



BEA Tuxedo

Using the BEA Tuxedo Workstation Component

BEA Tuxedo Release 7.1
Document Edition 7.1
May 2000

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Using the BEA Tuxedo Workstation Component

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About This Document

This document explains what the BEA Tuxedo Workstation component is, how to use the Workstation component in UNIX and Windows environments, and how to bring up the `bankapp` sample application on a workstation.

This document covers the following topics:

- Chapter 1, “Overview of Workstation,” provides a brief overview of the workstation component.
- Chapter 2, “Using the Workstation Component,” provides information on writing workstation client programs, using BEA Tuxedo System-supplied clients, and running BEA Tuxedo system clients on a workstation.
- Chapter 3, “Workstation for Windows,” describes the use of the BEA Tuxedo Workstation for Windows platforms.
- Chapter 4, “Bringing Up `bankapp` on Workstations,” describes the steps to follow in bringing up `bankapp`, the BEA Tuxedo system sample application, on a UNIX or Windows workstation.

What You Need to Know

This document is intended mainly for application developers who are interested in using the Workstation component in their applications. It provides an overview of the Workstation component, how to write and build client programs using the Workstation component, and how to bring up the `bankapp` application on a workstation.

e-docs Web Site

BEA product documentation is available on the BEA corporate Web site. From the BEA Home page, click on Product Documentation or go directly to the “e-docs” Product Documentation page at <http://www.e-docs.bea.com>.

How to Print the Document

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A PDF version of this document is available on the BEA Tuxedo documentation Home page on the e-docs Web site (and also on the documentation CD). You can open the PDF in Adobe Acrobat Reader and print the entire document (or a portion of it) in book format. To access the PDFs, open the BEA Tuxedo documentation Home page, click the PDF files button and select the document you want to print.

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In your e-mail message, please indicate that you are using the documentation for the BEA Tuxedo 7.1 release.

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When contacting Customer Support, be prepared to provide the following information:

- Your name, e-mail address, phone number, and fax number
- Your company name and company address
- Your machine type and authorization codes
- The name and version of the product you are using
- A description of the problem and the content of pertinent error messages

Documentation Conventions

The following documentation conventions are used throughout this document.

Convention	Item
boldface text	Indicates terms defined in the glossary.
Ctrl+Tab	Indicates that you must press two or more keys simultaneously.
<i>italics</i>	Indicates emphasis or book titles.

Convention	Item
monospace text	<p>Indicates code samples, commands and their options, data structures and their members, data types, directories, and file names and their extensions. Monospace text also indicates text that you must enter from the keyboard.</p> <p><i>Examples:</i></p> <pre>#include <iostream.h> void main () the pointer psz chmod u+w * \tux\data\ap .doc tux.doc BITMAP float</pre>
monospace boldface text	<p>Identifies significant words in code.</p> <p><i>Example:</i></p> <pre>void commit ()</pre>
<i>monospace italic text</i>	<p>Identifies variables in code.</p> <p><i>Example:</i></p> <pre>String <i>expr</i></pre>
UPPERCASE TEXT	<p>Indicates device names, environment variables, and logical operators.</p> <p><i>Examples:</i></p> <pre>LPT1 SIGNON OR</pre>
{ }	<p>Indicates a set of choices in a syntax line. The braces themselves should never be typed.</p>
[]	<p>Indicates optional items in a syntax line. The brackets themselves should never be typed.</p> <p><i>Example:</i></p> <pre>buildobjclient [-v] [-o name] [-f file-list]... [-l file-list]...</pre>
	<p>Separates mutually exclusive choices in a syntax line. The symbol itself should never be typed.</p>

