



Preparing WebSphere and Tomcat Application Servers for CA Datacom Server

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Abstract

- This session provides an overview of steps and best practices to deploy CA Datacom Server in Apache Tomcat and IBM WebSphere Liberty



Agenda

- DataSource Objects
- JNDI (Java Naming and Directory Interface) naming service
- JDBC Web Application Example
- Apache Tomcat DataSource implementation
- IBM WebSphere Liberty DataSource implementation



DataSource Objects

- Preferred means of getting a connection to a data source
- Provides connection pooling and distributed transactions
 - The DriverManager class does not provide these features
- Additional advantages
 - No longer hard code driver name or JDBC URL in your applications
 - Maintaining code is much simpler
- Naming Package
 - `javax.sql.*`



DataSource Objects (cont'd)

■ DataSource types

- `javax.sql.DataSource`
 - An interface that is a factory for connections to the physical data source that the object represents
- `javax.sql.PoolDataSource`
 - Establish the connection once and use the same connection for multiple requests to improve performance
- `javax.sql.XADataSource`
 - Simply a `ConnectionPoolDataSource` that allows for distributed transactions



JNDI (Java Naming and Directory Index) Naming Service

- Application Programming Interface (API) that provides naming and directory functionality to applications written using the Java™ programming language
 - JNDI enables components to locate other components and resources such as databases
- Naming package
 - `javax.naming.*`
- Context
 - The core interface for looking up, binding/unbinding, renaming objects and creating and destroying subcontexts
 - Must acquire an Initial Context before performing any operation on a naming or directory service:

```
InitialContext ctx = new InitialContext();
```



JNDI (cont'd)

■ Context lookup

- Pass the name of the object you want to retrieve

```
DataSource ds = DataSource) ctx.lookup("java:comp/env/jdbc");
```

■ JNDI subcontexts for connection factories in the Application Server

[Table 31-1](#) describes JNDI subcontexts for connection factories in the Application Server.

Table 31-1 JNDI Subcontexts for Connection Factories

Resource Manager Type	Connection Factory Type	JNDI Subcontext
JDBC	<code>javax.sql.DataSource</code>	<code>java:comp/env/jdbc</code>
JMS	<code>javax.jms.TopicConnectionFactory</code> <code>javax.jms.QueueConnectionFactory</code>	<code>java:comp/env/jms</code>
JavaMail	<code>javax.mail.Session</code>	<code>java:comp/env/mail</code>
URL	<code>java.net.URL</code>	<code>java:comp/env/url</code>
Connector	<code>javax.resource.cci.ConnectionFactory</code>	<code>java:comp/env/eis</code>
JAXR Resource Adapter	<code>javax.xml.registry.ConnectionFactory</code>	<code>java:comp/env/eis/JAXR</code>



JDBC Web Application

```
1  <%@ page import="javax.naming.*,javax.sql.*,java.sql.*, java.util.*, java.io.*" %>
2
3  <html>
4  <head>
7  <body>
8
9  <h1>Datacom Server</h1>
10
11
12  <%
13
14  try{
15
16      InitialContext ctx = new InitialContext();
17      if(ctx == null )
18          throw new Exception("Boom - No Context");
19
20      DataSource ds = (DataSource)ctx.lookup("java:comp/env/jdbc/TestDatacomServer");
21
22      if (ds != null) {
23          String connString = "Not Connected";
24          String colName = "";
25
26          Connection conn = ds.getConnection();
27
28          if(conn != null) {
29              connString = conn.toString();
30          }
31      }
32
33  <%= connString %>
```



JDBC Web Application

```
1  <%@ page import="javax.naming.*,javax.sql.*,java.sql.*, java.util.*, java.io.*" %>
2
3  <html>
4    <head>
5      <title>DatacomServer Test</title>
6    </head>
7    <body>
8
9    <h1>Datacom Server</h1>
10
```

```
18      throw new Exception("Boom - No Context");
19
20      DataSource ds = (DataSource)ctx.lookup("java:comp/env/jdbc/TestDatacomServer");
21
22      if (ds != null) {
23          String connString = "Not Connected";
24          String colName = "";
25
26          Connection conn = ds.getConnection();
27
28          if(conn != null) {
29              connString = conn.toString();
30      }
31
32      <%= connString %>
33
```



