



Merge DICOM Toolkit™ V. 5.9.0

PLATFORM NOTES

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The symbols glossary is provided electronically at <http://www.merge.com/Support/Resources.aspx>.



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Contents

| | |
|-------------------------------------------------------------------------|----|
| OVERVIEW | 8 |
| Document Roadmap | 8 |
| Document Conventions | 9 |
| Summary of Supported Platforms | 9 |
| 32-BIT MICROSOFT WINDOWS USING MICROSOFT VISUAL C++ (008-91204)..... | 10 |
| Supported Configurations..... | 10 |
| The Merge DICOM Toolkit Libraries | 10 |
| Miscellaneous Notes | 11 |
| Threading Support | 11 |
| Debug Version | 11 |
| Compression Support | 12 |
| Unicode Support | 12 |
| API Changes for Windows | 12 |
| Sample Applications | 13 |
| Installation | 13 |
| The Merge DICOM Toolkit Requirements | 13 |
| Post-Installation | 14 |
| Files | 14 |
| 64-BIT MICROSOFT WINDOWS USING MICROSOFT VISUAL C++ (008-91208)..... | 20 |
| Supported Configurations..... | 20 |
| The Merge DICOM Toolkit Libraries | 21 |
| Miscellaneous Notes | 22 |
| Debug Version | 22 |
| Sample Applications | 22 |
| API Changes for Windows | 22 |
| Threading Support | 23 |
| Compression Support | 23 |
| Unicode Support | 23 |
| Installation | 23 |
| The Merge DICOM Toolkit Requirements | 24 |

| | |
|---------------------------------------------------------------|----|
| Post-Installation | 24 |
| Files | 25 |
| 32-BIT MICROSOFT WINDOWS USING BORLAND® C++ (008-91205) | 30 |
| Supported Configurations..... | 30 |
| The Merge DICOM Toolkit Libraries | 31 |
| Miscellaneous Notes | 32 |
| API Changes for Windows | 32 |
| Threading Support | 33 |
| Compression Support | 33 |
| Unicode Support | 33 |
| Installation | 34 |
| Merge DICOM Toolkit Requirements | 34 |
| Post-Installation | 34 |
| Files | 35 |
| 32-BIT LINUX® ON INTEL® X86 (008-91126) | 40 |
| Supported Configurations..... | 40 |
| The Merge DICOM Toolkit Libraries | 40 |
| Miscellaneous Notes | 42 |
| Threading Support | 42 |
| Compression Support | 42 |
| Unicode Support | 42 |
| Files | 43 |
| 64-BIT LINUX® ON INTEL® X86-64 (008-91132) | 48 |
| Supported Configurations..... | 48 |
| The Merge DICOM Toolkit Libraries | 49 |
| Miscellaneous Notes | 50 |
| Threading Support | 50 |
| Compression Support | 51 |
| Unicode Support | 51 |
| Files | 52 |
| 32-BIT SOLARIS™ 10 ON INTEL® X86 (008-91117) | 57 |

| | |
|------------------------------------------------------------------|----|
| Supported Configurations..... | 57 |
| The Merge DICOM Toolkit Libraries | 57 |
| Miscellaneous Notes | 58 |
| Threading Support | 58 |
| Compression Support | 59 |
| Unicode Support | 59 |
| Files | 60 |
| 64-BIT SOLARIS™ 10 ON INTEL® X64 (008-91116) | 65 |
| Supported Configurations..... | 65 |
| The Merge DICOM Toolkit Libraries | 65 |
| Miscellaneous Notes | 66 |
| Threading Support | 66 |
| Compression Support | 66 |
| Unicode Support | 66 |
| Files | 67 |
| 32-BIT SOLARIS™ 8 ON SPARC® USING SUN™ COMPILER (008-91119) ... | 71 |
| Supported Configurations..... | 71 |
| The Merge DICOM Toolkit Libraries | 72 |
| Miscellaneous Notes | 73 |
| Threading Support | 73 |
| Compression Support | 73 |
| Unicode Support | 73 |
| Files | 74 |
| 32-BIT SOLARIS™ 8 ON SPARC® USING GCC COMPILER (008-91130) | 79 |
| Supported Configurations..... | 79 |
| The Merge DICOM Toolkit Libraries | 79 |
| Miscellaneous Notes | 81 |
| Threading Support | 81 |
| Compression Support | 81 |
| Unicode Support | 81 |
| Files | 82 |

| | |
|-------------------------------------------------------------|-----|
| 32-BIT MAC OS® X USING UNIVERSAL BINARIES (008-91301) | 86 |
| Supported Configurations..... | 86 |
| The Merge DICOM Toolkit Libraries | 87 |
| Miscellaneous Notes | 88 |
| Threading Support | 88 |
| Compression Support | 88 |
| Unicode Support | 88 |
| Files | 89 |
| 64-BIT MAC OS® X ON INTEL® X64 (008-91303) | 93 |
| Supported Configurations..... | 93 |
| The Merge DICOM Toolkit Libraries | 93 |
| Miscellaneous Notes | 94 |
| Threading Support | 94 |
| Compression Support | 94 |
| Unicode Support | 94 |
| Files | 95 |
| 32-BIT ANDROID ON ARMV7-A (008-91998) | 99 |
| Supported Configurations..... | 99 |
| The Merge DICOM Toolkit Libraries | 100 |
| Miscellaneous Notes | 101 |
| Threading Support | 101 |
| Compression Support | 101 |
| Unicode Support | 101 |
| Files | 102 |
| 64-BIT ANDROID ON ARMV8-A (89-00161-00) | 107 |
| Supported Configurations..... | 107 |
| The Merge DICOM Toolkit Libraries | 107 |
| Miscellaneous Notes | 108 |
| Threading Support | 108 |
| Compression Support | 108 |
| Unicode Support | 108 |

| | |
|----------------------------------------------------|-----|
| Files | 109 |
| 64-BIT IOS ON ARMV8-A (008-91990) | 113 |
| Supported Configurations..... | 113 |
| The Merge DICOM Toolkit Libraries | 114 |
| Miscellaneous Notes | 114 |
| Threading Support | 114 |
| Compression Support | 114 |
| Files | 114 |
| 32-BIT LINUX ON ARMV7-A (008-92001) – RETIRED..... | 118 |
| 64-BIT LINUX ON ARMV8A (89-00163-00) | 119 |
| Supported Configurations..... | 119 |
| The Merge DICOM Toolkit Libraries | 119 |
| Miscellaneous Notes | 120 |
| Threading Support | 120 |
| Compression Support | 120 |
| Files | 120 |

Overview

The Merge DICOM Toolkit™ provides DICOM functionality through Merge's Applications Programming Interface to various operating systems. While the Merge DICOM Toolkit provides the same consistent API, it takes advantage of the capabilities in each operating system. Refer to the appropriate chapter in this guide for your implementation.

Document Roadmap

The Merge DICOM Toolkit documentation is structured as shown in *Figure 1*.

Platform specific information required to use the toolkit on your target platform is specified in Platform Notes. This includes supported compilers, compiler options, link options, configuration, and run-time related issues.

Read me first!

The *User's Manual* is the foundation for all other documentation because it explains the concepts of DICOM and the toolkit. Before plunging into the *Reference Manual* or *Sample Application Guide* you should be comfortable with the material in the *User Manual*.

The *Reference Manual* contains detailed information on the toolkit. This includes the Application Programming Interface (API), tool kit configuration, the runtime object database, and status logging. The *Reference Manual* also includes guidelines for writing a DICOM conformance statement for an application.

The *DICOM Database Manual* is an optional extension that describes the organization of the Merge DICOM Toolkit Database and how to use it to extend standard services and define your own private services. Tools are supplied for converting the contents of the database into the binary runtime object database.

Sample Application

The *Sample Application Guide* describes approaches to developing specific classes of DICOM applications (Image Transfer, Query/Retrieve, Print, Media, Modality Worklist, etc.). The *Sample Application Guide* presents the pertinent information from Parts 3 or 4 of the DICOM Standard in a more readable way and in the context of the toolkit. The *Sample Application Guide* also details the DICOM messages that can be passed between applications on the network. In addition, the sample applications that are supplied for your platform are described within the *Sample Application Guide*.

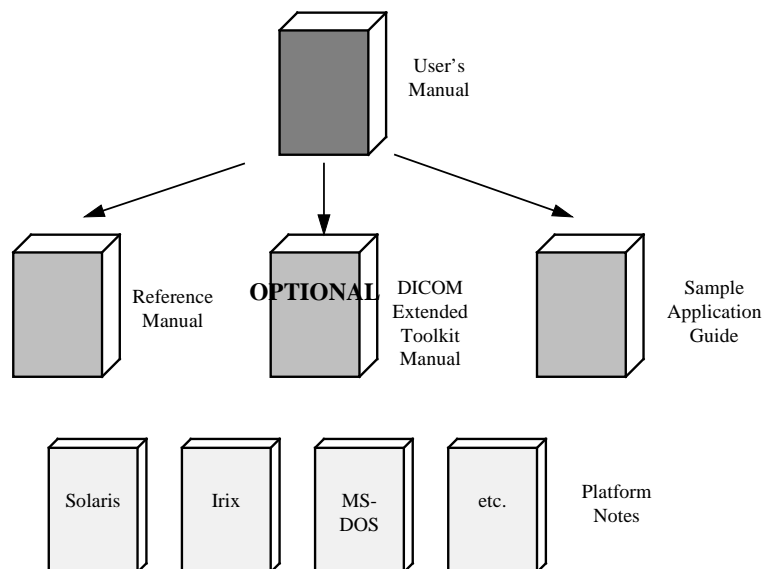


Figure 1: Merge DICOM Toolkit Documentation Roadmap

Document Conventions

This document follows a few formatting conventions:

Terms that are being defined are presented in **boldface**.

Sample Margin Note

Margin notes (in the left margin) are used to highlight important points or sections of the document.

Sample commands, sample output, source code, and function calls appear in `courier new` font.

Hexadecimal numbers are written with a trailing H. For example 16 decimal is equivalent to 10H hexadecimal.

Note: Notes are used to indicate information which may be helpful or of special interest to the reader.

Summary of Supported Platforms

- 32-Bit Microsoft Windows using Microsoft Visual C++ (008-91204)
- 64-Bit Microsoft Windows using Microsoft Visual C++ (008-91208)
- 32-Bit Microsoft Windows using Borland® C++ (008-91205)
- 32-Bit Linux® on Intel® x86 (008-91126)
- 64-Bit Fedora Core Linux® on Intel® x86-64 (008-91132)
- 32-Bit Solaris™ 10 on Intel® x86 (008-91117)
- 64-Bit Solaris™ 10 on Intel® x64 (008-91116)
- 32-Bit Solaris™ 8 on SPARC® using Sun™ Compiler (008-91119)
- 32-Bit Solaris™ 8 on SPARC® using GCC Compiler (008-91130)

- 32-Bit Mac OS® X Using Universal Binaries (008-91301)
- 64-Bit Mac OS® X on Intel® x64 (008-91303)
- 32-Bit Android on ARMv7-A (008-91998)
- 64-Bit Android on ARMv8-A (89-00161-00)
- 64-Bit iOS on ARMv7-A (008-91990)
- ~~32-Bit Linux on ARMv7-A (008-92001) – retired~~
- 64-Bit Linux on ARMv8-A (89-00163-00)

32-Bit Microsoft Windows using Microsoft Visual C++ (008-91204)

Supported Configurations

The following table describes the Merge DICOM Toolkit system requirements for 32-Bit Microsoft Windows using Microsoft Visual C++.

| Category | Requirement |
|------------------------|-------------------------------------------------------------------------------------------------------|
| Hardware | 32-bit Microsoft Windows supported Ethernet Network Interface Card. |
| Software (base) | 32-bit Microsoft Windows |
| Software (development) | 32-bit Microsoft Windows Microsoft Visual Studio 2005 SP1 Development System and Tools (or later). |

The Merge DICOM Toolkit Libraries

The Merge DICOM Toolkit for 32-Bit Microsoft Windows using Microsoft Visual C++ is provided in two forms: a **DLL** and a **static library**.

Static and dynamic link libraries

A static library is a collection of subroutines that are callable by your programs. To use them, simply link them with your program.

Dynamic link libraries, or DLL for short, are the cornerstone of Windows. A DLL is similar to a static library; it that it contains code that will be executed by many different modules. The difference, however, is that the code is not included in the executable file built by the linker or loader. Instead, the code is loaded at runtime when the resources are requested. The code is then mapped into the processes address space.

Two files make up this Merge DICOM Toolkit DLL: `MC3ADLL.LIB` and `MC3ADV.DLL`. The `MC3ADLL.LIB` file is called the Merge DICOM Toolkit **import library**. When a sample program is linked, the user must specify this file in the load line so that the loader will know how to resolve any calls made to Merge DICOM Toolkit DLL. The DLL file contains the actual “executable” code used by any programs that has linked with the import library.

The compile options in the following table should be used:

| Compile Options | Description |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| /O2 | (Optional) optimize for speed |
| /MT | Application is multithreaded and uses static C libraries. This option should be used when linking with the static library (<code>mc3adv.lib</code>). |
| /MD | Application is multithreaded and uses C libraries in the form of DLLs. This option should be used when linking with the DLL (<code>mc3adll.lib</code>). |
| /MDd | Application is multithreaded and uses debug C libraries in the form of DLLs. This option should be used when linking with the DLL (<code>mc3adlld.lib</code>). |

The link options in the following table should be used:

| Link Options | Description |
|--------------------|-----------------------------------------------------------------|
| /SUBSYSTEM:console | Needed for sample applications |
| /INCREMENTAL:no | Do not use incremental links |
| /MACHINE:I386 | Specify Intel x86 machine type |
| /LARGEADDRESSAWARE | Specify the ability to support larger than a 2GB address space. |

See the example `makefile` supplied with the toolkit for an example link line with further explanation of compiler options.

Note: Developer Studio projects are not included with the library.

Miscellaneous Notes

Threading Support

The Merge DICOM Toolkit for 32-bit Windows supports multi-threaded applications. Please see the *User's Manual* for details on the limitations for using Merge DICOM Toolkit with multiple threads.

Debug Version

The Merge DICOM Toolkit for 32-bit Windows provides an extra debug version of the library that shall be used with the debug versions of your application. This library should be used with /MDd in compiles. It enables diagnostic tools that depend on the Debug Runtime to work.

Compression Support

The Merge DICOM Toolkit for 32-bit Windows supports the PICTools (formerly known as Pegasus) libraries for compression/decompression from Accusoft (formerly Pegasus Imaging).

The Lossless and Lossy JPEG compressors can be utilized within your application without purchasing an additional license from Accusoft. However, the Lossy and Lossless JPEG Pegasus libraries are limited to compress and decompress at a maximum rate of 3 frames per second. This limit can be removed by purchasing a license from Accusoft (www.accusoft.com) and configuring that license in our `mergecom.pro` configuration file.

Note: To use the JPEG2000 compressor or decompressor in your applications, you must purchase a separate license from Accusoft.

Unicode Support

The Merge DICOM Toolkit for 32-bit Windows supports Unicode conversion of DICOM defined character sets with and without code extensions. Two optional shared object libraries, `icuuc49.dll` and `icudt49.dll`, are distributed with the toolkit and are used to perform Unicode character set conversion. Users that wish to use Unicode conversion functions must call `MC_Enable_Unicode_Conversion` to initialize the shared object libraries and ensure the dependency files listed in the table below are available at runtime. Existing users that have no plan to use the Unicode conversion functions don't need to deploy the two shared objects and their dependency files.

Dependency files of `icuuc49.dll` and `icudt49.dll` on 32-bit Windows platform:

| Unicode conversion library | Dependency File | Description |
|----------------------------|-----------------|-------------------|
| icuuc49.dll icudt49.dll | msvcr80.dll | Microsoft runtime |
| | msvc80.dll | Microsoft runtime |
| | advapi32.dll | Microsoft runtime |
| | kernel32.dll | Microsoft runtime |

API Changes for Windows

Three toolkit functions have different parameters for Windows. The following is a listing of the new parameters to these functions:

```
void MC_List_Message(
    int AmessageID,
    char* Afilename
);
```

```
void MC_List_Item(  
    int AitemID,  
    char* Afilename  
);  
void MC_List_File(  
    int AfileID,  
    char* Afilename  
);
```

The second parameter to each of these functions is defined as being a `FILE*` in the *Reference Manual*. Because `FILE*` variables cannot be passed to a DLL, these functions have been changed to pass a filename instead. With the static library, the output will be sent to `stdout` when the `Afilename` parameter is set to `NULL`. If it is set to `NULL` when using the DLL, an exception error will occur. When `Afilename` is set to a filename, the message, item, or file object is listed to this text file.

Sample Applications

Several sample programs are provided with Merge DICOM Toolkit. They are as follows: `stor_scp`, `stor_scu`, `qr_scp`, `qr_scu`, `qr_get_scp`, `qr_get_scu`, `prnt_scp`, `prnt_scu`, `work_scp`, `work_scu`, `ssl_scp`, `ssl_scu`, `comp`, `mpeg2dicom`, `duplicate` and `med_fsu`. All of these programs have been customized to work with Windows with the store server program having been given extra attention. The sample storage server (`stor_scp.c`) has been modified to create multiple threads to handle multiple simultaneous DICOM associations. A version of each sample application can be generated using both the static library and the Merge DICOM Toolkit DLL.

Installation

The following notes provide some details regarding installation requirements and procedures for the Merge DICOM Toolkit running on Windows operating systems.

The Merge DICOM Toolkit Requirements

The distribution media contains an archive zip file. In order to use the libraries on Intel based computers, the following hardware and software requirements must be met. Please note that the user must meet the requirements for a Windows operating system installation before the requirements for Merge DICOM Toolkit installation. We also assume you have installed the Microsoft Visual C++ compiler.

Hardware

- An Intel 32-bit x86 based microprocessor.
- One (or more) hard disks, with approximately 30 megabytes of free disk space for the installation. For execution, 40 megabytes should be sufficient. Image storage requires extra storage space.
- A CD-ROM drive.
- An Ethernet network adapter card which is supported by the Microsoft Windows operating system.

Software

- Microsoft® Windows operating system configured to use the TCP/IP transport services.
- Microsoft Visual Studio 2005 SP1 or higher

Post-Installation

Perform post-installation configuration

This section describes the necessary post-installation procedures that must be completed before Merge DICOM Toolkit is ready to be used.

Environment Variables

Merge DICOM Toolkit requires that an environment variable called MERGE_INI be set to point to the current initialization file (shipped as `merge.ini`). If this environment variable is not set, Merge DICOM Toolkit will look in the execution directory of your application to find this configuration file.

Directory and File Paths

When specifying the directory or file path for a windows program, it is necessary to declare the explicit directory or file path. The examples below are from the `merge.ini` file and the `mergecom.pro` file.

merge.ini

```
[MergeCOM3]
# MergeCOM-3 system profile parameters
MERGECOM_3_PROFILE = C:\mc3alib\mergecom.pro
# MergeCOM-3 service and message definitions
MERGECOM_3_SERVICES = C:\mc3db\mergecom.srv
# MergeCOM-3 application configurations
MERGECOM_3_APPLICATIONS = C:\mc3alib\mergecom.app
# Message log parameters
LOG_FILE = C:\mc3alib\merge.log # Name of log file
```

mergecom.pro

```
#####
#           MergeCOM-3 MESSAGE CONFIGURATION SECTION
#####
[MESSAGE_PARMS]
LARGE_DATA_STORE      = MEM # |FILE |VMEM Default = MEM
LARGE_DATA_SIZE       = 200
OBOW_BUFFER_SIZE      = 4096
DICTIONARY_FILE        = C:\mc3db\mrgcom3.dct
TEMP_FILE_DIRECTORY   = C:\temp
MSG_INFO_FILE          = C:\mc3db\mrgcom3.msg
```

