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Home

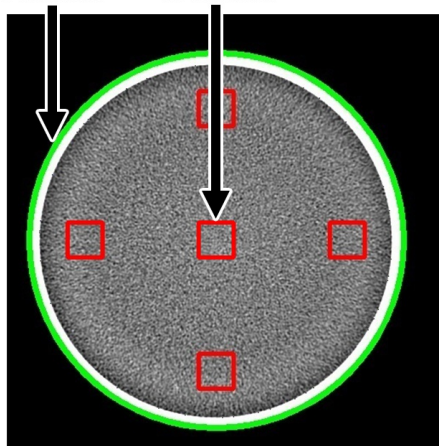


CTQA

stars **1** issues **0 open** pull requests **0 open** license **MIT**

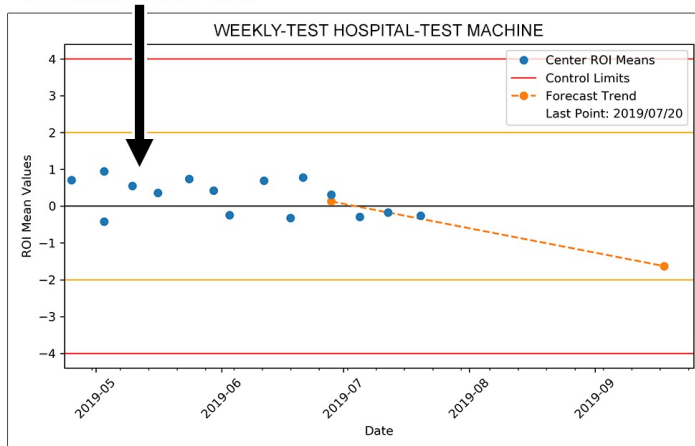
This utility aims to perform automated QA testing on CT machines for technologists.

Recognized Phantom Center Region Of Interest



Phantom Image

Center Region Of Interest Over Time



Generated Report

What is CTQA?

During the day-to-day operation of a CT machine, QA tests with a standardized phantom are usually performed to ensure images taken are accurate and artefact free. These QA tests, however, take time away from the technologist and can involve a factor of human error.

This utility aims to perform QA testing for the technologist. CTQA specializes in identifying the position of a phantom within an image and taking homogeneity measurements specific to the vendor. These measurements are tracked over time and any deviations are sent as notifications to the relevant parties.

Other Features Include:

- Automated Phantom detection
- Automated Homogeneity Testing
- Homogeneity Value Drift Prediction
- Notifications and Reports through email or a custom method
- Configurable homogeneity value limits
- Daily and Weekly Reports
- Subscribe to specific notification levels (Eg: Failures and Warnings only)

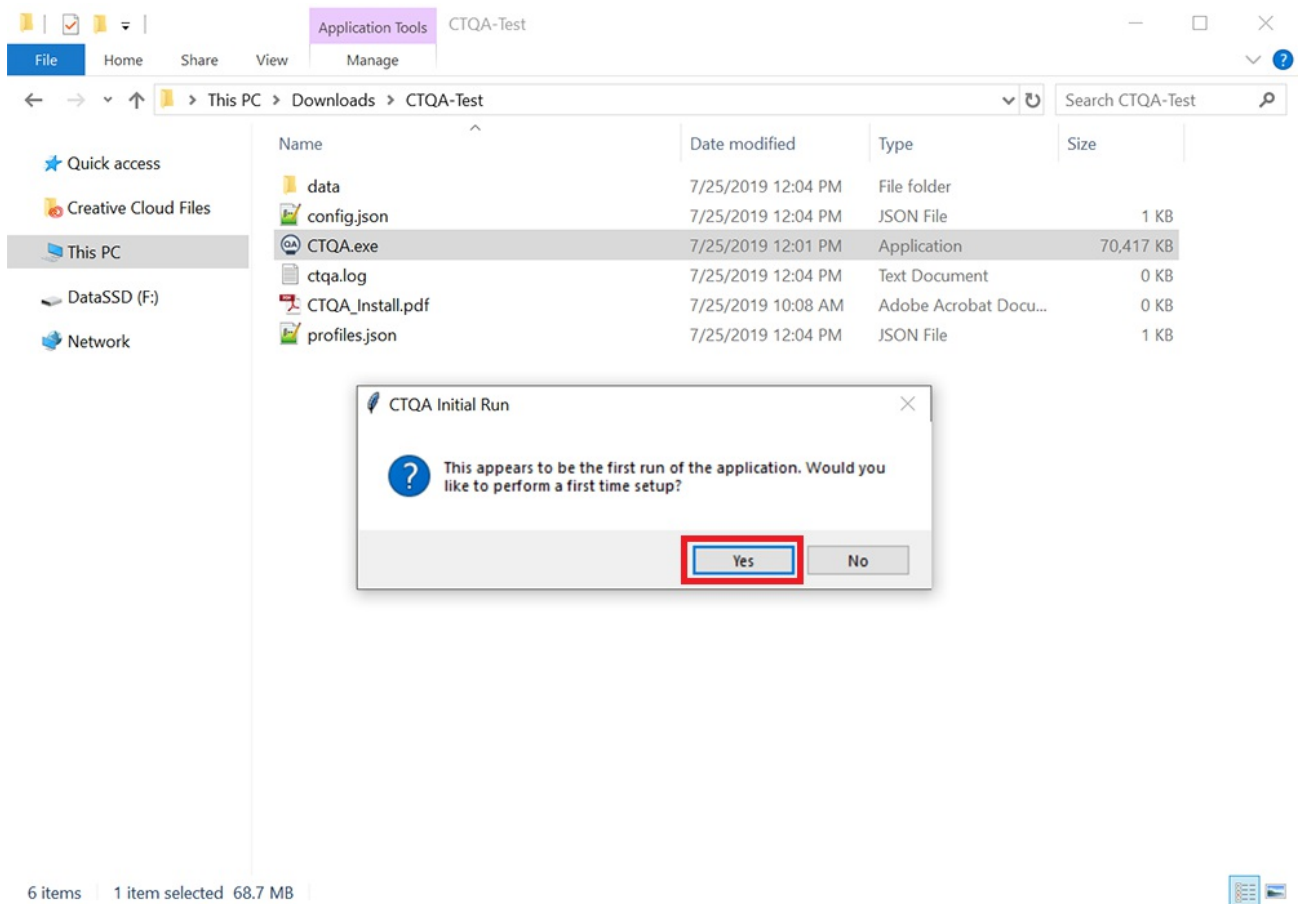
Installation

Prerequisites

- An Instance of Orthanc PACS Server [Download/Install here](#)
 - One Of:
 - Windows XP or higher (32 or 64 bit)
 - Windows Server 2008 R2 or higher (32 or 64 bit)
- Note:** If a version of Windows Server is used, "Desktop Experience" must be available to allow for usage of OpenCV.
- Images used for audits must *not* have a birth date within the DICOM tags

Installing

1. Please download the latest compatible release distribution from [here](#)
2. Extract the executable to a sensible location (CTQA will run from where you extract it). Please keep in mind extra files and folders will be created when the executable is run! There should be two extracted files sitting in the directory of your choice (CTQA.exe and CTQA-Install.pdf).
3. Run the executable (CTQA.exe). Click "Yes" to the first time setup prompt. If you plan on manually setting up the utility later, you can skip this and the following next few steps.



4. The CTQA options panel should pop up as the beginning of the first run setup. The options available are:

- **Source:** Where CTQA searches for images. Two options are available to choose: Orthanc and Test. The Orthanc option pulls images from an Orthanc Server instance while Test pulls images from an internal testing set.
- **Days to Forecast:** How many days into the future CTQA will predict to check if a machine is drifting out of set bounds.
- **Days to Graph (Daily):** How many days to graph on reports generated from the daily audit. The overall timeframe of a daily report is calculated from two dates: Start of Timeframe = [Date of Report Generation] - [Days to Graph (Daily)], End of Range = [Date of Report Generation] + [Days to Forecast]
- **Days to Graph (Weekly)** How many days to graph on reports generated from the weekly audit. The overall timeframe of a daily report is calculated from two dates: Start of Timeframe = [Date of Report Generation] - [Days to Graph (Weekly)], End of Range = [Date of Report Generation] + [Days to Forecast]

The next couple options are only configured if you choose Orthanc as your source (which is recommended):

- **Orthanc Rest Address:** The web address for the Orthanc server instance. This utility does not currently support Orthanc endpoints with a login.
- **Last Image Number:** The number corresponding to the last image audited by CTQA. This is used to keep track of new images added to the Orthanc server instance. This number can be reduced and a manual audit run to re-audit older images. Please increase this number to match the latest value in Orthanc if you do not wish to audit older images. The last image number can be found by entering the Orthanc web address with "/changes?since=last" added to the end.

Example:

```
http://192.168.1.121:8042/changes?since=last
```

Will load something similar to this:

```
{
  "Changes" : [],
  "Done" : true,
  "Last" : 888
}
```

In the above example, the "Last Image Number" would be 888.

It's recommended that you choose the "Orthanc" option from the sources list and enter the Orthanc web address into the Orthanc REST address entry box. The address should include an "http://" or an "https://" and will usually end with a port (Orthanc's default is port 8042, as seen in the example picture below).

After you've configured the settings to your liking, click the "Save Configuration" button and then click "Next".

The image displays three sequential screenshots of the "CTQA Service Configuration" window. Each window has a title bar with the CTQA logo and standard window controls. The "Options" section contains the following fields:

- Source:** A dropdown menu. In the first screenshot, it shows "Select a data source...". In the second and third, it is set to "ORTHANC".
- Days to Forecast:** A text input field with the value "60".
- Days to Graph (Daily):** A text input field with the value "365".
- Days to Graph (Weekly):** A text input field with the value "90".
- Orthanc REST Address:** A text input field. In the second screenshot, it contains the placeholder "Enter an address". In the third, it contains "https://192.168.1.121:8042".
- Last Image Number:** A text input field with the value "0".

