

z/OS
Version 2 Release 4

*Integrated Security Services Open
Cryptographic Enhanced Plug-ins
Application Programming*



Note

Before using this information and the product it supports, read the information in [“Notices” on page 31.](#)

This edition applies to Version 2 Release 4 of z/OS (5650-ZOS) and to all subsequent releases and modifications until otherwise indicated in new editions.

Last updated: 2019-07-10

© **Copyright International Business Machines Corporation 2007, 2019.**

US Government Users Restricted Rights – Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.

Contents

- Figures..... V**
- Tables..... vii**
- About this information..... ix**
 - Purpose of this information.....ix
 - Who should use this information..... ix
 - What this information contains..... ix
 - Where to find more information..... ix
- How to send your comments to IBM.....xi**
 - If you have a technical problem.....xi
- Summary of changes.....xiii**
 - Summary of changes for z/OS Version 2 Release 4 (V2R4)..... xiii
 - Summary of changes for z/OS Version 2 Release 3 (V2R3)..... xiii
 - Summary of changes for z/OS Version 2 Release 2 (V2R2)..... xiii
- Chapter 1. Introducing OCEP..... 1**
 - Overview.....1
 - OCEP trust policy.....2
 - OCEP data storage library..... 3
 - z/OS Security Server (RACF) support.....4
 - Developing security applications.....4
- Chapter 2. Configuring and getting started..... 7**
 - Verifying the OCSF installation and configuration.....7
 - Configuring the OCEP installation.....7
 - Authorizing daemon and user identities..... 7
 - Establishing program control..... 8
 - Refreshing RACF data.....8
 - Installing the OCEP code..... 9
 - Verifying OCEP installation..... 9
 - Uninstalling the OCEP Code.....10
- Chapter 3. Using the Trust Policy services..... 11**
 - Using the trust policy module.....11
 - Supported trust policy API..... 11
 - CSSM_TP_CertGroupVerify..... 12
 - Error Codes..... 13
 - Trust Policy Example.....13
- Chapter 4. Using data storage library services..... 19**
 - Using the data storage library services module.....19
 - Supported data library APIs..... 19
 - CSSM_DL_AbortQuery..... 20
 - CSSM_DL_DbClose..... 20
 - CSSM_DL_DbOpen..... 21

CSSM_DL_DataGetFirst.....	21
CSSM_DL_DataGetNext.....	23
CSSM_DL_FreeUniqueRecord.....	24
Error codes.....	25
Data storage library example.....	25
Appendix A. Accessibility.....	27
Accessibility features.....	27
Consult assistive technologies.....	27
Keyboard navigation of the user interface.....	27
Dotted decimal syntax diagrams.....	27
Notices.....	31
Terms and conditions for product documentation.....	32
IBM Online Privacy Statement.....	33
Policy for unsupported hardware.....	33
Minimum supported hardware.....	34
Trademarks.....	34
Index.....	35

Figures

1. Overview of the OCEP and OCSF Infrastructure.....2

Tables

1. Queriable Fields in the Certificate Record.....	3
2. Trust Policy Functions that are Supported by OCEP.....	11
3. OCEP Trust Policy Error Codes.....	13
4. Data Storage Library Functions that are Supported by OCEP.....	19
5. OCEP Data Storage Library Error Codes.....	25

About this information

This book contains information about (OCEP), which is a component of z/OS Integrated Security Services. Integrated Security Services works with the following components:

- z/OS Security Server Resource Access Facility (RACF)
- z/OS Firewall Technologies
- Lightweight Directory Access Protocol (LDAP) Server, which includes client and server function
- Open Cryptographic Enhanced Plug-ins

Purpose of this information

This information describes an overview of OCEP, the service provider modules that it provides, and how those modules work with Open Cryptographic Services Facility (OCSF) and Resource Access Control Facility (RACF) which comprises the Security Server component.

This information describes how to install and register the OCEP service provider modules for use with the OCSF Framework. In addition, it describes the application programming interfaces (APIs) that OCEP supports.

OCSF, which is a derivative of the IBM Keyworks technology, is an implementation of the Common Data Security Architecture (CDSA) for applications that run in the z/OS UNIX System Services (z/OS UNIX) environment.

Who should use this information

This information is written for programmers who have experience with writing and supporting security applications. Knowledge of the Open Cryptographic Services Facility (OCSF) Framework and the components of the z/OS Security Server is required. In addition, knowledge of the services provided by Integrated Cryptographic Service Facility (ICSF) is also helpful.

This information also provides guidance for system programmers to configure Open Cryptographic Enhanced Plug-ins (OCEP) for use on their z/OS systems. It describes how to install and register the OCEP service provider modules with the OCSF Framework.

In addition, this book should be used by application programmers who intend to use the functions and APIs supported by OCEP.

What this information contains

This information describes the Open Cryptographic Enhanced Plug-ins (OCEP) service provider modules and how they are intended to be used with the framework provided by OCSF. It also describes how these service provider modules enable applications to use z/OS Security Server (RACF), or an equivalent product, to provide security functions relating to digital certificates.

Where to find more information

For detailed information about the OCSF Framework, see following publications:

- *[z/OS Open Cryptographic Services Facility Application Programming](#)*
- *[z/OS Open Cryptographic Services Facility Service Provider Module Developer's Guide and Reference](#)*
-

For information about RACF's support for digital certificates and its interaction with OCEP, see following publications:

- [z/OS Security Server RACF Callable Services](#)
- [z/OS Security Server RACF Command Language Reference](#)
- [z/OS Security Server RACF Security Administrator's Guide](#)
-

For information about the publications that support the other elements of z/OS, see the [z/OS Information Roadmap](#).

How to send your comments to IBM

We invite you to submit comments about the z/OS® product documentation. Your valuable feedback helps to ensure accurate and high-quality information.

Important: If your comment regards a technical question or problem, see instead [“If you have a technical problem”](#) on page xi.

Submit your feedback by using the appropriate method for your type of comment or question:

Feedback on z/OS function

If your comment or question is about z/OS itself, submit a request through the [IBM RFE Community](#) (www.ibm.com/developerworks/rfe/).

Feedback on IBM® Knowledge Center function

If your comment or question is about the IBM Knowledge Center functionality, for example search capabilities or how to arrange the browser view, send a detailed email to IBM Knowledge Center Support at ibmkc@us.ibm.com.

Feedback on the z/OS product documentation and content

If your comment is about the information that is provided in the z/OS product documentation library, send a detailed email to mhvrcfs@us.ibm.com. We welcome any feedback that you have, including comments on the clarity, accuracy, or completeness of the information.

To help us better process your submission, include the following information:

- Your name, company/university/institution name, and email address
- The following deliverable title and order number: z/OS Integrated Security Services Open Cryptographic Enhanced Plug-ins Application Programming, SC14-7568-40
- The section title of the specific information to which your comment relates
- The text of your comment.

When you send comments to IBM, you grant IBM a nonexclusive authority to use or distribute the comments in any way appropriate without incurring any obligation to you.

IBM or any other organizations use the personal information that you supply to contact you only about the issues that you submit.

If you have a technical problem

If you have a technical problem or question, do not use the feedback methods that are provided for sending documentation comments. Instead, take one or more of the following actions:

- Go to the [IBM Support Portal](#) (support.ibm.com).
- Contact your IBM service representative.
- Call IBM technical support.

Summary of changes

This information includes terminology, maintenance, and editorial changes. Technical changes or additions to the text and illustrations for the current edition are indicated by a vertical line to the left of the change.

Summary of changes for z/OS Version 2 Release 4 (V2R4)

This information contains no technical changes for this release.

Summary of changes for z/OS Version 2 Release 3 (V2R3)

This information contains no technical changes for this release.

Summary of changes for z/OS Version 2 Release 2 (V2R2)

This information contains no technical changes for this release.

Chapter 1. Introducing OCEP

This section introduces the services that are provided by Open Cryptographic Enhanced Plug-ins (OCEP) and their relationship with Open Cryptographic Services Facility (OCSF) and z/OS Security Server RACF. (Any external security manager product that provides equivalent support may also be used.)

Overview

As [Figure 1 on page 2](#) shows, OCEP consists of two service provider modules (which are also called plug-ins) that are intended to be used with the Open Cryptographic Services Facility (OCSF) Framework:

- Trust Policy
- Data Storage Library

These service provider modules enable applications to use z/OS Security Server (RACF), or equivalent product, to provide security functions for digital certificates and key rings.

The OCEP service provider modules implement a subset of the application programming interfaces (APIs) that are defined by OCSF. Applications can use these OCEP service provider modules, and their supported APIs, to retrieve and use digital certificates and private keys that are stored in the RACF database on a z/OS system.

In addition to the OCSF Framework, the OCEP service provider modules are intended to work with the OCSF Certificate Library and Cryptographic Service Provider modules. As [Figure 1 on page 2](#) shows, the OCSF Framework itself manages the interactions between the service provider modules and the applications that use them.

