

CCDWS

Common Communication Driver for Web Services Technical Reference and Operating Manual

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Revision History

Date	Revision	CCDWS Version	Changes
2011-10-25	1.0	0.9.0 (beta)	❑ Initial revision
2011-11-03	1.1	0.9.0 (beta)	❑ Removed OpenSSL run-time library requirement
2011-11-07	1.2	0.9.1 (beta)	❑ Changed SignMessage option ❑ Added <i>Related Documents</i> section
2011-11-10	1.3	0.9.2 (beta)	❑ Added <i>Prefix</i> and <i>DataType</i> configuration options
2011-11-16	1.4	0.9.3 (beta)	❑ Removed <cr> from output file format specification
2011-12-12	1.5	0.9.4 (beta)	❑ Changed <i>SignMessage</i> configuration option to <i>SignMessageParts</i> ❑ Added <i>EncryptMessageParts</i> , <i>EncryptMessageBody</i> , and <i>EncryptCertificateFile</i> configuration options
2012-01-11	1.6	0.9.4 (beta)	❑ Added <i>Automated Installation Instructions</i> section ❑ Added other related documents ❑ Updated sample request and response messages ❑ Changed <i>DataType</i> configuration option to <i>PayloadType</i>
2012-01-31	1.7	0.9.5 (beta)	❑ Added <i>DetectParseErrors</i> configuration option
2012-05-30	1.8	0.9.6 (beta)	❑ Changed <i>MaxRetries</i> configuration option description to add conditions under which retries will be attempted. ❑ Changed default <i>ReadWriteTimeout</i> to 60 seconds.
2012-05-30	1.9	0.9.6 (beta)	❑ Fixed page footer text.
2012-08-06	1.10	0.9.6 (beta)	❑ Added missing <i>RootDir</i> configuration option. ❑ Changed <i>ProxyAddress</i> configuration option to <i>ProxyServer</i> ❑ Set <i>ProxyServer</i> and <i>ProxyPort</i> configuration option section to Main rather than Destination X.
2014-07-29	1.20	1.0.1	❑ Added description of CDA specified certificates in operating system's certificate store ❑ Added configuration options <i>ProviderOidPrefix</i> , <i>OfficeOidPrefix</i> , <i>CaCertificateName</i> , <i>RootCaCertificateName</i> , <i>CrlAltDistributionPoint</i> , <i>CrlDistributionPoint</i> , and <i>CrlRefreshDelay</i> ❑ Updated descriptions for <i>CaCertificateFile</i> , <i>CertificateFile</i> ❑ Added and updated sections for automated and manual installation to reflect the use of CDAnet certificates. ❑ Added Troubleshooting section
2014-10-10	1.21	1.0.1	❑ Added troubleshooting entry where certificate is in the CRL.
2014-10-22	1.22	1.0.1	❑ Added additional information in installation sections detailing location of installation files, and describing conditions for installing pre-1.0 functionality.
2014-11-28	1.23	1.0.1	❑ Added troubleshooting item regarding endpoints or certificates not matching the appropriate operating sytem. ❑ Added troubleshooting item regarding no valid certificate being found (either expired or missing). ❑ Changed error code for key marked as not exportable in troubleshooting guide to 1013. ❑ Changed error code for certificate not found to 1013

Date	Revision	CCDWS Version	Changes
			❑ Updated SSLVerify configuration option description.
2014-12-01	1.24	1.0.1	❑ Added configuration file sample ❑ Additional references to TELUS network
2014-12-03	1.25	1.0.2	❑ Added Foreground configuration option.
2015-05-12	2.1	1.0.3	❑ Added information for installing and operating within OS X.
2015-11-12	2.2	1.0.5	❑ Added Linux in addition to OS X information. ❑ Changed copyright notice and other references from HIEC to CHLIA

1. Introduction

This document provides technical and operational information for the Common Communications Driver for Web Services (CCDWS), sponsored by the Canadian Life and Health Insurance Association Inc. (CLHIA), and designed by Harder Software. CCDWS is designed to act as a communications interface between dental offices and healthcare insurers.

CCDWS is designed to run as a service application, polling for input request files. Upon discovery of an input file it will perform all tasks necessary to submit the claim and receive the adjudication response or acknowledgement in real time. It will operate in a parallel with the original CCD application, so that both carriers that accept dialup claims and those that accept web service claims can be supported simultaneously without modification to the dental software.

2. Related Documents

To obtain copies of the following documents, contact a participating CLHIA member.

CCDWS Requirements was authored by Alberta Blue Cross to provide the requirements and overall parameters for development of CCDWS.

CCDWS – Technical Design provides information on design and programming of the CCDWS application. This document was authored by Harder Software.

CCDWS – Test Plan can be used by software vendors and carriers to ensure that CCDWS is working as designed. This document was authored by Harder Software.

Point of Service (PoS) Application Services Transport Specification, Draft 1.9 defines much of the underlying transport specific specifications used for SOAP transactions. This document was authored by the Health Industry Electronic Commerce Association (HIEC).

3. Run-Time Environment

3.1. Operating Systems

CCDWS is currently compiled to execute in recent versions of 32 or 64-bit Windows, 64-bit Mac OS X, and 64-bit Linux.

3.2. Required Run-Time Libraries

All object libraries for the CCDWS executable file are statically linked, so that no additional run-time libraries beyond those provided by the operating system are required.

3.3. Location of Run-Time Files

CCDWS files can be installed in any local filesystem location, and the location of files can be controlled during the automated Windows installation process. Additionally, the configuration file location can be specified as a command-line option. However, the default values will allow CCDWS to run seamlessly alongside existing Windows CCD installations.

The file locations are as follows:

`<root>/<ccdws_exe>`: the CCDWS executable

`<root>/ccdws.ini`: the CCDWS configuration file

`<root>/ccdws.log`: the CCDWS log file

`<root>/<dest>/input.<ext>`: input file containing the request payload

`<root>/<dest>/output.<ext>`: structured output file corresponding to the input file

Where:

`<root>` is the root directory containing the executable file and others, as well as the destination directories.

`<ccdws_exe>` is the CCDWS executable. In Windows this is `ccdws.exe`. In Linux and OS X, this is `ccdws`.

`<dest>` is the destination directory, referenced by the [Destination `<dest>`] directory in `ccdws.ini`. The value of `<dest>` will often be a carrier abbreviation. For instance ABC = Alberta Blue Cross. The carrier TELUS has many alternative values such as NDC, SHNS, etc.

`<ext>` is the input/output file extension given by the dental software.

3.4. Location of Certificates

For Windows, CDAnet provides an installation application that should be used to install both the CA (certificate authority) and provider certificates into the operating system's certificate store. It is important that these certificates be installed correctly prior to using CCDWS.

If certificates are installed in the current user's environment it is important that CCDWS be installed such that it runs under the current user's account, regardless of whether it runs as a simple executable or as a service. If the certificates cannot be found, then communications will fail.

For Linux and OS X, CDAnet provides a Java application to create or update both a *cacerts* keystore file containing CA certificates, and a *providerkeys* keystore file containing provider certificates and keys. These are created in the current working directory of the Java application. They can be copied to the application's root directory, or any other location that is specified in the configuration file.

4. Input and Output Files

The CCDWS application communicates with the dental office software using file based inputs and outputs. This is consistent with the Windows CCD application, allowing coexistence of CCD with CCDWS, and seamless integration of CCDWS within an existing dental software installation.

4.1. File Location

The input files are obtained within the directory structure defined by the configuration option *RootDir*. In Windows the default is `c:\ccd`. Beneath that structure are destination directories. CCDWS will search for the input files based on sections within the configuration file. For instance, if a section [Destination XYZ] exists, then CCDWS will look for input files within `c:\ccd\XYZ`. It will do so for every destination section it finds.

4.2. Input File Generation

The CCDWS application expects that input files will be accessible only when they are generated in their entirety. This can be accomplished from the dental software by writing to a temporary file, then renaming the file to the correct naming convention as described below in the *Input File Format* section. CCDWS will also attempt to ensure it is not reading from a file being written to by first opening it in write mode, but this may not be a viable

locking mechanism in all operating systems.

4.3. Input File Format

The input file is given the name *input.xxx* where *input* is the base part of the filename (i.e. 'input'). This can be altered with the configuration option *InputFileName*, but will not typically need to be other than the default. *xxx* is a unique suffix within the input directory. Once an input has been processed, the first character of the file will be changed to an underscore ('_') so that it is not processed again.

The content of the file will be a valid CDAnet input, such as a claim request. CCDWS will accept CDAnet v2, v3, or v4 inputs so the dental office software is responsible for ensuring that the version is acceptable to the remote carrier. CCDWS will parse the input to ensure all fields are of appropriate types and mandatory fields are provided as per the standards, and to obtain the office sequence number used to populate the output file.

4.4. Output File Format

The output file will be generated for every input, unless the CCDWS is prevented from doing so due to file permissions or similar errors. Thus, even failures to successfully parse an input or failure to successfully connect to the remote carrier will result in an output.