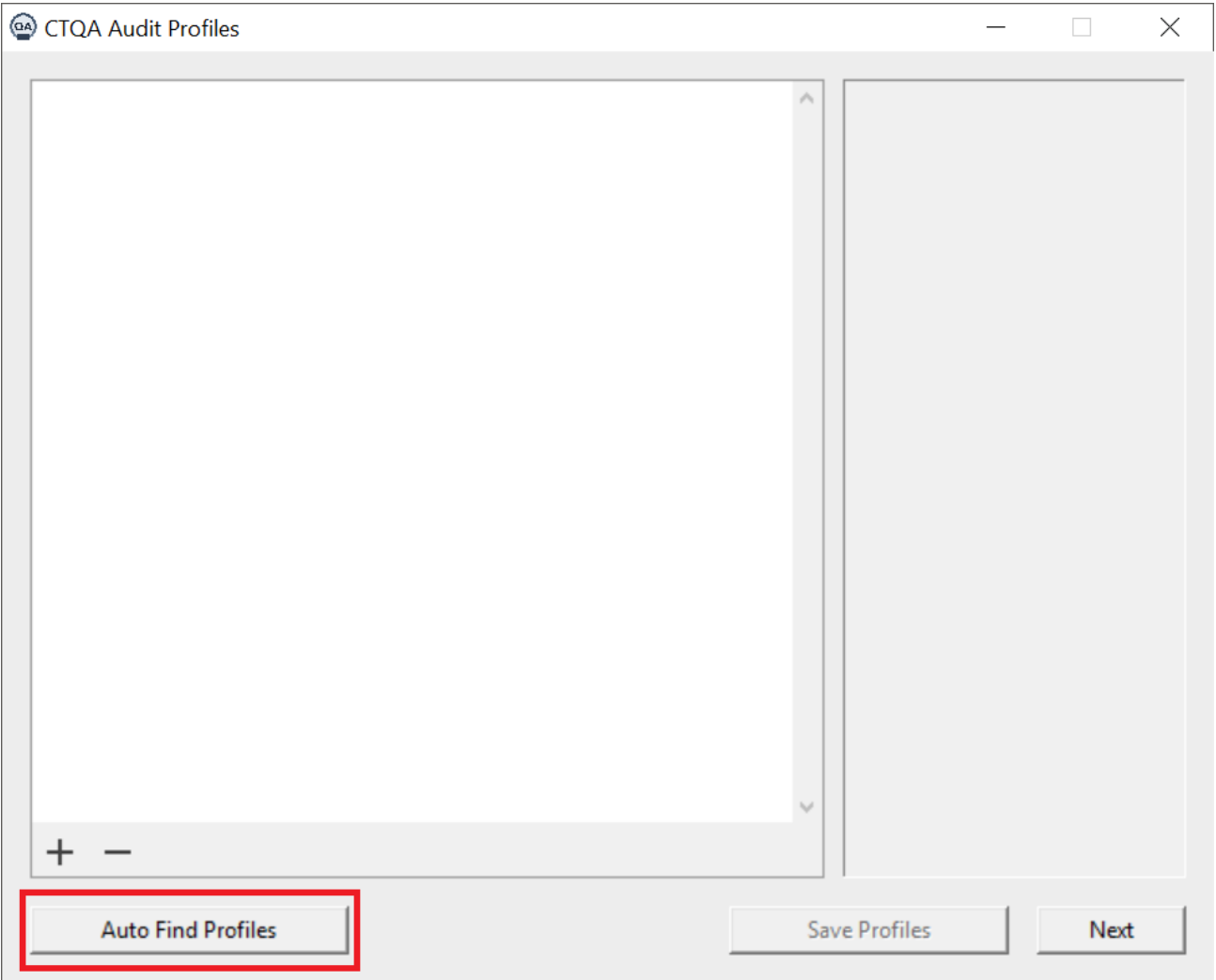
At the bottom of each window are two buttons: "Save Configuration" and "Next". In the third screenshot, both buttons are highlighted with red rectangular boxes.

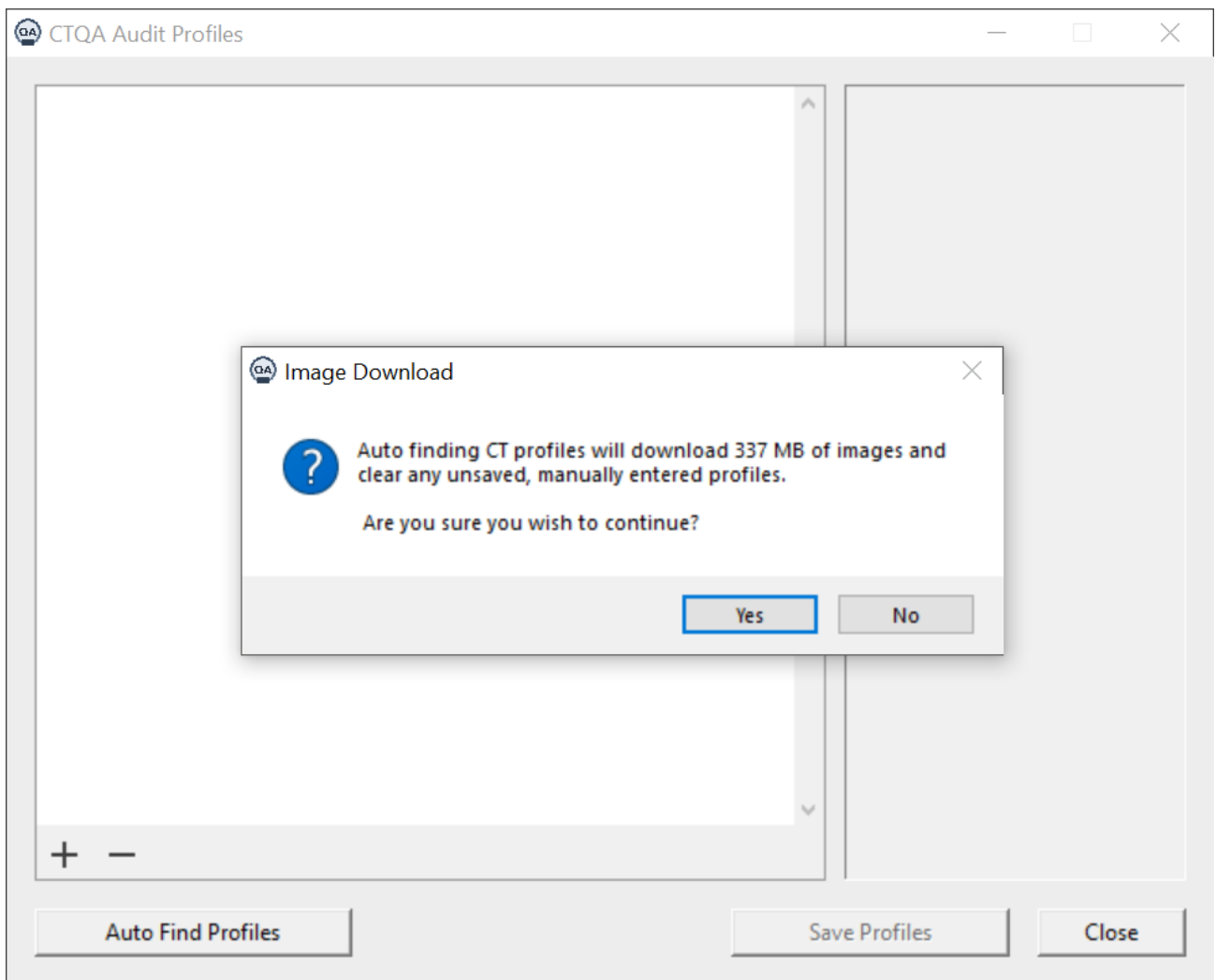
5. a) The Audit Profiles settings window should open (as seen in the image below). At this stage, you'll be configuring CTQA to identify and accurately audit images that machines will be submitting.

If the Orthanc instance already has existing images from the machines you wish to audit, click the "Auto Find Profiles" button. If the machine you wish to audit has not submitted yet, please proceed to step 5b to manually enter machine settings.

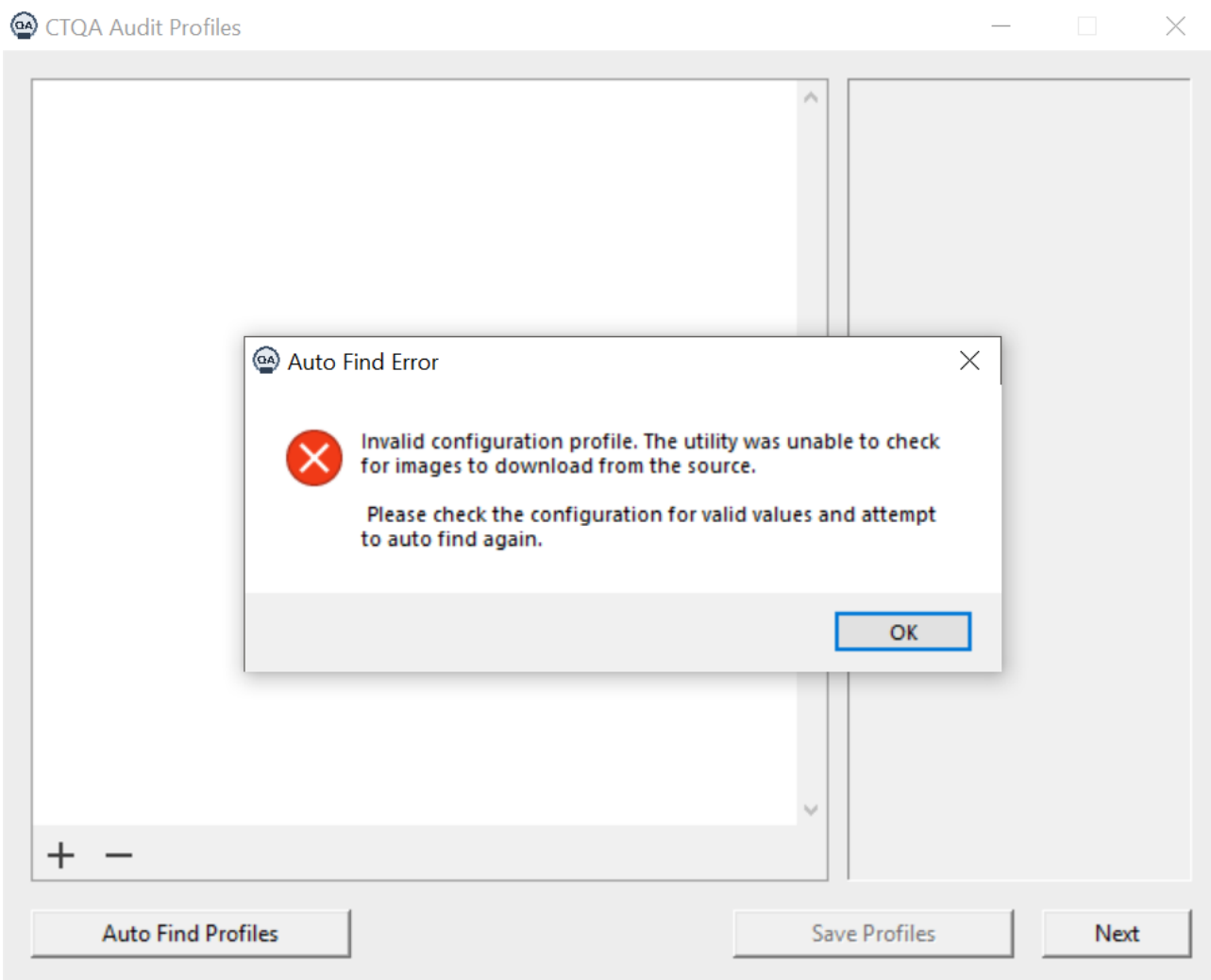
To auto find all machine profiles, CTQA will need to download all images from the selected Orthanc Instance. A popup should appear asking to confirm the download. Please pay attention to the download size and **ensure you have enough space on your machine to download.**

If you do not have enough space to download all images, proceed to step 5b to manually enter machine configuration settings. You'll also need to bump the "Last Image Number" setting previously configured in step 4. If left at 0, CTQA will download all images.





Note: If you encounter the error pictured below, this typically means that the Orthanc REST Address entered in step 4 was incorrect. You can either proceed to step 5b, manually enter your machine's settings, and correct the address later or click the "Next" button and edit the config within the main GUI to include the correct address.



5. b) To begin creating a settings profile for a machine, click the "+" button located in the bottom left corner (pictured below), above the "Auto Find Profiles" button.

The following settings in the machine's profile should be filled out according to the DICOM tags found within any image output by that machine.

