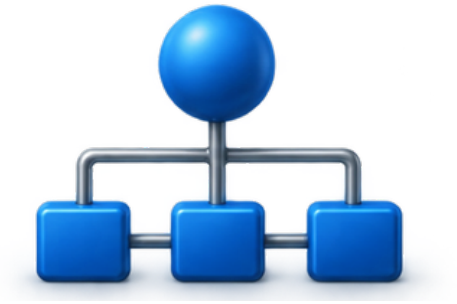

DCMrouter 3.0

Installation and User Manual

DICOM Routing Software

Version 3.0.0 · September 2026

Sup-C · Belgium · sup-c.com

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1 Introduction

DCMrouter is a DICOM router for Windows. It receives DICOM images from modalities, workstations and other systems, decides where each image has to go using routing rules, and forwards it reliably to one or more destinations such as a PACS, an archive or a viewing station.

DCMrouter is built for unattended 24/7 operation: images are always written to disk before they are forwarded, failed transfers are retried automatically, and the administrator can be notified by e-mail when something needs attention.

1.1 Main features

- **Receiving**: DICOM C-STORE SCP for all storage classes (including private and unknown SOP classes) and C-ECHO; optional TLS listener; hot folder import; checks on the called AE title and on allowed senders.
- **Routing**: rules on Calling AE, Called AE, Modality and any DICOM tag; one image can go to several destinations at once; tag modifications and anonymization per rule.
- **Sending**: per destination transfer syntax conversion (JPEG, JPEG-LS, JPEG 2000, HTJ2K, RLE, uncompressed), batches, parallel associations, time windows and TLS.
- **Reliability**: persistent queue per destination, automatic retries with increasing delay, a *hold* area that is released automatically when the destination is back online, recovery after a crash, a health monitor and a watchdog.
- **Monitoring**: live status, queue view, searchable history of every received and sent object, log viewer and e-mail notifications.

1.2 Components

Component	Purpose
DCMrouter.exe	The configuration and monitoring program (this manual). It requires administrator rights; Windows asks for confirmation (UAC) when it starts.
DCMrouterService.exe	The Windows service *SUP-C DCMrouter* that does the actual work: receiving, routing and sending. It runs in the background, also when nobody is logged on.
Data folder	`C:\ProgramData\SUP-C\DCMrouter` – configuration, history database, logs, queues and the license file. See chapter 16.

1.3 How an image travels through DCMrouter

1. A modality sends an image to DCMrouter (C-STORE), or a file is placed in the hot folder.
2. DCMrouter checks the association (called AE title, allowed senders, free disk space) and stores the image in the **Incoming** folder. Only then the sender receives *success*.
3. The routing rules are evaluated from top to bottom. Every matching rule adds its destinations; a rule with *Stop* ends the evaluation.
4. The image is placed in the **queue** of every destination (as a hard link, so it does not use extra disk space). Rules with modifications or anonymization get their own modified copy.
5. A forwarder per destination sends the queued images in batches, converting the transfer syntax when configured.

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6. If sending fails, the image is retried later. After the maximum number of attempts it moves to **Hold**. Hold is checked periodically with C-ECHO and released automatically as soon as the destination answers again.
7. Every step is recorded in the **history** (IN/OUT, status, patient, SOP Instance UID).

> **Tip:** Images without a matching rule are not lost: by default they are kept in the Unrouted folder (see Settings).

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2 System requirements

Item	Requirement
Operating system	Windows 10 (version 1809 or later), Windows 11, Windows Server 2019 or later – 64-bit (x64).
.NET	Not required. DCMrouter is self-contained: the .NET runtime is included in the program files.
Rights	Administrator rights for installation and for the configuration program.
Memory / CPU	4 GB RAM and 2 CPU cores are sufficient for most sites. Transfer syntax conversion (especially JPEG 2000) benefits from extra cores.
Disk space	About 250 MB for the program. For data: enough space for the images that are waiting in the queues and, if enabled, for kept copies of sent images. Keep at least a few GB free; below the *Stop receiving* threshold DCMrouter refuses new images.
Network	The DICOM port(s) of DCMrouter must be reachable from the senders (default 104, TLS default 2762). Outgoing connections to the destination ports must be allowed.

> **Tip:** Port 104 may already be used by other DICOM software on the same computer. In that case choose another port (for example 11112) and configure the senders accordingly.

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3 Installation

3.1 Running the setup

Start `DCMrouter-Setup-3.0.0.exe` and confirm the Windows security prompt. The setup wizard guides you through the following pages:

1. **Welcome** – click Next.
2. **License Agreement** – read the End User License Agreement. Select *I accept the agreement* to continue. Without acceptance the installation cannot continue.
3. **Select Destination Location** – default `C:\Program Files\SUP-C\DCMrouter`. Change it only when required.
4. **Select Additional Tasks** – see the table below.
5. **Ready to Install** – click Install. Running DCMrouter programs and an existing DCMrouter service are stopped automatically.
6. **Finish** – optionally start DCMrouter right away to configure it.

Task	Meaning
Install DCMrouter as Windows service	Registers the service *SUP-C DCMrouter* (automatic, delayed start) with automatic restart after a failure, and adds a Windows Firewall rule for the service. The service is **not started** yet, so you can configure DCMrouter first. Checked by default.
Clean start	Only shown when DCMrouter data is found on the computer. Deletes the existing configuration, history database, queues (including images not yet sent), status file and logs, so DCMrouter starts as an empty system. The license file is kept. You are asked to confirm.
Create a desktop shortcut	Adds a DCMrouter icon to the desktop.

> **Important:** Clean start permanently deletes images that are still waiting in a queue or in hold. Only use it on a new system, or when you are sure that all images have been delivered.

3.2 What is installed where

Location	Content
`C:\Program Files\SUP-C\DCMrouter`	DCMrouter.exe, DCMrouterService.exe, Dicom.Native.dll (image codecs), EULA.txt, install-service.ps1, uninstall-service.ps1
Start menu	SUP-C DCMrouter and SUP-C DCMrouter License Agreement
`C:\ProgramData\SUP-C\DCMrouter`	Created at first start: configuration, history, logs, data folders and the license file
Windows services	SUP-C DCMrouter (service name `DCMrouter`), account Local System

The setup itself contains no configuration, databases or license: every new installation starts empty.

3.3 After installation – next steps

1. Start **DCMrouter** from the start menu (or from the Finish page).
2. Because there is no license yet, a DEMO message is shown with the hardware ID of the computer. Send this ID to Sup-C to receive a license file (chapter 4). You can configure and test in demo mode.
3. Configure the listener, destinations and rules (chapter 5, Quick start).
4. Click **Save** and then **Start** to start the service.

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3.4 Updating to a new version

Run the setup of the new version. The existing service is stopped and registered again for the new program files. Do **not** select Clean start when you want to keep the configuration, history and queues. The license stays valid as long as the hardware is the same. The setup does not start the service: after the update, click **Start** in the top bar.

3.5 Uninstalling

Use Windows Settings → Apps → *SUP-C DCMrouter*. The service and the firewall rule are removed. You are then asked whether all DCMrouter data (configuration, history, queues and logs) must also be deleted – the default answer is No. The license file is always kept, so a re-installation on the same computer is licensed immediately.

3.6 Silent installation

For deployment tools the setup supports the standard Inno Setup command-line options, for example:

```
DCMrouter-Setup-3.0.0.exe /VERYSILENT /SUPPRESSMSGBOXES /NORESTART /TASKS="service"
/LOG="C:\Temp\dcmrouter-setup.log"
```

Option	Meaning
`/VERYSILENT`	No wizard and no progress window. Use `/SILENT` to show only the progress window.
`/TASKS="..."`	Comma-separated tasks: `service`, `cleanstart`, `desktopicon`. Tasks that are not listed are not selected.
`/DIR="..."`	Installation folder.
`/LOG="..."`	Writes a setup log file (useful for troubleshooting).

> **Tip:** With /VERYSILENT the license agreement is accepted implicitly. Make sure the customer has agreed to the EULA in another way.

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4 Licensing

DCMrouter is licensed per computer. A license is a small file (`DCMrouter.lic`) that is issued by Sup-C for the hardware ID of one specific computer. It is digitally signed and encrypted: it cannot be changed and it is not valid on another computer.

4.1 License types

Type	Description
Lifetime	Valid without time limit on the licensed computer.
Valid until (date)	Valid up to and including the end date. From 30 days before the end date DCMrouter shows a warning when it is started and the license text in the status bar turns orange. After the end date DCMrouter switches to demo mode.
Demo (no license)	All functions are available, but the router (service or local) stops automatically **60 minutes** after it was started. Suitable for installation, configuration and testing.

4.2 The license window

Click the license text at the bottom right of the main window (status bar) to open the license window.

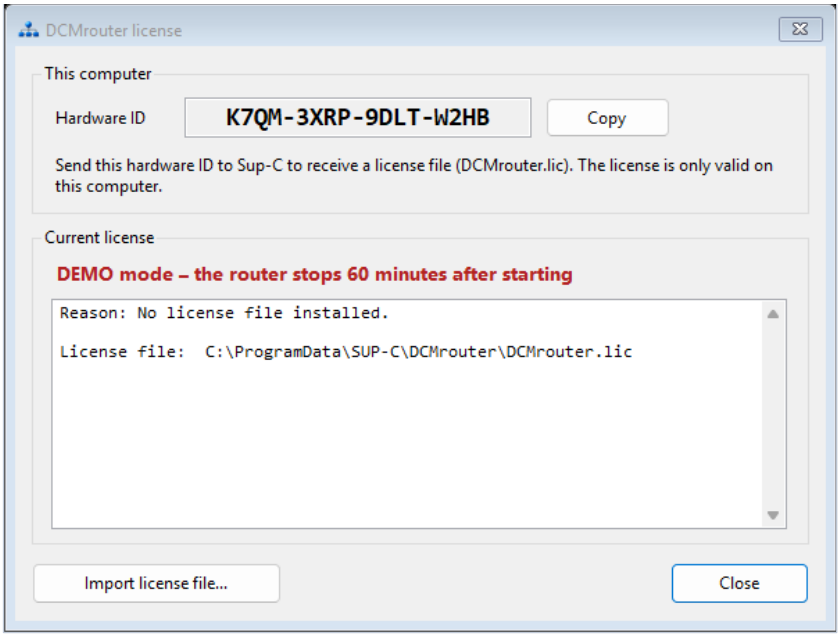

Figure 1 – License window in demo mode, with the hardware ID of this computer

Element	Purpose
Hardware ID	Unique ID of this computer (format XXXX-XXXX-XXXX-XXXX), calculated from the motherboard, system UUID and processor. It normally does not change when Windows is reinstalled; see the note in 4.4 for the changes that do.
Copy	Copies the hardware ID to the clipboard, so you can paste it in an e-mail to Sup-C.
Current license	Shows whether DCMrouter is licensed, and if not, why (no license file, license for another computer, expired, damaged file).
Import license file...	Selects the received `DCMrouter.lic`. The file is checked first; only a valid license for this computer is installed.