The format of the output file will be *output.xxx* where *output* is the base part of the filename (i.e. 'output'). This can be altered with the configuration option *OutputFileName*, but will not typically need to be other than the default. *xxx* is the same extension as that of the input file. If the file already exists it will be overwritten.

The content of the file will be as follows: *<sequence>,<status>,<extension>,[<response>]*

Where:

<sequence> is the office sequence number extracted from the input file (for non-CDAnet, this is 0)

<status> is the numerical status of the transaction, where zero (0) is success.

<extension> is the file extension

<response> is the response payload to the input, if *<status>* is zero (0).

See the section entitled *Status Codes* for details on possible status code values and their meanings.

5. Web Service Communications

The CCDWS application is designed to support web service communications. This means that the dental office must be able to access the internet.

Web services transmit XML encoded messages use the Simple Object Access Protocol (SOAP), typically transported using HTTP over TCP/IP in conjunction with other web standards, such as TLS/SSL secure communications. Additionally, web service extensions such as WS-Addressing and WS-Security are used to support secure delivery of messages. Response to the web services are returned similarly.

5.1. WSDL

The document entitled *CCDWS – Technical Design* contains the Web Services Design Language (WSDL) file used to define the web service call.

5.2. Sample Request Message Sent to Remote Server

The following message is generated by wrapping the CDAnet in a SOAP envelope, with a WS-Addressing

extension. The actual payload is truncated with ellipses (...).

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
  <SOAP-ENV:Header>
    <wsa5:MessageID xmlns:wsa5="http://www.w3.org/2005/08/addressing">
      uuid:86e96a14-f36d-40e1-93f3-cf511f0a312c
    </wsa5:MessageID>
    <wsa5:To xmlns:wsa5="http://www.w3.org/2005/08/addressing" SOAP-ENV:mustUnderstand="1">
      https://vendor.claimstream.ca:3540/DWST/CDAnetService
    </wsa5:To>
    <wsa5:Action xmlns:wsa5="http://www.w3.org/2005/08/addressing" SOAP-ENV:mustUnderstand="1">
      urn:hiec:v1:HIECService</wsa5:Action>
    </SOAP-ENV:Header>
    <SOAP-ENV:Body>
      <ccd:request xmlns:ccd="urn:hiec:v1">
        <ccd:Format>
          CDANET4
        </ccd:Format>
        <ccd:Value>
          ABCCDANET4 0133200401000094EX5100500...
        </ccd:Value>
      </ccd:request>
    </SOAP-ENV:Body>
  </SOAP-ENV:Envelope>
```

5.3. Sample Response Message Received from Remote Server

The following sample message was received from the remote server. HTTP headers are not shown, and the message within the <ccd:CDAnet_RESP> tags is truncated with ellipses (...). The message is also formatted for easier reading, as it was received without line feeds and indents.