Convention	Item
...	<p>Indicates one of the following in a command line:</p> <ul style="list-style-type: none">■ That an argument can be repeated several times in a command line■ That the statement omits additional optional arguments■ That you can enter additional parameters, values, or other information <p>The ellipsis itself should never be typed.</p> <p><i>Example:</i></p> <pre>buildobjclient [-v] [-o name] [-f file-list]... [-l file-list]...</pre>
. . . .	<p>Indicates the omission of items from a code example or from a syntax line. The vertical ellipsis itself should never be typed.</p>



1 Overview of Workstation

- What Is the BEA Tuxedo Workstation Component
- Workstation Administration

What Is the BEA Tuxedo Workstation Component

The Workstation component of the BEA Tuxedo system allows application clients to reside on a machine that does not have a full server-side installation, that is, a machine that does not support any administration or application servers. All communication between the client and the application servers takes place over the network.

A Workstation client process can run on a Windows or UNIX platform. The client has access to the ATMI. The networking behind requests is transparent to the user. A Workstation client does not have access to all the capabilities available to a native client. Both types of clients, however, can do the following:

- Send and receive messages
- Begin, end, or commit transactions
- Send and receive unsolicited messages
- Meet application security requirements

1 Overview of Workstation

- Communicate information about remote clients through the `tmadmin(1)` command

Note: A Workstation client communicates with application servers through a Workstation Handler (WSH) process.

Limitations of Workstation Clients

Workstation clients do not have access to all the functionality available to native clients. For example, unlike a native client, a Workstation client cannot join an application as `tpsadm`, which means that the client cannot subsequently subscribe to an event that issues a service call.

See Also

- “Workstation Connectivity: Using BEA Tuxedo Workstation” on page 4-26 in *Introducing the BEA Tuxedo System*
- “What Are the Workstation Handler and Workstation Listener” on page 3-62 in *Introducing the BEA Tuxedo System*
- “About Workstation Clients” on page 9-1 in *Setting Up a BEA Tuxedo Application*

Workstation Administration

To integrate a workstation client into a BEA Tuxedo application, you must define any required and desired parameters for that client in the application configuration file. See “Setting Up Workstation Clients” on page 10-1 in *Setting Up a BEA Tuxedo Application* for details.

See Also

- `buildwsh(1)` in *BEA Tuxedo Command Reference*
- `WSL(5)` in *BEA Tuxedo File Formats and Data Descriptions Reference*

1 *Overview of Workstation*

2 Using the Workstation Component

- Writing Client Programs
- Using BEA Tuxedo System-supplied Clients
- Running BEA Tuxedo System Clients on a Workstation
- How a Multithreaded or Multicontexted Workstation Client Joins an Application

Writing Client Programs

You can develop client programs targeted for workstations in the same way that you would develop client programs within the BEA Tuxedo system administrative domain (that is, native clients). All of the ATMI and FML functions are available to the Workstation client.

Interoperability Restrictions for Workstation Clients

Interoperability between BEA Tuxedo Release 7.1 Workstation clients and applications based on pre-7.1 releases of the BEA Tuxedo system is supported in any of the following situations:

- The client is neither multithreaded nor multicontexted.

- The client is multicontexted.
- The client is multithreaded and each thread is in a different context

A BEA Tuxedo Release 7.1 Workstation client with multiple threads in a single context cannot interoperate with a pre-7.1 release of the BEA Tuxedo system.

Building Client Programs

You compile and link-edit Workstation client programs using the `buildclient(1)` command. If you are building a Workstation client on a native node (that is, one on which the complete BEA Tuxedo system is installed), use the `-w` option to indicate the client should be built using the workstation libraries. Otherwise, on a native node, where both native and workstation libraries are present, the default is to use the native libraries. In this case, using the `-w` option ensures that the correct libraries for a workstation client are used. On a workstation, where only the workstation libraries are present, it is not necessary to use the `-w` option.

The following listing shows an example of the `buildclient(1)` command line on a native node.

