



## Cisco Unified JTAPI Examples

This chapter provides the source code for `makecall`, the Cisco Unified JTAPI program that is used to test the JTAPI installation. The `makecall` program comprises a series of programs that were written in Java by using the Cisco Unified JTAPI implementation.

For instructions on how to invoke `makecall`, see [Running makecall, on page 15](#).

The Cisco Unified JTAPI Test tool can also be used to review message examples and test JTAPI features and functions. For details, refer <http://developer.cisco.com/web/jtapi/docs>.

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### MakeCall.java

```
/** * makecall.java
 *
 * Copyright Cisco Systems, Inc.
 *
 * Performance-testing application (first pass) for Cisco JTAPI
 * implementation.
 *
 * Known problems:
 *
 * Due to synchronization problems between Actors, calls may
 * not be cleared when this application shuts down.
 */

//import com.ms.wfc.app.*;
import java.util.*;
import javax.telephony.*;
import javax.telephony.events.*;
import com.cisco.cti.util.Condition;
```

```

public class makecall extends TraceWindow implements ProviderObserver
{
    Vectoractors = new Vector ();
    ConditionconditionInService = new Condition ();
    Providerprovider;

    public makecall ( String [] args ) {

        super ( "makecall" + ": " + new CiscoJtapiVersion());
        try
        {

            println ( "Initializing Jtapi" );
            int curArg = 0;
            String providerName = args[curArg++];
            String login = args[curArg++];
            String passwd = args[curArg++];
            int actionDelayMillis = Integer.parseInt ( args[curArg++] );
            String src = null;
            String dest = null;

            JtapiPeer peer = JtapiPeerFactory.getJtapiPeer ( null );
            if ( curArg < args.length )
            {

                String providerString = providerName + ";login = " + login + ";passwd
= " + passwd;
                println ( "Opening " + providerString + "...\\n" );
                provider = peer.getProvider ( providerString );
                provider.addObserver ( this );
                conditionInService.waitTrue ();

                println ( "Constructing actors" );

                for ( ; curArg < args.length; curArg++ )
                {
                    if ( src == null )
                    {
                        src = args[curArg];
                    }
                    else
                    {
                        dest = args[curArg];
                        Originator originator = new Originator ( provider.getAddress ( src
),
                            dest, this, actionDelayMillis );
                        actors.addElement ( originator );
                        actors.addElement (
                            new Receiver ( provider.getAddress ( dest ), this,
actionDelayMillis,
                                originator )
                            );
                        src = null;
                        dest = null;
                    }
                }
                if ( src != null )
                {
                    println ( "Skipping last originating address \"" + src +
                        "\"; no destination specified" );
                }
            }
        }
    }
}

```

```

Enumeration e = actors.elements ();
while ( e.hasMoreElements () )
{
    Actor actor = (Actor) e.nextElement ();
    actor.initialize ();
}

Enumeration en = actors.elements ();
while ( en.hasMoreElements () )
{
    Actor actor = (Actor) en.nextElement ();
    actor.start ();
}
}
catch ( Exception e )
{
    println ( "Caught exception " + e );
}
}

public void dispose () {
    println ( "Stopping actors" );
    Enumeration e = actors.elements ();
    while ( e.hasMoreElements () )
    {
        Actor actor = (Actor) e.nextElement ();
        actor.dispose ();
    }
}

public static void main ( String [] args )
{
    if ( args.length < 6 )
    {
        System.out.println ( "Usage: makecall <server> <login> <password> <delay>
        <origin> <destination> ..." );
        System.exit ( 1 );
    }
    new makecall ( args );
}

public void providerChangedEvent ( ProvEv [] eventList ) {
    if ( eventList != null )
    {
        for ( int i = 0; i < eventList.length; i++ )
        {
            if ( eventList[i] instanceof ProvInServiceEv )
            {
                conditionInService.set ();
            }
        }
    }
}
}
}