Files

The following files are contained in the Merge DICOM Toolkit:

| Directory | File | Description |
|-----------|-------------------|------------------------------------------------------------------------------------------------------------|
| | read_me.txt | Information on this release of the toolkit. |
| | 0_w32 | Information concerning how this distribution was created. |
| mc3apps | comp.c | Sample compression/decompression application. |
| | comp.vcproj | VS 2005 project file. |
| | ct.img | Example CT image file. (This file is generated by mc3file and can be regenerated by the user, if need be.) |
| | duplicate.c | Sample for using MC_Standard_Compressor/MC_Standard_Decompressor via MC_Duplicate_Message. |
| | duplicate.vcproj | VS 2005 project file. |
| | general_util.c | General utilities for all sample programs. |
| | general_util.h | General utilities for all sample programs. |
| | makefile | Makefile for example programs. |
| | mc3apps.sln | VS 2005 solution file for sample applications. |
| | med_fsu.c | Media File Set Updater Application. |
| | med_fsu.vcproj | VS 2005 project file. |
| | merge.ini | Merge DICOM Toolkit Initialization Configuration File. (Used by all sample applications.) |
| | mergecom.app | Merge DICOM Toolkit Application Profile Configuration File. |
| | mergecom.pro | Merge DICOM Toolkit System Profile Configuration File. |
| | mergecom.srv | Merge DICOM Toolkit Service Profile Configuration File. |
| | mpeg2dicom.c | Sample for packing/unpacking MPEG2 streams into/from DICOM files. |
| | mpeg2dicom.vcproj | VS 2005 project file. |

| Directory | File | Description |
|-----------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| | prnt_scp.c | Sample Print SCP Application. |
| | prnt_scp.vcproj | VS 2005 project file. |
| | prnt_scu.c | Sample Print SCU Application. |
| | prnt_scu.vcproj | VS 2005 project file. |
| | prnt_svc.h | Sample Print Application header file. |
| | qr.h | Sample Query/Retrieve Application Include file. |
| | qr_get_scp.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| | qr_get_scp.vcproj | VS 2005 project file. |
| | qr_get_scu.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| | qr_get_scu.vcproj | VS 2005 project file. |
| | qr_scp.c | Sample Query/Retrieve SCP Application. |
| | qr_scp.vcproj | VS 2005 project file. |
| | qr_scu.c | Sample Query/Retrieve SCU Application. |
| | qr_scu.vcproj | VS 2005 project file. |
| | qr_util.c | Sample Query/Retrieve and Worklist Management Application utility functions. |
| | SampleApps.vsp s | Visual Studio project property file. |
| | sreport.c | Sample Structured Report Application |
| | sreport.vcproj | VS 2005 project file |
| | ssl_samp.c | SSL callbacks for SSL SCU and SSL SCP. |
| | ssl_samp.h | Header file for SSL callbacks for SSL SCU and SSL SCP. |
| | ssl_scp.c | Sample SCP application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |

| Directory | File | Description |
|-----------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| | ssl_scp.h | Header file for sample SSL SCP application. |
| | ssl_scp.vcproj | VS 2005 project file. |
| | ssl_scu.c | Sample SCU application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |
| | ssl_scu.vcproj | VS 2005 project file. |
| | stor_scp.c | Sample Storage SCP Application. |
| | stor_scp.vcproj | VS 2005 project file. |
| | stor_scu.c | Sample Storage SCU Application. |
| | stor_scu.vcproj | VS 2005 project file. |
| | work.dat | Database flat file, used by the Modality Worklist SCP application. |
| | workdata.c | Sample database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | workdata.h | Sample header file for database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | work_scp.c | Sample Modality Worklist and Modality Performed Procedure Step SCP Application. |
| | work_scp.vcproj | VS 2005 project file. |
| | work_scu.c | Sample Modality Worklist and Modality Performed Procedure Step SCU Application. |
| | work_scu.vcproj | VS 2005 project file. |

| Directory | File | Description |
|-----------|---------------|--------------------------------------------------------------------|
| mc3bin | genconf.exe | Configuration source file generation utility. |
| | gendict.exe | Dictionary source file generation utility. |
| | mc3comp.exe | Compare the values within two DICOM message or file objects. |
| | mc3conv.exe | Convert a DICOM message or file object into a new transfer syntax. |
| | mc3dcomb.exe | Runtime Dictionary Combine utility. |
| | mc3dict.exe | Runtime DICOM Data Dictionary utility. |
| | mc3echo.exe | DICOM Echo Test Utility. |
| | mc3file.exe | Generate a DICOM message object. |
| | mc3icomb.exe | Runtime Info Combine utility. |
| | mc3info.exe | Runtime Message Database generation utility. |
| | mc3list.exe | List a DICOM message object. |
| | mc3valid.exe | Validate a DICOM message object. |
| mc3doc | Database.pdf | Merge DICOM Toolkit DICOM Database Manual. |
| | Platform.pdf | This document. |
| | Refer.pdf | Merge DICOM Toolkit Reference Manual. |
| | Sample.pdf | Merge DICOM Toolkit Sample Applications Guide. |
| | User.pdf | Merge DICOM Toolkit User's Manual. |
| mc3inc | diction.h | DICOM Data Dictionary macros. |
| | mc3items.h | Library include file for use with mc3adv.lib. |
| | mc3media.h | Library include file for use with mc3adv.lib. |
| | mc3msg.h | Library include file for use with mc3adv.lib. |
| | mc3services.h | Library include file for use with mc3adv.lib. |
| | mc3status.h | Library include file for use with mc3adv.lib. |

| Directory | File | Description |
|--------------|---------------------------------------------|--------------------------------------------------------------|
| | mergecom.h | Library include file for use with mc3adv.lib. |
| | pcd.h | Pegasus include file. |
| | pic.h | Pegasus include file. |
| | stdtypes.h | Pegasus include file. |
| mc3lib | icuuc49.dll | Unicode conversion library. |
| | icudt49.dll | Unicode conversion data. |
| | jansson.dll | Library for encoding, decoding and manipulating JSON data. |
| | libxml2.dll | XML parsing library. |
| | mc3adll.lib | Merge DICOM Toolkit export library for mc3adv.dll. |
| | mc3adlld.lib | Merge DICOM Toolkit export library for mc3advd.dll. |
| | mc3adv.dll | Merge DICOM Toolkit dynamic link library. |
| | mc3adv.lib | Merge DICOM Toolkit software object code library. |
| | mc3advd.pdb | Debug database for Merge DICOM Toolkit dynamic link library. |
| | mc3advd.dll | Merge DICOM Toolkit dynamic link library for debug builds. |
| | mc3advd.pdb | Debug database for Merge DICOM Toolkit dynamic link library. |
| | picn20.dll | Pegasus dispatcher DLL. |
| | picn6120.dll | Pegasus library for JPEG-LS decompression. |
| | picn6220.dll | Pegasus library for JPEG Lossless compression. |
| | picn6320.dll | Pegasus library for JPEG Lossless decompression. |
| picn6420.dll | Pegasus library for JPEG Lossy compression. | |

| Directory | File | Description |
|-----------|--------------|----------------------------------------------------------|
| | picn6520.dll | Pegasus library for JPEG Lossy decompression. |
| | picn6820.dll | Pegasus library for JPEG 2000 compression. |
| | picn6920.dll | Pegasus library for JPEG 2000 decompression. |
| | picnm.lib | Pegasus export library for Pegasus DLLs. |
| mc3msg | default.pfl | Default configuration file used by mc3file. |
| | diction.pfl | Runtime DICOM Data Dictionary profile. |
| | message.txt | DICOM message formats for INFO purposes. |
| | info.pfl | Runtime Message Database profile. |
| | mc3dcomb.pfl | Sample configuration file for use with mc3dcomb utility. |
| | mc3icomb.cfg | Sample configuration file for use with mc3icomb utility. |
| | mrgcom3.dct | Runtime DICOM Data Dictionary File. |
| | mrgcom3.msg | Runtime Message Database File. |

64-Bit Microsoft Windows using Microsoft Visual C++ (008-91208)

Supported Configurations

The following table describes the Merge DICOM Toolkit system requirements for 64-Bit Microsoft Windows using Microsoft Visual C++.

| Category | Requirement |
|------------------------|------------------------------------------------------------------------------------------------------------------------------|
| Hardware | Microsoft Windows 2003/XP supported Ethernet Network Interface Card Intel EM64T or Advanced Micro Devices AMD64 Processor |
| Software (base) | A 64-bit Microsoft Windows operating system |
| Software (development) | Platform SDK or Microsoft Visual Studio 2005 |

The Merge DICOM Toolkit Libraries

The Merge DICOM Toolkit for 64-Bit Microsoft Windows using Microsoft Visual C++ is provided in two forms: a **DLL** and a **static library**.

Static and dynamic link libraries

A static library is a collection of subroutines that are callable by your programs. To use them, simply link them with your program.

Dynamic link libraries, or DLL for short, are the cornerstone of Windows. A DLL is similar to a static library; it that it contains code that will be executed by many different modules. The difference, however, is that the code is not included in the executable file built by the linker or loader. Instead, the code is loaded at runtime when the resources are requested. The code is then mapped into the processes address space.

Two files make up this Merge DICOM Toolkit DLL: `MC3ADLL64.LIB` and `MC3ADV64.DLL`. The `MC3ADLL64.LIB` file is called the Merge DICOM Toolkit **import library**. When a sample program is linked, the user must specify this file in the load line so that the loader will know how to resolve any calls made to Merge DICOM Toolkit DLL. The DLL file contains the actual “executable” code used by any programs that has linked with the import library.

The following compile options should be used:

| Compile Options | Description |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>/O2</code> | (Optional) optimize for speed. |
| <code>/MT</code> | Application is multithreaded and uses static C libraries. This option should be used when linking with the static library (<code>mc3adv64.lib</code>). |
| <code>/MD</code> | Application is multithreaded and uses C libraries in the form of DLLs. This option should be used when linking with the DLL (<code>mc3adll64.lib</code>). |
| <code>/MDd</code> | Application is multithreaded and uses debug C libraries in the form of DLLs. This option should be used when linking with the DLL (<code>mc3adll64d.lib</code>). |

The following link options should be used:

| Link Options | Description |
|---------------------------------|---------------------------------|
| <code>/SUBSYSTEM:console</code> | Needed for sample applications. |
| <code>/INCREMENTAL:no</code> | Do not use incremental links. |
| <code>/MACHINE:AMD64</code> | Specify Intel machine type. |

See the example `makefile` supplied with the toolkit for an example link line with further explanation of compiler options.

Note: Developer Studio projects are not included with the library.

Miscellaneous Notes

Debug Version

The Merge DICOM Toolkit for 64-bit Windows provides an extra debug version of the library that shall be used with the debug versions of your application. This library should be used with `/MDd` in compiles. It enables diagnostic tools that depend on the Debug Runtime to work.

Sample Applications

Several sample programs are provided with Merge DICOM Toolkit. They are as follows: `stor_scp`, `stor_scu`, `qr_scp`, `qr_scu`, `qr_get_scp`, `qr_get_scu`, `prnt_scp`, `prnt_scu`, `work_scp`, `work_scu`, `ssl_scp`, `ssl_scu`, `comp`, `mjpeg2dicom`, `duplicate` and `med_fsu`. All of these programs have been customized to work with Windows with the store server program having been given extra attention. The sample storage server (`stor_scp.c`) has been modified to create multiple threads to handle multiple simultaneous DICOM associations. A version of each sample application can be generated using both the static library and the Merge DICOM Toolkit DLL.

API Changes for Windows

Three toolkit functions have different parameters for Windows. The following is a listing of the new parameters to these functions:

```
void MC_List_Message(  
    int AmessageID,  
    char* Afilename  
);  
void MC_List_Item(  
    int AitemID,  
    char* Afilename  
);  
void MC_List_File(  
    int AfileID,  
    char* Afilename  
);
```

The second parameter to each of these functions is defined as being a `FILE*` in the *Reference Manual*. Because `FILE*` variables cannot be passed to a DLL, we have changed these functions to pass a filename instead. With the static library, the output will be sent to `stdout` when the `Afilename` parameter is set to `NULL`. If it is set to `NULL` when using the DLL, an exception error will occur. When `Afilename` is set to a filename, the message, item, or file object is listed to this text file.

Threading Support

The Merge DICOM Toolkit for 64-bit Windows supports multi-threaded applications. Please see the *User's Manual* for details on the limitations for using Merge DICOM Toolkit with multiple threads.

Compression Support

The Merge DICOM Toolkit for 64-bit Windows supports the PICTools (formerly known as Pegasus) libraries for compression/decompression from Accusoft.

The Lossless and Lossy JPEG compressors can be utilized within your application without purchasing an additional license from Accusoft. However, the Lossy and Lossless JPEG Pegasus libraries are limited to compress and decompress at a maximum rate of 3 frames per second. This limit can be removed by purchasing a license from Accusoft (www.accusoft.com) and configuring that license in our mergecom.pro configuration file.

Note: To use the JPEG2000 compressor or decompressor in your applications, you must purchase a separate license from Accusoft.

Unicode Support

The Merge DICOM Toolkit for 64-bit Windows supports Unicode conversion of DICOM defined character sets with and without code extensions. Two optional shared object libraries, icuuc49.dll and icudt49.dll, are distributed with the toolkit and are used to perform Unicode character set conversion. Users that wish to use Unicode conversion functions must call `MC_Enable_Unicode_Conversion` to initialize the shared object libraries and ensure the dependency files listed in the table below are available at runtime. Existing users that have no plan to use the Unicode conversion functions don't need to deploy the two shared objects and their dependency files.

Dependency files of icuuc49.dll and icudt49.dll on 64-bit Windows platform:

| Unicode conversion library | Dependency File | Description |
|----------------------------|-----------------|-------------------|
| icuuc49.dll icudt49.dll | msvcr80.dll | Microsoft runtime |
| | msvcp80.dll | Microsoft runtime |
| | advapi32.dll | Microsoft runtime |
| | kernel32.dll | Microsoft runtime |

Installation

The following notes provide some details regarding installation requirements and procedures for the Merge DICOM Toolkit running on Windows operating systems.

The Merge DICOM Toolkit Requirements

The distribution media contains an archive zip file. In order to use the libraries on Intel based computers, the following hardware and software requirements must be met. Please note that the user must meet the requirements for a Windows operating system installation before the requirements for Merge DICOM Toolkit installation. We also assume you have installed the Microsoft Platform SDK.

Hardware

- Intel 64-bit PC Pentium microprocessor or Micro Devices AMD64 Processor
- One (or more) hard disks, with approximately 30 megabytes of free disk space for the installation. For execution, 40 megabytes should be sufficient. Image storage requires extra storage space.
- A CD-ROM drive.
- An Ethernet network adapter card *supported by Windows 2003/XP*.

Software

- Microsoft® Windows operating system configured to use the TCP/IP transport services.
- Microsoft Platform SDK.

Post-Installation

Perform post-installation configuration

This section describes the necessary post-installation procedures that must be completed before Merge DICOM Toolkit is ready to be used.

Environment Variables

Merge DICOM Toolkit requires that an environment variable called MERGE_INI be set to point to the current initialization file (shipped as `merge.ini`). If this environment variable is not set, Merge DICOM Toolkit will look in the execution directory of your application to find this configuration file.

Directory and File Paths

When specifying the directory or file path for a windows program, it is necessary to declare the explicit directory or file path. The examples below are from the `merge.ini` file and the `mergecom.pro` file.

merge.ini

```
[MergeCOM3]
# MergeCOM-3 system profile parameters
MERGECOM_3_PROFILE = C:\mc3alib\mergecom.pro

# MergeCOM-3 service and message definitions
MERGECOM_3_SERVICES = C:\mc3db\mergecom.srv
# MergeCOM-3 application configurations
MERGECOM_3_APPLICATIONS = C:\mc3alib\mergecom.app
# Message log parameters.
LOG_FILE = C:\mc3alib\merge.log # Name of log file
```


mergecom.pro

```

#=====
#           MergeCOM-3 MESSAGE CONFIGURATION SECTION
#=====
[MESSAGE_PARMS]
    LARGE_DATA_STORE      = MEM # |FILE |VMEM Default =
MEM
    LARGE_DATA_SIZE       = 200
    OBOW_BUFFER_SIZE      = 4096
    DICTIONARY_ACCESS     = MEM # | FILE Default = MEM
    DICTIONARY_FILE       = C:\mc3db\mrgcom3.dct
    TEMP_FILE_DIRECTORY   = C:\temp
    MSG_INFO_FILE         = C:\mc3db\mrgcom3.msg

```

Files

The following files are contained in the Merge DICOM Toolkit:

| Directory | File | Description |
|-----------|------------------|------------------------------------------------------------------------------------------------------------|
| | read_me.txt | Information on this release of the toolkit. |
| | 0_w64 | Information concerning how this distribution was created. |
| mc3apps | comp.c | Sample compression/decompression application. |
| | comp.vcproj | VS 2005 project file. |
| | ct.img | Example CT image file. (This file is generated by mc3file and can be regenerated by the user, if need be.) |
| | duplicate.c | Sample for using MC_Standard_Compressor/MC_Standard_Decompressor via MC_Duplicate_Message. |
| | duplicate.vcproj | VS 2005 project file. |
| | general_util.c | General utilities for all sample programs. |
| | general_util.h | General utilities for all sample programs. |
| | makefile | Makefile for example programs. |
| | mc3apps.sln | VS 2005 solution file for sample applications. |
| | med_fsu.c | Media File Set Updater Application. |

| Directory | File | Description |
|-----------|-------------------|-------------------------------------------------------------------------------------------|
| | med_fsu.vcproj | VS 2005 project file. |
| | merge.ini | Merge DICOM Toolkit Initialization Configuration File. (Used by all sample applications.) |
| | mergecom.app | Merge DICOM Toolkit Application Profile Configuration File. |
| | mergecom.pro | Merge DICOM Toolkit System Profile Configuration File. |
| | mergecom.srv | Merge DICOM Toolkit Service Profile Configuration File. |
| | mpeg2dicom.c | Sample for packing/unpacking MPEG2 streams into/from DICOM files. |
| | mpeg2dicom.vcproj | VS 2005 project file. |
| | prnt_scp.c | Sample Print SCP Application. |
| | prnt_scp.vcproj | VS 2005 project file. |
| | prnt_scu.c | Sample Print SCU Application. |
| | prnt_scu.vcproj | VS 2005 project file. |
| | prnt_svc.h | Sample Print Application header file. |
| | qr.h | Sample Query/Retrieve Application Include file. |
| | qr_get_scp.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| | qr_get_scp.vcproj | VS 2005 project file. |
| | qr_get_scu.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| | qr_get_scu.vcproj | VS 2005 project file. |
| | qr_scp.c | Sample Query/Retrieve SCP Application. |
| | qr_scp.vcproj | VS 2005 project file. |
| | qr_scu.c | Sample Query/Retrieve SCU Application. |
| | qr_scu.vcproj | VS 2005 project file. |

| Directory | File | Description |
|-----------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| | qr_util.c | Sample Query/Retrieve and Worklist Management Application utility functions. |
| | SampleApps.vsp ops | Visual Studio project property file. |
| | sreport.c | Sample Structured Report Application |
| | sreport.vcproj | VS 2005 project file |
| | ssl_samp.c | SSL callbacks for SSL SCU and SSL SCP. |
| | ssl_samp.h | Header file for SSL callbacks for SSL SCU and SSL SCP. |
| | ssl_scp.c | Sample SCP application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |
| | ssl_scp.h | Header file for sample SSL SCP application. |
| | ssl_scp.vcproj | VS 2005 project file. |
| | ssl_scu.c | Sample SCU application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |
| | ssl_scu.vcproj | VS 2005 project file. |
| | stor_scp.c | Sample Storage SCP Application. |
| | stor_scp.vcproj | VS 2005 project file. |
| | stor_scu.c | Sample Storage SCU Application. |
| | stor_scu.vcproj | VS 2005 project file. |
| | work.dat | Database flat file, used by the Modality Worklist SCP application. |
| | workdata.c | Sample database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | workdata.h | Sample header file for database functions used by Modality Worklist and Performed Procedure Step SCP Application. |

| Directory | File | Description |
|-----------|-----------------|---------------------------------------------------------------------------------|
| | work_scp.c | Sample Modality Worklist and Modality Performed Procedure Step SCP Application. |
| | work_scp.vcproj | VS 2005 project file |
| | work_scu.c | Sample Modality Worklist and Modality Performed Procedure Step SCU Application. |
| | work_scu.vcproj | VS 2005 project file |
| mc3bin | genconf.exe | Configuration source file generation utility. |
| | gendict.exe | Dictionary source file generation utility. |
| | mc3comp.exe | Compare the values within two DICOM message or file objects. |
| | mc3conv.exe | Convert a DICOM message or file object into a new transfer syntax. |
| | mc3dcomb.exe | Runtime Dictionary Combine utility. |
| | mc3dict.exe | Runtime DICOM Data Dictionary utility. |
| | mc3echo.exe | DICOM Echo Test Utility. |
| | mc3file.exe | Generate a DICOM message object. |
| | mc3icomb.exe | Runtime Info Combine utility. |
| | mc3info.exe | Runtime Message Database generation utility. |
| | mc3list.exe | List a DICOM message object. |
| | mc3valid.exe | Validate a DICOM message object. |
| mc3doc | Database.pdf | Merge DICOM Toolkit DICOM Database Manual. |
| | Platform.pdf | This document. |
| | Refer.pdf | Merge DICOM Toolkit Reference Manual. |
| | Sample.pdf | Merge DICOM Toolkit Sample Applications Guide. |
| | User.pdf | Merge DICOM Toolkit User's Manual. |
| mc3inc | diction.h | DICOM Data Dictionary macros. |

| Directory | File | Description |
|-----------|----------------|--------------------------------------------------------------|
| | mc3items.h | Library include file for use with mc3adv.lib. |
| | mc3media.h | Library include file for use with mc3adv.lib. |
| | mc3msg.h | Library include file for use with mc3adv.lib. |
| | mc3services.h | Library include file for use with mc3adv.lib. |
| | mcstatus.h | Library include file for use with mc3adv.lib. |
| | mergecom.h | Library include file for use with mc3adv.lib. |
| | pcd.h | Pegasus include file. |
| | pic.h | Pegasus include file. |
| | stdtypes.h | Pegasus include file. |
| mc3lib | icuuc49.dll | Unicode conversion library. |
| | icudt49.dll | Unicode conversion data. |
| | jansson.dll | Library for encoding, decoding and manipulating JSON data. |
| | libxml2.dll | XML parsing library. |
| | mc3adll64.lib | Merge DICOM Toolkit export library for mc3adv.dll. |
| | mc3adll64d.lib | Merge DICOM Toolkit export library for mc3advd.dll. |
| | mc3adv64.dll | Merge DICOM Toolkit dynamic link library. |
| | mc3adv64.lib | Merge DICOM Toolkit software object code library. |
| | mc3adv64d.pdb | Debug database for Merge DICOM Toolkit dynamic link library. |
| | mc3adv64d.dll | Merge DICOM Toolkit dynamic link library for debug builds. |
| | mc3advd.pdb | Debug database for Merge DICOM Toolkit dynamic link library. |
| | picx20.dll | Pegasus dispatcher DLL. |

| Directory | File | Description |
|-----------|--------------|----------------------------------------------------------|
| | picx6120.ssm | Pegasus library for JPEG-LS decompression. |
| | picx6220.ssm | Pegasus library for JPEG Lossless compression. |
| | picx6320.ssm | Pegasus library for JPEG Lossless decompression. |
| | picx6420.ssm | Pegasus library for JPEG Lossy compression. |
| | picx6520.ssm | Pegasus library for JPEG Lossy decompression. |
| | picx6820.ssm | Pegasus library for JPEG 2000 compression. |
| | picx6920.ssm | Pegasus library for JPEG 2000 decompression. |
| | picxm.lib | Pegasus export library for Pegasus DLLs. |
| mc3msg | default.pfl | Default configuration file used by mc3file. |
| | diction.pfl | Runtime DICOM Data Dictionary profile. |
| | message.txt | DICOM message formats for INFO purposes. |
| | info.pfl | Runtime Message Database profile. |
| | mc3dcomb.pfl | Sample configuration file for use with mc3dcomb utility. |
| | mc3icomb.cfg | Sample configuration file for use with mc3icomb utility. |
| | mrgcom3.dct | Runtime DICOM Data Dictionary File. |
| | mrgcom3.msg | Runtime Message Database File. |

32-Bit Microsoft Windows using Borland® C++ (008-91205)

Supported Configurations

The following table describes the system requirements for the Merge DICOM Toolkit.

| Category | Requirement |
|------------------------|-----------------------------------------------------------------|
| Hardware | 32-bit Microsoft Windows Ethernet Network Interface Card. |
| Software (base) | 32-bit Microsoft Windows. |
| Software (development) | 32-bit Microsoft Windows. Borland C++ Builder 2006 or later. |

The Merge DICOM Toolkit Libraries

The Merge DICOM Toolkit for 32-Bit Microsoft Windows using Borland® C++ is provided in two forms: a **DLL** and a **static library**.

Static and dynamic link libraries

A static library is a collection of subroutines that are callable by your programs. To use them, simply link them with your program.