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4.3 Requesting and installing a license

1. Open the license window and click **Copy** next to the hardware ID.
2. Send the hardware ID, the customer name and the site to Sup-C.
3. You receive a license file `DCMrouter.lic`. Save it on the computer.
4. Open the license window, click **Import license file…** and select the file.
5. The status bar shows *Licensed to …* in green. A running service picks up the new license automatically within 30 seconds – no restart is needed.

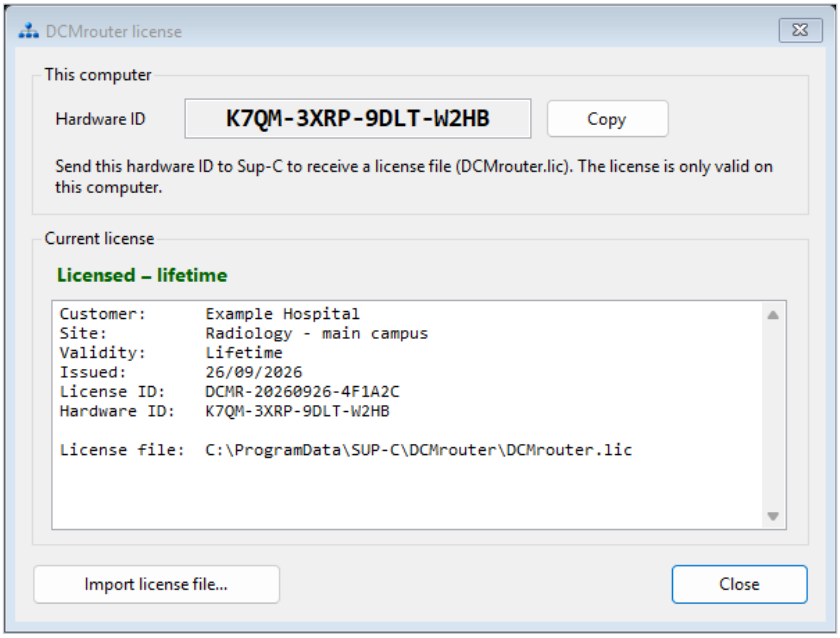

Figure 2 – License window with a valid lifetime license

4.4 Demo mode in detail

- At start-up of the configuration program a message explains the demo mode and shows the hardware ID.
- The Status tab shows when the router will stop, for example *DEMO: stops at 15:32 (23 min left)*.
- After 60 minutes the router stops receiving and sending. A service in demo mode stops itself cleanly (Windows does not restart it). The configuration program stays open and shows a message, so a license can be installed immediately.
- Images that are already in a queue are kept and are sent as soon as the router runs again.
- When a license expires while the router is running, DCMrouter switches to demo mode (60 minutes) and sends an e-mail notification to the administrator.

> **Tip:** The hardware ID changes when the motherboard is replaced (or repaired so that its serial number or system UUID changes) and when the processor is replaced by a different model. Adding or replacing memory, disks or network cards and installing Windows updates do not change it. On a virtual machine the ID belongs to the virtual machine: recreating or cloning it, or changing its UUID, results in a new ID. On the rare systems that report no usable hardware identifiers, the ID is linked to the Windows installation and changes when Windows is reinstalled. In these cases, request a new license from Sup-C with the new hardware ID.

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5 Quick start

This chapter shows the minimum configuration to receive images and forward them to one PACS. All screens are explained in detail in the following chapters.

1. **Receive (SCP) tab** – enter the AE title and port of DCMrouter (default DCMROUTER / 104). Keep *Accept all senders* checked for a first test.
2. **Destinations (PACS) tab** – click **Add**, enter name, AE title, host and port of the PACS and click **C-ECHO test**. The result must be OK. Click OK.
3. When this is the first destination, DCMrouter offers to create a rule *Everything to <destination>*. Answer Yes.
4. Click **Save** in the top bar.
5. Click **Start** to start the service (or **Install service** first when it was not installed by the setup).
6. Configure the modality with the AE title, IP address and port of DCMrouter and send a test study.
7. Check the **Status** tab (Sent counter) and the **History** tab (IN and OUT records with status OK).

> **Tip:** To test without installing the service, use Run locally in the top bar: the router then runs inside the configuration window until you stop it or close the window.

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6 The main window

The main window consists of the top bar, eight tabs and the status bar at the bottom.

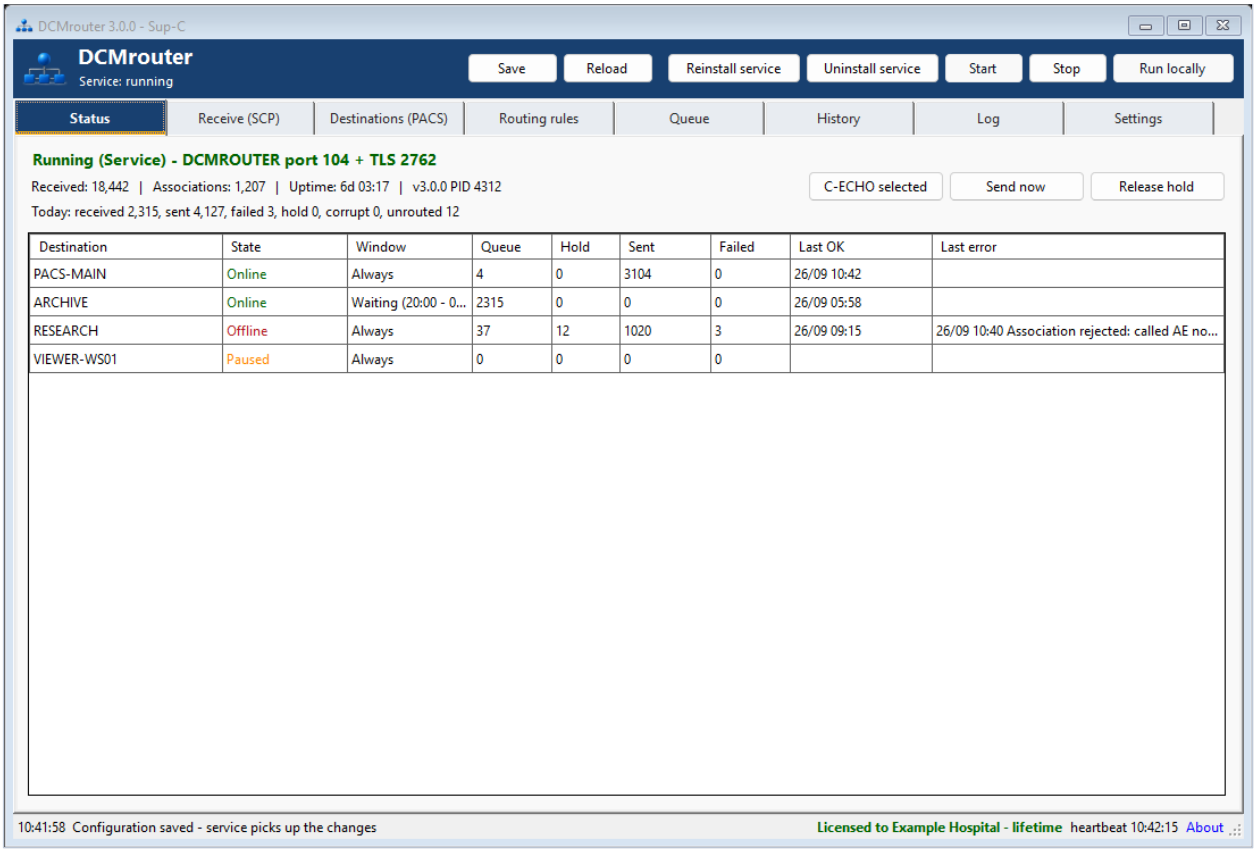

Figure 3 – Main window (Status tab)

6.1 Top bar

Figure 4 – Top bar

Below the DCMrouter name the state of the Windows service is shown (not installed, stopped, starting, running, stopping). *router running LOCALLY* is added when the router runs inside the window. *installed from another folder* means that the registered service points to other program files than the ones you are using – use Reinstall service to correct this.

Button	Function
Save	Checks the configuration and saves it. A running service picks up the changes automatically within a few seconds; no restart is needed (except when the data folder is changed). The status bar confirms the save.
Reload	Reloads the saved configuration and discards changes that were not saved.
Install service / Reinstall service	Saves the configuration, registers the Windows service (automatic, delayed start, automatic restart after failures) and starts it. When the service already exists, the button reads *Reinstall service*: the service is stopped, removed and registered again from the current program folder. Queues and configuration are kept.
Uninstall service	Stops and removes the Windows service. Queues, history and configuration are kept.
Start	Starts the service. Only available when the service is installed and stopped.