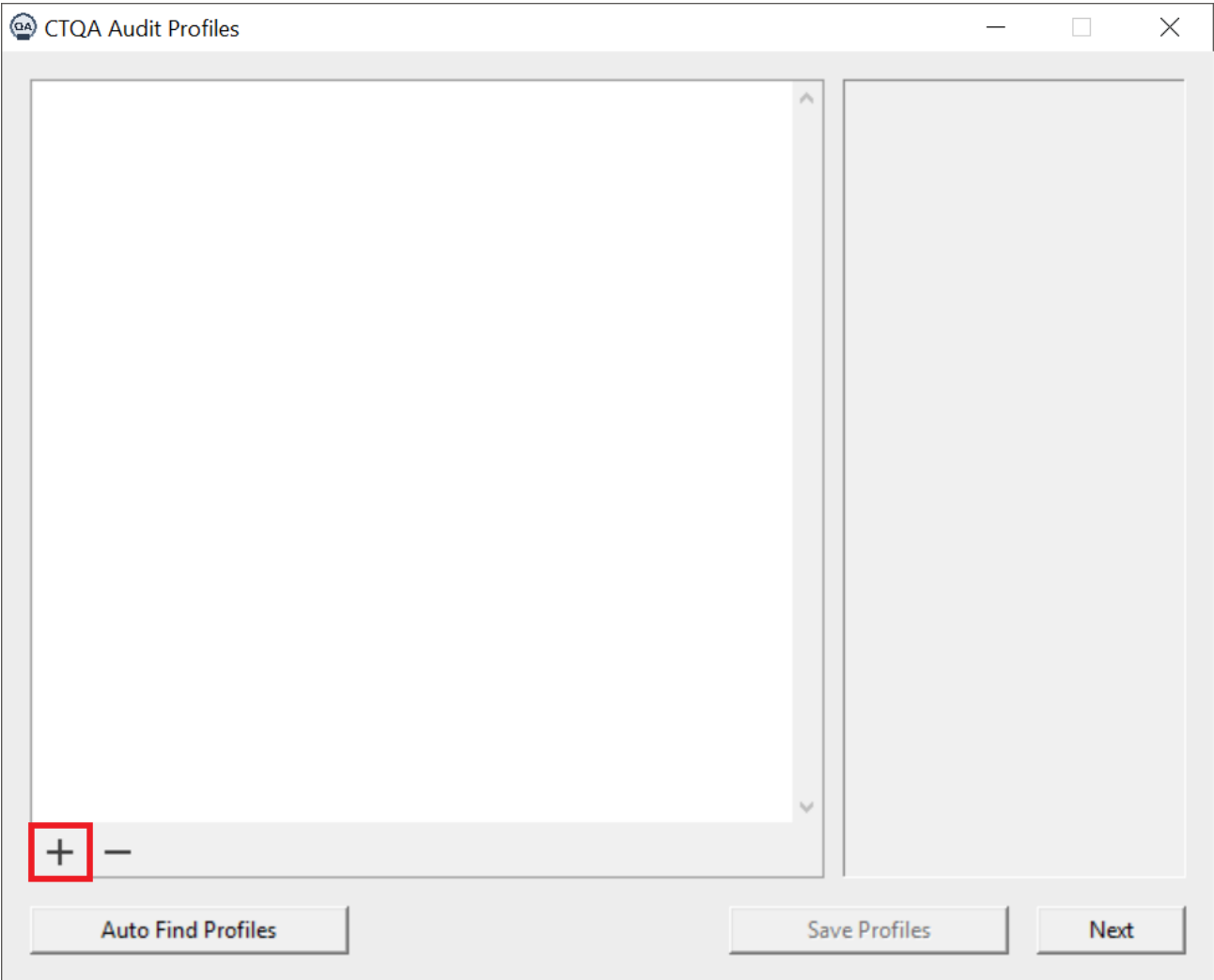
- **Station Name:** Please enter the value found in the DICOM tag (0008,1010). This is typically a value unique to the machine.
- **Manufacturer:** Please enter the value found in the DICOM tag (0008,0070). This is usually the name of the company that made the machine (Eg: GE Medical Systems, Toshiba, etc)
- **Manufacturer Model:** Please enter the value found in the DICOM tag (0008,1090). This is usually the model name of the machine.
- **Institution Name:** Please enter the value found in the DICOM tag (0008,0080). This is typically the formal name of the institution where the machine is located.

The other values can be configured as per your requirements. Descriptions of each setting are found below:

- **Homogeneity Slice Location:** This value corresponds to the slice location (DICOM tag 0020,1041) that CTQA will extract from a series to audit for homogeneity values.
- **Upper Homogeneity Limit:** This value indicates the upper bound on homogeneity values recorded for this machine. If a value goes outside this bound or values are predicted to exceed the bound, a failure or warning is issued.
- **Lower Homogeneity Limit:** The lower level for homogeneity values. Acts the same as the upper limit.

This step can be repeated for as many machines as you'd like.

Once you are done, click the "Save Profiles" button.



CTQA Audit Profiles

Station Name
Manufacturer

Station Name: testStation

Manufacturer: DEFAULT

Manufacturer Model: Toshiba

Institution Name: Test Hospital

Homogeneity
Slice Location: 60

Upper Homogeneity Limit: 4

Lower Homogeneity Limit: -4

Auto Find Profiles

Save Profiles

Next

6. After either step 5a or 5b, your machine's settings profiles should look something like the image below.

Click the "Next" button to proceed.

7. The main GUI for CTQA should now be open (pictured below). In the future, launching the application with the executable will now open this interface.

If the Orthanc server you're using has images ready to be audited, please click the "Manual Audit" button (second image below) located in the top right area of the utility. This will initiate an audit and, if everything is setup correctly, generate the appropriate reports.

If everything executes successfully, reports should be available to view under the "Reports" section. Double click any of the reports to open them. An example is pictured in the third image below.

CTQA Client

CTQA Reports

Reports

Report Name	Last Updated
Could not open reports folc	

Open Reports Folder View Report

CTQA Audit

Status

Source: ORTHANC

Notifications

Install Service

Manual Audit

Edit Config

Manage QA Profiles

Logs

```
2019-07-25 12:18:55,180 | WARNING :
2019-07-25 12:18:55,181 | WARNING : -----
2019-07-25 12:18:55,181 | ERROR : Creating config...
2019-07-25 12:18:55,184 | ERROR : Config file was crea
2019-07-25 13:13:32,718 | WARNING : Updating C:\Users\B
2019-07-25 13:14:01,313 | WARNING :
2019-07-25 13:14:01,314 | WARNING : -----
2019-07-25 13:15:24,725 | ERROR : <urlopen error [WinF
2019-07-25 13:20:47,338 | WARNING : Updating C:\Users\B
```

Open Log Open Log Folder

CTQA Client

CTQA Reports

Reports

Report Name	Last Updated
DAILY-TEST HOSPITAL-DISCC	2019-07-25 14:10
DAILY-TEST HOSPITAL-LIGH	2019-07-25 14:10

Open Reports Folder View Report

CTQA Audit

Status

Source: ORTHANC

Notifications

Install Service

Manual Audit

Edit Config

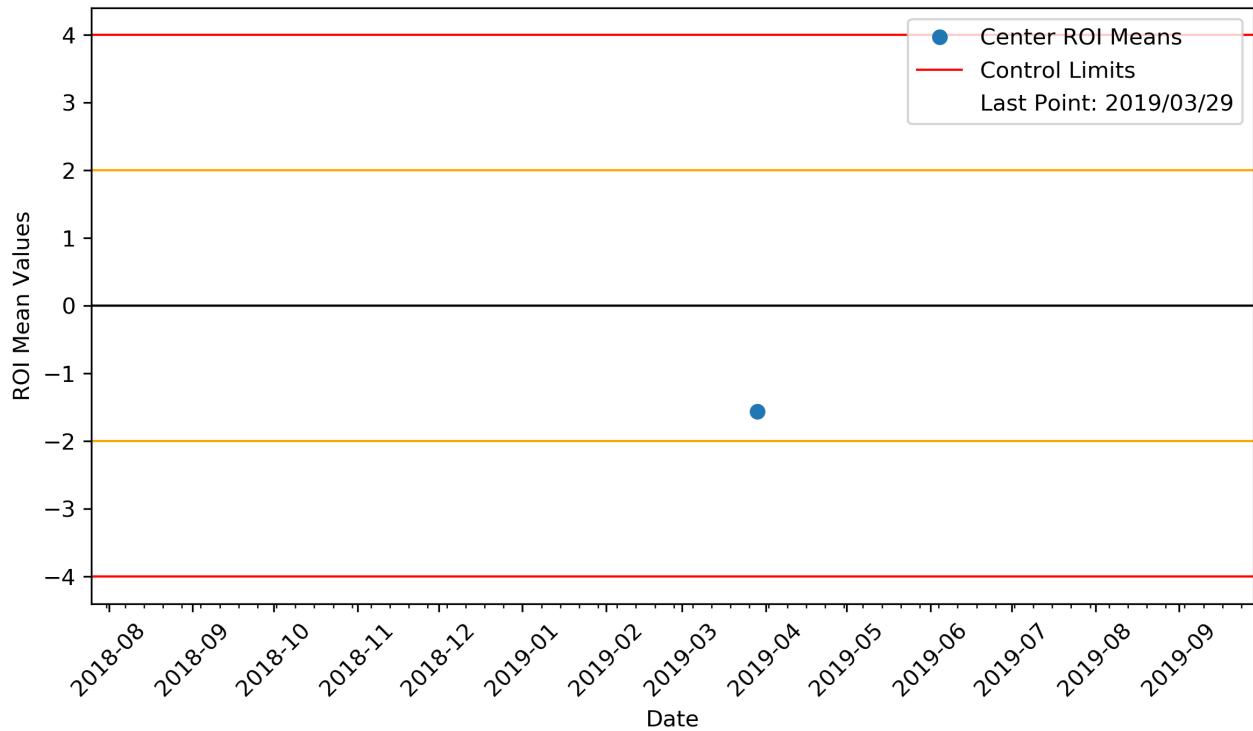
Manage QA Profiles

Logs

```
2019-07-25 14:10:05,664 | DEBUG : Auditing
2019-07-25 14:10:05,664 | ERROR : 'NoneType' object has no
2019-07-25 14:10:05,664 | ERROR : Error during audit of mac
2019-07-25 14:10:05,664 | ERROR : '>' not supported between
2019-07-25 14:10:05,664 | DEBUG : Auditing
2019-07-25 14:10:05,664 | ERROR : 'NoneType' object has no
2019-07-25 14:10:05,664 | ERROR : Error during audit of mac
2019-07-25 14:10:05,664 | ERROR : '>' not supported between
2019-07-25 14:10:05,664 | DEBUG : {'Homogeneity': {'
2019-07-25 14:10:05,680 | DEBUG : Generating report: DAILY-
2019-07-25 14:10:06,197 | DEBUG : Generating report: DAILY-
2019-07-25 14:10:06,716 | DEBUG : {'runType': 'daily', 'eve
2019-07-25 14:10:06,717 | WARNING : No suitable email found i
2019-07-25 14:10:06,717 | WARNING : No suitable email found i
2019-07-25 14:10:06,732 | INFO : Finished
```

