

TCAP

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The Transaction Capabilities Application Part (TCAP) is defined in ITU-T Recommendations Q.771-Q.775. TCAP allows services at network nodes to communicate with each other using an agreed-upon set of data elements. The primary purpose of TCAP is to facilitate multiple concurrent dialogs between the same sub-systems on the same machines, using Transaction IDs to differentiate these, similar to the way TCP ports facilitate multiplexing connections between the same IP addresses on the Internet.

## Restcomm jSS7 TCAP Usage

The `org.mobicients.protocols.ss7.tcap.api.TCAPStack` interface defines the methods required to represent the TCAP Protocol Stack. `TCAPStack` exposes `org.mobicients.protocols.ss7.tcap.api.TCAPProvider` that interacts directly with the `TCAPStack`. `TCAPProvider` defines methods that will be used by TCAP User Part to create new `org.mobicients.protocols.ss7.tcap.api.tc.dialog.Dialog` to be sent across the network. TCAP User Part also allows to register `org.mobicients.protocols.ss7.tcap.api.TCListener` to listen for TCAP messages.

`TCAPProvider` also exposes `org.mobicients.protocols.ss7.tcap.api.DialogPrimitiveFactory` to create dialog primitives and `org.mobicients.protocols.ss7.tcap.api.ComponentPrimitiveFactory` to create components. Components are a means of invoking an operation at a remote node.

The UML Class Diagram is depicted in the figure below:

