This document introduces you to the HP TP Web Connector product whose components run on Windows and OpenVMS platforms. The document also contains reference and usage information for:

- Building client programs that call ACMS tasks from various web, Java, and C-language interfaces
- Managing the environment in which the client programs run

Revision/Update Information: This is a revised document.

Operating System: OpenVMS Alpha Version 8.2
                 OpenVMS I64 Version 8.2-1

Software Version: HP TP Web Connector
                  Version 5.0

Hewlett-Packard Company
Palo Alto, California
# Contents

**Preface** ................................................................. xi

**1 Introduction to TPware Technology**

1.1 TPware Products .................................................. 1–1
1.2 Transaction Processing Through TPware ....................... 1–1
1.3 TPware Technology and HP TP Web Connector Capabilities ...... 1–2
1.4 Stub Generation and Adapters .................................. 1–3
1.5 Adapter Behavior .................................................. 1–4
1.5.1 Input Language Adapters ...................................... 1–4
1.5.2 Output Adapters ................................................ 1–5
1.6 Thread Controller .................................................. 1–5
1.7 TPware Management ................................................ 1–6

**2 Overview of Building a Client Interface**

2.1 General Steps in Building a Client Interface ................. 2–1
2.2 Generating a UUID ................................................. 2–2
2.3 Specifying Call Attributes and Management Information .... 2–3
2.3.1 Call Attributes for Calling ACMS Tasks .................. 2–3
2.4 Exception Information ............................................. 2–4
2.4.1 The STDL EINFO Definition ................................. 2–4
2.4.1.1 Exception Class ........................................... 2–5
2.4.1.2 Exception Code and Exception Code Group ............ 2–5
2.4.1.3 Exception Level ........................................... 2–5
2.4.1.4 Exception Source ......................................... 2–5
2.4.1.5 Exception Location ....................................... 2–6
2.4.2 Examining Returned Exception Information ................. 2–6
2.4.2.1 TPware Error Codes ....................................... 2–7
2.4.2.2 ACMS Client Error Codes ................................. 2–7
2.5 Taking the Next Step .............................................. 2–8
3 Preparing ACMS Applications for Client Access

3.1 HP TP Web Connector Components ........................................ 3–1
3.1.1 ACMSADU Extensions ................................................ 3–2
3.1.2 HP TP Web Connector Gateway for ACMS .......................... 3–2
3.2 Running the ACMSADU Extension ...................................... 3–3
3.2.1 Group_task Translation ............................................... 3–3
3.2.2 Actions During Group_task Translation ............................. 3–4
3.2.3 Application_group Translation ....................................... 3–4
3.2.4 Actions During Application_group Translation ..................... 3–5
3.2.5 Using the Output of Application_group Translation ............... 3–5
3.2.6 ACMSADU Extension Restrictions .................................. 3–6
3.2.7 Converting Records .................................................. 3–6
3.2.8 Translating Data Types from OpenVMS to STDL ................. 3–7
3.2.9 Translation of Other Record and Field Properties ................ 3–9

4 Compiling STDL Applications

4.1 STDL Compiler Environment Setup ..................................... 4–1
4.2 Using the STDL Compiler ................................................ 4–1

5 Using the Client Build Utility

5.1 Building Client Programs ................................................. 5–1
5.1.1 Building an Automation Client ...................................... 5–2
5.1.2 Building a C Client .................................................. 5–2
5.2 The Graphical User Interface .......................................... 5–3

6 Writing and Building C and Asynchronous Clients

6.1 Steps for Writing and Building the Client ............................. 6–1
6.2 C-Language Support ..................................................... 6–3
6.2.1 Function Prototypes and Argument Passing ....................... 6–4
6.2.1.1 Task Call Function Prototype Format ............................. 6–4
6.2.1.2 ACMS Task Call Arguments ..................................... 6–4
6.2.2 STDL to C Data Type Mapping ..................................... 6–5
6.2.2.1 Additional ACMS to C Data Type Support ...................... 6–6
6.2.3 Structures for STDL Data Types .................................... 6–6
6.2.4 STDL Identifier to C Identifier Conversion ......................... 6–7
6.3 Specifying the Call Attributes String .................................. 6–8
6.3.1 Calling ACMS Tasks with Call Attributes ......................... 6–8
6.4 Using the Asynchronous C Interface ................................... 6–9
6.4.1 Asynchronous Call Thread Use ...................................... 6–9
11 Managing the HP TP Web Connector Gateway for ACMS

11.1 HP TP Web Connector Gateway for ACMS Software ............... 11–1
11.2 Controlling the HP TP Web Connector Gateway for ACMS .... 11–2
11.2.1 Gateway Starting Requirements .......................... 11–2
11.2.2 Editing the System Startup File .......................... 11–3
11.2.3 Starting the Gateway from DCL .......................... 11–3
11.2.4 Gateway Startup Parameter File .......................... 11–4
11.2.5 Setting Up the TCP/IP Port Numbers ...................... 11–6
11.2.5.1 Specifying the TCP/IP Port Number for the Gateway Process .................................... 11–6
11.2.5.2 Specifying the Gateway TCP/IP Port Number for the Client ........................................ 11–6
11.2.6 Stopping the Gateway Process ............................ 11–7
11.2.7 Editing the System Shutdown File .......................... 11–7
11.2.8 Gateway Error Processing ............................... 11–8
11.3 Tuning the Gateway ........................................ 11–8
11.3.1 Tuning the Gateway Process .............................. 11–8
11.3.2 Overriding Default Process Quotas ....................... 11–8
11.3.3 General Tuning Guidelines .............................. 11–10

A TPware Error Logging

A.1 Error Logging Overview ...................................... A–1
A.2 Use of the Platform Event Log Facility ...................... A–2
A.3 Enabling and Disabling Error Logging to a File .............. A–2
A.3.1 Enabling Error Logging to a File on Windows Systems .... A–2
A.3.2 Disabling Error Logging to a File ........................ A–3
A.4 Viewing Records in the TPware Error Log File ............. A–3
A.4.1 Error Log Utility Syntax ................................ A–3
A.4.2 Sample Commands and Output .......................... A–5

Index

Examples

2–1 EINFO Data Type Definition .................................. 2–4
6–1 C Representation of an STDL Data Type Definition ....... 6–7
6–2 C Structure Definition for the einfo Variable ............. 6–10
8–1 The Java Adapter Sample add_task Call ................... 8–10
8–2 The JavaBeans Adapter Sample add_number Call .......... 8–11
<table>
<thead>
<tr>
<th>Page</th>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>11–1</td>
<td>Gateway Keywords</td>
<td>11–5</td>
</tr>
<tr>
<td>11–2</td>
<td>TCP/IP Port Categories and Numbers</td>
<td>11–6</td>
</tr>
<tr>
<td>11–3</td>
<td>Gateway Process Quotas</td>
<td>11–9</td>
</tr>
<tr>
<td>A–1</td>
<td>stdlog Option Flags and Default Values</td>
<td>A–4</td>
</tr>
</tbody>
</table>
Preface

This document provides reference and usage information that enables you to use the HP TP Web Connector product.

Intended Audience

This document is intended for the following audiences:

• Application programmers who need reference information about developing client programs with the HP TP Web Connector product to call ACMS tasks from various web, Java, Automation, and C-language interfaces.

• Information technology (IT) managers and system managers who need reference information about how to set up client programs developed with the HP TP Web Connector product and how to manage the HP TP Web Connector Gateway for ACMS on an OpenVMS system.

Operating System Information

For information about the versions of the operating system and other software that are compatible with this version of the HP TP Web Connector product, refer to the product’s Software Product Description (SPD). Use the SPD to verify which versions of your operating system are compatible with this version of the HP TP Web Connector product.

Structure

This document has the components shown in the following table:

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 1</td>
<td>Provides an overview of how the HP TP Web Connector product allows client systems to call HP transaction processing (TP) applications.</td>
</tr>
</tbody>
</table>
Chapter 2 Introduces the general procedures for building TPware interfaces for client systems to access ACMS tasks.

Chapter 3 Describes HP TP Web Connector components used for development on the ACMS system and for runtime support and management on a Windows system. Explains the use of the development components to translate ACMS applications so that you can build a client interface to access the ACMS applications.

Chapter 4 Describes the STDL compiler option flags used in generating HP TP Web Connector client programs.

Chapter 5 Explains how to use the TPware client build utility to create a client interface.

Chapter 6 Describes writing and building C and asynchronous clients.

Chapter 7 Discusses writing Automation servers and clients.

Chapter 8 Describes steps for writing and building Java clients.

Chapter 9 Describes application set-up operations.

Chapter 10 Explains how to use the TPware management utility on a Windows system to customize runtime settings for connecting HP TP Web Connector client programs that run on a Windows system and ACMS applications.

Chapter 11 Describes procedures for managing the HP TP Web Connector Gateway for ACMS on an OpenVMS system.

Appendix A Describes TPware error logging support.

### Associated Documents

**HP TP Web Connector Installation Guide** explains the installation of this product and related options.

### Conventions

This document uses the following conventions:

<table>
<thead>
<tr>
<th>Convention</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>italic type</td>
<td>Italic type emphasizes important information and indicates complete titles of documents. In format descriptions, it indicates variable parts of input that you must supply.</td>
</tr>
<tr>
<td>Convention</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>bold type</strong></td>
<td>New terms are highlighted in boldface type where they are defined in the text.</td>
</tr>
<tr>
<td><strong>user input</strong></td>
<td>In examples, user input is differentiated in boldface font from system output.</td>
</tr>
<tr>
<td><strong>monospace text</strong></td>
<td>Words in monospaced font in text indicate names of files, commands and options, user interface elements such as menu names, objects stored on the system, or system output used in examples.</td>
</tr>
<tr>
<td><strong>lowercase</strong></td>
<td>Commands that you enter (except where the command line includes an environment variable) are in lowercase.</td>
</tr>
<tr>
<td><strong>UPPERCASE</strong></td>
<td>Uppercase text indicates STDL syntax. Environment variables are in uppercase. Key words on the OpenVMS system are also indicated by uppercase text.</td>
</tr>
<tr>
<td>[ ]</td>
<td>In command syntax, square brackets enclose an optional choice or choices.</td>
</tr>
<tr>
<td>.</td>
<td>In examples, a vertical ellipsis indicates that information not directly related to the example has been omitted.</td>
</tr>
<tr>
<td><strong>Windows</strong></td>
<td>When used alone, Windows indicates any supported member of the family of Microsoft Windows operating systems. Where necessary, specific Windows operating systems are mentioned. For a list of Microsoft Windows operating systems supported by the HP TP Web Connector product, see the product's <em>Software Product Description ( SPD)</em>.</td>
</tr>
</tbody>
</table>
Introduction to TPware Technology

This chapter provides an overview of the technology used by HP TP Web Connector software.

1.1 TPware Products

TPware is a set of components from which several TP-related products are created. Different components are used to create different products. These products are as follows:

- **HP TP Web Connector**
- **HP TP Desktop Connector**

This document describes the HP TP Web Connector product, which allows web servers to call ACMS tasks.

1.2 Transaction Processing Through TPware

TPware software connects a web server and an ACMS TP application. As a TPware product, HP TP Web Connector software provides a C-language interface, an Automation interface, and a Java-language interface for connecting a client to your web server application.

HP TP Web Connector produces objects that you can easily use to connect a web server to your application. For example, in the Microsoft environment, HP TP Web Connector might create an Automation server that can be used with any software that supports Automation, such as the Internet Information Server (IIS), Microsoft Office, or Visual Basic. In the Microsoft environment, the interfaces are compatible with the Microsoft components architecture, or Common Object Model (COM). The Microsoft-compatible interface connects any Microsoft COM object to an ACMS application with minimal programming effort.
For other environments (for example, Microsoft environments that do not support Automation), HP TP Web Connector software translates the extracted information into a C program format. The C program format can be called from any software program that supports C program callouts; for example, the Netscape Web Server. The C program interface is available for connecting any other type of web server or client to an ACMS application. The C program interface easily connects any Windows program capable of calling a C program to such an application.

1.3 TPware Technology and HP TP Web Connector Capabilities

Using TPware technology, HP TP Web Connector software expands the capabilities of World Wide Web servers by enabling them to access ACMS tasks. For example, Figure 1–1 shows the connection between a web browser and a TP application with TPware code executing in the web server.

**Figure 1–1 Connecting Web Clients to TP Applications**

HP TP Web Connector software accomplishes this connection by enabling the creation of code called a **TP stub** that translates calls between web servers and TP applications. Using a web browser, the user accesses a page on a web server. The page can be an HTML page containing server-side scripts with either references to Automation objects, references to a shared library (for example, a DLL on a Windows system) or references to an Oracle Web Request Broker (WRB) cartridge loaded on the web server.

The script, shared library, or WRB cartridge processes the incoming request and gathers information needed for the transaction. With the gathered transaction information, the server then performs the following operations:

- Calls a TP application through a TP stub.
- Interprets the results from the TP application.
• Displays those results to the end user.

An Oracle WRB is the main controlling component under the Oracle Web Application Server architecture. The WRB is implemented as a CORBA-compliant object request broker and keeps track of the system execution and controls and provides services for the cartridges. The cartridges are written in C and perform the application logic. The cartridges are loaded by and interface with the WRB.

The TP application can be a TDL task executing under ACMS software on an OpenVMS platform.

1.4 Stub Generation and Adapters

HP TP Web Connector software uses TP stub technology to support the generation of interfaces that allow clients (including web browsers) to call tasks using a variety of language interfaces and communications mechanisms. For example, Figure 1–2 shows how a TP stub composed of.

To accomplish this stub-based calling mechanism, HP TP Web Connector divides the functionality of the TP stub into halves called adapters. Adapters convert calls from one format to another format. One half of the TP stub, the input adapter, takes an incoming call or communications message and transforms it into a standard form called the TPware standard call. The other half, the output adapter, takes the TPware standard call and transforms it into the appropriate form for the TP application (either a procedure call or a communications message). For example, if you were writing an Automation client to call ACMS tasks, you would use an adapter stub with an Automation input adapter and an ACMS Gateway output adapter. You would include this adapter stub in your client application to translate the input language calls to the proper format of output communications messages that invoke ACMS tasks.

Using adapters, TPware software extends the capabilities of stubs. By supporting stubs with various types of adapters, HP TP Web Connector software can support different language interfaces and communications mechanisms. Table 1–1 describes the adapters that HP TP Web Connector supports.
1.5 Adapter Behavior

HP TP Web Connector uses both input adapters and output adapters. Sections 1.5.1 and 1.5.2 describe their behavior.

1.5.1 Input Language Adapters

Input adapters are produced for clients that are written in a particular language or that use a particular calling mechanism. The input adapters present to a client the following characteristics of an interface:

- A way to call each procedure within the interface and pass arguments
  HP TP Web Connector interfaces (for example, ACMS applications and STDL task groups) consist of one or more procedures. Each procedure can take one or more arguments, each of which can be input, output, or inout.

- A way to retrieve exception information
  After a call is completed and control returns to the client, the client must have access to exception information generated during any part of the call processing.

- A way to specify the attributes for a call
  The client specifies call attributes to pass information to the output adapter on a call. The attributes being passed depend on the output adapter. For example, the ACMS Gateway adapter can take three call attributes: application, node, and authentication.
Table 1–1  Adapters Supported by HP TP Web Connector

<table>
<thead>
<tr>
<th>Description</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Adapters</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>Automation</td>
<td>Allows calls from clients using Microsoft Automation technology</td>
</tr>
<tr>
<td>C</td>
<td>Allows clients written in the C or C++ language to perform synchronous calls (for example, ISAPI or WRB cartridge clients)</td>
</tr>
<tr>
<td>Java or JavaBeans</td>
<td>Allows calls from Java-language clients</td>
</tr>
<tr>
<td>Output Adapters</td>
<td>ACMS Gateway</td>
</tr>
</tbody>
</table>

1.5.2 Output Adapters

Output adapters convert calls into the communications messages required to invoke remote tasks. They use a particular communications protocol and specify the following:

- Which call attributes it handles
- Which of the handled call attributes is the default attribute

A **default attribute** is the attribute that provides information about the location of the server application.

1.6 Thread Controller

On Windows platforms, the HP TP Web Connector product provides a **thread controller** that limits the number of connections to the called server machine. A thread controller is useful in a process that services multiple users and that can execute in multiple threads. The ability to control the connection limit decreases memory used in the called server to maintain network links and improves application performance by making more memory available to the application.

For example, a web server that services Automation clients runs in a single process, handles multiple concurrent requests, and uses a separate thread for each request. When you build such a multiple-user process, HP TP Web Connector provides a mechanism in the adapter code to optimize thread usage and supports a management interface that allows you to specify information...
to adjust thread usage with the needs of the TP applications being called (see Section 1.7).

The thread controller serves as a virtual TP monitor and increases performance for TP applications in the following ways:

- Solves problems with insufficient stack space to execute calls.
- Optimizes database access by allowing calls to processing procedures to be executed on a dedicated set of threads.
- Reduces I/O contention within the database by allowing application programmers to limit the number of threads that are concurrently executing processing procedures in a processing group. Additional client threads queue, waiting for a free thread.

For applications with many client threads, such as a web application, the thread controller can be especially useful.

1.7 TPware Management

HP TP Web Connector software provides a graphic user interface (GUI) utility that runs on Windows systems to allow you to enter management information. The management GUI installed with your HP TP Web Connector product allows you to specify management information for the following resources:

- Call attributes
- Thread pools

The management GUI allows you to specify information used when the output adapter calls TP applications.

The capabilities of the management GUI depend on the TPware products that are installed on a Windows system. When a manageable adapter is installed on a Windows system, the management interface for that adapter is enabled on that system. The information that you enter through the management GUI is stored locally on the system being managed (see Chapter 10).
Overview of Building a Client Interface

This chapter discusses the general procedure for building a client interface to your current application. Also see the online instructions for building samples supplied with the HP TP Web Connector product.

2.1 General Steps in Building a Client Interface

The HP TP Web Connector product builds a client interface to an existing TP application executing under ACMS software. To build a client, follow these general steps:

1. On the server development system, find the source code for the existing TP application.
   - If you are developing a client program to access existing ACMS tasks, do the following:
     a. Using the ACMSADU extension installed on the ACMS server development system, process the TDL source files to generate a source file that contains an STDL task group specification and data type definitions for the ACMS tasks. See Chapter 3 for instructions on preparing TDL applications.
     b. Copy the generated source file from the OpenVMS system to the client development system.
     c. Edit the generated STDL task group specification to supply a valid UUID (see Section 2.2).

2. On the client development system to which you copied the STDL source code, establish the environment for using the STDL compiler (see Section 4.1).

3. On the client development system, use the STDL compiler to process the STDL source files and to produce the output that facilitates client program development (see Section 4.2).
Note

When building Automation or C clients, you can perform this STDL compile step and, for Automation clients, the subsequent build step using the client build utility GUI (see Chapter 5).

4. Build the client interface.

See the following chapters that explain the specific steps for using the STDL compiler, for building the client executable, and for setting up management for different types of clients:

- Chapter 6 for writing and building C and asynchronous clients
- Chapter 7 for writing Automation clients
- Chapter 8 for writing Java clients
- Chapter 9 for setting up applications

5. On a Windows client execution system, set up the management environment for the client interface (see Chapter 10).

2.2 Generating a UUID

If you are developing a client that calls an ACMS task, replace the default zero UUID in your generated STDL task group specification with a valid UUID.

To generate a UUID use the guidgen application.

1. Invoke guidgen from either a DOS command line or the Tools menu item in Microsoft Visual C++. See the HP TP Web Connector SPD for supported versions of Microsoft Visual C++.

2. Select the Registry Format menu and Copy command to copy the UUID to the Windows clipboard.

3. Paste the UUID into the generated STDL task group specification.

4. After you paste the UUID, replace the braces, ( ) and ( ), with double quotes ( " ).
2.3 Specifying Call Attributes and Management Information

When your client calls ACMS tasks, it can pass information such as destination and authentication to output adapters on each call. HP TP Web Connector software does this through the use of the call attributes. A call attribute has the following syntax:

\[ \text{name:value} [ \text{:value} ] [ , ... ] \]

If the client specifies a call attribute value without specifying a name for it, then a default name is assumed. Section 2.3.1 describes the call attributes and default value for each adapter that supports passing call attributes.

If you omit a call attribute or specify a null call attributes string, the management GUI possibly provides the attribute information (see Section 10.2).

2.3.1 Call Attributes for Calling ACMS Tasks

The ACMS Gateway adapter uses call attributes from either the client or from management information. The client program can specify the call attributes as a string using the following syntax:

\[ \text{application[:name],node[:name],authorization[:account-name:password]} \]

Table 2–1 describes the call attributes and values.

<table>
<thead>
<tr>
<th>Call Attribute Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application[:name]</td>
<td>Name of the ACMS application (STDL task group name) being called</td>
</tr>
<tr>
<td>Node[:name]</td>
<td>Name of the TCP/IP node on which the ACMS gateway resides</td>
</tr>
<tr>
<td>Authorization[:</td>
<td>OpenVMS authorization information, requiring two values separated by a colon (:) character</td>
</tr>
</tbody>
</table>

account-name: | Name of the OpenVMS user account under which the task call is made |
password ]    | Password for the OpenVMS user account under which the task call is made |

By default, the application called is taken from the STDL task group name. The application attribute value accommodates the situation in which the client wants to call numerous ACMS applications that all contain the same number of tasks, with the same task names, and all take the same number of
similarly defined arguments. The software assigns to the DLL the name under which the task group is compiled, but overrides the application being called at runtime based on the value of this call attribute. Refer to Section 10.2.4 for further descriptions of these attributes. For example, a call attributes string for a client program might be:

*application:add_acms_appl,node:bigwig.corp.com,authentication:jones:sm*

Note: Do not use spaces in the string.

