

# HP TP Web Connector

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## Getting Started

**January 2006**

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

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**Hewlett-Packard Company**  
**Palo Alto, California**

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## 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:

Component	Description
Chapter 1	Provides an overview of how the HP TP Web Connector product allows client systems to call HP transaction processing (TP) applications.

Component	Description
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 STD L 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:

Convention	Description
<i>italic type</i>	Italic type emphasizes important information and indicates complete titles of documents. In format descriptions, it indicates variable parts of input that you must supply.

Convention	Description
<b>bold type</b>	New terms are highlighted in boldface type where they are defined in the text.
<b>user input</b>	In examples, user input is differentiated in boldface font from system output.
monospace text	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.
lowercase	Commands that you enter (except where the command line includes an environment variable) are in lowercase.
UPPERCASE	Uppercase text indicates STD L syntax. Environment variables are in uppercase. Key words on the OpenVMS system are also indicated by uppercase text.
[ ]	In command syntax, square brackets enclose an optional choice or choices.
. . . .	In examples, a vertical ellipsis indicates that information not directly related to the example has been omitted.
Windows	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 <i>Software Product Description</i> (SPD).



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# 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.

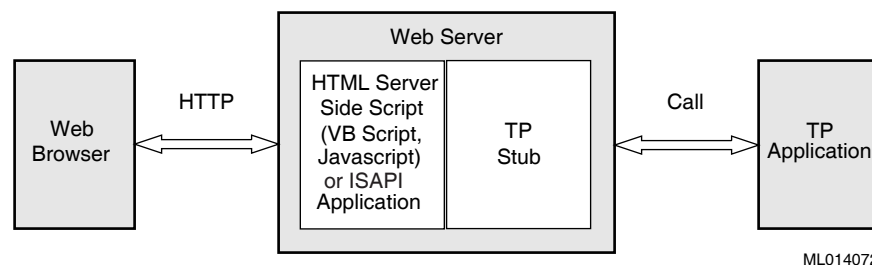
HP TP Web Connector produces objects that you can easily use to connect a web server to your application. For example, in the Microsoft environment, HP TP Web Connector might create an Automation server that can be used with any software that supports Automation, such as the Internet Information Server (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 .

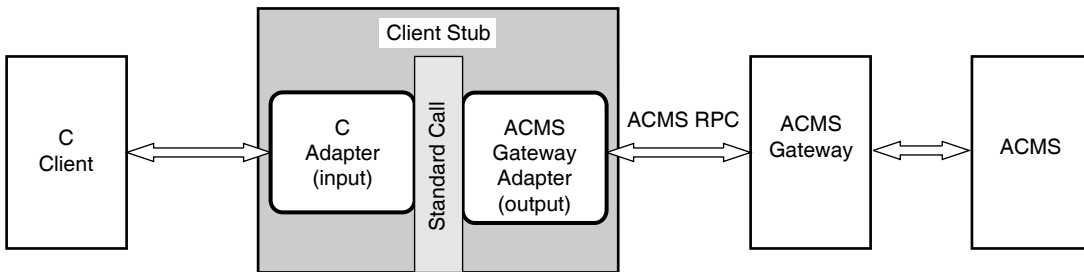
## 1.4 Stub Generation and Adapters

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.

**Figure 1–2 ACMS Adapter Technology**



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## 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**

	Description	Comment
Input Adapters	Asynchronous	Allows clients written in the C or C++ language to handle multiple active calls (for example, ISAPI or WRB cartridge clients)
	Automation	Allows calls from clients using Microsoft Automation technology
	C	Allows clients written in the C or C++ language to perform synchronous calls (for example, ISAPI or WRB cartridge clients)
	Java or JavaBeans	Allows calls from Java-language clients
Output Adapters	ACMS Gateway	Calls ACMS tasks through the HP TP Web Connector Gateway for ACMS

## 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).

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## 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).

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**Note**

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

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4. Build the client interface.

See the following chapters that explain the specific steps for using the STD L 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 STD L 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 STD L 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:

*name:value [ :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:

*application[:name],node[:name],authorization[:account-name:password]*

Table 2–1 describes the call attributes and values.