For a detailed description of the OCSF application programming interfaces and the service provider modules that OCSF supports, see the following publications:

- [*z/OS Open Cryptographic Services Facility Application Programming*](#).
- [*z/OS Open Cryptographic Services Facility Service Provider Module Developer's Guide and Reference*](#)

Introduction

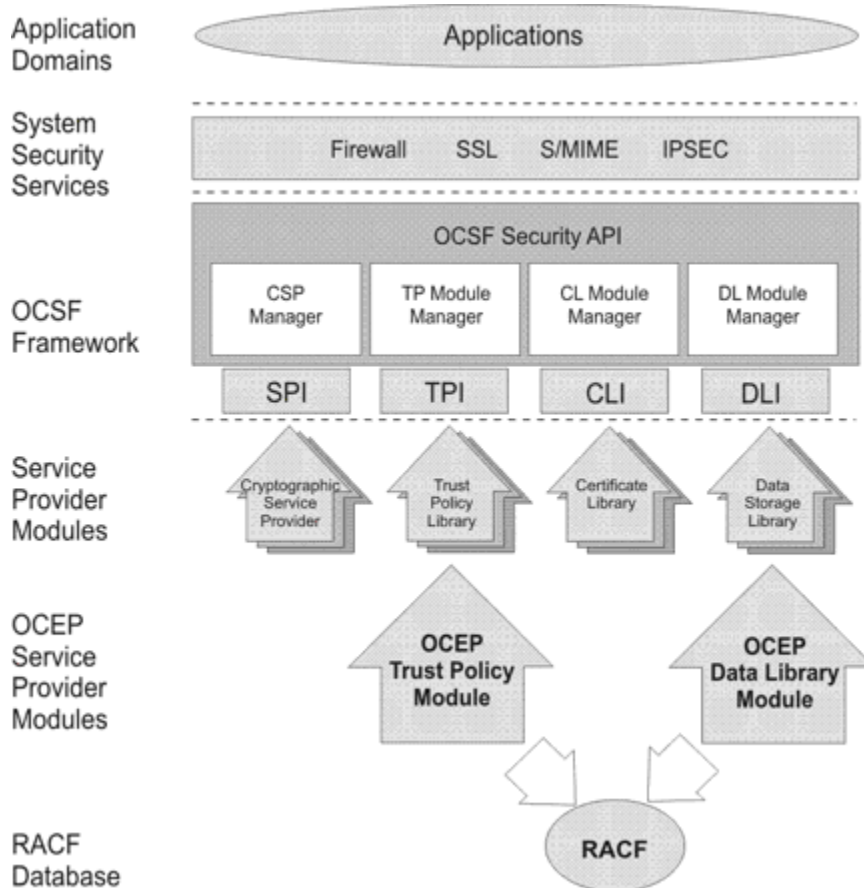


Figure 1. Overview of the OCEP and OCSF Infrastructure

OCEP trust policy

In the OCSF Framework, a trust policy (TP) service provider module implements policies that are defined by Certificate Authorities (CAs) and institutions. These policies define the level of trust that is required before certain actions can be performed. When a TP function has determined the trustworthiness of performing an action, the TP function may invoke other functions in a certificate library and a data storage library service provider module to carry out the mechanics of the approved action.

The OCEP Trust Policy service provider module implements the trust policy that is defined by a specific RACF key ring. (The OCEP Trust Policy service provider module, however, does not provide Certificate Revocation List support, as defined by OCSF.) It determines the validity of a certificate group (also called a "chain") by checking if the chain originated from a trusted certificate authority or if the first entity in the chain is connected to the key ring as a SITE certificate. A SITE certificate is one that the RACF administrator has explicitly defined and added as a trusted certificate.

For each digital certificate in the chain, the OCEP Trust Policy service provider module checks the signatures and ensures that the certificate has not been marked as not trusted by RACF. When a certificate is defined, it is marked as being trusted or not trusted by specifying the TRUST or NOTRUST operand, respectively, on the RACDCERT command. When a certificate is trusted, it indicates that the certificate is valid for the user, site, or the issuing certificate authority. It also indicates that the private key to this certificate has not been compromised.

The chain must originate from a certificate authority that is trusted. You do not have to use the RACDCERT command to add each digital certificate in that chain to RACF. However, if an individual certificate has been added to RACF, it must be marked as trusted; if not, the verification will fail and RACF will not use it to map to a user ID.

The OCEP Trust Policy must use the OCEP Data Storage Library as its data library service provider module. In addition, the OCEP Trust Policy uses the IBM Certificate Library, Version 1 as its certificate library

service provider. This module, which is provided with OCSF, verifies the syntax of the fields within the specific types of digital certificates. The OCEP Trust Policy also works with one of the cryptographic service providers that is supplied with OCSF. These service provider modules handle the cryptographic functions and policies that are associated with their specific cryptographic algorithms:

- IBM Software Cryptographic Service Provider, Version 1
- IBM Software Cryptographic Service Provider 2, Version 1
- IBM Weak Software Cryptographic Service Provider, Version 1
- IBM Weak Software Cryptographic Service Provider 2, Version 1

For more information about the OCEP Trust Policy service provider module and the supported API, see Chapter 3, “Using the Trust Policy services,” on page 11. For information about the certificate library and cryptographic service provider modules that are provided in OCSF, see *z/OS Open Cryptographic Services Facility Application Programming*.

OCEP data storage library

Within the OCSF framework, a data storage library service provider module provides persistent storage of security-related objects, such as digital certificates and keys. The OCEP Data Storage Library service provider module is designed to give applications read-only access to key ring information that has been defined and stored in the RACF database.

When the proper authorizations are established, OCEP can access this information from the RACF database. As Table 1 on page 3 shows, an application can use the OCEP Data Storage Library service provider module to query specific fields in the certificate record.

Field Name	Description	Length
Label	The value that identifies the certificate; it must be unique within the certificate class and user ID. For example, the label "CA Cert" may be used for a certificate for an individual user and for a certificate authority's certificate. Also, two different users may mark their private keys as "My Key".	1-32 characters (specified in RACF)
Subject DN	The DER-encoded X.500 Subject's Distinguished Name; it is not unique to this certificate.	256 bytes or less
Default for Ring Attribute	A binary boolean field that indicates if a default is specified; the value is unique to this certificate: Zero Not default Nonzero Default	4 bytes

In response to a query, the following information about the certificate will be returned to the application:

- DER-encoded certificate
- Private key for a user certificate, if it exists and if the calling user ID owns this certificate
- RACF user ID that owns the certificate
- Label associated with this certificate
- Subject DN
- Key type

Introduction

- Key size

This information is only returned for certificates that have been marked as trusted by RACF. If the certificate is not trusted, it will not be returned to the application.

For more information about the OCEP Data Storage Library service provider module and the supported APIs, see [Chapter 4, “Using data storage library services,” on page 19](#).

z/OS Security Server (RACF) support

In addition to supporting profiles for digital certificates, the RACF database supports the following classes of certificates (in the OCSF Framework, this is known as semantic information). Users who have the proper authority can issue a series of RACDCERT commands to create the certificate and key pairs and populate the RACF database with this information:

- User (server) certificates with optional private keys stored under the owning user ID
- Certificate Authorities (CAs) certificates (no private keys) that are stored at the system level under a unique user ID
- Site certificates (no private keys) that are stored at the system level under another unique user ID

In addition, RACF supports the concept of user-defined key rings (in the OCSF Framework, these are known as data stores). A key ring is stored under the owning user ID and may contain any of the preceding types of certificates. Entries in a key ring point to certificate records and contain additional attributes, such as:

- Default certificate/key
- Ring usage for the certificate/key

For example, the user key may be marked as a trusted root. The certificate record would still exist at the user level but it would be treated as a certificate authority for this key ring only.

- Private key type

This may be an Integrated Cryptographic Services Facility (ICSF) key token label or a non-ICSF key

- Private key bit size

For more information about RACF's support of digital certificates, see the [z/OS Security Server RACF Security Administrator's Guide](#). For information about the RACDCERT command, see [z/OS Security Server RACF Command Language Reference](#).

For more information about ICSF key tokens, see [z/OS Cryptographic Services ICSF Application Programmer's Guide](#) and the [z/OS Cryptographic Services ICSF System Programmer's Guide](#).

Developing security applications

The OCEP service provider modules are designed to plug in to the OCSF Framework. As such, applications that wish to use these service provider modules must understand and follow the OCSF requirements and conventions. For example, OCSF provides a set of APIs to perform core services, such as:

- Installing and attaching service provider modules

The calling application uses the OCSF CSSM_ModuleAttach function, for example, to attach the specified OCEP service provider modules. CSSM_ModuleAttach then returns a handle value that represents a unique pairing between the calling application and the specific OCEP service provider module. The calling routine must then specify this handle when it invokes an API that is supported by an OCEP service provider. See [“Example Code Using the OCEP Trust Policy APIs” on page 14](#) for an example.

- Querying the OCSF registry of available service provider modules
- Enabling calls to other APIs
- Managing storage

- Managing errors

In addition, because service provider modules may implement the OCSF APIs differently, you should be aware of any differences between the parameters that are supported. For example, OCSF also provides trust policy and data storage library service provider modules. However, the way in which the APIs are implemented by these OCSF service provider modules support differs from the way they are implemented by OCEP. You should review your applications to ensure that they can correctly use the APIs, as they are supported by the OCEP service provider modules.

For more information about these OCSF requirements, see [z/OS Open Cryptographic Services Facility Service Provider Module Developer's Guide and Reference](#).

Chapter 2. Configuring and getting started

This topic describes the procedures that you need to perform after you have completed the installation of the Open Cryptographic Enhanced Plug-ins (OCEP) code on your system.

Verifying the OCSF installation and configuration

Before you can run any applications that use the OCEP service provider modules, you must first ensure that several tasks have been completed for Open Cryptographic Services Facility (OCSF). The following items must be reviewed and completed:

- The OCSF code must be properly installed and configured on your system.
- Any necessary security authorizations must be granted and program controls must be established.
- The required RACF FACILITY class profiles (CDS.*) must be defined for OCSF.
- z/OS user identities must be authorized to access the CDS.* FACILITY class profiles.

For more information about the configuration requirements for OCSF, see [z/OS Open Cryptographic Services Facility Application Programming](#).

Configuring the OCEP installation

The following sections describe the actions that are required to configure OCEP for use on your system.

Authorizing daemon and user identities

IBM recommends that you assign unique z/OS and z/OS UNIX user identifiers (UIDs) to the daemons and applications that are authorized to use OCEP and OCSF services. This approach will maintain individual accountability for applications that are accessing cryptographic services on z/OS.

For example, assume that the following daemon application needs to use OCEP and OCSF services on z/OS. This daemon runs under the z/OS shell and the application is started by the daemon's profile.

UID	RACF Identity (User ID)	Home Directory
25	G092799	/u/apps/g092799

To create a RACF user profile with an OMVS segment, you would issue the following RACF ADDUSER command:

```
adduser g092799 omvs(uid(25) home('/u/apps/g092799') program('/bin/sh'))
```

For more information about how to define a RACF user ID, see the [z/OS Security Server RACF Command Language Reference](#) and the [z/OS Security Server RACF Security Administrator's Guide](#).

In addition, IBM recommends that the OCEP installation and verification scripts (see [“Installing the OCEP code”](#) on page 9 and [“Verifying OCEP installation”](#) on page 9) are run from a superuser; that is, a user ID that has been defined with a UID of 0.

