DcmStoreService (Dicom Store Service)

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v. 1.0 (2015)
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Executable tool that implements the Dicom "Storage SCP" service class and runs as a background service on computers with OS MS Windows (x86 platform Win 7-8-10-11).

Dicom Store Service (Storage SCP service class) – *light and efficient server for receiving and storing Dicom objects (images and radiation dose structured reports)*

DcmStoreService.exe (***vers. 1.1***). The stand-alone application must to be installed as a Windows service and run in "unattended" mode (running in the background 24 hours a day). It listens for association and connection requests from Dicom clients that implement the "Storage SCU" class (sending images or radiation dose structured objects). For remotely checking of ready and listening status, application can also accept the "Dicom Ping" message (Echo SCU). Application was developed and compiled in C++ with multithreaded code for better management of multiple accesses. The service installation operation does not modify the Windows registry, also leaving it clean even in the case of deletion ("zero foot print").

What do I need to do?

1. Unzip the archived files into a folder in which you have write and execute rights, e.g. c:\DcmStore. Put the executable "*DcmStoreService.exe*" in the release folder (e.g. c:\DcmStore\bin), while leaving the remaining files in the main folder. *Wow, you have everything you need!*

2. Now, you need to customize some parameters in a configuration file, "DcmStore.ini", using any text editor (e.g. notepad). The parameters to edit are quite self-explanatory for the following goals:

    a. Dicom network node setting (*AE Title, port number*);

    b. Choosing of the root folder where you require to store images and structured reports;

    c. Setting the hierarchy for creating subfolders where you can distribute downloaded images (see details in the next paragraph).

3. You have the possibility to install the application in two ways as you wish (you must have the computer administrator policy):

a. You can use Windows tools to install a service program (automatic restart required), e.g. via the Services module in the Windows Control Panel or directly via the ***services.msc*** command by clicking on start+run (Win+R) or from ***cmd*** shell.

b. You can use (recommended) the scripts you find in the main folder to install and activate the service, stop it, delete it, and query the OS to check its execution status in the background (see details below). Once you have installed and verified that it is working properly, you no longer must worry about its execution, even after switching off and restarting the computer, the service will run automatically, unless any malfunction problems occur.

Configuration file ***DcmStore.ini***: ***parameters and options***

The first two parameters must be set based on the Dicom node configuration provided by the company network administrator. The other parameters concern the position and structure of the root folder under which the images must be stored, possibly divided into subfolders. You must create the root folder before starting the service. Attention, it is possible to modify the parameters only after the '=' symbol, being careful not to modify the strings to its left, otherwise malfunctions could occur. The choices with a binary value of 0/1 take on the meaning of an option that is off and on respectively

- **localAE**= **XXX** (*string data*) - as Application Entity Title of the Dicom Storage server, choose a name agreed with the PACS system administrator and defined as a device enabled for the Storage SCP service class;
- **port**= **YYYY** (*number data*) TCP port number with which the application entity negotiates and establishes a connection with the PACS or radiological equipment console;
- **RDSR-DIR**= **X:\path1** (root folder in which the RD structured reports received are stored, which can be modified as desired, respecting the syntax, even on different disks e.g. D:\, E:\ etc.);
- **IMG-DIR**= **Y:\ path2** (root folder in which the received images are stored, editable as desired, respecting the syntax, even on different disks e.g. D:\, E:\ etc.);
- **logfile**= **0** *or* **1** (0/1 = does not create/create a logfile for any error messages useful for debugging; not easy to interpret for non-experts and it is recommended to keep it deactivated after testing the correct functioning of the dicom server);
- **num_threads**= **num** [1 ≤ num ≤ 16] [void or 0: default 5] (option that allows you to set the maximum number of available worker threads that can manage multiple concurrent Dicom associations);
- **folder-tree**= **0** *or* **1** (**= 0** the image files are all saved in the **IMG-DIR** folder only); **= 1** the image files are stored in a tree structure of subfolders, starting from a *master folder* nested under the root **IMG-DIR**, based on the sorting criterion chosen with the following three parameters:
- **order-by-patientID**= **0** *or* **1**
- **order-by-study**= **0** *or* **1**
- **order-by-series**= **0** *or* **1**
    - Setting ***order-by-patientID*** = **1** a master folder is created with the same name as the Patient-ID, = **0** the master folder is created with the same name as the Patient-Name.
    - Setting ***order-by-study*** = **0** or **1**, ***order-by-series***= **0** or **1** *options***,** determines whether subfolders corresponding to the "*Study-ID"* and/or the "*Series-number"* respectively are not or are created. Please note that the simultaneous choice of the option = 1 for both parameters determine the increase in the nesting level of the folder tree structure.

    - For RD structured reports it may be convenient, in some circumstances, to use a single folder for storing files (folder-tree option= 0) and periodically move them to other folders of your choice.
- **image-name-index**= **0** *or* **1** Disable/enable an image file renaming method with a prefix relating to the acquisition modality and a postfix equal to Dicom Image Number tag;
- **dicomdir**= **0** *or* **1** Disable/enable the creation of the directory file "DICOMDIR", stored under the master folder described above.

After reading the DcmStore.ini configuration file, the application performs some consistency tests on the options and, if necessary, forces some changes, as follow:

- if *dicomdir* is turned ON ➔ order-by-study and order-by-series are raised to ON
- if *image-name-index* is turned ON ➔ order-by-study and order-by-series are raised to ON

The remaining combinations, with image-name-index set to OFF, are your own choice although we recommend keeping at least order-by-study turned ON.

Notes and limitations about DICOMDIR

DICOMDIR *acts as a "Directory" for DICOM file sets and holds a full 4 level hierarchy (PATIENT --> STUDY --> SERIES --> IMAGE). DICOMDIR file will be created in the root directory of each stored File-set (patient's root folder). File system and file naming restrictions are required to conform to the DICOM standard: File and folder names referenced by the DICOMDIR file restricted to 8 characters, uppercase letters, digits and underscore only, with no extension. Please refer to DICOM standard part 10 document (PS 3.10) to get more information on DICOMDIR.*

DcmStoreService *starts generating the DICOMDIR file after the association with the client has been closed and not before having finished saving the file-set on the storage medium. Furthermore, it provides the update mode by adding subsequent studies downloaded and stored in the patient's directory.*

The possibility of creating the DICOMDIR in standalone mode has not been provided in this release.

Utility scripts

Five scripts that facilitate the management tasks of the Dicom server service, as described below, are in the main folder:

1) ***install-service.bat*** : it must be run first to install the application as "***windows service***"; it can only be used later for a new installation. Let's refer to a generic execution directory, e.g. x:\path\DcmStoreService\bin : It should not be necessary to modify it as it takes into account the main folder where you saved the package, however if you wish you should do it according to your needs.
2) ***start-service.bat*** : runs the service (status running)
3) ***stop-service.bat*** : stops the service from running (status stopping)
4) **query-service.bat** : checks the execution status of the service (*running* or *stopping)*
5) ***delete-service.bat***: uninstall the service

The scripts described above at points 1, 2, 3 and 5 must be run as administrator (right-click "run as administrator") while it is not necessary for script at point 4.

Note about starting the service

In the event of an execution error due to the lack of the C/C++ runtime library, the Microsoft VC_2015-17-19_redist.x86 installation package may help you to fix the problem. You can find this library package in the main folder and you can run it without any risk. However, consider that other applications may have already installed this library for their needs, in which case it is not necessary to install it again.

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