JDBC Web Application

```
1 10
2 11
3 12 <%
4 13
5 14 try{
6 15
7 16     InitialContext ctx = new InitialContext();
8 17     if(ctx == null )
9 18         throw new Exception("Boom - No Context");
10 19
11 20     DataSource ds = (DataSource)ctx.lookup("java:comp/env/jdbc/TestDatacomServer");
12 21
13 22     if (ds != null) {
14 23         String connString = "Not Connected";
15 24         String colName = "";
16 25
17 26         Connection conn = ds.getConnection();
18 27
19 28         if(conn != null) {
20 29             connString = conn.toString();
21 30
22 31     }
23 32
24 33     Datasource Connection: <%= connString %>
```



JDBC Web Application (cont'd)

```
31
32 Datasource Connection: <%= connString %>
33
34 <form method="POST">
35   <br/>
36   Enter a Query: <input type="text" name="Query">
37   <input type="submit" value="Submit" />
38 </form>
39
40 <%
41   String query = "";
42   query = request.getParameter("Query");
43   if (query != null) {
44
45
46   %>
47
48
49 <%
50   Statement stmt = conn.createStatement();
51   ResultSet rst = stmt.executeQuery(query);
52   ResultSetMetaData rsmd = rst.getMetaData();
53   int columnsNumber = rsmd.getColumnCount();
54   %>
55
56 Results: <br/> <br/>
57
```



JDBC Web Application (cont'd)

```
31
32 Datasource Connection: <%= connString %>
33
34 <form method="POST">
35     <br/>
36     Enter a Query: <input type="text" name="Query">
37     <input type="submit" value="Submit" />
38 </form>
39
40 <%
41
42     String query = "";
43     query = request.getParameter("Query");
44     if (query != null) {
45
46     %>
```

```
56 Results: <br/> <br/>
57
```



JDBC Web Application (cont'd)

31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46

47
48
49
50
51
52
53
54
55
56
57

<%

```
Statement stmt = conn.createStatement();  
ResultSet rst = stmt.executeQuery(query);  
ResultSetMetaData rsmd = rst.getMetaData();  
int columnsNumber = rsmd.getColumnCount();
```

%>

Results:

%>

Results:



JDBC Web Application (cont'd)

```
56 Results: <br/> <br/>
57
58 <%
59     while (rst.next())
60     {
61         for(int i=1; i <= columnsNumber; i++)
62         {
63             colName = rsmd.getColumnName(i);
64         }
65     }
66     out.println(rsmd.getColumnName(i) + " = " + rst.getString(i)); %> <br/>
67
68 <%
69     }
70 %>
71 <br/><br/>
72 <%
73     }
74     rst.close();
75     stmt.close();
76 }
77 conn.close();
78 }
79 }
80 } catch (Exception e) {
81     e.printStackTrace();
82 }
83 %>
```



JDBC Web Application (cont'd)

```
56
57 while (rst.next())
58 {
59     for(int i=1; i <= columnsNumber; i++)
60     {
61         colName = rsmd.getColumnName(i);
62
63
64
65         out.println(rsmd.getColumnName(i) + " = " + rst.getString(i)); %> <br/>
66
67
68     }
69
70
71
72
73 }
74     rst.close();
75     stmt.close();
76 }
77     conn.close();
78 }
79 }
80 } catch (Exception e) {
81     e.printStackTrace();
82 }
83 %>
```



JDBC Web Application (cont'd)

```
56
57 while (rst.next())
58 {
59     for(int i=1; i <= columnsNumber; i++)
60     {
61         colName = rsmd.getColumnName(i);
62
63
64
65         out.println(rsmd.getColumnName(i) + " = " + rst.getString(i)); %> <br/>
66
67
68     }
69
70
71     }
72     rst.close();
73     stmt.close();
74
75     }
76     conn.close();
77
78 }
79
80 } catch (Exception e) {
81     e.printStackTrace();
82
83 }
```