In the example, the application attribute has the value add_acms_appl, the node attribute has the value bigwig.corp.com, and the authentication attribute has the value jones:sm (the username and password to use for the call).

If you omit a call attribute or specify a null call attributes string, the management GUI provides the attribute information.

2.4 Exception Information

EINFO is the STDL mechanism for storing exception information generated during a call.

2.4.1 The STDL EINFO Definition

The coding for the STDL EINFO definition is shown in Example 2–1.

Example 2–1 EINFO Data Type Definition

```plaintext
TYPE EINFO IS
  RECORD
    ECLASS INTEGER;
    ECODE INTEGER;
    EPROC TEXT CHARACTER SET SIMPLE-LATIN SIZE 32;
    EPGROUP TEXT CHARACTER SET SIMPLE-LATIN SIZE 32;
    ESOURCE INTEGER;
    ECGROUP UUID;
  END RECORD;
```

When an exception is returned to the caller, the following information is available:

- Exception class
- Exception code and exception code group
Sections 2.4.1.1 to 2.4.1.5 describe the information. Section 2.4.2 describes how a caller examines the returned exception information.

2.4.1.1 Exception Class
An exception class is a grouping of exception conditions that is based on the type of recovery action that can be taken and that allows for portable exception handling. The exception class identifies the exception type as a nontransaction exception or as a transaction exception. Each exception class is initially raised as a specific exception type. The exception type can change depending on how the exception is reported.

2.4.1.2 Exception Code and Exception Code Group
An exception code is a detailed classification of an exception condition. For application-generated exceptions, the exception code is portable and is defined in a message group definition associated with the STDL task group.

2.4.1.3 Exception Level
An exception level is a classification of exception conditions based on whether the exception was generated by the execution of a called task that propagated the exception to the calling client.

An exception level is defined as either current or propagated. An exception level is defined as current when the current task execution generates the exception and when an exception is encountered during the invocation of a task.

An exception level is defined as propagated when the execution of a task called by the client interface generates the exception. A client cannot distinguish between a current exception and a propagated exception.

2.4.1.4 Exception Source
An exception source is a classification of exception conditions based on whether the exception was raised by the application or by the TPware runtime system. A value of zero indicates that the exception was raised by the system. A value of one indicates that the exception was raised by the application.
2.4.1.5 Exception Location
The exception location consists of the following text fields in EXCEPTION-INFO-WORKSPACE that contain names describing where the exception occurred:

- The name of the task (if the task raised the exception) in which the exception occurred, or an arbitrary string filled in by the application
- The name of the task group (if the task raised the exception) in which the exception occurred, or an arbitrary string filled in by the application

When an exception is raised in a task, the system sets the exception procedure to the task name, and the exception procedure group to the task group name.

2.4.2 Examining Returned Exception Information
Client programs examine the language-specific implementation of the STDL EINFO information upon completion of the call to the task. The TPware runtime system returns an exception by setting the STDL-defined external variable with agreed-upon standard values. The client program examines the exception data from the EINFO record returned as a result of the task call to determine whether an exception is raised.

1. If the ECLASS field contains a value of zero, no exception is returned and output arguments are returned.

2. If the ECLASS field contains a nonzero value, the following conditions apply:
   - An exception is returned. The ECODE field contains a nonzero value that indicates which exception occurred.
   - Output arguments are undefined.

3. If an exception is returned, the client program can examine the ESOURCE field to determine whether the exception was generated by the system (exception source is 0) or by the application (exception source is 1).

HP TP Web Connector provides an implementation-specific means to check these fields. For example, if the client is written in C, the einfo.h file defines the C structure einfo that the program can access to check status. When an exception is returned to the C program, the EINFO information is available in members of the einfo structure. The fields in the EINFO data type definition correspond to members of the einfo structure in C.

Sections 2.4.2.1 and 2.4.2.2 explain the possibilities for error codes in the ECODE field.
2.4.2.1 TPware Error Codes

If the ECODE field contains a value from 01 to 255 (0x01 to 0xFF), this signals a TPware runtime exception or data conversion errors in the output adapter. The TPware runtime exceptions and errors are described in the file stdlrt_msg.h.

The file is located in a directory with a name in the following format:

```
install-directory\std\include
```

For example, if you installed the product in the C:\tpware directory, then the STDL message file is located at:

```
C:\tpware\std\include\stdlrt_msg.h
```

If the client calls an ACMS task (uses the ACMS Gateway adapter), the ECODE field can alternatively contain an ACMS client error code (see Section 2.4.2.2).

The software provides language-dependent code that returns the error message text translated from the value in the ECODE field, as follows:

- For the C language clients, see Section 6.2.
- For Automation clients, see Section 7.5.
- For Java clients, see Section 8.3.1.

2.4.2.2 ACMS Client Error Codes

If the client calls an ACMS task (uses the ACMS Gateway adapter), the ECODE field can contain either a TPware error code (see Section 2.4.2.1) or a value from -3000 to -3199 (0xFFFFF448 to 0xFFFFF381). The negative value signals an ACMS Gateway adapter runtime exception. If this exception is related to an ACMS error, text related to the error may be found in an argument passed back to the client in the task call (see Section 6.2.1.2).

These exceptions are described in the file acmsda_client_messages.txt located in a directory with a name in the following format:

```
install-directory\std\include
```

For example, if you installed the product in the C:\tpware directory, then the client message file is located at:

```
C:\tpware\std\include\acmsda_client_messages.txt
```
2.5 Taking the Next Step

If your client is accessing an ACMS application, go to Chapter 3 for a description of the steps necessary to prepare ACMS applications for client access.

Chapter 4 describes the STDL compiler. This compiler generates the TP stubs from the application’s STDL task group specification files. You can use this compiler for all client types.

Chapter 5 describes the client build utility that you can use if you are building Automation or C clients. This build utility simplifies the processes used when using the STDL compiler.

Chapters 6 to 8 present specific procedures for different types of clients.

Chapter 9 discusses various setup tasks on the client that you must perform before you run your client program.
Preparing ACMS Applications for Client Access

If your client is going to call ACMS tasks, you need to perform some processing on the ACMS development system where the ACMS application is defined. This chapter explains how the HP TP Web Connector components on ACMS systems are used so that client programs, including web clients, can be built to access ACMS applications.

3.1 HP TP Web Connector Components

If your client calls ACMS tasks, use HP TP Web Connector components that you install and run on an ACMS system. The HP TP Web Connector software includes the following components that support the generation and use of client programs that access ACMS applications:

- **HP ACMS Application Definition Utility (ACMSADU) extension**
  Enables ACMSADU to translate an ACMS application into an STDL task group specification.

- **A gateway**
  Supports the ACMS RPC protocol between the ACMS Gateway output adapters on the calling system and ACMS applications on the called system (see Chapter 11).

The HP TP Web Connector components on the OpenVMS system (the ACMSADU extension and the gateway) reside on systems running ACMS software. The components can be on the same ACMS system or on different ACMS systems (refer to HP TP Web Connector Installation Guide).
3.1.1 ACMSADU Extensions

The extensions in the modified ACMSADU image enable you to translate an ACMS application to an STDL task group specification. HP TP Web Connector extension commands allow you to control the translation. ACMSADU performs the following HP TP Web Connector functions:

- Extracts information about ACMS tasks and records.
- Translates the extracted information to STDL format.
- Writes the translated information in a form that the STDL compiler can read.

Figure 3–1 shows how ACMSADU reads the application, group, task, and record definitions from the Common Data Dictionary (CDD).

Figure 3–1 ACMSADU Translation Model

ACMSADU produces as output an intermediate group file, from which it produces the STDL task group specification, including record definitions and task group headers with records as arguments.

3.1.2 HP TP Web Connector Gateway for ACMS

The gateway runs on an ACMS system and connects the ACMS Gateway adapter on the client system to the ACMS system on which the target application is running. You provide information that enables the connection between your client program and the ACMS tasks being called (see Section 10.2). Use command procedures provided with the software to control and manage the gateway (see Chapter 11).
3.2 Running the ACMSADU Extension

Translating applications from TDL to STDL performs the following operations:

- Group_task translation (see Section 3.2.1)
- Application_group translation (see Section 3.2.3)
- Record definition translation and conversion (see Section 3.2.7)

You perform these operations with HP TP Web Connector qualifiers for the ACMSADU BUILD GROUP and ACMSADU BUILD APPLICATION commands. Refer to *HP ACMS for OpenVMS ADU Reference Manual* for a listing of qualifiers.

Section 3.2.2 describes the actions that occur during group_task translation, and Section 3.2.4 describes the actions that occur during application_group translation.

3.2.1 Group_task Translation

Group_task translation produces temporary files containing ACMS task and task group information. Group_task translation must be performed for every ACMS group that comprises an application.

**Synopsis**

The command syntax is:

```
BUILD GROUP acms_group_name [/STDL]
```

**Description**

The `acms_group_name` parameter refers to the name of the ACMS group.

The /STDL qualifier directs ACMSADU to output task and record information that is used for the final translation to STDL. The output file produced by /STDL has a name in the following format:

```
GROUP.WDB
```

The .WDB file type indicates the intermediate-format web database file. The BUILD GROUP command writes the file to the default directory (refer to *HP ACMS for OpenVMS ADU Reference Manual* for information on DEFAULT TASK GROUP FILE).

The /NOSTDL qualifier instructs ACMSADU not to produce the intermediate-format file. The default parameter is /NOSTDL.
3.2.2 Actions During Group_task Translation

During group_task translation, ACMSADU performs the following actions:

- Reads information from the CDD.
- Processes the read information.
- Creates the intermediate-format file.

ACMSADU processes the group description and the description of any tasks and records associated with that group. ACMSADU builds descriptions of all records according to the CDD information. Then, ACMSADU creates a description of all tasks in the group along with the names of records used as parameters to those tasks. The intermediate-format file in which ACMSADU writes all this information is used as input to the application_group translation (see Section 3.2.3).

3.2.3 Application_group Translation

Application_group translation reads the group names specified in the application from the CDD and translates the intermediate-format group file built from the group_task translation to its equivalent STDL task group specification (see Section 3.2.1).

Synopsis

The command syntax is:

BUILD APPLICATION application_name [/STDL]

Description

The parameter application_name refers to the name of an ACMS application.

The /STDL qualifier directs the translator during the ACMSADU BUILD APPLICATION to generate STDL code using the intermediate-format group file that was created during the ACMSADU BUILD GROUP compilation. The output is a file with a name in the following format:

application_name.STDL

Note

As indicated by this format, ACMSADU creates an STDL task group specification but applies the ACMS application name as the STDL task group name.
ACMSADU generates in the default directory an STDL source file containing a task group specification and related data type definitions. The output file name *application_name* is derived from the ACMS application name. You use this file to create the client interface (see Section 3.2.5).

### 3.2.4 Actions During Application_group Translation

ACMSADU accesses the CDD to find the group name and reads application information from the CDD including the ACMS group name. Then ACMSADU uses the application name to locate and to read the corresponding group temporary file. Next, ACMSADU processes the internal descriptions of the records and writes them in STDL format with duplicate names removed (see Section 3.2.6 for the restrictions).

After each task name is processed, ACMSADU generates the STDL TASK ARGUMENT statement, which includes the task parameters and an indication as to whether they are input or output. The arguments are as follows:

- A record containing a text field of 256 characters for the selection string as an input argument.
- A record containing a text field of 80 characters for the extended status as an output argument.
- Any arguments defined in the TDL task definition, in order.

The resulting file that ACMSADU generates contains an STDL task group specification that you use in the next stage of development (see Section 3.2.5). See Section 3.2.6 for information on ACMSADU restrictions.

### 3.2.5 Using the Output of Application_group Translation

Use the file containing the STDL task group specification that ACMSADU generates (see Section 3.2.3) to generate the adapters for the client. The next steps you take are on the client development platform, as follows:

1. Copy the STDL task group specification to the client development system on which you have HP TP Web Connector installed and to the directory in which you are going to build the client.

2. Edit the STDL task group specification on the client development system to provide a nonzero UUID (see Section 2.2).

3. Follow the procedures for the type of client, as follows:
   - For the C client, see Chapter 6.
   - For the Automation server, see Chapter 7.
   - For the Java client, see Chapter 8.
3.2.6 ACMSADU Extension Restrictions

ACMSADU has the following restrictions:

- One ACMS task group per application
  Each application is limited to exactly one ACMS task group.

- An ACMS task cannot be renamed in the ACMS application definition.

- Exchange I/O not supported
  Exchange I/O statements are not supported. Refer to the HP ACMS for OpenVMS ADU Reference Manual for information on building no I/O tasks.

- COLUMN MAJOR feature not supported
  HP TP Web Connector software does not allow the reordering of rows and columns of an array to support the COLUMN MAJOR feature of the CDD.

- Record names must be unique
  All record names within a group must resolve to a unique name. STDL record names are the CDD simple names. If two CDD record names have the same simple name, edit the source code to differentiate the two records.

- All tasks are processed as GLOBAL
  ACMS software allows tasks to be identified as LOCAL or GLOBAL in the task, group, and application definitions. For the purposes of STDL translation, all tasks are processed as GLOBAL tasks. Therefore, when you build an application with the /STDL qualifier, all tasks appear in the .STDL file that the ACMSADU utility creates. If a HP TP Web Connector client calls a LOCAL ACMS task, the runtime system flags the call as an error.

3.2.7 Converting Records

ACMS software uses records to allow data to be passed from user agents or forms acting as agents, through the ACMS system to ACMS servers, and back to the caller. These records are buffers containing record-like structures made up of fields. Each field has a name, a data type, and other attributes.

The data descriptions used by ACMS software to describe records are defined by either the CDDL utility in DMU format or the CDO utility in CDO format, and then are placed into the CDD. Record descriptions are extracted from the CDD by various OpenVMS and user programs, including agents, forms systems, the ACMS system, and OpenVMS compilers when compiling ACMS servers. When creating an STDL task group specification from an ACMS
application, ACMSADU extracts record descriptions from the CDD and translates them to STDL format.

### 3.2.8 Translating Data Types from OpenVMS to STDL

Fields within the ACMS records all have an OpenVMS data type. ACMSADU creates the #Pragma statements in the generated data type definitions. During compiling, ACMSADU selects a corresponding STDL data type for each OpenVMS data type that can be expressed in the CDD. Not all OpenVMS data types are represented in STDL, so the ACMS Gateway adapter makes some conversions at runtime according to the ACMSADU selections. Tables 3–1 to 3–4 summarize the OpenVMS data type support for the HP TP Web Connector Gateway for ACMS software. Those data types labeled NOT SUPPORTED are flagged as warnings by the STDL compiler.

Table 3–1 describes integer support.

#### Table 3–1 Integer Support for the ACMS Gateway Adapter

<table>
<thead>
<tr>
<th>OpenVMS Data Type</th>
<th>STDL Data Type</th>
<th>OpenVMS Pragma Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIGNED BYTE</td>
<td>INTEGER SIZE 1</td>
<td>None</td>
</tr>
<tr>
<td>UNSIGNED BYTE</td>
<td>UNSIGNED INTEGER SIZE 1</td>
<td>None</td>
</tr>
<tr>
<td>SIGNED WORD</td>
<td>INTEGER SIZE 2</td>
<td>None</td>
</tr>
<tr>
<td>UNSIGNED WORD</td>
<td>UNSIGNED INTEGER SIZE 2</td>
<td>None</td>
</tr>
<tr>
<td>SIGNED LONGWORD</td>
<td>INTEGER SIZE 4</td>
<td>None</td>
</tr>
<tr>
<td>UNSIGNED LONGWORD</td>
<td>UNSIGNED INTEGER SIZE 4</td>
<td>None</td>
</tr>
<tr>
<td>SIGNED QUADWORD</td>
<td>ARRAY SIZE 8 OF OCTET</td>
<td>None</td>
</tr>
<tr>
<td>UNSIGNED QUADWORD</td>
<td>ARRAY SIZE 8 OF OCTET</td>
<td>None</td>
</tr>
<tr>
<td>SIGNED OCTAWORD</td>
<td>ARRAY SIZE 16 OF OCTET</td>
<td>None</td>
</tr>
<tr>
<td>UNSIGNED OCTAWORD</td>
<td>ARRAY SIZE 16 OF OCTET</td>
<td>None</td>
</tr>
</tbody>
</table>

Table 3–2 describes floating point and complex data type support.
Table 3–2  Floating Point and Complex Data Type Support for the ACMS Gateway Adapter

<table>
<thead>
<tr>
<th>OpenVMS Data Type</th>
<th>STDL Data Type</th>
<th>OpenVMS Pragma Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>F_FLOATING</td>
<td>FLOAT SIZE 4</td>
<td>F_FLOATING</td>
</tr>
<tr>
<td>D_FLOATING</td>
<td>FLOAT SIZE 8</td>
<td>D_FLOATING</td>
</tr>
<tr>
<td>G_FLOATING</td>
<td>FLOAT SIZE 8</td>
<td>G_FLOATING</td>
</tr>
<tr>
<td>H_FLOATING</td>
<td>ARRAY SIZE 16 OF OCTET</td>
<td>None</td>
</tr>
<tr>
<td>S_FLOATING</td>
<td>FLOAT SIZE 4</td>
<td>None</td>
</tr>
<tr>
<td>T_FLOATING</td>
<td>FLOAT SIZE 8</td>
<td>None</td>
</tr>
<tr>
<td>F_FLOATING COMPLEX</td>
<td>RECORD R FLOAT SIZE 4; I FLOAT SIZE 4; END RECORD;</td>
<td>F_FLOATING for each field</td>
</tr>
<tr>
<td>D_FLOATING COMPLEX</td>
<td>RECORD R FLOAT SIZE 8; I FLOAT SIZE 8; END RECORD;</td>
<td>D_FLOATING for each field</td>
</tr>
<tr>
<td>G_FLOATING COMPLEX</td>
<td>RECORD R FLOAT SIZE 8; I FLOAT SIZE 8; END RECORD;</td>
<td>G_FLOATING for each field</td>
</tr>
<tr>
<td>H_FLOATING COMPLEX</td>
<td>ARRAY SIZE 32 OF OCTET</td>
<td>None</td>
</tr>
</tbody>
</table>

Table 3–3 describes decimal data type support.

Table 3–3  Decimal Data Type Support for the ACMS Gateway Adapter

<table>
<thead>
<tr>
<th>OpenVMS Data Type</th>
<th>STDL Data Type</th>
<th>OpenVMS Pragma Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>PACKED DECIMAL</td>
<td>DECIMAL STRING SIZE X</td>
<td>PACKED DECIMAL</td>
</tr>
<tr>
<td>UNSIGNED NUMERIC</td>
<td>DECIMAL STRING SIZE X</td>
<td>UNSIGNED NUMERIC</td>
</tr>
<tr>
<td>LEFT OVERPUNCH NUMERIC</td>
<td>DECIMAL STRING SIZE X</td>
<td>LEFT OVERPUNCH NUMERIC</td>
</tr>
<tr>
<td>LEFT SEPARATE NUMERIC</td>
<td>DECIMAL STRING SIZE X</td>
<td>LEFT SEPARATE NUMERIC</td>
</tr>
</tbody>
</table>

1The maximum SIZE for the decimal data type is limited to 18.
Table 3–3  (Cont.) Decimal Data Type Support for the ACMS Gateway Adapter

<table>
<thead>
<tr>
<th>OpenVMS Data Type</th>
<th>STDL Data Type</th>
<th>OpenVMS Pragma Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>RIGHT OVERPUNCH NUMERIC</td>
<td>DECIMAL STRING SIZE X</td>
<td>RIGHT OVERPUNCH NUMERIC</td>
</tr>
<tr>
<td>RIGHT SEPARATE NUMERIC</td>
<td>DECIMAL STRING SIZE X</td>
<td>RIGHT SEPARATE NUMERIC</td>
</tr>
<tr>
<td>ZONED NUMERIC</td>
<td>DECIMAL STRING SIZE X</td>
<td>ZONED NUMERIC</td>
</tr>
</tbody>
</table>

1The maximum SIZE for the decimal data type is limited to 18.

Table 3–4 describes other data type support.

Table 3–4  Other Data Type Support for the ACMS Gateway Adapter

<table>
<thead>
<tr>
<th>OpenVMS Data Type</th>
<th>STDL Data Type</th>
<th>OpenVMS Pragma Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE</td>
<td>DATE</td>
<td>VMS DATE</td>
</tr>
<tr>
<td>VARYING STRING</td>
<td>Not supported</td>
<td></td>
</tr>
</tbody>
</table>

3.2.9 Translation of Other Record and Field Properties

Other properties may be defined in the CDD for records and fields. ACMSADU supports translation of the following property to STDL:

**OCCURS**

The OCCURS field declares fixed-length, one-dimensional arrays.

OCCURS  n TIMES
This chapter presents environment information and STDL command line reference material for use with HP TP Web Connector software in generating adapter stubs used for client access to TP applications.

Note

For information about invoking the STDL compiler through the client build utility graphical user interface (GUI) on a Windows system, see Chapter 5.

4.1 STDL Compiler Environment Setup

To run the STDL compiler, you must register the environment variables needed by the compiler. From a command window, run the stdl_set_version.bat batch file from the directory named in the following format:

install-directory\stdl\bin

The value install-directory is the drive and directory in which you installed the HP TP Web Connector software. For example, if you installed the product in the C:\tpware directory, you would type the following:

C:\tpware\stdl\bin\stdl_set_version.bat

When execution completes, the STDL development environment is set up.