For more information about how to define entities for daemons and applications on z/OS, see [z/OS UNIX System Services Planning](#).

Establishing program control

Program control is the concept of having "trusted" applications. Your installation can define libraries to RACF where these trusted applications will reside. You can activate program control on your system by issuing the RACF command SETROPTS WHEN(PROGRAM). When program control is active, processes will be marked "dirty" if they attempt to load programs from libraries that are not trusted.

z/OS UNIX also has the concept of trusted applications. In the UNIX file system, executable files may be tagged with the program-controlled extended attribute. If a user issues a z/OS UNIX shell command or runs a program that does not have the program-controlled extended attribute, the process becomes "dirty"; in either case, the process is never "cleaned". That is, the "dirty bit" remains on, which will cause certain services to fail as a result.

Establishing program control in RACF

By protecting load modules, your installation can establish controls over who can run certain programs and can, in turn, treat those programs as assets. You can protect individual load modules (programs) by creating a profile for the program in the RACF PROGRAM general resource class. A program that is protected by a profile in the PROGRAM class is called a controlled program. When RACF program control is activated on your system, OCEP also requires the following program libraries to be program-controlled:

- Language Environment, which includes the C/C++ run-time libraries
- Integrated Cryptographic Service Facility (ICSF), if it is used

For more information about RACF program control, see [z/OS Security Server RACF Security Administrator's Guide](#).

Establishing program control in HFS

You can mark programs and dynamically loaded libraries (DLLs) in the hierarchical file system (HFS) as being controlled ("trusted"). To do so, you must turn on the program-controlled extended attribute for the HFS file that contains the program or DLL. To turn on this extended attribute, issue the following z/OS UNIX shell command:

```
extattr +p filename
```

The OCSF dynamic link libraries and the files that comprise the OCEP service provider modules must have the program-controlled extended attribute. To check if a file has the program-controlled extended attribute, issue the shell command **ls** with the **-E** option. In the following example, this command is issued to verify that the program-controlled attribute is set for an OCEP file called `ibmoceptp.so`:

```
$ cd /usr/lpp/ocsf/addins
$ ls -E ibmoceptp.so
-rwxr-xr-x -ps 2 ROOT  SYS1  737280 Nov 3 22:07 ibmoceptp.so
```

The **p** flag in the command output indicates that this file has the program-controlled extended attribute. See [z/OS UNIX System Services Command Reference](#) and [z/OS UNIX System Services Planning](#) for more information about the z/OS UNIX shell commands and the program-controlled attribute.

Refreshing RACF data

After all of the z/OS Security Server (RACF) definitions have been made, the FACILITY class must be refreshed if it is RACLISTed. To do so, issue the following command:

```
setropts raclist(facility) refresh
```

If the FACILITY class is not active, you may activate it with the following command:

```
setropts classact(facility)
```

If you added members to the PROGRAM class profiles, program control for those members will not be in effect until you issue the following command:

```
setropts when(program) refresh
```

For more information about refreshing RACF data, see the *z/OS Security Server RACF Security Administrator's Guide*. For complete command syntax information, see *z/OS Security Server RACF Command Language Reference*.

Installing the OCEP code

OCEP provides an installation script, called **ocep_install**, that installs the OCEP code and registers the service provider modules with the OCSF Framework. You must run the OCEP installation script from a z/OS UNIX shell session. IBM recommends that the script be run from a superuser, which is a user ID that has been defined with a UID of 0.

To install the OCEP service provider modules, perform the following steps:

1. Ensure that OCSF has been properly installed on your system by running the install verification procedure (IVP), **ocsf_baseivp**.

For more information about installing OCSF and running the verification procedure, see *z/OS Open Cryptographic Services Facility Application Programming*.

2. Go to the directory where OCEP is installed, for example:

```
cd /usr/lpp/ocsf/bin
```

3. Run the OCEP installation script:

```
ocep_install
```

You will receive the following output:

```
Installing IBMOCEPTP...
Addin successfully installed.
Installing IBMOCEPDL...
Addin successfully installed.
```

Need more information about the installation script? See README.ocep_ivp file in the /usr/lpp/ocsf/ivp directory for more information about this installation script.

Verifying OCEP installation

After you have completed the steps described in “Installing the OCEP code” on page 9, you must run **ocep_ivp**, the OCEP installation verification program, to ensure that the OCEP code is installed and configured correctly. As with the installation script, IBM recommends that this IVP be run from a superuser, which is a user ID that has been defined with a UID of 0.

To do so, perform the following steps:

1. Go to the directory that contains the IVP, for example:

```
cd /usr/lpp/ocsf/ivp
```

2. Run the OCEP IVP program:

```
ocep_ivp
```

Getting Started

You will receive the following output:

```
Starting OCEP IVP
Initializing CSSM
CSSM Initialized
Attaching ibmocepd1
Attach successful, Detaching ibmocepd1
Detach of ibmocepd1 successful
Attaching ibmoceptp
Attach successful, Detaching ibmoceptp
Detach of ibmoceptp successful
Completed OCEP IVP
```

For more information about the installation verification procedure, see the README.ocep_ivp file in the /user/lpp/ocsf/ivp directory.

Uninstalling the OCEP Code

If you do not want to make OCEP available for use by applications, you can run the **ocep_uninstall** script, which is provided with OCEP. When you invoke this script, the OCEP service provider modules will no longer be registered to the OCSF Framework. IBM recommends that this script be run from a superuser.

To run this script, perform the following steps:

1. Go to the directory where OCEP is installed, for example:

```
cd /usr/lpp/ocsf/bin
```

2. Run the OCEP script:

```
ocep_uninstall
```

You will receive the following output:

```
Uninstalling IBMOCEPTP...
Addin successfully uninstalled.
Uninstalling IBMOCEPDL...
Addin successfully uninstalled.
```


Chapter 3. Using the Trust Policy services

This section describes the OCEP Trust Policy service provider module. It also describes its implementation of the trust policy API, as defined in the OCSF Framework.

Using the trust policy module

After you complete the installation steps described in “Installing the OCEP code” on page 9, the following OCEP Trust Policy service provider files are available for use on your system.

Function	Name	Directory Location
Header File	ibmoceptp.h	/user/lpp/ocsf/include
Executable Module	ibmoceptp.so	/user/lpp/ocsf/addins

To use the OCEP Trust Policy, an application must explicitly attach this service provider module. To do so, the application must use `CSSM_ModuleAttach`, which is an API provided by OCSF, to attach the specific GUID for the module. In turn, `CSSM_ModuleAttach` returns a handle that uniquely represents the pairing of the service provider module and the calling application.

The following GUID identifies the OCEP Trust Policy module; this GUID and other related constants are defined in the `ibmoceptp.h` header file:

```
// {5E43B291-1C38-11d2-8688-0004ACF320BC}  
static const CSSM_GUID IBMOCEPTP_GUID =  
{ 0x5e43b291, 0x1c38, 0x11d2, { 0x86, 0x88, 0x0, 0x4, 0xac, 0xf3, 0x20, 0xbc } };
```

For more information about the `CSSM_ModuleAttach` function and developing security applications, see *z/OS Open Cryptographic Services Facility Application Programming*.

Supported trust policy API

Table 2 on page 11 summarizes the trust policy functions that are defined in the OCSF Framework and how they are supported by the OCEP Trust Policy service provider module.

Function Name	Supported	Comments
<code>CSSM_TP_ApplyCrlToDb</code>	No	
<code>CSSM_TP_CertGroupConstruct</code>	No	
<code>CSSM_TP_CertGroupPrune</code>	No	
<code>CSSM_TP_CertGroupVerify</code>	Yes	See “ <code>CSSM_TP_CertGroupVerify</code> ” on page 12.
<code>CSSM_TP_CertRevoke</code>	No	
<code>CSSM_TP_CertSign</code>	No	
<code>CSSM_TP_CrlSign</code>	No	
<code>CSSM_TP_CrlVerify</code>	No	
<code>CSSM_TP_PassThrough</code>	No	

CSSM_TP_CertGroupVerify

Note: The following section provides an overview of the API that is supported by the OCEP Trust Policy service provider module. Only the parameters and values that are unique to OCEP's implementation are described.

For a full description of the syntax and supporting parameters of the remaining APIs that are implemented in the OCSF Framework, see [z/OS Open Cryptographic Services Facility Application Programming](#).

CSSM_TP_CertGroupVerify

Description

This function verifies a certificate chain, based on the Certificate Authorities and SITE certificates that are contained within the key ring.

Format

```
CSSM_BOOL CSSMAPI CSSM_TP_CertGroupVerify
(CSSM_TP_HANDLE TPHandle,
CSSM_CL_HANDLE CLHandle,
CSSM_DL_DB_LIST_PTR DBList,
CSSM_CSP_HANDLE CSPHandle,
const CSSM_FIELD_PTR PolicyIdentifiers,
uint32 NumberOfPolicyIdentifiers,
CSSM_TP_STOP_ON VerificationAbortOn,
const CSSM_CERTGROUP_PTR CertToBeVerified,
const CSSM_DATA_PTR AnchorCerts,
uint32 NumberOfAnchorCerts,
const CSSM_FIELD_PTR VerifyScope,
uint32 ScopeSize,
CSSM_TP_ACTION Action,
const CSSM_DATA_PTR Data,
CSSM_DATA_PTR *Evidence,
uint32 *EvidenceSize)
```

Parameters

***TPHandle* (input)**

the handle for this trust policy service provider module.

***CLHandle* (input)**

specifies the handle to the required certificate library service provider module, IBM Certificate Library, Version 1. This service provider module is provided in OCSF and it must be attached by the calling application.

***DBList* (input)**

identifies one DL and DB handle pair that represents a RACF key ring that was previously opened by a call to `CSSM_DL_DbOpen`. The *DLHandle* must be the handle that was returned by `CSSM_ModuleAttach` when the OCEP Data Storage Library service provider module was attached. This *DLHandle* is also specified on calls to the API [“CSSM_DL_DbOpen” on page 21](#).

***CSPHandle* (input)**

specifies the handle of one of the following cryptographic service provider modules. These service provider modules are provided in OCSF; the selected service provider module must also be attached by the calling application:

- IBM Software Cryptographic Service Provider, Version 1
- IBM Software Cryptographic Service Provider 2, Version 1
- IBM Weak Software Cryptographic Service Provider, Version 1

- IBM Weak Software Cryptographic Service Provider 2, Version 1

PolicyIdentifiers (input)

this parameter is ignored and may be specified as NULL.