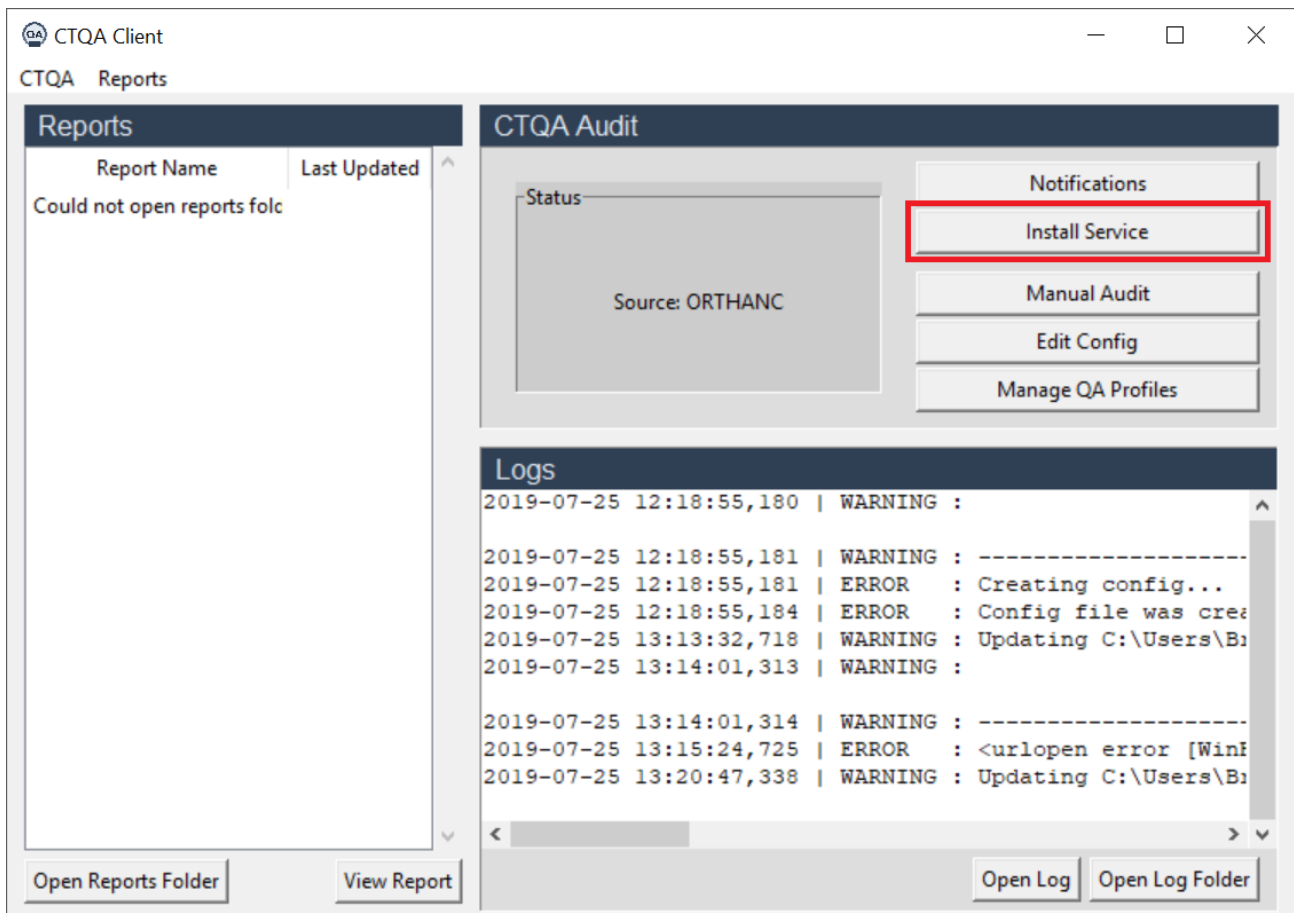
Open Log Open Log Folder

DAILY-TEST HOSPITAL-DISCOVERY 750HD-ctbay66



8. Next, to ensure CTQA runs automatically, two tasks need to be installed. To begin the installation, click the "Install Services" button, pictured below.

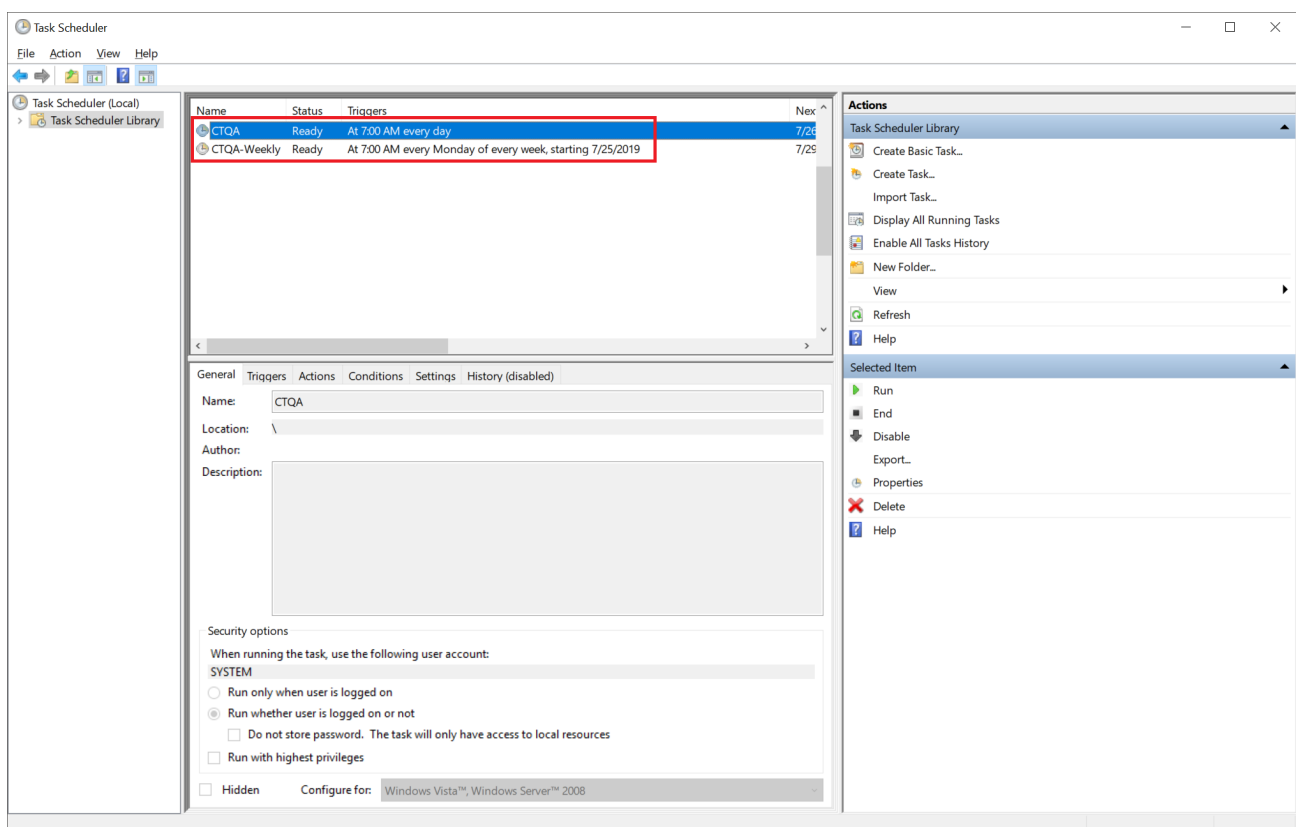
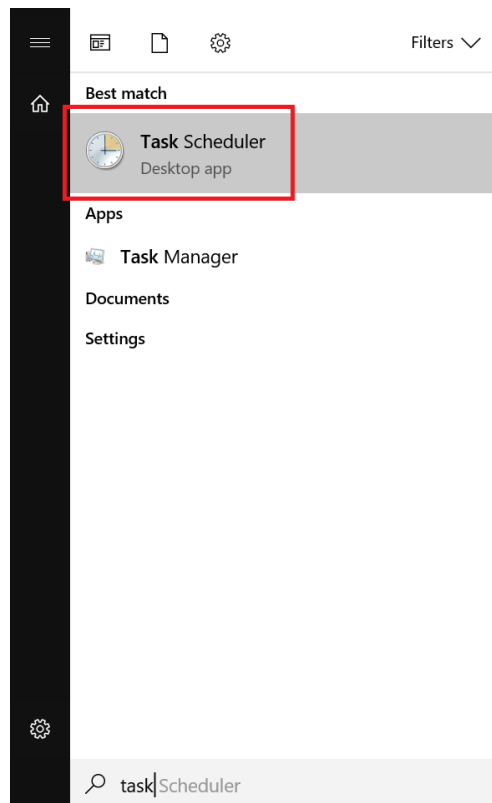
You will be prompted twice to allow a task to be installed. Please click "Yes" on both prompts.



9. Finally, we'll check if the two tasks were installed.

Please search for and open "Task Scheduler". Once Task scheduler has opened, please confirm that the tasks "CTQA" and "CTQA-Weekly" exist. You'll likely need to click on the "Task Scheduler Library" menu item located within the left sidebar of Task Scheduler.

If both exist, you've successfully installed CTQA!



Next Steps

- Check out the section on "Setting up Notification" to get automated reports and notifications sent to you through your method of choice.
- Review how to remove a data point in the "Removing a Data Point" section.

Migrating CTQA to a new Machine

1. Run CTQA.exe, click the "Uninstall Service" button, and agree to any prompts. Close CTQA after you are done.

2. Copy the CTQA executable and all the folders/files surrounding it onto the new system at a location of your choice. In the old CTQA installation, if you specified a different location for report storage, make sure to copy that over as well. If you're not sure, open up the "config.json" file and check the value stored next to the "reportLocation" key.
3. After you've finished copying over CTQA, open up the file "config.json" (located in the same directory as the CTQA executable) and change the "reportLocation" value to a blank value. An example follows:

Snippet of the original config.json

```
"LastPACSDateChecked": false,  
"ReportLocation": "C:\\\\CTQA\\\\reports", <--- CHANGE THIS VALUE  
"ServicesInstalled": false,  
"WarningHook": "",
```

Snippet of the modified config.json

```
"LastPACSDateChecked": false,  
"ReportLocation": "", <--- CHANGED VALUE  
"ServicesInstalled": false,  
"WarningHook": "",
```

Finally, save the file and close it.