Dynamic link libraries, or DLL for short, are the cornerstone Windows. A DLL is similar to a static library; in that it contains code that will be executed by many different modules. The difference, however, is that the code is not included in the executable file built by the linker or loader. Instead, the code is loaded at runtime when the resources are requested. The code is then mapped into the processes address space.

Two files make up this Merge DICOM Toolkit DLL: `MC3ADLL.LIB` and `MC3ADV.DLL`. The `MC3ADLL.LIB` file is called the Merge DICOM Toolkit import library. When a sample program is linked, the user must specify this file in the load line so that the loader will know how to resolve any calls made to Merge DICOM Toolkit DLL. The DLL file contains the actual “executable” code used by any programs that have linked with the import library.

The following compile options should be used:

| Compile Options | Description |
|-----------------|---------------------------------------|
| -O2 | (Optional) optimize for speed. |
| -WC | Generate a Windows “console” program. |
| -WM | Application is multithreaded. |

The following link options should be used:

| Link Options | Description |
|--------------|-------------------------------------------------------------------|
| -Tpe | Output file is an “.EXE”. |
| -ap | Generate a protected mode executable that runs in “console” mode. |

| | |
|----|--------------------------|
| -x | Do not use a “map” file. |
|----|--------------------------|

See the example `makefile` supplied with the toolkit for an example compile and link line. Some additional compile options were used with the sample applications. The following describes their usage.

- `-w-aus` — Identifier not used. Occasionally, in the sample applications, the status of a function call is returned to a variable in an “if” statement. This is usually done to aid debugging. The Borland compiler will note that this variable is never used. This flag will mask these types of warnings
- `-w-par` — Parameter not used. Occasionally, in the sample applications, parameters are passed into a function, only to be passed to another function. Borland’s compiler will note that the original parameter was not used in the original function, when it was in fact passed to another sub-function. This flag will mask these types of warnings.

Another thing to note when looking at the sample application `makefile` is that it is necessary to rely on Borland’s “response” files. A response file is an ordinary text file that contains either linker arguments, or compiler arguments.

A response file is needed because there is a Windows limitation to the length of all command line arguments passed to a program. With the number of compiler defines and flags that are used, this length would be exceeded. Therefore, “make” will temporarily create the response file, pass its filename to the linker or compiler as an argument, and then delete it. The temporary response files are named with an “*.rsp” or “*.dsp” file extension.

Note: Integrated Development Environment (IDE) projects are not included with the library.

Miscellaneous Notes

API Changes for Windows

Three toolkit functions have different parameters for Windows. The following is a listing of the new parameters to these functions:

```
void MC_List_Message(
    int AmessageID,
    char* Afilename
);
void MC_List_Item(
    int AitemID,
    char* Afilename
);
void MC_List_File(
    int AfileID,
    char* Afilename
);
```

The second parameter to each of these functions is defined as being a `FILE*` in the reference manual. Because `FILE*` variables cannot be passed to a DLL, we

have changed these functions to pass a filename instead. With the static library, the output will be sent to `stdout` when the `Afilename` parameter is set to `NULL`. If it is set to `NULL` when using the DLL, an exception error will occur. When `Afilename` is set to a filename, the message, item, or file object is listed to this text file.

Threading Support

The Merge DICOM Toolkit for Windows supports multi-threaded applications. Please see the *User's Manual* for details on the limitations for using Merge DICOM Toolkit with multiple threads.

Compression Support

The Merge DICOM Toolkit for 32-bit Windows supports the PICTools (formerly known as Pegasus libraries for compression/decompression from Accusoft.

The Lossless and Lossy JPEG compressors can be utilized within your application without purchasing an additional license from Accusoft. However, the Lossy and Lossless JPEG Pegasus libraries are limited to compress and decompress at a maximum rate of 3 frames per second. This limit can be removed by purchasing a license from Accusoft (www.accusoft.com) and configuring that license in our `mergecom.pro` configuration file.

Note: To use the JPEG2000 compressor or decompressor in your applications, you must purchase a separate license from Accusoft.

Unicode Support

The Merge DICOM Toolkit for 32-bit Windows supports Unicode conversion of DICOM defined character sets with and without code extensions. Two optional shared object libraries, `icuuc49.dll` and `icudt49.dll`, are distributed with the toolkit and are used to perform Unicode character set conversion. Users that wish to use Unicode conversion functions must call `MC_Enable_Unicode_Conversion` to initialize the shared object libraries and ensure the dependency files listed in the table below are available at runtime. Existing users that have no plan to use the Unicode conversion functions don't need to deploy the two shared objects and their dependency files.

Dependency files of `icuuc49.dll` and `icudt49.dll` on 32-bit Windows platform:

| Unicode conversion library | Dependency File | Description |
|----------------------------|-----------------|-------------------|
| icuuc49.dll icudt49.dll | msvcr80.dll | Microsoft runtime |
| | msvcp80.dll | Microsoft runtime |
| | advapi32.dll | Microsoft runtime |
| | kernel32.dll | Microsoft runtime |

Installation

The following notes provide some details regarding installation requirements and procedures for the Merge DICOM Toolkit running on Windows operating systems.

Merge DICOM Toolkit Requirements

The distribution media contains archived, ready-to-use versions of the Merge DICOM Toolkit libraries. In order to use the libraries on an Intel based computer, the following hardware and software requirements must be met. Please note that the user must meet the requirements for a Windows NT operating system installation before the requirements for Merge DICOM Toolkit installation. We also assume you have installed the Borland C++ Development Suite, with Design Tools.

Hardware

- An Intel 32-bit x86 based microprocessor.
- One (or more) hard disks, with approximately 30 megabytes of free disk space for the installation. For compilation and execution of the sample applications, 40 megabytes should be sufficient. Image storage requires extra storage space.
- An Ethernet network adapter card which is supported by Windows.

Software

- A 32-bit Microsoft® Windows Platform configured to use the TCP/IP transport services.
- Borland® C++ Builder 2006 or later.

Post-Installation

Perform post-installation configuration.

This section describes the necessary post-installation procedures that must be completed before Merge DICOM Toolkit is ready to be used.

Environment Variables

Merge DICOM Toolkit requires that an environment variable called MERGE_INI be set to point to the current initialization file (shipped as `merge.ini`). If this environment variable is not set, Merge DICOM Toolkit will look in the execution directory of your application to find this configuration file.

Directory and File Paths

When specifying the directory or file path for a windows program, it is necessary to declare the explicit directory or file path. The examples below are from the `merge.ini` file and the `mergecom.pro` file.

merge.ini

```
[MergeCOM3]
# MergeCOM-3 system profile parameters
MERGECOM_3_PROFILE = C:\mc3apps\mergecom.pro
```

```
# MergeCOM-3 service and message definitions
MERGECOM_3_SERVICES = C:\mc3apps\mergecom.srv
# MergeCOM-3 application configurations
MERGECOM_3_APPLICATIONS = C:\mc3apps\mergecom.app
# Message log parameters.
LOG_FILE = C:\mc3apps\merge.log # Name of log file
```

mergecom.pro

```
#####
#           MergeCOM-3 MESSAGE CONFIGURATION SECTION
#####
[MESSAGE_PARMS]
    LARGE_DATA_STORE      = MEM # | FILE | VMEM  Default = MEM
    LARGE_DATA_SIZE       = 200
    OBOW_BUFFER_SIZE      = 4096
    DICTIONARY_ACCESS     = MEM # | FILE   Default = MEM
    DICTIONARY_FILE       = C:\mc3msg\mrgcom3.dct
    TEMP_FILE_DIRECTORY   = C:\temp
    MSG_INFO_FILE         = C:\mc3msg\mrgcom3.msg
```

Files

The following files are contained in the Merge DICOM Toolkit:

| Directory | File | Description |
|-----------|----------------|------------------------------------------------------------------------------------------------------------|
| | read_me.txt | Information on this release of the toolkit. |
| | 0_bcc | Information concerning how this distribution was created. |
| mc3apps | comp.c | Sample compression/decompression application. |
| | ct.img | Example CT image file. (This file is generated by mc3file and can be regenerated by the user, if need be.) |
| | duplicate.c | Sample for using MC_Standard_Compressor/MC_Standard_Decompressor via MC_Duplicate_Message. |
| | general_util.c | General utilities for all sample programs. |
| | general_util.h | General utilities for all sample programs. |
| | makefile | Makefile for example programs. |
| | med_fsu.c | Media File Set Updater Application. |
| | merge.ini | Merge DICOM Toolkit Initialization Configuration File. (Used by all sample applications.) |

| Directory | File | Description |
|-----------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| | mergecom.app | Merge DICOM Toolkit Application Profile Configuration File. |
| | mergecom.pro | Merge DICOM Toolkit System Profile Configuration File. |
| | mergecom.srv | Merge DICOM Toolkit Service Profile Configuration File. |
| | mpeg2dicom.c | Sample for packing/unpacking MPEG2 streams into/from DICOM files. |
| | prnt_scp.c | Sample Print SCP Application. |
| | prnt_scu.c | Sample Print SCU Application |
| | prnt_svc.h | Sample Print Application header file. |
| | qr.h | Sample Query/Retrieve Application Include file. |
| | qr_get_scp.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| | qr_get_scu.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| | qr_scp.c | Sample Query/Retrieve SCP Application. |
| | qr_scu.c | Sample Query/Retrieve SCU Application. |
| | qr_util.c | Sample Query/Retrieve and Worklist Management Application utility functions. |
| | sreport.c | Sample Structured Report Application |
| | ssl_samp.c | SSL callbacks for SSL SCU and SSL SCP. |
| | ssl_samp.h | Header file for SSL callbacks for SSL SCU and SSL SCP. |
| | ssl_scp.c | Sample SCP application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |
| | ssl_scp.h | Header file for sample SSL SCP application. |

| Directory | File | Description |
|-----------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| | ssl_scu.c | Sample SCU application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |
| | stor_scp.c | Sample Storage SCP Application. |
| | stor_scu.c | Sample Storage SCU Application. |
| | work.dat | Database flat file, used by the Modality Worklist SCP application. |
| | workdata.c | Sample database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | workdata.h | Sample header file for database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | work_scp.c | Sample Modality Worklist and Modality Performed Procedure Step SCP Application. |
| | work_scu.c | Sample Modality Worklist and Modality Performed Procedure Step SCU Application. |

| Directory | File | Description |
|-----------|---------------|--------------------------------------------------------------------|
| mc3bin | genconf.exe | Configuration source file generation utility. |
| | gendict.exe | Dictionary source file generation utility. |
| | mc3comp.exe | Compare the values within two DICOM message or file objects. |
| | mc3conv.exe | Convert a DICOM message or file object into a new transfer syntax. |
| | mc3dcomb.exe | Runtime Dictionary Combine utility. |
| | mc3dict.exe | Runtime DICOM Data Dictionary utility. |
| | mc3echo.exe | DICOM Echo Test Utility. |
| | mc3file.exe | Generate a DICOM message object. |
| | mc3icomb.exe | Runtime Info Combine utility. |
| | mc3info.exe | Runtime Message Database generation utility. |
| | mc3list.exe | List a DICOM message object. |
| | mc3valid.exe | Validate a DICOM message object. |
| mc3doc | Database.pdf | Merge DICOM Toolkit DICOM Database Manual. |
| | Platform.pdf | This document. |
| | Refer.pdf | Merge DICOM Toolkit Reference Manual. |
| | Sample.pdf | Merge DICOM Toolkit Sample Applications Guide. |
| | User.pdf | Merge DICOM Toolkit User's Manual. |
| mc3inc | diction.h | DICOM Data Dictionary macros. |
| | mc3items.h | Library include file for use with mc3adv.lib. |
| | mc3media.h | Library include file for use with mc3adv.lib. |
| | mc3msg.h | Library include file for use with mc3adv.lib. |
| | mc3services.h | Library include file for use with mc3adv.lib. |
| | mc3status.h | Library include file for use with mc3adv.lib. |

| Directory | File | Description |
|-----------|--------------|------------------------------------------------------------|
| | mergecom.h | Library include file for use with mc3adv.lib. |
| | pcd.h | Pegasus include file. |
| | pic.h | Pegasus include file. |
| | stdtypes.h | Pegasus include file. |
| mc3lib | icuuc49.dll | Unicode conversion library. |
| | icudt49.dll | Unicode conversion data. |
| | jansson.dll | Library for encoding, decoding and manipulating JSON data. |
| | libxml2.dll | XML parsing library |
| | mc3adll.lib | Merge DICOM Toolkit export library for mc3adv.dll. |
| | mc3adv.dll | Merge DICOM Toolkit dynamic link library. |
| | mc3adv.lib | Merge DICOM Toolkit software object code library. |
| | picn20.dll | Pegasus dispatcher DLL. |
| | picn6120.dll | Pegasus library for JPEG-LS decompression. |
| | picn6220.dll | Pegasus library for JPEG Lossless compression. |
| | picn6320.dll | Pegasus library for JPEG Lossless decompression. |
| | picn6420.dll | Pegasus library for JPEG Lossy compression. |
| | picn6520.dll | Pegasus library for JPEG Lossy decompression. |
| | picn6820.dll | Pegasus library for JPEG 2000 compression. |
| | picn6920.dll | Pegasus library for JPEG 2000 decompression. |
| | picnm.lib | Pegasus export library for Pegasus DLLs. |
| mc3msg | default.pfl | Default configuration file used by mc3file. |
| | diction.pfl | Runtime DICOM Data Dictionary profile. |

| Directory | File | Description |
|-----------|--------------|----------------------------------------------------------|
| | message.txt | DICOM message formats for INFO purposes. |
| | info.pfl | Runtime Message Database profile. |
| | mc3dcomb.pfl | Sample configuration file for use with mc3dcomb utility. |
| | mc3icomb.cfg | Sample configuration file for use with mc3icomb utility. |
| | mrgcom3.dct | Runtime DICOM Data Dictionary File. |
| | mrgcom3.msg | Runtime Message Database File. |

32-Bit Linux® on Intel® x86 (008-91126)

Supported Configurations

The following table describes the system requirements for the Merge DICOM Toolkit.

| Category | Requirement |
|------------------------|-------------------------------------------|
| Hardware | Linux supported PC hardware. |
| Software (base) | Red Hat Linux 9.0 or later ¹ . |
| Software (development) | GCC 3.3.2. |

The Merge DICOM Toolkit Libraries

The Merge DICOM Toolkit for 32-Bit Linux on Intel x86 is provided in two forms: a **shared object** and a **static library**.

Static library

A static library is a collection of subroutines that are callable by your programs. To use them, simply link them with your program.

The compiler flags needed to link with the Merge DICOM Toolkit static library are:

¹ Merge DICOM Toolkit for Linux has been developed using Red Hat Linux. Although it should function under any distribution of Linux, Red Hat Linux is the supported version if distribution specific problems arise.

| Flag | Type | Description |
|------|--------------|-----------------------------------|
| -ldl | Compile time | Link with dynamic loading library |

Shared object

A shared object is similar to a static library. It contains entry points for your application to use and call and contains code that will be executed by many different modules. The difference, however, is that the code is not included in the executable file built by the linker or loader. Instead, the code is loaded at runtime when the resources are requested. The code is then mapped into the process's address space.

The use of the two types of libraries is exactly the same: they are “linked” into an application program by the system loader after the application has been compiled. The way the system loader constructs the executable is different, however.

When a static library is linked with an application, an executable is produced that contains the code of the application and the code of the library. This is not true with code produced and linked with shared object methods. The application and the shared “library” must be compiled and linked with special compiler flags.

The compiler flags needed to link with the Merge DICOM Toolkit shared object are:

| Flag | Type | Description |
|--------------|--------------|---------------------------------------------|
| -fPIC | Compile Time | Produced position independent code. |
| -D_REENTRANT | Compile Time | Produce reentrant code that is thread safe. |
| -ldl | Compile Time | Link with dynamic loading library. |

Also, the `LD_LIBRARY_PATH` environment variable will need to be modified to contain the path of the `mc3adv.so` file. The following is an excerpt from the `man` page of `ld` and describes the function of the `LD_LIBRARY_PATH` environment variable:

“`LD_LIBRARY_PATH` is a list of directories in which to search for libraries specified with the `-l` option. Multiple directories are separated by a colon.”
 “It is also used to specify libraries search path to the run-time linker, that is, if `LD_LIBRARY_PATH` exists in the environment, the run-time linker searches the directories named in it, before the default directories for the shared objects to be linked with the program at execution.”

It should be noted that the Merge DICOM Toolkit shared object (`mc3adv.so`) is designed to be “dynamic-safe” and optimized. This means that the shared object is safe when more than one application executed the same code at the same time.

Miscellaneous Notes

Threading Support

The Merge DICOM Toolkit for RedHat Linux supports multi-threaded applications. Please see the *User's Manual* for details on the limitations for using Merge DICOM Toolkit with multiple threads.

Compression Support

The Merge DICOM Toolkit for RedHat Linux supports the PICTools (formerly known as Pegasus) libraries for compression/decompression from Accusoft (formerly Pegasus Imaging).

The Lossless and Lossy JPEG compressors can be utilized within your application without purchasing an additional license from Accusoft. However, the Lossy and Lossless JPEG Pegasus libraries are limited to compress and decompress at a maximum rate of 3 frames per second. This limit can be removed by purchasing a license from Accusoft (www.accusoft.com) and configuring that license in our mergecom.pro configuration file.

Note: To use the JPEG2000 compressor or decompressor in your applications, you must purchase a separate license from Accusoft.

Built in RLE compression/decompression is also available.

Unicode Support

The Merge DICOM Toolkit for 32-bit Linux supports Unicode conversion of DICOM defined character sets with and without code extensions. Two optional shared object libraries, libicuuc.so.49 and libicudata.so.49, are distributed with the toolkit and are used to perform Unicode character set conversion. Users that wish to use Unicode conversion functions must call `MC_Enable_Unicode_Conversion` to initialize the shared object libraries and ensure the dependency files listed in the table below are available at runtime. Existing users that have no plan to use the Unicode conversion functions don't need to deploy the two shared objects and their dependency files.

Dependency files of libicuuc.so.49 and libicudata.so.49 on 32-bit Linux platform:

| Unicode conversion library | Dependency File | Description |
|------------------------------------|-----------------|-------------------------|
| libicuuc.so.49 libicudata.so.49 | libpthread.so.0 | Threading library |
| | libdl.so.2 | Dynamic loading library |
| | libstdc++.so.5 | Standard C++ library |
| | libm.so.6 | Math library |
| | libgcc_s.so.1 | GCC library |

| Unicode conversion library | Dependency File | Description |
|----------------------------|-----------------|---------------|
| | libc.so.6 | C library |
| | ld-linux.so.2 | Linux library |

Files

The following files are contained in the Merge DICOM Toolkit:

| Directory | File | Description |
|-----------|------------------|------------------------------------------------------------------------------------------------------------|
| | read_me | Information on this release of the toolkit. |
| | 0_inx | Information concerning how this distribution was created. |
| | setup.sh | Environment variables setup executable for sh. |
| | setup.csh | Environment variables setup executable for csh. |
| mc3apps | comp.c | Sample compression/decompression application. |
| | ct.img | Example CT image file. (This file is generated by mc3file and can be regenerated by the user, if need be.) |
| | duplicate.c | Sample for using MC_Standard_Compressor/MC_Standard_De compressor via MC_Duplicate_Message. |
| | general_util.c | General utilities for all sample programs. |
| | general_util.h | General utilities for all sample programs. |
| | inetd_echo_scp.c | Sample DICOM Echo SCP, using the inetd functionality. |
| | makefile | Makefile for example programs. |
| | med_fsu.c | Media File Set Updater Application. |
| | merge.ini | Merge DICOM Toolkit Initialization Configuration File. (Used by all sample applications.) |

| Directory | File | Description |
|-----------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| | mergecom.app | Merge DICOM Toolkit Application Profile Configuration File. |
| | mergecom.pro | Merge DICOM Toolkit System Profile Configuration File. |
| | mergecom.srv | Merge DICOM Toolkit Service Profile Configuration File. |
| | mpeg2dicom.c | Sample for packing/unpacking MPEG2 streams into/from DICOM files. |
| | prnt_scp.c | Sample Print SCP Application. |
| | prnt_scu.c | Sample Print SCU Application. |
| | prnt_svc.h | Sample Print Application header file |
| | qr.h | Sample Query/Retrieve Application Include file. |
| | qr_get_scp.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| | qr_get_scu.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| | qr_scp.c | Sample Query/Retrieve SCP Application. |
| | qr_scu.c | Sample Query/Retrieve SCU Application. |
| | qr_util.c | Sample Query/Retrieve and Worklist Management Application utility functions. |
| | sreport.c | Sample Structured Report Application |
| | ssl_samp.c | SSL callbacks for SSL SCU and SSL SCP. |
| | ssl_samp.h | Header file for SSL callbacks for SSL SCU and SSL SCP. |
| | ssl_scp.c | Sample SCP application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |
| | ssl_scp.h | Header file for sample SSL SCP application. |

| Directory | File | Description |
|-----------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| | ssl_scu.c | Sample SCU application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |
| | stor_scp.c | Sample Storage SCP Application. |
| | stor_scu.c | Sample Storage SCU Application. |
| | work.dat | Database flat file, used by the Modality Worklist SCP application. |
| | workdata.c | Sample database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | workdata.h | Sample header file for database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | work_scp.c | Sample Modality Worklist and Modality Performed Procedure Step SCP Application. |
| | work_scu.c | Sample Modality Worklist and Modality Performed Procedure Step SCU Application. |

| Directory | File | Description |
|-----------|--------------|--------------------------------------------------------------------|
| mc3bin | genconf | Configuration source file generation utility. |
| | gendict | Dictionary source file generation utility. |
| | mc3comp | Compare the values within two DICOM message or file objects. |
| | mc3conv | Convert a DICOM message or file object into a new transfer syntax. |
| | mc3dcomb | Runtime Dictionary Combine utility. |
| | mc3dict | Runtime DICOM Data Dictionary utility. |
| | mc3echo | DICOM Echo Test Utility. |
| | mc3file | Generate a DICOM message object. |
| | mc3icomb | Runtime Info Combine utility. |
| | mc3info | Runtime Message Database generation utility. |
| | mc3list | List a DICOM message object. |
| | mc3valid | Validate a DICOM message object. |
| mc3doc | Database.pdf | Merge DICOM Toolkit DICOM <i>Database Manual</i> . |
| | Platform.pdf | This document. |
| | Refer.pdf | Merge DICOM Toolkit <i>Reference Manual</i> . |
| | Sample.pdf | Merge DICOM Toolkit <i>Sample Applications Guide</i> . |
| | User.pdf | Merge DICOM Toolkit <i>User's Manual</i> . |
| mc3inc | bmp.h | Pegasus include file. |
| | diction.h | DICOM Data Dictionary macros. |
| | mc3items.h | Library include file for use with mc3adv.a. |
| | mc3media.h | Library include file for use with mc3adv.a. |
| | mc3msg.h | Library include file for use with mc3adv.a. |

| Directory | File | Description |
|-----------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | mc3services.h | Library include file for use with mc3adv.a. |
| | mcstatus.h | Library include file for use with mc3adv.a. |
| | mergecom.h | Library include file for use with mc3adv.a. |
| | pcd.h | Pegasus include file. |
| | pic.h | Pegasus include file. |
| | stdtypes.h | Pegasus include file. |
| mc3lib | libcudata.so.49 | Unicode conversion data. |
| | libicuuc.so.49 | Unicode conversion library. |
| | libxml2.so.2.9.3 | XML parsing library. |
| | libpicl20.so | Pegasus shared object which needs to be linked in when you compile your source. |
| | mc3adv.a | Merge DICOM Toolkit software static library. |
| | mc3adv.so | Merge DICOM Toolkit software shared object. |
| | picn6120.ssm | Pegasus library for JPEG-LS decompression. This file must be copied to the /usr/local/lib/pegasus directory, or must be in a directory pointed to by the SSMPATH environment variable. |
| | picn6220.ssm | Pegasus library for JPEG Lossless compression. This file must be copied to the /usr/local/lib/pegasus directory, or must be in a directory pointed to by the SSMPATH environment variable. |
| | picn6320.ssm | Pegasus library for JPEG Lossless decompression. This file must be copied to the /usr/local/lib/pegasus directory, or must be in a directory pointed to by the SSMPATH environment variable. |
| | picn6420.ssm | Pegasus library for JPEG Lossy compression. This file must be copied to the /usr/local/lib/pegasus directory, or must be in a directory pointed to by the SSMPATH environment variable. |

| Directory | File | Description |
|-----------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | picn6520.ssm | Pegasus library for JPEG Lossy decompression. This file must be copied to the /usr/local/lib/pegasus directory, or must be in a directory pointed to by the SSMPATH environment variable. |
| | picn6820.ssm | Pegasus library for JPEG 2000 compression. This file must be copied to the /usr/local/lib/pegasus directory, or must be in a directory pointed to by the SSMPATH environment variable. |
| | picn6920.ssm | Pegasus library for JPEG 2000 decompression. This file must be copied to the /usr/local/lib/pegasus directory, or must be in a directory pointed to by the SSMPATH environment variable. |
| mc3msg | default.pfl | Default configuration file used by mc3file. |
| | diction.pfl | Runtime DICOM Data Dictionary profile. |
| | message.txt | DICOM message formats for INFO purposes. |
| | info.pfl | Runtime Message Database profile. |
| | mc3dcomb.pfl | Sample configuration file for use with mc3dcomb utility. |
| | mc3icomb.cfg | Sample configuration file for use with mc3icomb utility. |
| | mrgcom3.dct | Runtime DICOM Data Dictionary File. |
| | mrgcom3.msg | Runtime Message Database File. |