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Button	Function
Stop	Stops the service. While it is stopped, no images can be received and senders have to send them again later. Images already in a queue stay there and are sent after the next start.
Run locally / Stop local	Runs the router inside this window without the service – for testing only. It stops when the window is closed. Not available while the service is running (both would use the same port).

> **Tip:** Clicking the DCMrouter logo or name in the top bar opens the About window.

6.2 Tabs

Tab	Purpose
Status	Live overview of the router and of every destination (chapter 7).
Receive (SCP)	How DCMrouter receives images: AE title, port, security, TLS, hot folder (chapter 8).
Destinations (PACS)	The systems DCMrouter sends to (chapter 9).
Routing rules	Which images go where, with optional modifications (chapter 10).
Queue	Files waiting to be sent or in hold, per destination (chapter 11).
History	Searchable record of every received and sent object, CSV export (chapter 12).
Log	Live view of the log file (chapter 13).
Settings	Folders, retention, disk thresholds, retries and e-mail notifications (chapter 14).

6.3 Status bar

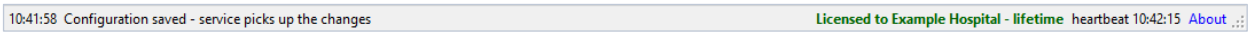

Figure 5 – Status bar

Field	Meaning
Left	Time and result of the last action (for example *Configuration saved*).
License	License state: green = licensed, orange = expires within 30 days, red = DEMO. Click it to open the license window.
Heartbeat	Time of the last sign of life of the router. *offline* when the router is not running.
About	Opens the About window with version, copyright and the license agreement.

6.4 Good to know

- Only one configuration window can be open at the same time.
- Closing the window does not stop the service. When there are unsaved changes, DCMrouter asks whether they must be saved.
- The window can be closed while the service keeps working; open it again at any time to check the status.

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7 Status tab

The Status tab gives a live overview (refreshed every 2 seconds) of the router and of every destination.

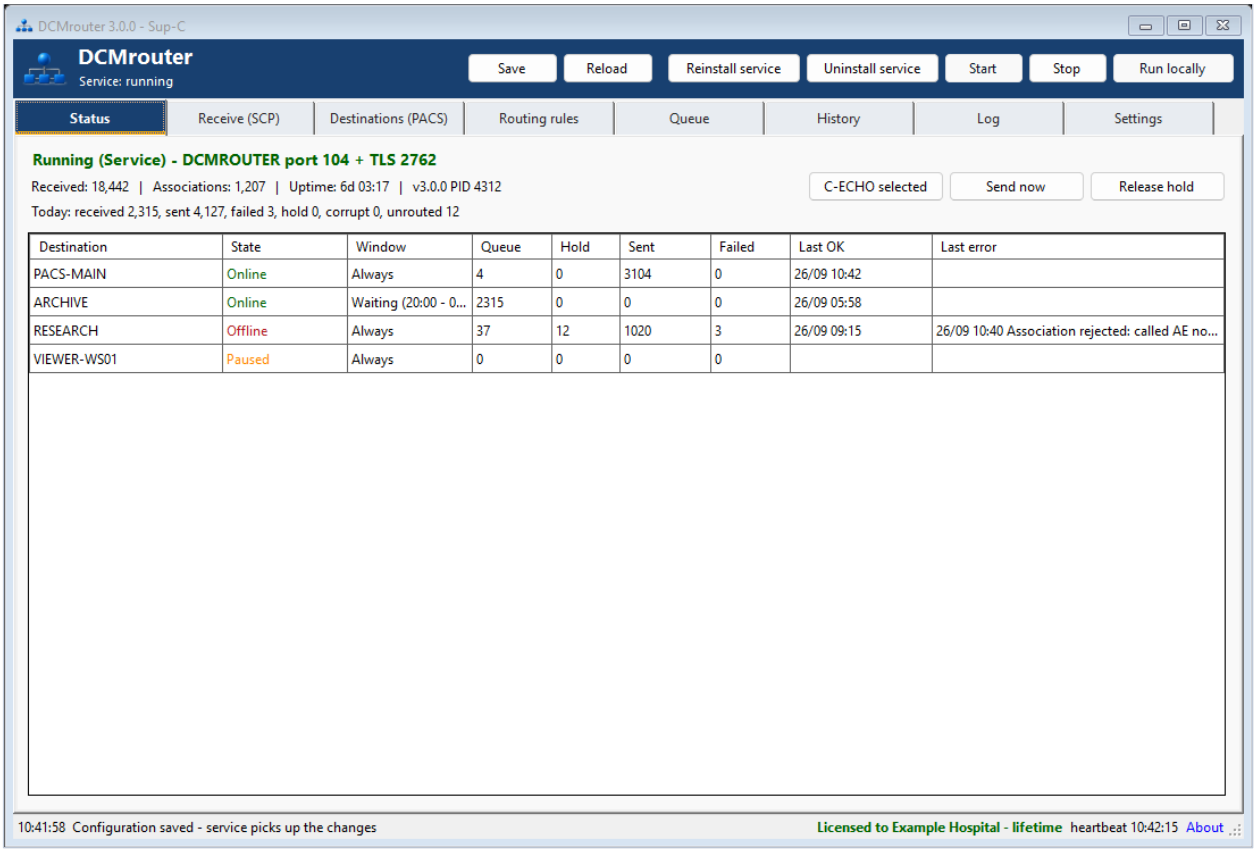

Figure 6 – Status tab

7.1 Information

Line	Meaning
Router state	Green *Running (Service)* or *Running (GUI)* with AE title and port(s). Red *Router not running* with the time of the last sign of life, or *Listener problem* when the port could not be opened. In demo mode the time at which the router stops is added.
Counters	Objects and associations received since the router started, uptime, version and process ID.
Today	Totals of today from the history: received, sent, failed, hold, corrupt and unrouted (refreshed every 15 seconds).

7.2 Destination overview

Column	Meaning
Destination	Name of the destination.
State	Online (green), Offline (red), Paused (orange, destination disabled) or Unknown (nothing sent yet).
Window	Always, Open (inside the time window) or Waiting (outside the time window, images wait in the queue).
Queue	Number of files waiting to be sent.

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Column	Meaning
Hold	Number of files that failed after the maximum number of attempts (shown in red when not zero).
Sent / Failed	Counters since the router started.
Last OK	Time of the last successful transfer.
Last error	Time and description of the last error.

7.3 Buttons

Button	Function
C-ECHO selected	Tests the connection to the selected destination and shows the response time.
Send now	Retries all queued files of the selected destination immediately instead of waiting for the next retry time (the time window still applies).
Release hold	Moves all files of the selected destination from hold back to the queue.

> **Tip:** Hold is released automatically when the destination answers a C-ECHO again. Release hold is only needed when you do not want to wait for the next check.

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8 Receive (SCP) tab

On this tab you configure how DCMrouter receives images: as a DICOM Storage SCP on the network, via TLS, and/or from a hot folder.

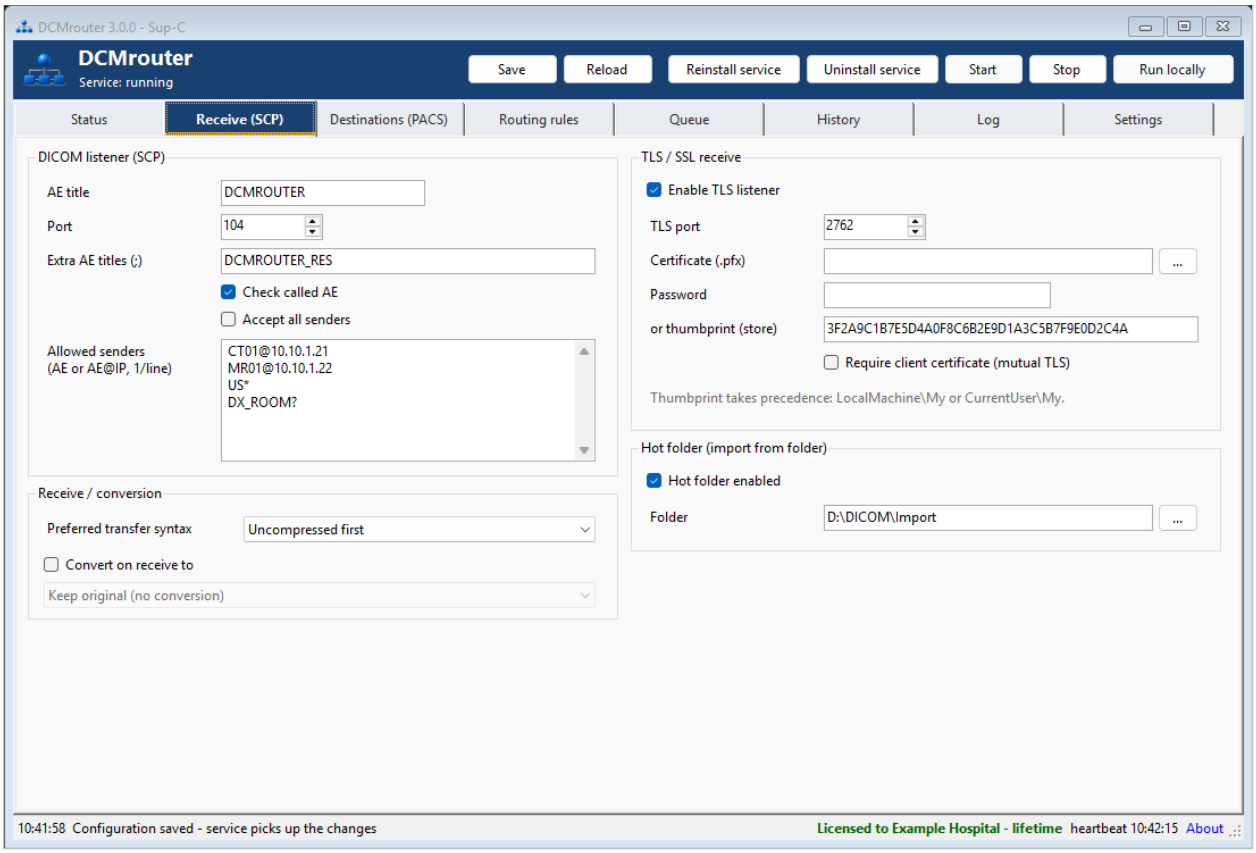

Figure 7 – Receive (SCP) tab

8.1 DICOM listener (SCP)

Field	Description
AE title	The AE title of DCMrouter (max. 16 characters). Senders must use this as called AE title.
Port	TCP port DCMrouter listens on (default 104).
Extra AE titles (;)	Additional AE titles DCMrouter answers to, separated by semicolons. Useful to route on the called AE: a modality sends to DCMROUTER_RES and a rule with Called AE = DCMROUTER_RES sends those images to research.
Check called AE	When checked, associations to an AE title that is not the router AE or one of the extra AE titles are rejected (*called AE not recognized*).
Accept all senders	When checked, every sender may send images. Uncheck it to allow only the senders in the list.
Allowed senders	One entry per line: an AE title or `AE@IP`. Wildcards `*` and `?` are allowed, for example `CT01@10.10.1.21`, `US*`, `DX_ROOM?`, `*@10.10.4.*`. Other senders are rejected (*calling AE not recognized*).