Listing 2-1 `buildclient` Command Line

```
TUXDIR=/var/opt/tuxedo CC=ncc; export TUXDIR CC
buildclient -w -o wsclt -f wsclt.c -f "userlib1.a userlib2.a"
```

The `-o` option provides a name for your output file. Input files are specified with the `-f firstfiles` option to indicate that they are link-edited before system libraries. As indicated in the example, you must define the `TUXDIR` environment variable to ensure that the `buildclient` command can locate system libraries. `CC` defaults to `cc` but can be set to another compiler, as shown in the example.

See Also

- “Writing Clients” on page 4-1 in *Programming a BEA Tuxedo Application Using C* and *Programming a BEA Tuxedo Application Using COBOL*
- “COBOL Language Bindings for the Workstation Component” on page 12-1 in *Programming a BEA Tuxedo Application Using COBOL*
- “Writing Security Code So Client Programs Can Join the Application” on page 3-4 in *Using BEA Tuxedo Security*
- `buildclient(1)` in *BEA Tuxedo Command Reference*

Using BEA Tuxedo System-supplied Clients

`wud` and `wud32` are BEA Tuxedo system-supplied driver programs provided for workstations. These driver programs are based on the standard BEA Tuxedo client programs, `ud` and `ud32`, that have been built using the Workstation libraries.

Use `wud(1)` to send FML buffers to BEA Tuxedo system servers. Use `wud32` with fielded FML32 buffers of type `FBFR32`.

Using wud in a Security Application

If `wud` is run in a security application, it requires an application password to access the application. If standard input is from a terminal, `wud` prompts the user for an application password. If you are running the client program from a script, which is a common occurrence with `wud`, the password is retrieved from the environment variable `APP_PW`. If this environment variable is not specified and an application password is required, then `wud` fails.

Do not confuse the `APP_PW` environment variable with the similar configuration file parameter, `SECURITY`, for which the value `APP_PW` enables the security feature.

See Also

- `ud`, `wud(1)` in *BEA Tuxedo Command Reference*

Running BEA Tuxedo System Clients on a Workstation

After the client programs have been developed and tested, they can be moved to the workstations where they will be available to users.

Verifying the Directory Structure on Workstation Clients

The following table describes the directory structure on a Workstation client after you have installed the Workstation component of the BEA Tuxedo system.

UNIX Directory	Windows Directory	Description
<code>\$APPDIR</code>	<code>%APPDIR%</code>	Contains the client executables. These executables are commonly kept in the directory from which the application is run.
<code>\$TUXDIR/bin</code>	<code>%TUXDIR%\bin</code>	Contains BEA Tuxedo system commands and system clients such as <code>wud</code> .
<code>\$TUXDIR/cobinclude</code>	<code>%TUXDIR%\cobinclude</code>	Contains <code>copylib</code> entries for use in COBOL programs.
<code>\$TUXDIR/include</code>	<code>%TUXDIR%\include</code>	Contains BEA Tuxedo system header files such as <code>atmi.h</code> .
<code>\$TUXDIR/lib</code>	<code>%TUXDIR%\lib</code>	Contains runtime libraries.
<code>\$TUXDIR/locale/C</code>	<code>%TUXDIR%\locale\C</code>	Contains message catalogs for the default locale (U.S. English).

UNIX Directory	Windows Directory	Description
\$TUXDIR/samples	%TUXDIR%\samples	Contains several subdirectories with sample applications.

Setting Environment Variables

Workstation clients make use of several environment variables. The following table shows the environment variables that are checked by `tpinit(3c)` or `TPINITIALIZE(3cbl)` when the workstation client attempts to join the application. See “Defining Workstation Clients” on page 10-1 in *Setting Up a BEA Tuxedo Application* for details on setting these environment variables.