```

## Actor.java

```

/** * Actor.java
 *

```

```

* Copyright Cisco Systems, Inc.
*
*/

import javax.telephony.*;
import javax.telephony.events.*;
import javax.telephony.callcontrol.*;
import javax.telephony.callcontrol.events.*;

import com.cisco.jtapi.extensions.*;
public abstract class Actor implements AddressObserver, TerminalObserver,
CallControlCallObserver, Trace
{

    public static final int ACTOR_OUT_OF_SERVICE = 0;
    public static final int ACTOR_IN_SERVICE = 1;
    private Tracetrace;
    protected intactionDelayMillis;
    private AddressobservedAddress;
    private Terminal observedTerminal;
    private boolean addressInService;
    private boolean terminalInService;
    protected int state = Actor.ACTOR_OUT_OF_SERVICE;

    public Actor ( Trace trace, Address observed, int actionDelayMillis ) {
        this.trace = trace;
        this.observedAddress = observed;
        this.observedTerminal = observed.getTerminals () [0];
        this.actionDelayMillis = actionDelayMillis;
    }

    public void initialize () {

        try
        {
            if ( observedAddress != null )
            {
                bufPrintln (
                    "Adding Call observer to address "
                    + observedAddress.getName ()
                );
                observedAddress.addCallObserver ( this );

                //Now add observer on Address and Terminal
                bufPrintln (
                    "Adding Address Observer to address "
                    + observedAddress.getName ()
                );

                observedAddress.addObserver ( this );

                bufPrintln (
                    "Adding Terminal Observer to Terminal" + observedTerminal.getName ()
                );

                observedTerminal.addObserver ( this );
            }
        }
        catch ( Exception e )
        {
        }
        finally
        {
            flush ();
        }
    }
}

```

```
    }
}

public final void start () {
    onStart ();
}

public final void dispose () {

    try
    {
        onStop ();
        if ( observedAddress != null )
        {

            bufPrintln (
                "Removing observer from Address "
                + observedAddress.getName ()
            );
            observedAddress.removeObserver ( this );

            bufPrintln (
                "Removing call observer from Address "
                + observedAddress.getName ()
            );
            observedAddress.removeCallObserver ( this );

        }
        if ( observedTerminal != null )
        {
            bufPrintln (
                "Removing observer from terminal "
                + observedTerminal.getName ()
            );
            observedTerminal.removeObserver ( this );
        }
    }
    catch ( Exception e )
    {
        println ( "Caught exception " + e );
    }
    finally
    {
        flush ();
    }
}

public final void stop () {
    onStop ();
}

public final void callChangedEvent ( CallEv [] events ) {
    //
    // for now, all metaevents are delivered in the
    // same package...
    //
    metaEvent ( events );
}

public void addressChangedEvent ( AddrEv [] events ) {
```

```

for ( int i = 0; i<events.length; i++ )
{
    Address address = events[i].getAddress ();
    switch ( events[i].getID () )
    {
        case CiscoAddrInServiceEv.ID:
            bufPrintln ( "Received " + events[i] + "for "+ address.getName () );
            addressInService = true;
            if ( terminalInService )
            {
                if ( state != Actor.ACTOR_IN_SERVICE )
                {
                    state = Actor.ACTOR_IN_SERVICE ;
                    fireStateChanged ();
                }
            }
            break;
        case CiscoAddrOutOfServiceEv.ID:
            bufPrintln ( "Received " + events[i] + "for "+ address.getName () );
            addressInService = false;
            if ( state != Actor.ACTOR_OUT_OF_SERVICE )
            { // you only want to notify when you had notified earlier that you are
IN_SERVICE
                state = Actor.ACTOR_OUT_OF_SERVICE;
                fireStateChanged ();
            }
            break;
    }
}
flush ();
}

public void terminalChangedEvent ( TermEv [] events ) {

    for ( int i = 0; i<events.length; i++ )
    {
        Terminal terminal = events[i].getTerminal ();
        switch ( events[i].getID () )
        {
            case CiscoTermInServiceEv.ID:
                bufPrintln ( "Received " + events[i] + "for " + terminal.getName () );
                terminalInService = true;
                if ( addressInService )
                {
                    if ( state != Actor.ACTOR_IN_SERVICE )
                    {
                        state = Actor.ACTOR_IN_SERVICE;
                        fireStateChanged ();
                    }
                }
                break;
            case CiscoTermOutOfServiceEv.ID:
                bufPrintln ( "Received " + events[i] + "for " + terminal.getName () );
                terminalInService = false;
                if ( state != Actor.ACTOR_OUT_OF_SERVICE )
                { // you only want to notify when you had notified earlier that you are
IN_SERVICE
                    state = Actor.ACTOR_OUT_OF_SERVICE;
                    fireStateChanged ();
                }
                break;
        }
    }
}
flush();
}