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8.2 Receive / conversion

Field	Description
Preferred transfer syntax	Which transfer syntax DCMrouter proposes first when a sender offers several: *Uncompressed first* (maximum compatibility) or *Lossless compression first* (less network traffic and disk space). Compressed and lossy images are always accepted as they are.
Convert on receive to	Optionally converts every received image to one transfer syntax before routing. Usually it is better to convert per destination (chapter 9).

8.3 TLS / SSL receive

Field	Description
Enable TLS listener	Opens an extra, encrypted DICOM port. The normal port stays available.
TLS port	Port of the TLS listener (default 2762). Must differ from the normal port.
Certificate (.pfx) + Password	Server certificate with private key as a PFX/P12 file.
or thumbprint (store)	Alternatively the thumbprint of a certificate in the Windows certificate store (LocalMachine\My or CurrentUser\My). The thumbprint takes precedence over the file.
Require client certificate	Mutual TLS: senders must present a valid client certificate.

8.4 Hot folder

With the hot folder DCMrouter imports DICOM files from a folder (for example files copied from a CD or exported by an application) as if they were received over the network.

- The folder and its subfolders are checked every 5 seconds.
- A file is only imported when it has not changed for 10 seconds and is not locked, so files that are still being copied are skipped.
- Non-DICOM files, DICOMDIR and temporary files (.tmp, .part, .partial, .crdownload, .txt, .json, .ini, .db) are ignored.
- After a successful import the file is **deleted** from the hot folder. Damaged DICOM files are moved to the Corrupt folder.
- Imported images get Calling AE *HOTFOLDER*, so you can create rules specifically for them.

> **Important:** Never use a folder that contains the only copy of images as hot folder: imported files are deleted from it.

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9 Destinations (PACS) tab

Destinations are the DICOM systems DCMrouter sends images to: PACS, archives, workstations, AI platforms, research systems and so on.

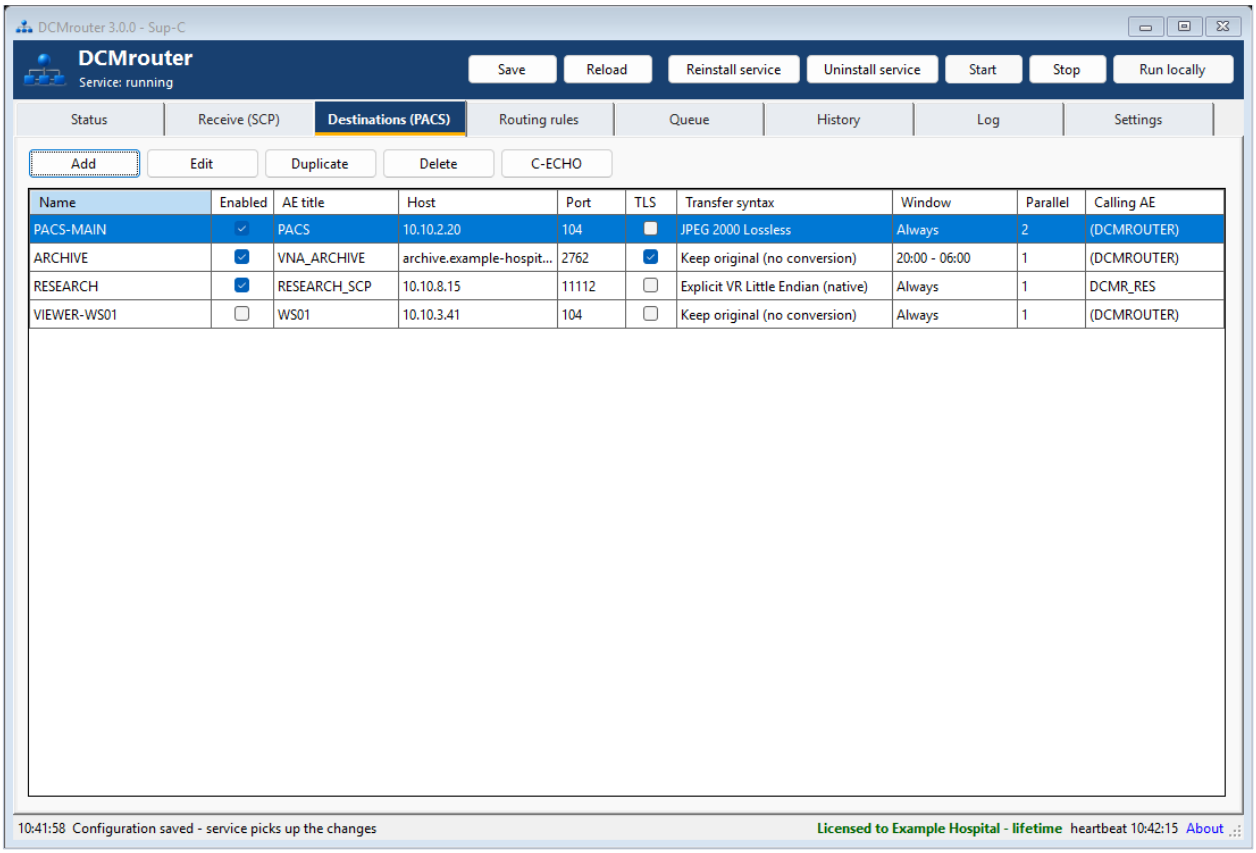

Figure 8 – Destinations tab

Button	Function
Add	Creates a new destination. For the first destination DCMrouter offers to create a rule that sends everything to it.
Edit	Opens the selected destination (a double-click also works).
Duplicate	Creates a copy – handy for a second PACS with similar settings.
Delete	Deletes the destination and removes it from all rules. Files still in its queue or hold stay on disk (Queue\<id> and Hold\<id> in the data folder).
C-ECHO	Tests the connection to the selected destination.

> **Important:** After a destination has been deleted and the configuration saved, the files that were still in its queue or hold are no longer associated with any destination: they are not sent, they are no longer shown on the Queue tab and they are not cleaned up automatically. They can only be reached with Windows Explorer in the data folder (Queue\<id> and Hold\<id>). Before deleting a destination, check on the Queue tab that its Queue and Hold are empty, or send, release or delete the remaining files first. Until you click Save, Reload undoes the deletion. Files that were left behind can be routed again by copying the .dcm files into the hot folder.

The grid shows the most important settings; the Calling AE between brackets means that the router AE title is used.

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9.1 Destination window

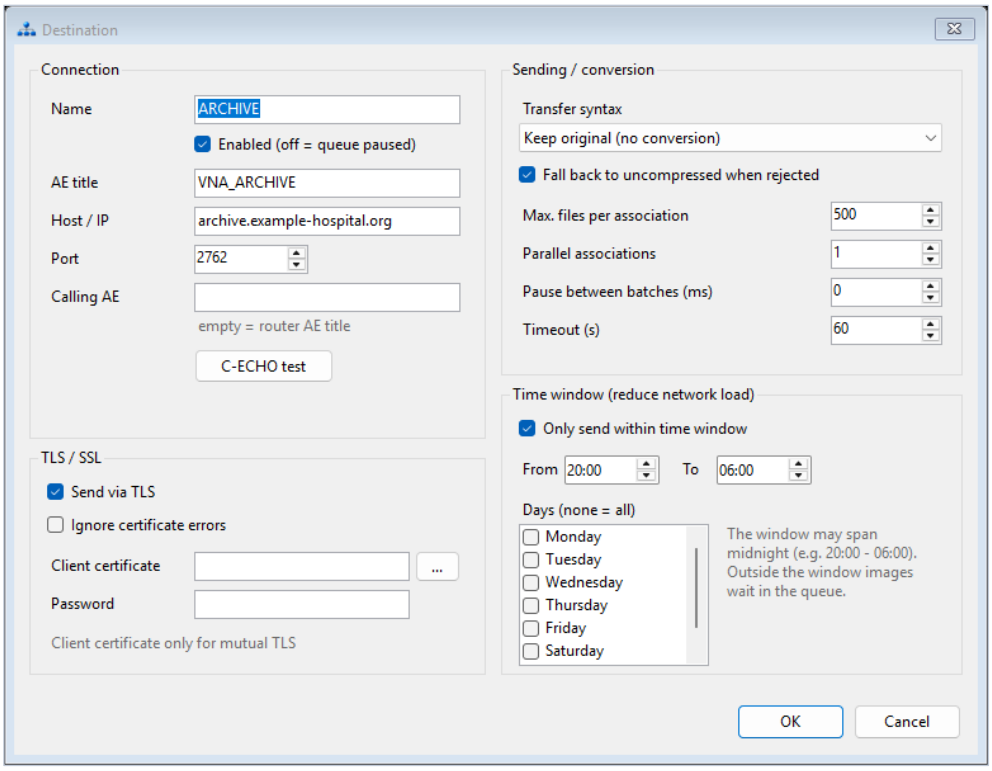

Figure 9 – Destination window

Connection

Field	Description
Name	Free name, shown everywhere in DCMrouter. Must be unique.
Enabled	When unchecked the destination is paused: images are still queued, but nothing is sent until it is enabled again.
AE title / Host / Port	Called AE title, host name or IP address and port of the destination.
Calling AE	The AE title DCMrouter uses towards this destination. Empty = the router AE title. Some PACS systems only accept known calling AE titles.
C-ECHO test	Tests the connection with the current (not yet saved) values.

