inetlab.SMPP;
using Inetlab.SMPP.Common;
using Inetlab.SMPP.Logging;

namespace TestLocalPerformance
{
    class Program
    {
        static void Main(string[] args)
        {
            LogManager.SetLoggerFactory(new ConsoleLogFactory(LogLevel.Info));

            StartApp().ConfigureAwait(false);

            Console.ReadLine();
        }

        public static async Task StartApp()
        {
            using (SmppServer server = new SmppServer(new IPEndPoint(IPAddress.Any, 7777)))
            {
                server.evClientBind += (sender, client, data) => { /*accept all*/ };
                server.evClientSubmitSm += (sender, client, data) => { /*receive all*/ };
                server.Start();

                using (SmppClient client = new SmppClient())
                {
                    await client.ConnectAsync("localhost", 7777);

                    await client.BindAsync("username", "password");

                    Console.WriteLine("Performance: " + await RunTest(client, 50000) + " m/s");
                }
            }
        }
    }
}
```

```

    }
}

public static async Task<int> RunTest(SmppClient client, int messagesNumber)
{
    List<Task> tasks = new List<Task>();

    Stopwatch watch = Stopwatch.StartNew();

    for (int i = 0; i < messagesNumber; i++)
    {
        tasks.Add(client.SubmitAsync(
            SMS.ForSubmit()
                .From("111")
                .To("222")
                .Coding(DataCodings.UCS2)
                .Text("test")));
    }

    await Task.WhenAll(tasks);

    watch.Stop();

    return Convert.ToInt32(messagesNumber / watch.Elapsed.TotalSeconds);
}
}
}

```

The performance test must be started always without attached debugger and application should be built with Release configuration.

SMPP Server FAQ (with sample app)

How to send message to the connected client

In following code target client is selected and [DeliverSm](#) message is sent to this client.

```
public async Task DeliverToClient(TextMessage message)
{
    string systemId = GetSystemIdByServiceAddress(message.ServiceAddress);

    SmppServerClient client = FindClient(systemId);

    await client.DeliverAsync(SMS.ForDeliver()
        .From(message.PhoneNumber)
        .To(message.ServiceAddress)
        .Text(message.Text)
    );
}
```

How to send messages out from the server on client bind

```

private void OnClientBind(object sender, SmppServerClient client, Bind pdu)
{
    if (client.BindingMode == ConnectionMode.Transceiver || client.BindingMode == ConnectionMode.Receiver)
    {
        //Start messages delivery

        Task messagesTask = DeliverMessagesAsync(client, pdu);

    }
}

private async Task DeliverMessagesAsync(SmppServerClient client, Bind pdu)
{
    var messages = _messageStore.GetMessagesForClient(pdu.SystemId, pdu.SystemType);

    foreach (TextMessage message in messages)
    {
        var pduBuilder = SMS.ForDeliver()
            .From(message.PhoneNumber)
            .To(message.ServiceAddress)
            .Text(message.Text);

        var responses = await client.DeliverAsync(pduBuilder);

        _messageStore.UpdateMessageState(message.Id, responses);
    }
}

public interface IServerMessageStore
{
    IEnumerable<TextMessage> GetMessagesForClient(string systemId, string systemType);
    void UpdateMessageState(string messageId, DeliverSmResp[] responses);
}

public class TextMessage
{
    public string Id { get; set; }
    public string PhoneNumber { get; set; }
    public string Text { get; set; }

    public string ServiceAddress { get; set; }
}

```

How to set MessageId

MessageId must be set on the server side. When the server receives [SubmitSm](#) or [SubmitMulti](#) PDU, it generates a corresponding response and sets MessageId.

You can change the MessageId property in [evClientSubmitSm](#) and [evClientSubmitMulti](#) event handlers.