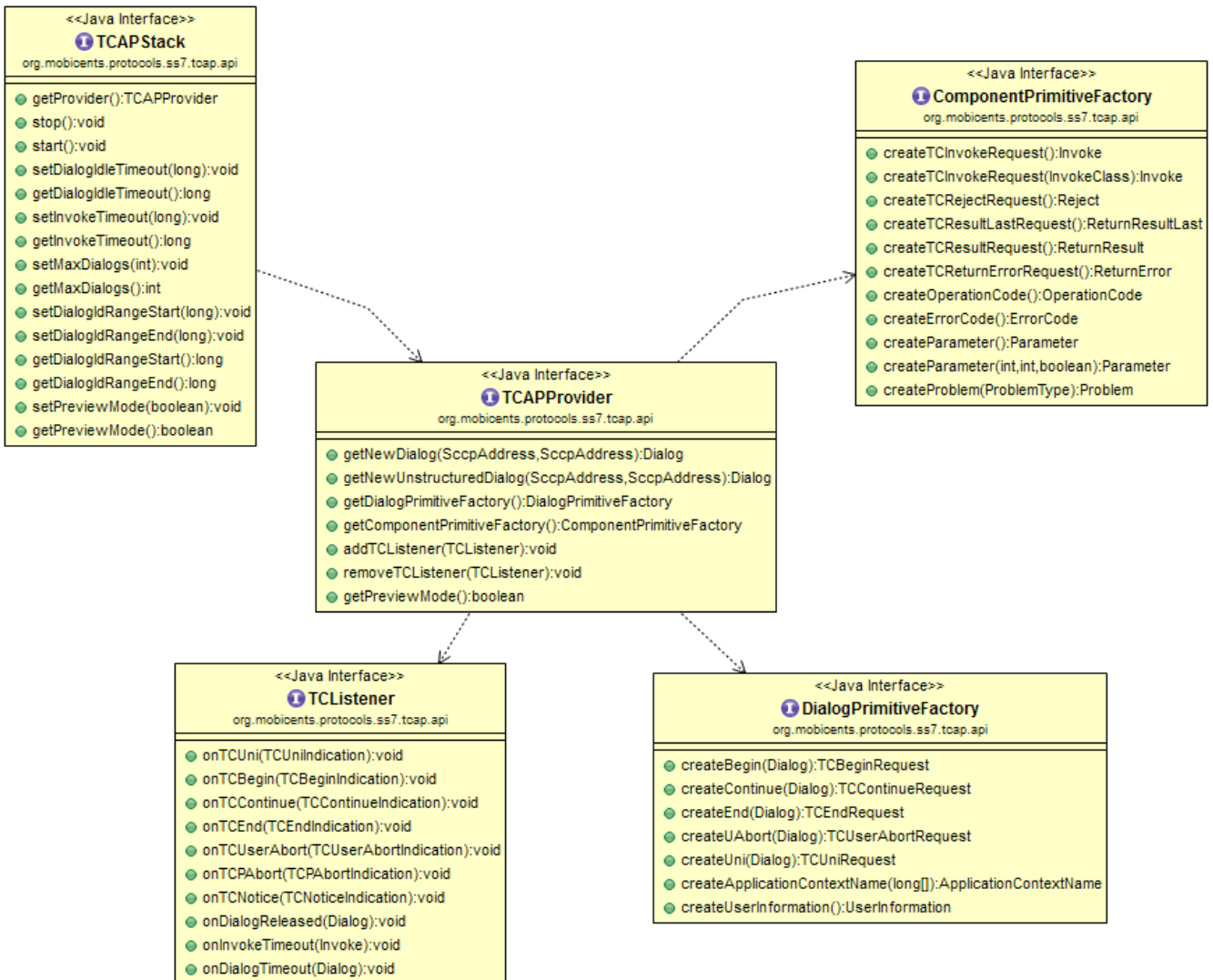


Figure 1. Restcomm jSS7 Stack TCAP Class Diagram

The `org.mobicens.protocols.ss7.tcap.TCAPStackImpl` is a concrete implementation of `TCAPStack`. The TCAP User Part gets access to `TCAPProvider` by doing JNDI lookup as explained in the [\[design\\_overview\\_ss7\\_service\]](#).

```

InitialContext ctx = new InitialContext();
try {
    String providerJndiName = "java:/mobicens/ss7/tcap";
    this.tcapProvider = ((TCAPProvider) ctx.lookup(providerJndiName));
} finally {
    ctx.close();
}
  
```

The TCAP User Part should register the concrete implementation of `TCListener` with `TCAPProvider` to listen for incoming TCAP messages.

```
public class ClientTest implements TListener{
    .....
    tcapProvider.addTListener(this);
    ....
}
```

TCAP User Part leverages `TCAPProvider` to create a new Dialog. The components between the nodes are exchanged within this Dialog.

```
SccpAddress localAddress = new SccpAddress(RoutingIndicator
.ROUTING_BASED_ON_DPC_AND_SSN, 1, null, 8);
SccpAddress remoteAddress = new SccpAddress(RoutingIndicator
.ROUTING_BASED_ON_DPC_AND_SSN, 2, null, 8);
clientDialog = this.tcapProvider.getNewDialog(localAddress, remoteAddress);
```

The TCAP User Part leverages `ComponentPrimitiveFactory` to create new components. These components are sent using the dialog.

Below is a list of common scenarios using the TCAP stack :

- Creating a TCAP Dialog by invoking the methods `TCAPProvider.getNewDialog()` or `getNewUnstructuredDialog()`
- Adding components into a Dialog for sending by `Dialog.sendComponent();`
- Sending a TCAP message TC-UNI, TC-BEGIN, TC-CONTINUE, TC-END or TC-ABORT via `Dialog.send()` methods.
- Waiting for responses from a peer
- When the TCAP stack receives a message from a peer, events like `TListener.onTCUni()`, `onTCBegin()`, `onTCContinue()`, `onTCEnd()`, `onTCUserAbort()`, `onTCPAbort()` will be invoked.
- After an Invoke component is received, a TCAP-User should process it and do one of the below:
  - send a response (ReturnResult, ReturnResulLast components) or
  - send an error (ReturnError or Reject components) or
  - invoke `Dialog.processInvokeWithoutAnswer()` method if TCAP-Users will not answer to the Invoke.

```
//create some INVOKE
Invoke invoke = cpFactory.createTCInvokeRequest();
invoke.setInvokeId(this.clientDialog.getNewInvokeId());
OperationCode oc = cpFactory.createOperationCode();
oc.setLocalOperationCode(12L);
invoke.setOperationCode(oc);
//no parameter
this.clientDialog.sendComponent(invoke);
```