TLS / SSL

Field	Description
Send via TLS	Uses an encrypted connection. The destination must offer a TLS port.
Ignore certificate errors	Accepts self-signed or expired certificates of the destination. Use only in a trusted network.
Client certificate	PFX file and password, only needed when the destination requires mutual TLS.

Sending / conversion

Field	Description
Transfer syntax	Converts images before sending: keep original, uncompressed (Explicit/Implicit VR Little Endian), lossless compression (JPEG Lossless, JPEG-LS, JPEG 2000, HTJ2K, RLE) or lossy compression. A warning is shown when you choose a lossy syntax. See Appendix B.

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Field	Description
Fall back to uncompressed	When the destination refuses the converted (compressed) syntax, the images are sent again as Explicit VR Little Endian.
Max. files per association	Number of images sent in one association (batch). Default 200.
Parallel associations	Number of simultaneous associations to this destination. More associations = faster, but also more load on the destination.
Pause between batches (ms)	Waiting time between two batches, to limit the load on network or destination.
Timeout (s)	Maximum waiting time for an answer of the destination.

Time window

With *Only send within time window* images for this destination are only sent between the From and To time, optionally on selected days only (no days selected = every day). Outside the window the images wait in the queue. The window may cross midnight (for example 20:00 – 06:00); the day of the start time counts. Typical use: sending prior studies or archive copies at night to reduce network load during the day.

> **Tip:** Images for a destination that cannot convert a file (for example video) are sent in their original transfer syntax; a warning is written to the log.

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10 Routing rules tab

Routing rules decide to which destinations an image is sent. The rules are evaluated from top to bottom for every received image.

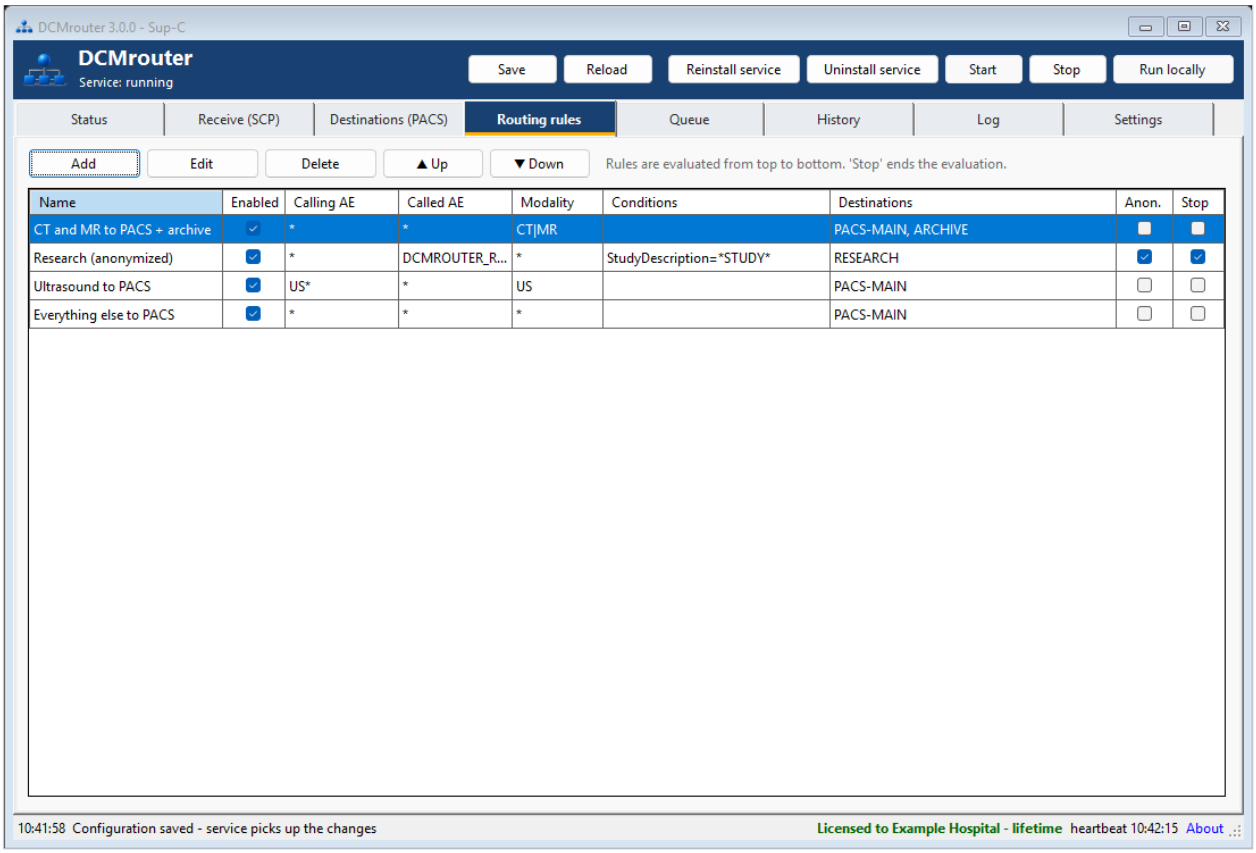

Figure 10 – Routing rules tab

10.1 How rules are evaluated

- Every enabled rule of which **all** conditions match adds its destinations. An image can therefore be sent to several destinations at once.
- A rule with **Stop** ends the evaluation: rules below it are skipped for that image.
- A rule with modifications or anonymization sends a modified copy to its own destinations; the original image is not changed for other rules.
- When no rule matches, the image is kept in the Unrouted folder or deleted, depending on Settings → No matching rule.
- Use **Up** and **Down** to change the order. Put specific rules (with Stop) above general rules such as *Everything else*.

Button	Function
Add / Edit / Delete	Manage rules (a double-click opens the rule).
Up / Down	Change the order of the selected rule.

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10.2 Rule window

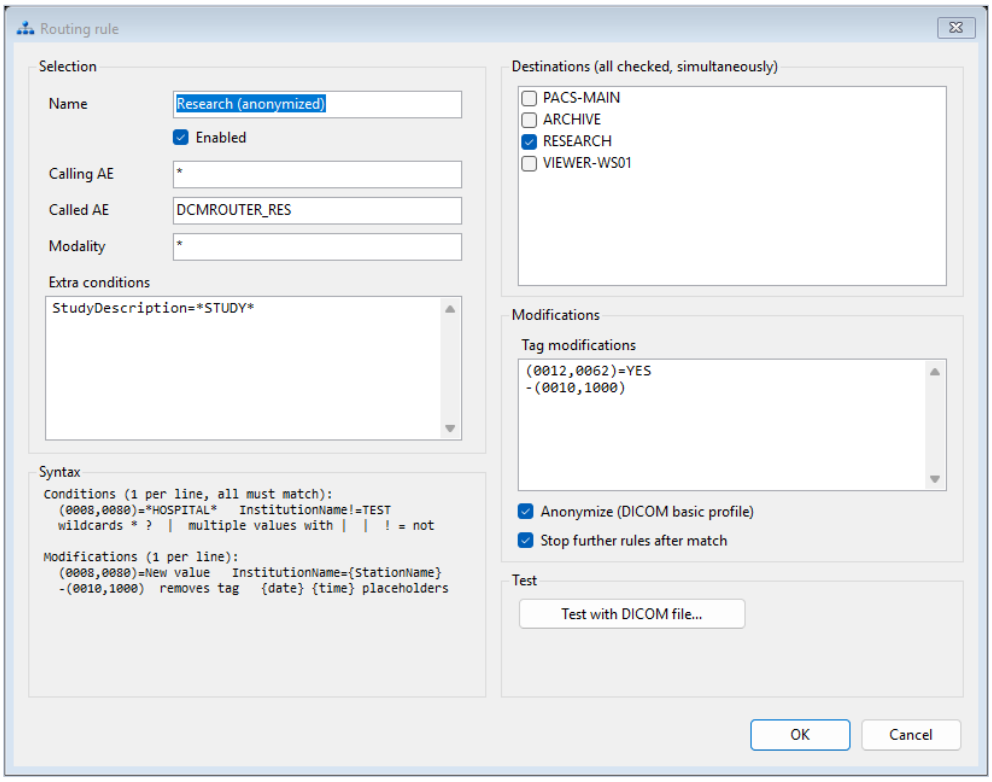

Figure 11 – Rule window

Field	Description
Name / Enabled	Name of the rule; a disabled rule is skipped.
Calling AE	AE title of the sender. `*` = every sender. Examples: `CT01`, `US*`, `CT01|CT02`, `!TEST*`.
Called AE	AE title the sender used for DCMrouter (the router AE or one of the extra AE titles).
Modality	Modality of the image, for example `CT`, `CT|MR`, `!SR`.
Extra conditions	Any DICOM tag, one condition per line; all conditions must match. Syntax: see 10.3.
Destinations	All checked destinations receive the image.
Tag modifications	Changes applied to the copy for this rule, one per line. Syntax: see 10.3.
Anonymize	Removes and replaces patient-identifying data according to the DICOM basic de-identification profile.
Stop further rules after match	Rules below this rule are not evaluated for matching images.
Test with DICOM file...	Checks a DICOM file against the conditions of this rule and shows *Match* or the reason why it does not match. AE conditions are not part of this test.