4.2 Using the STDL Compiler

The stdl command invokes the STDL compiler. The STDL compiler translates STDL definitions and specifications contained in the input source file and produces both object code to link with the clients and other outputs to aid source code development. For the HP TP Web Connector product, the STDL compiler generates adapter stubs used for client access to STDL tasks and ACMS applications.
Synopsis
The stdl command syntax is:

```
stdl [-cswLMNX]
    [-a in_adapter:out_adapter]
    [-h directory] [-i path]
    [-o directory] [-S include]
    [-u uuid] [-v version] source-file-name
```

**source-file-name**
The input STDL source file designated by `source-file-name` must contain a task group specification. Use a nonqualified or fully qualified file name as input to the `stdl` command. All files specified with nonqualified names must be in the current working directory. The compiler appends the `.stdl` suffix to the name of the STDL input source file if you omit a suffix in the source file name.

**Option Flags**
- `a in_adapter:out_adapter`
  Specifies an input adapter and an output adapter to provide interfaces between a calling client and a task.

  Input adapters are described in Table 4–1.

<table>
<thead>
<tr>
<th>Adapter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>async</td>
<td>Provides an asynchronous interface for a C-language client. To start the task call, the client calls an adapter procedure whose function prototype is generated by the STDL compiler. The call returns before the task call completes. When the task completes, the adapter invokes the callback routine provided by the client (see Section 6.4).</td>
</tr>
<tr>
<td>auto</td>
<td>Provides an interface for a client developed in an Automation language (see Section 7.3).</td>
</tr>
<tr>
<td>c</td>
<td>Provides a synchronous interface for a C-language client (see Section 6.2).</td>
</tr>
</tbody>
</table>

(continued on next page)
### Table 4–1 (Cont.) HP TP Web Connector Input Adapters

<table>
<thead>
<tr>
<th>Adapter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>java</td>
<td>Provides an interface for a Java client. The Java classes that represent the application objects present their data record fields as public members (see Section 8.3).</td>
</tr>
<tr>
<td>javabeans</td>
<td>Provides an interface similar to JavaBeans for a Java client. The Java classes that represent the application objects present their data record fields through accessor methods (see Section 8.3).</td>
</tr>
</tbody>
</table>

Output adapters are described in Table 4–2.

### Table 4–2 HP TP Web Connector Output Adapters

<table>
<thead>
<tr>
<th>Adapter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>acmsda</td>
<td>Produces an interface that calls ACMS tasks using ACMS RPC communications.</td>
</tr>
</tbody>
</table>

The flag produces an adapter stub that contains the particular input adapter suited to the language in which you developed the client and a specific output adapter designed to call the task. Based on the input and output adapters specified, other output files are produced (see the section titled “Compilation Output” later in this chapter).

- **-c**
  Generates a C header file (see the section titled “Compilation Output” later in this chapter). Use this option for clients that use a C or asynchronous C input adapter. The file is written either into the current working directory or into the directory specified by the -h flag.

- **-h directory**
  Specifies a directory into which the STDL compiler generates C header files. By default, the compiler generates the C header files in the current working directory.

- **-i path**
  Specifies a directory search path for STDL #INCLUDE and #CINCLUDE files. A path argument must be either a legal directory specification or an environment variable. If you specify multiple arguments, separate each by a semicolon (;), and enclose environment variables in percent characters (%).
For example:
/a/b;/b/b;%PATH%
C:a\a;D:b\b;%PATH%

The compiler searches for the #INCLUDE or #CINCLUDE files in the following order:

- Path containing the top-level source file
- Path specified by the -i flag
- Directories listed in the STDL_INCLUDE_PATH environment variable

-L
Produces a line-numbered source code listing file (see the section titled “Compilation Output” later in this chapter). Use the -S include flag with this flag to include in the listing file the contents of the files specified in the #INCLUDE and #CINCLUDE directives.

-M
Specifies that the STDL source files use Multivendor Integration Architecture (MIA) syntax. The default is X/Open syntax.

-N
Terminates with a null character each string contained in workspaces in the STDL source files. The default is to pad with space characters unused storage in strings in workspaces.

-o directory
Specifies a drive and directory into which the compiler generates output files (see the section titled “Compilation Output” later in this chapter). By default, the compiler generates these output files in the current working directory.

-s
Performs only syntax and semantic checks on the input source file. Does not generate any output files. By default, the compiler generates output as directed by other options.

-S include
When used with the -L flag, includes in the line-numbered source code listing file the contents of the files in the #INCLUDE and #CINCLUDE directives. If you specify the -L flag without the -S include flag, the compiler includes only the input source file in the listing file.
-u uuid
Specifies the default universal unique identifier (UUID) for the first processing
group specification in the input file that does not have a UUID specified in the
STDL syntax. If the input file contains a processing group specification with
no UUID specified, this flag is required. The -u flag applies only to processing
groups that you are compiling, not to processing groups to which the STDL
source refers. A UUID value comprises hexadecimal digits (X) grouped as
follows:
`'XXXXXXXX-XXXX-XXXX-XXXXXXXXXXXX'``

-v version
Specifies the default version number for any task group or processing
group specification in the input file that does not designate a version in the
specification syntax. The compiler defaults to assigning a version of 0.0 for
any processing group with no syntax-specified version unless you specify a
version with the -v flag. For version, specify a decimal literal without a sign.
Processing group specifications included for reference only do not require a
version number on the command line.

-w
Suppresses warning messages. The default is to display warning messages.

-X
Specifies that the STDL source files contain X/Open syntax.

The STDL compiler defaults to X/Open STDL syntax. To compile Multivendor
Integration Architecture (MIA) syntax, use the -M flag.

Description
The STDL compiler generates adapter stubs used for client access to ACMS
tasks. (Task compilation is not supported.) The compiler directs output to the
current working directory, the directory containing the top-level input source
files, or to directories specified by the option flags or by the values set by
environment variables.

The compiler converts the names of the task groups as follows:
- Changes the letters to lowercase
- Replaces any hyphen characters ( - ) with underscore characters ( _ ).
Compilation Output
The STDL compiler generates the following output files based on the contents of the STDL source files and on the flags used during compilation:

- Listing file with a name in the following format:
  
  `source-file-name.lis`
  
  The value `source-file-name` is the same name as the input source file and has a suffix of `.lis` that signifies a listing file.
  
  This file contains line-numbered source code statements, with error messages inserted directly under each source line containing an error, and a summary report. The file is generated when you use the `-L` flag.

- C header file with a name in the following format:
  
  `source-file-name.h`
  
  The value `source-file` is same name as the input source file and has a file type of `.h` to designate a C header file. The header file contains function prototypes and C-language definitions for STDL data types. This file is generated when you use the `-c` flag but omit the `-s` flag.
  
  Include this file in any C programs that call ACMS tasks, or that refer to STDL data type definitions.

- Adapter stub
  
  The name is in the following format:
  
  `group_in_adapter_out_adapter.obj`
  
  This file uses the converted name of the task group (`group`) and contains the adapter stub created with the `-a` flag and with the adapters specified in the `in_adapter` and `out_adapter` arguments. (If you specify an asynchronous input adapter, `c` appears in the name, not `async`.)
  
  The compiler generates the adapter stub if you use the `-a` flag but not the `-s` flag.
  
  Link the adapter stub as follows:
  
  - With the C client executable if the input adapter is `c` or `async` (see Chapter 6)
  - With the resource file `group_auto.res` if the input adapter is `auto` (to create an Automation server DLL, see Section 7.1)

- Resource file with a name in the following format:
  
  `group_auto.res`
This file uses the name of the task group *group* and provides access to a type library for use with an Automation adapter. The compiler generates this file if you specify the `-a` flag with an *auto* input adapter.

To create an Automation server DLL, link this OLE resource object with an adapter stub that includes an Automation adapter, with a name in the following format:

`group_auto_out_adapter.obj`

See Section 7.1.

- **Java archive file** with a name in the following format:
  ```
  group_out_adapter.jar
  ```

  This standalone file contains the Java classes for the task group with *group* as the converted name of the task group. The compiler generates this file if you specify the `-a` flag with *java* or *javabeans* as the input adapter. The file is used at runtime.
This chapter describes how to use the TPware client build utility and its GUI to build Automation or C clients on client systems.

5.1 Building Client Programs

The TPware client build utility provides a GUI that makes it easier for you to create Automation or C clients. You provide input through the GUI, and the utility creates the files needed to build the client program.

As input, you provide the utility with an STDL task group file name, an input adapter type, an output adapter type, and an output directory name. The utility places the created files in the specified output directory along with a log file that describes the results of running the utility, including errors if any occurred. The utility notifies you whether the build succeeded or failed.

Although the client build utility eliminates some of the complexity of having to create a makefile (the utility creates the client makefile), you need to refer to Chapter 2 and the specific client chapters for other steps associated with creating a client.

Using the client build utility requires that you fulfill the following prerequisites:

- Your client development must be on a supported client platform. See the HP TP Web Connector SPD for supported client platforms.
- Visual Studio must be in the path.
- Your STDL task group specification must contain a valid UUID. If you use ACMSADU to create your task group, generate the UUID and insert it into the task group’s STDL code before using the client build utility (see Section 2.2).
- You must copy your STDL task group specification file and any related files (such as a file containing data type definitions) from your server system to your client system.
• Your STDL task group specification must contain only one task group.

The following sections describe some differences in the way the utility builds specific clients.

### 5.1.1 Building an Automation Client

If the input adapter type that you specify is Automation, the utility creates a makefile that invokes the STDL compiler and the platform linker to create a DLL that is invoked by the Automation client. The utility performs the following operations:

1. Invokes the STDL compiler to create the required object files in a temporary subdirectory.
2. Invokes the linker to link all object files from this subdirectory into the DLL.
3. Places the DLL in the output directory.

See Chapter 7 for information about registering this DLL and other steps for creating an Automation client.

### 5.1.2 Building a C Client

If the input adapter type that you specify is C, the utility creates a makefile that invokes the STDL compiler to create build files in the output directory. As shown in Table 5–1, the files generated for building a client depend on the output adapter type that you specify.

<table>
<thead>
<tr>
<th>Adapter Type</th>
<th>File Type</th>
<th>File Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACMS</td>
<td>Header</td>
<td>input_file_name.h</td>
</tr>
<tr>
<td></td>
<td>Object</td>
<td>task_group_name_c_acmsda.obj</td>
</tr>
</tbody>
</table>

A header file (.h) is a file that you include in your C compile. Object files (.obj) are files that you link with your C client.

See Chapter 6 for more information about linking object files and libraries with your C client.
5.2 The Graphical User Interface

The client build utility allows you to easily enter your requisite build information through a GUI. By using the GUI, you do not need to use the STDL command-line interface and, in the case of Automation clients, you do not need to write a client build makefile.

To invoke the client build utility, choose TPware Client Build Utility from the TPware program group. When the TPware Client Build Utility screen opens, enter the information that is appropriate for the client that you want to build:

1. Enter the STDL Filename of your STDL task group specification, or click the Browse button to select the file name.

2. Enter an Output Directory name, or click the Browse button to select a directory. The utility generates output in this directory. If you do not specify an output directory, the utility generates the output files in the same directory that contains the input (that is, the same directory as the STDL task group specification file).

3. From the Input Adapter Type drop-down list, select one of the following:
   - C
   - Automation

4. From the Output Adapter Type drop-down list, select the output adapter type from a list that might include any of the following (depending on the TPware products that you have installed):
   - ACMS

5. Click the OK button. When the build is completed, the utility displays a message that notifies you whether the build was successful and gives you the option to view the log file.

In the output directory, the utility creates a subdirectory for temporary files. When the build is completed successfully, the utility deletes this subdirectory.

The utility also creates a log file, makefile, and a batch file in the output directory. If the object files or the DLL are created successfully, the utility deletes the makefile and batch file. However, if errors occur, the utility retains these files for debugging purposes.
Before invoking the makefile that invokes the STDL compiler, the utility runs the stdl_set_version.bat batch file to set up the environment for the STDL compiler to run successfully. The location of stdl_set_version.bat depends on an environment variable (STDL_DEV_DIR) that is set during installation of the product (see Section 4.1). If the utility cannot find this file via the environment variable, an error occurs.
6
Writing and Building C and Asynchronous Clients

Client programs written in C can call:
• TDL tasks executing under an ACMS system

6.1 Steps for Writing and Building the Client

To build a client program written in C, do the following:

1. Obtain the HP-related client development components depending on the type of tasks being called and the type of platform on which the client and server are being developed.
   • Perform the following steps to obtain the components:
     a. Copy to the client development system a task group specification and any related files from an ACMS system (see Section 2.1).
     b. Compile the STDL task group specification.

   Note

When building a C client program you can perform the compile step using the client build utility GUI (see Chapter 5) rather than the command line interface described here. However, this utility does not support asynchronous clients.

On the STDL compiler command line, use the -c flag and the -a flag. See Section 4.2 for the complete stdl command syntax. With the -a flag, supply the appropriate input adapter and output adapter from those shown in Table 6–1.
<table>
<thead>
<tr>
<th>Specification</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>async</td>
<td>Executes asynchronous calls to ACMS tasks.</td>
</tr>
<tr>
<td>c</td>
<td>Executes synchronous calls to ACMS tasks or.</td>
</tr>
<tr>
<td>acmsda</td>
<td>Calls ACMS tasks.</td>
</tr>
</tbody>
</table>

For example:

```
stdl -c -a c:acmsda test_task_group
```

The command generates a C header file and produces a C input adapter and a acmsda output adapter in the generated adapter stub. The compilation produces files with names in the following format:

- `group.h`
- `group_c_out_adapter.obj`

The format conventions are:

- `group` Converted name of the compiled STDL task group specification. When developing client interfaces for ACMS applications, the `group` name prefix is the ACMS `application_name` prefix (see Section 3.2.3).
- `c` Value for either the C or asynchronous input adapter. If you specify an asynchronous input adapter, `c` appears in the name, not `async`.
- `out_adapter` One of the values for the specified output adapters listed in Table 6–1.

See the section titled “Compilation Output” in Section 4.2.

2. Write the client procedures.
   
a. Use the header file to code the task calls (see Section 6.2).

b. Decide whether to use the call attributes string (see Section 6.3).

c. If the C client program that you are building executes asynchronous calls, see also Section 6.4.

d. Check status. After the call to the task, access STDL status using the `einfo` structure (see Section 6.5).

3. Compile the client program.
4. Link the following items to produce the client image. This step is the same for C or asynchronous C clients.
   - Objects and libraries that depend on the type of task that the C client calls and the output adapter used, as shown in Table 6–2.

<table>
<thead>
<tr>
<th>If Client Calls...</th>
<th>Input File Name</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACMS tasks (uses the acmsda adapter)</td>
<td>group_c_acmsda.obj</td>
<td>The adapter stub for the ACMS application (STDL task group)</td>
</tr>
<tr>
<td></td>
<td>stdl_acmsda.lib</td>
<td>ACMS Gateway adapter runtime link library</td>
</tr>
</tbody>
</table>

- Client program files
  - All of the object files
  - Any libraries required by the object files
- The TPware runtime library:
  
  stdl_rtm.lib

5. If your client uses the Microsoft Internet Information Server Application Programming Interface (ISAPI) to access TP applications, ensure that IIS can locate and cache the appropriate ISAPI DLLs for your C client (see Sections 9.6 and 9.5.1).

6.2 C-Language Support

The STDL compiler generates C header files to support client development. Include the following files in your C client:

- Group header file source-file-name.h—Contains the following source code:
  - Function prototypes that define the interface to the tasks and the structure definitions for arguments passed to the called tasks (see Sections 6.2.1 to 6.2.4). The STDL compiler generates the contents based on the tasks defined in the task group specification.
  - A generated function for specifying the call attributes string (see Section 6.3).
  - The stdl_srtl_translate_ecode function to return the error message text translated from the value in the ecode field (see Section 6.5.3).
6.2.1 Function Prototypes and Argument Passing

The STDL compiler creates a function prototype that contains a C external task name function declaration for each noncomposable task in a task group specification. The function prototypes are written to the group header file and have the formats described in Sections 6.2.1.1 and 6.2.1.2.

6.2.1.1 Task Call Function Prototype Format

Unless the calls are to ACMS applications (see Section 6.2.1.2), generated function prototypes have the following format:

\[\text{converted-task-name}(\text{argument} [...])\]

Task names are converted to function names according to the rules for identifiers (see Section 6.2.4). Task function declarations do not have a return value, and all arguments are passed as pointers.

In the client program, call the C procedure for the tasks as normal procedure calls.

For each task argument, declare a variable using the STDL data type definition from the group header file.

6.2.1.2 ACMS Task Call Arguments

If the calls are to ACMS applications, functions have two extra arguments in the following format:

\[\text{converted-task-name(string, status, argument} [...])\]

The extra arguments are:

- \textit{string}: A selection string, consisting of one STDL record containing one 256-character field of data type ISO-LATIN-1 text.
- \textit{status}: An extended status string, consisting of one STDL record containing one 80-character field of data type ISO-LATIN-1 text. This extended status is message text associated with an ACMS error returned from the ACMS application.

See Section 2.4.2.2.
6.2.2 STDL to C Data Type Mapping

The group header file contains C definitions corresponding to record data type definitions in the STDL source files. Table 6–3 maps the STDL data types to the C data types. The STDL compiler generates header files with these mappings.

<table>
<thead>
<tr>
<th>STDL</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARRAY SIZE $n$ OF type</td>
<td>type id[n]</td>
</tr>
<tr>
<td>ARRAY SIZE $n$ OF ARRAY SIZE $m$ OF type</td>
<td>type id[n] [m]</td>
</tr>
<tr>
<td>ARRAY SIZE $n$ TO $m$ DEPENDING ON number OF type</td>
<td>struct rec {</td>
</tr>
<tr>
<td></td>
<td>long int number ;</td>
</tr>
<tr>
<td></td>
<td>type id[n] ;</td>
</tr>
<tr>
<td></td>
<td>} ;</td>
</tr>
<tr>
<td>DECIMAL STRING SIZE $a$ SCALE $b$</td>
<td>char id[a+1]</td>
</tr>
<tr>
<td>INTEGER</td>
<td>long id (or equivalent signed long, long int or signed long int)</td>
</tr>
<tr>
<td>OCTET</td>
<td>unsigned char id</td>
</tr>
<tr>
<td>TYPE rec IS RECORD id IS type ; END ;</td>
<td>struct rec {</td>
</tr>
<tr>
<td></td>
<td>type id ; }</td>
</tr>
<tr>
<td>TEXT SIZE $n$ CHARACTER SET</td>
<td>char id[n]</td>
</tr>
<tr>
<td>ISO-LATIN-1</td>
<td></td>
</tr>
<tr>
<td>ISO-LATIN-2</td>
<td></td>
</tr>
<tr>
<td>SIMPLE-LATIN</td>
<td></td>
</tr>
<tr>
<td>UUID</td>
<td>uuid_t id</td>
</tr>
</tbody>
</table>

1The number of repetitions of a variable length array is mapped as a record rec containing the number of repetitions and the repeated array.

2The data transferred is a character string in ISO 6093:1985, signed NR1 format, consisting of a row of one sign (or blank character) and digits that do not include characters indicating a decimal point. The user program should convert the representation to a decimal number.

3The uuid_t value is a typedef for the DCE UUID.

Key to Variables

$a$, $b$, $m$, $n$—An appropriate decimal number

$id$, $number$, $rec$—An appropriate name

$type$—A valid STDL data type or a user-defined data type identifier
6.2.2.1 Additional ACMS to C Data Type Support

If you are developing a client to call an ACMS application, additional data types are supported. The ACMSADU provides compilation support for some OpenVMS data types and the ACMS Gateway adapter provides runtime support (see Section 3.2.8). Data types in addition to those supported by STDL are supported for writing clients for ACMS applications as shown in Table 6–4.

Table 6–4 Mapping of Additional ACMS Data Types to C Data Types

<table>
<thead>
<tr>
<th>STDL</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE</td>
<td>char[17] where the bytes are in the following format: YYYMMDDHHmmSSSttt For example, New Year 2002 at midnight is &quot;20020101000000000&quot;.</td>
</tr>
<tr>
<td>FLOAT SIZE 4</td>
<td>float</td>
</tr>
<tr>
<td>FLOAT SIZE 8</td>
<td>double</td>
</tr>
<tr>
<td>INTEGER SIZE 1</td>
<td>char</td>
</tr>
<tr>
<td>INTEGER SIZE 2</td>
<td>short</td>
</tr>
<tr>
<td>INTEGER SIZE 4</td>
<td>int</td>
</tr>
<tr>
<td>UNSIGNED INTEGER SIZE 1</td>
<td>unsigned char</td>
</tr>
<tr>
<td>UNSIGNED INTEGER SIZE 2</td>
<td>unsigned short</td>
</tr>
<tr>
<td>UNSIGNED INTEGER SIZE 4</td>
<td>unsigned int</td>
</tr>
</tbody>
</table>

6.2.3 Structures for STDL Data Types

C definitions of STDL data types have the struct format shown in Example 6–1.