**Table 2–1 ACMS Gateway Adapter Call Attribute Values**

Call Attribute Value	Description
Application[:name]	Name of the ACMS application (STDL task group name) being called
Node[:name]	Name of the TCP/IP node on which the ACMS gateway resides
Authorization:	OpenVMS authorization information, requiring two values separated by a colon (:) character
<i>account-name:</i>	Name of the OpenVMS user account under which the task call is made
<i>password ]</i>	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:sam"
```

---

**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:sam` (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 STDLE mechanism for storing exception information generated during a call.

### 2.4.1 The STDLE EINFO Definition

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

#### Example 2–1 EINFO Data Type Definition

```
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



- Exception level
- Exception source
- Exception location

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 STDLEINFO information upon completion of the call to the task. The TPware runtime system returns an exception by setting the STDLE-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 ERESOURCE 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\stdl\include*

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

`C:\tpware\stdl\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\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`

## 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*).

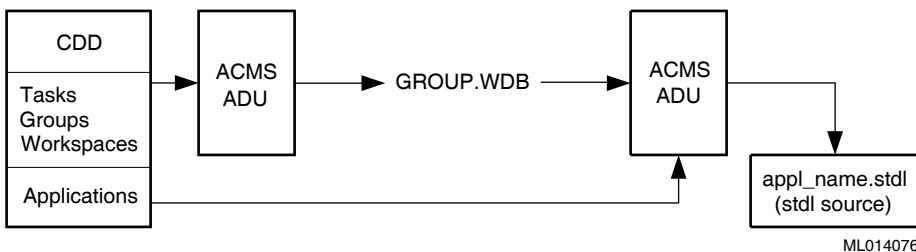
### 3.1.1 ACMSADU Extensions

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**

OpenVMS Data Type	STDL Data Type	OpenVMS Pragma Data Type
SIGNED BYTE	INTEGER SIZE 1	None
UNSIGNED BYTE	UNSIGNED INTEGER SIZE 1	None
SIGNED WORD	INTEGER SIZE 2	None
UNSIGNED WORD	UNSIGNED INTEGER SIZE 2	None
SIGNED LONGWORD	INTEGER SIZE 4	None
UNSIGNED LONGWORD	UNSIGNED INTEGER SIZE 4	None
SIGNED QUADWORD	ARRAY SIZE 8 OF OCTET	None
UNSIGNED QUADWORD	ARRAY SIZE 8 OF OCTET	None
SIGNED OCTAWORD	ARRAY SIZE 16 OF OCTET	None
UNSIGNED OCTAWORD	ARRAY SIZE 16 OF OCTET	None

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**

OpenVMS Data Type	STDL Data Type	OpenVMS Pragma Data Type
F_FLOATING	FLOAT SIZE 4	F_FLOATING
D_FLOATING	FLOAT SIZE 8	D_FLOATING
G_FLOATING	FLOAT SIZE 8	G_FLOATING
H_FLOATING	ARRAY SIZE 16 OF OCTET	None
S_FLOATING	FLOAT SIZE 4	None
T_FLOATING	FLOAT SIZE 8	None
F_FLOATING COMPLEX	RECORD R FLOAT SIZE 4; I FLOAT SIZE 4; END RECORD;	F_FLOATING for each field
D_FLOATING COMPLEX	RECORD R FLOAT SIZE 8; I FLOAT SIZE 8; END RECORD;	D_FLOATING for each field
G_FLOATING COMPLEX	RECORD R FLOAT SIZE 8; I FLOAT SIZE 8; END RECORD;	G_FLOATING for each field
H_FLOATING COMPLEX	ARRAY SIZE 32 OF OCTET	None

Table 3–3 describes decimal data type support.