10.3 Syntax of conditions and modifications

A tag can be written as `(0008,0080)`, as `00080080` or as its DICOM keyword, for example `InstitutionName`.

Example	Meaning
`(0008,0080)=*HOSPITAL*`	Institution Name contains HOSPITAL (wildcards `*` and `?`, not case-sensitive).
`InstitutionName!=TEST`	Institution Name is not TEST.
`StationName=CT1|CT2`	Station Name is CT1 or CT2.

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Example	Meaning
`StudyDescription=!*PHANTOM*`	Study Description does not contain PHANTOM.
`# comment`	Lines starting with # are ignored.
`(0008,0080)=Example Hospital`	Modification: sets (or overwrites) the tag.
`InstitutionalDepartmentName={StationName}`	Modification with a placeholder: the value of another tag.
`(0020,4000)=Routed {date} {time}`	Placeholders `{date}` (yyyyMMdd) and `{time}` (HHmmss).
`-(0010,1000)`	Modification: removes the tag (here Other Patient IDs).

> **Tip:** Invalid conditions or modifications are reported when you click OK, so a typing error cannot silently disable a rule.

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11 Queue tab

The Queue tab shows, per destination, the files that are waiting to be sent (Queue) or that failed after the maximum number of attempts (Hold).

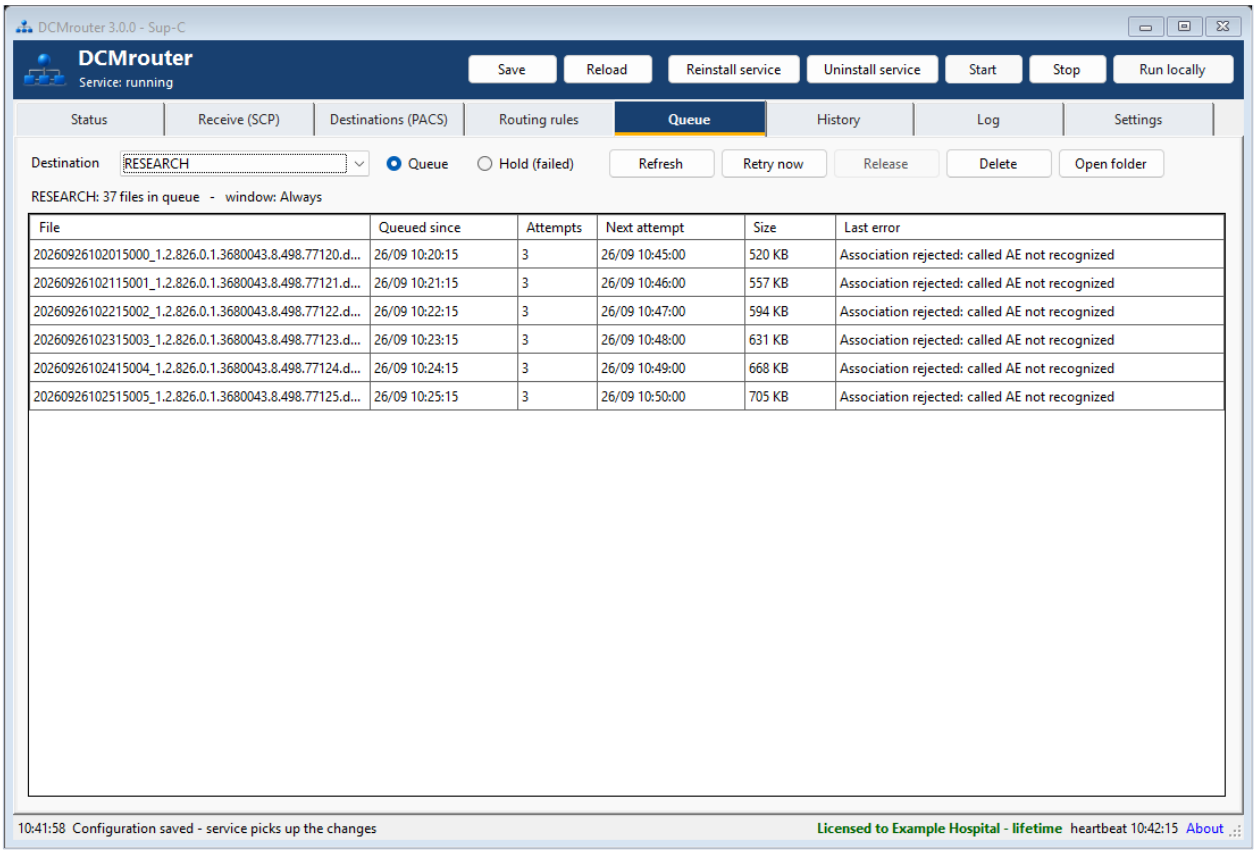

Figure 12 – Queue tab

Element	Function
Destination	Selects the destination.
Queue / Hold (failed)	Switches between waiting files and files in hold.
Refresh	Reloads the list (up to the first 2,000 files are shown).
Retry now	Queue: retries the selected files (or all when none is selected) immediately. Hold: moves them back to the queue.
Release	Moves the selected (or all) files from hold back to the queue.
Delete	Permanently deletes the selected files after confirmation. They will not be sent.
Open folder	Opens the queue or hold folder of this destination in Windows Explorer.

Column	Meaning
File	File name in the queue (time stamp + SOP Instance UID).
Queued since	When the file was queued.
Attempts	Number of failed attempts so far.
Next attempt	When the next attempt is planned.
Size / Last error	File size and the last error message of the destination.

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11.1 Retries and hold

After a failed attempt the waiting time doubles each time: first retry delay × 2^(attempts − 1), limited to the maximum retry delay. With the default settings (30 s, max. 1800 s, 5 attempts) the retries happen after about 30 s, 1 min, 2 min and 4 min; after the 5th failure the file moves to hold.

Hold is checked every 10 minutes (setting *Hold check*) with a C-ECHO. As soon as the destination answers, all files in hold are moved back to the queue and sent automatically.

> **Important:** Deleting files from the queue or hold cannot be undone. Only delete images when you are sure they are not needed at the destination.

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12 History tab

Every received and every sent object is recorded in the history database. Use it to answer questions such as *Did the CT study of this patient arrive in the PACS?*.

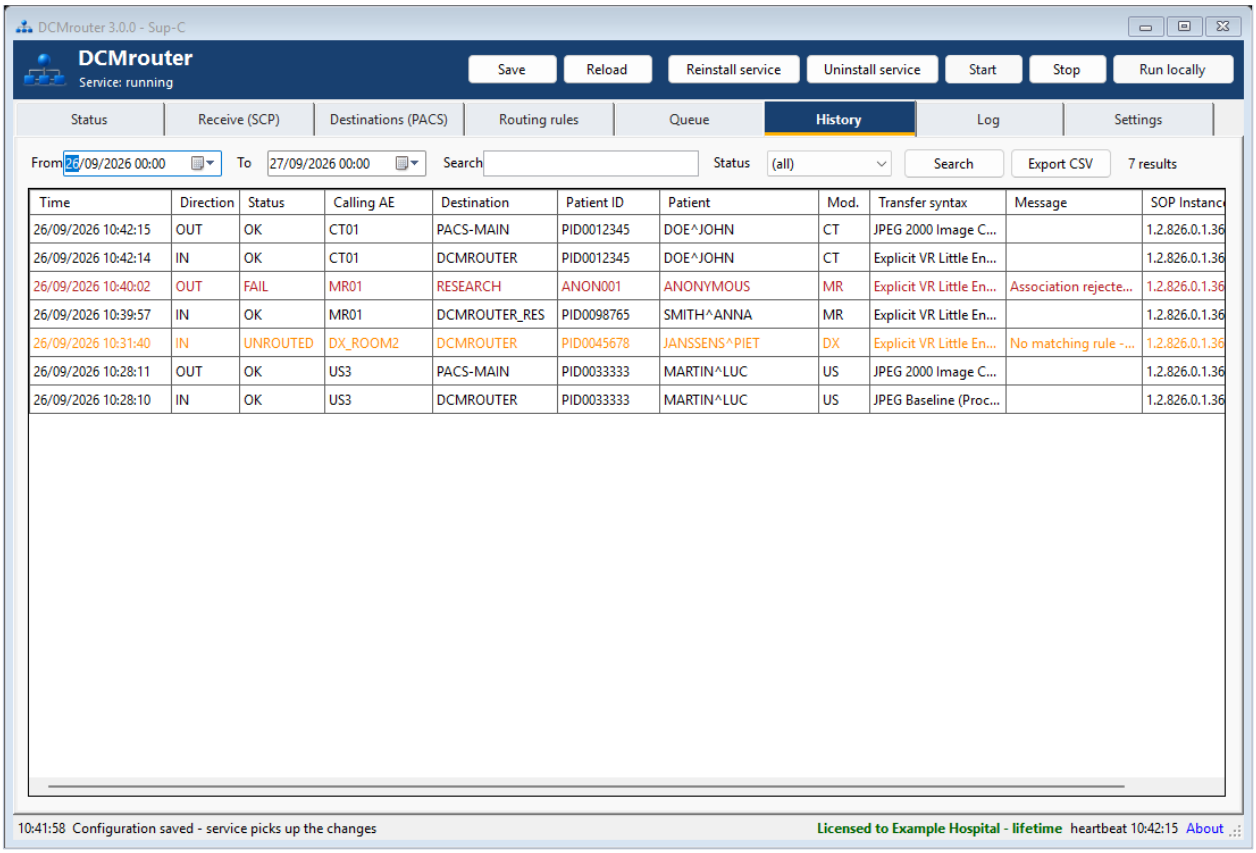

Figure 13 – History tab (example data)

Element	Function
From / To	Time range (default: today).
Search	Free text, searched in patient ID, patient name, calling AE, destination, modality, study and SOP Instance UID and message. Wildcards are not needed.
Status	Filter on status: (all), OK, FAIL, HOLD, CORRUPT, UNROUTED.
Search button	Runs the query. At most 5,000 results are shown; *5000+ (refine filter)* means there are more.
Export CSV	Exports the shown results to a CSV file (semicolon separated, opens directly in Excel).