The data type identifier from the STDL data type definition is used as the name of the C structure tag. Each field definition within the STDL record is a named member of the C structure. The order and number of the members of the structure within the C include file match the order and number of the field definitions in the STDL definition.
Example 6–1  C Representation of an STDL Data Type Definition

```
struct data-type-identifier {
  c_mapping_for_field_type field-1-name ;
  c_mapping_for_field_type field-2-name ;
  .
  .
  .
} ;
```

A field definition that refers to a previously defined data type identifier has the following format:

```
struct data-type-identifier field-name.
```

All comments in the data type definition appear in the generated C header file.

The STDL compiler represents DEPENDING ON as an array definition with the number of repetitions being defined by the application program:

```
TYPE rec_id IS RECORD
  number_id INTEGER ;
  array_id ARRAY SIZE n TO m DEPENDING ON number_id OF type ;
END ;
```

The values \( n \) and \( m \) represent numbers. Simple arrays within structures (records) are not null terminated.

6.2.4  STDL Identifier to C Identifier Conversion

The C identifiers are derived from the corresponding STDL identifiers according to the following rules:

- All uppercase Latin characters are converted to lowercase.
- Hyphens (\(-\)) are converted to underscores (\(_\)).
- No other characters are changed.

The C language does not support Kanji characters in identifiers.
6.3 Specifying the Call Attributes String

The C client passes to the C input adapter call attributes as a pointer to a string using a procedure generated by the STDL compiler. The function declaration for specifying the call attributes string is:

```c
void group_set (char * attributes_string)
```

The value for `group` is the converted name of the task group. The `attributes_string` argument represents values passed to the output adapter.

The values that you can pass to the output adapter vary with each output adapter (see Section 2.3). The information passed on the call is kept by the input adapter on a per-thread/per-group basis. If a thread calls tasks in more than one group, the thread must call the `group_set` procedure for each group for which it intends to set the call attributes. For example, if a thread calls ACMS applications, any login information set for one application is not used when calling another application.

If the client program provides a new call attributes string, the previous call attributes string is overwritten. If the client program provides a null string for the call attributes string, then subsequent calls made to that group from that thread will have no call attributes string.

If an error is encountered in the `group_set` procedure, the error is returned in the `einfo` structure (see Section 6.5).

6.3.1 Calling ACMS Tasks with Call Attributes

To call ACMS tasks (that is, use the ACMS Gateway adapter `acmsda`) with call attributes, your source code creates a string with the call attribute information. For example:

```c
char call_attr[100] = "application:add_acms_appl,
                    node:nodea,
                    authentication:usera:mypassword";
```

Note: Do not use spaces in the string.

Use the `group_set` function generated when you compiled the STDL task group specification to supply the address of the call attribute string. For example:

```c
add_acms_appl_set(&call_attr);
```

When the client program calls a task, the call attribute values specified in the `call_attr` array are passed to the output adapter.
6.4 Using the Asynchronous C Interface

The asynchronous input adapter allows a C client to execute asynchronous calls to ACMS tasks. The client thread must allocate the storage for the task arguments either on the heap or in static storage rather than in stack storage. The call made by the client thread returns before the task call completes and can do other work.

6.4.1 Asynchronous Call Thread Use

The output adapter for the asynchronous call executes on a separate thread from the client. After the called task executes, the runtime system executes a completion routine specified by the client thread on the same thread used for the output adapter. Use the management GUI to select the thread usage semantics that are best suited for your application (see Section 10.2.3).

6.4.2 Using C Clients with the Asynchronous C Adapter

The client program must include the header file generated by the STDL compiler.

The client thread performs each call to a task as follows:

- Uses the same name that an STDL C client would use.
- Passes two additional arguments as the first and second arguments:
  
  - The address of the completion routine
    
    Defines the completion routine as a _stdcall procedure that returns a void and accepts one argument: a pointer to void.
    
    If the client passes STDL_C_SYNCHRONOUS as the completion routine address, the call is made synchronously and the completion routine is not called.
    
    If the client passes NULL as the completion routine address, the call executes asynchronously, the output adapter executes on a separate thread, but no callback is made.

  - A pointer to void to pass to the completion routine
    
    This argument is passed to the completion routine, allowing it to establish the required context.

The client thread typically does the following:

- Allocates all of the task arguments on the heap.
- Passes, as the completion routine parameter, the address of a structure containing all of the arguments.
• Checks the `einfo` structure after starting the asynchronous call (see Section 6.5).
  If the client thread receives `einfo` status that indicates no error, the client thread successfully started the asynchronous call, and the runtime system always calls the completion routine.

• In the completion routine, checks the `einfo` structure. (This variable is thread-safe.)

Any error encountered in the execution of the called task is returned to the completion routine in the `einfo` structure.

6.5 Using the `einfo` Structure to Check Status

A C client executing either synchronous or asynchronous calls uses the `einfo` structure to check STDL EINFO status returned from the task call (see Section 2.4).

6.5.1 Exception Information Header File

The C structure definition that corresponds to the STDL EINFO data type definition is shown in Example 6–2.

Example 6–2  C Structure Definition for the einfo Variable

```c
#ifndef EINFO_H
#define EINFO_H

#define einfo tps_rpc_get_einfo()->info

typedef struct
{
  struct
  {
    int eclass;
    int ecode;
```
Example 6–2 (Cont.) C Structure Definition for the einfo Variable

```c
char eproc[32];
char epgroup[32];
int esource;
uuid_t ecgroup;
} info;
} tps_rpc_einfo_t;
/* function prototypes */
tps_rpc_einfo_t *tps_rpc_get_einfo();
#endif
```

The members in the einfo structure in C correspond to the fields in the STDL EINFO data type definition. The STDL compiler generates the C-language version of the STDL EINFO data type for use in C clients and servers.

6.5.2 Exception Class Header File

The `eclass.h` header file contains for each exception class identifier a C define statement using the following format:

```
#define class-identifier exception-class-value
```

For example:

```
#define ap_invocation_fault -3
```

The value `class-identifier` is the exception class and `exception-class-value` is the equivalent integer. Section 2.4 provides a summary of STDL exception information.

6.5.3 Examining Exception Information in C

C client programs examine the `einfo` structure upon completion of a procedure call. The runtime system returns an exception by setting the STDL-defined external variable `einfo`. To determine whether an exception is raised, the C client program examines the exception data supplied in the `einfo` external structure when the call returns. For example, use the structure member `einfo.eclass` to determine whether an exception is returned and use `einfo.ecode` to process the exception (see Section 2.4.2).

HP TP Web Connector software provides a function to retrieve the message text associated with the value found in the `einfo.ecode` field. For example:

```c
printf("Error on task call: %s\n", stdl_srtl_translate_ecode(einfo.ecode));
```
6.6 Next Steps

After you test and debug the client, set up the management environment.

1. Use the management GUI to establish runtime connections and parameters.
   • If the client calls ACMS tasks, set up parameters (see Section 10.2.4).
   • For all clients, establish the thread usage semantics setting. Thread control applies in the following circumstances:
     - If the client uses the ACMS Gateway output adapter, setting the thread control restricts the number of connections made to the called server machine. If there are too many connections (no limit is set), calls beyond a certain limit fail because of resource exhaustion. (The number of connections on the called server machine is controlled by a TCP/IP Services for OpenVMS parameter.)
       
       Use the Threads tab in the management GUI to establish the thread usage semantics setting (see Section 10.2.3).

2. Set up error logging for the client (see Appendix A).

3. If the client calls an ACMS task, set up the ACMS Gateway adapter environment (see Section 10.3).
Client programs developed with an Automation language (for example, Visual Basic, Visual J++, VBScript, and JScript) can call:

- Tasks in TDL task groups executing under ACMS software

For Java clients developed using Visual J++, the STDL compiler generates COM objects that you register and import into the Visual J++ project as Java classes. You use in your client application the generated Java classes to set and obtain record attributes and invoke tasks. For information on how to program using Java classes generated from COM objects, refer to the documentation provided with Microsoft Visual J++.

To write an Automation client, follow these general steps:

1. Build an Automation server for the Automation clients to use (see Section 7.1).
2. Code the client calls to tasks through the Automation server following the guidelines in Sections 7.2 and 7.3.

### 7.1 Steps for Building an Automation Server

Use the STDL compiler to generate an adapter stub containing an Automation input adapter and an output adapter that can call your TP application. Using this stub, create an **in-process** Automation server. An automation server converts Automation client calls to the format of call designated by the output adapter in the stub.

To build an Automation server, perform the following steps:

1. Copy to the client development system the task group specification and any related files from an ACMS system (see Section 2.1).
2. Compile the STDL task group specification.

**Note**

For ease of use, you can perform the compile and link steps using the client build utility GUI (see Chapter 5).

On the STDL compile command line, specify input and output adapters with the `-a` flag. See Section 4.2 for the complete `stdl` command syntax. Use `auto` for the input adapter and supply the appropriate output adapter from those shown in Table 7-1.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>acmsda</td>
<td>Calls ACMS tasks using a gateway</td>
</tr>
</tbody>
</table>

For example:

```
stdl -a auto:acmsda add_acms_appl
```

The command creates an Automation input adapter and an ACMS Gateway output adapter in the generated adapter stub. The compilation produces files with names in the following format:

```
<group>_auto_out_adapter.obj
<group>_auto.res
```

The format conventions are:

- `<group>` Converted name of the compiled STDL task group specification.
- `<out_adapter>` Name of one of the output adapters from Table 7-1.
- `<res>` Resource file for the Automation server.

See the section titled “Compilation Output” in Section 4.2.

3. Write the Automation server, using STDL-generated Automation code for the task group being accessed.

- Access data structures using STDL-generated methods (see Section 7.2).
- Call tasks using STDL-generated methods (see Section 7.3).
• Handle exceptions from task calls using TPware-supplied objects (see Section 7.2.1).

4. Specifying the /DLL qualifier to the linker to produce the Automation server DLL, link the following items:
   • Objects and libraries that depend on the type of task that the Automation server calls and the output adapter used, as shown in Table 7–2.

   Table 7–2 Automation Server Adapter-Dependent Link Input
<table>
<thead>
<tr>
<th>If Client Calls...</th>
<th>Input File Name</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACMS tasks (uses the acmsda adapter)</td>
<td>group_auto_acmsda.obj</td>
<td>The adapter stub for the ACMS application (the STDL task group)</td>
</tr>
<tr>
<td></td>
<td>stdl_acmsda.lib</td>
<td>ACMS Gateway adapter runtime link library</td>
</tr>
</tbody>
</table>

   • The resource file for the task group, with a name in the following format:
     group_auto.res
     The value group is the converted name of the compiled STDL task group specification.

   • The following libraries:
     stdl_rtm.lib
     stdl_auto.lib
     ole32.lib
     oleaut32.lib
     uuid.lib

5. Export the following procedures (these are implemented by the Automation server stub):
   DllGetClassObject
   DllCanUnloadNow
   DllRegisterServer
   DllUnregisterServer

6. After an Automation server is built, register it with COM using regsvr32 to allow it to be used by a client program. For example:
   regsvr32 add_acms_app1_auto_acmsda.dll
This `regsvr32` command on the Automation DLL registers the type library. The name of the type library is in the following format:

\[ \text{group\_Type\_Library} \]

The value \text{group} is the converted name of the task group specification. For example, registering the `add_acms_appl` Automation server assigns the type library name as follows:

\[ \text{add_acms_appl\_Type\_Library} \]

If you rebuild an Automation server and change the STDL task group specification or records used, you must first uninstall the original server with `regsvr32` and the `/u` flag.

### 7.2 Automation Objects and STDL Support

The HP TP Web Connector software provides Automation objects and the STDL compiler generates Automation objects for the client interface. Sections 7.2.1 to 7.2.4 describe the objects and their properties.

#### 7.2.1 Supplied Objects

The following standard Automation objects are supplied with HP TP Web Connector software:

- `STDL.std1_einfo`
- `STDL.std1_uuid`

These objects are installed when you install the HP TP Web Connector software.

The `STDL.std1_einfo` object is used to store STDL status information in a Microsoft Automation environment. This object has the following Automation properties described using Visual Basic data types:

- `eclass` AS LONG
- `ecode` AS LONG
- `ecode_string` AS STRING
- `eproc` AS STRING
- `epgroup` AS STRING
- `esource` AS STRING
- `egroup` AS `STDL.std1_uuid`

The `STDL.std1_uuid` object is used to store the STDL universal unique identifier (UUID). This object has the following Automation properties described using a Visual Basic data type:

- `uuid_string` AS STRING
7.2.2 STDL-Generated Automation Objects

The STDL compiler generates Automation objects based on the contents of the task group specification. The Automation client maps a task group to an Automation object as follows:

- One Automation object for each task group
- A method for each task
- A property named `einfo` that points to an `STDL.stdl_einfo` object that contains exception information for an STDL call (see Section 7.2.1)
- A property named `ecode_string` that contains the text of the message associated with the value of the error code returned in the `STDL.stdl_einfo.ecode` property (see Section 7.5.2).
- A property named `call_attributes` that Automation clients can access to specify call attribute values to pass to communications adapters on each call (see Section 7.4)
- Automation objects for STDL records

The Automation object generated for a group has a name in the following format:

```
group.Group
```

The value for `group` is the converted name of the task group (see Section 7.2.3).

Within the group Automation object, the STDL compiler creates a method for each task in the task group specification.

HP TP Web Connector software uses Automation objects to model STDL records. Because Automation does not directly support records, the STDL compiler generates an Automation object for each record used as an argument by a task in the task group being called.

The Automation object for each record has a name in the following format:

```
group.record-name
```

The compiler creates one of these objects in each of the following cases:

- The STDL data type is used as an argument to a task in the task group. The value `record-name` is derived from the STDL data type identifier that specifies the record layout.
- The STDL data type identifier is used as a data type for a field within another record object being generated for the task group (X/Open syntax only).
The value record-name is derived from the STDL data type identifier that specifies the record layout.

- An embedded record is used as a data type for a field within another record object being generated for the task group.
  The compiler gives the object a name in the following format:
  
  group.field-name_record
  
  The value field-name is derived from the STDL field name.

The compiler creates an object for each argument to be passed to a task. If an STDL record is used for more than one argument or is included in more than one other STDL record, the compiler generates only one STDL record object.

For each field within the record, the object has one Automation property. The property name is derived from the STDL field name and the type of the property depends on the STDL field type (see Section 7.2.4).

You can use an object browser (for example, the Visual Basic object viewer) to examine objects defined by the generated Automation server.

### 7.2.3 STDL Identifier to Automation Name Conversion

The compiler derives Automation names from the corresponding STDL identifiers according to the following rules:

- All uppercase Latin characters are converted to lowercase.
- Hyphen characters ( - ) are converted to underscore characters ( _ ).
- No other characters are changed.

### 7.2.4 Automation Data Type Support

When the STDL compiler generates an Automation object for each STDL record (see Section 7.2.2), each field from an STDL record is represented by a property within the generated record object. The type of the property is determined by the STDL data type of the field as shown in Table 7–3.
Table 7–3  Automation Data Type Mapping

<table>
<thead>
<tr>
<th>STDL Data Type</th>
<th>Automation Data Type</th>
<th>C</th>
<th>Visual Basic</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARRAY</td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>DATE</td>
<td></td>
<td>DATE</td>
<td>DATE</td>
</tr>
<tr>
<td>DECIMAL STRING</td>
<td></td>
<td>BSTR</td>
<td>STRING</td>
</tr>
<tr>
<td>FLOAT SIZE 4</td>
<td></td>
<td>float</td>
<td>SINGLE</td>
</tr>
<tr>
<td>FLOAT SIZE 8</td>
<td></td>
<td>double</td>
<td>DOUBLE</td>
</tr>
<tr>
<td>INTEGER SIZE 1</td>
<td></td>
<td>short</td>
<td>INTEGER</td>
</tr>
<tr>
<td>INTEGER SIZE 2</td>
<td></td>
<td>short</td>
<td>INTEGER</td>
</tr>
<tr>
<td>INTEGER SIZE 4</td>
<td></td>
<td>long</td>
<td>LONG</td>
</tr>
<tr>
<td>OCTET</td>
<td></td>
<td>unsigned char</td>
<td>BYTE</td>
</tr>
<tr>
<td>RECORD</td>
<td></td>
<td>Record object$^2$</td>
<td>Record object$^2$</td>
</tr>
<tr>
<td>TEXT CHARACTER SET ISO-LATIN-1</td>
<td></td>
<td>BSTR</td>
<td>STRING</td>
</tr>
<tr>
<td>TEXT CHARACTER SET ISO-LATIN-2</td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>TEXT CHARACTER SET ISO-UCS-2</td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>UNSIGNED INTEGER SIZE 1</td>
<td></td>
<td>unsigned char</td>
<td>BYTE</td>
</tr>
<tr>
<td>UNSIGNED INTEGER SIZE 2</td>
<td></td>
<td>short</td>
<td>INTEGER</td>
</tr>
<tr>
<td>UNSIGNED INTEGER SIZE 4</td>
<td></td>
<td>long</td>
<td>LONG</td>
</tr>
<tr>
<td>UUID</td>
<td></td>
<td>BSTR</td>
<td>STRING</td>
</tr>
</tbody>
</table>

$^1$Array references are to the base data type starting with an index of zero.
$^2$An Automation object for the record is created (see Section 7.2.2).
$^3$This data type support is not implemented.

7.2.4.1 JScript Date Fields

In JScript, date fields in workspaces are NOT JScript date objects, but are instead Automation dates. JScript dates are the number of milliseconds after January 1, 1970 UTC. For example:

```javascript
// Date below has value 0 for EST zone (note month 11 is December)
date1 = new Date(1969,11,31,19,0,0);
```

Assigning JScript dates to workspace dates is illegal. For example:

```javascript
workspace.datefield = new Date(1969,11,31,19,0,0);
```

The software returns the Microsoft JScript runtime error ‘800a01b6’, Object doesn’t support this property or method.
Automation dates are formatted as \( \textit{days.fractions} \) past 12/30/1899. The following assignments are legal:

\[
\begin{align*}
&\text{Date below is January 1, 1999 at 12:00 noon} \\
&\text{workspace.datefield = 36161.5;} \\
&\text{Date below is January 1, 1900 at 1:00 AM} \\
&\text{workspace.datefield = 2.041666;} 
\end{align*}
\]

### 7.3 Calling Tasks from Automation Clients

To call tasks within a task group, write the Automation client to perform the following actions:

1. If the client is written in Visual Basic, import the task group type library having a name in the following format:

   \textit{group} Type Library for ActiveX Access

2. Create an object for each record to be passed as an argument to the task. This is done by referencing the record object name (\textit{group.record-name}) in one of the following ways:
   
   - **In a CreateObject service**
     
     You can use the \textit{Server.CreateObject} method to create objects with session, page, or application scope. Objects with page scope are created each time the user accesses the page and are destroyed when the server finishes processing the current page. After session objects are created, they remain in existence until the current session either is abandoned or times out.

   - **By using object references in Visual Basic**
     
     For example, for the \textit{add_number} record in the \textit{add_task_group}, the object name is \textit{add_task_group.add_number}.

     If the client calls an ACMS task, the first two arguments are the selection string and status.

3. Fill in data in the record objects as necessary.

   The fields within the record objects are referenced as Automation properties of the created record object (see Section 7.2.2).

4. Create an object for the task group in one of the following ways:

   - **By referring to the group object in a CreateObject service with a name in the following format:**

     \textit{group.Group}
The value group is the converted name of the task group.

- By using object references in Visual Basic
  
  For example, the group object name for add_task_group is:
  ```vba
  add_task_group.Group
  ```

5. Optionally, set the call attributes string (see Section 7.4).

6. Within the task group object, call the task as a method.

7. Check the exception information contained in the group object for the status of the call to the task (see Section 7.5.1).

### 7.4 Specifying the Call Attributes String

Automation clients specify call attributes by referencing an Automation property on the group object (see Section 2.3). This property has the name call_attributes.

When a new group object is created, the call_attributes property is null. The Automation client can set the call_attributes property for use on subsequent method calls using that group object. If the Automation client provides a new call attributes string, the new string overwrites the old string. If the Automation client sets the call attributes string to null, then subsequent method calls on that object will have no call attributes string.

The Automation input adapter does not interpret the contents of the call attributes string. Any error in the contents of the string is not returned until the next call on that group object. If an error occurs, a runtime error is signaled (see Section 7.5.1).

#### 7.4.1 Calling ACMS Tasks with Call Attributes

To call ACMS tasks (that is, use the ACMS Gateway adapter acmsda) with call attributes, your source code sets the property call_attributes of the task group object with the call attribute information. For example, if the program creates an instance of a task object named acms as follows:

```vba
Set acms = CreateObject("add_acms_appl.group")
```

The program then simply sets the call_attributes property using the method call on the appropriate task group object. For example:
When the client program calls a task, the call attribute values specified in the acms.call_attributes method call are passed to the output adapter at runtime.

7.5 Automation Errors and Status Checking

Two types of error can be returned when calling a task.

- An Automation runtime error (see Section 7.5.1).
- A task call exception (see Section 7.5.2)

7.5.1 Automation Runtime Errors

Automation runtime error values are returned using a 32-bit number known as a result handle (HRESULT). Microsoft defines the structure of the HRESULT value.

Automation errors returned by the adapter begin at the HRESULT value 0x80041001. To determine an STDL error code from the HRESULT format, subtract 0x80041000 from the Automation error code value:

\[
\text{STDL-error-code} = \text{<Automation-error-code-value>} - 0x80041000
\]

STDL error codes and their corresponding messages are described in a message file (see Section 2.4.2.1).

7.5.2 Examining Exception Information in Automation

On each task call, the code should check the exception information for the status passed back with the call. If an exception occurs, the adapter sets the eclass property within the STDL.std_einfo object to the nonzero value returned from the task call and the edcode property within the STDL.std_einfo object to a nonzero value representing the STDL error code returned.