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

OpenVMS Data Type	STDL Data Type <sup>1</sup>	OpenVMS Pragma Data Type
PACKED DECIMAL	DECIMAL STRING SIZE X	PACKED DECIMAL
UNSIGNED NUMERIC	DECIMAL STRING SIZE X	UNSIGNED NUMERIC
LEFT OVERPUNCH NUMERIC	DECIMAL STRING SIZE X	LEFT OVERPUNCH NUMERIC
LEFT SEPARATE NUMERIC	DECIMAL STRING SIZE X	LEFT SEPARATE NUMERIC

<sup>1</sup>The maximum SIZE for the decimal data type is limited to 18.

(continued on next page)

**Table 3–3 (Cont.) Decimal Data Type Support for the ACMS Gateway Adapter**

OpenVMS Data Type	STDL Data Type <sup>1</sup>	OpenVMS Pragma Data Type
RIGHT OVERPUNCH NUMERIC	DECIMAL STRING SIZE X	RIGHT OVERPUNCH NUMERIC
RIGHT SEPARATE NUMERIC	DECIMAL STRING SIZE X	RIGHT SEPARATE NUMERIC
ZONED NUMERIC	DECIMAL STRING SIZE X	ZONED NUMERIC

<sup>1</sup>The 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**

OpenVMS Data Type	STDL Data Type	OpenVMS Pragma Data Type
DATE	DATE	VMS DATE
VARYING STRING	Not supported	

### 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



# 4

---

## Compiling STDL Applications

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 4–1 HP TP Web Connector Input Adapters**

Adapter	Description
<b>async</b>	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).
<b>auto</b>	Provides an interface for a client developed in an Automation language (see Section 7.3).
<b>c</b>	Provides a synchronous interface for a C-language client (see Section 6.2).

(continued on next page)



**Table 4–1 (Cont.) HP TP Web Connector Input Adapters**

Adapter	Description
<b>java</b>	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).
<b>javabeans</b>	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).

Output adapters are described in Table 4–2.

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

Adapter	Description
<b>acmsda</b>	Produces an interface that calls ACMS tasks using ACMS RPC communications.

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\;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.



---

## Using the Client Build Utility

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 5–1 Files Generated for a Client Build**

Adapter Type	File Type	File Name
ACMS	Header	<i>input_file_name.h</i>
	Object	<i>task_group_name_c_acmsda.obj</i>

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 6–1 C Client Adapter Specifications**

	Specification	Purpose
Input Adapters	async	Executes asynchronous calls to ACMS tasks .
	c	Executes synchronous calls to ACMS tasks or.
Output Adapters	acmsda	Calls ACMS tasks.

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:

<i>group</i>	Converted name of the compiled STDL task group specification. When developing client interfaces for ACMS applications, the <i>group</i> name prefix is the ACMS <i>application_name</i> prefix (see Section 3.2.3).
<i>c</i>	Value for either the C or asynchronous input adapter. If you specify an asynchronous input adapter, <i>c</i> appears in the name, not <i>async</i> .
<i>out_adapter</i>	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 6–2 C Client Adapter-Dependent Link Input**

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

- 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).

- Exception information header file `einfo.h`—Contains the C structure definition for the `einfo` external variable (see Section 6.5.1).
- Exception class header file `eclass.h`—Equates the symbolic name (class identifier) for each exception class with its exception class value (see Section 6.5.2).

## 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:

*converted-task-name*(*[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:

*converted-task-name*(*string,status[,argument [...]]*)

The extra arguments are:

<i>string</i>	A selection string, consisting of one STDL record containing one 256-character field of data type ISO-LATIN-1 text.
<i>status</i>	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 STD L to C Data Type Mapping