```

private void ServerOnClientSubmitSm(object sender, SmppServerClient client, SubmitSm data)
{
    data.Response.MessageId = Guid.NewGuid().ToString().Substring(0, 8);
}

```

Sample program [link](#) for the SMPP Server

Read more about [creating SMPP-server and Connect \(with sample app\)](#).

SMPP Address

SMPP Address (SME Address) is comprised of 3 parameters: **Address**, **TON**, **NPI**.

Address is a text field that represents originator and/or recipient of the message.

TON defines Type of Number

NAME	VALUE
Unknown	0
International	1
National	2
Network Specific	3
Subscriber Number	4
Alphanumeric	5
Abbreviated	6

NPI defines Numeric Plan Indicator

NAME	VALUE
Unknown	0
ISDN (E163/E164)	1
Data (X.121)	3
Telex (F.69)	4
Land Mobile (E.212)	6
National	8
Private	9
ERMES	10
Internet (IP)	14
WAP Client Id	18

Most used SME address examples

Mobile phone number:

address: +79171234567, TON: 1, NPI: 1

The phone number must be provided in the format `<country code><area code><subscriber number>`

Short number:

address: 55555, TON: 3, NPI: 0

Alphanumeric string:

address: MyService, TON: 5, NPI: 0

SSL/TLS Connection

Inetlab.SMPP library supports SSL connection between client and server.

For [SmppServer](#) class you can set server certificate and supported SSL/TLS protocols.

For [SmppClient](#) class you can specify supported SSL/TLS protocols, and optional client certificate for authentication.

```
using (SmppServer server = new SmppServer(new IPEndPoint(IPAddress.Any, 7777)))
{
    server.EnabledSslProtocols = SslProtocols.Tls12;
    server.ServerCertificate = new X509Certificate2("server_certificate.p12", "cert_password");

    server.Start();

    server.evClientConnected += (sender, client) =>
    {
        var clientCertificate = client.ClientCertificate;
        //You can validate client certificate and disconnect if it is not valid.
    };

    using (SmppClient client = new SmppClient())
    {
        client.EnabledSslProtocols = SslProtocols.Tls12;
        //if required you can be authenticated with client certificate
        client.ClientCertificates.Add(new X509Certificate2("client_certificate.p12", "cert_password"));

        if (await client.ConnectAsync("localhost", 7777))
        {
            BindResp bindResp = await client.BindAsync("username", "password");

            if (bindResp.Header.Status == CommandStatus.ESME_ROK)
            {
                var submitResp = await client.SubmitAsync(
                    SMS.ForSubmit()
                        .From("111")
                        .To("436641234567")
                        .Coding(DataCodings.UCS2)
                        .Text("Hello World!"));

                if (submitResp.All(x => x.Header.Status == CommandStatus.ESME_ROK))
                {
                    client.Logger.Info("Message has been sent.");
                }
            }

            await client.DisconnectAsync();
        }
    }
}
```

SubmitMulti. Send message to multiple destinations

The [SubmitMulti](#) command is used to submit SMPP message for delivery to multiple recipients or to one or more Distribution Lists.

Recipients can be specified with multiple invocation of the method [To](#)

```
await _client.SubmitAsync(SMS.ForSubmitMulti()  
    .ServiceType("test")  
    .Text("Test Test")  
    .From("MyService")  
    .To("1111")  
    .To("2222")  
    .To("3333")  
);
```

this can be done from the phone numbers collection

```
var pduBuilder = SMS.ForSubmitMulti()  
    .ServiceType("test")  
    .Text("Test Test")  
    .From("MyService");  
  
foreach (string phoneNumber in phoneNumbers)  
{  
    pduBuilder.To(phoneNumber);  
}
```

another possibility is to create [DistributionList](#)

```
List<IAddress> destList = new List<IAddress>();  
  
destList.Add(new SmeAddress("1111111111", AddressTON.Unknown, AddressNPI.ISDN));  
destList.Add(new DistributionList("my_distribution_list_on_SMPP_Server"));  
  
var submitResponses = await _client.SubmitAsync(SMS.ForSubmitMulti()  
    .ServiceType("test")  
    .Text("Test Test")  
    .From("MyService")  
    .ToDestinations(destList)  
);
```

When [SubmitMultiResp](#) response received, it means SMPP server stored message for further delivery to recipients.

[SubmitMulti](#) message for destination address is accepted by the SMPP server only when you receive [ESME_ROK](#) in all responses in then result list [IList<SubmitMultiResp>](#) and destination address does not exist in [UnsuccessfulDeliveries](#) of response.

MMS notifications

MMS Notification

After creating a MMS content and placing it on a web server, you can tell MMS compatible mobile phone to retrieve the content.

```
var smList = MMS.Notification(new MMSNotification
{
    TransactionId = "NOK5CyhldCAWF",
    From = "+79171234567/TYPE=PLMN",
    MessageClass = MMSMessageClass.Personal,
    MessageSize = 858,
    Expiry = TimeSpan.FromDays(30),
    ContentLocation = "http://test.com/resources/NOK5CyhldCAWFygAxJ"
})
.TransactionId(0x41);

await _client.SubmitAsync(smList);
```

MMS Delivery

When MMS Content was received from another MMS client, you can notify sender that receipt retrieved the content.