If no error occurs, the adapter sets the eclass property within the STDL.std_einfo object to zero. Use the ecode_string property on the task group object to extract the message text associated with the value of any error returned. For example:
Dim acms As Object
Set acms = CreateObject("add_acms_appl.group")
Call acms.add_task(ss, es, input1, input2, answer)
Msgbox ("ecode string = " & CStr(acms.ecode_string))

The CStr function extracts the text from the property on the acms object.

7.6 Next Steps

After you build and debug the client, set up the management environment for the client.

1. Use the management GUI to establish runtime parameters.
   - If the client calls ACMS tasks, set up parameters (see Section 10.2.4).
   - For all clients, establish the thread usage semantics setting. Thread control applies in the following circumstances:
     - If the client uses the ACMS Gateway output adapter, setting the thread control restricts the number of connections made to the called server machine. If there are too many connections (no limit is set), calls beyond a certain limit fail because of resource exhaustion. (The number of connections on the called server machine is controlled by a TCP/IP Services for OpenVMS parameter.)
       See Section 10.2.3.

2. Set up error logging for the client (see Appendix A).

3. If the client calls ACMS tasks, set up the ACMS Gateway adapter environment (see Section 10.3).
A client program developed with the Java language can call tasks in one of the following environments:

- TDL task groups executing under ACMS

### 8.1 Overview of Java Client Development

Support is provided for the following kinds of programs developed with the Java language:

- Clients developed using Microsoft Visual J++.
- Clients developed using the Sun Microsystems Java Development Kit (JDK). See the HP TP Web Connector SPD for supported versions.

For Java clients developed using Visual J++, the interface is provided through an Automation input adapter and COM objects (see Section 7.1).

For Java clients developed using the JDK, the interface is provided through the generated Java input adapter as described in this chapter. The Java client comprises the application code that you write and STDL-generated Java input adapter code.

Use the STDL compiler to generate an adapter stub containing a Java input adapter and an output adapter designated by the type of task calls that the client makes. The adapter stub is used to build a Java client.

The Java input adapter created as part of the generated adapter stub contains the following code:

- Java Native Interface (JNI) code
  
  Contained within the DLL that also contains the output adapter, the JNI code is the interface between the Java components of the stub and the TPware runtime.
Java code

Created as a collection of classes representing the task group specification and its records, this code is the interface between the client application and the JNI code.

Thus, your client does not invoke the JNI code directly. You use the Java classes in the client to call tasks. The Java code in the input adapter calls the JNI code to convert the task calls to the format designated by the output adapter that you specify for the adapter stub.

To write a Java client, follow these general steps:

1. Generate the adapter stub and related code for the Java client (see Section 8.2).
2. Code the client application including calls to tasks, following the appropriate guidelines (see Section 8.3).
3. Build the Java client and related runtime code (see Section 8.2).

8.2 Steps for Building a Java Client

The Java client can call a task on an ACMS system. To build a Java client with an adapter stub, perform the following steps:

1. Set up Java-specific environment variables.

   In addition to using stdl_set_version (see Section 4.1) and setting up your C/C++ programming environment, define the environment variables specific to your Java environment.

   (The .bat-style examples assume that your working directory is C:\work, and that the JDK was installed in the C:\jdk1.1.6 directory.)

   - **PATH**
     Define in the PATH environment variable the JDK bin directory and the directory containing the JNI DLL that is generated by the build. Place the standard JDK directory in the path before any other JDK environments installed on the machine. For example:

     ```cmd
     set path=c:\jdk1.1.6\bin;c:\work;%path%
     ```

   - **INCLUDE**
     Define in the INCLUDE environment variable the standard JDK and win32-specific directories. For example:

     ```cmd
     set include=c:\jdk1.1.6\include;c:\jdk1.1.6\include\win32;%include%
     ```
• **CLASSPATH**

  Define in the CLASSPATH environment variable your working
directory and the directory for the standard JDK classes. Place these
directories before those for any alternative JDK classes. For example:

  ```
  set classpath=.;..;c:\jdk1.1.6\lib\classes.zip;%classpath%
  ```

  Before actually running the adapter code, specify in the CLASSPATH
environment variable the path for the JAR file that is generated by the
build (see Section 8.8.1).

2. Optionally, define build environment variables for Java tools that are used
(see Table 8–1).

<table>
<thead>
<tr>
<th>Name</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>STDL_JAVA_JAR_OPTIONS</td>
<td>Overrides default JAR command line options</td>
</tr>
<tr>
<td>STDL_JAVA_JAVAC_OPTIONS</td>
<td>Overrides default JAVAC command line options</td>
</tr>
<tr>
<td>STDL_JAVA_JDK_HOME</td>
<td>Specifies the location of the JDK installation root</td>
</tr>
</tbody>
</table>

  Use these environment variables only to change default operations for the
Java tools that the STDL compiler calls.

3. Copy to the client development system a task group specification and any
related files from an ACMS system (see Section 2.1).

4. Compile the STDL task group specification.

  On the STDL compile command line, specify input and output adapters
with the `-a` flag. See Section 4.2 for the complete STDL compiler command
syntax. Supply the appropriate input adapter and output adapter from
those shown in Table 8–2.
<table>
<thead>
<tr>
<th>Specification</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>java</td>
<td>The Java classes that represent the application objects present their data record fields as public members.</td>
</tr>
<tr>
<td>javabeans</td>
<td>The Java classes that represent the application objects present their data record fields through accessor methods.</td>
</tr>
<tr>
<td>acmsda</td>
<td>Calls ACMS tasks using a gateway.</td>
</tr>
</tbody>
</table>

For example:

```
stdl -a java:acmsda add_acms_appl
```

The command creates a Java input adapter and an ACMS Gateway output adapter in the generated adapter stub. The compilation produces the following files:

- A Java archive with a name in the following format:
  ```
group_out_adapter.jar
  ```

- A Java adapter stub with a name in the following format:
  ```
group_java_out_adapter.obj
  ```

The format conventions are:

- `group`: Converted name of the compiled STDL task group specification (see Section 8.3.2.1).
- `out_adapter`: Name of one of the output adapters from Table 8–2.

See the section titled “Compilation Output” in Section 4.2.

5. Write the Java client, using STDL-generated Java classes for the task group being accessed (see Section 8.3).

6. Link the components by producing the DLL for the Java client. Specifying the /DLL qualifier to the linker, link the following items:

- The TPware runtime library:
  ```
  stdl_rtm.lib
  ```

† The value `group` is a converted name (see Section 8.3.2.1).
• Objects and libraries that depend on the type of task that the client calls and the output adapter that the client uses, as shown in Table 8–3.

<table>
<thead>
<tr>
<th>If Client Calls...</th>
<th>Input File Name</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACMS tasks (uses acmsda adapter)</td>
<td>group_java_acmsda.obj</td>
<td>The adapter stub for the ACMS application (the STDL task group)</td>
</tr>
<tr>
<td></td>
<td>stdl_acmsda.lib</td>
<td>ACMS Gateway adapter runtime link library</td>
</tr>
</tbody>
</table>

After you perform the link operations and before you run the client, see Section 8.8 for other steps to perform.

8.3 Java Classes and STDL Support

The HP TP Web Connector software provides the native runtime environment. The STDL compiler generates Java classes and the Java Native Interface (JNI) for the client. Sections 8.3.1 to 8.3.3 describe the objects and their properties. See Sections 8.3.3 through 8.6 for information on coding the Java client.

8.3.1 Einfo Java Class and Access Support

The Java class Einfo is supplied for each task group to store STDL status information in a Java environment. The task group class has a property called einfo with a property type of Einfo.

The support for this class depends on whether you use java or javabeans as the input adapter in the -a flag on the STDL command line.

• For the java input adapter, this class has the following public fields:

```java
public int eclass
public int ecode
public String ecodeString
public String eproc
public String epgroup
public int esource
public String ecgroup
```
For the javabeans input adapter, this class has the following public accessor methods:

```java
int getEclass()    void setEclass(int)
int getEcode()     void setEcode(int)
String getEcodeString()    void setEcode(String)
String getEproc()  void setEproc(String)
String getEpgroup() void setEpgroup(String)
int getEsource()   void setEsource(int)
String getEcgroup() void setEcgroup(String)
```

See Examples 8–1 and 8–2 for sample code and Section 8.6 for coding guidelines.

### 8.3.2 STDL-Generated Java Classes and Methods

The STDL compiler generates Java classes and methods based on the contents of the task group specification. The Java client maps a task group to Java classes and methods as follows:

- **Name conversion (see Section 8.3.2.1)**
- **One Java class for each task group (called a task group class) and an invocation method for each task (see Section 8.3.2.2).**
- **Classes for STDL records (data type identifiers) and for STDL arguments (workspaces) used by a task in the task group; and support for accessing the record classes created (see Section 8.3.2.3).**
- **Support for Java clients to specify call attribute values to pass to the output adapter on each call (see Section 8.5).**

#### 8.3.2.1 STDL Compiler Name Conversion

When processing the STDL task group specification and related code, the STDL compiler derives the `group` name and class names from STDL identifiers as follows:

- Changes the task group name (`group`) or an STDL record name to lowercase. If you are developing a client interface for an ACMS application, the `group` name prefix is the ACMS `application_name` prefix (see Section 3.2.3).
- Replaces any hyphen characters (`-`) with underscore characters (`_`).
- Changes the first character of the name to uppercase.
8.3.2.2 Task Group Class and Methods

Within the Java class generated for a task group, the STDL compiler creates an **invocation method** for each task in the task group specification. To enable a client program to invoke each task in the task group, the task group class `group` contains an invocation method for each task, in the following format.

```
group.task_name([argument[,...]]);
```

The name `task_name` for each invocation method is the same as the corresponding converted task name. This format is for both the Java and Javabeans adapters.

If the client is calling an ACMS application, methods have two extra arguments in the following format:

```
group.task_name(string,status,[argument[,...]]);
```

The extra arguments are:

- `string` A selection string, consisting of one STDL record containing one 256-character field of data type ISO-LATIN-1 text.
- `status` An extended status string, consisting of one STDL record containing one 80-character field of data type ISO-LATIN-1 text. This extended status is message text associated with an ACMS error returned from the ACMS application.

The task group class encapsulates an `Einfo` class to process exception information returned from a task call (see Section 8.3.1).

8.3.2.3 Record Classes and Methods

HP TP Web Connector software uses Java classes to model STDL records. The STDL compiler generates a Java class for each record in a task and a class for each argument to be passed to a task. The Java class for an STDL record has a name in the following format:

```
record-name_field-name
```

The value `record-name` is derived from the STDL data type identifier that specifies the record layout according to the conversion rules (see Section 8.3.2.1). The value `field-name` is derived from the STDL field name according to the conversion rules (see Section 8.3.2.1).

The compiler creates one of these record classes in each of the following cases:

- The STDL data type identifier is used as an argument to a task in the task group.
• The STDL data type identifier is used as a data type for a field within another record object being generated for the task group (X/Open syntax only).

  The value *record-name* is derived from the STDL data type identifier that specifies the field record layout according to the conversion rules (see Section 8.3.2.1).

• An embedded record is used as a data type for a field within another record class being generated for the task group.

If an STDL data type identifier is used for more than one argument or is included in more than one other STDL record, the compiler generates only one STDL record class.

Support for fields depends on whether you use java or javabeans as the input adapter in the -a flag on the STDL command line.

• For the java input adapter, public fields are created, with names in the following format:

  ```java
class TaskGroup {
  public data-type field-name;
  }
```

  The public field name is derived from the STDL field name according to the conversion rules (see Section 8.3.2.1). The data type *data-type* depends on the STDL field type (see Section 8.3.3).

  To support call attributes, the task group object has a public field defined (see Section 8.5).

• For the javabeans input adapter, for each field within the record classes generated, both a *get* and a *set* accessor method are created, with names in the following format:

  ```java
class TaskGroup {
  data-type getfield-name();
  void setfield-name(data-type);
  }
```

  The method name is derived from the STDL field name according to the conversion rules (see Section 8.3.2.1). The data type *data-type* depends on the STDL field type (see Section 8.3.3).

  To support call attributes, the task group object has a property that can be accessed by set and get accessor methods (see Section 8.5).

You can use a class browser in an integrated development environment (IDE) to examine objects defined by the generated Java classes.
8.3.3 Java Data Type Support

When the STDL compiler generates Java classes for STDL records (see Section 8.3.2), each field from an STDL record is given a data type as shown in Table 8–4.

<table>
<thead>
<tr>
<th>STDL Data Type</th>
<th>Java Data Type</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARRAY</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>DATE</td>
<td>Date</td>
<td></td>
</tr>
<tr>
<td>DECIMAL STRING</td>
<td>String</td>
<td></td>
</tr>
<tr>
<td>FLOAT SIZE 4</td>
<td>float</td>
<td>32-bit IEEE 754</td>
</tr>
<tr>
<td>FLOAT SIZE 8</td>
<td>double</td>
<td>64-bit IEEE 754</td>
</tr>
<tr>
<td>INTEGER SIZE 1</td>
<td>byte</td>
<td></td>
</tr>
<tr>
<td>INTEGER SIZE 2</td>
<td>short</td>
<td></td>
</tr>
<tr>
<td>INTEGER SIZE 4</td>
<td>int</td>
<td></td>
</tr>
<tr>
<td>OCTET</td>
<td>byte</td>
<td>A signed quantity</td>
</tr>
<tr>
<td>RECORD</td>
<td>Record object</td>
<td>2</td>
</tr>
<tr>
<td>TEXT CHARACTER SET ISO-LATIN-1</td>
<td>String</td>
<td>Unicode characters</td>
</tr>
<tr>
<td>TEXT CHARACTER SET ISO-LATIN-2</td>
<td>String</td>
<td>3</td>
</tr>
<tr>
<td>TEXT CHARACTER SET ISO-UCS-2</td>
<td>String</td>
<td>3</td>
</tr>
<tr>
<td>UNSIGNED INTEGER SIZE 1</td>
<td>byte</td>
<td>Signed value</td>
</tr>
<tr>
<td>UNSIGNED INTEGER SIZE 2</td>
<td>short</td>
<td>Signed value</td>
</tr>
<tr>
<td>UNSIGNED INTEGER SIZE 4</td>
<td>int</td>
<td>Signed value</td>
</tr>
</tbody>
</table>

1. Array references are to the base data type starting with an index of zero.
2. A Java object for the record is created (see Section 7.2.2).
3. This data type support is not implemented.

8.4 Calling Tasks from Java Clients

To call tasks within a task group, write the Java client to perform the actions shown in the following examples. Example 8–1 shows a client generated from using the java input adapter.
Example 8–1 The Java Adapter Sample add_task Call

class AddMtsClient
{
    int add(int x, int y) throws Exception
    {
        1 Add_task_group_mts taskGroup = new Add_task_group_mts();
        2 Add_number inp1 = new Add_number();
            Add_number inp2 = new Add_number();
            Add_number result = new Add_number();
        3 inp1.Data = x;
            inp2.Data = y;
        4 taskGroup.add_task(inp1, inp2, result);
        5 if (taskGroup.einfo.eclass != 0 || taskGroup.einfo.ecode != 0)
            {
                System.out.println("Einfo error on task call");
                System.out.println("eclass = " + taskGroup.einfo.eclass);
                System.out.println("ecode = 0x" + Integer.toHexString(taskGroup.einfo.ecode));
                System.out.println("eproc = " + taskGroup.einfo.eproc);
                System.out.println("epgroup = " + taskGroup.einfo.epgroup);
                System.out.println("esource = " + taskGroup.einfo.esource);
                throw new Exception("Application error");
            }
        6 return result.Data;
    }
}

static public void main(String args[])
{
    add_mts_client addMtsClient = new add_mts_client();
    if (args.length != 2)
        System.out.println("Usage: x y");
    else
        try
            {
                int x = Integer.parseInt(args[0]);
                int y = Integer.parseInt(args[1]);
                System.out.println("Answer = " + addMtsClient.add(x, y));
            }
        catch (NumberFormatException e) {
                System.out.println("Invalid Input");
        }
        catch (Exception e) {
                System.out.println(e);
        }
}

The items in the following list correspond to the callouts in Example 8–1.

1 Create the object that represents the task group itself. Use the new method and refer to the task group class name Add_task_group_mts.
Create an object for each record to be used by the `Add_task_group_mts` object. Use the `new` method and refer to the class name. In this example, three `Add_number` objects are created.

Fill in the data in the record objects as necessary. Directly access the public fields within the record argument.

Call the task. Use the `add_task` invocation method within the `Add_task_group_mts` task group object, and pass the three `Add_number` argument parameters.

Directly access the `Einfo` object and its fields in the `Add_task_group_mts` task group object to determine the result of the task call.

Obtain the numeric result of the task call by directly accessing the output `Add_number` object.

Example 8–2 shows a client generated from using the `javabeans` input adapter.

**Example 8–2 The JavaBeans Adapter Sample add_number Call**

```java
import java.beans.*;
import java.io.*;

class AddMtsClient {
    int add(int x, int y) throws Exception {
        try {
            Add_task_group_mts addTaskGroupMts = (Add_task_group_mts) Beans.instantiate(null, "Add_task_group_mts");
            Einfo einfo = (Einfo) Beans.instantiate(null, "Einfo");
            Add_number inp1 = (Add_number) Beans.instantiate(null, "Add_number");
            Add_number inp2 = (Add_number) Beans.instantiate(null, "Add_number");
            Add_number result = (Add_number) Beans.instantiate(null, "Add_number");

            inp1.setData(x);
            inp2.setData(y);
            addTaskGroupMts.add_number(inp1, inp2, result);
        } catch (BeansException ex) {
            // Handle exception
        }
        return 0;
    }
}
```
Example 8–2 (Cont.) The JavaBeans Adapter Sample add_number Call

```java
6    einfo = addTaskGroupMts.getEinfo();
7    if (einfo.getEclass() != 0 || einfo.getEcode() != 0) {
        System.out.println("Einfo error on task call");
        System.out.println("Einfo.eclass = " + einfo.getEclass());
        System.out.println("Einfo.ecode = 0x" + Integer.toHexString(einfo.getEcode()));
        System.out.println("Einfo.eproc = " + einfo.getEproc());
        System.out.println("Einfo.epgroup = " + einfo.getEpgroup());
        System.out.println("Einfo.esource = " + einfo.getEsourse());
        throw new Exception("Application error");
    }
8    return result.getData();
}
```

```java
catch (UnsatisfiedLinkError e) {
    System.out.println("Unable to locate matching DLL add_task_group_mts_java_mts[_g].dll");
    throw e;
}
catch (ClassNotFoundException e) {
    System.out.println("Unable to locate an application class");
    throw e;
}
catch (IOException e) {
    System.out.println("Unable to load an application class");
    throw e;
}
```

```java
static public void main(String args[]) {
    add_mts_client addMtsClient = new add_mts_client();
    if (args.length != 2) {
        System.out.println("Usage: x y");
    }
    else {
        try {
            int x = Integer.parseInt(args[0]);
            int y = Integer.parseInt(args[1]);
            System.out.println("Answer = " + addMtsClient.add(x, y));
        }
        catch (NumberFormatException e) {
            System.out.println("Invalid Input");
        }
        catch (Exception e) {
            System.out.println(e);
        }
    }
}
```

The items in the following list correspond to the callouts in Example 8–2.

1. Import the classes.
2 Create the object that represents the task group itself. Use the Beans.instantiate method and refer to the task group class name Add_task_group_mts.

3 Create an object for each record to be used by the Add_task_group_mts object. This includes the implicitly used einfo object and objects that are explicitly passed as arguments to the Add_task_group_mts.add_number method. Use the Beans.instantiate method and refer to the class name. In this example, three Add_number class objects and one Einfo class object are created.

4 Fill in the data in the record objects as necessary. The fields within the record argument and Einfo objects are accessed through their get and set accessor methods.

5 Call the task. Use the add_number invocation method within the Add_task_group_mts task group object, and pass the three Add_number argument parameters.

6 Obtain the contents of the Einfo object from the Add_task_group_mts object through the getEinfo accessor method and update the local einfo object with the returned information.

7 Examine the einfo object using its accessor methods to determine the result of the task call.

8 Obtain the numeric result of the task call by accessing the output return object using its getData accessor method.

8.5 Specifying the Call Attributes in a Java Client

A Java client can specify call attributes using one of two techniques depending on whether you use java or javabeans as the input adapter in the -a flag on the STDL command line.

- If you use java as the input adapter, directly set the call_attributes field (see Section 8.5.1).

- If you use javabeans as the input adapter, refer to a String property in the task group class named call_attributes (see Section 8.5.2).

The values that you specify in the call attributes depend on the output adapter that the client program uses. For more information on call attributes support for each output adapter, see Section 2.3.
8.5.1 Using Call Attributes with the Java Adapter

If the Java client program is using the java input adapter and calling an output adapter that supports call attributes, use the call_attributes field on the task group object. The field is defined in the following format:

```java
public String call_attributes
```

The program creates a string to hold the call attributes. For example, if the program calls an ACMS task:

```java
String attr = new String("application:add_acms_appl,node:a,authentication:ua:pwrda");
```

**Note** Do not use spaces in the string.

The program must refer to the task group object created using the task group class generated for that group and then set the call_attributes field on the task group object under which the task calls are made. For example:

```java
add_acms_appl AddAcmsAppl = new add_acms_appl();
.
.
AddAcmsAppl.call_attributes = attr;
```

The values in `attr` are assigned to the task group object call_attributes field. For details of the runtime processing of call attributes, see Section 8.5.3.