Environment Variable	Description
WSALLOWPRE71	Determines whether the workstation machine running BEA Tuxedo 7.1 or later software is allowed to interoperate with pre-Release 7.1 BEA Tuxedo applications. Setting the variable to Y (<code>WSALLOWPRE71=Y</code>) allows interoperability.
WSBUFFERS	The number of packets per application.
WSDEVICE	Device name to be used to access the network. This variable is only required when the BEA Tuxedo system is using the TLI networking interface.
WSENVFILE	Name of a file containing environment variable settings to be set in the client’s environment.
WSFADDR	The network address used by the workstation client when connecting to the workstation listener or workstation handler. This variable, along with the <code>WSFRANGE</code> variable, determines the range of TCP/IP ports to which a workstation client will attempt to bind before making an outbound connection. This address must be a TCP/IP address.
WSFRANGE	The range of TCP/IP ports to which a workstation client process attempts to bind before making an outbound connection. The <code>WSFADDR</code> parameter specifies the base address of the range. The default is 1.

Environment Variable	Description
WSNADDR	The network address of the workstation listener (WSL) process through which clients gain access to the application. Use the value specified in the application configuration file for the workstation listener to be called. If the value begins with the characters 0x, the system interprets it as a string of hexadecimal digits; otherwise, the system interprets it as ASCII characters.
WSRPLYMAX	Maximum amount of core memory that ATMI functions use for buffering application replies before they are dumped to disk. Used by <code>tpinit(3c)</code> and <code>TPINITIALIZE(3cbl)</code> . Replies obtained using <code>tpgetrply(3c)</code> , <code>TPGETRPLY(3cbl)</code> , and unsolicited messages are buffered in this area. When this area is filled with one or more messages, the overflow is written to a disk file. The system default limit is 256,000 bytes. Whether you use <code>WSRPLYMAX</code> to set a lower limit depends on the amount of available memory on your machine. Writing replies to disk causes a substantial reduction in performance.
WSTYPE	Workstation type. Used within <code>tpinit(3c)</code> and <code>TPINITIALIZE(3cbl)</code> when invoked by a workstation client to negotiate encode/decode responsibilities with the native site. If you do not specify <code>WSTYPE</code> , the system performs encoding, even if it is also unspecified on the native site. You must explicitly specify the same <code>WSTYPE</code> value for both sites to ensure that the encode/decode feature is turned off.

Other environment variables may be needed by Workstation clients on a UNIX workstation depending on the BEA Tuxedo system features being used. The `compilation(5)` reference page in *BEA Tuxedo File Formats and Data Descriptions Reference* explains which variables are needed under what circumstances.

Creating an Environment File

If you have created an environment file, it is read when `tpinit(3c)` or `TPINITIALIZE(3cbl)` is called. The following listing shows a sample file that could be used for two different applications.

Listing 2-2 Environment File

```
TUXDIR=/opt/tuxedo
[application1]
;this is a comment
/* this is a comment */
#this is a comment
//this is a comment
set FIELDTBLS=appl_flds
set FLDTBLDIR=/opt/app1/udataobj
[application2]
FIELDTBLS=app2_flds
FLDTBLDIR=/opt/app2/udataobj
```

The format of the file is as follows:

- Any leading space and tab characters on each line are ignored and are not considered in the following points.
- Lines containing variables to be put into the environment are of the following form:

```
variable=value
or
set variable=value
```

where *variable* must begin with an alphabetic or underscore character and contain only alphanumeric or underscore characters, and *value* may contain any character except newline.
- Within the *value*, strings of the form $\${env}$ are expanded using variables already in the environment. Forward referencing is not supported and if a value is not set, the variable is replaced with the empty string. Backslash (\) may be used to escape the dollar sign and itself. All other shell quoting and escape mechanisms are ignored and the expanded *value* is placed into the environment.
- Lines beginning with slash (/), pound sign (#), or exclamation point (!) are treated as comments and ignored. Lines beginning with other characters besides these comment characters, a left square bracket, or an alphabetic or underscore character are reserved for future use; their use is undefined.
- The file is partitioned into sections by lines of the form

```
[label]
```

where *label* is the name of the section and follows the same rules for *variable* above. The label is silently truncated if longer than 31 characters.