```
var smList = MMS.Delivery(new MMSDelivery
{
    MessageId = "0413103225500000000004",
    To = "+79171234567/TYPE=PLMN",
    Date = new DateTime(2020, 4, 13, 12, 32, 40),
    Status = MMSStatus.Retrieved
})
.TransactionId(0x42);

await _client.SubmitAsync(smList);
```

WAP Push

WAP PUSH enables the delivery of multimedia content to mobile devices. A hyperlink is delivered to the mobile device of the recipient as a Service Indication message. The recipient mobile device will automatically prompt the recipient to download the content on the hyperlink and display it over a GPRS/WAP connection.

```
byte transactionId = 1;

var responses = await _client.SubmitAsync(SMS.ForWapPush()
    .TransactionId(transactionId)
    .From("1111").To("60166609999")
    .Title("Google").Url("http://www.google.com")
);
```

Implementing USSD (Unstructured Supplementary Service Data)

Overview

The USSD session can be initiated by the Mobile Station (MS) or an External Short Message Entity (ESME). The USSD messages create a real-time connection during a USSD session. The connection remains open, allowing a two-way exchange of a sequence of data.

This makes USSD more responsive than services that use SMS.

USSD can be used to provide:

- enhance mobile marketing capabilities
- menu-based information services
- interactive data services
- mobile-money services
- location-based content services
- callback service (to reduce phone charges while roaming)
- configuring the phone on the network

Requirements

USSD over SMPP solution is always vendor specific and requires service description from your SMPP provider or mobile network operator. We can help you to implement this with Inetlab.SMPP library, but you need to send us this description.

Types of USSD messages

- Set up a session: Begin message
- Continue a session: Continue message
- End a session: End message
- Abort a session: Abort message

Types of USSD operations

The USSD session involves the following operations:

Request: to request a session

- If the session is initiated by an MS, the MS can only send a Request message in the first message. In the subsequent message exchange, the MS can only respond to the Request or Notify message from an ESME.
- If the session is initiated by an ESME, the Request message can be sent by only the ESME, while the MS can only respond to the message.

Notify: to notify of a session

The Notify message can be sent by only an ESME. The Notify message differs from the Request message in that an MS responds to a Notify message automatically, but the response to a Request message can only be done manually. For example, send a response character string.

Response: to respond to a session

The response to a Request or Notify message can be sent by the MS or an ESME. When the ESME sends a Response message, it indicates the end of a session.

Release: to release a session

When an ESME ends a session initiated by itself, the operation type can only be Release.

Getting Help

To get support please contact us at [InetLab website contact page](#) or via our [forum](#).

Migration from v1.x to 2.x

How to solve some compile issues:

SmppClient

1. Missing `BatchMonitor` class. Use instead `client.Submit(Enumerable<SubmitSm> batch)`. It waits when all responses will be received for a batch.
2. Events `evBindComplete`, `evSubmitComplete`, `evQueryComplete` were deprecated. It is possible to use async await pattern or `ContinueWith` for corresponding `Bind`, `Submit`, `Query` methods.
3. `_client.AddressRange`, `_client.AddrNpi` and `_client.AddrTon` must be specified as `_client.EsmeAddress = new SmeAddress(AddressRange, AddrTon, AddrNpi);`
4. Sequence number and Command Status are moved to Header property of PDU.
 - `data.Status` replaced with `data.Header.Status`,
 - `data.Sequence` replaced with `data.Header.Sequence`
1. `client.GetMessageText` is moved to `client.EncodingMapper.GetMessageText`
2. PDU Properties
 - `SourceAddrTon`, `SourceAddrNpi`, `SourceAddr` replaced with `SourceAddress` of type `SmeAddress`
 - `DestAddrTon`, `DestAddrNpi`, `DestAddr` replaced with `DestinationAddress` of type `SmeAddress`
 - `UserDataPdu` replaced with `UserData`
 - `Optional` replaced with `Parameters`
1. Property `MessageText` in `SubmitSm`, `SubmitMulti`, `DeliverSm`, `DataSm`, `ReplaceSm` classes is deprecated. Use the method `pdu.GetMessageText(client.EncodingMapper)`.
2. Method `SmppClientBase.MapEncoding` moved to `SmppClientBase.EncodingMapper.MapEncoding`

SmppServer

1. Namespace for `SmppServerClient` class changed to `Inetlab.SMPP`.
2. `EndPoint` of the server must be specified in `SmppServer` constructor, instead of `Start` method of this class.

Serialization

Method `submitSm.Serialize` can be replaced with extension method:

```
byte[] pduData = submitSm.Serialize(client.EncodingMapper);
```

Static method `SubmitSm.Deserialize` can be replaced with code:

```
byte[] pduData = ...;

SubmitSm pdu = pduData.Deserialize<SubmitSm>(client.EncodingMapper);
```

Report a Bug

To report a bug please contact us at [InetLab website contact page](#) or via our [forum](#).

Changelog

[2.9.0] - 2020-12-31 (Not Yet Released)

Added

- MMS m-notification-ind and m-delivery-ind over SMPP
- WorkersTaskScheduler class creates worker threads to handle received requests for a client.
- ReceiveTaskScheduler property in SmppClientBase class. Received requests can be handled in individual or global TaskScheduler or in standard TaskScheduler.Default. By default client uses WorkersTaskScheduler with 3 worker threads.
- RetryUntilConnectedAsync extension method for SmppClient class that helps to establish connection when a SMPP server is temporary unreachable.
- SubmitBatchAndWaitForDeliveryAsync extension method for SmppClient class that helps to submit a batch of SubmitSm PDUs and receive all delivery receipts.
- SubmitWithRepeatAsync extension method that help to repeat the SubmitSm requests on disconnection or unsuccessful response status.

Changed

- Target Framework changed from .NET 4.5.2 to .NET 4.6.1
- SmppClientBase.SendQueueLimit limits a number of requests waiting for response. When this limit is exceeded, SubmitAsync method is blocked until queue has a free slot.
- Less GC pressure by reusing reading buffer.
- Improve DeliverReceipt deserialization when received PDU has wrong DataCoding.
- Deliver receipt serializer enriches DeliverSm PDU with optional parameters (MessageState, ReceiptedMessageId, NetworkErrorCode) only when PDU was not received from remote side.
- Throws GenericNackSmppException when GENERICK_NACK response received in Submit methods.
- Throws ObjectDisposedException when trying to call public method on disposed classes SmppClientBase, SmppClient, SmppServerClient
- New implementation of SMPP connection that frees all used resources after disconnect.
- Improved batch submit. Send several PDUs in one TCP packet.

Fixed

- ArgumentNullException in MessageComposer by adding a PDU with empty text
- SmppClientBase.SendSpeedLimit sends more than allowed PDUs when run SubmitAsync in tasks.
- GSMEncoding returns wrong number of bytes for Turkish charset when both NationalLanguageLockingShift and NationalLanguageSingleShift are specified.

Removed

- evConnected event from SmppClientBase class. SmppClient is connected after call of the method ConnectAsync or on the event evRecoverySucceeded. SmppServer has own method evClientConnected.
- Obsolete properties from PDU classes.
- QueueState class and SmppClientBase.Queue property. Use SmppClientBase.Metrics instead.
- SmppClientBase.WorkerThreads property. Set the SmppClientBase.ReceiveTaskScheduler property to the instance new WorkersTaskScheduler(3).

[2.8.6] - 2020-11-19

Fixed

- CancelSm serialization

[2.8.5] - 2020-11-12

Fixed

- NationalLanguageLockingShift user data header

[2.8.4] - 2020-11-12

Breaking Changes

- license file Inetlab.SMPP.license must contain product name. Generate new license file in your Inetlab Account. ### Fixed
- write license loading errors in license status.

[2.8.3] - 2020-11-04

Fixed

- failed to verify license on macos

[2.8.2] - 2020-09-01

Fixed

- inaccurate SendSpeedLimit on the machine with high-resolution performance counter.

[2.8.1] - 2020-06-16

Fixed

- SendSpeedLimit and result speed has significant difference.
- Send Queue can be blocked in some edge cases.
- Reconnect doesn't start when ThreadPool is overloaded
- Race condition in MessageComposer causes NullReferenceException

[2.8.0] - 2020-04-02

Added:

- SendResponseAsync method in SmppClientBase class. Response sending can be prevented in a event handler by changing it to null. req.Response = null;
- Extension method CanBeEncoded to validate an Encoding for given text message
- MessageComposer with persistence storage interface to save message parts in external database instead of memory.

Fixed:

- NullReferenceException in the event evFullMessageReceived of MessageComposer class
- Setup Project: Unable to update the dependencies of the project. The dependencies for the object 'Inetlab.SMPP.dll' cannot be determined.

[2.7.1] - 2020-01-20

Changed