```

```
    }

    final void delay ( String action ) {
        if ( actionDelayMillis != 0 )
        {
            println ( "Pausing " + actionDelayMillis + " milliseconds before " + action
        );
            try
            {
                Thread.sleep ( actionDelayMillis );
            }
            catch ( InterruptedException e )
            {
            }
        }
    }

    protected abstract void metaEvent ( CallEv [] events );

    protected abstract void onStart ();
    protected abstract void onStop ();
    protected abstract void fireStateChanged ();

    public final void bufPrint ( String string ) {
        trace.bufPrint ( string );
    }
    public final void bufPrintln ( String string ) {
        trace.bufPrint ( string );
        trace.bufPrint ( "\n" );
    }
    public final void print ( String string ) {
        trace.print ( string );
    }
    public final void print ( char character ) {
        trace.print ( character );
    }
    public final void print ( int integer ) {
        trace.print ( integer );
    }
    public final void println ( String string ) {
        trace.println ( string );
    }
    public final void println ( char character ) {
        trace.println ( character );
    }
    public final void println ( int integer ) {
        trace.println ( integer );
    }
    public final void flush () {
        trace.flush ();
    }
}
```

## Originator.java

```
/** * originator.java
 *
 * Copyright Cisco Systems, Inc.
 *
```

```

*/

import javax.telephony.*;
import javax.telephony.events.*;
import javax.telephony.callcontrol.*;
import javax.telephony.callcontrol.events.*;

import com.ms.com.*;
import com.cisco.jtapi.extensions.*;

public class Originator extends Actor
{
    Address srcAddress;
    String destAddress;
    int iteration;
    StopSignal stopSignal;
    boolean ready = false;
    int receiverState = Actor.ACTOR_OUT_OF_SERVICE;
    boolean callInIdle = true;

    public Originator ( Address srcAddress, String destAddress, Trace trace,
        int actionDelayMillis ) {
        super ( trace, srcAddress, actionDelayMillis ); // observe srcAddress
        this.srcAddress = srcAddress;
        this.destAddress = destAddress;
        this.iteration = 0;
    }

    protected final void metaEvent ( CallEv [] eventList ) {
        for ( int i = 0; i < eventList.length; i++ )
        {
            try
            {
                CallEv curEv = eventList[i];

                if ( curEv instanceof CallCtlTermConnTalkingEv )
                {
                    TerminalConnection tc =
                ((CallCtlTermConnTalkingEv)curEv).getTerminalConnection ();
                    Connection conn = tc.getConnection ();
                    if ( conn.getAddress ().getName ().equals ( destAddress ) )
                    {
                        delay ( "disconnecting" );
                        bufPrintln ( "Disconnecting Connection " + conn );
                        conn.disconnect ();
                    }
                }
                else if ( curEv instanceof CallCtlConnDisconnectedEv )
                {
                    Connection conn = ((CallCtlConnDisconnectedEv)curEv).getConnection
                ();
                    if ( conn.getAddress ().equals ( srcAddress ) )
                    {
                        stopSignal.canStop ();
                        setCallProgressState ( true );
                    }
                }
            }
            catch ( Exception e )
            {
                println ( "Caught exception " + e );
            }
            finally
            {