64-Bit Linux® on Intel® x86-64 (008-91132)

Supported Configurations

The following table describes the system requirements for the Merge DICOM Toolkit.

| Category | Requirement |
|----------|----------------------------------------------------|
| Hardware | Intel x86-64 Pentium processor or AMD64 processor. |

| | |
|------------------------|---------------------------------------|
| Software (base) | Fedora Core 3 or later ² . |
| Software (development) | GCC 4.0.2. |

The Merge DICOM Toolkit Libraries

The Merge DICOM Toolkit for 64-Bit Fedora Core Linux on Intel x86-64 is provided in two forms: a **shared object** and a **static library**.

Static library

A static library is a collection of subroutines that are callable by your programs. To use them, simply link them with your program.

The compiler flags needed to link with the Merge DICOM Toolkit static library are:

| Flag | Type | Description |
|------|--------------|------------------------------------|
| -ldl | Compile time | Link with dynamic loading library. |

Shared object

A shared object is similar to a static library. It contains entry points for your application to use and call and contains code that will be executed by many different modules. The difference, however, is that the code is not included in the executable file built by the linker or loader. Instead, the code is loaded at runtime when the resources are requested. The code is then mapped into the processes address space.

The use of the two types of libraries is exactly the same: they are “linked” into an application program by the system loader after the application has been compiled. The way the system loader constructs the executable is different, however.

When a static library is linked with an application, an executable is produced that contains the code of the application and the code of the library. This is not true with code produced and linked with shared object methods. The application and the shared “library” must be compiled and linked with special compiler flags.

The compiler flags used to generate the Merge DICOM Toolkit static library are:

| Flag | Type | Description |
|--------------|--------------|---------------------------------------------|
| -m64 | Compile Time | Produce 64 bit code. |
| -O3 | Compile Time | Optimization level. |
| -D_REENTRANT | Compile Time | Produce reentrant code that is thread safe. |

² Merge DICOM Toolkit for Fedora Core Linux has been developed using Fedora Core 3. Although it should function under any distribution of Linux, Fedora Core Linux is the supported version if distribution specific problems arise.

The compiler flags used to generate the Merge DICOM Toolkit shared object are:

| Flag | Type | Description |
|--------------|--------------|---------------------------------------------|
| -fPIC | Compile Time | Produced position independent code. |
| -m64 | Compile Time | Produce 64 bit code. |
| -O3 | Compile Time | Optimization level. |
| -D_REENTRANT | Compile Time | Produce reentrant code that is thread safe. |

The compiler flags needed to link with the Merge DICOM Toolkit dynamic library are:

| Flag | Type | Description |
|------|--------------|------------------------------------|
| -ldl | Compile time | Link with dynamic loading library. |

Also, the `LD_LIBRARY_PATH` environment variable will need to be modified to contain the path of the `mc3adv.so` file. The following is an excerpt from the man page of `ld` and describes the function of the `LD_LIBRARY_PATH` environment variable:

“`LD_LIBRARY_PATH` is a list of directories in which to search for libraries specified with the `-l` option. Multiple directories are separated by a colon.”
 “It is also used to specify libraries search path to the run-time linker, that is, if `LD_LIBRARY_PATH` exists in the environment, the run-time linker searches the directories named in it, before the default directories for the shared objects to be linked with the program at execution.”

It should be noted that the Merge DICOM Toolkit shared object (`mc3adv.so`) is designed to be “dynamic-safe” and optimized. This means that the shared object is safe when more than one application executed the same code at the same time.

Miscellaneous Notes

Threading Support

The Merge DICOM Toolkit for Fedora Core Linux supports multi-threaded applications. Please see the User’s Manual for details on the limitations for using Merge DICOM Toolkit with multiple threads.

Compression Support

The Merge DICOM Toolkit for Fedora Core Linux supports the PICTools (formerly known as Pegasus) libraries for compression/decompression from Accusoft (formerly Pegasus Imaging).

The Lossless and Lossy JPEG compressors can be utilized within your application without purchasing an additional license from Accusoft. However, the Lossy and Lossless JPEG Pegasus libraries are limited to compress and decompress at a maximum rate of 3 frames per second. This limit can be removed by purchasing a license from Accusoft (www.accusoft.com) and configuring that license in our mergecom.pro configuration file.

Note: To use the JPEG2000 compressor or decompressor in your applications, you must purchase a separate license from Accusoft.

Built in RLE compression/decompression is also available.

Unicode Support

The Merge DICOM Toolkit for 64-bit Linux supports Unicode conversion of DICOM defined character sets with and without code extensions. Two optional shared object libraries, libicuuc.so.49 and libicudata.so.49, are distributed with the toolkit and are used to perform Unicode character set conversion. Users that wish to use Unicode conversion functions must call `MC_Enable_Unicode_Conversion` to initialize the shared object libraries and ensure the dependency files listed in the table below are available at runtime. Existing users that have no plan to use the Unicode conversion functions don't need to deploy the two shared objects and their dependency files.

Dependency files of libicuuc.so.49 and libicudata.so.49 on 64-bit Linux platform:

| Unicode conversion library | Dependency File | Description |
|------------------------------------|----------------------|-------------------------|
| libicuuc.so.49 libicudata.so.49 | libpthread.so.0 | Threading library |
| | libdl.so.2 | Dynamic loading library |
| | libstdc++.so.6 | Standard C++ library |
| | libm.so.6 | Math library |
| | libgcc_s.so.1 | GCC library |
| | libc.so.6 | C library |
| | ld-linux-x86-64.so.2 | Linux library |

Files

The following files are contained in the Merge DICOM Toolkit:

| Directory | File | Description |
|-----------|------------------|------------------------------------------------------------------------------------------------------------|
| | read_me | Information on this release of the toolkit. |
| | 0_Inx_64 | Information concerning how this distribution was created. |
| | setup.sh | Environment variables setup executable for sh. |
| | setup.csh | Environment variables setup executable for csh. |
| mc3apps | comp.c | Sample compression/decompression application. |
| | ct.img | Example CT image file. (This file is generated by mc3file and can be regenerated by the user, if need be.) |
| | duplicate.c | Sample for using MC_Standard_Compressor/MC_Standard_De compressor via MC_Duplicate_Message. |
| | general_util.c | General utilities for all sample programs. |
| | general_util.h | General utilities for all sample programs. |
| | inetd_echo_scp.c | Sample DICOM Echo SCP, using the inetd functionality. |
| | makefile | Makefile for example programs. |
| | med_fsu.c | Media File Set Updater Application. |
| | merge.ini | Merge DICOM Toolkit Initialization Configuration File. (Used by all sample applications.) |
| | mergecom.app | Merge DICOM Toolkit Application Profile Configuration File. |
| | mergecom.pro | Merge DICOM Toolkit System Profile Configuration File. |
| | mergecom.srv | Merge DICOM Toolkit Service Profile Configuration File. |

| Directory | File | Description |
|-----------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| | mpeg2dicom.c | Sample for packing/unpacking MPEG2 streams into/from DICOM files. |
| | prnt_scp.c | Sample Print SCP Application. |
| | prnt_scu.c | Sample Print SCU Application. |
| | prnt_svc.h | Sample Print Application header file. |
| | qr.h | Sample Query/Retrieve Application Include file. |
| | qr_get_scp.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| | qr_get_scu.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| | qr_scp.c | Sample Query/Retrieve SCP Application. |
| | qr_scu.c | Sample Query/Retrieve SCU Application. |
| | qr_util.c | Sample Query/Retrieve and Worklist Management Application utility functions. |
| | sreport.c | Sample Structured Report Application |
| | ssl_samp.c | SSL callbacks for SSL SCU and SSL SCP. |
| | ssl_samp.h | Header file for SSL callbacks for SSL SCU and SSL SCP. |
| | ssl_scp.c | Sample SCP application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |
| | ssl_scp.h | Header file for sample SSL SCP application. |
| | ssl_scu.c | Sample SCU application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |
| | stor_scp.c | Sample Storage SCP Application. |
| | stor_scu.c | Sample Storage SCU Application. |

| Directory | File | Description |
|-----------|--------------|-------------------------------------------------------------------------------------------------------------------|
| | work.dat | Database flat file, used by the Modality Worklist SCP application. |
| | workdata.c | Sample database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | workdata.h | Sample header file for database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | work_scp.c | Sample Modality Worklist and Modality Performed Procedure Step SCP Application. |
| | work_scu.c | Sample Modality Worklist and Modality Performed Procedure Step SCU Application. |
| mc3bin | genconf | Configuration source file generation utility. |
| | gendict | Dictionary source file generation utility. |
| | mc3comp | Compare the values within two DICOM message or file objects. |
| | mc3conv | Convert a DICOM message or file object into a new transfer syntax. |
| | mc3dcomb | Runtime Dictionary Combine utility. |
| | mc3dict | Runtime DICOM Data Dictionary utility. |
| | mc3echo | DICOM Echo Test Utility. |
| | mc3file | Generate a DICOM message object. |
| | mc3icomb | Runtime Info Combine utility. |
| | mc3info | Runtime Message Database generation utility. |
| | mc3list | List a DICOM message object. |
| | mc3valid | Validate a DICOM message object. |
| mc3doc | Database.pdf | Merge DICOM Toolkit DICOM <i>Database Manual</i> . |
| | Platform.pdf | This document. |
| | Refer.pdf | Merge DICOM Toolkit <i>Reference Manual</i> . |

| Directory | File | Description |
|-----------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Sample.pdf | Merge DICOM Toolkit <i>Sample Applications Guide</i> . |
| | User.pdf | Merge DICOM Toolkit <i>User's Manual</i> . |
| mc3inc | bmp.h | Pegasus include file. |
| | diction.h | DICOM Data Dictionary macros. |
| | mc3items.h | Library include file for use with mc3adv.a. |
| | mc3media.h | Library include file for use with mc3adv.a. |
| | mc3msg.h | Library include file for use with mc3adv.a. |
| | mc3services.h | Library include file for use with mc3adv.a. |
| | mcstatus.h | Library include file for use with mc3adv.a. |
| | mergecom.h | Library include file for use with mc3adv.a. |
| | pcd.h | Pegasus include file. |
| | pic.h | Pegasus include file. |
| | stdtypes.h | Pegasus include file. |
| mc3lib | libcudata.so.49 | Unicode conversion data. |
| | libicuuc.so.49 | Unicode conversion library. |
| | libxml2.so.2.9.3 | XML parsing library |
| | libpiclx20.so | Pegasus shared object which needs to be linked in when you compile your source. |
| | mc3adv.a | Merge DICOM Toolkit software static library. |
| | mc3adv.so | Merge DICOM Toolkit software shared object. |
| | picx6120.ssm | Pegasus library for JPEG-LS decompression. This file must be copied to the /usr/local/lib/pegasus directory, or must be in a directory pointed to by the SSMPATH environment variable. |

| Directory | File | Description |
|-----------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | picx6220.ssm | Pegasus library for JPEG Lossless compression. This file must be copied to the /usr/local/lib/pegasus directory, or must be in a directory pointed to by the SSMPATH environment variable. |
| | picx6320.ssm | Pegasus library for JPEG Lossless decompression. This file must be copied to the /usr/local/lib/pegasus directory, or must be in a directory pointed to by the SSMPATH environment variable. |
| | picx6420.ssm | Pegasus library for JPEG Lossy compression. This file must be copied to the /usr/local/lib/pegasus directory, or must be in a directory pointed to by the SSMPATH environment variable. |
| | picx6520.ssm | Pegasus library for JPEG Lossy decompression. This file must be copied to the /usr/local/lib/pegasus directory, or must be in a directory pointed to by the SSMPATH environment variable. |
| | picx6820.ssm | Pegasus library for JPEG 2000 compression. This file must be copied to the /usr/local/lib/pegasus directory, or must be in a directory pointed to by the SSMPATH environment variable. |
| | picx6920.ssm | Pegasus library for JPEG 2000 decompression. This file must be copied to the /usr/local/lib/pegasus directory, or must be in a directory pointed to by the SSMPATH environment variable. |
| mc3msg | default.pfl | Default configuration file used by mc3file. |
| | diction.pfl | Runtime DICOM Data Dictionary profile. |
| | message.txt | DICOM message formats for INFO purposes. |
| | info.pfl | Runtime Message Database profile. |
| | mc3dcomb.pfl | Sample configuration file for use with mc3dcomb utility. |
| | mc3icomb.cfg | Sample configuration file for use with mc3icomb utility. |

| Directory | File | Description |
|-----------|-------------|-------------------------------------|
| | mrgcom3.dct | Runtime DICOM Data Dictionary File. |
| | mrgcom3.msg | Runtime Message Database File. |

32-Bit Solaris™ 10 on Intel® x86 (008-91117)

Supported Configurations

The following table describes the system requirements for the Merge DICOM Toolkit.

| Category | Requirement |
|------------------------|--------------------------------------------------------------------|
| Hardware | Solaris 10 on Intel x86 supported Ethernet Network Interface Card. |
| Software (base) | Solaris 10 Operating System. |
| Software (development) | GCC compiler. |

The Merge DICOM Toolkit Libraries

The Merge DICOM Toolkit for 32-Bit Solaris™ 10 on Intel® x86 is provided in two forms: a shared object and a static library.

Static library

A static library is a collection of subroutines that are callable by your programs. To use them, simply link them with your program.

The compiler flags needed to link with the Merge DICOM Toolkit static library are:

| Flag | Type | Description |
|--------------|--------------|------------------------------------------------------------------------------------------------------|
| -O3 | Compile time | Optimization level. |
| -D_REENTRANT | Compile time | This option specifies that the library is reentrant and can be used in a multi-threaded environment. |
| -ldl | Compile time | Link with dynamic loading library. |

Shared objects

A shared object is similar to a static library. It contains entry points for your application to use and call and contains code that will be executed by many different modules. The difference, however, is that the code is not included in the executable file built by the linker or loader. Instead, the code is loaded at runtime when the resources are requested. The code is then mapped into the processes address space.

The use of the two types of libraries is exactly the same: they are “linked” into an application program by the system loader after the application has been compiled. The way the system loader constructs the executable is different, however.

When a static library is linked with an application, an executable is produced that contains the code of the application and the code of the library. This is not true with code produced and linked with shared object methods. The application and the shared “library” must be compiled and linked with special compiler flags.

The compiler flags needed to link with the Merge DICOM Toolkit shared object are:

| Flag | Type | Description |
|--------------|--------------|------------------------------------------------------------------------------------------------------|
| -O3 | Compile time | Optimization level. |
| -fPIC | Compile time | Produced position independent code. |
| -D_REENTRANT | Compile time | This option specifies that the library is reentrant and can be used in a multi-threaded environment. |
| -ldl | Compile time | Link with dynamic loading library. |

Also, the `LD_LIBRARY_PATH` environment variable will need to be modified to contain the path of the `mc3adv.so` file. The following is an excerpt from the man page of `ld` and describes the function of the `LD_LIBRARY_PATH` environment variable:

“`LD_LIBRARY_PATH` is a list of directories in which to search for libraries specified with the `-l` option. Multiple directories are separated by a colon.”
 “It is also used to specify libraries search path to the run-time linker, that is, if `LD_LIBRARY_PATH` exists in the environment, the run-time linker searches the directories named in it, before the default directories for the shared objects to be linked with the program at execution.”

It should be noted that the Merge DICOM Toolkit shared object (`mc3adv.so`) is designed to be “dynamic-safe” and optimized. This means that the shared object is safe when more than one application executed the same code at the same time.

Miscellaneous Notes

Threading Support

The Merge DICOM Toolkit for Solaris on Intel x86 supports multi-threaded applications. Please see the *User’s Manual* for details on the limitations for using Merge DICOM Toolkit with multiple threads.

Compression Support

The Merge DICOM Toolkit for Solaris on Intel x86 now supports the PICTools (formerly known as Pegasus) libraries for compression/decompression from Accusoft (formerly Pegasus Imaging).

The Lossless and Lossy JPEG compressors can be utilized within your application without purchasing an additional license from Accusoft. However, the Lossy and Lossless JPEG Pegasus libraries are limited to compress and decompress at a maximum rate of 3 frames per second. This limit can be removed by purchasing a license from Accusoft (www.accusoft.com) and configuring that license in our mergecom.pro configuration file.

Note: To use the JPEG2000 compressor or decompressor in your applications, you must purchase a separate license from Accusoft.

Built in RLE compression/decompression is also available.

Unicode Support

The Merge DICOM Toolkit for Solaris on Intel x86 supports Unicode conversion of DICOM defined character sets with and without code extensions. Two optional shared object libraries, libicuuc.so.49 and libicudata.so.49, are distributed with the toolkit and are used to perform Unicode character set conversion. Users that wish to use Unicode conversion functions must call MC_Enable_Unicode_Conversion to initialize the shared object libraries and ensure the dependency files listed in the table below are available at runtime. Existing users that have no plan to use the Unicode conversion functions don't need to deploy the two shared objects and their dependency files.