JDBC Web Application (cont'd)

```
84
85
86 <br/>
87 
88
89
90 </body>
91 </html>
```



Apache Tomcat DataSource Implementation

- Configure META-INF/Context.xml

```
1  <Context>
2
28
29
30  <Resource name="jdbc/TestDatacomServer" auth="Container" type="javax.sql.DataSource"
31          maxTotal="100" maxIdle="30" maxWaitMillis="10000"
32          username="" password="" driverClassName="ca.datacom.jdbc.DatacomJdbcDriver"
33          url="jdbc:datacom://USILCA11:6567/ServerName=CTC_2016_SERVER_R15"/>
34
35  </Context>
```

Note: The CA Datacom Server jar file (cadcjdbc.jar) is located in the Apache Tomcat /lib directory.



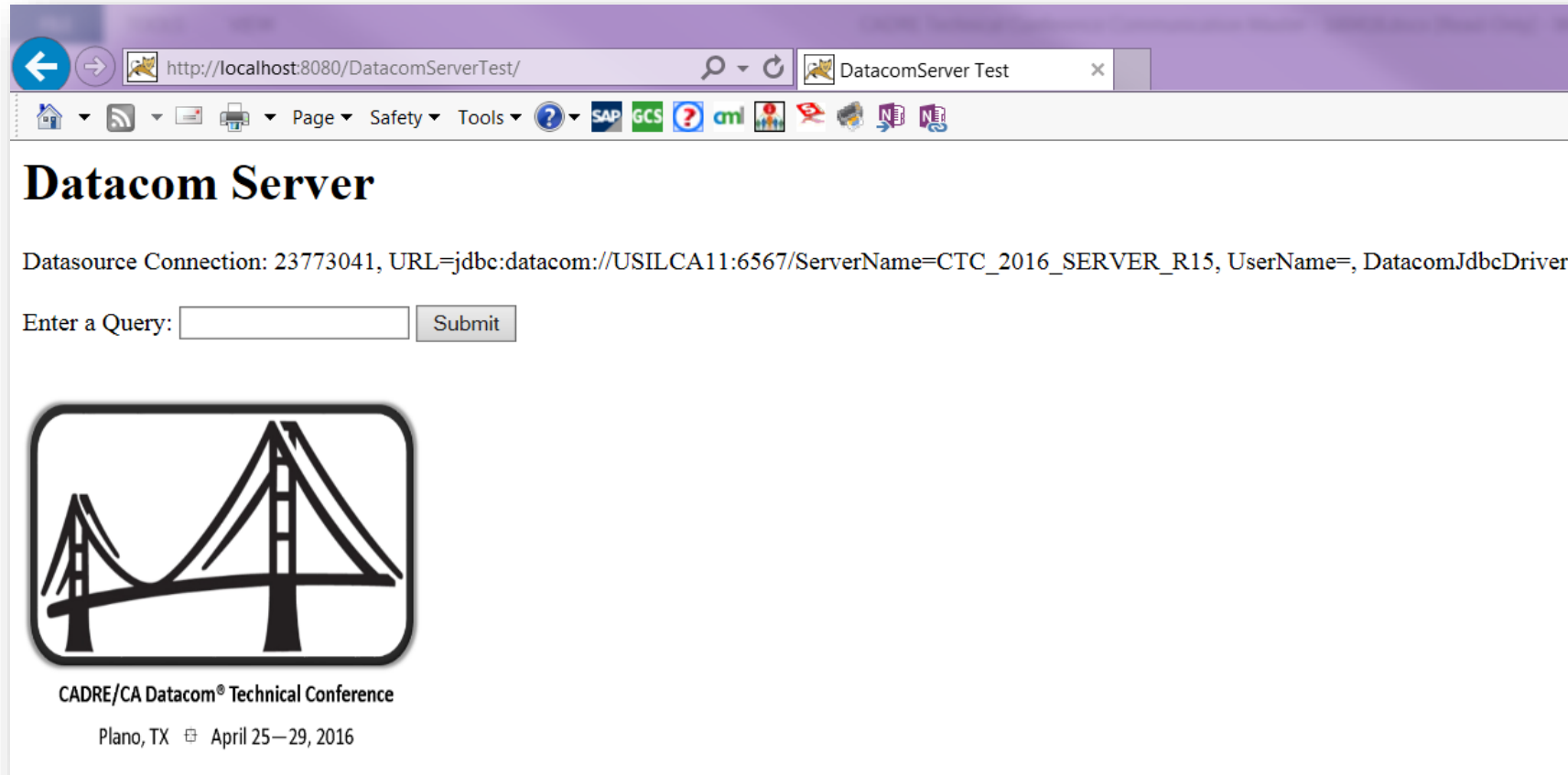
Apache Tomcat DataSource Implementation

- Configure WEB-INF/web.xml

```
1 <web-app xmlns="http://java.sun.com/xml/ns/j2ee"  
2     xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"  
3     xsi:schemaLocation="http://java.sun.com/xml/ns/j2ee  
4     http://java.sun.com/xml/ns/j2ee/web-app_2_4.xsd"  
5     version="2.4">  
6     <description>Datacom Server Test App</description>  
7     <resource-ref>  
8         <description>DB Connection</description>  
9         <res-ref-name>jdbc/TestDatacomServer</res-ref-name>  
10        <res-type>javax.sql.DataSource</res-type>  
11        <res-auth>Container</res-auth>  
12    </resource-ref>  
13  
14 </web-app>
```



Demo of Apache Tomcat



IBM WebSphere Liberty Implementation

■ Configure server.xml

```
server.xml
1 <!--
2 COPYRIGHT LICENSE: This information contains sample code provided in source code form.
3 You may copy, modify, and distribute these sample programs in any form without payment
4 to IBM for the purposes of developing, using, marketing or distributing application
5 programs conforming to the application programming interface for the operating platform
6 for which the sample code is written.
7
8 Notwithstanding anything to the contrary, IBM PROVIDES THE SAMPLE SOURCE CODE ON
9 AN "AS IS" BASIS AND IBM DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING,
10 BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY,