```
<S:Envelope xmlns:S="http://schemas.xmlsoap.org/soap/envelope/">
  <S:Header>
    <To xmlns="http://www.w3.org/2005/08/addressing">
      www.w3.org/2005/08/addressing/anonymous
    </To>
    <Action xmlns="http://www.w3.org/2005/08/addressing">
      urn:cda-org:v1/CDAnetService/CDAnet_REQResponse
    </Action>
    <MessageID xmlns="http://www.w3.org/2005/08/addressing">
      uuid:WLS1:WseeJaxwsFileStore_auto_2:cf3d8cb7529a97cc:-5c264069:1333bb18cb8:-7ff2
    </MessageID>
    <RelatesTo xmlns="http://www.w3.org/2005/08/addressing">
      uuid:f6b3829a-9141-4090-9a4a-1e581ffec00a
    </RelatesTo>
  </S:Header>
  <S:Body>
    <ccd:response xmlns:ccd="urn:hiec:v1">
      <ccd:Format>
        CDANET4
      </ccd:Format>
      <ccd:Value>
        ABCCDANET4 0133200411...
      </ccd:Value>
    </ccd:response>
  </S:Body>
</S:Envelope>
```

6. Error Handling

Errors encoded in the transaction responses are not detected as error conditions by CCDWS, and are sent back to clients applications with no modifications.

In the event of detected errors, CCDWS will write a non-zero status code back to the output file. To be compatible with CCD, these are limited to the subset of codes that are relevant to web services. As web service

errors may be different than those supported by the CCD code set, a general error code will often be returned with details stored in the log file. For status codes and internal error codes, see the section entitled *Status Codes* and *Internal Error Codes*.

7. Configuration

While starting the CCDWS application, a command line option (*-c <configFile>*) may be provided to identify the location and name of the configuration file. In Windows, if combined with the installation parameter (*-i*) it will store this information in the registry for starting as a service. If run in command line mode, it will use that location upon start up. If no location is provided, it will look for the configuration file at *c:\ccd\ccdws.ini* in the Windows environment.

The CCDWS application must be restarted for any changes in the configuration file to take effect.

7.1. Configuration File Format

The format of the configuration file is similar to a Windows .ini file. There are section names and properties within those sections. Empty lines and lines beginning with ';' or '#' are ignored. However, there are differences from the standard .ini format. These can mainly be summed up as the ability for sections to inherit global properties, or properties from other sections:

Section and name values are insensitive, but the values may not be, depending on the context. For instance, usernames and passwords will typically be case sensitive, while filenames may not be in a Windows environment.

There is a global properties area at the top of the file. This acts as a default for properties read from any section, and is useful for settings that you may wish to use on a global level.

Each section may inherit properties from another section with an *InheritSection* property. This acts much like the global properties area, whereby values are read from that section. As an example, if we have two destination sections [Destination ABC] and [Destination NDC], they may both have the property *InheritSection=Destination Common*. The [Destination Common] section may contain the property *ConnectTimeout=10* meaning that the connection timeout for both of those destinations is set to 10 seconds. These inherited properties may be overridden in the calling section. For instance, a *ConnectTimeout* setting in [Destination ABC] or [Destination NDC] will override that in [Destination Common].

Note that the order of properties in a section is not important, and neither is the order of sections. The one exception is the global properties must appear before any section name.

As the configuration file may contain passwords, it is important that casual users should not have access to it.

7.2. Configuration Reference

Configuration properties and descriptions are shown below. See the section *Sample Configuration File* to view some common configuration properties in context.

The *Global* section is ultimately searched for by all properties as a default. This is not shown in the Sections listing for each property unless it is the only applicable section.

Action

Sections: [Destination X]

Default Value: urn:cda-org:v1:CDANet_REQ

Required: No

Description: The web service requires both an endpoint and an action. The default action need only be changed if the carrier defines a WSDL with different action value.

See Also: Endpoint

Authentication

Sections: [Destination X]

Default Value: None

Required: No

Description: This defines the authentication scheme used by the remote server. Current valid values are 'UsernameTokenDigest', 'UsernameTokenText', and BinarySecurityToken. If no property is defined, no authentication scheme is included in the request. This will only be applicable if WS-Security is enabled.

CACertificateFile

Sections: [Destination X]

Default Value: None

Required: No

Description: Specifies the file name for the certificate authority (CA) certificate, if the SSL/TLS is used in the destination protocol (i.e. if the destination URL begins with https://). If an absolute path is not given, the file will be found relative to the destination directory. If this option is not provided, the operating system's certificate store (or Linux and OS X CAKeystoreFile) will be searched using the values of CACertificateName and CARootCertificateName. The contents of CACertificateFile are expected to be in PEM format.

See Also: CertificateFile, CertificateKeyPassword, SSLVerify, CACertificateName, RootCACertificateName.

CACertificateName

Sections: [Destination X]

Default Value: CanDentAssocCA or CanDentAssocTestCA

Required: No

Description: Specifies the name of the certificate authority certificate used to generate the client certificate(s) stored in the certificate store. The default value depends on the certificate that may have been automatically retrieved from the certificate store based on the input message. This will be overridden if the value of *CACertificateFile* is provided. There may also be a root certificate authority certificate in the store that is used to generate this one. This value is ignored if *SSLVerify* is disabled.

See Also: RootCACertificateName, CACertificateFile, CertificateKeyPassword, CAKeystoreFile, KeystorePassword, SSLVerify

CAKeystoreFile

Sections: [Main]

Default Value: cacerts

Required: Yes, for Linux and OS X

Description: For Linux and OS X installations, specifies the name of the Java keystore file containing trusted certificate authority certificates. If no path is given, it is expected to reside in the *RootDir* directory.

See Also: KeystoreFile

CertificateFile

Sections: [Destination X]

Default Value: None

Required: No

Description: Specifies the file name for the client certificate/key pair, if SSL/TLS is used in the

destination protocol (i.e. if the destination URL begins with https://). This may not be required if client authentication is not used, or if certificates are located in the operating system's certificate store. If an absolute path is not given, the file will be found relative to the destination directory. If the key component of the certificate/key pair is password protected, then the CertificateKeyPassword property is used to decrypt it. Otherwise, ensure that the file is stored in a secure directory. Note that if this option is provided, it will override the location of certificates in the certificate store using ProviderOidPrefix and OfficeOidPrefix. The contents of CertificateFile are expected to be in PEM format.

See Also: CACertificateFile, CACertificateName, RootCACertificateName, CertificateKeyPassword, ProviderOidPrefix, OfficeOidPrefix, KeyStoreFile, CAKeystoreFile

CertificateKeyPassword

Sections: [Destination X]

Default Value: None

Required: No

Description: Specifies the password of the key contained in the client certificate/key pair, if the SSL/TLS is used in the destination protocol (i.e. if the destination URL begins with https://). This may not be required if client authentication is not used. If the key is not password protected, then this property is not required. If it is required, ensure that casual users cannot view the configuration file.

See Also: CACertificateFile, CertificateFile, SSLVerify

ConnectTimeout

Sections: [Destination X]

Default Value: 10

Required: No

Description: This property can be set to the number of seconds that a connection attempt will wait before a failure is detected.

See Also: ReadWriteTimeout

CrlAltDistributionPoint

Sections: [Main], [Destination X]

Default Value:

Environment	Distribution Point
Windows XP Test	http://www.candentassocca.ca/1/CanDentAssocTestCA.crl
Windows XP Production	http:// www.candentassocca.ca /1/CanDentAssocCA.crl
Non-XP Windows Test	http://www.candentassocca.ca/CanDentAssocTestCA.crl
Non-XP Windows Production	http://www.candentassocca.ca /CanDentAssocCA.crl

Required: No

Description: This property can be set override the default alternative distribution point for downloading a new CRL (certificate revocation list) if the CrlDistributionPoint location fails. The default value depends on the certificate that may have been automatically retrieved from the certificate store based on the input message. If SslVerify is set to 0, the CRL will not be downloaded, nor used. If CrlDistributionPoint and CrlAltDistributionPoint are set to empty values then normal SSL verification will occur, but a CRL will not be downloaded or used.

See Also: CrlDistributionPoint, CrlRefreshDelay, SslVerify

CrlDistributionPoint

Sections: [Main], [Destination X]

Default Value:

Environment	Distribution Point
-------------	--------------------

Windows XP Test	http://ca.cda-adc.ca/CanDentAssocTestCA.crl
Windows XP Production	http://ca.cda-adc.ca/CanDentAssocCA.crl
Non-Windows XP Test	http://ca.cda-adc.ca/256/CanDentAssocTestCA.crl
Non-Windows XP Production	http://ca.cda-adc.ca/256/CanDentAssocCA.crl

Required: No

Description: This property can be set to override the default distribution point for downloading a new CRL (certificate revocation list). The default value depends on the certificate that may have been automatically retrieved from the certificate store based on the input message. If *SslVerify* is set to 0, the CRL will not be downloaded, nor used. If *CrlDistributionPoint* and *CrlAltDistributionPoint* are set to empty values then normal SSL verification will occur, but a CRL will not be downloaded or used.

See Also: *CrlAltDistributionPoint*, *CrlRefreshDelay*, *SslVerify*

CrlRefreshDelay

Sections: [Main]

Default Value: 86400

Required: No

Description: This property can be set to override the default time for downloading a new CRL (certificate revocation list). When the number of seconds between the current time and the last modification time of the CRL stored in the file system exceeds this value, a new one is downloaded during the subsequent transaction. A value of 0 will disable the refresh delay and use only the values of the CRL's *nextCRLPublish* and *nextUpdate* properties. Note that these properties will also be used even when *CrlRefreshDelay* is nonzero, so that either the refresh delay or the CRL properties may trigger an update. The default value is equivalent to one day. If *SslVerify* is set to 0, the CRL will not be downloaded, nor used.

See Also: *CrlDistributionPoint*, *SslVerify*

DetectParseErrors

Sections: [Main], [Destination X]

Default Value: 0

Required: No

Description: CDAnet inputs are parsed to retrieve field values. If this option is set to 1, CCDWS will perform standard validation of the message. If it fails, then it will display details in the log file, as well as setting the output status to 1034 (Request Invalid). CDAnet critical parse failures will still cause a failure and output status of 1034, regardless of the configuration value. Note that payload types other than CDAnet will ignore this option.

EncryptCertificateFile

Sections: [Destination X]

Default Value: None

Required: No

Description: Specifies the name of the certificate file containing the public certificate used to encrypt a message. For either *EncryptMessageBody* or *EncryptMessageParts* to function, *EncryptCertificateFile* must refer to a valid public certificate file. Additionally WS-Security must also be enabled.

See Also: *EncryptMessageParts*, *EncryptMessageBody*, WS-Security

EncryptMessageBody

Sections: [Destination X]

Default Value: 0

Required: No

Description: If EncryptionCertificateFile is configured properly, and WS-Security is enabled, setting this to nonzero will cause the entire message body to be encrypted. Use EncryptMessageParts if the content of specific nodes is to be encrypted.

See Also: EncryptionCertificateFile, WS-Security, EncryptMessageParts

EncryptMessageParts

Sections: [Destination X]

Default Value: None

Required: No

Description: If EncryptionCertificateFile is configured properly, and WS-Security is enabled, setting EncryptMessageParts to a comma separated list of nodes (with associated namespaces) will cause those nodes to be encrypted. For example, "ccd:CDAnet_REQ" will cause the contents of that node to be encrypted. To encrypt the entire body, use EncryptMessageBody.