NumberOfPolicyIdentifiers (input)

this parameter is ignored and may be specified as 0.

VerificationAbortOn (input)

this parameter is ignored and may be specified as CSSM_TP_STOP_ON_POLICY.

CertToBeVerified (input)

a pointer to the CSSM_CERTGROUP structure containing a certificate that has at least one signed certificate for verification. An unsigned certificate template cannot be verified.

AnchorCerts (input)

this parameter is ignored and may be specified as NULL.

NumberOfAnchorCerts (input)

this parameter is ignored and may be specified as 0.

VerifyScope (input)

this parameter is ignored and may be specified as NULL.

ScopeSize (input)

this parameter is ignored and may be specified as 0.

Action (input)

this parameter is ignored and may be specified as 0.

Data (input)

this parameter is ignored and may be specified as NULL.

Evidence (input)

this parameter is ignored and may be specified as NULL.

EvidenceSize (output)

this parameter is ignored and may be specified as 0.

Error Codes

Table 3 on page 13 lists the error codes that are unique to OCEP's support of the Trust Policy service provider module.

Decimal Value	Error Description
8010	CA certificate not found in key ring
8011	Certificate chain not trusted

For information about the OCSF APIs that perform error reporting and recovery, plus a list of other OCSF-defined error codes, see *z/OS Open Cryptographic Services Facility Application Programming*.

Trust Policy Example

“Example Code Using the OCEP Trust Policy APIs” on page 14 shows a sample program that uses the trust policy API supported by OCEP. The **highlighted** entries demonstrate how to attach this service provider module and invoke the API; this sample also includes statements to attach the OCEP Data Storage Library service provider module.

Example Code Using the OCEP Trust Policy APIs

```

/*****
 * File name: oceptptest.c
 * Description: Sample program to execute TP_CertGroupVerify
 *****/

/* required header files */
#include <stdlib.h>
#include <stdio.h>
#include <string.h>
#include <cssm.h>
#include <cssmapi.h>
#include <cssmtype.h>
#include <ibmcl.h>
#include <ibmswcsp.h>
#include <ibmoceptdl.h>
#include <ibmoceptp.h>
#include <unistd.h>

/* function prototypes */
CSSM_RETURN errorMsg(char * );
CSSM_RETURN buildCertGroup(CSSM_CERTGROUP *, char * [], uint32);
void freeCertGroup(CSSM_CERTGROUP *);
CSSM_RETURN openDB(char *);
void closeDB(void);
CSSM_RETURN attachPlugins(void);
void detachPlugins(void);

/* global pointers */
CSSM_CL_HANDLE ibm_cl_handle;
CSSM_CSP_HANDLE ibm_csp_handle;
CSSM_TP_HANDLE ibm_tp_handle;
CSSM_DL_HANDLE ibm_dl_handle;
CSSM_DL_DB_HANDLE dl_db_handle;
CSSM_DL_DB_LIST ibm_dl_db_list;
CSSM_API_MEMORY_FUNCS MemoryFuncs;

/* memory functions */
void myfree ( void *MemPtr, void *AllocRef )
{ free (MemPtr); }

void *mymalloc ( unsigned int Size, void *AllocRef )
{ return malloc (Size); }

void *myrealloc (void *MemPtr, unsigned int Size, void *AllocRef)
{ return realloc (MemPtr, Size); }

void *mycalloc (unsigned int Num, unsigned int Size, void *AllocRef)
{ return calloc (Num, Size); }

/*****
 * name: main
 *****/
void main(int argc, char *argv[])
{
    CSSM_VERSION cssm_version = {CSSM_MAJOR, CSSM_MINOR};
    CSSM_CERTGROUP certGroup;
    char * ringName = argv[1];

    if (argc < 3)
    {
        printf("Too few parameters specified.\n");
        printf("Usage: oceptptest userid/keyring certfile1 certfile2 ...\n");
        return;
    }

    MemoryFuncs.malloc_func = mymalloc;
    MemoryFuncs.free_func = myfree;
    MemoryFuncs.realloc_func = myrealloc;
    MemoryFuncs.calloc_func = mycalloc;

    if (buildCertGroup(&certGroup, &argv[2], argc-2) != CSSM_OK) return;

    if (CSSM_Init(&cssm_version, &MemoryFuncs, NULL) != CSSM_OK)
    {
        errorMsg("Failed CSSM_Init");
    }
}

```

```

    return;
}
if ((attachPlugins() == CSSM_OK) &&
    (openDB(ringName) == CSSM_OK))
{
    if (CSSM_TP_CertGroupVerify (
        ibm_tp_handle,
        ibm_cl_handle,
        &ibm_dI_db_list,
        ibm_csp_handle,
        NULL, 0, CSSM_TP_STOP_ON_POLICY,
        &certGroup,
        NULL, 0, NULL, 0, 0, NULL, NULL, 0))

        printf("Certificate verification succeeded\n");
    else errorMsg("Certificate verification failed");
}
closeDB();
detachPlugins();
freeCertGroup(&certGroup);

return;
}
/*****
 * name: errorMsg - Show error message and error code
 *****/
CSSM_RETURN errorMsg(char * message)
{
    printf("%s\n",message);
    printf("Error code is %d\n",CSSM_GetError()->error);
    return(CSSM_FAIL);
}

/*****
 * name: buildCertGroup - Allocate and load certificate data
 *****/
CSSM_RETURN buildCertGroup(CSSM_CERTGROUP * certGroupPtr,
                           char * certFile[], uint32 certCount)
{
    FILE * inFile;
    CSSM_DATA * certArray = (CSSM_DATA *) calloc(certCount,sizeof(CSSM_DATA));
    uint32 i, certSize;

    certGroupPtr->NumCerts = certCount;
    certGroupPtr->CertList = certArray;

    for (i=0; i <= certCount-1; i++)
    {
        inFile = fopen(certFile[i],"rb");
        if (!inFile)
        {
            printf("File %s could not be opened\n",certFile[i]);
            return(CSSM_FAIL);
        }
        /* Find size of certificate file */
        fseek(inFile,0L,SEEK_END);
        certSize = ftell(inFile);
        rewind(inFile);

        /* Read in certificate data*/
        certArray[i].Length = certSize;
        certArray[i].Data = (uint8 *)calloc(certSize, sizeof(char));
        fread(certArray[i].Data, 1, certSize, inFile);
        fclose(inFile);
    }
    return(CSSM_OK);
}
/*****
 * name: freeCertGroup - Free certificate data storage
 *****/
void freeCertGroup(CSSM_CERTGROUP * certGroupPtr)
{
    CSSM_DATA * certArray = certGroupPtr->CertList;
    uint32 i;
    uint32 certCount = certGroupPtr->NumCerts;

    for (i=0; i <= certCount-1; i++)
    {
        free(certArray[i].Data);
    }
}

```

```

    }
    free(certArray);
    return;
}

/*****
 * name: openDB - Initialize data library
 *****/

CSSM_RETURN openDB(char * ringName)
{
    CSSM_DB_ACCESS_TYPE access = {CSSM_TRUE, CSSM_FALSE, CSSM_FALSE, CSSM_FALSE};

    dl_db_handle.DLHandle = ibm_dl_handle;
    dl_db_handle.DBHandle = CSSM_DL_DbOpen(ibm_dl_handle,
        ringName,
        &access,
        NULL,
        NULL);
    if (!dl_db_handle.DBHandle)
        return(errorMsg("Failed CSSM_DL_DbOpen"));

    ibm_dl_db_list.NumHandles = 1;
    ibm_dl_db_list.DLDBHandle = &dl_db_handle;

    return(CSSM_OK);
}

/*****
 * name: closeDB - Free data library storage
 *****/

void closeDB(void)
{
    if (dl_db_handle.DBHandle)
        if (CSSM_DL_DbClose(dl_db_handle) != CSSM_OK)
            errorMsg("Failed CSSM_DL_DbClose");
    return;
}

/*****
 * name: attachPlugins - Attach required service provider modules
 *****/

CSSM_RETURN attachPlugins(void)
{
    CSSM_GUID      ibmcsp_guid = IBMSWCSP_GUID;
    CSSM_VERSION   CL_version = {IBM_CL_MAJOR_VERSION,  IBM_CL_MINOR_VERSION};
    CSSM_VERSION   CSP_version = {IBMSWCSP_MAJOR_VERSION, IBMSWCSP_MINOR_VERSION};
    CSSM_VERSION   TP_version = {IBMOCEPTP_MAJOR_VERSION, IBMOCEPTP_MINOR_VERSION};
    CSSM_VERSION   DL_version; /* C compiler disallows DL version as initializer */
    DL_version.Major = IBMOCEPDL_MAJOR_VERSION;
    DL_version.Minor = IBMOCEPDL_MINOR_VERSION;
    ibm_cl_handle = CSSM_ModuleAttach(&ibmcl_guid, &CL_version,
        &MemoryFuncs, 0, 0, 0, NULL, NULL);
    if (!ibm_cl_handle) return(errorMsg("Failed attach of CL"));

    ibm_csp_handle = CSSM_ModuleAttach(&ibmcsp_guid, &CSP_version,
        &MemoryFuncs, 0, 0, 0, NULL, NULL);
    if (!ibm_csp_handle) return(errorMsg("Failed attach of CSP"));

    ibm_dl_handle = CSSM_ModuleAttach(&IBMOCEPDL_GUID, &DL_version,
        &MemoryFuncs, 0, 0, 0, NULL, NULL);
    if (!ibm_dl_handle) return(errorMsg("Failed attach of DL"));

    ibm_tp_handle = CSSM_ModuleAttach(&IBMOCEPTP_GUID, &TP_version,
        &MemoryFuncs, 0, 0, 0, NULL, NULL);
    if (!ibm_tp_handle) return(errorMsg("Failed attach of TP"));

    return(CSSM_OK);
}

/*****
 * name: detachPlugins - Detach service provider modules
 *****/

void detachPlugins(void)
{
    if (ibm_cl_handle)
        if (CSSM_ModuleDetach(ibm_cl_handle) != CSSM_OK)
            errorMsg("Failed detach of CL");

    if (ibm_csp_handle)
        if (CSSM_ModuleDetach(ibm_csp_handle) != CSSM_OK)

```

```
    errorMsg("Failed detach of CSP");  
    if (ibm_dl_handle)  
        if (CSSM_ModuleDetach(ibm_dl_handle) != CSSM_OK)  
            errorMsg("Failed detach of DL");  
    if (ibm_tp_handle)  
        if (CSSM_ModuleDetach(ibm_tp_handle) != CSSM_OK)  
            errorMsg("Failed detach of TP");  
    return;  
}
```


Chapter 4. Using data storage library services

This section describes the OCEP Data Storage Library service provider module. It also describes its implementation of the data library APIs that are defined in the OCSF Framework.