- Variable lines between the top of the file and the first label are put into the environment for all applications; this is the global section. A label of [] also indicates the global section. Other variables are put into the environment only if the label matches the application label specified for the application.

Using tuxreadenv

When you call the `tuxreadenv(3c)` function, it reads the environment file and adds the environment variables to the environment for the entire process, independent of platform. These variables are available using `tuxgetenv(3c)` and can be reset using `tuxputenv(3c)`.

```
void tuxreadenv(char *file, char *label)
```

If *file* is NULL, then a default file name is used. The default file names for various platforms are as follows:

- Windows: %TUXDIR%\TUXEDO.ENV
- UNIX: \$TUXDIR/TUXEDO.env

If the value of *label* is NULL, then only variables in the global section are put into the environment. For other values of *label*, the global section variables plus any variables in a section matching the *label* are put into the environment.

An error message is printed to the userlog under the following conditions:

- a memory failure
- a non-null file name does not exist
- a non-null label does not exist

Each time `tpinit(3c)` is called (either explicitly or implicitly by calling another ATMI function), `tuxreadenv(3c)` is called automatically in Workstation clients. If `WSENVFILE` is set in the environment, then it designates the environment file; otherwise, NULL is passed to `tuxreadenv()` for the file name so that the default file

is used. If `WSAPP` is set in the environment, then it is to be used as the section label in the environment file; otherwise, `NULL` is passed to `tuxreadenv()` for the label name. Application clients may also call `tuxreadenv()` explicitly.

The environment is implemented and available in different ways on different platforms. A uniform interface to the environment is provided via the existing `tuxgetenv(3c)` and `tuxputenv(3c)` functions. These functions provide access to the following:

- All variables from the specified `WSENVFILE` file for the specified `WSAPP` label (or the defaults if not specified)
- The environment variables in the operating system environment

See Also

- `tpinit(3c)` in *BEA Tuxedo C Function Reference*
- `tuxreadenv(3c)` in *BEA Tuxedo C Function Reference*

How a Multithreaded or Multicontexted Workstation Client Joins an Application

To join a BEA Tuxedo application, a multithreaded workstation client must always call `tpinit()` with the `TPMULTICONTEXTS` flag set, even if the client is running in single-context mode.

See Also

- `tpinit(3c)` in *BEA Tuxedo C Function Reference*

2 *Using the Workstation Component*

3 Workstation for Windows

- Benefits of Using Workstation on a Windows Platform
- Software Prerequisites
- Writing Client Programs
- How a Multithreaded or Multicontexted Workstation Client Joins an Application

Benefits of Using Workstation on a Windows Platform

The Windows instantiation of Workstation offers significant benefits to application developers:

- Executable text is shared among applications, saving memory.
- BEA Tuxedo Workstation upgrades are possible without relinking or modifying an application program's executable file.
- Dynamic linking permits interpretive graphical application generator tools (such as Visual Basic, ObjectVision and SQLWindows) to call BEA Tuxedo system services.

Note: All references to Windows apply to Windows 95, Windows 98, and Windows NT.

Software Prerequisites

The software prerequisites for running the Workstation component for Windows are as follows:

- Workstation for Windows runs under the Windows 95, Windows 98 and Windows NT operating systems.
- In Windows, the native TCP/IP stack is used.
- In Windows, while using TCP/IP any Windows Sockets Compliant TCP/IP stack can be used.
- The server machine must have the BEA Tuxedo system and the native-side BEA Tuxedo Workstation installed.

Writing Client Programs

You can develop client programs targeted for Windows workstations in the same way that you would develop native client programs within the BEA Tuxedo system administrative domain. All of the ATMI functions are available.