See Also: EncryptionCertificateFile, WS-Security, EncryptMessageBody.

Endpoint

Sections: [Destination X]

Default Value: None

Required: Yes

Description: The web service requires both an endpoint and an action. The endpoint is specified as a URL (protocol://address/path).

See Also: Action

FaultToAddress

Sections: [Destination X]

Default Value: None

Required: No

Description: If WS-Addressing is enabled, FaultToAddress provides an option to indicate where fault messages should be delivered. This is only necessary if the carrier requires it.

See Also: WS-Addressing, FromAddress, ReplyToAddress

Foreground

Sections: [Main]

Default Value: 0

Required: No

Description: By default, if CCDWS is executed as a Windows application, it will operate in the background by closing its console. If set to 1, it will not close the console. Setting to foreground is useful for testing, when setting LogFile=stdout or LogFile=stderr. This setting has no effect when executed from a user console, or as a service.

FromAddress

Sections: [Destination X]

Default Value: None

Required: No

Description: If WS-Addressing is enabled, FromAddress provides an option to indicate who the message is from. This is only necessary if the carrier requires it.

See Also: WS-Addressing, ReplyToAddress, FaultToAddress

InheritSection

Sections: All

Default Value: None

Required: No

Description: Any section can use this property to define another section to inherit properties from. Properties defined in both the calling section and the inherited section take the value of the calling section (i.e. the specific section value overrides the inherited value). Defining an InheritSection property allows multiple sections to use the same set of property values.

InputFilename

Sections: [Main]

Default Value: input

Required: No

Description: Specifies the base part of the input filename that will be searched for within the destination directories.

See Also: OutputFilename

LogBackupExtension

Sections: [Main]

Default Value: .bak

Required: No

Description: Specifies the backup extension to be appended to the log file name when the maximum size of the log file has been reached and it begins a new log file. This option will only be used if the LogMaxSize option is greater than 0 (zero).

See Also: LogMaxSize

KeystoreFile

Sections: [Main]

Default Value: providerkeys

Required: Yes, for Linux and OS X

Description: For Linux and OS X installations, specifies the name of the Java keystore file containing provider certificate/key pairs. If no path is given, it is expected to reside in the *RootDir* directory.

See Also: CAKeystoreFile, KeystorePassword

KeystorePassword

Sections: [Main]

Default Value: (exists but not shown here)

Required: Yes, for Linux and OS X

Description: Specifies the password of the Java keystore file containing practitioner certificate/key pairs, and defined by the *KeyStoreFile* option. Additionally, it is the password for all private keys within the file.

See Also: CAKeystoreFile, KeystoreFile

LogDir

Sections: [Main]

Default Value: value of RootDir

Required: No

Description: Specifies the directory where log files are stored.

See Also: LogFile, LogLevel

LogFile

Sections: [Main]

Default Value: None

Required: Yes

Description: The main execution thread and all listening threads write to their own structured log files, with the degree of detail defined by the LogLevel property. If an absolute path is not given, the file will be found relative to the destination directory. Special filenames *stdout* and *stderr* are interpreted to write the file directly to those file descriptors. In a console environment it is easiest to define this property as *stdout* in the global section and not define (or comment out) the properties in the [Main] section. Special substitution variables may also be used:

%Y = century and year

%M = month with leading zero

%D = day of month with leading zero

%h = hour of day with leading zero

%m = minute with leading zero

%s = second with leading zero

If any of these variables changes while log messages are written, the current logfile is closed, and a new one opened with the appropriate new name prior to writing the message.

See Also: LogDir, LogLevel

LogLevel

Sections: [Main]

Default Value: 4

Required: No

Description: Specifies the level of detail written to the structured log file. Valid values are: 0 (Off), 1 (Critical), 2 (Errors), 3 (Warnings), 4 (Terse), 5 (Verbose), and 6 (Debug). Each level includes levels below it.

See Also: LogDir, LogFile

LogMaxSize

Sections: [Main]

Default Value: 512000

Required: No

Description: Specifies the maximum size of the log file before it will be moved to a backup, so that a new one will begin. If set to 0 (zero), then no maximum size is used. The backup file name will be that of original log file, with a backup extension. This will be .bak by default, and can be controlled by the LogBackupExtension option.

See Also: LogBackupExtension

MaxRetries

Sections: [Main], [Destination X]

Default Value: 1

Required: No

Description: Specifies the maximum number of times CCDWS will attempt to automatically resend a SOAP request. Values configured in Destination sections will override that stored in the Main section of the configuration file. Note that retries will only be attempted for HTTP errors (except 401 and 403, SOAP faults with the actor defined as "Server," read timeouts, or connection failures. Faults returned from the server with the actor defined as "Client" will not be retried.

OfficeOidPrefix

Sections: [Destination X]

Default Value: 2.16.840.1.113883.3.20.2

Required: No

Description: If set, the default Office OID prefix will be substituted with the new value. This is used in

matching the client SSL/TLS certificate in the operating system's certificate store with the value *<OfficeOidPrefix>.<Office ID>*, where the value of *<Office ID>* is extracted from field B02 of the request message. In addition, the value of *ProviderOidPrefix* behaves in the same way with the Provider ID from field B01 of the request message. Both of these must be satisfied to match the certificate. Note that setting the value of *CertificateFile* will override this matching process and instead use the .PEM formatted file specified.

See Also: *OfficeOidPrefix*, *CertificateFile*, *CaCertificateFile*

OutputFilename

Sections: [Main]

Default Value: output

Required: No

Description: Specifies the base part of the output filename that will be generated in response to an input request.

See Also: *InputFilename*

PayloadType

Sections: [Destination X], [Main]

Default Value: CDANET

Required: No

Description: Currently, CDANET is the only payload type that is handled specially, where the input message is parsed and validated, along with other minor features. Other values are supported, but provide no special handling. A *PayloadType* value provided in the destination section will override the value in the main section. The *Format* node of the resulting SOAP request message will contain this value uppercased. Additionally, for CDANET, it will also automatically append the version number to the *Format* node.

Prefix

Sections: [Destination X]

Default Value: None

Required: No

Description: This option is specific to CDANet inputs, for backward compatibility with CCD. If defined, it will overwrite the transaction prefix (A01) field with its value. A special macro %V can be used to substitute the version number of the current input. For example, if the value is CDANET%V, then the prefix will be replaced with CDANET4 for version 4 inputs, and CDANET2 for version 2 inputs. To submit %V without macro substitution, use %%V.

ProviderOidPrefix

Sections: [Destination X]

Default Value: 2.16.840.1.113883.3.20.1

Required: No

Description: If set, the default Provider OID prefix will be substituted with the new value. This is used in matching the client SSL/TLS certificate in the operating system's certificate store with the value *<ProviderOidPrefix>.<Provider ID>*, where the value of *<Provider ID>* is extracted from field B01 of the request message. In addition, the value of *OfficeOidPrefix* behaves in the same way with the office ID from field B02 of the request message. Both of these must be satisfied to match the certificate. Note that setting the value of *CertificateFile* will override this matching process and instead use the .PEM formatted file specified.

See Also: *OfficeOidPrefix*, *CertificateFile*, *CaCertificateFile*

ProxyServer

Sections: [Main]

Default Value: None

Required: No

Description: If set, then the server will be accessed through the given proxy address or hostname. Additionally, the ProxyPort option is then required.

See Also: ProxyPort

ProxyPort

Sections: [Main]

Default Value: None

Required: No, unless ProxyServer is defined

Description: If set, then the server will be accessed through the given proxy server address or hostname and port number. If ProxyServer is not defined, then this property is ignored.

See Also: ProxyServer

ReadWriteTimeout

Sections: [Destination X]

Default Value: 60

Required: No

Description: Defines the maximum number of seconds to successfully read from or write to the remote client or to the server. Normally, 60 seconds will be more than ample. If the read or write fails, then an error condition arises and reported in the log file (if LogLevel is set to at least 1), and the session is terminated.

See Also: ConnectTimeout

ReplyToAddress

Sections: [Destination X]

Default Value: None

Required: No

Description: If WS-Addressing is enabled, ReplyAddress provides an option to indicate the address to which the response should be delivered. This is only necessary if the carrier requires it.

See Also: WS-Addressing, FromAddress, FaultToAddress

RootCACertificateName

Sections: [Client X], [Destination X]

Default Value: CanDentAssocROOTCA

Required: No

Description: Specifies the name of the root certificate authority certificate used to sign the CA certificate that generated the client certificate(s) stored in the certificate store. This will be overridden if the value of CACertificateFile is provided. This value is ignored if SSLVerify is disabled.

See Also: CACertificateName, CACertificateFile, CertificateKeyPassword, KeyStoreFile, KeyStorePassword, SSLVerify

RootDir

Sections: [Main]

Default Value: current working directory of service

Required: No

Description: Specifies the root directory, which should contain the *ccdws.exe* executable, *ccdws.ini* configuration file, and related support files. All destination folders should be subdirectories of this.

See Also: LogDir

SignMessageBody

Sections: [Destination X]

Default Value: 0

Required: No

Description: Setting SignMessageBody to a non-zero value will cause the message body to be signed as part of the WS-Security extension. To sign the entire message, use SignMessageParts instead. Note that WS-Security must be enabled for this option to be used.

See Also: WS-Security, SignMessageParts

SignMessageParts

Sections: [Destination X]

Default Value: None

Required: No

Description: Setting SignMessageParts to a comma separated list of nodes (with associated namespaces) will cause those nodes to be signed. For example, "ccd:CDAnet_REQ, wsa5:To, wsa5:Action" will cause those three nodes to be signed. If EncryptMessageParts is also set to a list of nodes, then the full set of nodes will be signed. To sign just the message body, use SignMessageBody instead. Note that WS-Security must be enabled for this option to be used.

See Also: WS-Security, SignMessageBody, EncryptMessageParts

SSLVerify

Sections: [Destination X]

Default Value: 1

Required: No

Description: By default, if SSL/TLS encryption is used, CCDWS will verify both the local certificate/key pair and the remote server certificate. The verification may be bypassed by setting SSLVerify to 0. It is recommended that this be done only as a temporary workaround, as it reduces the security of the connection.

See Also: CACertificateFile, CertificateFile, CertificateKeyPassword, CRLDistributionPoint, CRLAltDistributionPoint, CRLRefreshDelay

WS-Addressing

Sections: [Destination X]

Default Value: 0

Required: No

Description: Setting WS-Addressing to a non-zero value will enable this web service extension. It will also allow additional WS-Addressing options (FromAddress, ReplyToAddress, FaultToAddress) to be configured.

See Also: WS-Security, FromAddress, ReplyToAddress, FaultToAddress

WS-Security

Sections: [Destination X]

Default Value: 0

Required: No

Description: Setting WS-Security to a non-zero value will enable this web service extension. It will also allow additional WS-Security options (Authentication, SignMessage, SignMessageBody) to be configured.

See Also: WS-Addressing, Authentication, SignMessage, SignMessageBody

7.3. Sample Configuration File

The following *ccdws.ini* configuration file sample shows some common properties in context, along with descriptive comments. Note that all other properties not included will be used with their default values.