```



```

        flush ();
    }
}

protected void makecall ()
throws ResourceUnavailableException, InvalidStateException,
    PrivilegeViolationException, MethodNotSupportedException,
    InvalidPartyException, InvalidArgumentException {
    println ( "Making call #" + ++iteration + " from " + srcAddress + " to " +
        destAddress + " " + Thread.currentThread ().getName () );
    Call call = srcAddress.getProvider ().createCall ();
    call.connect ( srcAddress.getTerminals ()[0], srcAddress, destAddress );
    setCallProgressState ( false );
    println ( "Done making call" );
}

protected final void onStart () {
    stopSignal = new StopSignal ();
    new ActionThread ().start ();
}

protected final void fireStateChanged () {
    checkReadyState ();
}

protected final void onStop () {
    stopSignal.stop ();
    Connection[] connections = srcAddress.getConnections ();
    try
    {
        if ( connections != null )
        {
            for (int i = 0; i < connections.length; i++)
            {
                connections[i].disconnect ();
            }
        }
    }
    catch ( Exception e )
    {
        println ( " Caught Exception " + e );
    }
}

public int getReceiverState () {
    return receiverState;
}

public void setReceiverState ( int state ) {
    if ( receiverState != state )
    {
        receiverState = state;
        checkReadyState ();
    }
}

public synchronized void checkReadyState ()
{
    if ( receiverState == Actor.ACTOR_IN_SERVICE && state ==

```

```

Actor.ACTOR_IN_SERVICE )
{
    ready = true;
}
else
{
    ready = false;
}
notifyAll ();
}

public synchronized void setCallProgressState ( boolean isCallInIdle )
{
    callInIdle = isCallInIdle;
    notifyAll ();
}

public synchronized void doAction ()
{
    if ( !ready || !callInIdle )
    {
        try
        {
            wait ();
        }
        catch ( Exception e )
        {
            println ( " Caught Exception from wait state" + e );
        }
    }
    else
    {
        if ( actionDelayMillis != 0 )
        {
            println ( "Pausing " + actionDelayMillis + " milliseconds before making
call " );
            flush ();
            try
            {
                wait ( actionDelayMillis );
            }
            catch ( Exception ex )
            {
            }
        }
        //make call after waking up,  recheck the flags before making the call
        if ( ready && callInIdle )
        {
            try
            {
                makecall ();
            }
            catch ( Exception e )
            {
                println ( " Caught Exception in MakeCall " + e + " Thread = " +
                    Thread.currentThread ().getName ());
            }
        }
    }
}

class ActionThread extends Thread {

```

```

    ActionThread ( ) {
        super ( "ActionThread");
    }

    public void run () {
        while ( true )
        {
            doAction ();
        }
    }
}

```

## Receiver.java

```

/** * Receiver.java
 *
 * Copyright Cisco Systems, Inc.
 *
 */

import javax.telephony.*;
import javax.telephony.events.*;
import javax.telephony.callcontrol.*;
import javax.telephony.callcontrol.events.*;

public class Receiver extends Actor
{
    Address address;
    StopSignal stopSignal;
    Originator originator;

    public Receiver ( Address address, Trace trace, int actionDelayMillis,
        Originator originator ) {
        super ( trace, address, actionDelayMillis );
        this.address = address;
        this.originator = originator;
    }

    protected final void metaEvent ( CallEv [] eventList ) {
        for ( int i = 0; i < eventList.length; i++ )
        {
            TerminalConnection tc = null;
            try
            {
                CallEv curEv = eventList[i];

                if ( curEv instanceof CallCtlTermConnRingingEv )
                {
                    tc = ((CallCtlTermConnRingingEv)curEv).getTerminalConnection ();
                    delay ( "answering" );
                    bufPrintln ( "Answering TerminalConnection " + tc );
                    tc.answer ();
                    stopSignal.canStop ();
                }
            }
            catch ( Exception e )
            {
            }
        }
    }
}

```

```

        bufPrintln ( "Caught exception " + e );
        bufPrintln ( "tc = " + tc );
    }
    finally
    {
        flush ();
    }
}

protected final void onStart () {
    stopSignal = new StopSignal ();
}

protected final void onStop () {
    stopSignal.stop ();
    Connection[] connections = address.getConnections ();
    try
    {
        if ( connections != null )
        {
            for (int i = 0; i < connections.length; i++ )
            {
                connections[i].disconnect ();
            }
        }
    }
    catch ( Exception e )
    {
        println ( " Caught Exception " + e );
    }
}

protected final void fireStateChanged () {
    originator.setReceiverState ( state );
}
}