Dependency files of libicuuc.so.49 and libicudata.so.49 for Solaris on Intel x86 platform:

| Unicode conversion library | Dependency File | Description |
|------------------------------------|-----------------|----------------------|
| libicuuc.so.49 libicudata.so.49 | libpthread.so.1 | Threading library |
| | libc.so.1 | C library |
| | libstdc++.so.6 | Standard C++ library |
| | libm.so.2 | Math library |
| | libgcc_s.so.1 | GCC library |

Files

The following files are contained in the Merge DICOM Toolkit:

| Directory | File | Description |
|-----------|------------------|------------------------------------------------------------------------------------------------------------|
| | read_me | Information on this release of the toolkit. |
| | 0_x86 | Information concerning how this distribution was created. |
| | setup.sh | Environment variables setup executable for sh. |
| | setup.csh | Environment variables setup executable for csh. |
| mc3apps | comp.c | Sample compression/decompression application. |
| | ct.img | Example CT image file. (This file is generated by mc3file and can be regenerated by the user, if need be.) |
| | duplicate.c | Sample for using MC_Standard_Compressor/MC_Standard_De compressor via MC_Duplicate_Message. |
| | general_util.c | General utilities for all sample programs. |
| | general_util.h | General utilities for all sample programs. |
| | inetd_echo_scp.c | Sample DICOM Echo SCP, using the inetd functionality. |
| | makefile | Makefile for example programs. |
| | med_fsu.c | Media File Set Updater Application. |
| | merge.ini | Merge DICOM Toolkit Initialization Configuration File. (Used by all sample applications.) |
| | mergecom.app | Merge DICOM Toolkit Application Profile Configuration File. |
| | mergecom.pro | Merge DICOM Toolkit System Profile Configuration File. |
| | mergecom.srv | Merge DICOM Toolkit Service Profile Configuration File. |

| Directory | File | Description |
|-----------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| | mpeg2dicom.c | Sample for packing/unpacking MPEG2 streams into/from DICOM files. |
| | prnt_scp.c | Sample Print SCP Application. |
| | prnt_scu.c | Sample Print SCU Application. |
| | prnt_svc.h | Sample Print Application header file. |
| | qr.h | Sample Query/Retrieve Application Include file. |
| | qr_get_scp.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| | qr_get_scu.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| | qr_scp.c | Sample Query/Retrieve SCP Application. |
| | qr_scu.c | Sample Query/Retrieve SCU Application. |
| | qr_util.c | Sample Query/Retrieve and Worklist Management Application utility functions. |
| | sreport.c | Sample Structured Report Application |
| | ssl_samp.c | SSL callbacks for SSL SCU and SSL SCP. |
| | ssl_samp.h | Header file for SSL callbacks for SSL SCU and SSL SCP. |
| | ssl_scp.c | Sample SCP application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |
| | ssl_scp.h | Header file for sample SSL SCP application. |
| | ssl_scu.c | Sample SCU application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |
| | stor_scp.c | Sample Storage SCP Application. |
| | stor_scu.c | Sample Storage SCU Application. |

| Directory | File | Description |
|-----------|--------------|-------------------------------------------------------------------------------------------------------------------|
| | work.dat | Database flat file, used by the Modality Worklist SCP application. |
| | workdata.c | Sample database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | workdata.h | Sample header file for database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | work_scp.c | Sample Modality Worklist and Modality Performed Procedure Step SCP Application. |
| | work_scu.c | Sample Modality Worklist and Modality Performed Procedure Step SCU Application. |
| mc3bin | genconf | Configuration source file generation utility. |
| | gendict | Dictionary source file generation utility. |
| | mc3comp | Compare the values within two DICOM message or file objects. |
| | mc3conv | Convert a DICOM message or file object into a new transfer syntax. |
| | mc3dcomb | Runtime Dictionary Combine utility. |
| | mc3dict | Runtime DICOM Data Dictionary utility. |
| | mc3echo | DICOM Echo Test Utility. |
| | mc3file | Generate a DICOM message object. |
| | mc3icomb | Runtime Info Combine utility. |
| | mc3info | Runtime Message Database generation utility. |
| | mc3list | List a DICOM message object. |
| | mc3valid | Validate a DICOM message object. |
| mc3doc | Database.pdf | Merge DICOM Toolkit DICOM <i>Database Manual</i> . |
| | Platform.pdf | This document. |
| | Refer.pdf | Merge DICOM Toolkit <i>Reference Manual</i> . |

| Directory | File | Description |
|-----------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Sample.pdf | Merge DICOM Toolkit <i>Sample Applications Guide</i> . |
| | User.pdf | Merge DICOM Toolkit <i>User's Manual</i> . |
| mc3inc | bmp.h | Pegasus include file. |
| | diction.h | DICOM Data Dictionary macros. |
| | mc3items.h | Library include file for use with mc3adv.a. |
| | mc3media.h | Library include file for use with mc3adv.a. |
| | mc3msg.h | Library include file for use with mc3adv.a. |
| | mc3services.h | Library include file for use with mc3adv.a. |
| | mcstatus.h | Library include file for use with mc3adv.a. |
| | mergecom.h | Library include file for use with mc3adv.a. |
| | pcd.h | Pegasus include file. |
| | pic.h | Pegasus include file. |
| | stdtypes.h | Pegasus include file. |
| mc3lib | libcudata.so.49 | Unicode conversion data. |
| | libicuuc.so.49 | Unicode conversion library. |
| | libpics20.so | Pegasus shared object which needs to be linked in when you compile your source. |
| | libxml2.so.2.9.3 | XML parsing library. |
| | mc3adv.a | Merge DICOM Toolkit software static library. |
| | mc3adv.so | Merge DICOM Toolkit software shared object. |
| | picn6120.ssm | Pegasus library for JPEG-LS decompression. This file must be copied to the /usr/local/lib/pegasus directory, or must be in a directory pointed to by the SSMPATH environment variable. |
| | picn6220.ssm | Pegasus library for JPEG Lossless compression. This file must be copied to the |

| Directory | File | Description |
|-----------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | /usr/local/lib/pegasus directory, or must be in a directory pointed to by the SSMPATH environment variable. |
| | picn6320.ssm | Pegasus library for JPEG Lossless decompression. This file must be copied to the /usr/local/lib/pegasus directory, or must be in a directory pointed to by the SSMPATH environment variable. |
| | picn6420.ssm | Pegasus library for JPEG Lossy compression. This file must be copied to the /usr/local/lib/pegasus directory, or must be in a directory pointed to by the SSMPATH environment variable. |
| | picn6520.ssm | Pegasus library for JPEG Lossy decompression. This file must be copied to the /usr/local/lib/pegasus directory, or must be in a directory pointed to by the SSMPATH environment variable. |
| | picn6820.ssm | Pegasus library for JPEG 2000 compression. This file must be copied to the /usr/local/lib/pegasus directory, or must be in a directory pointed to by the SSMPATH environment variable. |
| | picn6920.ssm | Pegasus library for JPEG 2000 decompression. This file must be copied to the /usr/local/lib/pegasus directory, or must be in a directory pointed to by the SSMPATH environment variable. |
| mc3msg | default.pfl | Default configuration file used by mc3file. |
| | diction.pfl | Runtime DICOM Data Dictionary profile. |
| | message.txt | DICOM message formats for INFO purposes. |
| | info.pfl | Runtime Message Database profile. |
| | mc3dcomb.pfl | Sample configuration file for use with mc3dcomb utility. |
| | mc3icomb.cfg | Sample configuration file for use with mc3icomb utility. |
| | mrgcom3.dct | Runtime DICOM Data Dictionary File. |
| | mrgcom3.msg | Runtime Message Database File. |

64-Bit Solaris™ 10 on Intel® x64 (008-91116)

Supported Configurations

The following table describes the system requirements for the Merge DICOM Toolkit.

| Category | Requirement |
|------------------------|---------------------------------------------------------------------------|
| Hardware | Solaris 10 on 64-bit Intel x86 supported Ethernet Network Interface Card. |
| Software (base) | 64-bit Solaris 10 Operating System. |
| Software (development) | gcc compiler. |

The Merge DICOM Toolkit Libraries

The Merge DICOM Toolkit for 64-Bit Solaris™ 10 on Intel® x64 is provided in two forms: a shared object and a static library.

Static library

A static library is a collection of subroutines that are callable by your programs. To use them, simply link them with your program.

The compiler flags needed to link with the Merge DICOM Toolkit static library are:

| Flag | Type | Description |
|--------------|--------------|------------------------------------------------------------------------------------------------------|
| -O3 | Compile time | Optimization level. |
| -D_REENTRANT | Compile time | This option specifies that the library is reentrant and can be used in a multi-threaded environment. |
| -ldl | Compile time | Link with dynamic loading library. |

Shared object

A shared object is similar to a static library. It contains entry points for your application to use and call and contains code that will be executed by many different modules. The difference, however, is that the code is not included in the executable file built by the linker or loader. Instead, the code is loaded at runtime when the resources are requested. The code is then mapped into the processes address space.

The usage of the two types of libraries is exactly the same: they are “linked” into an application program by the system loader after the application has been compiled. The way the system loader constructs the executable is different, however.

When a static library is linked with an application, an executable is produced that contains the code of the application and the code of the library. This is not true

with code produced and linked with shared object methods. The application and the shared “library” must be compiled and linked with special compiler flags.

The compiler flags needed to link with the Merge DICOM Toolkit shared object are:

| Flag | Type | Description |
|--------------|--------------|------------------------------------------------------------------------------------------------------|
| -O3 | Compile time | Optimization level. |
| -fPIC | Compile time | Produced position independent code. |
| -D_REENTRANT | Compile time | This option specifies that the library is reentrant and can be used in a multi-threaded environment. |
| -ldl | Compile time | Link with dynamic loading library. |

Also, the `LD_LIBRARY_PATH` environment variable will need to be modified to contain the path of the `mc3adv.so` file. The following is an excerpt from the `man` page of `ld` and describes the function of the `LD_LIBRARY_PATH` environment variable:

“`LD_LIBRARY_PATH` is a list of directories in which to search for libraries specified with the `-l` option. Multiple directories are separated by a colon.”
 “It is also used to specify libraries search path to the run-time linker, that is, if `LD_LIBRARY_PATH` exists in the environment, the run-time linker searches the directories named in it, before the default directories for the shared objects to be linked with the program at execution.”

It should be noted that the Merge DICOM Toolkit shared object (`mc3adv.so`) is designed to be “dynamic-safe” and optimized. This means that the shared object is safe when more than one application executed the same code at the same time.

Miscellaneous Notes

Threading Support

The Merge DICOM Toolkit for Solaris on Intel x64 supports multi-threaded applications. Please see the *User's Manual* for details on the limitations for using Merge DICOM Toolkit with multiple threads.

Compression Support

The Merge DICOM Toolkit for Solaris on Intel x64 does not support the Pegasus compression/decompression libraries.

Built in RLE compression/decompression is available.

Unicode Support

The Merge DICOM Toolkit for Solaris on Intel x64 supports Unicode conversion of DICOM defined character sets with and without code extensions. Two optional

shared object libraries, libicuuc.so.49 and libicudata.so.49, are distributed with the toolkit and are used to perform Unicode character set conversion. Users that wish to use Unicode conversion functions must call `MC_Enable_Unicode_Conversion` to initialize the shared object libraries and ensure the dependency files listed in the table below are available at runtime. Existing users that have no plan to use the Unicode conversion functions don't need to deploy the two shared objects and their dependency files.

Dependency files of libicuuc.so.49 and libicudata.so.49 for Solaris on Intel x64 platform:

| Unicode conversion library | Dependency File | Description |
|------------------------------------|-----------------|----------------------|
| libicuuc.so.49 libicudata.so.49 | libpthread.so.1 | Threading library |
| | libc.so.1 | C library |
| | libstdc++.so.6 | Standard C++ library |
| | libm.so.2 | Math library |
| | libgcc_s.so.1 | GCC library |

Files

The following files are contained in the Merge DICOM Toolkit:

| Directory | File | Description |
|-----------|-----------|------------------------------------------------------------------------------------------------------------|
| | read_me | Information on this release of the toolkit. |
| | 0_x64 | Information concerning how this distribution was created. |
| | setup.sh | Environment variables setup executable for sh. |
| | setup.csh | Environment variables setup executable for csh. |
| mc3apps | comp.c | Sample compression/decompression application. |
| | ct.img | Example CT image file. (This file is generated by mc3file and can be regenerated by the user, if need be.) |

| Directory | File | Description |
|-----------|------------------|---------------------------------------------------------------------------------------------|
| | duplicate.c | Sample for using MC_Standard_Compressor/MC_Standard_De compressor via MC_Duplicate_Message. |
| | general_util.c | General utilities for all sample programs. |
| | general_util.h | General utilities for all sample programs. |
| | inetd_echo_scp.c | Sample DICOM Echo SCP, using the inetd functionality. |
| | makefile | Makefile for example programs. |
| | med_fsu.c | Media File Set Updater Application. |
| | merge.ini | Merge DICOM Toolkit Initialization Configuration File. (Used by all sample applications.) |
| | mergecom.app | Merge DICOM Toolkit Application Profile Configuration File. |
| | mergecom.pro | Merge DICOM Toolkit System Profile Configuration File. |
| | mergecom.srv | Merge DICOM Toolkit Service Profile Configuration File. |
| | mpeg2dicom.c | Sample for packing/unpacking MPEG2 streams into/from DICOM files. |
| | prnt_scp.c | Sample Print SCP Application. |
| | prnt_scu.c | Sample Print SCU Application. |
| | prnt_svc.h | Sample Print Application header file. |
| | qr.h | Sample Query/Retrieve Application Include file. |
| | qr_get_scp.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| | qr_get_scu.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| | qr_scp.c | Sample Query/Retrieve SCP Application. |
| | qr_scu.c | Sample Query/Retrieve SCU Application. |

| Directory | File | Description |
|-----------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| | qr_util.c | Sample Query/Retrieve and Worklist Management Application utility functions. |
| | sreport.c | Sample Structured Report Application |
| | ssl_samp.c | SSL callbacks for SSL SCU and SSL SCP. |
| | ssl_samp.h | Header file for SSL callbacks for SSL SCU and SSL SCP. |
| | ssl_scp.c | Sample SCP application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |
| | ssl_scp.h | Header file for sample SSL SCP application. |
| | ssl_scu.c | Sample SCU application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |
| | stor_scp.c | Sample Storage SCP Application. |
| | stor_scu.c | Sample Storage SCU Application. |
| | work.dat | Database flat file, used by the Modality Worklist SCP application. |
| | workdata.c | Sample database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | workdata.h | Sample header file for database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | work_scp.c | Sample Modality Worklist and Modality Performed Procedure Step SCP Application. |
| | work_scu.c | Sample Modality Worklist and Modality Performed Procedure Step SCU Application. |

| Directory | File | Description |
|-----------|---------------|--------------------------------------------------------------------|
| mc3bin | genconf | Configuration source file generation utility. |
| | gendict | Dictionary source file generation utility. |
| | mc3comp | Compare the values within two DICOM message or file objects. |
| | mc3conv | Convert a DICOM message or file object into a new transfer syntax. |
| | mc3dcomb | Runtime Dictionary Combine utility. |
| | mc3dict | Runtime DICOM Data Dictionary utility. |
| | mc3echo | DICOM Echo Test utility. |
| | mc3file | Generate a DICOM message object. |
| | mc3icomb | Runtime Info Combine utility. |
| | mc3info | Runtime Message Database generation utility. |
| | mc3list | List a DICOM message object. |
| | mc3valid | Validate a DICOM message object. |
| mc3doc | Database.pdf | Merge DICOM Toolkit DICOM <i>Database Manual</i> . |
| | Platform.pdf | This document. |
| | Refer.pdf | Merge DICOM Toolkit <i>Reference Manual</i> . |
| | Sample.pdf | Merge DICOM Toolkit <i>Sample Applications Guide</i> . |
| | User.pdf | Merge DICOM Toolkit <i>User's Manual</i> . |
| mc3inc | diction.h | DICOM Data Dictionary macros. |
| | mc3items.h | Library include file for use with mc3adv.a. |
| | mc3media.h | Library include file for use with mc3adv.a. |
| | mc3msg.h | Library include file for use with mc3adv.a. |
| | mc3services.h | Library include file for use with mc3adv.a. |

| Directory | File | Description |
|-----------|------------------|----------------------------------------------------------|
| | mcstatus.h | Library include file for use with mc3adv.a. |
| | mergecom.h | Library include file for use with mc3adv.a. |
| mc3lib | libcudata.so.49 | Unicode conversion data. |
| | libcucuc.so.49 | Unicode conversion library. |
| | libxml2.so.2.9.3 | XML parsing library. |
| | mc3adv.a | Merge DICOM Toolkit software static library. |
| | mc3adv.so | Merge DICOM Toolkit software shared object. |
| mc3msg | default.pfl | Default configuration file used by mc3file. |
| | diction.pfl | Runtime DICOM Data Dictionary profile. |
| | message.txt | DICOM message formats for INFO purposes. |
| | info.pfl | Runtime Message Database profile. |
| | mc3dcomb.pfl | Sample configuration file for use with mc3dcomb utility. |
| | mc3icomb.cfg | Sample configuration file for use with mc3icomb utility. |
| | mrgcom3.dct | Runtime DICOM Data Dictionary File. |
| | mrgcom3.msg | Runtime Message Database File. |

32-Bit Solaris™ 8 on SPARC® using Sun™ Compiler (008-91119)

Supported Configurations

The following table describes the system requirements for the Merge DICOM Toolkit.

| Category | Requirement |
|-----------------|----------------------------------------------------|
| Hardware | Solaris supported Ethernet Network Interface Card. |
| Software (base) | Solaris 8 Operating System. |

| | |
|------------------------|----------------------------|
| Software (development) | Sun Studio C Compiler v10. |
|------------------------|----------------------------|

The Merge DICOM Toolkit Libraries

The Merge DICOM Toolkit for 32-Bit Solaris 8 on SPARC using Sun Compiler is provided in two forms: a **shared object** and a **static library**.

Static library

A static library is a collection of subroutines that are callable by your programs. To use them, simply link them with your program.

The compiler flags needed to link with the Merge DICOM Toolkit static library are:

| Flag | Type | Description |
|-----------|--------------|------------------------------------|
| -Xa | Compile time | Specifies ANSI C conformance. |
| -misalign | Compile time | Handle misaligned data. |
| -xO3 | Compile time | Optimization enabled. |
| -ldl | Compile time | Link with dynamic loading library. |

Shared object

A shared object is similar to a static library. It contains entry points for your application to use and call and contains code that will be executed by many different modules. The difference, however, is that the code is not included in the executable file built by the linker or loader. Instead, the code is loaded at runtime when the resources are requested. The code is then mapped into the processes address space.

The use of the two types of libraries is exactly the same: they are “linked” into an application program by the system loader after the application has been compiled. The way the system loader constructs the executable is different, however.

When a static library is linked with an application, an executable is produced that contains the code of the application and the code of the library. This is not true with code produced and linked with shared object methods. The application and the shared “library” must be compiled and linked with special compiler flags.

The compiler flags needed to link with the Merge DICOM Toolkit shared object are:

| Flag | Type | Description |
|-----------|--------------|-------------------------------------|
| -Xa | Compile time | Specifies ANSI C conformance. |
| -KPIC | Compile time | Produced position independent code. |
| -misalign | Compile time | Handle misaligned data. |

| | | |
|------|--------------|------------------------------------|
| -xO3 | Compile time | Optimization enabled. |
| -ldl | Compile time | Link with dynamic loading library. |

Also, the `LD_LIBRARY_PATH` environment variable will need to be modified to contain the path of the `mc3adv.so` file. The following is an excerpt from the `man` page of `ld` and describes the function of the `LD_LIBRARY_PATH` environment variable:

“`LD_LIBRARY_PATH` is a list of directories in which to search for libraries specified with the `-l` option. Multiple directories are separated by a colon.”
 “It is also used to specify libraries search path to the run-time linker, that is, if `LD_LIBRARY_PATH` exists in the environment, the run-time linker searches the directories named in it, before the default directories for the shared objects to be linked with the program at execution.”

It should be noted that the Merge DICOM Toolkit shared object (`mc3adv.so`) is designed to be “dynamic-safe” and optimized. This means that the shared object is safe when more than one application executed the same code at the same time.

Miscellaneous Notes

Threading Support

The Merge DICOM Toolkit for Solaris supports multi-threaded applications. Please see the *User's Manual* for details on the limitations for using Merge DICOM Toolkit with multiple threads.

Compression Support

The Merge DICOM Toolkit for Solaris 8 supports the PICTools (formerly known as Pegasus) libraries for compression/decompression from Accusoft (formerly Pegasus Imaging).

Previous versions of this Merge DICOM Toolkit distributed two versions of the library: one that supported the Pegasus libraries and another that did not. Starting with the 3.7.0 release, only one version of the library is distributed that supports the Pegasus libraries.

The Lossless and Lossy JPEG compressors can be utilized within your application without purchasing an additional license from Accusoft. However, the Lossy and Lossless JPEG Pegasus libraries are limited to compress and decompress at a maximum rate of 3 frames per second. This limit can be removed by purchasing a license from Accusoft (www.accusoft.com) and configuring that license in our `mergecom.pro` configuration file.

Note: To use the JPEG2000 compressor or decompressor in your applications, you must purchase a separate license from Accusoft.

Unicode Support

The Merge DICOM Toolkit for Solaris on Sparc using Sun compiler supports Unicode conversion of DICOM defined character sets with and without code

extensions. Two optional shared object libraries, libicuuc.so.49 and libicudata.so.49, are distributed with the toolkit and are used to perform Unicode character set conversion. Users that wish to use Unicode conversion functions must call `MC_Enable_Unicode_Conversion` to initialize the shared object libraries and ensure the dependency files listed in the table below are available at runtime. Existing users that have no plan to use the Unicode conversion functions don't need to deploy the two shared objects and their dependency files.

Dependency files of libicuuc.so.49 and libicudata.so.49 for Solaris on Sparc using Sun compiler platform:

| Unicode conversion library | Dependency File | Description |
|------------------------------------|-----------------|-------------------------|
| libicuuc.so.49 libicudata.so.49 | libpthread.so.1 | Threading library |
| | libc.so.1 | C library |
| | libCrun.so.1 | C runtime library |
| | libm.so.1 | Math library |
| | libdl.so.1 | Dynamic loading library |
| | libthread.so.1 | Threading library |
| | libc_psr.so.1 | SUN library |