Status	Meaning
IN / OK	Image received and stored.
OUT / OK	Image sent successfully (the transfer syntax column shows what was sent).
OUT / FAIL	Attempt failed; the file stays in the queue and is retried (shown in red).
OUT / HOLD	Maximum number of attempts reached; the file is in hold.
CORRUPT	Unreadable file received or found in the queue; moved to the Corrupt folder.
IN / UNROUTED	No rule matched (shown in orange).

> **Tip:** The history is kept for 90 days by default (Settings → Keep history). It contains patient data: treat exported CSV files accordingly.

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13 Log tab

The Log tab shows the log of the router. When the router runs locally, the log is shown live; otherwise the newest service log file is followed.

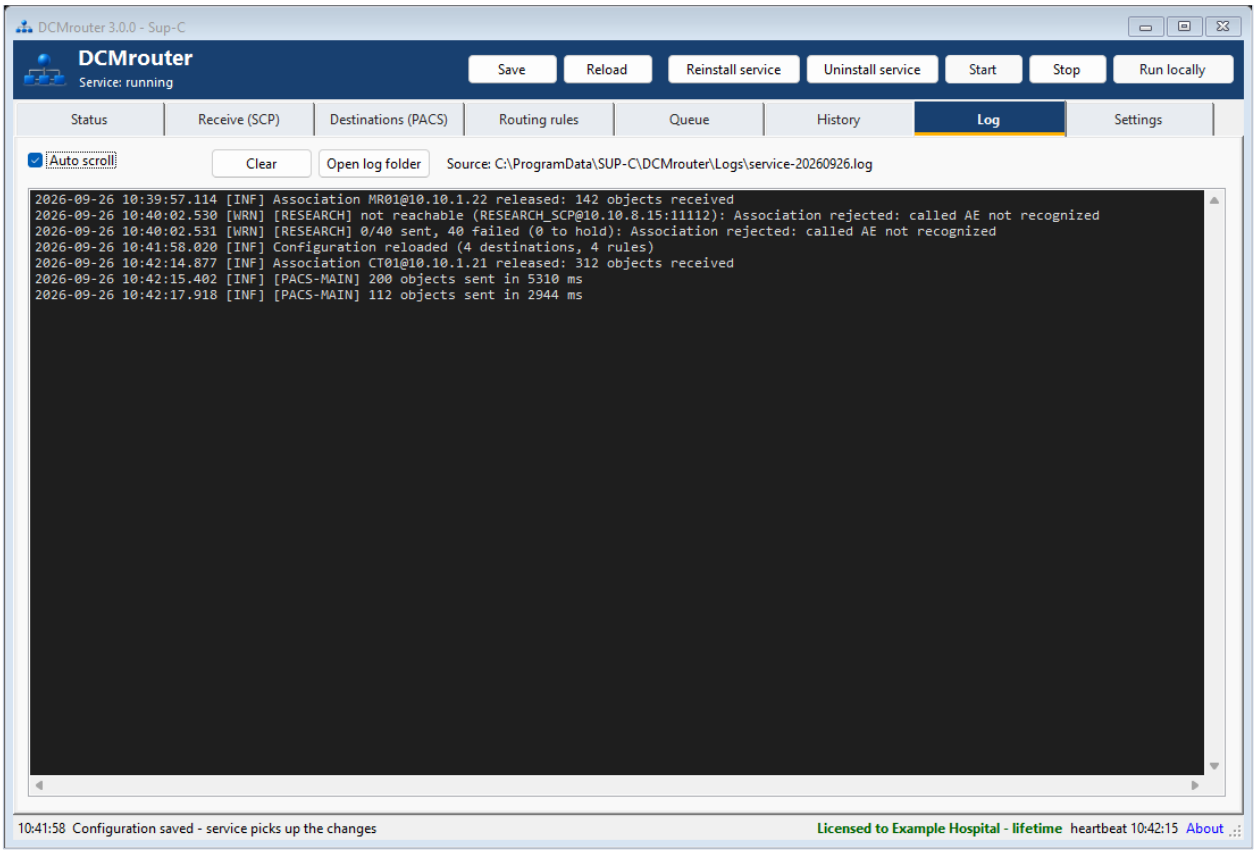

Figure 14 – Log tab

Element	Function
Source	Which log is shown (local router or the path of the service log file).
Auto scroll	Keeps the newest lines in view.
Clear	Clears the view only; the log file is not changed.
Open log folder	Opens the log folder in Windows Explorer.

Level	Meaning
[INF]	Information: start/stop, associations, batches sent, configuration reloaded.
[WRN]	Warning: destination not reachable, rejected association, conversion not possible, low disk space.
[ERR]	Error: listener could not start, corrupt data, unexpected errors.
[DBG]	Details, only when Debug logging is enabled in Settings.

Log files are named `service-yyyyMMdd.log` (service) and `gui-yyyyMMdd.log` (configuration program) and are kept for 30 days by default.

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14 Settings tab

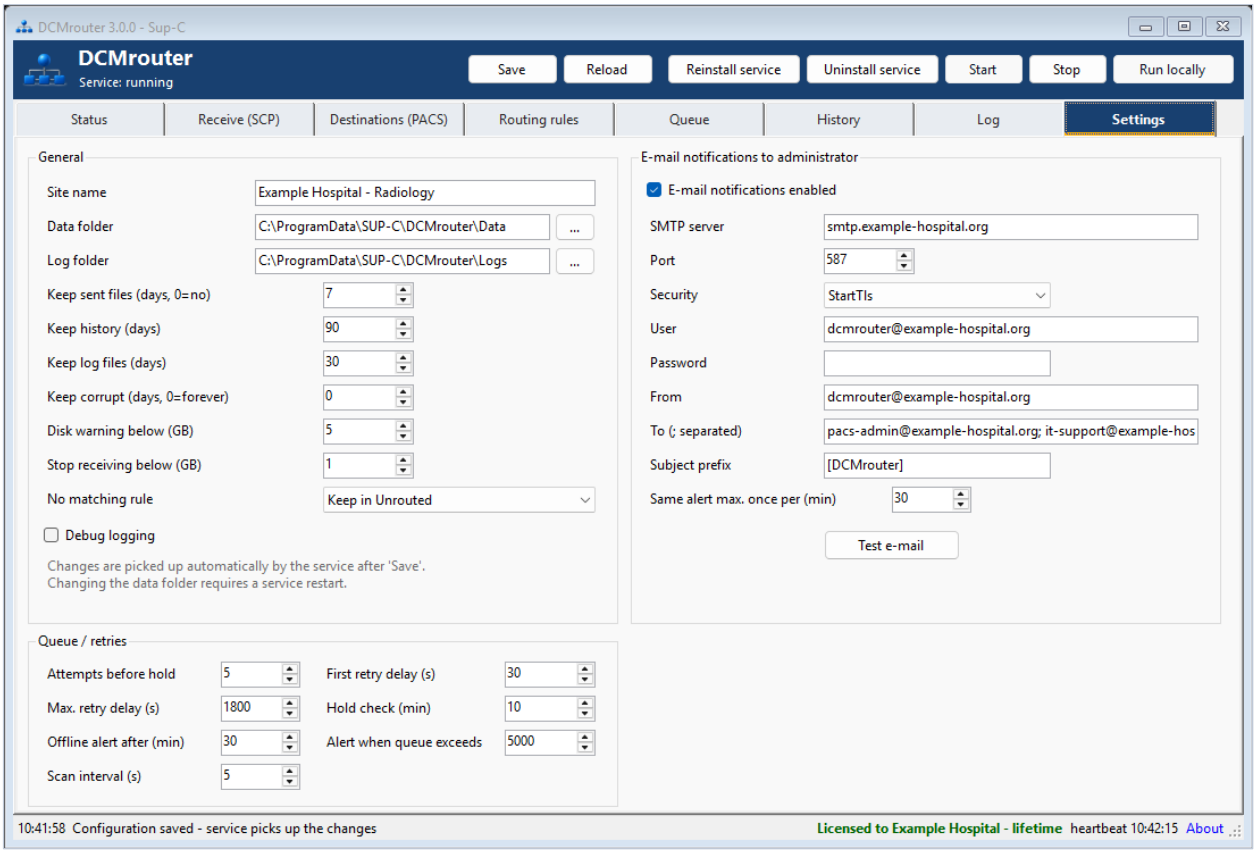

Figure 15 – Settings tab

14.1 General

Field	Description
Site name	Name of the site, used in e-mail notifications (default: computer name).
Data folder	Folder for incoming, queued, sent, corrupt and unrouted images. Default `C:\ProgramData\SUP-C\DCMrouter\Data`. A change takes effect after a restart of the service; files in the old folder are not moved.
Log folder	Folder for the log files.
Keep sent files (days, 0=no)	Keeps a copy of every sent image for the given number of days in Sent\<destination>\<date>. 0 = no copies.
Keep history (days)	Retention of the history database.
Keep log files (days)	Retention of the log files.
Keep corrupt (days, 0=forever)	Retention of the Corrupt folder.
Disk warning below (GB)	Below this free space an e-mail warning is sent.
Stop receiving below (GB)	Below this free space new associations and images are refused, so the disk never fills up completely. Must be lower than the warning threshold.
No matching rule	Keep in Unrouted (default) or Delete images that match no rule.
Debug logging	Writes detailed logging. Takes effect immediately after Save; use it only while troubleshooting.