Interoperability Restrictions for Workstation Clients

Interoperability between BEA Tuxedo Release 7.1 Workstation clients and applications based on pre-7.1 releases of the BEA Tuxedo system is supported in any of the following situations:

- The client is neither multithreaded nor multicontexted.
- The client is multicontexted.
- The client is multithreaded and each thread is in a different context

A BEA Tuxedo Release 7.1 Workstation client with multiple threads in a single context cannot interoperate with a pre-7.1 release of the BEA Tuxedo system.

Building Client Programs

To compile client programs written in C, you can use any compiler that can read Microsoft C import libraries. To compile COBOL source programs that call the ATMI, use the `LITLINK` option of the COBOL compiler. For details, see “COBOL Language Bindings for the Workstation Component” on page 12-1 in *Programming a BEA Tuxedo Application Using COBOL*.

Use `buildclient(1)` with the `-w` flag to link-edit your client programs.

You can also build BEA Tuxedo clients without using the `buildclient(1)` utility. If you are using Microsoft Visual C++ projects, use the following settings:

- Set the Preprocessor option to `-DWIN32`
- Add `WTUXWS32.LIB MSVCRT.LIB` to the input libraries for the linker option.

In addition, set the `INCLUDE`, `LIB`, and `PATH` search directories appropriately.

Runtime

When you run client programs, your `PATH` must include `%TUXDIR%\bin`.

Limitations

The BEA Tuxedo libraries (DLLs) prior to BEA Tuxedo Release 7.1 are not thread-safe. For applications written using the pre-Release 7.1 DLLs, threads should not be used; otherwise, threaded access is serialized through all BEA Tuxedo calls (such as `ATMI`, `FML`, `userlog()`, and so on).

See Also

- “Writing Clients” on page 4-1 in *Programming a BEA Tuxedo Application Using C* or *Programming a BEA Tuxedo Application Using COBOL*

- “COBOL Language Bindings for the Workstation Component” on page 12-1 in *Programming a BEA Tuxedo Application Using COBOL*
- “Writing Security Code So Client Programs Can Join the Application” on page 3-4 in *Using BEA Tuxedo Security*
- `buildclient(1)` in *BEA Tuxedo Command Reference*

How a Multithreaded or Multicontexted Workstation Client Joins an Application

To join a BEA Tuxedo application, a multithreaded workstation client must always call `tpinit(3c)` with the `TPMULTICONTEXTS` flag set, even if the client is running in single-context mode.

See Also

- `tpinit(3c)` in *BEA Tuxedo C Function Reference*

4 Bringing Up bankapp on Workstations

- Characteristics of a Workstation Application
- Bringing Up bankapp on a Workstation Client
- Changes on the Native Site
- Setting the bankapp Variables
- Building the bankapp Client
- Running the bankapp Client

Characteristics of a Workstation Application

In a workstation application, client processes are moved off the native site. The listener process (WSL) runs with a well-known network address and starts surrogate workstation handlers (WSH) as needed. Servers run on one or more machines within the BEA Tuxedo administrative domain.

Existing servers are available to run on the BEA Tuxedo system nodes in either single processor (SHM) or multiprocessor (MP) mode.

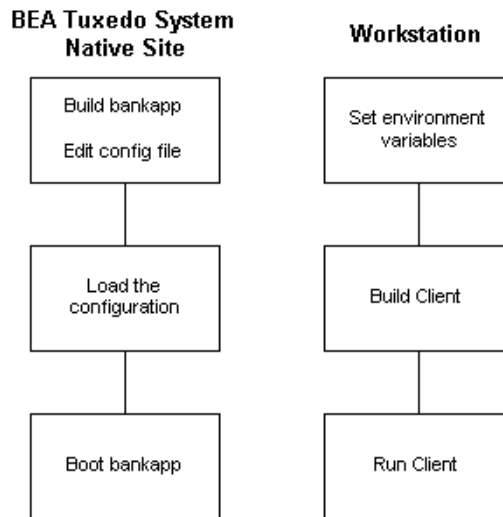
On Workstations, the sample applications are located in the following directories:

- `$TUXDIR/samples/atmi/bankapp` (UNIX)
- `%TUXDIR%\samples\atmi\bankapp` (Windows)

Bringing Up bankapp on a Workstation Client

The following illustration shows the steps in the process of bringing up bankapp on a Workstation client.