```
# =====
#
# Configuration File - Common Communications Driver for Web Services
#
# Configuration filename: ccdws.ini
# Description: Configuration file for CCDWS.
# Created by: Harder Software Ltd.
# Creation Date: 2014-12-01
#
# =====

# -----
# Main controller section, containing options for the application
# -----
[Main]

# Levels: 0=off,1=critical,2=error,3=warning,4=terse,5=verbose,6=debug
LogLevel=5

# Base name for input file and output filenames. If CCD is installed, then
# its values will be used. Otherwise the defaults input and output will be
# used.
InputFileName=input
OutputFileName=output

# Uncomment the following line to run in the foreground when executing CCDWS
# as a Windows application. This has no affect when run as a service,
# nor when launched from a user command prompt.
# Foreground=1

# -----
# Common destination section. Each destination section inherits from this,
# but can override in its own section if necessary.
# -----
[Destination Common]

# default time to wait for a successful send or receive. Default of 60 should
# be sufficient.
ReadWriteTimeout=60

# default time to wait for a connection to the remote server. Default of 10
# should be sufficient.
ConnectTimeout=10

# -----
# Alberta Blue Cross
# -----
[Destination ABC]

# Inherit default values from the given section.
InheritSection=Destination Common

# Value to be overwritten on all transaction prefix (A01) fields, if set.
Prefix=ABCCDANET4

# uncomment the following for testing
Endpoint=https://vendor.claimstream.ca:3542/DWST/HIECService

# uncomment the following line for production
# Endpoint=https://abc.claimstream.ca:3522/DWS/HIECService
```

```

# -----
# TELUS Group A
# -----
[Destination TELUSA]

# Inherit default values from the given section.
InheritSection=Destination Common

# Value to be overwritten on all transaction prefix (A01) fields, if set.
Prefix=@

# uncomment the following line for staging
# Endpoint=https://cesdental.uat.telushealth.com/dental/HIEC_vs1

# uncomment the following line for production
Endpoint=https://cesdental.telushealth.com/dental/HIEC_vs1

# -----
# TELUS Group B
# -----
[Destination TELUSB]

# Inherit default values from the given section.
InheritSection=Destination Common

# Value to be overwritten on all transaction prefix (A01) fields, if set.
Prefix=HD*

# uncomment the following line for staging
# Endpoint=https://cesdental.uat.telushealth.com/dental/HIEC_vs1

# uncomment the following line for production
Endpoint=https://cesdental.telushealth.com/dental/HIEC_vs1

```

8. Automated Installation Instructions

These instructions assume that CCDWS will be installed in Windows.

See the section entitled *Manual Installation Instructions* for information on installing CCDWS manually.

8.1. Before Installation

Before installing CCDWS, ensure that any existing CCD or CCDWS run-time environment is known, such as the installation directory (typically c:\ccd). Locations are provided in the *Run-Time Environment* section. The CDAnet certificate locations must also be known. Specifically, note whether they are installed just for the user or whether they were installed at the machine level (making them available to all users).

You will need to have administrative privileges to install CCDWS as a service, so either login as Administrator, or as a user that has these privileges.

Be certain that you have access to the newer certificates distributed by the Canadian Dental Association. For those that DO NOT have these certificates and are installing CCDWS for the first time then it will be important to first install a version of CCDWS prior to 1.0 to obtain the appropriate configuration. Once that is installed, it will be possible to simply update to version 1.0 or greater.

You can find older versions at http://www.hardersoft.com/web_updates/ccdws/old_versions. The latest version prior to 1.0 is 0.9.6.9.

The latest version will be found at http://www.hardersoft.com/web_updates/ccdws.

8.2. Installing CDA Certificates to the Certificate Store

From version 1.0 onward, CCDWS supports the storage and retrieval of both client and certificate authority certificates within the operating system's certificate store.

The Canadian Dental Association provides a special installation application to install its certificates.

In Windows, if CCDWS is installed as a service, it will find certificates that are installed under the local computer context. However, CDA prefers that they be installed under a user account context so they are not available to all users. If this is done, then either the CCDWS must be run as an application under a user that has the certificates installed, or if it is installed as a service, then the service must be configured to log on as a user that has the certificates installed.

Installation and access of certificates in a computer's certificate store is an area that may be prone to configuration issues. If the certificates cannot be found, then there will be connection issues.

8.3. Removing old Installations of CCDWS

As of CCDWS version 1.0, CDAnet certificates are installed into the operating system's certificate store. If an older version is installed, then it must first be uninstalled, or the configuration file will not contain the correct information. You can uninstall it either as an option from the setup application, or from the CCDWS application section of the Windows Start menu.

Note that if you inadvertently uninstall CCDWS, and need to recover the configuration file, it should be found in the installation directory with the filename ccdws.ini.save. It can be copied to ccdws.ini to retain the old configuration.

8.4. Running the Setup Program

The CCDWS setup program is distributed as an executable file. Save it in any accessible location and execute it.

8.5. Accepting the EULA and Reading Installation Notes

When installing for the first time, you will be required to review and accept the End User License Agreement (EULA) before continuing. Once accepted, recent installation notes will be displayed. Please read these notes carefully before continuing.

8.6. Setup Type

When the Setup Type dialog box is displayed, the recommended selection is *Complete*. This will install the CCDWS service and all supported destinations.

Selecting *Compact* will install only the latest CCDWS service. If destinations have previously been installed they will be removed, and their sections in the configuration file will be disabled (not removed).

Selecting *Custom* will allow customized selection of the CCDWS service and all destinations as separate components. At a minimum, for any functionality, the CCDWS service and at least one destination should be installed.

8.7. Destination Folder

The default location for installation of CCDWS is c:\ccd, which is the default for the CCD application, and normally the recommended location for CCDWS. Note that if CCD is installed in another location, change the CCDWS location to match it.

8.8. Service Account

Installation of version 1.0 and above will request the name of a service account. Versions prior to this will not.

The CCDWS service must be able to find the certificates it uses for communicating with the remote carriers. If certificates are installed under a user account (this would typically be that of the user performing the installation), then enter the user account with optional preceding Windows domain, and the account password. If certificates are stored under the machine account, then leave the account information blank and it will use the local service account.

8.9. Actions Performed on Installation

During the installation, the appropriate folders will be created, with most necessary files stored in the destination subfolders. The *ccdws.exe* executable and *ccdws.ini* configuration file will be stored in the destination folder.

If a CCD installation already exists, then the installation program will first detect whether CCD is running, and force it to be shut down.

If the CCD configuration file *ccd.ini* contains any network configurations that match those of the supported CCDWS destinations, these will be disabled (but not removed). Note that if CCDWS is uninstalled or a destination is removed, network configurations in *ccd.ini* will be re-enabled.

The CCDWS configuration will extract what it can from *ccd.ini*. For instance, it will use the input and output filename conventions.

8.10. Configuration File Review and Edit

Some things cannot be reliably determined from the existing *ccd.ini* configuration file. Additionally, this may not exist if CCD is not already installed.

Just prior to completion of the installation, and before the CCDWS service is started, a dialog box will display, asking whether to review or edit the configuration file. Select *Yes* to do so if necessary.

One example of a necessary change to the configuration file is if vendor-specific customizations must be made, such as unique certificate file names, or special CDAnet prefix. This document cannot provide details on the changes that must be made.

8.11. Completion and Starting the CCDWS Service

The final dialog box will contain a checkbox entitled *Run CCDWS now*. This will cause the service to start. In most cases this should remain checked.

8.12. Additional Tasks Upon Successful Installation

If a running instance of CCD was terminated during the installation, then it will need to be restarted.

If vendor or other client-specific certificates are required for any destinations have not been installed into the operating system's certificate store, then they will need to be installed to successfully complete any transactions. Note that the CCDWS service will not need to be restarted if this step is performed after its installation. It will only need to be restarted if the configuration file is subsequently changed.

9. Manual Installation Instructions

These instructions assume that CCDWS will be installed in Windows, and that the default file locations are used.

See the section entitled *Automated Installation Instructions* for information on installing CCDWS with a special setup application.

9.1. Before Installation

Before installing CCDWS, ensure that any existing CCD or CCDWS run-time environment is known, such as the installation directory (typically c:\ccd in Windows). Locations are provided in the *Run-Time Environment* section.

In Windows, you will need to have administrative privileges to install CCDWS as a service, so either login as Administrator, or as a user that has these privileges. In Linux and OS X, you must have appropriate read, write, and execute privileges in the CCDWS and related directories.

Be certain that you have access to the newer certificates distributed by the Canadian Dental Association.

For those installation in Windows that DO NOT have these certificates (i.e. are using the old vendor certificates) and are installing CCDWS for the first time then it will be important to first install a version of CCDWS prior to 1.0 to obtain the appropriate configuration. Once that is installed, it will be possible to simply update to version 1.0 or greater.

You can find older versions at http://www.hardersoft.com/web_updates/ccdws/old_versions. The latest version prior to 1.0 is 0.9.6.9.

The latest version will be found at http://www.hardersoft.com/web_updates/ccdws.

9.2. Extracting Files

If an existing CCDWS service instance is running, ensure that it's stopped, as per the section entitled *Controlling the CCDWS Service*.

The provided "zip" file will contain the latest application and configuration files in the appropriate directories for installation. Assuming the CCDWS home directory is c:\ccd, and the zip file is named ccdws_1001.zip, copy the zip file into a temporary location, and open it within Windows Explorer or the Mac Finder. You should see a single directory *ccd* within that archive. Drag this with your mouse to drive C in Windows, or the appropriate installation directory in Linux and OS X.

If files already exist, you may be prompted to replace them. It is best to back up the existing directory before doing so.

9.3. Installing CDA Certificates to the Certificate Store

From version 1.0 onward, CCDWS supports the storage and retrieval of both client and certificate authority certificates within the operating system's certificate store.

The Canadian Dental Association provides a special installation application to install its certificates.

In Windows, if CCDWS is installed as a service, it will find certificates that are installed under the local computer context. However, CDA prefers that they be installed under a user account context so they are not available to all users. If this is done, then either the CCDWS must be run as an application under a user that has the certificates installed, or if it is installed as a service, then the service must be configured to log on as a user that has the certificates installed.

In Linux and OS X, a *providerkeys* file and *cacerts* file are created in the current working directory if they do not exist. If they do exist, ensure that they are placed in the currently working directory prior to running the installation application. The two files generated can either be placed in the CCDWS root directory or in some other location if specified in the configuration file.

Installation and access of certificates in a computer's certificate store is an area that may be prone to

configuration issues. If the certificates cannot be found, then there will be connection issues.

9.4. Copying Certificate Files to the File System

Note that this section is included for backward compatibility with sites that provided vendor certificate files. CCDWS from version 1.0 onward now supports individual certificates for each provider and office, and common CA certificates.

Previously, each destination administrator should have provided a CA certificate file and (optionally) a certificate/key pair. They were to be copied to the appropriate location. For instance, if Alberta Blue Cross certificates were available, they were to be copied to directory *c:\ccd\abc*. The destination CA certificate may already have been installed there as part of the extraction process. All CA certificates and certificate/key pairs should have *.pem* extensions.

9.5. Updating the CCDWS Configuration File

The base configuration file provided will be called *ccdws_default.ini*. This prevents it from overwriting any customized configuration you may already have, such as proxy information, etc.

If this is the first installation, then copy *ccdws_default.ini* to *ccdws.ini*. Otherwise, you should do a manual comparison and merge any changes to the existing *ccdws.ini* file. Use a text editor such as Notepad to perform these changes.

For each destination XYZ, ensure a section called [*Destination XYZ*] exists. For instance, ensure that the section [*Destination ABC*] exists if the ABC (Alberta Blue Cross) subdirectory exists, or [*Destination TELUSA*] exists if the TELUSA (TELUS) subdirectory exists. The destination section name is case insensitive. You can find contents for these sections in the *ccd* subdirectories (i.e. *abc*, *telus*).

9.6. Updating the Existing CCD Configuration File

If the CCD application is already installed and is configured to submit claims to the same destination, its configuration file will need to be altered so that it does not attempt to send claims to the same destination as CCDWS. Use a text editor such as Notepad to view and alter the file *c:\ccd.ini*.

If a section entitled [*XYZ*] exists in the *ccd.ini*, change the section name. The automated installation application will change the name to [*XYZ_DISABLED*].

If the CCD configuration file is an older style, it may contain a line such as *network XYZ*, followed by a line containing the word *begin*. In this case, change the line *network XYZ* to some alternative name. The automated installation application will change this to *network XYZ_DISABLED*.

Restart CCD when this has been completed.

9.7. Confirming CCDWS Operation

Once everything is properly configured, it should be confirmed that the CCDWS can run within the operating environment. To do so, open up a command prompt, and enter the following commands:

```
cd c:\ccd
ccdws -v
```

The output from the second command should look something like the following (with expected differences in version and creation date:

9.8. Installing the CCDWS Service

In Windows, if this is the first time that CCDWS is being installed, it must also be installed as a Windows Service. If it has been installed as a service previously, then this step need not be performed.

To install as a service, open a Windows command prompt, and enter the following commands, each following by the enter key:

```
cd c:\ccd  
ccdws -i
```

The output from the second command should look the following:

```
CCDWS service installed.
```

This will install the service, but it will not yet be running. To start and control the service, see the following section entitled *Controlling the CCDWS Service*.

In Linux and OS X, CCDWS can be run as a service, as these are simply command-line applications. Typically this is done with a special service control script. This is not yet included with CCDWS.

10. Controlling the CCDWS Service

CCDWS will be normally run as a service, so that it will start automatically when the operating system starts, and stop when the operating system is shut down. When it is first installed it will not yet be running until it is either started manually, or the operating system is restarted.

These instructions are specific to Windows. Note that the user that controls CCDWS should have Administrative control of the host, or control of service startup and shutdown.

10.1. GUI Control

In the Windows environment, CCDWS execution is controlled through the Windows Services. To access the services dialog box, from the Start menu, go to Control Panel -> Administrative Tools -> Services. The CCDWS service can be found by scrolling through the service names.

The service is controlled by right clicking on the CCDWS service name, and selecting *Start* or *Stop*. To control whether the service start automatically at runtime, select *Properties* and change the *Startup type*. Setting to Manual causes the service to only start manually. Setting to Automatic will cause it to start when Windows starts. Manual control of the service is also possible from this dialog, using the *Start* and *Stop* buttons. *Pause* and *Resume* are not enabled.

10.2. Command Line Control

Windows also has a command line tool for controlling services, called *sc*. This may be executed from a host other than the one where CCDWS is installed. If so, then supply the hostname preceded by two backslashes (e.g. \\hostname). In the following examples, replace [hostname] with the correct hostname in the format given. Otherwise, leave the argument out of the command.

To check the status of the service, enter the following:

```
sc [hostname] interrogate ccdws
```

To start the service, enter the following:

```
sc [hostname] start ccdws
```

To stop the service, enter the following:

```
sc [hostname] stop ccdws
```

In Linux and OS X, control of the service is dependent on the script used. This is not currently provided with CCDWS.

11. Executing CCDWS from the Command Line

Although CCDWS will be normally run as a service, it can be executed from the command line. This is useful mainly for troubleshooting. To do so in Windows, open a command prompt and enter the following commands (assuming CCDWS is installed in the default location):

```
cd c:\ccd  
ccdws
```

In Linux and OS X, the location will be wherever CCDWS is installed. For instance:

```
cd /usr/local/sbin  
./ccdws
```

In Windows, the application will continue to run in the foreground until the command prompt is closed, or *Ctrl-C* is pressed. In Linux and OS X, it will immediately run in the background with no log messages sent to the screen unless the *ForegroundMode* configuration option is set.

From the command line it is possible to display log information directly to the console, which is very useful when debugging. To do this, set the *LogFile* configuration value to either *stdout* or *stderr*. The *LogLevel* value should be set to see the desired level of information.

12. Log Files

CCDWS writes to log files to record information relating to connections, hex dumps of messages sent and received, warnings, errors, and debugging information. The amount of detail included is determined by the log level that is configured.

12.1. Log File Format

Format of the log files is quite structured, with the following features:

- ❑ Each time CCDWS is started, a header is written to the log indicating the application name and version. The time the log opened is also recorded.
- ❑ Each time CCDWS is stopped, a footer is written indicating the time the log was closed.
- ❑ Every entry is preceded by a timestamp in the form YYYY-MM-DD HH:MM:SS>.
- ❑ Verbose and Debug levels show multi-line message contents as hexadecimal dumps.

12.2. Configuring Log Filenames and Levels

The configuration setting *LogDir* should be set to the location where all of the log files will reside. This defaults

to the *RootDir* directory (c:\ccd in Windows).

If the *LogFile* configuration value is a simple filename or relative path then that will be appended to the *LogDir* value for a complete path. If the value begins with a slash or backslash (i.e. '/' or '\') or with a drive letter, then it is considered an absolute path and the *LogDir* value is not prepended to it. Additionally, if the *LogFile* value is *stdout* or *stderr*, then the *LogDir* value is ignored and the log file will be written to either the stdout or stderr file handle. Note that the latter case will only work when CCDWS is executed from the command line mode. The default value for *LogFile* is *ccdws.log*.

The amount of information stored in the log is configurable. See the *LogLevel* property in the *Configuration Reference*.

Note that each level also records lower level messages. For example, the Terse level (4) also records Critical (1), Error (2) and Warning (3) messages.

0 – Off: No messages at all are recorded.

1 – Critical: Errors causing the application to fail

2 – Errors: Only error messages are recorded.

3 – Warnings: Non-critical warning messages are recorded. It is good practice to repair the source of warnings when these messages appear.

4 – Terse: Small amount of information recorded.

5 – Verbose: Additional informational messages, plus hexadecimal dumps of request and response messages. Use this level to record full transaction information.

6 – Debug: Internal method calls and contents of variables are recorded. This level should only be used during development or when troubleshooting problems.

NOTE: While CCDWS supports these levels, there are currently no Critical messages defined.

12.3. Log File Rotation

Log files can be automatically rotated by using any of the substitution variables as defined in the *LogFile* property of the *Configuration Reference* section. For instance, %Y%M%D embedded in the name will cause the filename to change daily, assuming messages are written to the log.

Alternatively, the *LogMaxSize* property in the configuration file can be used to limit the size of log files. When the log file size passes this size, it is moved to a backup file with the extension given by *LogBackupExtension* (the default is *.bak*), and the original file is truncated. The default value for *LogMaxSize* is 512000 (500 KB).

If *LogMaxSize* is set to 0 (i.e. disabled) and substitution variables not used in *LogFile*, then the log file should be watched and either rotated manually or with a separate application. Otherwise, it will continue to grow without bound.

12.4. Sample Log File with Notes

The following log file was generated from a test server with *LogLevel* = 5 (verbose). It has been condensed for clarity. Notes follow the end of the log.