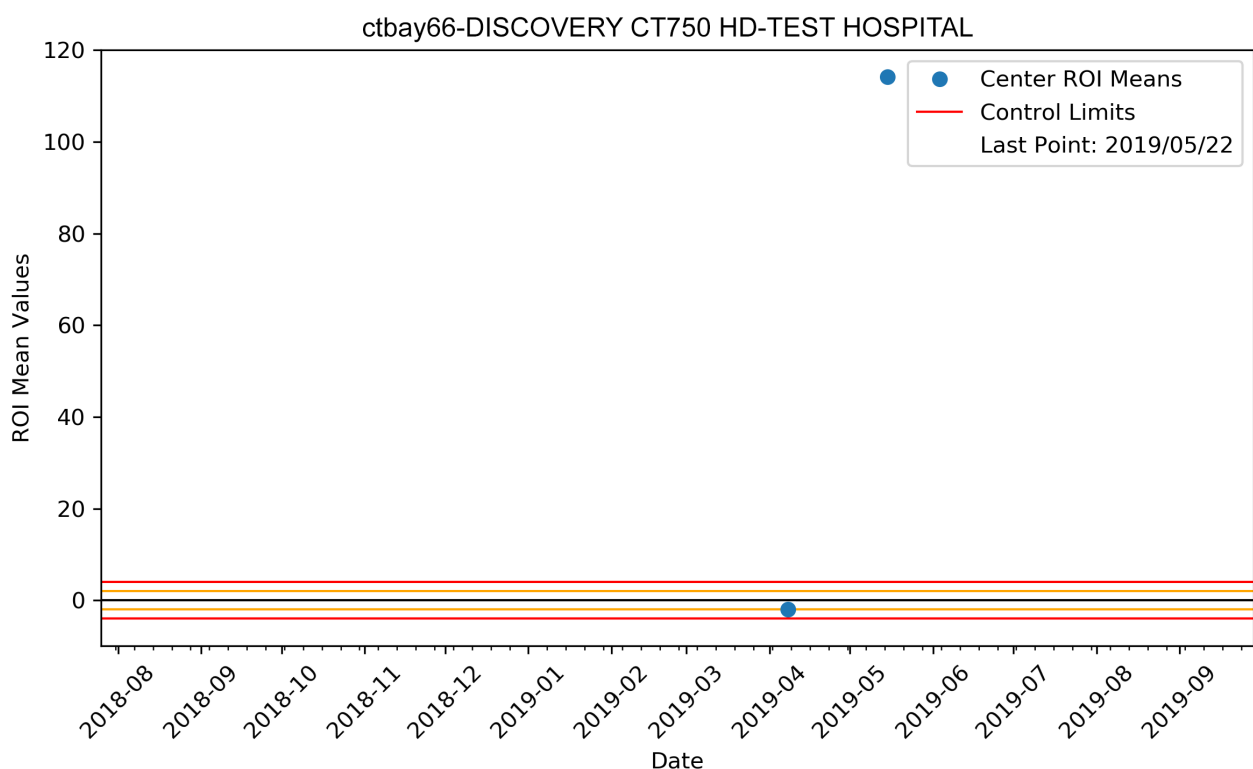
4. Run CTQA.exe on the new machine. Click the "Install Service" button and agree to all prompts.

CTQA should now be migrated to the new machine!

Removing a Data Point

Preface

During the operation of a CT machine, improper or malformed scans can be generated and accidentally sent. This can result in CTQA generating a skewed graph, which is undesirable. Such a scenario is illustrated by the image below:



The next few steps detail how to remove the outlier point from Orthanc, CTQA, and the generated report.

Instructions

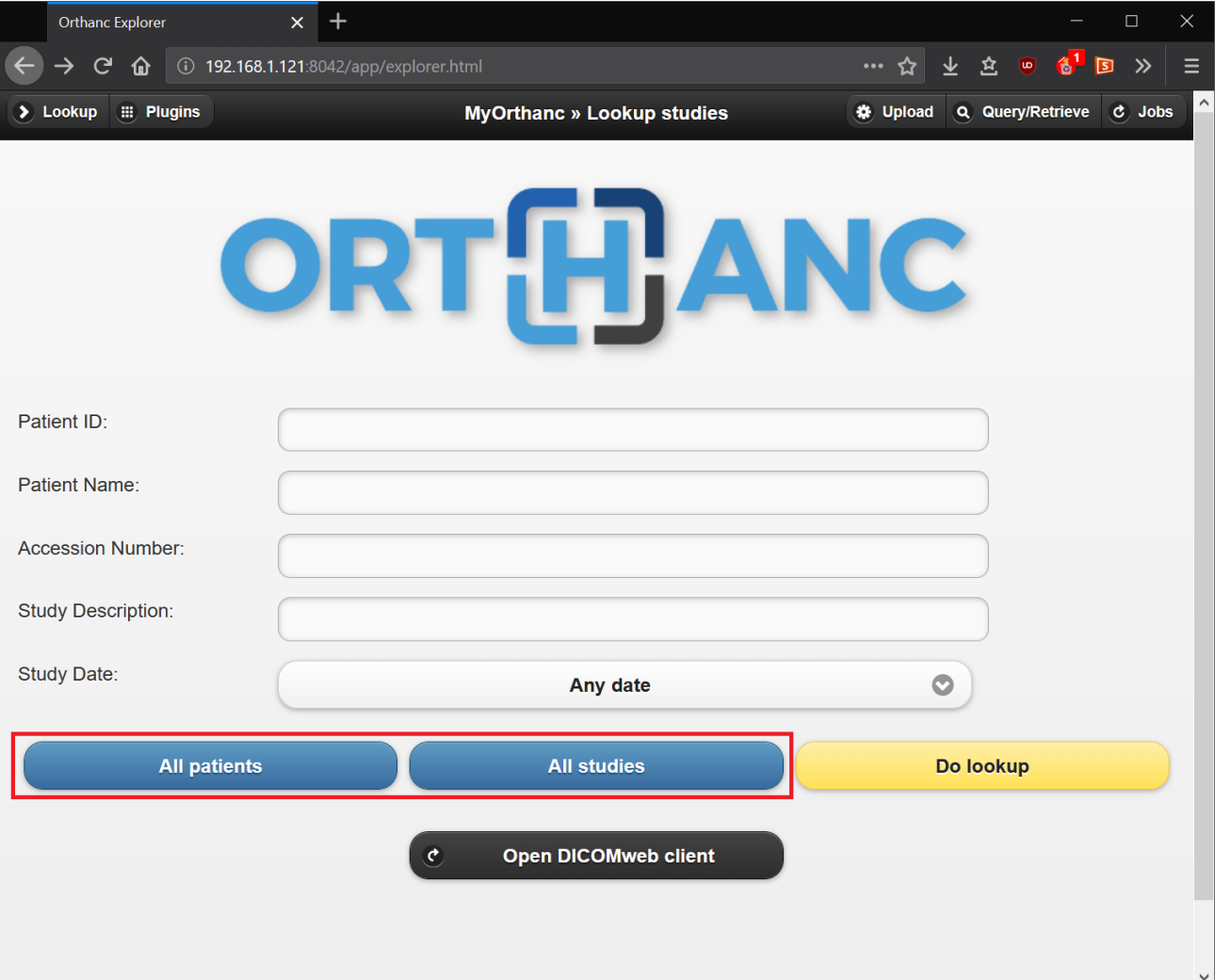
Please Note: Before beginning data removal, you need to know the details of the CT machine (name, make, etc) and the date of the offending point.

In the instructions below, we will remove a point recorded on May 15 by ctbay66 at the institution, Test Hospital.

You can skip steps 1-3 if you intend on keeping the outlier scan in your Orthanc instance. Steps 4-7 will simply remove the audit data from CTQA and clear the outlying point(s) from your report(s)

1. The process of data removal begins by deleting the undesirable results from Orthanc. Please open a web browser of your choice and access the Orthanc web interface. The address for the web interface defaults to the IP of the server with the port 8042 (Eg: "192.168.1.121:8042", as seen in the photo below).

Once the page has loaded in, please click on either the "All Patients" button or the "All Studies" button (whichever is easiest to find the undesirable scan). Typically, the "All Studies" view is the quickest method for finding the undesirable scan.



2. Find and click the undesirable scan within the list. Make sure to pay careful attention that the machine details and date match the undesirable scan!

MyOrthanc » All studies

192.168.1.121:8042/app/explorer.html#find-studies

AccessionNumber:
 InstitutionName: **Test Hospital 2**
 ReferringPhysicianName:
 StudyDate: **Wednesday, May 15, 2019**
 StudyID: 7366
 StudyInstanceUID: 1.2.840.113619.2.340.3.3943320575.502.1557930717.101

PatientBirthDate: ?
 PatientID: **phantom**
 PatientSex:
 RETIRED_OtherPatientIDs:
 AccessionNumber:
 InstitutionName: **Test Hospital**
 ReferringPhysicianName:
 StudyDate: **Wednesday, May 15, 2019**
 StudyID: 24215
 StudyInstanceUID: 1.2.840.113619.2.437.3.2013935615.518.1557876216.404

PatientBirthDate: ?
 PatientID: **phantom**
 PatientSex:
 RETIRED_OtherPatientIDs:
 AccessionNumber:
 InstitutionName: **Test Hospital**
 ReferringPhysicianName:
 StudyDate: **Friday, May 3, 2019**
 StudyID: 31106
 StudyInstanceUID: 1.2.840.113619.2.452.3.1711950616.463.1556861241.646

PatientBirthDate: ?
 PatientID: **phantom**
 PatientSex:
 RETIRED_OtherPatientIDs:
 AccessionNumber:
 InstitutionName: **Test Hospital**
 ReferringPhysicianName:
 StudyDate: **Friday, May 10, 2019**
 StudyID: 24445
 StudyInstanceUID: 1.2.840.113619.2.437.3.1711933208.869.1557357596.420

PatientBirthDate: ?
 PatientID: **phantom**

3. On the left side of the Orthanc study information page, click the "Delete this study" button.

MyOrthanc » Patient » Study

192.168.1.121:8042/app/explorer.html#study?uuid=352b5252-e27f6c91-7b5afe0f-6...

Lookup Plugins Upload Query/Retrieve Jobs

Patient

PatientBirthDate: ?
PatientID: phantom
PatientSex: RETIRED_OtherPatientIDs:

Study

AccessionNumber:
InstitutionName: Test Hospital
ReferringPhysicianName:
StudyDate: Wednesday, May 15, 2019
StudyID: 24215
StudyInstanceUID: 1.2.840.113619.2....

Filter items...

Wednesday, May 15, 2019

Noise, Res, LCD

Status: Unknown
Modality: CT
OperatorsName:
ProtocolName: 10.1 Quality Assurance
SeriesInstanceUID: 1.2.840.113619.2.437.3.2013935615.518.1557876216.407
SeriesNumber: 1
StationName: ct01