Files

The following files are contained in the Merge DICOM Toolkit:

| Directory | File | Description |
|------------|-------------------------------|------------------------------------------------------------------------------------------------------------|
| | read_me | Information on this release of the toolkit. |
| | 0_sol | Information concerning how this distribution was created. |
| | setup.sh | Environment variables setup executable for sh. |
| | setup.csh | Environment variables setup executable for csh. |
| mc3apps | comp.c | Sample compression/decompression application. |
| | ct.img | Example CT image file. (This file is generated by mc3file and can be regenerated by the user, if need be.) |
| | duplicate.c | Sample for using MC_Standard_Compressor/MC_Standard_De compressor via MC_Duplicate_Message. |
| | general_util.c | General utilities for all sample programs. |
| | general_util.h | General utilities for all sample programs. |
| | inetd_echo_scp.c | Sample DICOM Echo SCP, using the inetd functionality. |
| | makefile | Makefile for example programs. |
| | med_fsu.c | Media File Set Updater Application. |
| | merge.ini | Merge DICOM Toolkit Initialization Configuration File. (Used by all sample applications.) |
| | mergecom.app | Merge DICOM Toolkit Application Profile Configuration File. |
| | mergecom.pro | Merge DICOM Toolkit System Profile Configuration File. |
| | mergecom.srv | Merge DICOM Toolkit Service Profile Configuration File. |
| | mpeg2dicom.c | Sample for packing/unpacking MPEG2 streams into/from DICOM files. |
| prnt_scp.c | Sample Print SCP Application. | |

| | |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| prnt_scu.c | Sample Print SCU Application. |
| prnt_svc.h | Sample Print Application header file. |
| qr.h | Sample Query/Retrieve Application Include file. |
| qr_get_scp.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| qr_get_scu.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| qr_scp.c | Sample Query/Retrieve SCP Application. |
| qr_scu.c | Sample Query/Retrieve SCU Application. |
| qr_util.c | Sample Query/Retrieve and Worklist Management Application utility functions. |
| sreport.c | Sample Structured Report Application |
| ssl_samp.c | SSL callbacks for SSL SCU and SSL SCP. |
| ssl_samp.h | Header file for SSL callbacks for SSL SCU and SSL SCP. |
| ssl_scp.c | Sample SCP application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |
| ssl_scp.h | Header file for sample SSL SCP application. |
| ssl_scu.c | Sample SCU application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |
| stor_scp.c | Sample Storage SCP Application. |
| stor_scu.c | Sample Storage SCU Application. |
| work.dat | Database flat file, used by the Modality Worklist SCP application. |
| workdata.c | Sample database functions used by Modality Worklist and Performed Procedure Step SCP Application. |

| | | |
|--------|--------------|-------------------------------------------------------------------------------------------------------------------|
| | workdata.h | Sample header file for database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | work_scp.c | Sample Modality Worklist and Modality Performed Procedure Step SCP Application. |
| | work_scu.c | Sample Modality Worklist and Modality Performed Procedure Step SCU Application. |
| mc3bin | genconf | Configuration source file generation utility. |
| | gendict | Dictionary source file generation utility. |
| | mc3comp | Compare the values within two DICOM message or file objects. |
| | mc3conv | Convert a DICOM message or file object into a new transfer syntax. |
| | mc3dcomb | Runtime Dictionary Combine utility. |
| | mc3dict | Runtime DICOM Data Dictionary utility. |
| | mc3echo | DICOM Echo Test utility. |
| | mc3file | Generate a DICOM message object. |
| | mc3icomb | Runtime Info Combine utility. |
| | mc3info | Runtime Message Database generation utility. |
| | mc3list | List a DICOM message object. |
| | mc3valid | Validate a DICOM message object. |
| mc3doc | Database.pdf | Merge DICOM Toolkit DICOM <i>Database Manual</i> . |
| | Platform.pdf | This document. |
| | Refer.pdf | Merge DICOM Toolkit <i>Reference Manual</i> . |
| | Sample.pdf | Merge DICOM Toolkit <i>Sample Applications Guide</i> . |
| | User.pdf | Merge DICOM Toolkit <i>User's Manual</i> . |
| mc3inc | bmp.h | Pegasus include file. |
| | diction.h | DICOM Data Dictionary macros. |

| | | |
|--------|------------------|---------------------------------------------------------------------------------|
| | mc3items.h | Library include file for use with mc3adv.a. |
| | mc3media.h | Library include file for use with mc3adv.a. |
| | mc3msg.h | Library include file for use with mc3adv.a. |
| | mc3services.h | Library include file for use with mc3adv.a. |
| | mcstatus.h | Library include file for use with mc3adv.a. |
| | mergecom.h | Library include file for use with mc3adv.a. |
| | pcd.h | Pegasus include file. |
| | pic.h | Pegasus include file. |
| | stdtypes.h | Pegasus include file. |
| mc3lib | libcudata.so.49 | Unicode conversion data |
| | libicuuc.so.49 | Unicode conversion library |
| | libxml2.so.2.9.3 | XML parsing library |
| | libpicu20.so | Pegasus shared object which needs to be linked in when you compile your source. |
| | mc3adv.a | Merge DICOM Toolkit software static library. |
| | mc3adv.so | Merge DICOM Toolkit software shared object. |
| | picu6120.so | Pegasus shared library for JPEG-LS decompression. |
| | picu6220.so | Pegasus shared library for JPEG Lossless compression. |
| | picu6320.so | Pegasus shared library for JPEG Lossless decompression. |
| | picu6420.so | Pegasus shared library for JPEG Lossy compression. |
| | picu6520.so | Pegasus shared library for JPEG Lossy decompression. |
| | picu6820.so | Pegasus shared library for JPEG 2000 compression. |

| | | |
|--------|--------------|----------------------------------------------------------|
| | picu6920.so | Pegasus shared library for JPEG 2000 decompression. |
| mc3msg | default.pfl | Default configuration file used by mc3file. |
| | diction.pfl | Runtime DICOM Data Dictionary profile. |
| | message.txt | DICOM message formats for INFO purposes. |
| | info.pfl | Runtime Message Database profile. |
| | mc3dcomb.pfl | Sample configuration file for use with mc3dcomb utility. |
| | mc3icomb.cfg | Sample configuration file for use with mc3icomb utility. |
| | mrgcom3.dct | Runtime DICOM Data Dictionary File. |
| | mrgcom3.msg | Runtime Message Database File. |

32-Bit Solaris™ 8 on SPARC® using GCC Compiler (008-91130)

Supported Configurations

The following table describes the system requirements for the Merge DICOM Toolkit.

| Category | Requirement |
|------------------------|----------------------------------------------------|
| Hardware | Solaris supported Ethernet Network Interface Card. |
| Software (base) | Solaris 8 Operating System. |
| Software (development) | gcc 3.4.6 |

The Merge DICOM Toolkit Libraries

The Merge DICOM Toolkit for 32-Bit Solaris 8 on SPARC using GCC Compiler is provided in two forms: a **shared object** and a **static library**.

Static library

A static library is a collection of subroutines that are callable by your programs. To use them, simply link them with your program.

The compiler flags needed to link with the Merge DICOM Toolkit static library are:

| Flag | Type | Description |
|------|--------------|------------------------------------|
| -O3 | Compile time | Optimization level. |
| -ldl | Compile time | Link with dynamic loading library. |

Shared object

A shared object is similar to a static library. It contains entry points for your application to use and call and contains code that will be executed by many different modules. The difference, however, is that the code is not included in the executable file built by the linker or loader. Instead, the code is loaded at runtime when the resources are requested. The code is then mapped into the processes address space.

The use of the two types of libraries is exactly the same: they are “linked” into an application program by the system loader after the application has been compiled. The way the system loader constructs the executable is different, however.

When a static library is linked with an application, an executable is produced that contains the code of the application and the code of the library. This is not true with code produced and linked with shared object methods. The application and the shared “library” must be compiled and linked with special compiler flags.

The compiler flags needed to link with the Merge DICOM Toolkit shared object are:

| Flag | Type | Description |
|-------|--------------|------------------------------------|
| -O3 | Compile time | Optimization level |
| -fPIC | Compile Time | Produced position independent code |
| -ldl | Compile time | Link with dynamic loading library |

Also, the `LD_LIBRARY_PATH` environment variable will need to be modified to contain the path of the `mc3adv.so` file. The following is an excerpt from the `man` page of `ld` and describes the function of the `LD_LIBRARY_PATH` environment variable:

“`LD_LIBRARY_PATH` is a list of directories in which to search for libraries specified with the `-l` option. Multiple directories are separated by a colon.”
 “It is also used to specify libraries search path to the run-time linker, that is, if `LD_LIBRARY_PATH` exists in the environment, the run-time linker searches the directories named in it, before the default directories for the shared objects to be linked with the program at execution.”

It should be noted that the Merge DICOM Toolkit shared object (`mc3adv.so`) is designed to be “dynamic-safe” and optimized. This means that the shared object is safe when more than one application executed the same code at the same time.

Miscellaneous Notes

Threading Support

The Merge DICOM Toolkit for Solaris 8 supports multi-threaded applications. Please see the *User's Manual* for details on the limitations for using Merge DICOM Toolkit with multiple threads.

Compression Support

The Merge DICOM Toolkit for Solaris 8 supports the PICTools (formerly known as Pegasus) libraries for compression/decompression from Accusoft (formerly Pegasus Imaging).

Previous versions of this Merge DICOM Toolkit distributed two versions of the library: one that supported the Pegasus libraries and another that did not. Starting with the 3.7.0 release, only one version of the library is distributed that supports the Pegasus libraries.

The Lossless and Lossy JPEG compressors can be utilized within your application without purchasing an additional license from Accusoft . However, the Lossy and Lossless JPEG Pegasus libraries are limited to compress and decompress at a maximum rate of 3 frames per second. This limit can be removed by purchasing a license from Accusoft (www.accusoft.com) and configuring that license in our mergecom.pro configuration file.

Note: To use the JPEG2000 compressor or decompressor in your applications, you must purchase a separate license from Accusoft .

Unicode Support

The Merge DICOM Toolkit for Solaris on Sparc using GCC compiler supports Unicode conversion of DICOM defined character sets with and without code extensions. Two optional shared object libraries, libicuuc.so.49 and libicudata.so.49, are distributed with the toolkit and are used to perform Unicode character set conversion. Users that wish to use Unicode conversion functions must call MC_Enable_Unicode_Conversion to initialize the shared object libraries and ensure the dependency files listed in the table below are available at runtime. Existing users that have no plan to use the Unicode conversion functions don't need to deploy the two shared objects and their dependency files.

Dependency files of libicuuc.so.49 and libicudata.so.49 for Solaris on Sparc using GCC compiler platform:

| Unicode conversion library | Dependency File | Description |
|------------------------------------|-----------------|----------------------|
| libicuuc.so.49 libicudata.so.49 | libpthread.so.1 | Threading library |
| | libc.so.1 | C library |
| | libstdc++.so.6 | Standard C++ library |

| Unicode conversion library | Dependency File | Description |
|----------------------------|-----------------|-------------------------|
| | libm.so.1 | Math library |
| | libgcc_s.so.1 | GCC library |
| | libdl.so.1 | Dynamic loading library |
| | libthread.so.1 | Threading library |
| | libc_psr.so.1 | SUN library |

Files

The following files are contained in the Merge DICOM Toolkit:

| Directory | File | Description |
|-----------|------------------|------------------------------------------------------------------------------------------------------------|
| | read_me | Information on this release of the toolkit. |
| | 0_sol8 | Information concerning how this distribution was created. |
| | setup.sh | Environment variables setup executable for sh. |
| | setup.csh | Environment variables setup executable for csh. |
| mc3apps | comp.c | Sample compression/decompression application. |
| | ct.img | Example CT image file. (This file is generated by mc3file and can be regenerated by the user, if need be.) |
| | duplicate.c | Sample for using MC_Standard_Compressor/MC_Standard_De compressor via MC_Duplicate_Message. |
| | general_util.c | General utilities for all sample programs. |
| | general_util.h | General utilities for all sample programs. |
| | inetd_echo_scp.c | Sample DICOM Echo SCP, using the inetd functionality. |
| | makefile | Makefile for example programs. |

| | |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| med_fsu.c | Media File Set Updater Application. |
| merge.ini | Merge DICOM Toolkit Initialization Configuration File. (Used by all sample applications.) |
| mergecom.app | Merge DICOM Toolkit Application Profile Configuration File. |
| mergecom.pro | Merge DICOM Toolkit System Profile Configuration File. |
| mergecom.srv | Merge DICOM Toolkit Service Profile Configuration File. |
| mpeg2dicom.c | Sample for packing/unpacking MPEG2 streams into/from DICOM files. |
| prnt_scp.c | Sample Print SCP Application. |
| prnt_scu.c | Sample Print SCU Application. |
| prnt_svc.h | Sample Print Application header file. |
| qr.h | Sample Query/Retrieve Application Include file. |
| qr_get_scp.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| qr_get_scu.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| qr_scp.c | Sample Query/Retrieve SCP Application. |
| qr_scu.c | Sample Query/Retrieve SCU Application. |
| qr_util.c | Sample Query/Retrieve and Worklist Management Application utility functions. |
| sreport.c | Sample Structured Report Application |
| ssl_samp.c | SSL callbacks for SSL SCU and SSL SCP. |
| ssl_samp.h | Header file for SSL callbacks for SSL SCU and SSL SCP. |
| ssl_scp.c | Sample SCP application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |

| | | |
|--------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| | ssl_scp.h | Header file for sample SSL SCP application. |
| | ssl_scu.c | Sample SCU application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |
| | stor_scp.c | Sample Storage SCP Application. |
| | stor_scu.c | Sample Storage SCU Application. |
| | work.dat | Database flat file, used by the Modality Worklist SCP application. |
| | workdata.c | Sample database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | workdata.h | Sample header file for database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | work_scp.c | Sample Modality Worklist and Modality Performed Procedure Step SCP Application. |
| | work_scu.c | Sample Modality Worklist and Modality Performed Procedure Step SCU Application. |
| mc3bin | genconf | Configuration source file generation utility. |
| | gendict | Dictionary source file generation utility. |
| | mc3comp | Compare the values within two DICOM message or file objects. |
| | mc3conv | Convert a DICOM message or file object into a new transfer syntax. |
| | mc3dcomb | Runtime Dictionary Combine utility. |
| | mc3dict | Runtime DICOM Data Dictionary utility. |
| | mc3echo | DICOM Echo Test Utility. |
| | mc3file | Generate a DICOM message object. |
| | mc3icomb | Runtime Info Combine utility. |
| | mc3info | Runtime Message Database generation utility. |
| | mc3list | List a DICOM message object. |

| | | |
|--------|------------------|---------------------------------------------------------------------------------|
| | mc3valid | Validate a DICOM message object. |
| mc3doc | Database.pdf | Merge DICOM Toolkit DICOM <i>Database Manual</i> . |
| | Platform.pdf | This document. |
| | Refer.pdf | Merge DICOM Toolkit <i>Reference Manual</i> . |
| | Sample.pdf | Merge DICOM Toolkit <i>Sample Applications Guide</i> . |
| | User.pdf | Merge DICOM Toolkit <i>User's Manual</i> . |
| mc3inc | bmp.h | Pegasus include file. |
| | diction.h | DICOM Data Dictionary macros |
| | mc3items.h | Library include file for use with mc3adv.a. |
| | mc3media.h | Library include file for use with mc3adv.a. |
| | mc3msg.h | Library include file for use with mc3adv.a. |
| | mc3services.h | Library include file for use with mc3adv.a. |
| | mcstatus.h | Library include file for use with mc3adv.a. |
| | mergecom.h | Library include file for use with mc3adv.a. |
| | pcd.h | Pegasus include file. |
| | pic.h | Pegasus include file. |
| | stdtypes.h | Pegasus include file. |
| mc3lib | libcudata.so.49 | Unicode conversion data. |
| | libicuuc.so.49 | Unicode conversion library. |
| | libpicu20.so | Pegasus shared object which needs to be linked in when you compile your source. |
| | libxml2.so.2.9.3 | XML parsing library. |
| | mc3adv.a | Merge DICOM Toolkit software static library. |
| | mc3adv.so | Merge DICOM Toolkit software shared object. |

| | | |
|--------|--------------|----------------------------------------------------------|
| | picu6120.so | Pegasus shared library for JPEG-LS decompression. |
| | picu6220.so | Pegasus shared library for JPEG Lossless compression. |
| | picu6320.so | Pegasus shared library for JPEG Lossless decompression. |
| | picu6420.so | Pegasus shared library for JPEG Lossy compression. |
| | picu6520.so | Pegasus shared library for JPEG Lossy decompression. |
| | picu6820.so | Pegasus shared library for JPEG 2000 compression. |
| | picu6920.so | Pegasus shared library for JPEG 2000 decompression. |
| mc3msg | default.pfl | Default configuration file used by mc3file. |
| | diction.pfl | Runtime DICOM Data Dictionary profile. |
| | message.txt | DICOM message formats for INFO purposes. |
| | info.pfl | Runtime Message Database profile. |
| | mc3dcomb.pfl | Sample configuration file for use with mc3dcomb utility. |
| | mc3icomb.cfg | Sample configuration file for use with mc3icomb utility. |
| | mrgcom3.dct | Runtime DICOM Data Dictionary File. |
| | mrgcom3.msg | Runtime Message Database File. |

32-Bit Mac OS® X Using Universal Binaries (008-91301)

Supported Configurations

The following table describes the system requirements for the Merge DICOM Toolkit.

| Category | Requirement |
|------------------------|-----------------------------------------------------------------------------|
| Hardware | Mac OS X supported hardware. |
| Software (base) | Mac OS X v10.4 or later. |
| Software (development) | i686-apple-darwin8-gcc-4.0.1 (GCC) 4.0.1 (Apple Computer, Inc. build 5250). |

The Merge DICOM Toolkit Libraries

The Merge DICOM Toolkit for 32-Bit Mac OS® X Using Universal Binaries is provided as a **static library** and a **dynamic library**.

Static library

A static library is a collection of subroutines that are callable by your programs. To use them, simply link it with your program. The following compilation options were utilized to create the static library:

| Compile Options | Description |
|----------------------------------------------|---------------------------------------------|
| -arch i386 | Support Intel based MacOS X computers |
| -arch ppc | Support PowerPC based MacOS X computers |
| -isysroot /Developer/SDKs/MacOSX10.4u.sdk | Use the MacOS X 10.4 SDK. |
| -O2 | Enable optimization. |
| -D_REENTRANT | Produce reentrant code that is thread safe. |

Dynamic library

A dynamic library is similar to a static library. It contains entry points for your application to use and call and contains code that will be executed by many different modules. The difference, however, is that the code is not included in the executable file built by the linker or loader. Instead, the code is loaded at runtime when the resources are requested. The code is then mapped into the processes address space.

The following compile options were used to generate the dynamic library:

| Compile Options | Description |
|--------------------------------------------------|------------------------------------------|
| -arch i386 | Support Intel based MacOS X computers. |
| -arch ppc | Support PowerPC based MacOS X computers. |
| -isysroot /Developer/SDKs/MacOSX10.4u .sdk | Use the MacOS X 10.4 SDK. |

| | |
|--------------|---------------------------------------------|
| -O2 | Enable optimization. |
| -D_REENTRANT | Produce reentrant code that is thread safe. |

The following link options were used to generate the dynamic library:

| Link Options | Description |
|---------------------------------------------------|---------------------------------------------------------|
| -dynamiclib | Create a dynamic library. |
| -install_name mc3adv.dylib | Set the name of the dynamic library. |
| -arch i386 | Support Intel based MacOS X computers. |
| -arch ppc | Support PowerPC based MacOS X computers. |
| -single_module | Build the library so it only has one module. |
| -flat_namespace | Force the output to be built as a flat namespace image. |
| -Wl, -syslibroot, /Developer/SDKs/MacOSX10.4u.sdk | Use the MacOS X 10.4 SDK. |

Miscellaneous Notes

Threading Support

The Merge DICOM Toolkit for MacOS X with Universal Binaries supports multi-thread applications. It utilizes the pthreads library to support multiple threads.

Compression Support

The Merge DICOM Toolkit for MacOS X with Universal Binaries does not support the Pegasus libraries for JPEG compression and decompression.

Unicode Support

The Merge DICOM Toolkit for 32-bit MacOS X with Universal Binaries supports Unicode conversion of DICOM defined character sets with and without code extensions. Two optional shared object libraries, libicuuc.49.dylib and libicudata.49.dylib, are distributed with the toolkit and are used to perform Unicode character set conversion. Users that wish to use Unicode conversion functions must call MC_Enable_Unicode_Conversion to initialize the shared object libraries and ensure the dependency files listed in the table below are available at runtime. Existing users that have no plan to use the Unicode conversion functions don't need to deploy the two shared objects and their dependency files.

Dependency files of libcuc.49.dylib and libcudata.49.dylib for 32-bit MacOS X with Universal Binaries platform:

| Unicode conversion library | Dependency File | Description |
|---------------------------------------|-------------------|----------------------|
| libcuc.49.dylib libcudata.49.dylib | libstdc++.6.dylib | Standard C++ library |
| | libgcc_s.1.dylib | GCC library |
| | libSystem.B.dylib | Mac OS X library |

Files

The following files are contained in the Merge DICOM Toolkit:

| Directory | File | Description |
|-----------|------------------|------------------------------------------------------------------------------------------------------------|
| | read_me | Information on this release of the toolkit. |
| | 0_osxi | Information concerning how this distribution was created. |
| | setup.sh | Environment variables setup executable for sh. |
| | setup.csh | Environment variables setup executable for csh. |
| mc3apps | comp.c | Sample compression/decompression application. |
| | ct.img | Example CT image file. (This file is generated by mc3file and can be regenerated by the user, if need be.) |
| | duplicate.c | Sample for using MC_Standard_Compressor/MC_Standard_De compressor via MC_Duplicate_Message. |
| | general_util.c | General utilities for all sample programs. |
| | general_util.h | General utilities for all sample programs. |
| | inetd_echo_scp.c | Sample DICOM Echo SCP, using the inetd functionality. |
| | makefile | Makefile for example programs. |
| | med_fsu.c | Media File Set Updater Application. |

| | |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| merge.ini | Merge DICOM Toolkit Initialization Configuration File. (Used by all sample applications.) |
| mergecom.app | Merge DICOM Toolkit Application Profile Configuration File. |
| mergecom.pro | Merge DICOM Toolkit System Profile Configuration File. |
| mergecom.srv | Merge DICOM Toolkit Service Profile Configuration File. |
| mpeg2dicom.c | Sample for packing/unpacking MPEG2 streams into/from DICOM files. |
| prnt_scp.c | Sample Print SCP Application. |
| prnt_scu.c | Sample Print SCU Application. |
| prnt_svc.h | Sample Print Application header file. |
| qr.h | Sample Query/Retrieve Application Include file. |
| qr_get_scp.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| qr_get_scu.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| qr_scp.c | Sample Query/Retrieve SCP Application. |
| qr_scu.c | Sample Query/Retrieve SCU Application. |
| qr_util.c | Sample Query/Retrieve and Worklist Management Application utility functions. |
| sreport.c | Sample Structured Report Application |
| ssl_samp.c | SSL callbacks for SSL SCU and SSL SCP. |
| ssl_samp.h | Header file for SSL callbacks for SSL SCU and SSL SCP. |
| ssl_scp.c | Sample SCP application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |
| ssl_scp.h | Header file for sample SSL SCP application. |

| | | |
|--------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| | ssl_scu.c | Sample SCU application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |
| | stor_scp.c | Sample Storage SCP Application. |
| | stor_scu.c | Sample Storage SCU Application. |
| | work.dat | Database flat file, used by the Modality Worklist SCP application. |
| | workdata.c | Sample database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | workdata.h | Sample header file for database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | work_scp.c | Sample Modality Worklist and Modality Performed Procedure Step SCP Application. |
| | work_scu.c | Sample Modality Worklist and Modality Performed Procedure Step SCU Application. |
| mc3bin | genconf | Configuration source file generation utility. |
| | gendict | Dictionary source file generation utility. |
| | mc3comp | Compare the values within two DICOM message or file objects. |
| | mc3conv | Convert a DICOM message or file object into a new transfer syntax. |
| | mc3dcomb | Runtime Dictionary Combine utility. |
| | mc3dict | Runtime DICOM Data Dictionary utility. |
| | mc3echo | DICOM Echo Test Utility. |
| | mc3file | Generate a DICOM message object. |
| | mc3icomb | Runtime Info Combine utility. |
| | mc3info | Runtime Message Database generation utility. |
| | mc3list | List a DICOM message object. |
| | mc3valid | Validate a DICOM message object. |

| | | |
|--------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------|
| mc3doc | Database.pdf | Merge DICOM Toolkit DICOM <i>Database Manual</i> . |
| | Platform.pdf | This document. |
| | Refer.pdf | Merge DICOM Toolkit <i>Reference Manual</i> . |
| | Sample.pdf | Merge DICOM Toolkit <i>Sample Applications Guide</i> . |
| | User.pdf | Merge DICOM Toolkit <i>User's Manual</i> . |
| mc3inc | diction.h | DICOM Data Dictionary macros. |
| | mc3items.h | Library include file for use with mc3adv.a. |
| | mc3media.h | Library include file for use with mc3adv.a. |
| | mc3msg.h | Library include file for use with mc3adv.a. |
| | mc3services.h | Library include file for use with mc3adv.a. |
| | mcstatus.h | Library include file for use with mc3adv.a. |
| | mergecom.h | Library include file for use with mc3adv.a. |
| mc3lib | libcudata49.dylib | Unicode conversion data. |
| | libcudata49.dylib.ppc | Unicode conversion data for Power PC based machine. This file must be renamed to libcudata.49.dylib before running application. |
| | libcuuc.49.dylib | Unicode conversion library. |
| | libxml2.2.dylib | XML parsing library. |
| | mc3adv.a | Merge DICOM Toolkit software static library. |
| | mc3adv.dylib | Merge DICOM Toolkit software dynamic library. |
| mc3msg | default.pfl | Default configuration file used by mc3file. |
| | diction.pfl | Runtime DICOM Data Dictionary profile. |
| | message.txt | DICOM message formats for INFO purposes. |
| | info.pfl | Runtime Message Database profile. |

| | | |
|--|--------------|----------------------------------------------------------|
| | mc3dcomb.pfl | Sample configuration file for use with mc3dcomb utility. |
| | mc3icomb.cfg | Sample configuration file for use with mc3icomb utility. |
| | mrgcom3.dct | Runtime DICOM Data Dictionary File. |
| | mrgcom3.msg | Runtime Message Database File. |

64-Bit Mac OS® X on Intel® x64 (008-91303)

Supported Configurations

The following table describes the system requirements for the Merge DICOM Toolkit.

| Category | Requirement |
|------------------------|-----------------------------------------------------------------------------|
| Hardware | Mac OS X supported 64-bit Intel x86 hardware. |
| Software (base) | Mac OS X v10.5.6 or later. |
| Software (development) | i686-apple-darwin8-gcc-4.0.1 (GCC) 4.0.1 (Apple Computer, Inc. build 5484). |

The Merge DICOM Toolkit Libraries

The Merge DICOM Toolkit for 64-Bit Mac OS® X on Intel® x64 is provided as a **static library** and a **dynamic library**.