```
=====
CCDWS (beta) version 0.9.0.24
Log opened 2011-10-25 09:08:39
=====
2011-10-25 09:09:10> Found 1 request.
2011-10-25 09:09:10> Read 500 bytes from input file c:\ccd\ABC\input.001.
    000000:  41 42 43 74 65 73 74 20-20 20 20 20 30 30 30 30  ABCtest      0000
```

```

000010: 30 34 30 34 30 31 30 30-30 30 39 30 48 31 20 31 040401000090H1 1
000020: 30 30 35 30 30 20 30 30-30 30 34 35 39 30 31 32 00500 0000459012
000030: 32 34 30 30 34 34 36 39-35 39 30 31 32 32 34 30 2400446959012240
000040: 30 34 34 36 39 20 20 20-20 20 20 20 20 20 30 04469 0
...
0001B0: 30 30 30 30 30 58 20 20-20 20 30 30 32 30 32 31 00000X 002021
0001C0: 31 31 32 30 31 31 31 30-32 34 30 30 20 20 20 20 112011102400
0001D0: 20 30 30 31 33 33 30 20-20 20 20 20 30 30 30 30 001330 0000
0001E0: 30 30 20 20 20 20 20 30-30 30 30 30 30 58 20 20 00 000000X
0001F0: 20 20 30 30 00
2011-10-25 09:09:11> Sending 1367 bytes to destination ABC.
000000: 50 4F 53 54 20 2F 44 57-53 31 2F 43 44 41 6E 65 POST /DWS1/CDAne
000010: 74 53 65 72 76 69 63 65-20 48 54 54 50 2F 31 2E tService HTTP/1.
000020: 31 0D 0A 48 6F 73 74 3A-20 68 69 65 63 2E 61 62 1..Host: hiee.ab
000030: 2E 62 6C 75 65 63 72 6F-73 73 2E 63 61 0D 0A 55 .bluecross.ca..U
000040: 73 65 72 2D 41 67 65 6E-74 3A 20 67 53 4F 41 50 ser-Agent: gSOAP
...
000510: 20 20 20 20 20 30 30 30-30 30 30 58 20 20 20 20 000000X
000520: 30 30 3C 2F 63 63 64 3A-43 44 41 6E 65 74 5F 52 00</ccd:CDAnet_R
000530: 45 51 3E 3C 2F 53 4F 41-50 2D 45 4E 56 3A 42 6F EQ></SOAP-ENV:Bo
000540: 64 79 3E 3C 2F 53 4F 41-50 2D 45 4E 56 3A 45 6E dy></SOAP-ENV:En
000550: 76 65 6C 6F 70 65 3E velope>
2011-10-25 09:09:22> Received 1510 bytes from destination ABC.
000000: 48 54 54 50 2F 31 2E 31-20 32 30 30 20 4F 4B 0D HTTP/1.1 200 OK.
000010: 0A 44 61 74 65 3A 20 54-75 65 2C 20 32 35 20 4F .Date: Tue, 25 O
000020: 63 74 20 32 30 31 31 20-31 36 3A 30 39 3A 31 31 ct 2011 16:09:11
000030: 20 47 4D 54 0D 0A 53 65-72 76 65 72 3A 20 4F 72 GMT..Server: Or
000040: 61 63 6C 65 2D 41 70 70-6C 69 63 61 74 69 6F 6E acle-Application
...
0005A0: 64 65 72 61 74 69 6F 6E-2E 20 20 20 20 20 20 20 deration.
0005B0: 20 20 20 20 20 20 20 20-20 20 20 20 20 20 20 20
0005C0: 20 20 20 20 20 20 20 20-20 20 20 20 20 20 20 20
0005D0: 20 20 20 20 20 20 20 20-20 20 3C 2F 43 44 41 6E </CDAn
0005E0: 65 74 5F 52 45 53 et_RES
2011-10-25 09:09:22> Received 24 bytes from destination ABC.
000000: 50 3E 3C 2F 53 3A 42 6F-64 79 3E 3C 2F 53 3A 45 P></S:Body></S:E
000010: 6E 76 65 6C 6F 70 65 3E nvelope>
2011-10-25 09:09:22> Received 2 bytes from destination ABC.
000000: 0D 0A ..
2011-10-25 09:09:22> Received 5 bytes from destination ABC.
000000: 30 0D 0A 0D 0A 0....
2011-10-25 09:09:22> Wrote 580 bytes to output file c:\ccd\ABC/output.001.
000000: 34 2C 30 2C 30 30 31 2C-41 42 43 74 65 73 74 20 4,0,001,ABCtest
000010: 20 20 20 20 30 30 30 30-30 34 30 34 32 31 30 30 000004042100
000020: 30 30 39 30 30 30 35 37-31 59 35 39 30 31 32 32 009000571Y590122
000030: 34 30 30 34 34 36 39 33-33 33 33 36 39 37 31 20 400446933336971
000040: 20 20 20 20 20 30 30 30-30 30 30 30 30 30 30 000000000000
...
000200: 66 6F 72 20 63 6F 6E 73-69 64 65 72 61 74 69 6F for consideratio
000210: 6E 2E 20 20 20 20 20 20-20 20 20 20 20 20 20 20 n.
000220: 20 20 20 20 20 20 20 20-20 20 20 20 20 20 20 20
000230: 20 20 20 20 20 20 20 20-20 20 20 20 20 20 20 20
000240: 20 20 20 0D .
2011-10-25 09:09:22> Processed 1 transaction: 1 succeeded, 0 failed.
2011-10-25 09:11:53> Signal 2 received.
-----
Log closed 2011-10-25 09:11:53
-----

```

Notes regarding the log:

- ❑ The CCDWS service was started for a single transaction then stopped.
- ❑ A single input was discovered, for the destination ABC. Its filename was input.001.
- ❑ Contents of the messages sent and received are shown in hexadecimal on the left and ASCII on the right.

These are called 'hex dumps'.

- ❑ Because of the large size of XML messages, ellipses (...) are used between the first five and last five lines of each hex dump section.
- ❑ The input request was 500 bytes long. This can be seen both from the given log message, and from the actual hex dump numbers. Note the left side of the last line of the input hex dump is 0x0001F0, indicating the position of the first byte. Following it are three more bytes, so that last byte number is 0x0001F3. It is a zero offset count, so add one more to the bytes position to get 0x0001F4. Translated to decimal, this is 500.
- ❑ The input was translated to a SOAP request message, transported over HTTP. The total size of the transported message was 1367 bytes.
- ❑ CCDWS successfully connected to the endpoint <https://hie.ab.bluecross.ca/DWS1/CDAnetService>, as shown in the HTTP header. The https is not shown as part of the HTTP protocol, but was contained in the actual message's WS-Addressing nodes.
- ❑ A chunked response (1510, 24, 2, 5 bytes) from the server was received, containing the SOAP response.
- ❑ The output file output.001 of size 580 bytes was written to disk. From the first header fields of that file, we can see that the office sequence number was 4, the status was 0 (success), and the file extension was 001. With comma separators these make up a total of 8 bytes, with a since 0xD byte terminator. So, the actual CDAnet response message was $580 - 8 - 1 = 571$ bytes in size.
- ❑ CCDWS determined that this was a success since it received the response, regardless of the status of the actual response, so it indicated that one transaction was processed, one succeeded and none failed.
- ❑ Overall time for the transaction was approx 12 seconds, starting at 09:09:10 and ending at 09:09:22. The majority of this time was waiting for a response, as we can see that the request was sent at 09:09:11, and response was received at 09:09:22. This is a relatively long time

13. Status Codes

CCDWS uses a subset of CCD status codes to populate the output file. Many of the CCD codes do not apply as they are specific to telephony communications. For errors that don't fit within the CCD code set, the default 1001 code will be returned. For error conditions, further error details including internal error codes are recorded in the log file.

Code	Message	Description
0	Success	The request was sent to the remote server and the response was successfully received and stored in the output file.
1001	General error	A general error occurred. Check the log file for details, including internal error
1026	No answer	CCDWS could not connect to the remote server.
1033	Error reading input	The input file could not be read.
1034	Request invalid	The input request does not conform to CDAnet v2, v3, or v4 message standards. See the log file for details.

Code	Message	Description
1042	Server timeout	A timeout occurred either sending the message to the server (write timeout) or receiving a response from the server (read timeout).
1043	Invalid characters	The server responded with unexpected data. This may happen in the server address is incorrect or the server is not correctly configured.
1045	Server disconnect	The server disconnected unexpectedly. This will most frequently occur if a connection was made, but an SSL/TLS error was detected.

14. Internal Error Codes

The following subsections describe errors that may appear in log files, along with descriptions (and possible resolutions where appropriate).

Numbers below 6000 or about 10000 may vary on different operating systems. Here they refer to Windows error values.

Code	Message	Description
2	The system cannot find the file specified.	The specified file does not exist or cannot be found. This message can occur whenever a specified file does not exist
3	The system cannot find the path specified.	The specified directory does not exist, or a component of a path does not specify an existing directory.
4	The system cannot open the file.	No more file descriptors are available, so no more files can be opened.
5	Access is denied.	Application may not have permissions to read, write, or execute one or more files, such as a log file, configuration file etc. Ensure that CCDWS user has rights to all its read and write locations.
8	Not enough storage is available to process this command.	Not enough memory on CCDWS host, or there is a memory leak. Try rebooting workstation. Contact support personnel if the problem persists.
112	There is not enough space on the disk.	Log files and/or temporary files cannot be written because there is no space left on the hard disk. Free up space by deleting old files, check the disk partitions to be certain that it is correctly partitioned, and look into purchasing a larger disk if necessary.
6012	Payload parse error.	Payload contents were not in the expected format. Remote client is sending invalid data.

Code	Message	Description
7001	SOAP: The service returned a client fault.	A fault occurred, and the server has determined it is a problem with CCDWS. Ensure the configuration for the destination is correct.
7002	SOAP: The service returned a server fault.	A fault occurred, and the server has determined it is a problem with the server itself. If the problem continues contact support personnel.
7011	SOAP: Internal error.	Contact support personnel.
7012	SOAP: An exception raised by the service	General SOAP fault. Neither client nor server has been specified. Look for further information in the log file.
7014	SOAP: No data in HTTP message.	An HTTP response was returned but did not contain a body.