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14.2 Queue / retries

Field	Description
Attempts before hold	Number of failed attempts after which a file moves to hold (default 5).
First retry delay (s)	Waiting time after the first failure; it doubles with every next failure (default 30).
Max. retry delay (s)	Upper limit of the waiting time (default 1800).
Hold check (min)	How often hold is checked with C-ECHO (default 10).
Offline alert after (min)	E-mail when a destination has been unreachable for this long (default 30).
Alert when queue exceeds	E-mail when the queue of a destination contains more files (default 5000).
Scan interval (s)	How often an idle forwarder checks its queue for new files (default 5).

14.3 E-mail notifications to administrator

Field	Description
E-mail notifications enabled	Switches all notifications on or off.
SMTP server / Port	Mail server, for example smtp.office365.com and port 587.
Security	Auto, None, SslOnConnect (port 465), StartTls (port 587) or StartTlsWhenAvailable.
User / Password	Login for the mail server (empty when not required). The password is stored encrypted.
From / To	Sender address and one or more recipients separated by semicolons.
Subject prefix	Text at the start of the subject, for easy mail filtering (default [DCMrouter]).
Same alert max. once per (min)	Prevents floods: the same alert is sent at most once in this period.
Test e-mail	Sends a test message with the current (not yet saved) settings.

Notifications are sent for:

- listener could not start, or did not respond and was restarted automatically;
- destination offline for longer than the configured time, and back online;
- files moved to hold, and queue larger than the threshold;
- corrupt data received or found in a queue;
- low disk space, and disk full (receiving refused);
- license no longer valid (demo mode started);
- service crashed (Windows restarts it automatically).

> **Tip:** After changing settings always click Save. The service applies the new configuration within seconds.

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15 Reliability and background tasks

Mechanism	What it does
Store first	An image is written to disk before the sender receives success. A power failure does not lose acknowledged images.
Crash recovery	At start-up, images that were received but not yet routed (Incoming folder) are routed again.
Health monitor	Every 60 seconds: listener self-test via TCP with automatic restart, disk space check, queue and offline alerts.
Watchdog	When the engine does not respond for 10 minutes, the service process stops itself and Windows restarts it.
Service recovery	Windows restarts the service after 5 s, 15 s and then 60 s after a failure.
Housekeeping	Every hour: removal of old sent copies, history records, corrupt files and temporary files according to Settings. Old log files are removed automatically when a new daily log file is started.
Configuration reload	A saved configuration is picked up by the running service without restart.

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16 Files and folders

```
C:\ProgramData\SUP-C\DCMrouter\
  config.json          configuration (passwords encrypted)
  DCMrouter.lic        license file
  heartbeat.json       live status of the service for the configuration program
  audit.db             history database
  Logs\                service-*.log, gui-*.log
  Data\Incoming        received, not yet routed
  Data\Queue\<id>      queue per destination (+ .dcm.json with attempts/error)
  Data\Hold\<id>       failed after the maximum attempts, released automatically
  Data\Sent\<id>\date  kept copies of sent images (when enabled)
  Data\Corrupt\date    unreadable files + .txt with the reason
  Data\Unrouted\date   images without a matching rule
  Data\Temp            temporary files
```

Important: The easiest and safest complete backup is the entire folder `C:\ProgramData\SUP-C\DCMrouter\` (plus the data and log folders when they were moved in Settings). The Queue and Hold folders can contain DICOM images that have not yet been delivered to their destination, so they are important for a complete system backup. As a minimum, back up config.json, DCMrouter.lic and, if the history must be kept, audit.db. Do not edit config.json manually while the service is running – use the configuration program.

Important: The data folders contain complete DICOM images and the history database (audit.db) contains patient names and IDs. Treat backups, files copied for troubleshooting and diagnostic information sent to support as confidential patient data, according to the policies of your organization. DCMrouter does not write patient names or IDs to its log files, but the logs do contain DICOM UIDs, file names, AE titles and IP addresses.

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17 Troubleshooting

Symptom	Cause and solution
Status: *Listener problem* / log: *Only one usage of each socket address*	The port is already in use by other software (often another DICOM application on port 104). Choose another port on the Receive tab or stop the other application.
Modality: association rejected, *calling AE not recognized*	The sender is not in the Allowed senders list, or its IP address does not match. Add it, or check Accept all senders.
Modality: association rejected, *called AE not recognized*	The modality uses a wrong AE title for DCMrouter. Correct the modality or add the AE title to Extra AE titles.
C-ECHO to a destination fails (timeout)	Wrong host or port, the destination is down, or a firewall blocks the connection. Test with C-ECHO in the Destination window.
Destination rejects the association	The destination does not know the calling AE title of DCMrouter. Register DCMrouter (AE title, IP, port) in the destination, or set the Calling AE of the destination.
Files stay in Hold	The destination is still unreachable. Check the last error on the Status tab. Hold is released automatically when the destination answers C-ECHO.
Images in Unrouted	No rule matched. Check the rules (order, Stop, conditions) and use Test with DICOM file. Unrouted files can be sent again by copying them to the hot folder.
Log: *Conversion … failed – original sent*	The image could not be converted to the chosen transfer syntax (for example video). The original was sent instead.
Router stops after 60 minutes	No valid license (demo mode). Check the license window for the reason and install a license.
License: *License is for another computer*	The license was issued for another hardware ID, or the hardware was changed. Request a new license with the hardware ID shown in the license window.
Status shows *Router not running* while the service runs	The service writes its status every few seconds. Check the service log for errors, and check that the service runs as Local System.
Test e-mail fails	Check server, port and Security (587 = StartTls, 465 = SslOnConnect), user and password, and whether the mail server allows sending from this computer.
Receiving refused, e-mail *Disk full*	Free disk space is below the *Stop receiving* threshold. Free up space, check the queues (a destination may be offline) and the retention settings.

17.1 Running the service in a console window

For diagnosis the service can be started in a console window. Stop the Windows service first, then open an administrator command prompt:

```
cd "C:\Program Files\SUP-C\DCMrouter"
DCMrouterService.exe --console
```

Stop it with Ctrl+C. Run it as administrator; otherwise the log and status files cannot be written.

17.2 Information for support

- Version (About window) and hardware ID (license window).
- The service log of the relevant day (Log tab → Open log folder).
- A screenshot of the Status tab and, when relevant, the history records (Export CSV). The history contains patient data – see chapter 16 before sending it.

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Appendix A About DCMrouter

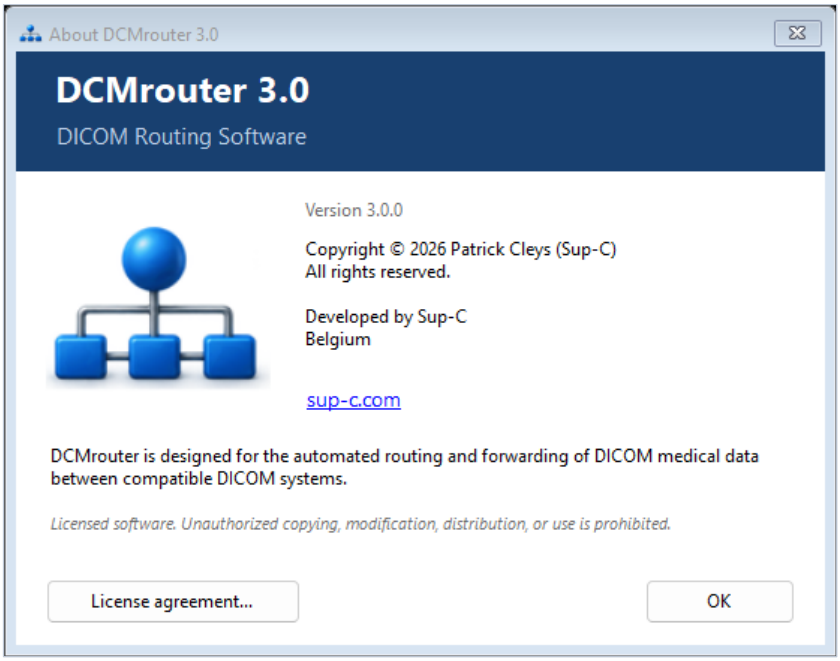

Figure 16 – About window

The About window (status bar → About, or a click on the logo) shows the version, the copyright and a button to open the End User License Agreement.

Appendix B Transfer syntaxes

Name in DCMrouter	UID	Type
Keep original (no conversion)	–	–
Explicit VR Little Endian (native)	1.2.840.10008.1.2.1	uncompressed
Implicit VR Little Endian (native)	1.2.840.10008.1.2	uncompressed
Explicit VR Big Endian (native, retired)	1.2.840.10008.1.2.2	uncompressed
Deflated Explicit VR Little Endian	1.2.840.10008.1.2.1.99	lossless
JPEG Lossless SV1 (Process 14)	1.2.840.10008.1.2.4.70	lossless
JPEG Lossless (Process 14)	1.2.840.10008.1.2.4.57	lossless
JPEG Baseline 8-bit	1.2.840.10008.1.2.4.50	**lossy**
JPEG Extended 12-bit	1.2.840.10008.1.2.4.51	**lossy**
JPEG-LS Lossless	1.2.840.10008.1.2.4.80	lossless
JPEG-LS Near-Lossless	1.2.840.10008.1.2.4.81	**lossy**
JPEG 2000 Lossless	1.2.840.10008.1.2.4.90	lossless
JPEG 2000	1.2.840.10008.1.2.4.91	**lossy**
HTJ2K Lossless	1.2.840.10008.1.2.4.201	lossless
HTJ2K Lossless RPCL	1.2.840.10008.1.2.4.202	lossless
HTJ2K	1.2.840.10008.1.2.4.203	**lossy**
RLE Lossless	1.2.840.10008.1.2.5	lossless

> **Important:** Lossy compression permanently removes image information. Do not use it for images that are used for diagnosis unless this is explicitly approved.

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Appendix C License agreement

DCMrouter is licensed software. The full End User License Agreement is shown during installation, is installed as `EULA.txt` in the program folder, and can be opened from the start menu and from the About window.

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