Send to DICOMweb server

Osimis Web Viewer

Transfers accelerator

Interact

Delete this study

Send to DICOM modality

Anonymize

Access

4. Next, navigate to your CTQA installation directory and open the "data" folder (located at CTQA's root).

CTQA-Test

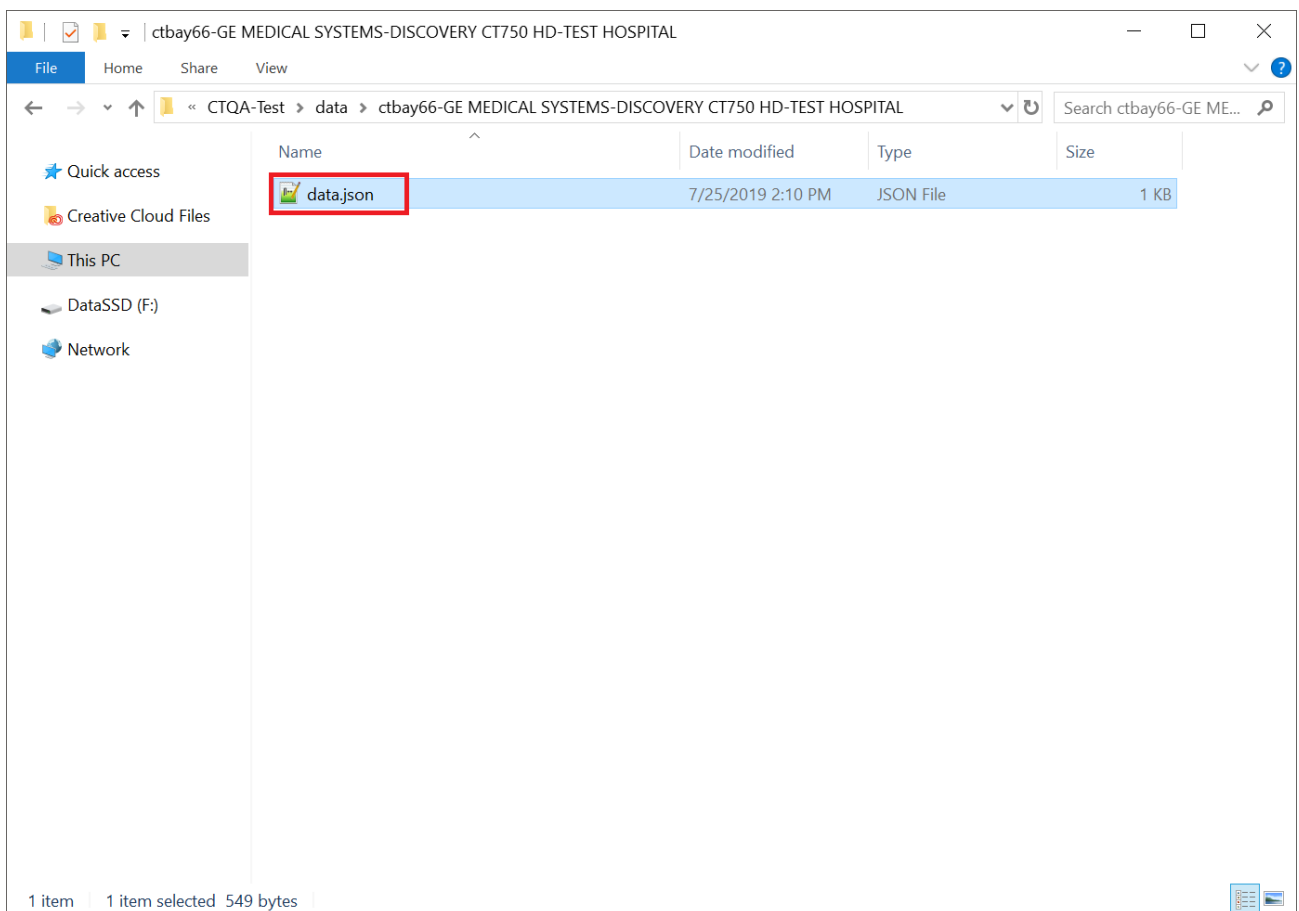
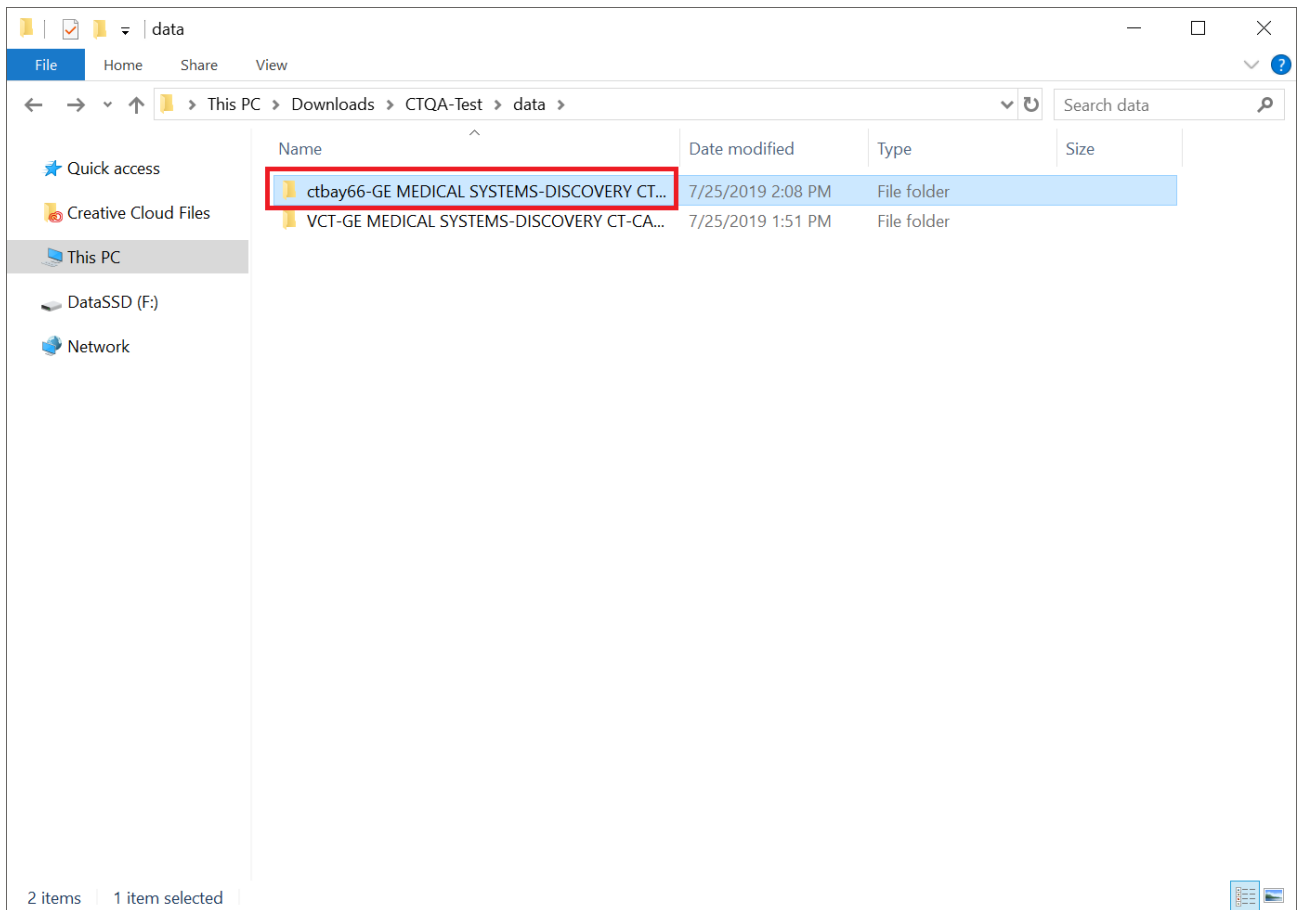
File Home Share View

This PC > Downloads > CTQA-Test

Name	Date modified	Type	Size
data	7/25/2019 2:08 PM	File folder	
reports	7/25/2019 2:19 PM	File folder	
roi_selections	7/25/2019 2:10 PM	File folder	
config.json	7/25/2019 2:52 PM	JSON File	1 KB
CTQA.exe	7/25/2019 12:01 PM	Application	70,417 KB
ctqa.log	7/25/2019 2:35 PM	Text Document	254 KB
CTQA_Install.pdf	7/25/2019 10:08 AM	Adobe Acrobat Docu...	0 KB
ek	7/25/2019 1:47 PM	eastobuy	1 KB
profiles.json	7/25/2019 2:18 PM	JSON File	4 KB

9 items 1 item selected

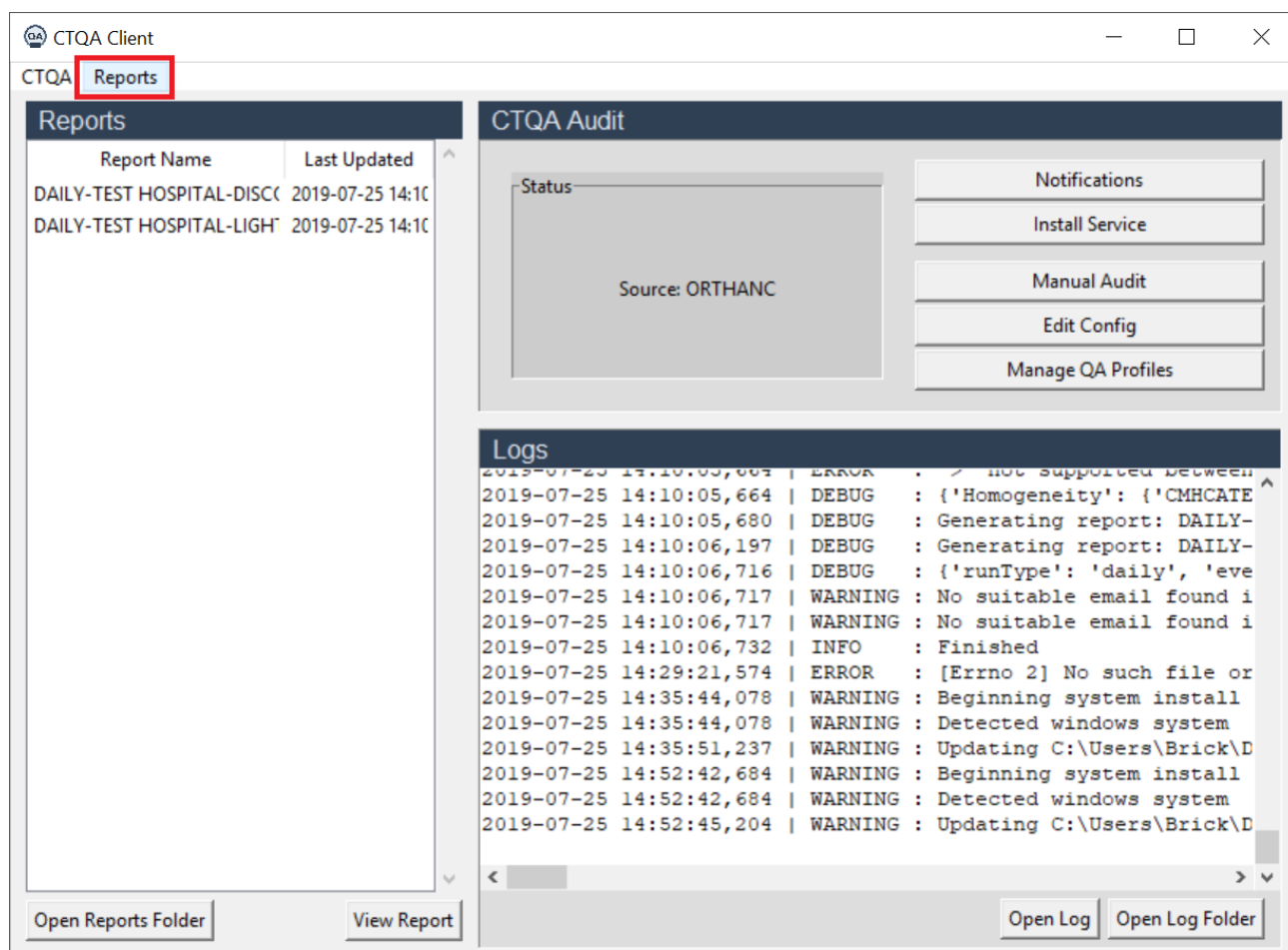
5. Open the folder corresponding to the machine with the undesirable point and then open the JSON file within.