8.5.2 Using Call Attributes with the JavaBeans Adapter

If you use javabeans as the input adapter, refer to a String property in the task group class named call_attributes. The call_attributes property has the following accessor methods:

```java
setCall_attributes(String)
String getCall_attributes()
```

If the Java client program is using the javabeans input adapter and calling an output adapter that supports call attributes, use the set accessor method `setCall_attributes` on the task group object. The program can create a string to hold the call attributes to be specified. For example, if the program calls an ACMS task:
String attr = new String("application:add_acms_appl,node:a,authentication:ua:pwrd")

Note: Do not use spaces in the string.

To specify the attribute values, the program must refer to the task group object created using the task group class and then supply the string to the set accessor method. For example:

```java
add_acms_appl AddAcmsAppl = (add_acms_appl) Beans.instantiate(null, "add_acms_appl");

AddAcmsAppl.setCall_attributes(attr);
```

For details of the runtime processing of call attributes, see Section 8.5.3.

8.5.3 Runtime Processing of Call Attributes

When a new group object is created, the call attributes are null. Using the group object, the client can set the call attributes value for use on subsequent method invocations. If the client provides a new call attributes value, the new value overwrites the old value. If the client sets the call attributes value to null, subsequent method invocations on that object have no call attributes value.

The input adapter does not interpret the contents of the call attributes value. Any error in the value is not returned until the next invocation on that group object.

For more information on call attributes support for each output adapter, see Section 2.3.

8.6 Java Runtime Errors

Java-related runtime error values are returned by one of the following techniques.

- Throwing an exception
- Throwing an error

HP TP Web Connector native environment errors or errors returned from the application server are returned in the Einfo class (see Section 8.3.1). STDL ecode error codes that can be returned and their corresponding messages are described in Section 2.4.2. The STDL eclass codes are specified in the eclass.h file.
8.6.1 Accessing Error Text in the Java Adapter Environment
In the java adapter environment, access the ecodeString field directly to retrieve message text related to an error returned from a task call. For example:

```java
System.out.println("ecodeString = \" + taskGroup.einfo.ecodeString);
```
The field is accessed in the einfo object contained in the taskGroup object.

8.6.2 Accessing Error Text in the JavaBeans Adapter Environment
In the javabeans adapter environment, use the getEcodeString() public accessor method in the Einfo Java class to retrieve message text related to an error returned from a task call. For example:

```java
einfo = taskGroup.getEinfo();
System.out.println("einfo.ecodeString = \" + einfo.getEcodeString());
```
This code could display the following in an error situation:

`einfo.ecodeString = ACMSDI_INVLOGIN, Invalid login attempt`

On a successful call, this code displays the following:

`einfo.ecodeString = Normal completion`

8.7 IDE Interaction with a Java Adapter
If you use javabeans as the input adapter with the -a flag, the generated classes provide a partial implementation of the JavaBeans standard. The Java input adapter defines the Java classes that the client uses. Discover these classes by using one of the following:

- A Java-aware IDE environment
- The normal JDK BeanBox

The extent of introspection support depends on the capabilities of the development environment that you use. Default discovery is provided by the STDL compiler naming conventions for methods and properties. Simple BeanInfo classes provide introspection support for the classes generated for the following items:

- One for each task group class
- One for each Einfo class
• One for each record class

These BeanInfo classes are additional files in the STDL-generated Java archive.

The following are javabean adapter restrictions:
• No graphic representation of the adapter classes is provided.
• No additional development objects for property editors are provided.
• No additional Bean customizers are provided.
• No implementation of Bean serialization is provided.

8.8 Next Steps

After you build the Java client, set up the client (see Section 8.8.1) and the management environment (see Section 8.8.2).

8.8.1 Java Client Setup

To run and successfully access a TP application, a Java client depends on the Java adapter classes and the Java adapter JNI code.

Keep the Java adapter stub DLL and the JAR file containing the Java adapter classes synchronized. Both files must be generated from the same STDL build so that procedures in the DLL match procedures in the JAR file. If the procedures do not match, an UnsatisfiedLinkError is thrown.

Ensure that the Java client can locate and use the Java adapter classes. The JAR file containing the Java adapter classes must be available with other class libraries used by the client. Make the file available by adding its path to the classpath environment variable. For example:

```java
java -classpath add_acms_appl_acmsda.jar;%classpath% add_acms_client 1 1
```

The command runs a console application in the same directory as the JAR file and explicitly names the JAR file and existing classpath environment variable. For convenient use, place the command in a .bat file.

If any task group classes in the JAR file are instantiated, the Java Virtual Machine locates and loads the adapter stub DLL and performs initialization operations. If the DLL location is not in the executable path when the Java client runs, an UnsatisfiedLinkError is thrown.
To run the Java client under a debugger, rename or copy the adapter stub DLL and append _g to the name of the DLL. For example:

C:\java> copy add_acms_appl_java_acmsda.dll add_acms_appl_java_acmsda_g.dll
C:\java>

The Java Virtual Machine requires that the _g be appended to the DLL name.

8.8.2 Management Environment Setup

Set up the management environment for the client. Perform the following steps.

1. Use the management GUI to establish runtime parameters.
   • If the client calls ACMS tasks, set up parameters (see Section 10.2.4).
   • For all clients, establish the thread usage semantics setting (see Section 10.2.3). Thread control applies in the following circumstances:
     – If the client uses the ACMS Gateway output adapter, setting the thread control restricts the number of connections made to the called server machine. If there are too many connections (no limit is set), calls beyond a certain limit fail because of resource exhaustion. (The number of connections on the called server machine is controlled by a TCP/IP Services for OpenVMS parameter.)

2. Set up error logging for the client (see Appendix A).

3. If the client calls ACMS tasks, set up the ACMS Gateway adapter environment (see Section 10.3).
This chapter describes various application set-up operations.

9.1 Calling STDL Tasks from IIS

If the client calls tasks (ACMS tasks) from Internet Information Server (IIS), use the management GUI to establish the thread usage semantics setting for the task group.

9.1.1 Establishing Thread Usage Semantics Settings

Establishing the thread usage semantics setting avoids stack overflows and limits the number of concurrent connections. When an Active Server Page calls an Automation object within IIS, the amount of free stack space remaining is very limited.

9.1.2 Thread Usage Semantics Setting for Calling ACMS Tasks

If your client calls ACMS tasks, set the thread usage semantics setting to Execute call on a separate thread, but limit the number of TPware threads and set the thread limit.

Each active call between a thread using the ACMS Gateway output adapter on the Windows system and the HP TP Web Connector Gateway for ACMS process on the OpenVMS system uses a separate TCP/IP connection. This connection usage can cause the gateway to exhaust process and system resources, including TCP/IP sockets. Choose an appropriate value for the thread limit so that the number of threads is sufficient to handle the expected load, but not so high as to cause the HP TP Web Connector Gateway for ACMS process to exceed its OpenVMS quotas or consume all available TCP/IP sockets. See Section 10.2.3 for the steps to set the thread usage semantics.
9.2 Setting Up the IIS

Before you run an ASP application, make sure that the Internet Information Server (IIS) has read and execute access to the directory containing the .asp files. Refer to your web server documentation for instructions on how to add virtual directories and to set permissions. Before running the samples in the Internet Service Manager, copy the files to an empty directory before using them and add, as a virtual directory, the directory with a name in the following format:

`install-directory\std\samples\web`

The value for `install-directory` is the location in which you installed the product.

9.3 Environment Variables and IIS

To load any newly added systemwide environment variables that are needed by IIS, shut down and restart the Windows system. For more information on managing IIS, see either the Microsoft online documentation or knowledge base articles at the Microsoft World Wide Web site.

9.4 Oracle Web Application Server

Oracle WRB cartridge applications generally follow the ISAPI model. Built as a DLL, the cartridge contains the application code that runs in the web server with the input and output adapters. The application code and adapters form the client side of the web-server based application.

To run cartridges with the Oracle Application Web Server, register the cartridges with the WRB. When registering a cartridge, you give it a name by which it can be referred in the HTML document. For example, in the add sample code, the cartridge name is used in the action attribute of the form used to pass in numbers to be added. If the path to the cartridge can be located, the cartridge is invoked and uses the WRB API to gather information from other fields in the form. The cartridge calls through the adapter to invoke the TP task.

When the TP task completes, the cartridge can obtain the results from the parameters that it passed. The cartridge can again use the WRB API to generate HTML commands and text, to create dynamically a new Web page, and to request that the WRB display the generated HTML source code. Sample HTML code supplied with the product include some specific steps to build and install the add cartridge.
9.5 DLL Caching in IIS

When an ASP application creates an Automation object, IIS loads the Automation server (that is, the DLL). After the DLL is loaded, IIS caches it in memory indefinitely to improve performance. If you need to unload the DLL (for example, to recompile or overwrite it), stop and restart the Internet Information Services (see Section 9.5.1).

See the Microsoft knowledge base for more information on the lifetime of a COM component under IIS and ASP.

9.5.1 Stopping and Starting Internet Information Services

If you need to unload a DLL (for example, either an Automation DLL or an ISAPI DLL) to either recompile or overwrite it, perform the following steps:

1. Flush the IIS DLL cache using one of the following techniques.
   - In a Command Prompt window, enter the following command:
     ```
     net stop IISadmin
     ```
   - Perform the equivalent operations in the Internet Service Manager.

2. Recompile or overwrite the DLL.

3. Restart all the Internet Information Services using one of the following techniques:
   - In a Command Prompt window, enter the following command:
     ```
     net start IISadmin
     ```
   - Perform the equivalent operations in the Internet Service Manager.

See the Microsoft knowledge base articles at the Microsoft World Wide Web site for more information on ISAPI DLLs and the IIS.

9.6 Locating ISAPI DLLs

IIS must be able to locate any ISAPI DLLs. To ensure this and to avoid having to specify the exact paths, put the ISAPI DLLs in the same directory as the HTML application.†

† In the sample applications, the ISAPI DLLs are expected to be in the same directory as the HTML application.
This chapter describes procedures you use to manage the environment on a client system running the HP TP Web Connector product:

- Supplying management information (see Section 10.1)
- Using the management GUI (see Section 10.2)
- Setting up the ACMS Gateway adapter environment if your client calls ACMS tasks (see Section 10.3)

On a client system, you can log errors (see Appendix A).

## 10.1 Supplying Management Information

In general, the management GUI provides information to the TPware thread controller and various adapters.

### 10.1.1 Management Information Sources

Whenever the thread controller or an adapter runtime needs information, it uses the following sources (the first listed has the highest precedence):

1. **The call attributes (if any) from the client program**
   
   Call attributes can supply only some of the required information. Thread control information cannot be supplied this way.

2. **Local settings**
   
   You supply local settings through the local management GUI. Local settings are used if the information is not or cannot be supplied as a call attribute.

3. **Remote settings (if Sharing is enabled)**
   
   Through the management GUI, you can name a remote node from which management information is retrieved. The TPware runtime caches the remote settings on the local node.

4. **Cached information from the remote node (if Sharing is enabled)**
If an attempt is made to use settings from a remote node and that node cannot be reached, then the last information (if any) retrieved from that node is used.

10.1.2 Management Information by Groups
The management GUI gives you the ability to customize management settings that are specific to your applications and environment. You can enter settings at two levels:

- A group whose name you supply
- The Default group

Entering an attribute for a named group allows you to tailor that management attribute for a specific task group. Entering an attribute for the Default group sets up a value that is common for all task groups. For example, setting thread usage semantics for the Default group allows the runtime system to use this setting if it cannot find an entry for a particular task group.

10.2 Using the Management GUI
Find the management GUI in the TPware program group. The utility may have any combination of the following tabs:

- **Computer** for selecting the system on which you want to manage HP TP Web Connector components (see Section 10.2.1)
- **Sharing** for specifying either of the following:
  - That this computer uses local settings with the option to share its settings with other clients
  - That the computer you are managing uses shared management settings from a remote node

See Section 10.2.2.

- **Threads** for supplying thread usage semantics for clients running on the computer system that you are managing (see Section 10.2.3)
- **ACMS** for setting parameters for the ACMS Gateway adapter on the computer that you are managing (see Section 10.2.4)

The management tabs available depend on the TPware products and options you have installed.
10.2.1 Computer Settings

The Computer tab allows you to select either the local node or a remote node for management. This setting defaults to the local node.

When you change the node, the tabs displayed reflect the options installed on that node. If you choose Share Local Settings, all the tabs appear.

The name of the computer being managed appears in the title bar.

10.2.2 Using Shared Settings

The Sharing tab allows you to set up a particular node from which multiple clients can read their management settings. If many client nodes need the same management settings, you can reduce setup time on each client node by using the shared-settings feature.

The Sharing tab allows you to do the following:

• Choose the local node as the source for the management settings (see Section 10.2.2.1).

• Choose a remote node as the source for the management settings that will apply to the node that you are managing (see Section 10.2.2.2).

10.2.2.1 Using Local Settings

If you click Use Local Settings, the management settings are read from the local registry. You can also click Share Local Settings if you want to share this node's settings with other client nodes. By sharing settings, you can choose that node as the remote source for management information for another computer that you are managing.

10.2.2.2 Using Shared Remote Settings

If you click Use Remote Settings, then you need to supply the Remote Node Name on which these management settings exist. In this context, remote node means another node on which you have configured management GUI settings and have enabled Share Local Settings.

Each time a setting is read from a remote node, that setting is written to a local cache. The local cache is used when the remote node is unreachable.

If you change your remote node, or if you switch from Use Remote Settings to Use Local Settings, the management GUI warns that all cached entries will be deleted and prompts you to confirm this action. If you confirm, then the GUI deletes all cached settings. If you do not confirm, the GUI redisplays the original settings.
If you select Use Remote Settings, but have configured local management settings (including the Default group settings), the local settings override the remote settings.

10.2.2.3 Restrictions on Registry Access

On Windows platforms, there are various restrictions that affect how a client user account accesses a remote node’s registry at runtime to obtain management information.

The following restrictions apply if the remote node is:

• A server in the domain:
  – When the client is logged into the domain
    All users have access, regardless of whether the guest account on the remote node is enabled or not.
  – When the client is not logged into the domain
    If a user has an account on the remote node, the password for the remote account must match the password for the local account. If the guest account is enabled on the remote node, all users have access, and the password restriction does not apply.

• A server not in the domain:
  If a user has an account on the remote node, the password for the remote account must match the password for the local account. However, if the guest account is enabled on the remote node, all users have access.

The following restrictions apply if the remote node is:

• A workstation in the domain:
  – When the client is logged into the domain
    The user must be a member of the domain admin group, regardless of whether the guest account on the remote node is enabled.
  – When the client is not logged into the domain
    The user must have an account (with matching password) on the remote node and be in the domain admin group for that node.

• A workstation not in the domain:
  The user must have an account (with matching password) on the remote node and be in the domain admin group for that node.
10.2.3 Threads Settings

Each thread in a multithreaded process (for example, a web server) uses system resources to do its work. To better manage the allocation of system resources among threads, you can manage the number of active threads servicing each call.

By managing the maximum number of active execution threads, you put a throttle value on the calls made to the server. Incoming requests are queued until an execution thread is free. By adjusting the maximum number of active threads, you can optimize resource usage on the both the client and server nodes.

The Threads tab allows you to specify thread usage semantics that the TPware or the adapter runtime systems use. This information is supplied through local settings, remote settings, or cached settings (see Section 10.1).

10.2.3.1 Thread Usage Semantics Settings

To specify the thread usage semantics for a task group, the Threads tab has the following thread usage semantics settings available:

- **Execute call on the caller’s thread**
  This setting is suitable when the user volume is low and you do not need to limit the number of concurrent calls to the server. This is the default usage semantics setting for all input adapters. However, if this setting is in effect when a client is using an C asynchronous input adapter, then the **Execute call on a separate thread** semantic setting is used instead.

- **Execute call on a separate thread**
  This setting is suitable when the user volume is low or when the calling thread runs out of stack space under the **Execute call on the caller’s thread** setting. This setting uses more system resources than the **Execute call on the caller’s thread** setting, because the HP TP Web Connector runtime creates as many additional threads as it needs to handle the user load.

- **Execute call on a separate thread, but limit maximum threads to __**
  This setting has the same benefits as the **Execute call on a separate thread** setting, but is suitable for servers with high user volume. Using this setting, you can limit the number of threads that are created on the calling end. Limiting the number of threads limits concurrency in the server procedures. For some types of server applications, this limit can increase performance.
In contrast, if you specify the **Execute call on a separate thread setting**, the software creates a separate thread for each concurrent request. The result is that the called server can consume excessive resources and contribute to degraded performance.

- **Execute call on the caller’s thread, but limit maximum threads to __**
  
  This setting has the same benefits as the **Execute call on a separate thread setting**, but is suitable for servers with high user volume. Using this setting, you can limit the number of concurrent calls that can be made to the called server. Limiting the number of concurrent calls limits concurrency in the server procedures. For some types of server applications, this limit can increase performance.

Table 10–1 specifies the thread settings that you should use for a particular output adapter.

### Table 10–1 Output Adapter Thread Usage Semantics Settings

<table>
<thead>
<tr>
<th>Output Adapter</th>
<th>Execute call on the caller's thread</th>
<th>Execute call on a separate thread</th>
<th>Execute call on a separate thread, but limit maximum threads to __</th>
<th>Execute call on caller’s thread, but limit maximum threads to __</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>OK&lt;sup&gt;1&lt;/sup&gt;</td>
<td>OK</td>
<td>OK</td>
<td>OK</td>
</tr>
<tr>
<td>ACMS Gateway</td>
<td>OK</td>
<td>Not needed&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Recommended to avoid overloading the ACMS Gateway</td>
<td>Recommended to avoid overloading the ACMS Gateway</td>
</tr>
</tbody>
</table>

<sup>1</sup>OK means that this setting works for the output adapter and that your selection depends on your situation.

<sup>2</sup>Not needed indicates those cases in which executing the output adapter on a separate thread does not provide any advantage unless the number of threads is limited.

### 10.2.3.2 Specifying Thread Usage Semantics Settings

To specify the thread usage semantics setting for a task group, perform these steps:

1. Click the **Threads** tab. The Default group entry appears in the Group Name drop-down box.

2. If you are configuring the Default group or an existing group, omit this step. To configure a new group that does not use default settings, do the following:
   a. Click the **New Group** button. The New Group dialog box appears.
   b. In the New Group dialog box, enter the group name.
   c. Click the Add button to add the group to the Group Name list box.
The **New Group** dialog box remains displayed, in case you want to enter multiple group names.

d. When you finish entering group names, click the **Done** button.

3. Select a group from the **Group Name** list box (initially, the **Default** group appears in the box). Do the following for the selected group.

   a. Specify thread usage semantics for the group in the **Group Name** box by clicking the appropriate radio button. Use the guidelines in Section 10.2.3.1 to set the appropriate threads usage semantics for your application.

   b. If the selected semantics setting allows you to limit the number of threads, enter a positive integer value for the thread limit.

   Repeat these steps for each selected group.

4. When you finish specifying the thread usage semantics settings for one or more groups, click the **Save** button. The **Execution Semantics** fields for **Default** remain empty until you click the appropriate semantics setting and click **Save**.

   See Section 10.2.3.3 for an explanation of when threads settings take effect.

   If there are any unsaved changes, a dialog box asks whether you want to save all changes.

10.2.3.3 **When Thread Usage Semantics Settings Take Effect**

Settings for the maximum number of threads take effect immediately if, and only if, the following conditions apply:

- The settings are local.
- The node is being managed locally.

If you modify a group's thread limit, the change takes effect immediately. It is not necessary to restart a client to have the modifications take effect.

Restart a client to have the modifications take effect if one of the following conditions applies:

- An application uses remote settings.
- The node is managed remotely.
- You change a group's thread usage semantics setting.
- You apply settings for the first time.
- You remove settings.
10.2.3.4 Deleting Thread Usage Semantics Settings

To delete the thread usage semantics setting of a group, do the following:

1. Click the Threads tab.
2. Select the group from the Group Name list box.
3. Click the Delete button.

See Section 10.2.3.3 for when threads settings take effect.

If a group is not listed in the Group Name list box, that group has the thread usage semantics setting of the Default group. If you do not specify the semantics setting for the Default group, an unlisted group has the default semantics setting, Execute call on the caller’s thread, as described in Section 10.2.3.1.

10.2.4 ACMS Gateway Adapter Settings

The ACMS tab allows you to provide information related to the ACMS Gateway adapter. The STDL task group (for which you provide this information) is generated by the ACMSADU extension and given the ACMS application name as its task group name.

When you click the ACMS tab, the Default group entry appears in the Group Name drop-down box, but the ACMS Gateway adapter settings fields for Default remain empty until you enter the relevant information and click Save. Configuring the Default group allows the runtime system to use these default settings if it cannot find an entry for a particular task group.

The ACMS Gateway adapter settings that you need to provide are:

- **Server Node**: The TCP/IP node on which the ACMS Gateway resides. Running on an ACMS system, the ACMS Gateway connects the ACMS Gateway adapter in the client on the Windows system to the ACMS tasks running on the OpenVMS system.
- **Username**: The name of the user account on the OpenVMS system that clients use for ACMS calls.
- **Password**: The password for the OpenVMS user account that clients use for ACMS calls. (The password is not echoed.)