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14 THE SAMPLE SOURCE CODE. IBM HAS NO OBLIGATION TO PROVIDE MAINTENANCE, SUPPORT,
15 UPDATES, ENHANCEMENTS OR MODIFICATIONS TO THE SAMPLE SOURCE CODE.
16
17 (C) Copyright IBM Corp. 2001, 2012.
18 All Rights Reserved. Licensed Materials - Property of IBM.
19 -->
20 <server description="Sample Server for JDBC">
21
22     <!-- Enable features -->
23     <featureManager>
24         <feature>servlet-3.0</feature>
25         <feature>jdbc-4.1</feature>
26         <feature>jndi-1.0</feature>
27         <feature>jsp-2.2</feature>
28     </featureManager>
29
30     <httpEndpoint id="defaultHttpEndpoint" httpPort="9121" httpsPort="9444"/>
31
32     <application id="datacomServerTestApp" location="{server.config.dir}/apps/datacomServer.war" type="war" name="datacomServer" context-root="datacomServer"/>
33     <include location="myConfigDir/myds.xml"/>
34
35 </server>
36
```



IBM WebSphere Liberty Implementation

■ Configure server.xml

```
server.xml
1 <!--
2 COPYRIGHT LICENSE: This information contains sample code provided in source code form.
3 You may copy, modify, and distribute these sample programs in any form without payment
4 -->
20 <server description="Sample Server for JDBC">
21
22   <!-- Enable features -->
23   <featureManager>
24     <feature>servlet-3.0</feature>
25     <feature>jdbc-4.1</feature>
26     <feature>indi-1.0</feature>
27     <feature>jsp-2.2</feature>
28   </featureManager>
29
30   <httpEndpoint id="defaultHttpEndpoint" httpPort="9121" httpsPort="9444"/>
31
32   <application id="datacomServerTestApp" location="${server.config.dir}/apps/datacomServer.war" type="war" name="datacomServer" context-root="datacomServer"/>
33   <include location="myConfigDir/myds.xml"/>
34
35 </server>
36
```

```

27     <feature>jsp-2.2</feature>
28   </featureManager>
29
30   <httpEndpoint id="defaultHttpEndpoint" httpPort="9121" httpsPort="9444"/>
31
32   <application id="datacomServerTestApp" location="${server.config.dir}/apps/datacomServer.war" type="war" name="datacomServer" context-root="datacomServer"/>
33   <include location="myConfigDir/myds.xml"/>
34
35 </server>
36
```