7020	SOAP: Out of memory.	Not enough memory on CCDWS to create SOAP objects, or there is a memory leak. If host has sufficient memory ensure other memory intensive applications are not using it up. Try rebooting workstation. Contact support personnel if the problem persists.
7023	SOAP: An element was null while it is not supposed to be null.	The WSDL expects a non-null element, but a null element was found. Contact support personnel.
7028	SOAP: A connection error occurred.	The endpoint is not specified in the configuration file or the destination host is not accepting connections on the expected port. Confirm the endpoint with the destination administrator. Ensure firewall is allowing access to the endpoint.
7030	SOAP: An SSL error occurred.	A general SSL occurred. Details may be displayed a fault message in the log.
7039	SOAP: SOAP version mismatch or no SOAP message.	Check that the endpoint for the destination refers to a webservice destination. HTTP responses that contain data but not a SOAP response will generate this error.
7098	SOAP: Read timeout.	A timeout occurred waiting for a response. Contact support personnel if the problem persists.
7099	SOAP: Server disconnect.	This can occur if the destination server terminated the connection. If the error continues contact support personnel.
7400	HTTP: Bad Request.	The web service appears to be malformed. Check that all of the configuration options for the destination are appropriate.
7401	HTTP: Unauthorized.	The endpoint attempting to be accessed requires authentication. Check that all of the configuration options for the destination are appropriate.
7403	HTTP: Forbidden.	The server has forbidden access to the endpoint

Code	Message	Description
		attempting to be accessed. Check that all of the configuration options for the destination are appropriate.
7404	HTTP: Not Found.	The endpoint's path is not valid. Check that all of the configuration options for the destination are appropriate.
7405	HTTP: Method Not Allowed.	Some servers are poorly configured where the endpoint is a path or is to be redirected. If it is specified with a trailing slash, ensure that this is provided on the endpoint.
7407	HTTP: Proxy Authentication Required.	Ensure that the ProxyPassword configuration option is populated correctly, and that all other proxy related options are valid.
7408	HTTP: Request Timeout.	Problem writing data to the destination host. Try again, and contact support personnel if the problem persists.
7415	HTTP: Unsupported Media Type.	This may be a result of an incompatibility between the SOAP version submitted by CCDWS and that of the destination server. Contact support personnel.
7500	HTTP: Internal Server Error.	An internal error occurred at the destination server. Contact support personnel.
7501	HTTP: Not Implemented.	The destination server does not support the functionality to fulfil the request. Confirm that the destination endpoint is correct. Contact support personnel if the problem persists.
7502	HTTP: Bad Gateway.	The destination server received an invalid response from an upstream server. Contact support personnel if the problem persists.
7503	HTTP: Service Unavailable.	The destination server is unable to handle the request due to temporary overloading or maintenance of the server. Contact support personnel if the problem persists.
7504	HTTP: Gateway Timeout.	The destination server did not receive a timely response from an upstream server. Contact support personnel if the problem persists.
7505	HTTP: HTTP Version not supported.	The SOAP version supported by CCDWS and that of the destination are not compatible. Contact support personnel.

15. Troubleshooting

If problems occur in the operation of CCDWS, it is most useful to increase the value of LogLevel to 6 in the *ccdws.ini* configuration file, and restart the service. Doing so provides the maximum amount of information in the log file. Often it is enough for a vendor or other technical person to review the log and identify the issue. Otherwise, the log file or relevant portions can be sent to support personnel for analysis.

The following table can be used to help troubleshoot common issues that may arise during CCDWS execution:

Status Code	Internal Error Code	Problem	Resolution
1001	5	CCDWS is denied access to write a file. Confirmed by a message in the log file.	This error may be due to permission issues of the CCDWS service. It must be able to write to both its root directory and all of its subdirectories. Check that the appropriate permission is provided. If system policies prevent the local service user from writing to these directories, set the service user as a domain user with the necessary privileges.
1001	7030	SSL handshake error. Confirmed by message in log indicating certificate for provider ID and office could not be found and SSL tcp_connect error.	Check that certificate that matches both the provider and office in the input message is installed in the certificate store, and is accessible by the user CCDWS is operating under.
1001	7030	SSL verify error of remote endpoint. Confirmed by message in log also showing certificate issuer and subject.	Check that CACertificateFile configuration option in ccdws.ini is NOT set if using latest CDA certificates. Check the Endpoint configuration option in ccdws.ini is correct for the destination. Check that CanDentAssocCA and CanDentAssocROOTCA certificates are both installed in the operating certificate's certificate store. The former should be an intermediate CA, while the latter should be a ROOT CA.
1001	None	The CRL file downloaded is not in the correct format. Check for an error in the log file for a message indicating the CRL file could not be loaded. Prior to that, there may be a line in the log indicating an ASN1 tag error.	Delete all *.CRL files in the CCDWS root directory. If the error continues with subsequent claims then the distribution point may have changed. Determine the correct value from the carrier, and use this to populate the CrlDistributionPoint configuration option.
1001	None	The certificate corresponding to the provider identified in the transaction is in the CRL. The log file will contain a line indicating that the certificate is in the CRL and the transaction will not be attempted.	Contact CDAnet to determine why the certificate is in the CRL. Obtain and install a new certificate if appropriate.
1013	None	The appropriate certificate/key pair could be found for the current transaction, but the key is marked as	Check whether the key is marked as non-exportable by viewing the certificate in the certificate store. If it is

Status Code	Internal Error Code	Problem	Resolution
		non-exportable, so that transaction failed. The log file will contain a message indicating the key was marked as non-exportable.	not exportable, the option to export the key with the certificate will be disabled. You must then either delete and install the certificate marking the key as exportable, or export the certificate/key pair using a third-party tool such as Jailbreak, then re-import with the key marked as exportable.
1013	None	A valid certificate could not be found for the dental provider and office. This can mean the certificate does not exist, or its date range is not valid for the current date (typically this means the certificate is expired). Confirm by checking the log file for an error indicating that a valid certificate could not be found.	Contact CDAnet to obtain a valid certificate.
1045	7030	The CRL is out of date. Confirmed by checking the log file for a line indicating an SSL verify error with the reason that CRL has expired.	<p>Delete the existing *.CRL file (or files) in the CCDWS root directory and rerun the service.</p> <p>Ensure that the date and time is correct on the computer where CCDWS is installed. If not, set the time and take steps to ensure the time stays current.</p> <p>Ensure that the CCDWS root directory is writable by the CCDWS service.</p>
1045	7030	The server endpoint is not correct for the certificate being used. sha1 and sha256 certificates must use different endpoints. Confirmed by two messages in the log file. The first indicates "unable to get certificate CRL". The second contains indicates that the certificate verify failed. Additional confirmation can be found by looking for the signature hash algorithm identified in the log file. For Windows XP hosts, this should be sha1WithRSAEncryption. For all others it should be sha256WithRSAEncryption.	<p>Review certificates in the Windows certificate store, and verify that the signature hash algorithm matches that required for the operating system.</p> <p>If multiple certificates are in the certificate store for the same provider, then delete those that do not have the correct hash algorithm. If only one exists, then contact CDAnet to obtain a new certificate as it may have been installed incorrectly, or may be an artifact from an operating system upgrade.</p> <p>If the signature hash algorithm is correct for the operating system, then the server's endpoint may be incorrect in the configuration file. Verify this with the</p>

Status Code	Internal Error Code	Problem	Resolution
			carrier to ensure that the correct endpoint for the operating system is configured.

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