```

## StopSignal.java

```

/** * StopSignal.java
 *
 * Copyright Cisco Systems, Inc.
 *
 */

class StopSignal {
    boolean stopping = false;
    boolean stopped = false;
    synchronized boolean isStopped ()
    {
        return stopped;
    }
    synchronized boolean isStopping ()
    {
        return stopping;
    }
    synchronized void stop ()
    {

```

```
    if ( !stopped )
    {
        stopping = true;
        try
        {
            wait ();
        }
        catch ( InterruptedException e )
        {
        }
    }
}
synchronized void canStop ()
{
    if ( stopping = true )
    {
        stopping = false;
        stopped = true;
        notify ();
    }
}
}
```

## Trace.java

```
/** * Trace.java
 *
 * Copyright Cisco Systems, Inc.
 *
 */
public interface Trace
{
    /**
     * bufPrint (str) puts str in buffer only.
     */
    public void bufPrint ( String string );

    /**
     * print () println () bufPrint and invoke flush ();
     */
    public void print ( String string );
    public void print ( char character );
    public void print ( int integer );
    public void println ( String string );
    public void println ( char character );
    public void println ( int integer );

    /**
     * flush out the buffer.
     */
    public void flush ();
}
```

# TraceWindow.java

```

/** * TraceWindow.java
 *
 * Copyright Cisco Systems, Inc.
 *
 */

import java.awt.*;
import java.awt.event.*;

public class TraceWindow extends Frame implements Trace
{
    TextArea textArea;
    boolean traceEnabled = true;
    StringBuffer buffer = new StringBuffer ();

    public TraceWindow (String name ) {
        super ( name );
        initWindow ();
    }

    public TraceWindow(){
        this("");
    }

    private void initWindow() {
        this.addWindowListener(new WindowAdapter () {
            public void windowClosing(WindowEvent e){dispose
        };}
        );
        textArea = new TextArea();
        setSize(400, 400);
        add(textArea);
        setEnabled(true);
        this.show();
    }

    public final void bufPrint ( String str ) {
        if ( traceEnabled )
        {
            buffer.append ( str );
        }
    }

    public final void print ( String str ) {
        if ( traceEnabled )
        {
            buffer.append ( str );
            flush ();
        }
    }
    public final void print ( char character ) {
        if ( traceEnabled )

```

```

    {
        buffer.append ( character );
        flush ();
    }
}
public final void print ( int integer ) {
    if ( traceEnabled )
    {
        buffer.append ( integer );
        flush ();
    }
}
public final void println ( String str ) {
    if ( traceEnabled )
    {
        print ( str );
        print ( '\n' );
        flush ();
    }
}
public final void println ( char character ) {
    if ( traceEnabled )
    {
        print ( character );
        print ( '\n' );
        flush ();
    }
}
public final void println ( int integer ) {
    if ( traceEnabled )
    {
        print ( integer );
        print ( '\n' );
        flush ();
    }
}

public final void setTrace ( boolean traceEnabled ) {
    this.traceEnabled = traceEnabled;
}

public final void flush () {
    if ( traceEnabled )
    {
        textArea.append ( buffer.toString());
        buffer = new StringBuffer ();
    }
}

public final void clear () {
    textArea.setText("");
}
}
}

```

## Running makecall

To Invoke makecall on the client workstation, from the Windows NT command line, navigate to the **makecall** directory where JTAPI Tools directory was installed and execute the following command:

```
jview makecall <server name> <login> <password> 1000 <device 1> <device2>
```

`<server name>` specifies the hostname or IP address of your Cisco Unified Communications Manager.

`<device1>` and `<device2>` are directory numbers of IP phones. Make sure that the phones are part of the associated devices of a given user as administered in the Cisco Unified Communications Manager's directory administration.

`<login>` and `<password>` apply similarly as administered in the directory.

This will test that you have installed and configured everything correctly. The application will make calls between the two devices with an action delay of 1000 msec until terminated.