Using the data storage library services module

After you complete the installation steps described in “Installing the OCEP code” on page 9, the following OCEP Data Storage Library service provider files are available for use on your system.

Function	Name	Directory Location
Header File	ibmocepdL.h	/user/lpp/ocsf/include
Executable Module	ibmocepdL.so	/user/lpp/ocsf/addins

To use the OCEP Data Storage Library Services, an application must explicitly attach this service provider module. To do so, the application must use `CSSM_ModuleAttach`, which is an API provided by OCSF, to attach the specific GUID for the service provider module. In turn, `CSSM_ModuleAttach` returns a handle that uniquely represents the pairing of the OCEP service provider module and the calling application.

The following GUID identifies the OCEP Data Storage Library service provider module; this GUID and other related constants are defined in the `ibmocepdL.h` header file:

```
// {5E43B2A3-1C38-11d2-8688-0004ACF320BC}  
static const CSSM_GUID IBMOCEPDL_GUID =  
{ 0x5e43b2a3, 0x1c38, 0x11d2, { 0x86, 0x88, 0x0, 0x4, 0xac, 0xf3, 0x20, 0xbc } };
```

For more information about the `CSSM_ModuleAttach` function and developing security applications, see *z/OS Open Cryptographic Services Facility Application Programming*.

Supported data library APIs

Table 4 on page 19 summarizes the data library functions that are defined in the OCSF Framework and if they are supported by the OCEP Data Storage Library service provider module.

Function Name	Supported	Comments
<code>CSSM_DL_AbortQuery</code>	Yes	See “ <code>CSSM_DL_AbortQuery</code> ” on page 20.
<code>CSSM_DL_Authenticate</code>	No	
<code>CSSM_DL_DbClose</code>	Yes	See “ <code>CSSM_DL_DbClose</code> ” on page 20.
<code>CSSM_DL_DbCreate</code>	No	
<code>CSSM_DL_DbDelete</code>	No	
<code>CSSM_DL_DbExport</code>	No	
<code>CSSM_DL_DbImport</code>	No	
<code>CSSM_DL_DbOpen</code>	Yes	See “ <code>CSSM_DL_DbOpen</code> ” on page 21.
<code>CSSM_DL_DbSetRecordParsingFunctions</code>	No	
<code>CSSM_DL_DbGetRecordParsingFunctions</code>	No	
<code>CSSM_DL_GetDbNameFromHandle</code>	No	

CSSM_DL_AbortQuery

Function Name	Supported	Comments
CSSM_DL_DataDelete	No	
CSSM_DL_DataGetFirst	Yes	See “ CSSM_DL_DataGetFirst ” on page 21.
CSSM_DL_DataGetNext	Yes	See “ CSSM_DL_DataGetNext ” on page 23.
CSSM_DL_DataInsert	No	
CSSM_DL_FreeUniqueRecord	Yes	See “ CSSM_DL_FreeUniqueRecord ” on page 24.
CSSM_DL_PassThrough	No	

Note: The following sections provide an overview of the APIs that are supported by the OCEP Data Storage Library service provider modules. Only those parameters and values that are unique to OCEP's implementation are described. For a full description of the syntax and supporting parameters of the remaining APIs that are implemented in the OCSF Framework, see [z/OS Open Cryptographic Services Facility Application Programming](#).

CSSM_DL_AbortQuery

Description

This function ends the query that was initiated by “[CSSM_DL_DataGetFirst](#)” on page 21 or “[CSSM_DL_DataGetNext](#)” on page 23. It releases the *ResultsHandle* that was returned by a previous query. The calling application must use this API to free the related storage that was obtained.

Format

```
CSSM_RETURN CSSMAPI CSSM_DL_DataAbortQuery  
(CSSM_DL_DB_HANDLE DLDBHandle,  
CSSM_HANDLE ResultsHandle)
```

Parameters

DLDBHandle (input)

specifies the RACF key ring handle; this is a required value.

ResultsHandle (input)

is the handle returned by the function “[CSSM_DL_DataGetFirst](#)” on page 21.

CSSM_DL_DbClose

Description

This function closes an open key ring (data store). The calling application must use this API to free the related storage that was obtained.

Format

```
CSSM_RETURN CSSMAPI CSSM_DL_DbClose  
(CSSM_DL_DB_HANDLE DLDBHandle)
```

Parameters

DLDBHandle (input)

specifies the RACF key ring handle; this is a required value.

CSSM_DL_DbOpen

Description

This function opens the specified key ring (data store).

Format

```
CSSM_DB_HANDLE CSSMAPI CSSM_DL_DbOpen
(CSSM_DL_HANDLE DLHandle,
const char *DbName,
const CSSM_DB_ACCESS_TYPE_PTR AccessRequest,
const CSSM_USER_AUTHENTICATION_PTR UserAuthentication,
const void *OpenParameters)
```

Parameters

***DLHandle* (input)**

the handle that describes the data storage library module to be used to perform this function.

***DbName* (input)**

a pointer to the string containing the logical name of the key ring (data store). This name has the following format:

```
userid/user-key ring
```

userid

the 1-8 character user ID associated with this key ring; the user ID must be specified in uppercase characters.

user-key ring

the case-sensitive ring name, which may contain up to 237 characters

***AccessRequest* (input)**

indicates the requested access mode; this must be specified as READONLY.

***UserAuthentication* (input)**

must be specified as NULL, as RACF access controls will be used to determine user authentication.

***OpenParameters* (input)**

this parameter is ignored and must be specified as NULL.

CSSM_DL_DataGetFirst

Description

This function retrieves the first record in the key ring (data store) that matches the given selection criteria. Information is only returned for certificates that have been marked as trusted by RACF. If the certificate has not been marked as trusted, it is not returned to the application; that is, it is as if the certificate is not connected to the key ring.

The selection criteria is specified in the *Query* structure, which has specific characteristics when used with the OCEP Data Storage Library service provider module. The function returns a unique record identifier that is associated with the retrieved record. This identifier can then be used in other references to the retrieved data record. For example, it can be specified on calls to [“CSSM_DL_FreeUniqueRecord”](#) on page 24.

Note:

1. The calling application is responsible for freeing the storage that is acquired for the returned *Data* (including its sub-pieces *CertData* and *PvtKeyData*) and *Attributes* parameters. Also, the storage that was acquired for the *CSSM_DB_UNIQUE_RECORD* must be freed by calling

“CSSM_DL_FreeUniqueRecord” on page 24. In addition, the storage that was acquired for the results handle must be freed by calling “CSSM_DL_AbortQuery” on page 20.

2. Because the private key data returned could be either an ICSF token label or a non-ICSF key, the application must attach the appropriate Cryptographic Service Provider (CSP) as identified by the *CspId* field in the CSSM_KEYHEADER.

Format

```
CSSM_DB_UNIQUE_RECORD_PTR CSSMAPI CSSM_DL_DataGetFirst
(CSSM_DL_DB_HANDLE DLDBHandle,
const CSSM_QUERY_PTR Query,
CSSM_HANDLE_PTR ResultsHandle,
CSSM_BOOL *EndOfDataStore,
CSSM_DB_RECORD_ATTRIBUTE_DATA_PTR Attributes,
CSSM_DATA_PTR Data)
```

Parameters

DLDBHandle (input)

specifies the RACF key ring handle; this is a required value.

Query (input)

specifies the information that will be used to query the specified key ring; this is a required value and it must have the following structure:

RecordType

must be set to CSSM_DL_DB_RECORD_CERT.

Conjunctive

must be set to CSSM_DB_NONE.

NumSelectionPredicates

must be either 0 or 1. If set to 1, then *SelectionPredicates* must point to a CSSM_SELECTION_PREDICATE structure, which has the following format:

DbOperator

must be set to CSSM_DB_EQUAL

Attribute

one of the queryable attributes, coded as follows:

- *Info.AttributeNameFormat*, which must be set to CSSM_DB_ATTRIBUTE_NAME_AS_NUMBER
- *Info.Label.AttributeNumber*, which must be one the following vales:
 - CSSM_DL_ATTRIBUTE_LABEL = 0x3 - Query on label
 - OCEP_DL_ATTRIBUTE_DEFAULT = 0x4 - Query on default flag (this constant is defined in the *ibmocepd.h* header file)
 - CSSM_DL_ATTRIBUTE_SUBJECT = 0x101 - Query on DER-encoded subject's name

ResultsHandle (output)

contains the key ring handle, which should be saved and used to retrieve subsequent records that satisfied this query.

EndOfDataStore (output)

one of the following flags, which indicates if a record that satisfied this query was available to be retrieved in the current operation:

CSSM_FALSE

a record was available and was retrieved, unless an error condition occurred.

CSSM_TRUE

all records satisfying the query have been previously retrieved and no record has been returned by this operation.

Attributes (output)

contains the attribute values of the retrieved record. This structure has the following format:

SemanticInformation

a structure defined by `CSSM_DB_CERTRECORD_SEMANTICS`; the following flags are supported:

- `CSSM_DB_CERT_USE_TRUSTED`, which indicates this is a Certificate Authority certificate.
- `CSSM_DB_CERT_USE_OWNER`, which indicates this is User/Server certificate, with a possible private key.

If neither bit is set, a SITE certificate is indicated. A SITE certificate is one that the RACF administrator has explicitly defined and added as a trusted certificate.