When the ACMS tab settings of a specified group change, all newly started clients see the changed settings. Clients that are running when the changes take effect do not see the changes. Ensure that you restart all clients that call the group so that the modifications take effect.
If the gateway node uses a TCP/IP port that is different from the default, you also need to provide that information through an environment variable (see Section 10.3.2).

If the client specifies call attributes, they override all management settings.

10.2.4.1 Configuring a New ACMS Group
You need to configure a new ACMS group when the group is the Default group or any task group that does not use the default settings. If you want a group to use the Default group settings, do not perform the following configuration procedure for that group (the runtime system applies default group information to any group without an entry). The procedures differ for changing the settings of an existing ACMS group (see Section 10.2.4.2).

To configure a new ACMS task group, perform the following steps:

1. Click the ACMS tab. The Default group automatically appears in the Group Name box.
2. If you are configuring the Default group or an existing group, omit this step. To configure a new group that does not use default settings, do the following.
   a. Click the New Group button. The New Group dialog box appears.
   b. In the New Group dialog box, enter the group name.
   c. Click the Add button to add the group to the Group Name list box.
3. Enter specific Server Node, Username, and Password information for the group shown in the Group Name box.
4. Click the Save button.
5. If you have already set the thread usage semantics for the ACMS Default group, omit this step. Otherwise, click the Threads tab and select the desired thread usage semantics for the group (see Section 10.2.3.1).

10.2.4.2 Changing ACMS Gateway Adapter Group Settings
To change the ACMS Gateway adapter settings of a group, perform the following steps:

1. Click the ACMS tab.
2. Select a group from the Group Name list box to view its settings.
3. Type in the new information for Server Node, Username, and Password for the group shown in the Group Name box.
4. After you make changes, save them by clicking the Save button.
5. Restart all clients that call the group so the modifications take effect.

If there are any unsaved changes, a dialog box asks whether you want to save all changes.

10.2.4.3 Deleting ACMS Gateway Adapter Group Settings

To delete the settings of a group, perform the following steps:

1. Click the ACMS tab.
2. Select the group in the Group Name list box.
3. Click the Delete button.
4. Restart all clients that call the group so the modifications take effect.

If a group does not appear in the Group Name list box, that group uses the settings for the Default group, provided that you have entered the Default group settings.

10.3 Setting Up the ACMS Gateway Adapter Environment

If your client calls ACMS tasks, you may need to do the following:

- Specify an ACMS Gateway adapter error log file (see Section 10.3.1).
- Specify a TCP/IP port number (see Section 10.3.2).

10.3.1 Specifying an ACMS Gateway Adapter Error Log File

To diagnose problems with communications between the ACMS Gateway adapter and the HP TP Web Connector Gateway for ACMS, specify a file on the client system in which the runtime system writes exception information. In the process in which the client runs, define the following environment variable with the full path and name of a file that holds the exception information:

\texttt{STDL\_ACMSDA\_LOG}

If the environment variable is defined when the client starts, the runtime system creates the file. If a file of the same name exists, the software appends information to it. Examine the file with any editor that can read ASCII text.

These exceptions are described in the file \texttt{acmsda\_client\_messages.txt} located in the installation directory.

On a Windows system, the directory has a name in the following format:

\texttt{install\-directory\stdl\include}
For example, if you installed the product in the `c:\tpware` directory, then the client message file is located at:

`c:\tpware\stdl\include\acmsda_client_messages.txt`

### 10.3.2 Specifying a TCP/IP Port Number for Calls to ACMS Tasks

If the OpenVMS node running the gateway process defines a TCP/IP port number different from the default (see Table 11–1), the client process needs to know that port number.

To specify the gateway node's TCP/IP port number in the client process, define the following environment variable with the `node-name` of the node running the gateway process:

`STDL_ACMSDA_PORT_node-name`

For the value of the environment variable, supply the integer number of the port used on the gateway node.
This chapter provides introductory, management, and tuning information about the HP TP Web Connector Gateway for ACMS software.

- Section 11.1 introduces the HP TP Web Connector Gateway for ACMS.
- Section 11.2 describes procedures for managing the HP TP Web Connector Gateway for ACMS process on the OpenVMS system.
- Section 11.3 provides information for tuning HP TP Web Connector Gateway for ACMS parameters to optimize performance.

### 11.1 HP TP Web Connector Gateway for ACMS Software

Software called the **HP TP Web Connector Gateway for ACMS** provides the connection between the ACMS Gateway output adapter running in HP TP Web Connector clients and tasks being called in applications running on an ACMS system. The term *gateway* used throughout this chapter refers to the HP TP Web Connector Gateway for ACMS software. When you install the gateway software on an ACMS system, you choose whether to install HP TP Web Connector Gateway for ACMS software with or without the ACMSADU extension (refer to *HP TP Web Connector Installation Guide*).

Set up and use the gateway as follows:

1. On a Windows system on which you have installed TPware components, use the management GUI to provide information that allows the connection between the ACMS Gateway adapter and the gateway (see Section 10.2.4).

2. On an ACMS system on which you have installed the gateway software, have the gateway process running. OpenVMS command procedures are provided to control the process (see Section 11.2).

You can run multiple gateway processes on the same system (see Table 11–1).
3. On the systems on which HP TP Web Connector clients run, specify the TCP/IP port number that the ACMS Gateway adapter uses to communicate with the gateway (see Section 10.3.2). If a gateway process uses the default port number, no setup operations for TCP/IP port numbers are required on the gateway and client systems.

At runtime, the ACMS Gateway adapter uses TCP/IP to communicate with the gateway. Using management information that you provide to the client program, the ACMS Gateway adapter finds the system on which the gateway runs.

Using information that you supply to the gateway process, the gateway receives the call from the ACMS Gateway adapter and invokes the called task on the ACMS system. The gateway uses the ACMS RPC protocol to communicate with the ACMS application. The gateway also returns status from the called task to the client that invoked the task.

11.2 Controlling the HP TP Web Connector Gateway for ACMS

Sections 11.2.1 to 11.2.7 discuss starting, setting up, and stopping the gateway. Section 11.3 discusses specifying gateway process quotas.

11.2.1 Gateway Starting Requirements

Run the gateway under either the user name SYSTEM or another user name with a [1,4] UIC with the following OpenVMS privileges:

- CMKRNL
- NETMBX
- SECURITY
- SYSLCK
- SYSNAM
- SYSPRV
- TMPMBX

To properly start the gateway, the user name must be an authorized ACMS agent. Use ACMSUDU to authorize the user name.
11.2.2 Editing the System Startup File

To start the gateway, use the following command procedure found in the system startup directory:

```
SYS$STARTUP:ACMSDA$STARTUP.COM
```

Add to the OpenVMS system startup file the command line that starts the gateway process. If you separate the startup procedures into modules, make sure that you add the lines to the correct file.

Position the startup command line for the gateway after the line that invokes the ACMS startup command procedure.

```
Note

Start the ACMS system first and then start the gateway.
```

Starting the gateway automatically enables the use of TCP/IP protocols.

The gateway supports the use of a parameter file to customize settings at runtime. See Sections 11.2.4 and 11.3.2.

11.2.3 Starting the Gateway from DCL

If you need to start the gateway at times other than at OpenVMS startup, run the command procedure from the gateway account (see Section 11.2.1). Use the following commands to restart the gateway:

```
$ @SYS$STARTUP:ACMSDA$SHUTDOWN
.
.
$ @SYS$STARTUP:ACMSDA$STARTUP
%RUN-S-PROC_ID, identification of created process is 42600450
$
```

The following example shows the batch startup method, using SYSTEM as the gateway account:

```
$ SUBMIT/USER=SYSTEM/NOLOG SYS$STARTUP:ACMSDA$STARTUP
Job ACMSDA$STARTUP (queue SYS$BATCH, entry 1208) started on SYS$BATCH
$
```

This command procedure defines some logical names and issues a RUN command to start the gateway in a detached process with the correct privileges and a default set of qualifiers specifying the process quotas. To alter the quotas, follow the guidelines given in Section 11.3.2.
If the ACMS system is stopped, requests made through the ACMS Gateway adapter are refused until the ACMS system is available. The gateway process continues running. It detects when the ACMS system restarts and processes new requests.

If a TPware client has trouble calling an ACMS task, verify that the gateway process is running under an account that satisfies the requirements described in Section 11.2.1. If the gateway process is running under a user name that does not satisfy the requirements, shut down the gateway and restart it under the appropriate user name.

11.2.4 Gateway Startup Parameter File

The parameter file is a user-specified ASCII text file that lists overrides to gateway runtime quotas and defaults. Provided for starting the gateway, the ACMSDA$STARTUP.COM file can read an optional parameter file that you can supply. HP provides the following default parameter file:

```
ACMSDA$STARTUP.PRM
```

You can use the file as supplied or modify it to suit local needs.

The parameter file can contain customized settings such as user name quotas and OpenVMS parameters. The parameter file defines logical names from keywords that determine the gateway characteristics according to the following rules:

- The logical names are defined in the process logical name table for the process that invokes the gateway startup command procedure.
- If the keywords are not specified or are specified as null, the process logical names are not defined.
- For those keywords that take a value, use an equal sign (=) with or without spaces between the keyword and the value.
- Enclose multiple values in parentheses, separating each value with a comma (,).

Example 11–1 is a sample parameter file.

**Example 11–1 Gateway Startup Parameter File**

```
!To select the Port numbers and gateway host
!
```

(continued on next page)
Example 11–1 (Cont.) Gateway Startup Parameter File

TCPIP_PORT = 1023
!
! For Multiple Gateways for Debugging purposes
!
SERVER_NAME = DBG1
!
! OpenVMS Parameters
!
AST_LIMIT = 100
BUFFER_LIMIT = 65535
ENQUEUE_LIMIT = 200
EXTENT = 2000
FILE_LIMIT = 100
IO_BUFFERED = 300
IO_DIRECT = 100
MAXIMUM_WORKING_SET = 750
PAGE_FILE = 100000
PRIORITY = 4
QUEUE_LIMIT = 20
WORKING_SET = 150

To specify the parameter file to start the gateway in batch mode, use a command in the following format:

SUBMIT/USERNAME=SYSTEM SYS$STARTUP:ACMSDA$STARTUP /PARAM=SYS$STARTUP:file-name

The value file-name is the name of the parameter file that you supply.
Table 11–1 contains the list of keywords for parameters that you can include in this file.

Table 11–1 Gateway Keywords

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>SERVER_NAME</td>
<td>Defines a gateway-name extension to distinguish between multiple gateways on the same node. The value is a name of up to 5 characters appended to ACMSDA$SRV to create the process name.</td>
</tr>
</tbody>
</table>

(continued on next page)
### Table 11–1 (Cont.) Gateway Keywords

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCPIP_PORT</td>
<td>Defines the number to be used by the gateway for its TCP/IP port. The default is 1022. This value must match the value used in clients (see Section 11.2.5.)</td>
</tr>
</tbody>
</table>

#### 11.2.5 Setting Up the TCP/IP Port Numbers

If a gateway process is going to use a port number other than the default (see Table 11–1), clients calling ACMS tasks with the ACMS Gateway adapter must specify the port number that the gateway is using. Perform the following setup operations.

1. Set up the port number on the gateway (see Section 11.2.5.1).

2. Use that value for the port number in clients that call through the gateway (see Section 11.2.5.2).

If a gateway process uses the default port number, no setup operations for TCP/IP port numbers are required on the gateway and client systems.

#### 11.2.5.1 Specifying the TCP/IP Port Number for the Gateway Process

TCP/IP uses numeric port numbers as endpoints of communication. Table 11–2 lists the categories and ranges of port numbers.

### Table 11–2 TCP/IP Port Categories and Numbers

<table>
<thead>
<tr>
<th>Category</th>
<th>Port Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserved privileged ports</td>
<td>0 to 255</td>
</tr>
<tr>
<td>Privileged ports</td>
<td>256 to 1023</td>
</tr>
<tr>
<td>Nonprivileged ports</td>
<td>1024 to 65 535</td>
</tr>
</tbody>
</table>

Port number 1023 is the highest unassigned privileged port number.

A numeric port number specifies the object to which the gateway connects. A gateway process automatically uses one of the privileged ports by default (see Table 11–1). If a gateway process cannot use the default value for the port number, you must assign it an available and unreserved port number from the values shown in Table 11–2.
To assign a TCP/IP port number to the gateway, specify TCPIP_PORT in the
startup parameter file, which is optionally passed to the gateway startup
command file. For example:

TCPIP_PORT=1023

The example assigns the port number 1023 (see Example 11–1). This port
number is the same value that you set for the client to connect through the
gateway (see Section 11.2.5.2).

11.2.5.2 Specifying the Gateway TCP/IP Port Number for the Client
The ACMS Gateway adapter through which a client calls an ACMS task uses
the same default value of the TCP/IP port number as that used by the gateway
process. If you set up the gateway process to use a TCP/IP port number other
than the default value (see Section 11.2.5.1), you must specify the same number
for the client. The port number that you specify for the client must match the
port number used by the gateway. For more information, see Section 10.3.2.

11.2.6 Stopping the Gateway Process
To stop the gateway process, use the following command procedure found in
the system startup directory:

SYS$STARTUP:ACMSDA$SHUTDOWN.COM

Run the procedure from the account that is authorized as the ACMS agent (see
Section 11.2.1). For example:

$ @SYS$STARTUP:ACMSDA$SHUTDOWN

The command procedure cancels all active tasks, shuts down the gateway,
and deassigns the logical names. This ensures that the gateway process exits
properly.

11.2.7 Editing the System Shutdown File
To have the gateway process stop automatically when the OpenVMS system
is shut down, edit the system shutdown file located in the system startup
directory. Find the following line in the file:

$ @SYS$STARTUP:ACMSTOP.COM

At any point before the line that stops the ACMS system, add the following
command line to the system shutdown file:

$ @SYS$STARTUP:ACMSDA$SHUTDOWN.COM
The command procedure shuts down the gateway properly before the ACMS system shuts down.

**11.2.8 Gateway Error Processing**

Gateway errors are logged in the ACMS Software Error log (SWLUP). To evaluate gateway error information on the OpenVMS gateway system, see the following file.

SYS$HELP:ACMSDA$GATEWAY_MESSAGES.TXT

Examine this file to evaluate and respond to gateway errors.

**11.3 Tuning the Gateway**

The following sections describe tuning the gateway by setting system parameters, overriding quotas, and setting a maximum buffer size.

**11.3.1 Tuning the Gateway Process**

Because the size and nature of the load on the gateway varies widely from site to site, monitor the behavior of the gateway process and adjust its parameters and quotas according to the demand placed on it, as you would any OpenVMS process. Section 11.3.2 describes the mechanism to override the default gateway process quotas.

**11.3.2 Overriding Default Process Quotas**

Override the default runtime process quotas for the gateway by supplying a file specification on the startup command line.

To use the parameter file to start the gateway, modify the startup command line so that it specifies the parameter file. For example:

```bash
$ @SYS$STARTUP:ACMSDA$STARTUP.COM SYS$STARTUP:ACMSDA$STARTUP.PRM
```

To perform the same function in batch mode from the DCL command line, enter the SUBMIT command. For example:

```bash
$ SUBMIT/USER=SYSTEM/NOLOG SYS$STARTUP:ACMSDA$STARTUP- $ _$ /PARAMETER=(SYS$STARTUP:ACMSDA$STARTUP.PR M)
```

Job ACMSDA$STARTUP (queue SYS$BATCH, entry 1209) started on SYS$BATCH

$%

Completely specify the data file; that is, device, directory, name, and type. If the specified data file cannot be accessed, the gateway uses default values for process quotas.
The data file contains lines in the following format:

\[\text{value-name} = \text{desired-value}\]

Example 11–2 shows a sample data file.

**Example 11–2 Gateway Process Quota Data File**

```plaintext
! Override default values for HP TP Web Connector Gateway for ACMS start-up
!
Page_file = 15000
Working_set = 700 ! Required to support VERY_LARGE application
```

To comment a line, use an exclamation point (!) to introduce the comment text. To make the text readable, use space and tab characters. Table 11–3 shows the values available for overriding.

**Table 11–3 Gateway Process Quotas**

<table>
<thead>
<tr>
<th>Process Quota</th>
<th>Summary Description</th>
<th>Alpha Default Value(^1)</th>
<th>I64 Default Value(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AST_LIMIT</td>
<td>Number of outstanding asynchronous system traps (ASTs) allowed</td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td>BUFFER_LIMIT</td>
<td>Maximum buffered I/O memory (bytes)</td>
<td>65,536</td>
<td>65,536</td>
</tr>
<tr>
<td>ENQUEUE_LIMIT</td>
<td>Maximum outstanding locks allowed</td>
<td>2,000</td>
<td>2,000</td>
</tr>
<tr>
<td>EXTENT</td>
<td>Maximum physical memory (pages)</td>
<td>20,000</td>
<td>20,000</td>
</tr>
<tr>
<td>FILE_LIMIT</td>
<td>Maximum open files</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>IO_BUFFERED</td>
<td>Maximum outstanding buffered I/O operations</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>IO_DIRECT</td>
<td>Maximum in-progress direct (disk) I/O operations</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>MAXIMUM_WORKING_SET</td>
<td>Working set maximum size (pages)</td>
<td>4,000</td>
<td>4,000</td>
</tr>
</tbody>
</table>

\(^1\)Information about tuning guidelines appears in Section 11.3.3.
### Table 11–3 (Cont.) Gateway Process Quotas

<table>
<thead>
<tr>
<th>Process Quota</th>
<th>Summary Description</th>
<th>Alpha Default Value</th>
<th>I64 Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAGE_FILE</td>
<td>Maximum reserved pages in page file</td>
<td>100,000</td>
<td>100,000</td>
</tr>
<tr>
<td>PRIORITY</td>
<td>Base process priority</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>QUEUE_LIMIT</td>
<td>Maximum outstanding timer queue entries</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>WORKING_SET</td>
<td>Number of working set pages</td>
<td>2,000</td>
<td>2,000</td>
</tr>
</tbody>
</table>

1Information about tuning guidelines appears in Section 11.3.3.

For more information on the quotas, refer to the RUN command description in the OpenVMS DCL documentation. Section 11.3.3 explains some tuning guidelines for the gateway.

### 11.3.3 General Tuning Guidelines

Use the following guidelines for deciding on initial values for quotas.

- When you set initial values for the gateway quotas, assume that the gateway is working under the heaviest load you expect. Specifically, in computing buffered I/O limit or page file quotas, compute the quotas for the moment when:
  - The maximum number of clients have concurrent task calls outstanding.
  - Client programs have task calls outstanding that represent the largest total passed workspace sizes.

The guidelines let you use as much information as you have about your workload. For example, you may know that, although 40 client programs are running, at most 30 have task calls in progress at the same time.

- Alternatively, apply the guidelines assuming that the maximum number of client programs are calling tasks at the same time. This more conservative approach may overestimate the actual required quota values, but it is more tolerant of changes in your workload over time and is easier to analyze.
TPware software supports recording of runtime errors that cannot be returned to the client process. The software attempts to log these errors and any additional information required to help diagnose the problem indicated by the errors.

A.1 Error Logging Overview

If the TPware software encounters an error at runtime, it attempts to return the error to the client program. If the error cannot be returned to the client, or if additional information should be logged to help diagnose a primary error, TPware attempts to log the primary error and any additional information. The software uses one of the following types of error logging:

- Error logging to a platform event log facility
  By default, TPware software writes error information to a central event log facility specific to the platform (see Section A.2).

- Error logging to a file
  If you define stdl_log_file as a system environment variable, TPware software writes error information to the TPware error log file defined by the environment variable (see Section A.3).

The stdlog utility is used to view records in a TPware error log file (see Section A.4).

You can use the STDL_SOURCE_TRACE environment variable to have information about the source of the error included in the log. If you set the environment variable to the value TRUE, the runtime system includes in the log the number of the source line and the name of the file containing the application source related to the error.
A.2 Use of the Platform Event Log Facility
TPware software writes error information to a platform event log facility if you do not log errors to a TPware error log file. The software uses the Windows Application Event Log as the event log facility.

A.3 Enabling and Disabling Error Logging to a File
Enable TPware error logging to a file by defining a system environment variable named stdl_log_file. Supply as a value for stdl_log_file the specification of the file to which the error information is to be written.

A.3.1 Enabling Error Logging to a File on Windows Systems
On a Windows 2000 system, if the system environment variable stdl_log_file is defined, error information is logged to the TPware file. Define a system environment variable as follows:
1. From the desktop, double click My Computer.
2. In the My Computer window, double click Control Panel.
3. In the Control Panel window, double click the System icon.
4. In the System Properties window, click the Environment tab.
5. In the Environment window under the System Variables list, do the following:
   a. Click on an existing system environment variable.
   b. Click in the Variable text box and type stdl_log_file.
   c. Click in the Value text box and enter the full path and name for the error log file for that system. The value entered for stdl_log_file must be a valid path and file name. For example:
      d:\tpwaresamples\myerror.log
   d. Click the Set button.
   e. Click the OK button.
6. Reboot the system for the change to take effect.
TPware errors are subsequently logged to the file specified by the stdl_log_file environment variable. If the file does not exist, the software creates it. If the file exists, error logging information is appended to it.
A.3.2 Disabling Error Logging to a File
To disable error logging to the TPware error log file, delete the system environment variable named stdl_log_file. If the system environment variable stdl_log_file is not defined, the results depend on the operating system (see Section A.1).

A.4 Viewing Records in the TPware Error Log File
If error logging to a file is enabled on the client system (see Section A.3), use the TPware stdlog utility to view records in the TPware error log file.