Static library

A static library is a collection of subroutines that are callable by your programs. To use them, simply link it with your program. The following compilation options were utilized to create the static library:

| Compile Options | Description |
|-----------------|---------------------------------------------|
| -arch i386 | Support Intel based MacOS X computers. |
| -m64 | Generate code for a 64-bit environment. |
| -O2 | Enable optimization. |
| -D_REENTRANT | Produce reentrant code that is thread safe. |

Dynamic library

A dynamic library is similar to a static library. It contains entry points for your application to use and call and contains code that will be executed by many

different modules. The difference, however, is that the code is not included in the executable file built by the linker or loader. Instead, the code is loaded at runtime when the resources are requested. The code is then mapped into the processes address space.

The following compile options were used to generate the dynamic library:

| Compile Options | Description |
|-----------------|---------------------------------------------|
| -arch i386 | Support Intel based MacOS X computers |
| -m64 | Generate code for a 64-bit environment |
| -O2 | Enable optimization. |
| -D_REENTRANT | Produce reentrant code that is thread safe. |

The following link options were used to generate the dynamic library:

| Link Options | Description |
|----------------------------|---------------------------------------------------------|
| -dynamiclib | Create a dynamic library. |
| -install_name mc3adv.dylib | Set the name of the dynamic library. |
| -arch i386 | Support Intel based MacOS X computers. |
| -single_module | Build the library so it only has one module. |
| -flat_namespace | Force the output to be built as a flat namespace image. |

Miscellaneous Notes

Threading Support

The Merge DICOM Toolkit for 64-bit MacOS X supports multi-threaded applications. It utilizes the pthreads library to support multiple threads.

Compression Support

The Merge DICOM Toolkit for 64-bit MacOS X does not support the Pegasus libraries for JPEG compression and decompression, only RLE compression is supported.

Unicode Support

The Merge DICOM Toolkit for 64-bit MacOS X on Intel supports Unicode conversion of DICOM defined character sets with and without code extensions. Two optional shared object libraries, libicuuc.49.dylib and libicudata.49.dylib, are distributed with the toolkit and are used to perform Unicode character set

conversion. Users that wish to use Unicode conversion functions must call `MC_Enable_Unicode_Conversion` to initialize the shared object libraries and ensure the dependency files listed in the table below are available at runtime. Existing users that have no plan to use the Unicode conversion functions don't need to deploy the two shared objects and their dependency files.

Dependency files of `libcuc.49.dylib` and `libcudata.49.dylib` for 64-bit MacOS X on Intel platform:

| Unicode conversion library | Dependency File | Description |
|---------------------------------------|-------------------|----------------------|
| libcuc.49.dylib libcudata.49.dylib | libstdc++.6.dylib | Standard C++ library |
| | libgcc_s.1.dylib | GCC library |
| | libSystem.B.dylib | Mac OS X library |

Files

The following files are contained in the Merge DICOM Toolkit:

| Directory | File | Description |
|-----------|----------------|-----------------------------------------------------------------------------------------------------------------------|
| | read_me | Information on this release of the toolkit. |
| | 0_osxi64 | Information concerning how this distribution was created. |
| | setup.sh | Environment variables setup executable for sh. |
| | setup.csh | Environment variables setup executable for csh. |
| mc3apps | comp.c | Sample compression/decompression application. |
| | ct.img | Example CT image file. (This file is generated by mc3file and can be regenerated by the user, if need be.) |
| | duplicate.c | Sample for using <code>MC_Standard_Compressor/MC_Standard_Decompressor</code> via <code>MC_Duplicate_Message</code> . |
| | general_util.c | General utilities for all sample programs. |
| | general_util.h | General utilities for all sample programs. |

| Directory | File | Description |
|-----------|------------------|-------------------------------------------------------------------------------------------|
| | inetd_echo_scp.c | Sample DICOM Echo SCP, using the inetd functionality. |
| | makefile | Makefile for example programs. |
| | med_fsu.c | Media File Set Updater Application. |
| | merge.ini | Merge DICOM Toolkit Initialization Configuration File. (Used by all sample applications.) |
| | mergecom.app | Merge DICOM Toolkit Application Profile Configuration File. |
| | mergecom.pro | Merge DICOM Toolkit System Profile Configuration File. |
| | mergecom.srv | Merge DICOM Toolkit Service Profile Configuration File. |
| | mpeg2dicom.c | Sample for packing/unpacking MPEG2 streams into/from DICOM files. |
| | prnt_scp.c | Sample Print SCP Application. |
| | prnt_scu.c | Sample Print SCU Application. |
| | prnt_svc.h | Sample Print Application header file. |
| | qr.h | Sample Query/Retrieve Application Include file. |
| | qr_get_scp.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| | qr_get_scu.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| | qr_scp.c | Sample Query/Retrieve SCP Application. |
| | qr_scu.c | Sample Query/Retrieve SCU Application. |
| | qr_util.c | Sample Query/Retrieve and Worklist Management Application utility functions. |
| | sreport.c | Sample Structured Report Application |
| | ssl_samp.c | SSL callbacks for SSL SCU and SSL SCP. |

| Directory | File | Description |
|-----------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| | ssl_samp.h | Header file for SSL callbacks for SSL SCU and SSL SCP. |
| | ssl_scp.c | Sample SCP application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |
| | ssl_scp.h | Header file for sample SSL SCP application. |
| | ssl_scu.c | Sample SCU application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |
| | stor_scp.c | Sample Storage SCP Application. |
| | stor_scu.c | Sample Storage SCU Application. |
| | work.dat | Database flat file, used by the Modality Worklist SCP application. |
| | workdata.c | Sample database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | workdata.h | Sample header file for database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | work_scp.c | Sample Modality Worklist and Modality Performed Procedure Step SCP Application. |
| | work_scu.c | Sample Modality Worklist and Modality Performed Procedure Step SCU Application. |

| Directory | File | Description |
|-----------|---------------|--------------------------------------------------------------------|
| mc3bin | genconf | Configuration source file generation utility. |
| | gendict | Dictionary source file generation utility. |
| | mc3comp | Compare the values within two DICOM message or file objects. |
| | mc3conv | Convert a DICOM message or file object into a new transfer syntax. |
| | mc3dcomb | Runtime Dictionary Combine utility. |
| | mc3dict | Runtime DICOM Data Dictionary utility. |
| | mc3echo | DICOM Echo Test Utility. |
| | mc3file | Generate a DICOM message object. |
| | mc3icomb | Runtime Info Combine utility. |
| | mc3info | Runtime Message Database generation utility. |
| | mc3list | List a DICOM message object. |
| | mc3valid | Validate a DICOM message object. |
| mc3doc | Database.pdf | Merge DICOM Toolkit DICOM <i>Database Manual</i> . |
| | Platform.pdf | This document. |
| | Refer.pdf | Merge DICOM Toolkit <i>Reference Manual</i> . |
| | Sample.pdf | Merge DICOM Toolkit <i>Sample Applications Guide</i> . |
| | User.pdf | Merge DICOM Toolkit <i>User's Manual</i> . |
| mc3inc | diction.h | DICOM Data Dictionary macros. |
| | mc3items.h | Library include file for use with mc3adv.a. |
| | mc3media.h | Library include file for use with mc3adv.a. |
| | mc3msg.h | Library include file for use with mc3adv.a. |
| | mc3services.h | Library include file for use with mc3adv.a. |

| Directory | File | Description |
|-----------|--------------------|-----------------------------------------------------------|
| | mcstatus.h | Library include file for use with mc3adv.a. |
| | mergecom.h | Library include file for use with mc3adv.a. |
| mc3lib | libcudata.49.dylib | Unicode conversion data. |
| | libcuc.49.dylib | Unicode conversion library. |
| | libxml2.2.dylib | XML parsing library. |
| | mc3adv.a | Merge DICOM Toolkit software static library. |
| | mc3adv.dylib | Merge DICOM Toolkit software object code dynamic library. |
| mc3msg | default.pfl | Default configuration file used by mc3file. |
| | diction.pfl | Runtime DICOM Data Dictionary profile. |
| | message.txt | DICOM message formats for INFO purposes. |
| | info.pfl | Runtime Message Database profile. |
| | mc3dcomb.pfl | Sample configuration file for use with mc3dcomb utility. |
| | mc3icomb.cfg | Sample configuration file for use with mc3icomb utility. |
| | mrgcom3.dct | Runtime DICOM Data Dictionary File. |
| | mrgcom3.msg | Runtime Message Database File. |

32-Bit Android on ARMv7-A (008-91998)

Supported Configurations

The following table describes the system requirements for the Merge DICOM Toolkit.

| Category | Requirement |
|-----------------|-------------------------------------|
| Hardware | Android supported ARMv7-A hardware. |
| Software (base) | Android 5.1 (Lollipop) or later. |

| | |
|------------------------|--------------------------------------------------|
| Software (development) | Android NDK Revision 10e (arm gcc-4.8 toolchain) |
|------------------------|--------------------------------------------------|

The Merge DICOM Toolkit Libraries

The Merge DICOM Toolkit for Android on ARMv7-A is provided in two forms: a **shared object** and a **static library**.

Static library

A static library is a collection of subroutines that are callable by your programs. To use them, simply link them with your program. There are no specific compiler options needed to link with the static library.

Shared object

A shared object is similar to a static library. It contains entry points for your application to use and call and contains code that will be executed by many different modules. The difference, however, is that the code is not included in the executable file built by the linker or loader. Instead, the code is loaded at runtime when the resources are requested. The code is then mapped into the processes address space.

The use of the two types of libraries is exactly the same: they are “linked” into an application program by the system loader after the application has been compiled. The way the system loader constructs the executable is different, however.

When a static library is linked with an application, an executable is produced that contains the code of the application and the code of the library. This is not true with code produced and linked with shared object methods. The application and the shared “library” must be compiled and linked with special compiler flags.

The compiler flags used to generate the Merge DICOM Toolkit static library and shared object are:

| Flag | Type | Description |
|---------------|--------------|------------------------------------------------------------|
| -O3 | Compile Time | Optimization level. |
| -fsigned-char | Compile Time | char data type is treated as unsigned on ARM architecture. |
| -fpic | Compile Time | Produce position independent code. |
| -D_REENTRANT | Compile Time | Produce reentrant code that is thread safe. |

Also, the `LD_LIBRARY_PATH` environment variable will need to be modified to contain the path of the `libmc3adv.so` file. The following is an excerpt from the man page of `ld` and describes the function of the `LD_LIBRARY_PATH` environment variable:

“`LD_LIBRARY_PATH` is a list of directories in which to search for libraries specified with the `-l` option. Multiple directories are separated by a colon.”
 “It is also used to specify libraries search path to the run-time linker, that is, if

`LD_LIBRARY_PATH` exists in the environment, the run-time linker searches the directories named in it, before the default directories for the shared objects to be linked with the program at execution.”

It should be noted that the Merge DICOM Toolkit shared object (`libmc3adv.so`) is designed to be “dynamic-safe” and optimized. This means that the shared object is safe when more than one application executed the same code at the same time.

Miscellaneous Notes

Threading Support

The Merge DICOM Toolkit for Android supports multi-threaded applications. Please see the *User’s Manual* for details on the limitations for using Merge DICOM Toolkit with multiple threads.

Compression Support

The Merge DICOM Toolkit for Android on ARMv7-A supports the AIMTools (formerly known as Pegasus) Imaging libraries for decompression only from Accusoft.

The JPEG2000, Lossy JPEG and the Lossless JPEG decompressors can be utilized within your application without purchasing an additional license from Accusoft. However, the JPEG2000, Lossy and Lossless JPEG Pegasus libraries are limited to decompressing at a maximum rate of 3 frames per second. This limit can be removed by purchasing a license from Accusoft Corporation (www.accusoft.com) and configuring that license in our `mergecom.pro` configuration file.

Built in RLE compression/decompression is also available.

Unicode Support

The Merge DICOM Toolkit for 32-bit Android supports Unicode conversion of DICOM defined character sets with and without code extensions. Two optional shared object libraries, `libicuuc.so.49` and `libicudata.so.49`, are distributed with the toolkit and are used to perform Unicode character set conversion. Users that wish to use Unicode conversion functions must call `MC_Enable_Unicode_Conversion` to initialize the shared object libraries and ensure the dependency files listed in the table below are available at runtime. Existing users that have no plan to use the Unicode conversion functions don’t need to deploy the two shared objects and their dependency files.

Dependency files of `libicuuc.so.49` and `libicudata.so.49` on 32-bit Android platform:

| Unicode conversion library | Dependency File | Description |
|------------------------------------|-----------------|-------------------------|
| libicuuc.so.49 libicudata.so.49 | libdl.so | Dynamic loading library |
| | libc.so | C library |

| Unicode conversion library | Dependency File | Description |
|----------------------------|-----------------|--------------|
| | libm.so | Math library |

Files

The following files are contained in the Merge DICOM Toolkit:

| Directory | File | Description |
|-----------|---------------------|------------------------------------------------------------------------------------------------------------|
| | read_me | Information on this release of the toolkit. |
| | 0_andrARMv7A | Information concerning how this distribution was created. |
| | setup.sh | Environment variables setup executable for sh. |
| mc3apps | Application.apps.mk | Application.mk file for samples. |
| | comp.c | Sample compression/decompression application. |
| | ct.img | Example CT image file. (This file is generated by mc3file and can be regenerated by the user, if need be.) |
| | duplicate.c | Sample for using MC_Standard_Compressor/MC_Standard_De compressor via MC_Duplicate_Message. |
| | general_util.c | General utilities for all sample programs. |
| | general_util.h | General utilities for all sample programs. |
| | inetd_echo_scp.c | Sample DICOM Echo SCP, using the inetd functionality. |
| | makefile | Makefile for example programs. |
| | med_fsu.c | Media File Set Updater Application. |
| | merge.ini | Merge DICOM Toolkit Initialization Configuration File. (Used by all sample applications.) |
| | mergecom.app | Merge DICOM Toolkit Application Profile Configuration File. |

| Directory | File | Description |
|-----------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| | mergecom.pro | Merge DICOM Toolkit System Profile Configuration File. |
| | mergecom.srv | Merge DICOM Toolkit Service Profile Configuration File. |
| | mpeg2dicom.c | Sample for packing/unpacking MPEG2 streams into/from DICOM files. |
| | prnt_scp.c | Sample Print SCP Application. |
| | prnt_scu.c | Sample Print SCU Application. |
| | prnt_svc.h | Sample Print Application header file. |
| | qr.h | Sample Query/Retrieve Application Include file. |
| | qr_get_scp.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| | qr_get_scu.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| | qr_scp.c | Sample Query/Retrieve SCP Application. |
| | qr_scu.c | Sample Query/Retrieve SCU Application. |
| | qr_util.c | Sample Query/Retrieve and Worklist Management Application utility functions. |
| | sreport.c | Sample Structured Report Application |
| | ssl_samp.c | SSL callbacks for SSL SCU and SSL SCP. |
| | ssl_samp.h | Header file for SSL callbacks for SSL SCU and SSL SCP. |
| | ssl_scp.c | Sample SCP application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |
| | ssl_scp.h | Header file for sample SSL SCP application. |
| | ssl_scu.c | Sample SCU application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |

| Directory | File | Description |
|-----------|----------------------------------|-------------------------------------------------------------------------------------------------------------------|
| | stor_scp.c | Sample Storage SCP Application. |
| | stor_scu.c | Sample Storage SCU Application. |
| | work.dat | Database flat file, used by the Modality Worklist SCP application. |
| | workdata.c | Sample database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | workdata.h | Sample header file for database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | work_scp.c | Sample Modality Worklist and Modality Performed Procedure Step SCP Application. |
| | work_scu.c | Sample Modality Worklist and Modality Performed Procedure Step SCU Application. |
| mc3bin | genconf | Configuration source file generation utility. |
| | gendict | Dictionary source file generation utility. |
| | mc3comp | Compare the values within two DICOM message or file objects. |
| | mc3conv | Convert a DICOM message or file object into a new transfer syntax. |
| | mc3dcomb | Runtime Dictionary Combine utility. |
| | mc3dict | Runtime DICOM Data Dictionary utility. |
| | mc3echo | DICOM Echo Test Utility. |
| | mc3file | Generate a DICOM message object. |
| | mc3icomb | Runtime Info Combine utility. |
| | mc3info | Runtime Message Database generation utility. |
| | mc3list | List a DICOM message object. |
| mc3valid | Validate a DICOM message object. | |
| mc3doc | Database.pdf | Merge DICOM Toolkit DICOM <u>Database Manual</u> . |

| Directory | File | Description |
|-----------|-----------------|---------------------------------------------------------------------------------|
| | Platform.pdf | This document. |
| | Refer.pdf | Merge DICOM Toolkit Reference Manual. |
| | Sample.pdf | Merge DICOM Toolkit Sample Applications Guide. |
| | User.pdf | Merge DICOM Toolkit User's Manual. |
| mc3inc | bmp.h | Pegasus include file. |
| | diction.h | DICOM Data Dictionary macros. |
| | mc3items.h | Library include file for use with libmc3adv.a. |
| | mc3media.h | Library include file for use with libmc3adv.a. |
| | mc3msg.h | Library include file for use with libmc3adv.a. |
| | mc3services.h | Library include file for use with libmc3adv.a. |
| | mcstatus.h | Library include file for use with libmc3adv.a. |
| | mergecom.h | Library include file for use with libmc3adv.a. |
| | pcd.h | Pegasus include file. |
| | pic.h | Pegasus include file. |
| | stdtypes.h | Pegasus include file. |
| mc3lib | libcudata.so.49 | Unicode conversion data. |
| | libicuuc.so.49 | Unicode conversion library. |
| | libmc3adv.a | Merge DICOM Toolkit software static library. |
| | libmc3adv.so | Merge DICOM Toolkit software shared object. |
| | libpicd20.so | Pegasus shared object which needs to be linked in when you compile your source. |

| Directory | File | Description |
|-----------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | libpicd6320.so | Pegasus library for JPEG Lossless decompression. This file must be in a directory pointed to by the LD_LIBRARY_PATH environment variable or the PEGASUS_OPCODE_PATH configuration setting in mergecom.pro. |
| | libpicd6520.so | Pegasus library for JPEG Lossy decompression. This file must be in a directory pointed to by the LD_LIBRARY_PATH environment variable or the PEGASUS_OPCODE_PATH configuration setting in mergecom.pro. |
| | libpicd6920.so | Pegasus library for JPEG 2000 decompression. This file must be in a directory pointed to by the LD_LIBRARY_PATH environment variable or the PEGASUS_OPCODE_PATH configuration setting in mergecom.pro. |
| | libxml2.la | libtool library file for libxml2 |
| | libxml2.so | libxml2 shared object |
| mc3msg | default.pfl | Default configuration file used by mc3file. |
| | diction.pfl | Runtime DICOM Data Dictionary profile. |
| | message.txt | DICOM message formats for INFO purposes. |
| | info.pfl | Runtime Message Database profile. |
| | mc3dcomb.pfl | Sample configuration file for use with mc3dcomb utility. |
| | mc3icomb.cfg | Sample configuration file for use with mc3icomb utility. |
| | mrgcom3.dct | Runtime DICOM Data Dictionary File. |
| | mrgcom3.msg | Runtime Message Database File. |

64-Bit Android on ARMv8-A (89-00161-00)

Supported Configurations

The following table describes the system requirements for the Merge DICOM Toolkit.

| Category | Requirement |
|------------------------|------------------------------------------------------|
| Hardware | Android supported ARMv8-A hardware. |
| Software (base) | Android 5.1 (Lollipop) or later. |
| Software (development) | Android NDK Revision 10e (aarch64 gcc-4.9 toolchain) |

The Merge DICOM Toolkit Libraries

The Merge DICOM Toolkit for Android on ARMv8-A is provided in two forms: a **shared object** and a **static library**.

Static library

A static library is a collection of subroutines that are callable by your programs. To use them, simply link them with your program. There are no specific compiler options needed to link with the static library.

Shared object

A shared object is similar to a static library. It contains entry points for your application to use and call and contains code that will be executed by many different modules. The difference, however, is that the code is not included in the executable file built by the linker or loader. Instead, the code is loaded at runtime when the resources are requested. The code is then mapped into the processes address space.

The use of the two types of libraries is exactly the same: they are “linked” into an application program by the system loader after the application has been compiled. The way the system loader constructs the executable is different, however.

When a static library is linked with an application, an executable is produced that contains the code of the application and the code of the library. This is not true with code produced and linked with shared object methods. The application and the shared “library” must be compiled and linked with special compiler flags.