NumberOfAttributes

indicates the number of `CSSM_DB_ATTRIBUTE_DATA` structures that are pointed to by *Attributes*. Each of these structures will be coded as the *Query* attribute. In addition, the following non-queriable attribute will also be present:

- `CSSM_DL_ATTRIBUTE_ID = 0x101` - The RACF user ID that is associated with this certificate profile

Data (output)

is a pointer to a `CSSM_DATA` structure that contains the nonattribute record data; for RACF, this is the certificate and an optional private key. `Data->Data` will point to the following structure:

```
typedef struct ocep_cert_key_record {
    CSSM_DATA CertData;    //DER encoded certificate
    CSSM_KEY PrvtKeyData; //Optional Private key,
                        //KeyData.Length=KeyData.Data=NULL if not present
} OCEP_CERT_KEY_RECORD, *OCEP_CERT_KEY_RECORD_PTR
```

CSSM_DL_DataGetNext**Description**

This function retrieves the next data record in the key ring that matches the selection criteria (specified by the “[CSSM_DL_DataGetFirst](#)” on [page 21](#) function). Information is only returned for certificates that have been marked as trusted by RACF; if the certificate has not been marked as trusted, it will not be returned to the calling application.

Format

```
CSSM_DB_UNIQUE_RECORD_PTR CSSMAPI CSSM_DL_DataGetNext
(CSSM_DL_DB_HANDLE DLDBHandle,
CSSM_HANDLE ResultsHandle,
CSSM_BOOL *EndOfDataStore,
CSSM_DB_RECORD_ATTRIBUTE_DATA_PTR Attributes,
CSSM_DATA_PTR Data)
```

Parameters**DLDBHandle (input)**

specifies the RACF key ring handle; this is a required value.

ResultsHandle (input)

this is the handle that is returned by the “[CSSM_DL_DataGetFirst](#)” on [page 21](#) function.

EndOfDataStore (output)

one of the following flags, which indicates if a record that satisfied this query was available to be retrieved in the current operation:

CSSM_FALSE

a record was available and was retrieved, unless an error condition occurred.

CSSM_TRUE

all records satisfying the query have been previously retrieved and no record has been returned by this operation.

Attributes (output)

contains the attribute values of the retrieved record. This structure has the following format:

SemanticInformation

a structure defined by `CSSM_DB_CERTRECORD_SEMANTICS`; the following flags are supported:

- `CSSM_DB_CERT_USE_TRUSTED`, which indicates this is a Certificate Authority certificate.
- `CSSM_DB_CERT_USE_OWNER`, which indicates this is a User/Server certificate, with a possible private key.

If neither bit is set, a SITE certificate is indicated. A SITE certificate is one that the RACF administrator has explicitly defined and added as a trusted certificate.

NumberOfAttributes

indicates the number of `CSSM_DB_ATTRIBUTE_DATA` structures that are pointed to by *Attributes*. Each of these structure will be coded as the *Query* attribute (as described in “[CSSM_DL_DataGetFirst](#)” on page 21). In addition, the following non-queriable attribute will also be present:

- `CSSM_DL_ATTRIBUTE_ID = 0x101` - The RACF user ID that is associated with this certificate profile.

Data (output)

is a pointer to a `CSSM_DATA` structure that contains the nonattribute record data; for RACF, this is the certificate and an optional private key. `Data->Data` will point to the following structure:

```
typedef struct ocep_cert_key_record {
    CSSM_DATA CertData; //DER encoded certificate
    CSSM_KEY PvtKeyData; //Optional Private key,
                        //KeyData.Length=KeyData.Data=NULL if not present
} OCEP_CERT_KEY_RECORD, *OCEP_CERT_KEY_RECORD_PTR
```

CSSM_DL_FreeUniqueRecord

Description

Frees the pointer to the unique record ID that is returned by the “[CSSM_DL_DataGetFirst](#)” on page 21 or “[CSSM_DL_DataGetNext](#)” on page 23 functions. The record itself and the data it contains are unchanged. The calling application must use this API to free the related storage that was obtained.

Format

```
CSSM_RETURN CSSMAPI CSSM_DL_FreeUniqueRecord
(CSSM_DL_DB_HANDLE DLDBHandle,
CSSM_DB_UNIQUE_RECORD_PTR UniqueRecord)
```

Parameters

DLDBHandle (input)

specifies the RACF key ring handle; this is a required value.

UniqueRecord (input)

the unique record ID (CSSM_DB_UNIQUE_RECORD), which is returned by [“CSSM_DL_DataGetFirst”](#) on page 21 or [“CSSM_DL_DataGetNext”](#) on page 23.

Error codes

Table 5 on page 25 lists the error codes that are unique to OCEP's support of the Data Storage Library Services APIs.

Table 5. OCEP Data Storage Library Error Codes	
Decimal Value	Error Description
6010	Number of selection predicates exceeded the maximum
6011	Incorrect attribute length was specified
6012	Incorrect <i>DBName</i> specified
6013	Incorrect user ID length specified
6014	Ring name is missing
6015	Unsupported access request type
6016	SAF service (IRRSDL00) not available
6800 - 6899	Errors that are returned by the IRRSDL00 (R_datalib) callable service. The last two decimal digits represent the reason code returned from the service. See the <i>z/OS Security Server RACF Callable Services</i> book for more information about these error codes.

For information about the OCSF APIs that perform error reporting and recovery, plus a list of other OCSF-defined error codes, see [z/OS Open Cryptographic Services Facility Application Programming](#).

Data storage library example

“Example Code Using the OCEP Data Storage Library Services APIs” on page 25 shows excerpts from a sample program that uses the data storage library APIs that are supported by OCEP; this is not a complete program. For an example of how to attach the OCEP Data Storage Library service provider module, see the sample program in [“Example Code Using the OCEP Trust Policy APIs”](#) on page 14.

The **highlighted** entries demonstrate how you can use the supported APIs to extract the default certificate and private key from a key ring called "MyRing". The key ring is owned by user ID WEBSRVR. This example also returns the DER-encoded subject's distinguished name.

Example Code Using the OCEP Data Storage Library Services APIs

```
#include "ibmocepdl.h"

/* Declare the key ring info */
CSSM_DL_DB_HANDLE Handles;
CSSM_DB_ACCESS_TYPE READONLY = { CSSM_TRUE, CSSM_FALSE, CSSM_FALSE, CSSM_FALSE };
char ringname[] = "WEBSRVR/MyRing";

/* Declare one attribute to search on, DEFAULT*/
CSSM_SELECTION_PREDICATE DefFlag;
CSSM_QUERY MyQuery;
int YES = 1;
```

Data Storage Library Example

```
/* Declare the output fields */
CSSM_DB_UNIQUE_RECORD_PTR Record_ID;
CSSM_HANDLE OutScanHandle;
CSSM_BOOL EOData;
CSSM_DB_RECORD_ATTRIBUTE_DATA OutAttributes;
OCEP_CERT_KEY_RECORD *MyCertAndKey;
CSSM_DATA OutData, MyCert, MySubjectsName;
CSSM_KEY MyKey;

/* Declare misc */
CSSM_DB_ATTRIBUTE_DATA_PTR p;
int i;

/* Open the key ring. This assumes the OCEP DL has already been attached
and Handles.DLHandle set */
Handles.DBHandle=
CSSM_DL_DbOpen(Handles.DLHandle,ringname,READONLY,NULL,NULL);

/* Setup the attribute value */
DefFlag.DbOperator= CSSM_DB_EQUAL;
DefFlag.Attribute.Value.Length=Size_Of(YES); // Length must be four bytes
DefFlag.Attribute.Value.Data= &YES;
DefFlag.Attribute.Info.AttributeNameFormat=
CSSM_DB_ATTRIBUTE_NAME_AS_NUMBER;
DefFlagAttribute.Info.Label.AttributeNumber= OCEP_DL_ATTRIBUTE_DEFAULT;

/* Prepare the query */
MyQuery.RecordType= CSSM_DL_DB_RECORD_CERT;
MyQuery.Conjunctive= CSSM_DB_NONE;
MyQuery.NumSelectionPredicates= 1;
MyQuery.SelectionPredicate= &DefFlag;

Record_ID=
CSSM_DL_DataGetFirst(Handles,&MyQuery,&OutScanHandle,&EOData,&OutAttributes,&OutData);
if (!EOData && Record_ID) // If record returned
{
    /* Get the DER encoded certificate */
    MyCertAndKey= OutData.Data; // Data points to an OCEP_CERT_KEY_RECORD
    MyCert.Length= MyCertAndKey->CertData.Length; // Length of DER encoded certificate
    MyCert.Data= MyCertAndKey->CertData.Data; // DER encoded certificate
    if (MyCertAndKey->PrvtKeyData.KeyData.Length != 0) // Is a private key present?
    {
        /* Get the private key */
        MyKey.KeyData.Length= MyCertAndKey->PrvtKeyData.KeyData.Length;
        MyKey.KeyData.Data= MyCertAndKey->PrvtKeyData.KeyData.Data;
        memcpy(MyKey.KeyHeader,
            MyCertAndKey->PrvtKeyData.KeyHeader,sizeof(CSSM_KEYHEADER);
    }
    else
        ; // perform some error action
    /* Get the subject's DN */
    for (i=0,p=OutAttributes.AttributeData ; i < OutAttributes.NumberOfAttributes ; i++,p++)
        if (p->Info.Label.AttributeNumber == CSSM_DL_ATTRIBUTE_SUBJECT)
        {
            MySubjectsName.Length= p->Value.Length;
            MySubjectsName.Data= p->Value.Data;
        }
    //
    // Make use of the certificate/key/subject's name here
    //
    /* Clean up this record */
    free(MyCertAndKey->CertData.Data); // Free certificate storage
    free(MyCertAndKey->PrvtKeyData.KeyData.Data); // Free key data storage
    free(MyCertAndKey); // Free OCEP_CERT_KEY_RECORD storage
    /* Now clean up the attributes */
    for (i=0,p=OutAttributes.AttributeData ; i < OutAttributes.NumberOfAttributes ; i++,p++)
        free(p->Value.Data); // Free individual attribute data
    free(OutAttributes.AttributeData); // Free CSSM_DB_ATTRIBUTE_DATA list
    CSSM_DL_FreeUniqueRecord(Handles,Record_ID);
    // Free storage associated with the record ID
    }
    /* Cleanup this key ring scan */
    CSSM_DL_AbortQuery(Handles,OutScanHandle);
    /* Close the key ring */
    CSSM_DL_DbClose(Handles);
}
```

Appendix A. Accessibility

Accessible publications for this product are offered through [IBM Knowledge Center \(www.ibm.com/support/knowledgecenter/SSLTBW/welcome\)](http://www.ibm.com/support/knowledgecenter/SSLTBW/welcome).