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

**Table 6–3 Mapping STD L Data Types to C Data Types**

STD L	C
ARRAY SIZE <i>n</i> OF <i>type</i>	<i>type id[n]</i>
ARRAY SIZE <i>n</i> OF ARRAY SIZE <i>m</i> OF <i>type</i>	<i>type id[n] [m]</i>
ARRAY SIZE <i>n</i> TO <i>m</i> DEPENDING ON <i>number</i> OF <i>type</i> <sup>1</sup>	struct <i>rec</i> { long int <i>number</i> ; <i>type id[n]</i> ; } ;
DECIMAL STRING SIZE <i>a</i> SCALE <i>b</i>	char <i>id[a+1]</i> <sup>2</sup>
INTEGER	long <i>id</i> (or equivalent signed long, long int or signed long int)
OCTET	unsigned char <i>id</i>
TYPE <i>rec</i> IS RECORD <i>id</i> IS <i>type</i> ; END ;	struct <i>rec</i> { <i>type id</i> ; } ;
TEXT SIZE <i>n</i> CHARACTER SET ISO-LATIN-1 ISO-LATIN-2 SIMPLE-LATIN	char <i>id[n]</i>
UUID	uuid_t <i>id</i> <sup>3</sup>

<sup>1</sup>The number of repetitions of a variable length array is mapped as a record *rec* containing the number of repetitions and the repeated array.

<sup>2</sup>The 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.

<sup>3</sup>The 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 STD L 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**

STDL	C
DATE	char[17] where the bytes are in the following format: YYYYMMDDHHmmSSttt For example, New Year 2002 at midnight is "20020101000000000".
FLOAT SIZE 4	float
FLOAT SIZE 8	double
INTEGER SIZE 1	char
INTEGER SIZE 2	short
INTEGER SIZE 4	int
UNSIGNED INTEGER SIZE 1	unsigned char
UNSIGNED INTEGER SIZE 2	unsigned short
UNSIGNED INTEGER SIZE 4	unsigned int

### 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 STD L 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 STD L 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 STD L Identifier to C Identifier Conversion

The C identifiers are derived from the corresponding STD L 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 STD L compiler. The function declaration for specifying the call attributes string is:

```
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:

```
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 STD L task group specification to supply the address of the call attribute string. For example:

```
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 STD L compiler.

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

- Uses the same name that an STD L 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 `STD L_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

```
#ifndef EINFO_H
#define EINFO_H
.
.
.
#define einfo tps_rpc_get_einfo()->info
typedef struct
{
    struct
    {
        int    eclass;
        int    ecode;
    }
}
```

(continued on next page)

### Example 6–2 (Cont.) C Structure Definition for the einfo Variable

```
char    eproc[32];
char    epgroup[32];
int      ource;
uid_t    ecgroup;
} einfo;
} 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 STDLEINFO data type definition. The STDLE compiler generates the C-language version of the STDLEINFO 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 STDLE 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 STDLE-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:

```
printf("Error on task call: %s\n\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).

---

## Writing Automation Servers and Clients

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 STD L 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 STD L 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 7–1 Automation Server Output Adapters**

Specification	Purpose
acmsda	Calls ACMS tasks using a gateway

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:

<i>group</i>	Converted name of the compiled STD L task group specification. When developing client interfaces for ACMS applications, the <i>group</i> name prefix is the ACMS <i>application_name</i> prefix (see Section 3.2.3).
<i>out_adapter</i>	Name of one of the output adapters from Table 7–1.
<i>res</i>	Resource file for the Automation server.

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

3. Write the Automation server, using STD L-generated Automation code for the task group being accessed.
  - Access data structures using STD L-generated methods (see Section 7.2).
  - Call tasks using STD L-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**

If Client Calls...	Input File Name	Comment
ACMS tasks (uses the acmsda adapter)	<i>group_auto_acmsda.obj</i>	The adapter stub for the ACMS application (the STDL task group)
	<i>stdl_acmsda.lib</i>	ACMS Gateway adapter runtime link library

- 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\_appl\_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:

`group_Type_Library`

The value *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:

`add_acms_appl_Type_Library`

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

## 7.2 Automation Objects and STD L Support

The HP TP Web Connector software provides Automation objects and the STD L 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:

`STD L.stdl_einfo`  
`STD L.stdl_uuid`

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

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

<code>eclass</code>	AS LONG
<code>ecode</code>	AS LONG
<code>ecode_string</code>	AS STRING
<code>eproc</code>	AS STRING
<code>epgroup</code>	AS STRING
<code>esource</code>	AS STRING
<code>ecgroup</code>	AS <code>STD L.stdl_uuid</code>

The `STD L.stdl_uuid` object is used to store the STD L 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 STD L-Generated Automation Objects

The STD L 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 `STD L.stdl_einfo` object that contains exception information for an STD L 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 `STD L.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 STD L 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 STD L compiler creates a **method** for each task in the task group specification.

HP TP Web Connector software uses Automation objects to model STD L records. Because Automation does not directly support records, the STD L 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 STD L data type is used as an argument to a task in the task group.  
The value *record-name* is derived from the STD L data type identifier that specifies the record layout.
- The STD L 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 STD L 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 STD L field name.

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

For each field within the record, the object has one Automation property. The property name is derived from the STD L field name and the type of the property depends on the STD L 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 STD L Identifier to Automation Name Conversion

The compiler derives Automation names from the corresponding STD L 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 STD L compiler generates an Automation object for each STD L record (see Section 7.2.2), each field from an STD L record is represented by a property within the generated record object. The type of the property is determined by the STD L data type of the field as shown in Table 7–3.

**Table 7–3 Automation Data Type Mapping**

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

<sup>1</sup>Array references are to the base data type starting with an index of zero.

<sup>2</sup>An Automation object for the record is created (see Section 7.2.2).

<sup>3</sup>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:

```
// 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:

```
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 *days.fractions* past 12/30/1899. The following assignments are legal:

```
// Date below is January 1,1999 at 12:00 noon
workspace.datefield = 36161.5;
// Date below is January 1,1900 at 1:00 AM
workspace.datefield = 2.041666;
```

## 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:

*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 (*group.record-name*) in one of the following ways:

- In a CreateObject service

You can use the `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 `add_number` record in the `add_task_group`, the object name is `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:

*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:

```
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:

```
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:

```
acms.call_attributes = ("application:add_acms_appl,node:a,authentication:usra:psswrld")
```

---

**Note**

---

Do not use spaces in the string.

---

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 STDLE error code from the HRESULT format, subtract 0x80041000 from the Automation error code value:

*STDLE-error-code* = <Automation-error-code-value> - 0x80041000

STDLE 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 `STDLE.stdle_einfo` object to the nonzero value returned from the task call and the `ecode` property within the `STDLE.stdle_einfo` object to a nonzero value representing the STDLE error code returned.

If no error occurs, the adapter sets the `eclass` property within the `STDLE.stdle_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).



---

## Writing Java Clients

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:

```
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:

```
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 8–1 Optional Build Environment Variables for Java Tools**

Name	Purpose
STDL_JAVA_JAR_OPTIONS	Overrides default JAR command line options
STDL_JAVA_JAVAC_OPTIONS	Overrides default JAVAC command line options
STDL_JAVA_JDK_HOME	Specifies the location of the JDK installation root

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 8–2 Java Client Adapters**

	Specification	Purpose
Input Adapters	java	The Java classes that represent the application objects present their data record fields as public members.
	javabeans	The Java classes that represent the application objects present their data record fields through accessor methods.
Output Adapters	acmsda	Calls ACMS tasks using a gateway.

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 8–3 Java Client Adapter-Dependent Link Input**

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

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:

```
public int    eclass
public int    ecode
public String ecodeString
public String eproc
public String epgroup
public int    ource
public String ecgroup
```

- For the `javabeans` input adapter, this class has the following public accessor methods:

```
int getEclass()           void setEclass(int)
int getEcode()           void setEcode(int)
String getEcodeString()
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 STD L-Generated Java Classes and Methods

The STD L 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 STD L records (data type identifiers) and for STD L 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 STD L Compiler Name Conversion

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

- Changes the task group name (*group*) or an STD L 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:

<i>string</i>	A selection string, consisting of one STDL record containing one 256-character field of data type ISO-LATIN-1 text.
<i>status</i>	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:

```
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:

```
setfield-name(data-type)
```

```
data-type getfield-name()
```

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 8–4 Java Data Type Mapping**

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

<sup>1</sup>Array references are to the base data type starting with an index of zero.

<sup>2</sup>A Java object for the record is created (see Section 7.2.2).

<sup>3</sup>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`.

- 2 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.
- 3 Fill in the data in the record objects as necessary. Directly access the public fields within the record argument.
- 4 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.
- 5 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.
- 6 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