- move InterfaceVersion property to the SmppClientBase class

Fixed:

- GenericNack PDU has not been sent when wrong PDU header is received.

[2.7.0] - 2019-12-11

Added

- Added Metrics property for SmppClientBase class.
- Support of 16 bit concatenation parameters in SMS builder classes.

Changed

- ReceiveSpeedLimit with rate limiting. Measure PDU count for defined time unit instead of interval between PDUs.
- rename async-methods according to the dotnet naming conventions
- InactivityTimeout starts when SmpServerClient is connected and EnquireLinkInterval is not defined for this client.
- Generate long number MessageId for SubmitSmResp and SubmitMultiResp. According to SMPP Protocol MessageId should contain only digits.
- Timeout timer in MessageComposer restarts when next segment of the message is received.

Fixed

- Submit hangs after unexpected disconnect.
- Exception by changing send or receive buffer size.
- SmpTime.Format for relative time.
- OverflowException in GSMEncoding.

Removed

- Support of .NET Standard 1.4
- InactivityTimeout from SmpClient

[2.6.14] - 2019-09-20

Fixed

- SmpTime.Format for relative time.
- exception in demo applications

[2.6.13] - 2019-08-14

Fixed

- multithread-issue with ConnectedClients in SmpServer class
- set SmpClient.SystemID and SmpClient.SystemType properties when client is bound.

[2.6.12] - 2019-07-26

Added

- convert UserDataHeader to and from byte array
- SmpTime functions for formatting and parsing scheduled delivery times and expiry times in PDU.
- EnsureReferenceNumber method that sets next reference number for a list of concatenated PDUs.
- property InactivityTimeout in the class SmpClientBase. Default is 2 minutes. Connection will be dropped when in specified period of time no SMPP message was exchanged. InactivityTimeout doesn't work when EnquireLinkInterval is defined.

Fixed

- SmpServer: when client.ReceiveSpeedLimit is set to any value, first message is always throttled.
- text splitting: Incorrect message length of 1st PDU when text encoded in GSM encoding and contains extended characters
- ReferenceNumber=0 for submitted concatenated PDUs.

[2.6.11] - 2019-04-20

Fixed

- Connection failed. Error Code: 10048. Only one usage of each socket address (protocol/network address/port) is normally permitted. Occurs when call Connect method from different threads at the same time.

[2.6.10] - 2019-04-19

Fixed

- exceptions by incorrect disconnect.

[2.6.9] - 2019-04-15

Fixed

- Request property is null in received response PDU class.

Added

- ReceiveBufferSize and SendBufferSize properties for SmppClientBase.

[2.6.8] - 2019-03-27

Fixed

- wrong text splitting in SMS builder for GSMPackedEncoding.

[2.6.7] - 2019-03-27

Fixed

- StackOverflowException by submitting array of SubmitMulti.
- destination addresses serialization for SubmitMulti
- short message length calculation

[2.6.6] - 2019-03-25

Fixed

- exception in GetMessageText method for DeliverSm with empty text.

[2.6.5] - 2019-03-18

Fixed

- exception in GetMessageText method for DeliverSm without receipt.

[2.6.4] - 2019-03-15

Fixed

- missed last character in the last segment of the concatenated message created with SMS builders.

Added

- Extension method smppPdu.GetMessageText(EncodingMapper) as replacement for MessageText property in a PDU class.
- TLVCollection.RegisterParameter(ushort tag) method for registering custom TLV parameter type for any tag value. It helps to represent some complex parameters as structured objects. Example: var parameter = pdu.Parameters.Of();

Changed

- MessageText property in PDU classes is obsolete. Use the function client.EncodingMapper.GetMessageText(pdu) or pdu.GetMessageText(client.EncodingMapper) to get the message text contained in the PDU.

[2.6.3] - 2019-03-04

Fixed

- failed to raise some events with attached delegate that doesn't have target object.

Improved

- FileLogger multi-threading improvements.

[2.6.2] - 2019-02-07

Added

- ILogFactory interface with implementations for File and Console

Fixed

- client hangs by Dispose when it was never connected

[2.6.1] - 2019-02-04

Fixed

- Cannot send 160 characters in one part SMS in GSM Encoding

[2.6.0] - 2019-01-14

Added

- ProxyProtocolEnabled property for SmppServerClient class. This property should be enabled in evClientConnected event handler to detect proxy protocol in the network stream of connected client.