Figure 4-1 Steps in bringing up bankapp



Changes on the Native Site

Install and build the bankapp software on the native site. The procedure for doing this is described in “Tutorial for bankapp, a Full C Application” on page 3-1 in *Tutorials for Developing a BEA Tuxedo Application* and in the following README files on the master machine where you BEA Tuxedo system software is installed:

- `$TUXDIR/samples/atmi/bankapp/README` (on UNIX systems)
- `%TUXDIR%\samples\atmi\bankapp\README.nt` (on Windows systems)

Editing the Configuration File

You need to edit the configuration file you plan to use (either `ubbshm` or `ubbmp`) to specify the workstation listener (WSL) as a server in the `GROUPS` and `SERVERS` sections, and to specify `MAXWSCLIENTS` in the `MACHINES` section. When you edit the `GROUPS` section, put the entry for `WSGRP` ahead of the `DEFAULT` line or move the specifications for `TMSNAME` and `TMSCOUNT` to the server groups that use them; they should not be assigned to `WSGRP`. The new specifications should be in the following format.

```
*MACHINES
DEFAULT:  MAXWSCLIENTS=50

#
*GROUPS

WSGRP      GRPNO=<next available group #>  LMID=SITE1
#
*SERVERS

WSL        SRVGRP=WSGRP                SRVID=1
          CLOPT="-A -n //machine:port -m 1 -M 5 -x 10"
```

Also, remember to increase the `MAXACCESSERS` parameter in the `RESOURCES` or `MACHINES` section to cover the new workstation clients.

Loading and Booting the Configuration

Before you can start using a Workstation client, you need to run `tmloadcf(1)` to load the configuration file into its binary form and `tmboot(1)` to start the application. These commands do not have to be run immediately; there is work to be done in getting the `bankapp` clients installed on your workstations and getting them built. However, the application must be running on the BEA Tuxedo system native site when you attempt to join the application from a workstation. The steps for loading and booting

bankapp on the native site are part of the overall procedure documented in “Tutorial for bankapp, a Full C Application” on page 3-1 in *Tutorials for Developing a BEA Tuxedo Application*.

See Also

- `tmloadcf(1)` in *BEA Tuxedo Command Reference*
- `WSL(5)` in *BEA Tuxedo File Formats and Data Descriptions Reference*
- “Tutorial for bankapp, a Full C Application” on page 3-1 in *Tutorials for Developing a BEA Tuxedo Application*
- “Defining a Workstation Listener (WSL) as a Server” on page 10-4 in *Setting Up a BEA Tuxedo Application*

Setting the bankapp Variables

To set your environment to run bankapp, complete the following procedure on the workstation client.

1. Set the following environment variables.
`WSNADDR=<WSL advertised address(es)>`
`WSTYPE=<type of Workstation machine>`
2. Include `$TUXDIR/bin` (on UNIX systems) or `%TUXDIR%\bin` (on Windows systems) in your `PATH`.
3. Verify that your environment is set appropriately to run the C compiler.

Building the bankapp Client

To build a client program, enter the following commands.

```
mkfldhdr bankflds  
buildclient -w -o bankclt -f bankclt.c
```

Running the bankapp Client

To run the `bankapp` client on the Workstation, complete the following procedure.

1. Verify that the value of `WSNADDR` on the Workstation client matches the value of the `CLOPT -n` option for the WSL in the `SERVERS` section of the configuration file on the native site.
2. If `bankapp` has not been booted on the native site, make sure it has been booted before you attempt to run a Workstation client.
3. Execute `bankclt` to run the Workstation client.

4 *Bringing Up bankapp on Workstations*