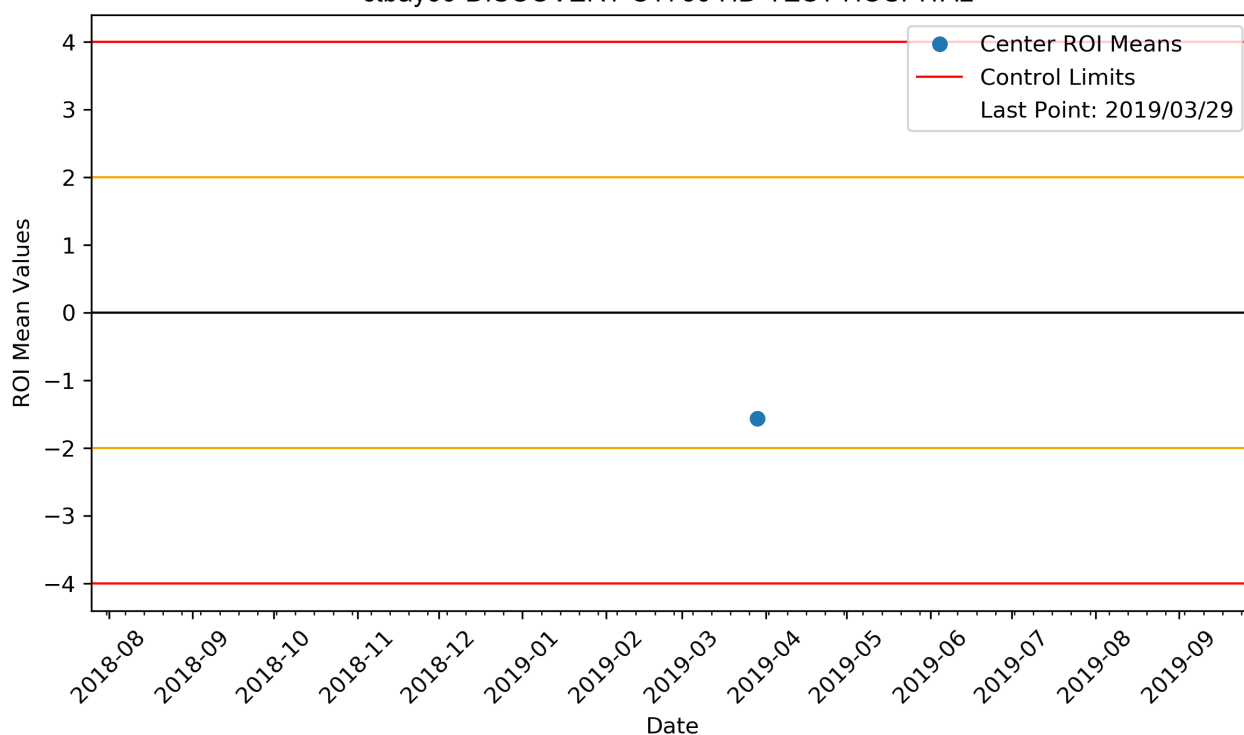
6. Within the JSON file, find the key pertaining to the date of the offending data point. The key will have the date format "YYYYMMDD". Once you have found the date key, delete it and all data within it (example illustrated below).

```
data.json
1 {
2   "Homogeneity": {
3     "20190329": {
4       "PERIPHERAL": {
5         "NORTH": -0.7126710291493159,
6         "SOUTH": -0.06484235574063058,
7         "EAST": -0.4509220701963117,
8         "WEST": -0.2296252230814991
9       },
10      "PERIPHERAL-COMP": {
11        "NORTH": 0.8477096966091613,
12        "SOUTH": 1.4955383700178466,
13        "EAST": 1.1094586555621655,
14        "WEST": 1.3307555026769782
15      },
16      "CENTER": {
17        "MEAN": -1.5603807257584772,
18        "STD": 4.994114403693369
19      }
20    },
21    "20190515": {
22      "PERIPHERAL": {
23        "NORTH": 0.8441403926234384,
24        "SOUTH": 1.1838191552647235,
25        "EAST": 1.2522308149910768,
26        "WEST": 1.9262343842950624
27      },
28      "PERIPHERAL-COMP": {
29        "NORTH": 113.30636525877453,
30        "SOUTH": 112.96668649613325,
31        "EAST": 112.8982748364069,
32        "WEST": 112.22427126710292
33      },
34      "CENTER": {
35        "MEAN": 114.15050565139798,
36        "STD": 27.757157616927703
37      }
38    },
39  },
40  "Linearity": {}
41 }
```

7. Finally, open CTQA, click the top menu item "Reports", and click both "Regenerate Daily Reports" and "Regenerate Weekly Reports". This should recreate the relevant reports, removing the offending point.



ctbay66-DISCOVERY CT750 HD-TEST HOSPITAL



Setting Up Notifications

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 - [Warning Hook](#)
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Introduction

CTQA is currently capable of emitting events through two methods:

1. As an email through an Exchange or SMTP account
2. As a Base64 JSON string

The first method involves the simplest setup (registering an existing email account of your choice). The second method enables custom notification systems (Eg: texting reports).

If you're interested in building a custom notification system for CTQA, a good starting point would be the following project: [ctqa-hooks-notifier](#).

For more information on setting up custom notifications within CTQA, check out the Custom Notifications section on this page.

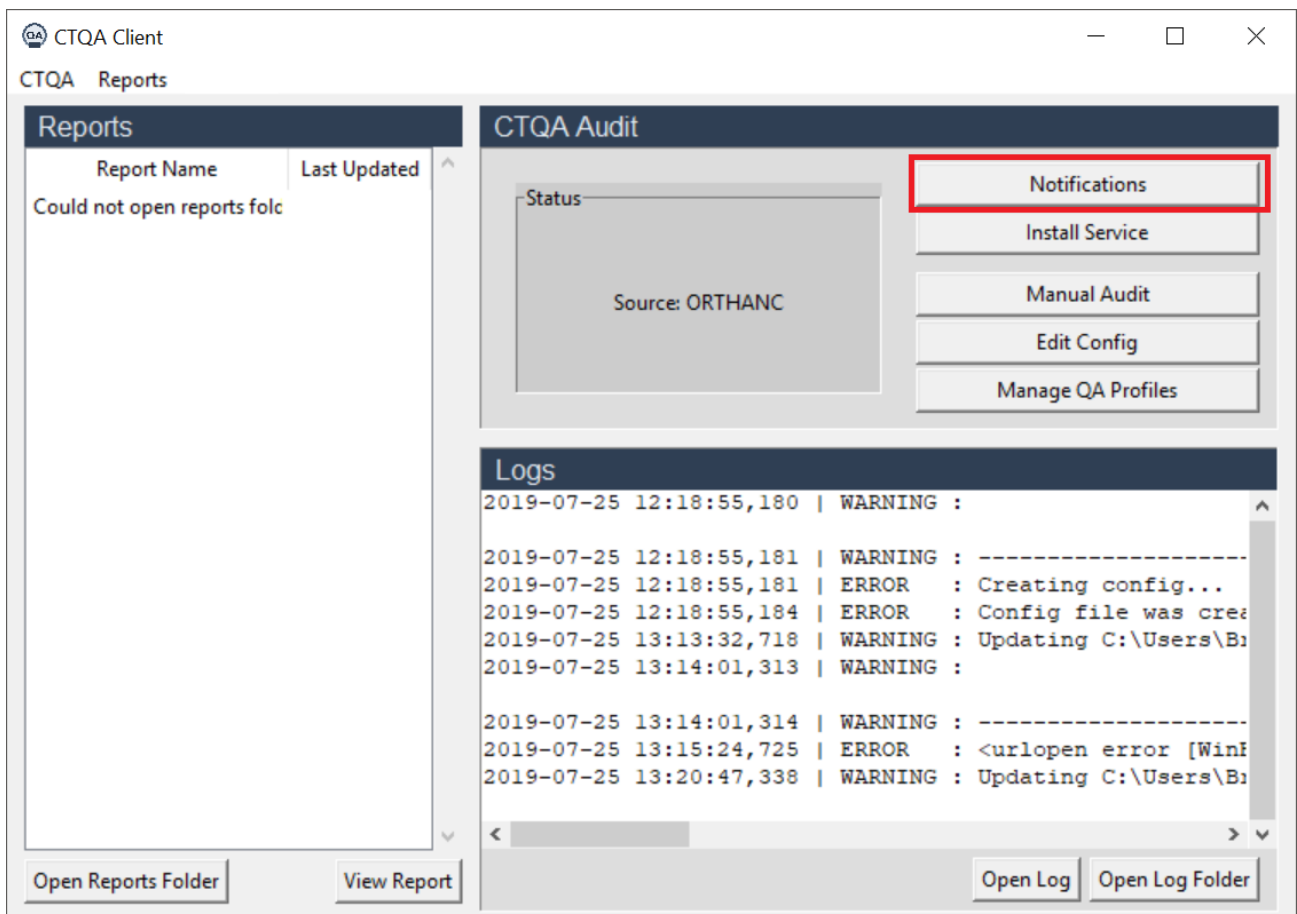
Setting Up Email-based Reporting

DISCLAIMER: To allow for automated audits and email-based reporting, CTQA stores the sending email account's password in a file within its installation directory. This file *is* encrypted, however, the encryption key is closeby. If you wish to add email-based notifications, please **do not** store your CTQA installation in a public spot.

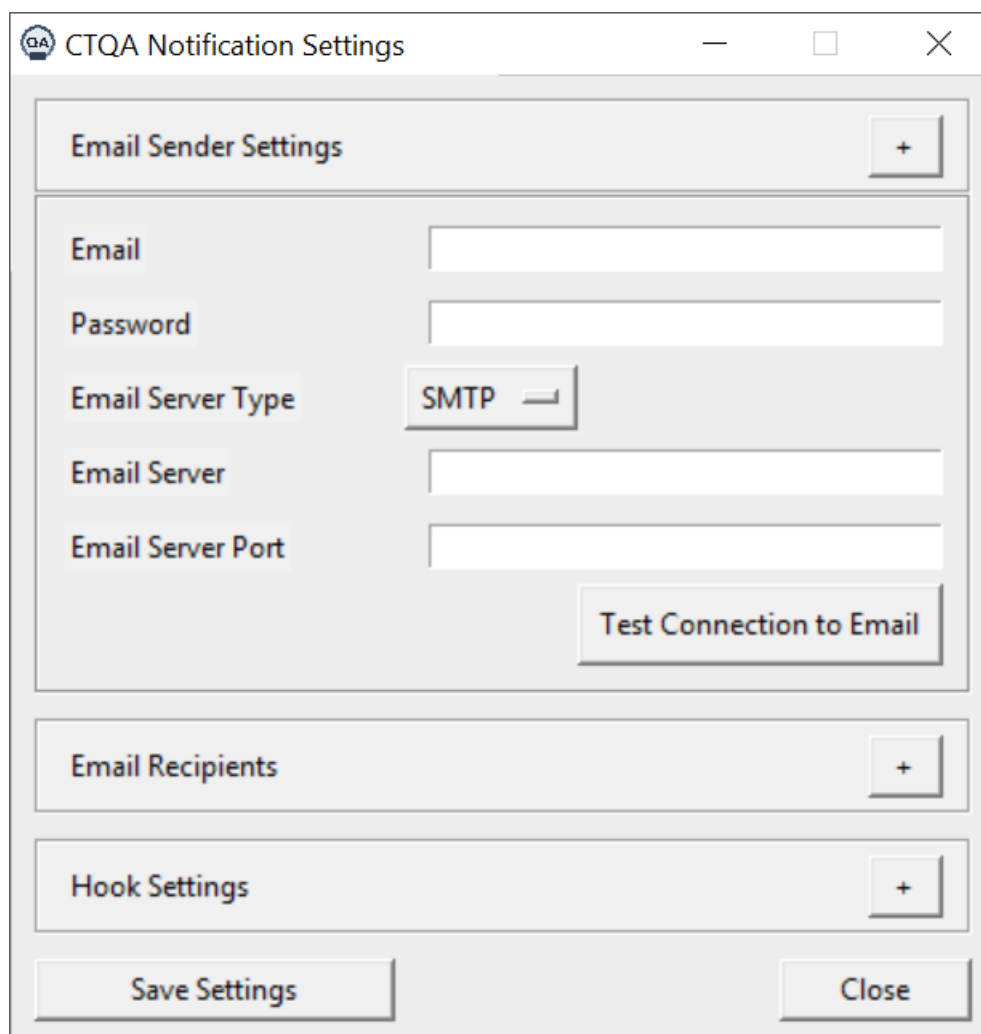
If the above password policy isn't acceptable, please evaluate the Custom Notifications section.