- Signed with Strong Name
- ClonePDU, Serialize methods for SmppPDU classes.
- SMS.ForData method for building concatenated DataSm PDUs.
- SMS.ForDeliver is able to create delivery receipt in MessagePayload parameter.

Fixed

- SmppServer stops accepting new connections by invalid handshake
- Text splitter for building concatenated message parts
- Event evClientDataSm didn't raise in the SmppServer.
- Sometimes SmppServerClient doesn't disconnect properly in SmppServer
- concurrency issues in MessageComposer
- library sends response with status ESME_ROK when SmppServer has no attached event handler for a request PDU. It should send unsuccess status f.i. ESME_RINVCMDID.

API Changes

- Replaced methods AddMessagePayload, AddSARReferenceNumber, AddSARSequenceNumber, AddSARTotalSegments and AddMoreMessagesToSend with corresponding classes in Inetlab.SMPP.Parameters namespace.
- Renamed the property "Optional" to "Parameters" in PDU classes. (backwards-compatible)
- Removed unnecessary TLV constructor with length parameter. Length is always equal to value array length.
- Removed ISmppMessage interface
- Renamed namespace Inetlab.SMPP.Common.Headers to Inetlab.SMPP.Headers
- Rename property UserDataPdu to UserData for classes SubmitSm, SubmitMulti DeliverSm, ReplaceSm. (backwards-compatible)
- MessageInPayload method tells SMS builder to send complete message text in message_payload parameter. With optional messageSize method parameter you can decrease the size of message segment if you need to send concatenation in SAR parameters.
- Simplified ILog interface

[2.5.4] - 2018-09-16

Changed

- MessageComposer.Timeout property to TimeStamp

Added

- SmpClient.Submit methods with IEnumerable parameter
- better documentation

Fixed

- Handle SocketException OperationAborted when server stops

[2.5.3] - 2018-09-08

Fixed

- SubmitSpeedLimit is ignored
- sometimes SMPP PDU reading is failed

[2.5.2] - 2018-08-06

Fixed

- Messages with data coding Class0 (0xF0) are split up in wrong way

[2.5.1] - 2018-07-30

Fixed

- wrong BindingMode for SmpServerClient after Unbind.

[2.5.0] - 2018-07-29

Added

- Automatic detection for Proxy protocol <https://www.haproxy.com/blog/haproxy/proxy-protocol/> ### Implemented
- Unbind logic for SmpClient and SmpServerClient classes

[2.4.1] - 2018-06-19

Fixed

- issue with licensing module

[2.4.0] - 2018-05-30

Added

- Automatic connection recovery.

[2.3.2] - 2018-04-20

Added

- MessageComposer allows to get its items for concatenated messages. ### Changed
- creation for user data headers types.

[2.3.1] - 2018-04-18

Fixed

- PDU reader and writer
- split text on concatenation parts

[2.3.0] - 2018-03-18

Added

- `SmppClientBase.SendQueueLimit` limits the number of sending SMPP messages to remote side. Delays further SMPP requests when limit is exceeded.

Changed

- `SmppServerClient.ReceiveQueueLimit` replaced with `SmppClientBase.ReceivedRequestQueueLimit`

Improved

- improved: processing of connect and disconnect.

[2.2.0] - 2018-02-01

Improved

- better processing of request and response PDU

Changed

- Flow Control. `SmppServerClient.ReceiveQueueLimit` defines allowed number of SMPP requests in receive queue. If receive queue is full, library stops receive from network buffer and waits until queue has a place again. It is better alternative for ESME_RMSGQFUL response status. ### Fixed
- `MessageComposer` raises `evFullMessageReceived` sometimes two times by processing concatenated message with two parts.

[2.1.2] - 2017-12-11

Improved

- internal queue for processing PDU.

[2.1.1] - 2017-12-10

Improved

- processing of connect and disconnect

Added

- `From` and `To` methods with `SmeAddress` parameter to SMS Builders

[2.1.0] - 2017-10-18

Added

- `SendSpeedLimit` property for `SmppClientBase` class, that limits number of requests per second to remote side
- Priority processing for response PDUs.
- `Name` property to distinguish instances in logger
- `Deliver` method in `SmppServerClient` class
- `SubmitData` method in `SmppClientBase` class

[2.0.1] - 2017-10-06

Added

- decode receipt for `IntermediateDeliveryNotification`

Fixed

- sequence number generation

[2.0.0] - 2017-08-15

- first version for .NET Standard 1.4

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