If you experience difficulty with the accessibility of any z/OS information, send a detailed message to the [Contact z/OS web page \(www.ibm.com/systems/z/os/zos/webqs.html\)](http://www.ibm.com/systems/z/os/zos/webqs.html) or use the following mailing address.

IBM Corporation
Attention: MHVRCFS Reader Comments
Department H6MA, Building 707
2455 South Road
Poughkeepsie, NY 12601-5400
United States

Accessibility features

Accessibility features help users who have physical disabilities such as restricted mobility or limited vision use software products successfully. The accessibility features in z/OS can help users do the following tasks:

- Run assistive technology such as screen readers and screen magnifier software.
- Operate specific or equivalent features by using the keyboard.
- Customize display attributes such as color, contrast, and font size.

Consult assistive technologies

Assistive technology products such as screen readers function with the user interfaces found in z/OS. Consult the product information for the specific assistive technology product that is used to access z/OS interfaces.

Keyboard navigation of the user interface

You can access z/OS user interfaces with TSO/E or ISPF. The following information describes how to use TSO/E and ISPF, including the use of keyboard shortcuts and function keys (PF keys). Each guide includes the default settings for the PF keys.

- [*z/OS TSO/E Primer*](#)
- [*z/OS TSO/E User's Guide*](#)
- [*z/OS ISPF User's Guide Vol I*](#)

Dotted decimal syntax diagrams

Syntax diagrams are provided in dotted decimal format for users who access IBM Knowledge Center with a screen reader. In dotted decimal format, each syntax element is written on a separate line. If two or more syntax elements are always present together (or always absent together), they can appear on the same line because they are considered a single compound syntax element.

Each line starts with a dotted decimal number; for example, 3 or 3.1 or 3.1.1. To hear these numbers correctly, make sure that the screen reader is set to read out punctuation. All the syntax elements that have the same dotted decimal number (for example, all the syntax elements that have the number 3.1) are mutually exclusive alternatives. If you hear the lines 3.1 USERID and 3.1 SYSTEMID, your syntax can include either USERID or SYSTEMID, but not both.

The dotted decimal numbering level denotes the level of nesting. For example, if a syntax element with dotted decimal number 3 is followed by a series of syntax elements with dotted decimal number 3.1, all the syntax elements numbered 3.1 are subordinate to the syntax element numbered 3.

Certain words and symbols are used next to the dotted decimal numbers to add information about the syntax elements. Occasionally, these words and symbols might occur at the beginning of the element itself. For ease of identification, if the word or symbol is a part of the syntax element, it is preceded by the backslash (\) character. The * symbol is placed next to a dotted decimal number to indicate that the syntax element repeats. For example, syntax element *FILE with dotted decimal number 3 is given the format 3 * FILE. Format 3* FILE indicates that syntax element FILE repeats. Format 3* * FILE indicates that syntax element * FILE repeats.

Characters such as commas, which are used to separate a string of syntax elements, are shown in the syntax just before the items they separate. These characters can appear on the same line as each item, or on a separate line with the same dotted decimal number as the relevant items. The line can also show another symbol to provide information about the syntax elements. For example, the lines 5.1*, 5.1 LASTRUN, and 5.1 DELETE mean that if you use more than one of the LASTRUN and DELETE syntax elements, the elements must be separated by a comma. If no separator is given, assume that you use a blank to separate each syntax element.

If a syntax element is preceded by the % symbol, it indicates a reference that is defined elsewhere. The string that follows the % symbol is the name of a syntax fragment rather than a literal. For example, the line 2.1 %OP1 means that you must refer to separate syntax fragment OP1.

The following symbols are used next to the dotted decimal numbers.

? indicates an optional syntax element

The question mark (?) symbol indicates an optional syntax element. A dotted decimal number followed by the question mark symbol (?) indicates that all the syntax elements with a corresponding dotted decimal number, and any subordinate syntax elements, are optional. If there is only one syntax element with a dotted decimal number, the ? symbol is displayed on the same line as the syntax element, (for example 5? NOTIFY). If there is more than one syntax element with a dotted decimal number, the ? symbol is displayed on a line by itself, followed by the syntax elements that are optional. For example, if you hear the lines 5 ?, 5 NOTIFY, and 5 UPDATE, you know that the syntax elements NOTIFY and UPDATE are optional. That is, you can choose one or none of them. The ? symbol is equivalent to a bypass line in a railroad diagram.

! indicates a default syntax element

The exclamation mark (!) symbol indicates a default syntax element. A dotted decimal number followed by the ! symbol and a syntax element indicate that the syntax element is the default option for all syntax elements that share the same dotted decimal number. Only one of the syntax elements that share the dotted decimal number can specify the ! symbol. For example, if you hear the lines 2? FILE, 2.1! (KEEP), and 2.1 (DELETE), you know that (KEEP) is the default option for the FILE keyword. In the example, if you include the FILE keyword, but do not specify an option, the default option KEEP is applied. A default option also applies to the next higher dotted decimal number. In this example, if the FILE keyword is omitted, the default FILE(KEEP) is used. However, if you hear the lines 2? FILE, 2.1, 2.1.1! (KEEP), and 2.1.1 (DELETE), the default option KEEP applies only to the next higher dotted decimal number, 2.1 (which does not have an associated keyword), and does not apply to 2? FILE. Nothing is used if the keyword FILE is omitted.

*** indicates an optional syntax element that is repeatable**

The asterisk or glyph (*) symbol indicates a syntax element that can be repeated zero or more times. A dotted decimal number followed by the * symbol indicates that this syntax element can be used zero or more times; that is, it is optional and can be repeated. For example, if you hear the line 5.1* data area, you know that you can include one data area, more than one data area, or no data area. If you

hear the lines 3* , 3 HOST, 3 STATE, you know that you can include HOST, STATE, both together, or nothing.

Notes:

1. If a dotted decimal number has an asterisk (*) next to it and there is only one item with that dotted decimal number, you can repeat that same item more than once.
2. If a dotted decimal number has an asterisk next to it and several items have that dotted decimal number, you can use more than one item from the list, but you cannot use the items more than once each. In the previous example, you can write HOST STATE, but you cannot write HOST HOST.
3. The * symbol is equivalent to a loopback line in a railroad syntax diagram.

+ indicates a syntax element that must be included

The plus (+) symbol indicates a syntax element that must be included at least once. A dotted decimal number followed by the + symbol indicates that the syntax element must be included one or more times. That is, it must be included at least once and can be repeated. For example, if you hear the line 6.1+ data area, you must include at least one data area. If you hear the lines 2+, 2 HOST, and 2 STATE, you know that you must include HOST, STATE, or both. Similar to the * symbol, the + symbol can repeat a particular item if it is the only item with that dotted decimal number. The + symbol, like the * symbol, is equivalent to a loopback line in a railroad syntax diagram.

Notices

This information was developed for products and services that are offered in the USA or elsewhere.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not grant you any license to these patents. You can send license inquiries, in writing, to:

*IBM Director of Licensing
IBM Corporation
North Castle Drive, MD-NC119
Armonk, NY 10504-1785
United States of America*

For license inquiries regarding double-byte character set (DBCS) information, contact the IBM Intellectual Property Department in your country or send inquiries, in writing, to:

*Intellectual Property Licensing
Legal and Intellectual Property Law
IBM Japan Ltd.
19-21, Nihonbashi-Hakozakicho, Chuo-ku
Tokyo 103-8510, Japan*

The following paragraph does not apply to the United Kingdom or any other country where such provisions are inconsistent with local law: INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

This information could include missing, incorrect, or broken hyperlinks. Hyperlinks are maintained in only the HTML plug-in output for the Knowledge Centers. Use of hyperlinks in other output formats of this information is at your own risk.

Any references in this information to non-IBM websites are provided for convenience only and do not in any manner serve as an endorsement of those websites. The materials at those websites are not part of the materials for this IBM product and use of those websites is at your own risk.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Licensees of this program who wish to have information about it for the purpose of enabling: (i) the exchange of information between independently created programs and other programs (including this one) and (ii) the mutual use of the information which has been exchanged, should contact:

*IBM Corporation
Site Counsel
2455 South Road*

Poughkeepsie, NY 12601-5400
USA

Such information may be available, subject to appropriate terms and conditions, including in some cases, payment of a fee.

The licensed program described in this document and all licensed material available for it are provided by IBM under terms of the IBM Customer Agreement, IBM International Program License Agreement or any equivalent agreement between us.

Any performance data contained herein was determined in a controlled environment. Therefore, the results obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

All statements regarding IBM's future direction or intent are subject to change or withdrawal without notice, and represent goals and objectives only.

This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

COPYRIGHT LICENSE:

This information contains sample application programs in source language, which illustrate programming techniques on various operating platforms. You may copy, modify, and distribute these sample programs in any form without payment to IBM, for the purposes of developing, using, marketing or distributing application programs conforming to the application programming interface for the operating platform for which the sample programs are written. These examples have not been thoroughly tested under all conditions. IBM, therefore, cannot guarantee or imply reliability, serviceability, or function of these programs. The sample programs are provided "AS IS", without warranty of any kind. IBM shall not be liable for any damages arising out of your use of the sample programs.

Terms and conditions for product documentation

Permissions for the use of these publications are granted subject to the following terms and conditions.

Applicability

These terms and conditions are in addition to any terms of use for the IBM website.

Personal use

You may reproduce these publications for your personal, noncommercial use provided that all proprietary notices are preserved. You may not distribute, display or make derivative work of these publications, or any portion thereof, without the express consent of IBM.

Commercial use

You may reproduce, distribute and display these publications solely within your enterprise provided that all proprietary notices are preserved. You may not make derivative works of these publications, or

reproduce, distribute or display these publications or any portion thereof outside your enterprise, without the express consent of IBM.