IBM WebSphere Liberty implementation

■ Configure myds.xml

```
myds.xml
1 <server>
2   <include location="${shared.config.dir}/JDBCDatacomServerLibs.xml"/>
3   <jdbcDriver id="DatacomServerEmbedded" libraryRef="JDBCDatacomServerLibs" javax.sql.DataSource="ca.datacom.jdbc.DatacomDataSource"/>
4   <dataSource id="ds1" jndiName="jdbc/TestDatacomServer" jdbcDriverRef="DatacomServerEmbedded" type="javax.sql.DataSource">
5     <properties proxyName="USILCA11" hostPort="6567" networkProtocol="TCP" serverName="CTC_2016_SERVER_R15"></properties>
6   </dataSource>
7   <featureManager>
8     <feature>jndi-1.0</feature>
9     <feature>jdbc-4.1</feature>
10    <feature>localConnector-1.0</feature>
11  </featureManager>
12 </server>
13
```



IBM WebSphere Liberty implementation

■ Configure myds.xml

```
myds.xml
1 <server>
2   <include location="${shared.config.dir}/JDBCDatacomServerLibs.xml"/>
3   <jdbcDriver id="DatacomServerEmbedded" libraryRef="JDBCDatacomServerLibs" javax.sql.DataSource="ca.datacom.jdbc.DatacomDataSource"/>
4   <dataSource id="ds1" jndiName="jdbc/TestDatacomServer" jdbcDriverRef="DatacomServerEmbedded" type="javax.sql.DataSource">
5     <properties proxyName="USILCA11" hostPort="6567" networkProtocol="TCP" serverName="CTC_2016_SERVER_R15"></properties>
6   </dataSource>
7   <featureManager>
8     <feature>jndi-
9     <feature>jdbc-
10    <feature>local
11  </featureManager>
12 </server>
13
```

When using connection pooling, you may define the jdbcDriver property as:
javax.sql.ConnectionPoolDataSource = "ca.Datacom.jdbc.DatacomConnectionPoolDataSource"

Note: Your Java web application will need to use the ConnectionPoolDataSource and PooledConnection objects



IBM WebSphere Liberty Implementation

- Configure WEB-INF/ibm-web-bnd.xml

```
1 <web-bnd
2     xmlns="http://websphere.ibm.com/xml/ns/javaee"
3     xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
4     xsi:schemaLocation="http://websphere.ibm.com/xml/ns/javaee
5                         http://websphere.ibm.com/xml/ns/javaee/ibm-web-bnd_1_0.xsd"
6     version="1.0">
7     <virtual-host name="default_host"/>
8     <resource-ref name="jdbc/TestDatacomServer" binding-name="jdbc/TestDatacomServer"/>
9 </web-bnd>
10
```