# Restcomm jSS7 TCAP User Part Example

Below is a TCAP User Part example. This example creates a dialog and exchanges messages within a structured dialog. Refer to source for function calls.

```
package org.mobicenss7.protocols.ss7.tcap;

import javax.naming.InitialContext;
import javax.naming.NamingException;

import org.mobicenss7.protocols.ss7.indicator.RoutingIndicator;
import org.mobicenss7.protocols.ss7.sccp.parameter.SccpAddress;
import org.mobicenss7.protocols.ss7.tcap.api.ComponentPrimitiveFactory;
import org.mobicenss7.protocols.ss7.tcap.api.TCAPException;
import org.mobicenss7.protocols.ss7.tcap.api.TCAPProvider;
import org.mobicenss7.protocols.ss7.tcap.api.TCAPSendException;
import org.mobicenss7.protocols.ss7.tcap.api.TCListener;
import org.mobicenss7.protocols.ss7.tcap.api.tc.dialog.Dialog;
import org.mobicenss7.protocols.ss7.tcap.api.tc.dialog.events.TCBeginIndication;
import org.mobicenss7.protocols.ss7.tcap.api.tc.dialog.events.TCBeginRequest;
import org.mobicenss7.protocols.ss7.tcap.api.tc.dialog.events.TCContinueIndication;
import org.mobicenss7.protocols.ss7.tcap.api.tc.dialog.events.TCEndIndication;
import org.mobicenss7.protocols.ss7.tcap.api.tc.dialog.events.TCEndRequest;
import org.mobicenss7.protocols.ss7.tcap.api.tc.dialog.events.TCNoticeIndication;
import org.mobicenss7.protocols.ss7.tcap.api.tc.dialog.events.TCPAbortIndication;
import org.mobicenss7.protocols.ss7.tcap.api.tc.dialog.events.TCUniIndication;
import org.mobicenss7.protocols.ss7.tcap.api.tc.dialog.events.TCUserAbortIndication;
import org.mobicenss7.protocols.ss7.tcap.api.tc.dialog.events.TerminationType;
import org.mobicenss7.protocols.ss7.tcap.asn.ApplicationContextName;
import org.mobicenss7.protocols.ss7.tcap.asn.comp.Invoke;
import org.mobicenss7.protocols.ss7.tcap.asn.comp.OperationCode;

/**
 * Simple example demonstrates how to use TCAP Stack
 *
 * @author Amit Bhayani
 *
 */
public class ClientTest implements TCListener {
    // encoded Application Context Name
    public static final long[] _ACN_ = new long[] { 0, 4, 0, 0, 1, 0, 19, 2 };
    private TCAPProvider tcapProvider;
    private Dialog clientDialog;

    ClientTest() throws NamingException {

        InitialContext ctx = new InitialContext();
        try {
            String providerJndiName = "java:/mobicenss7/tcap";
            this.tcapProvider = ((TCAPProvider) ctx.lookup(providerJndiName));
        } catch (NamingException e) {
            e.printStackTrace();
        }
    }
}
```

```

    } finally {
        ctx.close();
    }

    this.tcapProvider.addTCListener(this);
}

public void sendInvoke() throws TCAPException, TCAPSendException {
    SccpAddress localAddress = new SccpAddress(RoutingIndicator
.ROUTING_BASED_ON_DPC_AND_SSN, 1, null, 8);
    SccpAddress remoteAddress = new SccpAddress(RoutingIndicator
.ROUTING_BASED_ON_DPC_AND_SSN, 2, null, 8);

    clientDialog = this.tcapProvider.getNewDialog(localAddress, remoteAddress);
    ComponentPrimitiveFactory cpFactory = this.tcapProvider
.getComponentPrimitiveFactory();

    // create some INVOKE
    Invoke invoke = cpFactory.createTCInvokeRequest();
    invoke.setInvokeId(this.clientDialog.getNewInvokeId());
    OperationCode oc = cpFactory.createOperationCode();
    oc.setLocalOperationCode(12L);
    invoke.setOperationCode(oc);
    // no parameter
    this.clientDialog.sendComponent(invoke);
    ApplicationContextName acn = this.tcapProvider.getDialogPrimitiveFactory
().createApplicationContextName(_ACN_);
    // UI is optional!
    TCBeginRequest tcbr = this.tcapProvider.getDialogPrimitiveFactory
().createBegin(this.clientDialog);
    tcbr.setApplicationContextName(acn);
    this.clientDialog.send(tcbr);
}

public void onDialogReleased(Dialog d) {
}

public void onInvokeTimeout(Invoke tcInvokeRequest) {
}

public void onDialogTimeout(Dialog d) {
    d.keepAlive();
}

public void onTCBegin(TCBeginIndication ind) {
}

public void onTCContinue(TCContinueIndication ind) {
    // send end
    TCEndRequest end = this.tcapProvider.getDialogPrimitiveFactory().createEnd(
ind.getDialog());
}

```

```

        end.setTermination(TerminationType.Basic);
        try {
            ind.getDialog().send(end);
        } catch (TCAPSendException e) {
            throw new RuntimeException(e);
        }
    }

    public void onTCEnd(TCEndIndication ind) {
        // should not happen, in this scenario, we send data.
    }

    public void onTCUni(TCUniIndication ind) {
        // not going to happen
    }

    public void onTCPAbort(TCPAbortIndication ind) {
        // TODO Auto-generated method stub
    }

    public void onTCUserAbort(TCUserAbortIndication ind) {
        // TODO Auto-generated method stub
    }

    public void onTCNotice(TCNoticeIndication ind) {
        // TODO Auto-generated method stub
    }

    public static void main(String[] args) {

        try {
            ClientTest c = new ClientTest();
            c.sendInvoke();
        } catch (NamingException e) {
            // TODO Auto-generated catch block
            e.printStackTrace();
        } catch (TCAPException e) {
            // TODO Auto-generated catch block
            e.printStackTrace();
        } catch (TCAPSendException e) {
            // TODO Auto-generated catch block
            e.printStackTrace();
        }
    }
}

```