A.4.1 Error Log Utility Syntax
Open a Command Prompt window and run the stdlog utility.

Synopsis
Use the following syntax:

stdlog [ option-flag ...]

You can use the stdlog utility in interactive mode or single command mode.

If you enter the stdlog command alone or without the -1 flag, the utility enters interactive mode. If the environment variable stdl_log_file is defined, the software opens and displays the related file. If the environment variable is not defined, the utility runs and displays the following prompt:

Enter the log file name:

At the file name prompt, enter the name of the file in the current directory and press Enter. If the file is not in the current directory, enter the full path. The utility displays the specified file and redisplays the prompt.

At the prompt, press Ctrl + C to stop the utility and return control to the Command Prompt window.

If you specify the stdlog command and option flags, you can issue the entire command in one line. The utility executes the single command and returns control to the command prompt.

Option Flag Default Values
All default options are applied to extracting information from the log file. The names and default values of the option flags are shown in Table A–1.
Table A–1  stdlog Option Flags and Default Values

<table>
<thead>
<tr>
<th>Option Flag</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>-b [date-time]</td>
<td>Displays records with all times before the current date and time of day.</td>
</tr>
<tr>
<td>-l log-file-name</td>
<td>Displays records in the file specified by the definition of the stdl_log_file environment variable. Otherwise, prompts for the name of the log file to access.</td>
</tr>
<tr>
<td>-s [ date-time]</td>
<td>Displays records with all times since the earliest date and time of day.</td>
</tr>
</tbody>
</table>

Option Flags

-\[ yyyy-mm-dd [ -hh:mm [ :ss [ .ttt ] ]] \]
Displays error records that have been logged before the specified absolute date and time of day, expressed in Coordinated Universal Time (UTC) format where:

<table>
<thead>
<tr>
<th>YYYY</th>
<th>Year from 0000 to 9999</th>
</tr>
</thead>
<tbody>
<tr>
<td>MM</td>
<td>Month of the year from 01 to 12</td>
</tr>
<tr>
<td>DD</td>
<td>Day of the month from 01 to 31</td>
</tr>
<tr>
<td>HH</td>
<td>Hour of the day from 00 to 23</td>
</tr>
<tr>
<td>MM</td>
<td>Minutes from 00 to 59</td>
</tr>
<tr>
<td>SS</td>
<td>Seconds from 00 to 59</td>
</tr>
<tr>
<td>TTT</td>
<td>Thousandths of seconds from 000 to 999</td>
</tr>
</tbody>
</table>

If you omit the flag, the software displays all records before the current date and time of day.

If you specify -b, but omit the date and time of day, the software displays the records before 00:00:00 on the current date.

If you specify -b and a date, but omit the time, the software displays the records before 00:00:00 on the specified date.

-\I log-file-name
Displays the specified log file log-file-name from the current working directory.
If the file is not in the current working directory, specify the full path of the file to display.

If you omit the flag and the stdl_log_file environment variable is not defined, the utility prompts for a file name.

A–4  TPware Error Logging
-s [ yyyy-mm-dd [-hh:mm [:ss [:ttt ]]]]
Displays error records that have been logged since the specified absolute date and time of day, expressed in UTC format where:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>yyyy</td>
<td>Year from 0000 to 9999</td>
</tr>
<tr>
<td>mm</td>
<td>Month of the year from 01 to 12</td>
</tr>
<tr>
<td>dd</td>
<td>Day of the month from 01 to 31</td>
</tr>
<tr>
<td>hh</td>
<td>Hour of the day from 00 to 23</td>
</tr>
<tr>
<td>mm</td>
<td>Minutes from 00 to 59</td>
</tr>
<tr>
<td>ss</td>
<td>Seconds from 00 to 59</td>
</tr>
<tr>
<td>ttt</td>
<td>Thousandths of seconds from 000 to 999</td>
</tr>
</tbody>
</table>

If you omit the flag, the software displays all error records since the earliest date and time of day.

If you specify -s, but omit the date and time of day, the software displays error records since 00:00:00 on the current date.

If you specify -s and the date, but omit the time of day, the software displays error records since 00:00:00 on the specified date.

A.4.2 Sample Commands and Output

Example A–1 shows a command to select error records from a file located in the current working directory using a time interval specified by -s and -b flags.

Example A–1 Specifying a Time Interval with the stdlog Utility

C:\tpwarelogdir> stdlog -l my.log -s 1998-09-09 -b 1998-09-10

C:\tpwarelogdir>

The file my.log in the current directory is opened. The command displays error records written during the 24-hour period since 00:00:00 on September 9, 1998 and before 00:00:00 on September 10, 1998.

A sample of the stdlog output is shown in Example A–2.

Example A–2 stdlog Utility Sample Output

(continued on next page)
Example A–2 (Cont.) stdlog Utility Sample Output

************************************************************************
STDL Log Report
d:\tpwaresamples\myerror.log
1998-09-21-09:43:09.810
************************************************************************

SELECTION CRITERIA:
Before:  
Since:  
Format: SYSTEM
Type:  
************************************************************************

************************************************************************
USER: SYSTEM
POSTED BY: Client Process
PID: 483
TYPE: Fault
SEVERITY: error
%STDL-E-SRTLCALLGRPBAD, Group init error
************************************************************************

The display consists of heading lines and one record for each TPware error enclosed by lines of asterisk (*) characters. The heading lines contain:

• The full path of the error log file
• The date and time of the day on which the stdlog utility created the report
• Selection criteria used
  – On the Before: line, the date and time of day on a -b flag.
  – On the Since: line, the date and time of day on a -s flag.

The record for each error shows:

• On the USER: line, the name of the user running the client program when the error occurred.
• On the TIME: line, the day, date, time of day, and year when the record was posted.
• On the PID: line, the process identification of the program posting the error record.
• On the TYPE line, the Fault error type. Only faults are logged.
• On the SEVERITY: line, the text error for all errors, primary and secondary.
• On the line under the **SEVERITY**: line, the text describing the error, with any symbolic error code.

The format for the date and time of day is:

```
yyyy-mm-dd-hh:mm:ss.ttt
```

- **yyyy**  Year from 0000 to 9999
- **mm**  Month of the year from 01 to 12
- **dd**  Day of the month from 01 to 31
- **hh**  Hour of the day from 00 to 23
- **mm**  Minutes from 00 to 59
- **ss**  Seconds from 00 to 59
- **ttt**  Thousandths of seconds from 000 to 999
Index

A

Accessor method
   getCall_attributes, 8–14
   Java field, 8–8
   setCall_attributes, 8–14
ACMS
   HP TP Web Connector Gateway for, 11–1
   thread usage semantics setting, 9–1
   web access to, 1–2
ACMSADU
   application_group translation, 3–4
   BUILD APPLICATION command, 3–4
   BUILD GROUP command, 3–3
   extension, 3–2
   functions, 3–2
   group_task translation, 3–3
   restrictions, 3–6
   translation model, 3–2
ACMSDA$GATEWAY_MESSAGES.TXT, 11–8
ACMSDA$SHUTDOWN, 11–7
   procedure use, 11–3, 11–7
ACMSDA$SRV, 11–5
ACMSDA$STARTUP
   parameter file, 11–4
   procedure use, 11–3, 11–8
acmsda output adapter, 6–2, 7–2, 8–4
acmsda_client_messages.txt, 2–7, 10–10
ACMS Gateway adapter
   call attributes, 2–3
   compile
      Automation, 7–2
      C client, 6–1
   ACMS Gateway adapter (cont’d)
      Java, 8–3
      data type conversion, 3–7
      error logging, 10–10
      link
         Automation, 7–3
         C, 6–3
         Java, 8–5
   management settings, 10–8 to 10–10
   port number specification, 10–11
ACMS management settings tab, 10–8
Adapter
   Automation server, 7–2
   behavior, 1–4
   C client, 6–1
   data type mapping
      Automation, 7–6
      C, 6–5
      Java, 8–9
   function, 1–3
   input, 1–3, 1–5, 4–2
      asynchronous, 6–9
      Automation, 7–1
      behavior, 1–4
      Java, 8–2
   Java, 8–3
   language, 1–4
   management, 1–6
   output, 1–3, 1–5, 4–3
   stub
      flag to produce, 4–3
      name format, 4–6
   supported, 1–4

Index–1
Call_attributes property
  Automation, 7–5
Cartridge, 1–2
  use, 9–2
C client
  ACMS task call arguments, 6–4
  adapters, 6–1
  asynchronous calls, 6–9
  asynchronous interface, 6–9
  call attributes
    specifying, 6–8
  data type mapping, 6–5
  einfo handling, 6–10
  exception handling, 6–11
  function prototypes and argument passing, 6–4
  header file
    file name, 6–2
    generating, 6–2
    STDL-generated, 6–3
  identifier conversion, 6–7
  ISAPI, 6–3
  language support, 6–3
  linking, 6–2
  programming steps, 6–1
  STDL record representation, 6–6
  writing, 6–1
C header
  compiler flag, 4–3
  directory compiler flag, 4–3
  file name format, 4–6
C input adapter, 6–2
Class
  exception, 2–5
  Java, 8–5
    BeanInfo, 8–16
    embedded record name format, 8–7
    fields, 8–5
    public accessor methods, 8–6
    STDL name conversion, 8–6
    STDL record mapping, 8–7
    task group, 8–6
Classpath environment variable, 8–17
Client program
  Automation server, 7–1
  C, 6–1
    asynchronous interface, 6–9
  calling tasks
    Automation, 7–8
    C, 6–4
    Java, 8–9, 8–11
  EINFO processing, 2–6
  exception handling, 2–6
    Java, 8–1
  COLUMN MAJOR support, 3–6
Command
  BUILD APPLICATION, 3–4
  BUILD GROUP, 3–3
  stdlog, A–3
Completion routine
  address, 6–9
  argument, 6–9
Computer tab, 10–3
CreateObject service, 7–8
Current exception level, 2–5

D

Data type
  ACMS Gateway adapter
    decimal, 3–8
    floating point, 3–7
    integer, 3–7
    other, 3–9
  Automation adapter, 7–6
    field
      Java, 8–9
      identifier
        C representation, 6–6
        Java, 8–6
    Java adapter, 8–9
      translating ACMS, 3–7
  DATE, 6–6
  ACMS Gateway adapter, 3–9
  Java format, 8–9
  JScript format, 7–7
Date-time format, A–4, A–5
   error log, A–7
Decimal
   ACMS Gateway adapter, 3–8
   C string format, 6–5
Default attribute, 1–5
Direct I/O gateway default value, 11–9
DLL
   Automation server
      procedures, 7–3
   ISAPI
      cache, 9–3
      caching, 9–3
      locating, 9–3
DllCanUnloadNow, 7–3
DllGetClassObject, 7–3
DllRegisterServer, 7–3
DllUnregisterServer, 7–3

E
eclass
   define format, 6–11
   header file, 6–4
eclass.h, 6–4
ecode_string property, 7–5
   example, 7–10
einfo
   Automation object, 7–4
   header file, 6–3
   Java client
      accessor methods, 8–6
      fields, 8–5
   property, 7–5
   struct definition, 6–10
Einfo
   Java class, 8–5
EINFO
   checking, 2–6
      Automation, 7–10
      C client, 6–10
      Java client, 8–13
   data type definition, 2–4
einfo.h, 6–3
Enqueue limit gateway default value, 11–9
Environment variables
   error logging, A–1
   Java, 8–3
   STDL compiler
      Windows, 4–1
Error codes
   ACMS client, 2–7
   Automation, 7–10
   symbolic in error log, A–6
   TPware, 2–7
Error logging
   HP TP Web Connector Gateway for
      ACMS, 11–8
   platform, A–1
   to a file
      ACMS Gateway adapter, 10–10
      TPware, A–1
      disabling, A–3
      enabling, A–2
   TPware, A–1
   sample output, A–5
   viewing records, A–3
Exception
   class, 2–5
      C field, 6–10
      checking in client program, 2–6
   code, 2–5
      Automation-derived, 7–10
      Automation property, 7–10
      C field, 6–10
   code group
      C field, 6–10
   header file, 6–3
   level, 2–5
      current, 2–5
      propagated, 2–5
   location, 2–6
   procedure
      C field, 6–10
   procedure group
      C field, 6–10
   source, 2–5
      C field, 6–10
Exception
source (cont’d)
checking in client program, 2–6
Exchange I/O support, 3–6
Execute call
on caller’s thread
limit maximum, 10–6
on separate thread, 10–5
limit maximum, 10–5
Export, 7–3
Extent gateway default value, 11–9

F
Field
Automation treatment, 7–6
C representation, 6–6
Java treatment, 8–7
translating ACMS, 3–9
Fields, 8–5
File limit gateway default value, 11–9
FLOAT, 6–6
Floating point
ACMS Gateway adapter, 3–7
Automation format, 7–7
C format, 6–6
Java format, 8–9

G
Gateway
See HP TP Web Connector Gateway for ACMS
getCall_attributes, 8–14
Group
ACMS translation, 3–4
Automation, 7–5
Automation object, 7–8
changing settings, 10–9
configuring new, 10–9
deleting, 10–10
header file, 6–3
type library, 7–4
GROUP.WDB, 3–3
Group_set function, 6–8
Group_task translation, 3–3
Guidgen, 2–2

H
Header file, 4–6
generating, 6–2
TPware-provided, 6–3, 6–4
HP TP Web Connector
adapters used
input, 1–5
output, 1–5
components
on ACMS systems, 3–1
data type conversion
decimal, 3–8
floating point, 3–7
integer, 3–7
other, 3–9
operation, 1–2
web client connection, 1–2
HP TP Web Connector Gateway for ACMS, 11–1
controlling, 11–2 to 11–8
error processing, 11–8
multiple on same node, 11–5
process name, 11–5
process quotas, 11–8
defaults, 11–9
starting, 11–2
command procedure, 11–3
startup parameter file, 11–4
stopping, 11–7
tuning, 11–8 to 11–10
HRESULT, 7–10, 8–15
HTML page, 1–2

I
Identifier conversion
C, 6–7
Java, 8–6
IIS
See Internet Information Server (IIS)
Include file path compiler flag, 4–3
Integer
  Automation format, 7–7
  C format, 6–5, 6–6
  Java format, 8–9
INTEGER, 6–6
Integer ACMS Gateway adapter, 3–7
Internet Information Server (IIS), 1–1
  DLL caching, 9–3
  environment variables, 9–2
  setting up, 9–2
  thread usage semantics setting, 9–1
ISAPI
  C client, 6–3
  DLL
    caching, 9–3
    creating, 7–3
    locating, 9–3
    procedures exported, 7–3
    registering type library, 7–4
Java client (cont’d)
  linking
    Windows, 8–4 to 8–5
    Microsoft Visual J++, 8–1
  output adapters, 8–3
  setup, 8–17
    debugger, 8–18
    management environment, 8–18
  java input adapter, 8–4
Level
  exception, 2–5
  current, 2–5
  propagated, 2–5
Library
  ole32, 7–3
  oleaut32, 7–3
  stdl_acmsda, 6–3, 7–3, 8–5
  stdl_auto, 7–3
  stdl_rtm, 6–3, 7–3, 8–4
  uuid, 7–3
Link
  Automation server, 7–3
  C client, 6–2
  Java client, 8–4
Listing
  compiler flag, 4–4
  file name format, 4–6
Locks outstanding limit gateway default value, 11–9
Management
  client interface, 10–1
  GUI, 10–2
    introduction, 1–6
    tabs, 10–2
  HP TP Web Connector Gateway for ACMS, 11–1
  Management GUI
    Windows restrictions, 10–4
Messages
ACMSDAGATEWAY_MESSAGES.TXT, 11–8
acmsda_client_messages.txt, 2–7, 10–10
communications, 1–5
stdlrt_msg.h, 2–7
Method, 7–5
client use, 7–9
Java
 invocation, 8–6
 public accessor, 8–6
MIA compiler flag, 4–4

N
Name conversion
Java, 8–6
Net start command, 9–3
Net stop command, 9–3
Nontransaction exception
exception class role, 2–5

O
Object
Automation
 accessing, 7–8
group name format, 7–5
mapping
 STDL group, 7–5
 STDL record, 7–5
record name format, 7–5
 embedded, 7–6
 supplied, 7–4
Java
 accessing, 8–11, 8–13
 creating, 8–10, 8–12, 8–13
JDK, 8–1
mapping
 STDL group, 8–6
 STDL record, 8–9
JavaBeans
 Microsoft Visual J++, 7–1
OCCURS, 3–9
Octet
 Automation format, 7–7
 C format, 6–5
 Java format, 8–9
OLE
 type library, 4–7
ole32.lib, 7–3
 oleaut32.lib, 7–3
Output compiler flag, 4–4

P
Page file gateway default value, 11–9
Page object, 7–8
Port
 number assignment
 client, 11–7
 changing, 10–11
 gateway, 11–6
 number categories, 11–6
Priority gateway default value, 11–10
Process quotas
 HP TP Web Connector Gateway for ACMS, 11–8
Propagated exception level, 2–5
Property
call_attributes
 Automation, 7–5
 Java, 8–14
ecode
 Automation, 7–10
einfo
 Automation, 7–5
 Java, 8–5
field
 Automation, 7–6
OCCURS, 3–9

Q
Quotas
 HP TP Web Connector Gateway for ACMS initial values, 11–10
Record
   ACMS
      converting, 3–6
      name rules, 3–6
      translating, 3–9
   Automation treatment, 7–5
      accessing, 7–8
      writing to fields, 7–8
   C format, 6–5
      field mapping, 6–6
   Java treatment, 8–7
Register, 7–3
Registry access restrictions, 10–4
Resource file, 4–6
   link Automation, 7–3
Restrictions
   ACMSADU, 3–6
   javabeans adapter, 8–17
   registry access, 10–4
Result handle, 7–10, 8–15

Server
   See also HP TP Web Connector Gateway for ACMS
      calling TP application, 1–2
      writing Automation, 7–1
SERVER_NAME, 11–5
Session object, 7–8
setCall_attributes, 8–14
Shared settings, 10–3
Shutdown
   HP TP Web Connector Gateway for ACMS, 11–7
Source
   exception, 2–5
      EINFO field, 2–4
   Source include compiler flag, 4–4
   Standard call, 1–3

Startup
   HP TP Web Connector Gateway for ACMS, 11–2
   STDL.stdl_einfo, 7–4
   STDL.stdl_uuid, 7–4
   STDL compiler
      environment setup
         Windows, 4–1
      syntax, 4–2
   stdlog utility
      sample output, A–5
   stdlog utility, A–3
      -b, A–4
      date format, A–7
      -l, A–4
      mode
         interactive, A–3
         single command, A–3
      option flag
         default value, A–3
      -s, A–4
      sample output, A–5
      syntax, A–3
   stdl_rtm.lib, 6–3, 7–3, 8–4
   stdl_acmsda.lib, 6–3, 7–3, 8–5
   STDL_ACMSDA_LOG, 10–10
   STDL_ACMSDA_PORT_node-name, 10–11
   stdl_auto.lib, 7–3
   STDL_C_SYNCHRONOUS, 6–9
   STDL_JAVA_JDK_HOME, 8–3
   STDL_JAVA_JAVAC_OPTIONS, 8–3
   STDL_JAVA_JAR_OPTIONS, 8–3
   stdl_log_file, A–1, A–2
   stdl_rtm.lib, 6–3, 7–3, 8–4
   stdl_set_version.bat, 4–1
   STDL_SOURCE_TRACE, A–1
   stdl_srtl_translate_ecode function, 6–3
      example, 6–11
String
   C decimal format, 6–5
   padding compiler flag, 4–4
Stub
  adapter
    flag to produce, 4–3
    name format, 4–6
Automation server, 7–2
Java, 8–4
Java client building, 8–2
split functionality, 1–3
TP, 1–2
Syntax
  BUILD APPLICATION command, 3–4
  BUILD GROUP command, 3–3
stdlog utility, A–3
Syntax compiler flag, 4–4

T

Task
  ACMS GLOBAL, 3–6
    call
      Automation client, 7–8
      C client, 6–4
      C client for ACMS, 6–4
      Java client, 8–7, 8–9, 8–11
      Java client ACMS format, 8–7
      renaming restriction, 3–6
Task group
  ACMS Gateway adapter settings, 10–8
    name conversion, 4–5
    thread usage semantics, 10–5
    change, 10–6
    delete, 10–8
Task group specification
  ACMS generation, 3–3 to 3–5
    steps, 3–3
compile
  Automation server, 7–1
  Java client, 8–3
output files, 6–2, 7–2, 8–4
TCP/IP
  port numbers, 11–6
TCP/IP_PORT, 11–6, 11–7
Text
  format
    C, 6–5
Thread controller, 1–5
Threads
  asynchronous call use, 6–9
  settings tab, 10–5
  usage semantics, 10–5
    ACMS tasks, 9–1
    change, 10–6
    delete, 10–8
Threads settings, 10–5
Throttle value, 10–5
Time format, A–4, A–5
Timer queue entries gateway default value, 11–10
TPware
  management GUI, 1–6, 10–2
  products, 1–1
  runtime library, 6–3, 7–3, 8–4
  standard call, 1–3
Translation, 3–3
  application_group, 3–4
  group_task, 3–3
Tuning
  HP TP Web Connector Gateway for ACMS, 11–8
Type library
  Automation object, 7–4
  Visual Basic name, 7–8

U

UTC format, A–4, A–5
UUID
  Automation object, 7–4
  C format, 6–5
  compiler flag, 4–4
  generation, 2–2
  uuid.lib, 7–3

V

Variable-length array
  C, 6–5