```

1 import java.beans.*;
  import java.io.*;
  class AddMtsClient {
    int add(int x, int y) throws Exception {
      try {
2      Add_task_group_mts addTaskGroupMts =
        (Add_task_group_mts) Beans.instantiate(null, "Add_task_group_mts");
3      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");

4      inp1.setData(x);
        inp2.setData(y);
5      addTaskGroupMts.add_number(inp1, inp2, result);
    }
  }

```

(continued on next page)

### Example 8–2 (Cont.) The JavaBeans Adapter Sample add\_number Call

```
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.getEsource());
    throw new Exception("Application error");
  }
8  return result.getData();
  }
  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;
  }
  }
  }

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 STDCL 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:

```
public String call_attributes
```

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

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

---

#### 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:

```
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:

```
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:pwr")
```

---

**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:

```
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). STDLE code error codes that can be returned and their corresponding messages are described in Section 2.4.2. The STDLE class 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:

```
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:

```
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 javabeans 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 -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).

---

## Performing Setup Operations

This chapter describes various application set-up operations.

### 9.1 Calling STD L 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.<sup>†</sup>

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<sup>†</sup> In the sample applications, the ISAPI DLLs are expected to be in the same directory as the HTML application.





# 10

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## Managing the Client Interface

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 redisplay 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**

Output Adapter	Execute call on the caller's thread	Execute call on a separate thread	Execute call on a separate thread, but limit maximum threads to __	Execute call on caller's thread, but limit maximum threads to __
C	OK <sup>1</sup>	OK	OK	OK
ACMS Gateway	OK	Not needed <sup>2</sup>	Recommended to avoid overloading the ACMS Gateway	Recommended to avoid overloading the ACMS Gateway

<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 STD L 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:

`STD_L_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 `acmsda_client_messages.txt` located in the installation directory.

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

*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.



# 11

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## Managing the HP TP Web Connector Gateway for ACMS

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**

Keyword	Meaning
SERVER_NAME	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.

(continued on next page)

**Table 11–1 (Cont.) Gateway Keywords**

Keyword	Meaning
TCP/IP_PORT	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.)

## 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**

Category	Port Numbers
Reserved privileged ports	0 to 255
Privileged ports	256 to 1023
Nonprivileged ports	1024 to 65 535

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:

```
$ @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:

```
$ SUBMIT/USER=SYSTEM/NOLOG SYS$STARTUP:ACMSDA$STARTUP-  
_$_ /PARAMETER=(SYS$STARTUP:ACMSDA$STARTUP.PRM)  
Job ACMSDA$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:

*value-name=desired-value*

Example 11–2 shows a sample data file.

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

```
! 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**

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

<sup>1</sup>Information about tuning guidelines appears in Section 11.3.3.

(continued on next page)

**Table 11–3 (Cont.) Gateway Process Quotas**

Process Quota	Summary Description	Alpha Default Value <sup>1</sup>	I64 Default Value <sup>1</sup>
PAGE_FILE	Maximum reserved pages in page file	100,000	100,000
PRIORITY	Base process priority	4	4
QUEUE_LIMIT	Maximum outstanding timer queue entries	20	20
WORKING_SET	Number of working set pages	2,000	2,000

<sup>1</sup>Information 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.

# A

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## TPware Error Logging

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 `-l` 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 redisplay 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**

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

**Option Flags****-b** [ *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:

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

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.

**-l** *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.

**-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:

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

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

```
*****
STDLog Report
d:\tpwaresamples\myerror.log
1998-09-21-09:43:09.810
*****
SELECTION CRITERIA:
Before:
Since:
Format: SYSTEM
Type:
*****
*****
USER: SYSTEM
TIME: 1998-09-20-15:43:09.543
POSTED BY: Client Process
PID: 483
TYPE: Fault
SEVERITY: error
%STDLog-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*

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



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