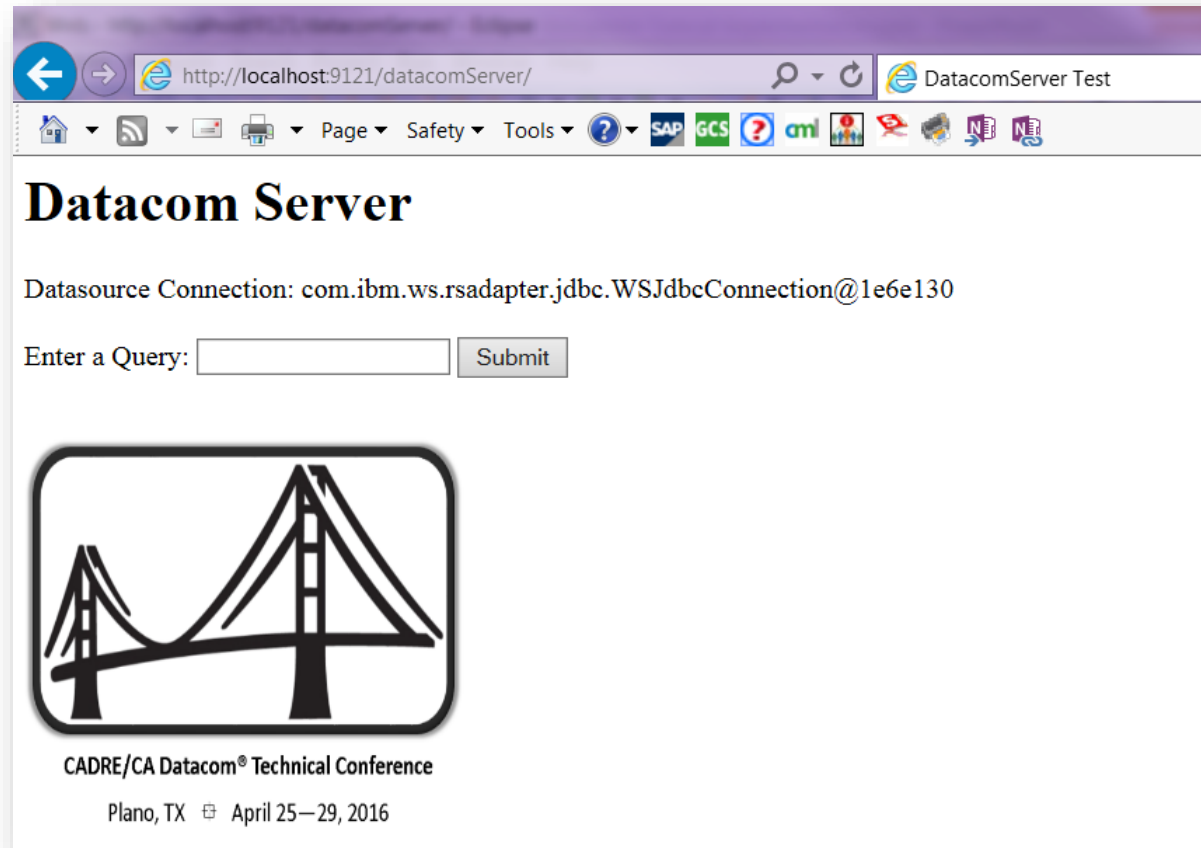
IBM WebSphere Liberty implementation

■ Configure WEB-INF/web.xml

```
1 <web-app xmlns="http://java.sun.com/xml/ns/j2ee"
2         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
3         xsi:schemaLocation="http://java.sun.com/xml/ns/j2ee
4         http://java.sun.com/xml/ns/j2ee/web-app_2_4.xsd"
5         version="2.4">
6
7     <resource-ref>
8         <description>DB Connection</description>
9         <res-ref-name>jdbc/TestDatacomServer</res-ref-name>
10        <res-type>javax.sql.DataSource</res-type>
11        <res-auth>Container</res-auth>
12    </resource-ref>
13
14 </web-app>
15
```



Demo of IBM WebSphere Liberty



References

- **The Java™ Tutorials – Connecting with DataSource Objects**
<http://docs.oracle.com/javase/tutorial/jdbc/basics/sqldatasources.html>
- **The Java™ Tutorials – JNDI Naming**
<http://docs.oracle.com/javaee/1.4/tutorial/doc/Resources2.html>
- **Apache Tomcat 8 – JNDI Datasource How-To**
<http://tomcat.apache.org/tomcat-8.0-doc/jndi-datasource-examples-howto.html>
- **IBM WebSphere Liberty – Using Liberty as an Application development Environment**
http://www.ibm.com/support/knowledgecenter/SSEQTP_8.5.5/com.ibm.websphere.wlp.doc/ae/thread_twlp_devenv.html?cp=SSEQTP_8.5.5%2F1-3-11-0
- **CA Datacom Tools - 15.0 – Working with Datacom Server**
<http://docops.ca.com/ca-datacom-tools/15-0/en/working-with-datacom-server>



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