Rights

Except as expressly granted in this permission, no other permissions, licenses or rights are granted, either express or implied, to the publications or any information, data, software or other intellectual property contained therein.

IBM reserves the right to withdraw the permissions granted herein whenever, in its discretion, the use of the publications is detrimental to its interest or, as determined by IBM, the above instructions are not being properly followed.

You may not download, export or re-export this information except in full compliance with all applicable laws and regulations, including all United States export laws and regulations.

IBM MAKES NO GUARANTEE ABOUT THE CONTENT OF THESE PUBLICATIONS. THE PUBLICATIONS ARE PROVIDED "AS-IS" AND WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT, AND FITNESS FOR A PARTICULAR PURPOSE.

IBM Online Privacy Statement

IBM Software products, including software as a service solutions, ("Software Offerings") may use cookies or other technologies to collect product usage information, to help improve the end user experience, to tailor interactions with the end user, or for other purposes. In many cases no personally identifiable information is collected by the Software Offerings. Some of our Software Offerings can help enable you to collect personally identifiable information. If this Software Offering uses cookies to collect personally identifiable information, specific information about this offering's use of cookies is set forth below.

Depending upon the configurations deployed, this Software Offering may use session cookies that collect each user's name, email address, phone number, or other personally identifiable information for purposes of enhanced user usability and single sign-on configuration. These cookies can be disabled, but disabling them will also eliminate the functionality they enable.

If the configurations deployed for this Software Offering provide you as customer the ability to collect personally identifiable information from end users via cookies and other technologies, you should seek your own legal advice about any laws applicable to such data collection, including any requirements for notice and consent.

For more information about the use of various technologies, including cookies, for these purposes, see IBM's Privacy Policy at ibm.com/privacy and IBM's Online Privacy Statement at ibm.com/privacy/details in the section entitled "Cookies, Web Beacons and Other Technologies," and the "IBM Software Products and Software-as-a-Service Privacy Statement" at ibm.com/software/info/product-privacy.

Policy for unsupported hardware

Various z/OS elements, such as DFSMS, JES2, JES3, and MVS™, contain code that supports specific hardware servers or devices. In some cases, this device-related element support remains in the product even after the hardware devices pass their announced End of Service date. z/OS may continue to service element code; however, it will not provide service related to unsupported hardware devices. Software problems related to these devices will not be accepted for service, and current service activity will cease if a problem is determined to be associated with out-of-support devices. In such cases, fixes will not be issued.

Minimum supported hardware

The minimum supported hardware for z/OS releases identified in z/OS announcements can subsequently change when service for particular servers or devices is withdrawn. Likewise, the levels of other software products supported on a particular release of z/OS are subject to the service support lifecycle of those products. Therefore, z/OS and its product publications (for example, panels, samples, messages, and product documentation) can include references to hardware and software that is no longer supported.

- For information about software support lifecycle, see: [IBM Lifecycle Support for z/OS \(www.ibm.com/software/support/systemsz/lifecycle\)](http://www.ibm.com/software/support/systemsz/lifecycle)
- For information about currently-supported IBM hardware, contact your IBM representative.

Trademarks

IBM, the IBM logo, and ibm.com are trademarks or registered trademarks of International Business Machines Corp., registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the Web at [Copyright and Trademark information \(www.ibm.com/legal/copytrade.shtml\)](http://www.ibm.com/legal/copytrade.shtml).

Index

Special Characters

-E operand, ls command [8](#)

A

accessibility

contact IBM [27](#)

features [27](#)

activating FACILITY class [8](#)

ADDUSER [7](#)

ADDUSER command [7](#)

APIs

CSSM_DL_DbClose [20](#)

data storage library [3](#)

format

CSSM_DL_DbOpen [21](#)

applications

authorizing [7](#)

trusted [8](#)

assistive technologies [27](#)

attribute, extended [8](#)

authorizing applications [7](#)

B

bit, dirty [8](#)

C

C/C++ run-time libraries [8](#)

cancelling registration [10](#)

CDS.* profiles [7](#)

certificate revocation list [2](#)

class profiles, FACILITY [7](#)

codes, error [13](#), [25](#)

commands

RACDCERT [4](#)

components, z/OS Integrated Security Services [ix](#)

configuring

OCEP [7](#)

Open Cryptographic Services Facility (OCSF) installation [7](#)

contact

z/OS [27](#)

creating a user profile [7](#)

CSSM_DL_AbortQuery

example usage [25](#)

CSSM_DL_DataGetFirst

example usage [25](#)

format [21](#)

CSSM_DL_DataGetNext [23](#)

CSSM_DL_DbClose

example usage [13](#), [25](#)

CSSM_DL_DbOpen

example usage [13](#), [25](#)

CSSM_DL_FreeUniqueRecord

example usage [25](#)

format [24](#)

CSSM_ModuleAttach

example usage [13](#)

overview [4](#)

use with service provider modules [11](#), [19](#)

CSSM_TP_CertGroupVerify

format [12](#)

CSSM_TP_CertGroupVerify example usage [13](#)

D

daemons, authorizing [7](#)

data storage library

APIs [3](#)

how to use [19](#)

overview [3](#)

required files [19](#)

data storage library APIs

CSSM_DL_DataGetNext [23](#)

error codes [25](#)

example code [25](#)

data storage library services

GUID value [19](#)

data, refreshing [8](#)

deregistering OCEP [10](#)

developing applications

security [4](#)

digital certificate support, RACF [4](#)

dirty bit [8](#)

E

error codes

data storage library APIs [25](#)

establishing program control [8](#)

example applications

data storage library [25](#)

trust policy [13](#)

example code

trust policy [13](#)

example usage CSSM_TP_CertGroupVerify [13](#)

executable file

ibmocepd.h [19](#)

ibmocepd.so [19](#)

executable files

ibmoceptp.h [11](#)

ibmoceptp.so [11](#)

extattr [8](#)

extattr command [8](#)

extended attribute [8](#)

F

FACILITY class

FACILITY class *(continued)*

- activating [8](#)
- defining profiles [7](#)
- feedback [xi](#)

G

- general resource class, PROGRAM [8](#), [9](#)
- GUID value [11](#)

H

- header files
 - ibmocepd.h [19](#), [25](#)
 - ibmocepd.so [19](#)
- HFS program control [8](#)

I

- IBM Certificate Library, Version 1 [3](#), [12](#)
- IBM Software Cryptographic Service Provider 2, Version 1 [3](#), [12](#)
- IBM Software Cryptographic Service Provider, Version 1 [3](#), [12](#)
- IBM Weak Software Cryptographic Service Provider 2, Version 1 [3](#), [13](#)
- IBM Weak Software Cryptographic Service Provider, Version 1 [3](#), [12](#)
- ibmocepd.h
 - header files [25](#)
- ibmocepd.so [19](#)
- ibmoceptp.h [11](#)
- ibmoceptp.so [11](#)
- installation
 - ocep_install installation script [9](#)
 - user ID requirements [9](#)
- installation procedures
 - procedures [9](#)
 - verification [9](#)
- installation verification procedure (IVP) [9](#)
- Integrated Cryptographic Service Facility
 - libraries [8](#)
- Integrated Cryptographic Services Facility (ICSF)
 - token label [4](#)
- IRRSDL00 callable service [25](#)
- IVP (installation verification procedure) [9](#)

K

- keyboard
 - navigation [27](#)
 - PF keys [27](#)
 - shortcut keys [27](#)

L

- Language Environment run-time libraries [8](#)
- ls [8](#)
- ls command [8](#)

N

- navigation
 - keyboard [27](#)
- NOTRUST operand [2](#)

O

- OCEP
 - configuring [7](#)
 - data storage library [3](#)
 - ocep_install installation script [9](#)
 - ocep_ivp verification program [9](#)
 - ocep_uninstall script [10](#)
- OMVS segment [7](#)
- Open Cryptographic Services Facility (OCSF)
 - infrastructure [1](#)
 - publications [ix](#)
 - verifying installation [7](#)
- Open Cryptographic Services Facility (OCSF) installation
 - configuring [7](#)
- oscf_baseivp [9](#)
- overview
 - applications
 - trusted [8](#)
 - OCEP trust policy [2](#)

P

- p flag [8](#)
- predicate structure [22](#)
- preface [ix](#)
- profiles, FACILITY class [7](#)
- PROGRAM
 - RACF classes [8](#)
- program control
 - activating [9](#)
 - using RACF [8](#)
- program control using HFS extended attribute [8](#)
- program directory, z/OS [7](#)
- PROGRAM general resource class [8](#), [9](#)
- Purpose of this information [ix](#)

Q

- query
 - certificate record fields [3](#)
 - data structure [22](#)

R

- R_datalib callable service [25](#)
- RACDCERT
 - commands [2](#)
- RACDCERT command [2](#), [4](#)
- RACF
 - publications [x](#)
- RACF classes
 - PROGRAM [9](#)
 - user profile [7](#)
- readme files [9](#), [10](#)
- refreshing RACF data [8](#)
- registering OCEP code [9](#)

resource class, general [8](#)
run-time libraries [8](#)

S

sample applications
 data storage library [25](#)
 trust policy [13](#)
semantic information [4](#)
sending to IBM
 reader comments [xi](#)
service modules
 required files [19](#)
SETROPTS [8](#)
SETROPTS command [8](#)
shortcut keys [27](#)
SITE certificate
 definition [2](#)
 indication in retrieved record [23](#), [24](#)
superuser [7](#)
superuser, z/OS UNIX [9](#)

T

trademarks [34](#)
TRUST operand [2](#)
trust policy [11](#)
trust policy module
 required files [11](#)
trusted applications [8](#)

U

uninstall script [10](#)
user interface
 ISPF [27](#)
 TSO/E [27](#)
user profile, RACF [7](#)
using RACF
 PROGRAM [8](#)

V

verification
 OCEP installation [9](#)
verifying
 OSCF installation [7](#)

W

What this information contains [ix](#)
Where do i find more information? [ix](#)
Who should use this information [ix](#)

Z

z/OS Integrated Security Services and related components [ix](#)
z/OS Security Server (RACF)
 digital certificate support [4](#)
z/OS UNIX superuser [7](#), [9](#)
z/OS UNIX System Services
 OMVS segment [7](#)



SC14-7568-40