The compiler flags used to generate the Merge DICOM Toolkit static library and shared object are:

| Flag | Type | Description |
|---------------|--------------|------------------------------------------------------------|
| -O3 | Compile Time | Optimization level. |
| -fsigned-char | Compile Time | char data type is treated as unsigned on ARM architecture. |

| Flag | Type | Description |
|--------------|--------------|---------------------------------------------|
| -fpic | Compile Time | Produce position independent code. |
| -D_REENTRANT | Compile Time | Produce reentrant code that is thread safe. |

Also, the `LD_LIBRARY_PATH` environment variable will need to be modified to contain the path of the `libmc3adv.so` file. The following is an excerpt from the `man` page of `ld` and describes the function of the `LD_LIBRARY_PATH` environment variable:

“`LD_LIBRARY_PATH` is a list of directories in which to search for libraries specified with the `-l` option. Multiple directories are separated by a colon.”
 “It is also used to specify libraries search path to the run-time linker, that is, if `LD_LIBRARY_PATH` exists in the environment, the run-time linker searches the directories named in it, before the default directories for the shared objects to be linked with the program at execution.”

It should be noted that the Merge DICOM Toolkit shared object (`libmc3adv.so`) is designed to be “dynamic-safe” and optimized. This means that the shared object is safe when more than one application executed the same code at the same time.

Miscellaneous Notes

Threading Support

The Merge DICOM Toolkit for Android supports multi-threaded applications. Please see the *User's Manual* for details on the limitations for using Merge DICOM Toolkit with multiple threads.

Compression Support

The AIMTools libraries from Accusoft do not provide support for JPEG/J2K compression/decompression for the Merge DICOM Toolkit for Android on ARMv8-A.

Built in RLE compression/decompression is available.

Unicode Support

The Merge DICOM Toolkit for 64-bit Android supports Unicode conversion of DICOM defined character sets with and without code extensions. Two optional shared object libraries, `libicuuc.so.49` and `libcudata.so.49`, are distributed with the toolkit and are used to perform Unicode character set conversion. Users that wish to use Unicode conversion functions must call `MC_Enable_Unicode_Conversion` to initialize the shared object libraries and ensure the dependency files listed in the table below are available at runtime. Existing users that have no plan to use the Unicode conversion functions do not need to deploy the two shared objects and their dependency files.

Dependency files of libicuuc.so.49 and libcudata.so.49 on 64-bit Android platform:

| Unicode conversion library | Dependency File | Description |
|-----------------------------------|-----------------|-------------------------|
| libicuuc.so.49 libcudata.so.49 | libdl.so | Dynamic loading library |
| | libc.so | C library |
| | libm.so | Math library |

Files

The following files are contained in the Merge DICOM Toolkit:

| Directory | File | Description |
|-----------|---------------------|------------------------------------------------------------------------------------------------------------|
| | read_me | Information on this release of the toolkit. |
| | 0_andrARMv8A | Information concerning how this distribution was created. |
| | setup.sh | Environment variables setup executable for sh. |
| mc3apps | Application.apps.mk | Application.mk file for samples. |
| | comp.c | Sample compression/decompression application. |
| | ct.img | Example CT image file. (This file is generated by mc3file and can be regenerated by the user, if need be.) |
| | duplicate.c | Sample for using MC_Standard_Compressor/MC_Standard_De compressor via MC_Duplicate_Message. |
| | general_util.c | General utilities for all sample programs. |
| | general_util.h | General utilities for all sample programs. |
| | inetd_echo_scp.c | Sample DICOM Echo SCP, using the inetd functionality. |
| | makefile | Makefile for example programs. |
| | med_fsu.c | Media File Set Updater Application. |

| Directory | File | Description |
|-----------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| | merge.ini | Merge DICOM Toolkit Initialization Configuration File. (Used by all sample applications.) |
| | mergecom.app | Merge DICOM Toolkit Application Profile Configuration File. |
| | mergecom.pro | Merge DICOM Toolkit System Profile Configuration File. |
| | mergecom.srv | Merge DICOM Toolkit Service Profile Configuration File. |
| | mpeg2dicom.c | Sample for packing/unpacking MPEG2 streams into/from DICOM files. |
| | prnt_scp.c | Sample Print SCP Application. |
| | prnt_scu.c | Sample Print SCU Application. |
| | prnt_svc.h | Sample Print Application header file. |
| | qr.h | Sample Query/Retrieve Application Include file. |
| | qr_get_scp.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| | qr_get_scu.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| | qr_scp.c | Sample Query/Retrieve SCP Application. |
| | qr_scu.c | Sample Query/Retrieve SCU Application. |
| | qr_util.c | Sample Query/Retrieve and Worklist Management Application utility functions. |
| | sreport.c | Sample Structured Report Application |
| | ssl_samp.c | SSL callbacks for SSL SCU and SSL SCP. |
| | ssl_samp.h | Header file for SSL callbacks for SSL SCU and SSL SCP. |
| | ssl_scp.c | Sample SCP application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |

| Directory | File | Description |
|-----------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| | ssl_scp.h | Header file for sample SSL SCP application. |
| | ssl_scu.c | Sample SCU application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |
| | stor_scp.c | Sample Storage SCP Application. |
| | stor_scu.c | Sample Storage SCU Application. |
| | work.dat | Database flat file, used by the Modality Worklist SCP application. |
| | workdata.c | Sample database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | workdata.h | Sample header file for database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | work_scp.c | Sample Modality Worklist and Modality Performed Procedure Step SCP Application. |
| | work_scu.c | Sample Modality Worklist and Modality Performed Procedure Step SCU Application. |

| Directory | File | Description |
|-----------|---------------|--------------------------------------------------------------------|
| mc3bin | genconf | Configuration source file generation utility. |
| | gendict | Dictionary source file generation utility. |
| | mc3comp | Compare the values within two DICOM message or file objects. |
| | mc3conv | Convert a DICOM message or file object into a new transfer syntax. |
| | mc3dcomb | Runtime Dictionary Combine utility. |
| | mc3dict | Runtime DICOM Data Dictionary utility. |
| | mc3echo | DICOM Echo Test utility. |
| | mc3file | Generate a DICOM message object. |
| | mc3icomb | Runtime Info Combine utility. |
| | mc3info | Runtime Message Database generation utility. |
| | mc3list | List a DICOM message object. |
| | mc3valid | Validate a DICOM message object. |
| mc3doc | Database.pdf | Merge DICOM Toolkit DICOM Database Manual. |
| | Platform.pdf | This document. |
| | Refer.pdf | Merge DICOM Toolkit Reference Manual. |
| | Sample.pdf | Merge DICOM Toolkit Sample Applications Guide. |
| | User.pdf | Merge DICOM Toolkit User's Manual. |
| mc3inc | diction.h | DICOM Data Dictionary macros |
| | mc3items.h | Library include file for use with libmc3adv.a. |
| | mc3media.h | Library include file for use with libmc3adv.a. |
| | mc3msg.h | Library include file for use with libmc3adv.a. |
| | mc3services.h | Library include file for use with libmc3adv.a. |

| Directory | File | Description |
|-----------|------------------|----------------------------------------------------------|
| | mcstatus.h | Library include file for use with libmc3adv.a. |
| | mergecom.h | Library include file for use with libmc3adv.a. |
| mc3lib | libicudata.so.49 | Unicode conversion data. |
| | libicuuc.so.49 | Unicode conversion library. |
| | libmc3adv.a | Merge DICOM Toolkit software static library. |
| | libmc3adv.so | Merge DICOM Toolkit software shared object. |
| | libxml2.la | libtool library file for libxml2 |
| | libxml2.so | libxml2 shared object |
| mc3msg | default.pfl | Default configuration file used by mc3file. |
| | diction.pfl | Runtime DICOM Data Dictionary profile. |
| | message.txt | DICOM message formats for INFO purposes. |
| | info.pfl | Runtime Message Database profile. |
| | mc3dcomb.pfl | Sample configuration file for use with mc3dcomb utility. |
| | mc3icomb.cfg | Sample configuration file for use with mc3icomb utility. |
| | mrgcom3.dct | Runtime DICOM Data Dictionary File. |
| | mrgcom3.msg | Runtime Message Database File. |

64-Bit iOS on ARMv8-A (008-91990)

Supported Configurations

The following table describes the system requirements for the Merge DICOM Toolkit.

| Category | Requirement |
|----------|---------------------------------|
| Hardware | iOS supported ARMv8-A hardware. |

| | |
|------------------------|------------------------------------------|
| Software (base) | iOS 8.1 or later. |
| Software (development) | XCode 6.4 (Apple LLVM version 6.1.0 gcc) |

The Merge DICOM Toolkit Libraries

The Merge DICOM Toolkit for iOS on ARMv8-A is provided as a **static library**.

Static library

A static library is a collection of subroutines that are callable by your programs. To use them, simply link them with your program. There are no specific compiler options needed to link with the static library.

When a static library is linked with an application, an executable is produced that contains the code of the application and the code of the library.

The compiler flags used to generate the Merge DICOM Toolkit static library are:

| Flag | Type | Description |
|--------------|--------------|---------------------------------------------|
| -O2 | Compile Time | Optimization level. |
| -D_REENTRANT | Compile Time | Produce reentrant code that is thread safe. |
| -isysroot | Compile Time | iPhoneOS6.1.sdk |

Miscellaneous Notes

Threading Support

The Merge DICOM Toolkit for iOS supports multi-threaded applications. Please see the *User's Manual* for details on the limitations for using Merge DICOM Toolkit with multiple threads.

Compression Support

The Pegasus libraries do not provide support for JPEG/J2K compression/decompression for the Merge DICOM Toolkit for iOS on ARMv8-A.

Built in RLE compression/decompression is available.

Files

The following files are contained in the Merge DICOM Toolkit:

| Directory | File | Description |
|-----------|---------|-----------------------------------------------------------|
| | read_me | Information on this release of the toolkit. |
| | 0_ios | Information concerning how this distribution was created. |

| Directory | File | Description |
|-----------|------------------|------------------------------------------------------------------------------------------------------------|
| | setup.sh | Environment variables setup executable for sh. |
| | setup.csh | Environment variables setup executable for csh. |
| mc3apps | comp.c | Sample compression/decompression application. |
| | ct.img | Example CT image file. (This file is generated by mc3file and can be regenerated by the user, if need be.) |
| | duplicate.c | Sample for using MC_Standard_Compressor/MC_Standard_De compressor via MC_Duplicate_Message. |
| | general_util.c | General utilities for all sample programs. |
| | general_util.h | General utilities for all sample programs. |
| | inetd_echo_scp.c | Sample DICOM Echo SCP, using the inetd functionality. |
| | iOSSampleApp.zip | Xcode project exemplifying how to integrate the toolkit library into Swift application. |
| | makefile | Makefile for example programs. |
| | med_fsu.c | Media File Set Updater Application. |
| | merge.ini | Merge DICOM Toolkit Initialization Configuration File. (Used by all sample applications.) |
| | mergecom.app | Merge DICOM Toolkit Application Profile Configuration File. |
| | mergecom.pro | Merge DICOM Toolkit System Profile Configuration File. |
| | mergecom.srv | Merge DICOM Toolkit Service Profile Configuration File. |
| | mpeg2dicom.c | Sample for packing/unpacking MPEG2 streams into/from DICOM files. |
| | prnt_scp.c | Sample Print SCP Application. |
| | prnt_scu.c | Sample Print SCU Application. |

| Directory | File | Description |
|-----------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| | prnt_svc.h | Sample Print Application header file. |
| | qr.h | Sample Query/Retrieve Application Include file. |
| | qr_get_scp.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| | qr_get_scu.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| | qr_scp.c | Sample Query/Retrieve SCP Application. |
| | qr_scu.c | Sample Query/Retrieve SCU Application. |
| | qr_util.c | Sample Query/Retrieve and Worklist Management Application utility functions. |
| | sreport.c | Sample Structured Report Application |
| | ssl_samp.c | SSL callbacks for SSL SCU and SSL SCP. |
| | ssl_samp.h | Header file for SSL callbacks for SSL SCU and SSL SCP. |
| | ssl_scp.c | Sample SCP application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |
| | ssl_scp.h | Header file for sample SSL SCP application. |
| | ssl_scu.c | Sample SCU application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |
| | stor_scp.c | Sample Storage SCP Application. |
| | stor_scu.c | Sample Storage SCU Application. |
| | work.dat | Database flat file, used by the Modality Worklist SCP application. |
| | workdata.c | Sample database functions used by Modality Worklist and Performed Procedure Step SCP Application. |

| Directory | File | Description |
|-----------|--------------|-------------------------------------------------------------------------------------------------------------------|
| | workdata.h | Sample header file for database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | work_scp.c | Sample Modality Worklist and Modality Performed Procedure Step SCP Application. |
| | work_scu.c | Sample Modality Worklist and Modality Performed Procedure Step SCU Application. |
| mc3bin | genconf | Configuration source file generation utility. |
| | gendict | Dictionary source file generation utility. |
| | mc3comp | Compare the values within two DICOM message or file objects. |
| | mc3conv | Convert a DICOM message or file object into a new transfer syntax. |
| | mc3dcomb | Runtime Dictionary Combine utility. |
| | mc3dict | Runtime DICOM Data Dictionary utility. |
| | mc3echo | DICOM Echo Test Utility. |
| | mc3file | Generate a DICOM message object. |
| | mc3icomb | Runtime Info Combine utility. |
| | mc3info | Runtime Message Database generation utility. |
| | mc3list | List a DICOM message object. |
| | mc3valid | Validate a DICOM message object. |
| mc3doc | Database.pdf | Merge DICOM Toolkit DICOM <i>Database Manual</i> . |
| | Platform.pdf | This document. |
| | Refer.pdf | Merge DICOM Toolkit <i>Reference Manual</i> . |
| | Sample.pdf | Merge DICOM Toolkit <i>Sample Applications Guide</i> . |
| | User.pdf | Merge DICOM Toolkit <i>User's Manual</i> . |
| mc3inc | diction.h | DICOM Data Dictionary macros. |

| Directory | File | Description |
|-----------|--------------------|----------------------------------------------------------|
| | mc3items.h | Library include file for use with mc3adv.a. |
| | mc3media.h | Library include file for use with mc3adv.a. |
| | mc3msg.h | Library include file for use with mc3adv.a. |
| | mc3services.h | Library include file for use with mc3adv.a. |
| | mcstatus.h | Library include file for use with mc3adv.a. |
| | mergecom.h | Library include file for use with mc3adv.a. |
| mc3lib | libcudata.49.dylib | Unicode conversion data. |
| | libicuuc.49.dylib | Unicode conversion library. |
| | libxml2.2.dylib | XML parsing library. |
| | libxml2.a | XML parsing library. |
| | mc3adv.a | Merge DICOM Toolkit software static library. |
| mc3msg | default.pfl | Default configuration file used by mc3file. |
| | diction.pfl | Runtime DICOM Data Dictionary profile. |
| | message.txt | DICOM message formats for INFO purposes. |
| | info.pfl | Runtime Message Database profile. |
| | mc3dcomb.pfl | Sample configuration file for use with mc3dcomb utility. |
| | mc3icomb.cfg | Sample configuration file for use with mc3icomb utility. |
| | mrgcom3.dct | Runtime DICOM Data Dictionary File. |
| | mrgcom3.msg | Runtime Message Database File. |

32-Bit Linux on ARMv7-A (008-92001) – RETIRED

The Merge DICOM Toolkit for Linux on ARMv7-A has been retired starting with release 5.5.0.

64-Bit Linux on ARMv8A (89-00163-00)

Supported Configurations

The following table describes the system requirements for the Merge DICOM Toolkit.

| Category | Requirement |
|------------------------|-------------------------------|
| Hardware | Linux supported ARM hardware. |
| Software (base) | Linaro Linux 3.19 or later. |
| Software (development) | GCC compiler version 4.9.3 |

The Merge DICOM Toolkit Libraries

The Merge DICOM Toolkit for Linux on ARMv8 is provided in two forms: a static library and a shared object.

Static library

A static library is a collection of subroutines that are callable by your programs. To use them, simply link them with your program. There are no specific compiler options needed to link with the static library.

Shared object

A shared object is similar to a static library. It contains entry points for your application to use and call and contains code that will be executed by many different modules. The difference, however, is that the code is not included in the executable file built by the linker or loader. Instead, the code is loaded at runtime when the resources are requested. The code is then mapped into the processes address space.

The use of the two types of libraries is exactly the same: they are “linked” into an application program by the system loader after the application has been compiled. The way the system loader constructs the executable is different, however.

When a static library is linked with an application, an executable is produced that contains the code of the application and the code of the library. This is not true with code produced and linked with shared object methods. The application and the shared “library” must be compiled and linked with special compiler flags.

The compiler flags used to generate the Merge DICOM Toolkit static library and shared object are:

| Flag | Type | Description |
|--------------|--------------|---------------------------------------------|
| -O3 | Compile Time | Optimization level. |
| -D_REENTRANT | Compile Time | Produce reentrant code that is thread safe. |

Miscellaneous Notes

Threading Support

The Merge DICOM Toolkit for Linux on ARMv8 supports multi-threaded applications. Please see the *User's Manual* for details on the limitations for using Merge DICOM Toolkit with multiple threads.

Compression Support

The Pegasus libraries do not provide support for JPEG/J2K compression/decompression for the Merge DICOM Toolkit for Linux on ARMv8-A.

Built in RLE compression/decompression is available.

Files

The following files are contained in the Merge DICOM Toolkit:

| Directory | File | Description |
|-----------|------------------|------------------------------------------------------------------------------------------------------------|
| | read_me | Information on this release of the toolkit. |
| | 0_InxARMv8 | Information concerning how this distribution was created. |
| | setup.sh | Environment variables setup executable for sh. |
| mc3apps | comp.c | Sample compression/decompression application. |
| | ct.img | Example CT image file. (This file is generated by mc3file and can be regenerated by the user, if need be.) |
| | duplicate.c | Sample for using MC_Standard_Compressor/MC_Standard_De compressor via MC_Duplicate_Message. |
| | general_util.c | General utilities for all sample programs. |
| | general_util.h | General utilities for all sample programs. |
| | inetd_echo_scp.c | Sample DICOM Echo SCP, using the inetd functionality. |
| | makefile | Makefile for example programs. |
| | med_fsu.c | Media File Set Updater Application. |
| | merge.ini | Merge DICOM Toolkit Initialization Configuration File. (Used by all sample applications.) |

| Directory | File | Description |
|-----------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| | mergecom.app | Merge DICOM Toolkit Application Profile Configuration File. |
| | mergecom.pro | Merge DICOM Toolkit System Profile Configuration File. |
| | mergecom.srv | Merge DICOM Toolkit Service Profile Configuration File. |
| | mpeg2dicom.c | Sample for packing/unpacking MPEG2 streams into/from DICOM files. |
| | prnt_scp.c | Sample Print SCP Application. |
| | prnt_scu.c | Sample Print SCU Application. |
| | prnt_svc.h | Sample Print Application header file. |
| | qr.h | Sample Query/Retrieve Application Include file. |
| | qr_get_scp.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| | qr_get_scu.c | Sample Query/Retrieve SCP Application using C-GET for retrieval in source form. |
| | qr_scp.c | Sample Query/Retrieve SCP Application. |
| | qr_scu.c | Sample Query/Retrieve SCU Application. |
| | qr_util.c | Sample Query/Retrieve and Worklist Management Application utility functions. |
| | sreport.c | Sample Structured Report Application |
| | ssl_samp.c | SSL callbacks for SSL SCU and SSL SCP. |
| | ssl_samp.h | Header file for SSL callbacks for SSL SCU and SSL SCP. |
| | ssl_scp.c | Sample SCP application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |
| | ssl_scp.h | Header file for sample SSL SCP application. |

| Directory | File | Description |
|-----------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| | ssl_scu.c | Sample SCU application for the Storage Service Class using secure socket connections. Modification required to run on platforms other than Windows. |
| | stor_scp.c | Sample Storage SCP Application. |
| | stor_scu.c | Sample Storage SCU Application. |
| | work.dat | Database flat file, used by the Modality Worklist SCP application. |
| | workdata.c | Sample database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | workdata.h | Sample header file for database functions used by Modality Worklist and Performed Procedure Step SCP Application. |
| | work_scp.c | Sample Modality Worklist and Modality Performed Procedure Step SCP Application. |
| | work_scu.c | Sample Modality Worklist and Modality Performed Procedure Step SCU Application. |

| Directory | File | Description |
|-----------|---------------|--------------------------------------------------------------------|
| mc3bin | genconf | Configuration source file generation utility. |
| | gendict | Dictionary source file generation utility. |
| | mc3comp | Compare the values within two DICOM message or file objects. |
| | mc3conv | Convert a DICOM message or file object into a new transfer syntax. |
| | mc3dcomb | Runtime Dictionary Combine utility. |
| | mc3dict | Runtime DICOM Data Dictionary utility. |
| | mc3echo | DICOM Echo Test utility. |
| | mc3file | Generate a DICOM message object. |
| | mc3icomb | Runtime Info Combine utility. |
| | mc3info | Runtime Message Database generation utility. |
| | mc3list | List a DICOM message object. |
| | mc3valid | Validate a DICOM message object. |
| mc3doc | Database.pdf | Merge DICOM Toolkit DICOM <i>Database Manual</i> . |
| | Platform.pdf | This document. |
| | Refer.pdf | Merge DICOM Toolkit <i>Reference Manual</i> . |
| | Sample.pdf | Merge DICOM Toolkit <i>Sample Applications Guide</i> . |
| | User.pdf | Merge DICOM Toolkit <i>User's Manual</i> . |
| mc3inc | diction.h | DICOM Data Dictionary macros |
| | mc3items.h | Library include file for use with mc3adv.a. |
| | mc3media.h | Library include file for use with mc3adv.a. |
| | mc3msg.h | Library include file for use with mc3adv.a. |
| | mc3services.h | Library include file for use with mc3adv.a. |

| Directory | File | Description |
|-----------|--------------|----------------------------------------------------------|
| | mcstatus.h | Library include file for use with mc3adv.a. |
| | mergecom.h | Library include file for use with mc3adv.a. |
| mc3lib | mc3adv.a | Merge DICOM Toolkit software static library. |
| | mc3adv.so | Merge DICOM Toolkit software shared object. |
| mc3msg | default.pfl | Default configuration file used by mc3file. |
| | diction.pfl | Runtime DICOM Data Dictionary profile. |
| | message.txt | DICOM message formats for INFO purposes. |
| | info.pfl | Runtime Message Database profile. |
| | mc3dcomb.pfl | Sample configuration file for use with mc3dcomb utility. |
| | mc3icomb.cfg | Sample configuration file for use with mc3icomb utility. |
| | mrgcom3.dct | Runtime DICOM Data Dictionary File. |
| | mrgcom3.msg | Runtime Message Database File. |