ISUP

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( ISDN User Part or ISUP ) is part of  which is used to establish telephone calls and manage call switches( exchanges). Exchanges are connected via E1 or T1 trunks. Each trunk is divided by means of TDM into time slots. Each time slot is distinguished as circuit. Circuits (identified by code) are used  as medium to transmit voice data between user equipment (or exchanges if more than one is involved).

```
allows not only to setup a call, but to exchange information about exchange state and
its resources(circuits).
```

Restcomm  is based on  Q.76X series of documents.

# ISUP Configuration

Restcomm  stack is configured with simple properties. Currently following properties are supported:

*Table 1. ISUP Configuration options*

| Name | Default value | Value range | Description |
|---|---|---|---|
| ni | None, must be provided | 0-3 | Sets value of network indicator that should be used by stack. |
| localspc | None, must be provided | 0 - (2^14)-1 | Sets local signaling point code. It will be used as OPC for outgoing signaling units. |
| t1 | 4s | 4s - 15s | Sets T1 value. Started when REL is sent. See A.1/Q.764 |
| t5 | 5 min. | 5min - 15 min | Sets T5 value. Started when initial REL is sent. See A.1/Q.764 |
| t7 | 20s | 20s -30s | Sets T7 value. (Re)Started when Address Message is sent. See A.1/Q.764 |
| t2 | 15s | 15s - 60s | Sets T12 value. Started when BLO is sent. See A.1/Q.764 |

| Name | Default value | Value range | Description |
|---|---|---|---|
| t13 | 5min | 5min - 15min | Sets T13 value. Started when initial BLO is sent. See A.1/Q.764 |
| t14 | 5s | 15s - 60s | Sets T14 value. Started when UBL is sent. See A.1/Q.764 |
| t15 | 5min | 5min - 15min | Sets T15 value. Started when initial UBL is sent. See A.1/Q.764 |
| t16 | 5s | 15s - 60s | Sets T16 value. Started when RSC is sent. See A.1/Q.764 |
| t17 | 5min | 5min - 15min | Sets T17 value. Started when initial RSC is sent. See A.1/Q.764 |
| t18 | 5s | 15s - 60s | Sets T18 value. Started when CGB is sent. See A.1/Q.764 |
| t19 | 5min | 5min - 15min | Sets T19 value. Started when initial CGB is sent. See A.1/Q.764 |
| t20 | 5s | 15s - 60s | Sets T20 value. Started when CGU is sent. See A.1/Q.764 |
| t21 | 5min | 5min - 15min | Sets T21 value. Started when initial CGU is sent. See A.1/Q.764 |
| t22 | 5s | 15s - 60s | Sets T22 value. Started when GRS is sent. See A.1/Q.764 |
| t23 | 5min | 5min - 15min | Sets T23 value. Started when initial GRS is sent. See A.1/Q.764 |
| t28 | 10s | 10s | Sets T28 value. Started when CQM is sent. See A.1/Q.764 |
| t33 | 12s | 12s - 15s | Sets T33 value. Started when INR is sent. See A.1/Q.764 |

Note that before start user must provide two interfaces to stack:

*Mtp3UserPart*

implementation of transport layer which should be used by stack

*CircuitManager*

circuit manager implementation. This interface stores information on mapping between `CIC`(Circuit Identification Code) and `DPC`(Destination Point Code) used as destination for outgoing messages.

# ISUP Usage

The `org.mobicents.protocols.ss7.isup.ISUPStack` interface defines the methods required to represent ISUP Protocol Stack. ISUPStack exposes `org.mobicents.protocols.ss7.isup.ISUPProvider`. This interface defines the methods that will be used by any registered ISUP User application implementing the `org.mobicents.protocols.ss7.isup.ISUPListener` to listen ISUP events(messages and timeouts).

# ISUP Example

Below is simple example of stack usage:

```
import java.io.ByteArrayOutputStream;
import java.io.IOException;
import java.util.ArrayList;
import java.util.List;
import java.util.Properties;

import org.mobicents.protocols.ss7.isup.ISUPEvent;
import org.mobicents.protocols.ss7.isup.ISUPListener;
import org.mobicents.protocols.ss7.isup.ISUPProvider;
import org.mobicents.protocols.ss7.isup.ISUPStack;
import org.mobicents.protocols.ss7.isup.ISUPTimeoutEvent;
import org.mobicents.protocols.ss7.isup.ParameterException;
import org.mobicents.protocols.ss7.isup.impl.ISUPStackImpl;
import org.mobicents.protocols.ss7.isup.message.ISUPMessage;

import org.mobicents.ss7.linkset.oam.Layer4;
import org.mobicents.ss7.linkset.oam.Linkset;

public class ISUPTest implements ISUPListener
{

    protected ISUPStack stack;
    protected ISUPProvider provider;

    protected Linkset isupLinkSet;


    public void setUp() throws Exception {
```

```
        this.isupLinkSet = ....; //same linksets as in SS7Service
        this.stack = new ISUPStackImpl();
        this.stack.configure(getSpecificConfig());
        this.provider = this.stack.getIsupProvider();
        this.provider.addListener(this);
        Mtp3UserPart userPart = // create with proper factory, dahdii, dialogi, m3ua
        this.stack.setMtp3UserPart(userPart);
        CircuitManagerImpl circuitManager = new CircuitManagerImpl();
        circuitManager.addCircuit(1, 431613); // CIC - 1, DPC for it - 431613


        this.stack.setCircuitManager(circuitManager);
        this.stack.start();

    }


    public void onEvent(ISUPEvent event) {
        ISUPMessage msg = event.getMessage();
        switch(msg.getCircuitIdentificationCode().getCIC())
        {
            case AddressCompleteMessage._COMMAND_CODE:
            //only complete
            break;
            case ConnectedMessage._COMMAND_CODE:
            case AnswerMessage._COMMAND_CODE:
            //we are good to go
            ConnectedNumber cn = (ConnectedNumber)msg.getParameter(ConnectedNumber
._PARAMETER_CODE);
            //do something
            break;
            case ReleaseMessage._COMMAND_CODE:
            //remote end does not want to talk
            RealeaseCompleteMessage rlc = provider.getMessageFactory().createRLC();
            rlc.setCircuitIdentificationCode(msg.getCircuitIdentificationCode());
            rlc.setCauseIndicators(   ((ReleaseComplete)msg).getCauseIndicators());
            provider.sendMessage(rlc);

        }

    }

    public void onTimeout(ISUPTimeoutEvent event) {
        switch(event.getTimerId())
        {
            case ISUPTimeoutEvent.T1:
                //do something
                break;
            case ISUPTimeoutEvent.T7:
                //do even more
```

```
                break;
            }

        }

    }
```