Adding an Email Account to Send Reports/Notifications

1. Open up the main CTQA GUI and click the notifications button located in the top right corner.



2. A new window should open up with multiple labelled sections. Click the plus button on the section labelled "Email Sender Settings". The window should look similar to what is pictured below.



3. Within the Email Sender Settings section, enter the details for the email account you wish to use. Detailed below are what the contents of each entry box should typically be:

- **Email:** Should contain the email address you wish to use. Eg: test@test.com
- **Password:** The password for the email account should be entered here.
- **Email Server Type:** Please choose the type of email account you will be using. SMTP and Exchange accounts are currently supported.

If you're using an Exchange email account, the next couple settings don't have to be filled in. SMTP accounts must fill in these settings.

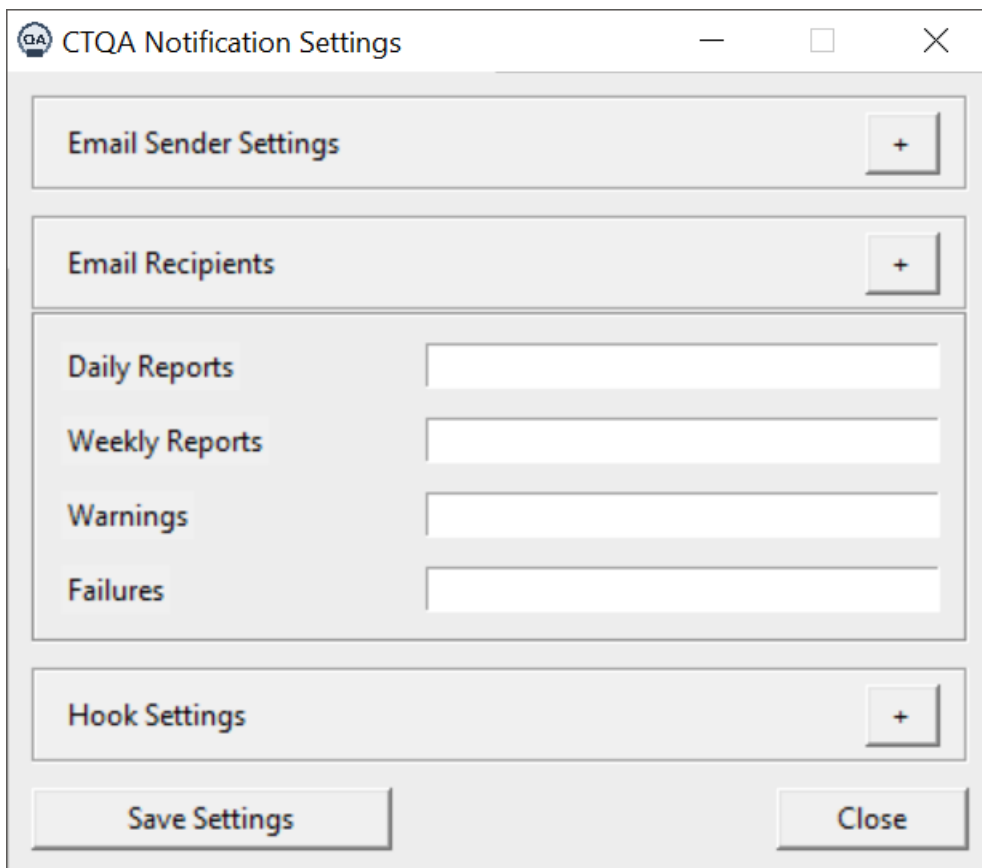
- **Email Server:** The address of the mail server for the email account. Eg: mail.google.com
- **Email Server Port:** The port for the mail server. Must be a number. Eg: 587

4. After filling in the email account's credentials, it's recommended you test the connection by clicking the "Test Connection to Email" button. If all is successful, a success message will pop up. If the connection was unsuccessful, read the error message and double-check you entered the correct email settings.

Click the "Save Settings" button and the "Close" button when you're done setting up the account.

Adding Report/Notification Email Recipients

1. Open up the main CTQA GUI and click the notifications button located in the top right corner.
2. The CTQA Notifications Settings window should open up with multiple labelled sections. Click the "+" button beside the settings label "Email Recipients". The panel pictured below should expand.



The screenshot shows the 'CTQA Notification Settings' window. It features a title bar with the text 'CTQA Notification Settings' and standard window controls (minimize, maximize, close). The main content area is divided into several sections. At the top is 'Email Sender Settings' with a '+' button to its right. Below that is 'Email Recipients' with a '+' button to its right. The 'Email Recipients' section is expanded, revealing four sub-sections: 'Daily Reports', 'Weekly Reports', 'Warnings', and 'Failures'. Each of these sub-sections has a corresponding text input field to its right. At the bottom of the window is a 'Hook Settings' section with a '+' button to its right. At the very bottom are two buttons: 'Save Settings' and 'Close'.

3. Each section within the email recipients panel can be filled in with the emails of people who would like to receive the corresponding notifications and events. Here's what each section sends:

Daily Reports: If any reports are generated from the daily CTQA run, they are sent to the recipients on this list.

Weekly Reports: On the Monday of every week, CTQA compiles all reports generated and sends it off to the recipients on this list. The weekly reports can have a separate date range from the daily ones. This can allow for easy submission checks for all submitting machines.

Warnings: If CTQA predicts a drift in the future for a machine, a warning is sent to all recipients on this list.

Failures: If CTQA records a point out-of-bounds, a warning is sent to all recipients on this list.

Please Note: Multiple emails must have semicolons between them. An example follows:

```
email1@test.com; email2@test.com; email3@test.com
```

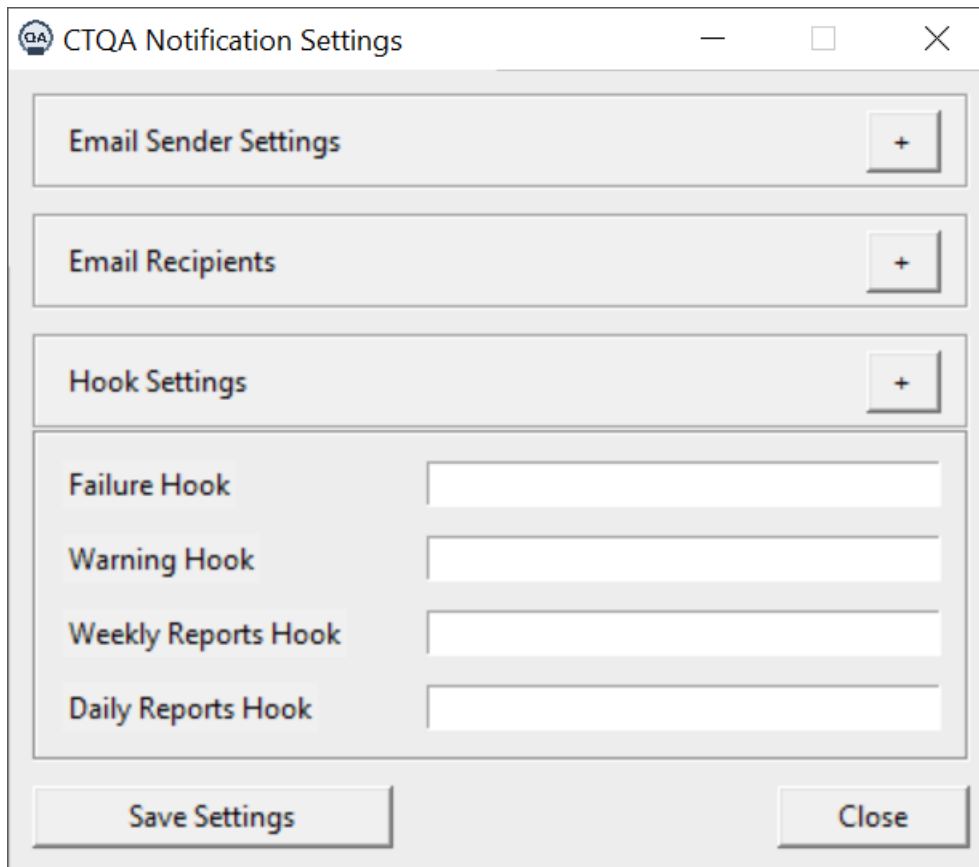
4. After you've input all relevant recipients, click the "Save Settings" button located in the lower left area of the window. CTQA can now be closed.

Custom Notifications

CTQA enables custom notifications through usage of four hooks (daily, weekly, warning, and failure hooks). Each hook takes in a list of paths. Upon an event or notification, the activated hook executes each path, passing a raw version of the notification or event as an argument. The raw version of the notification or event takes the form of a base64 JSON string.

Adding Paths to CTQA Hooks

1. Open up the main CTQA GUI and click the notifications button located in the top right corner.
2. The CTQA Notifications Settings window should open up with multiple labelled sections. Click the "+" button beside the settings label "Hook Settings". The panel pictured below should expand.



3. Each section within the hook settings panel can be filled in with paths to executables. Each hook emits the same type of information as the above email recipient notifications and events.

Paths are separated by a semicolon. Eg:

```
C:\\Path\\to\\Executable.exe; D:\\Second\\Path\\To\\Executable.exe
```

Information Emitted by Each Hook

Daily Hook

What's in the notification:

- A list of paths to the changed daily reports

An example of what an execution would look like:

```
C:\\Path\\To\\Executable.exe "WyIuL3Rlc3QvZ3JhcGgucG5nIl0=" daily
```

Base64 JSON Decoded:

```
[\"./test/graph.png\"]
```

Weekly Hook

What's in the notification:

- A list of paths to all the reports generated by CTQA

An example of what an execution would look like:

```
C:\\Path\\To\\Executable.exe "WyIuL3Rlc3QvZ3JhcGgucG5nIl0=" weekly
```

Base64 JSON Decoded:

```
[\"./test/graph.png\"]
```

Warning Hook

What's in the event:

- What type of event it is (warning or failure)
- How many days ahead CTQA looked to generated this prediction
- The region of interest value
- The corresponding machine's report location

An example of what an execution would look like:

```
C:\\Path\\To\\Executable.exe "eyJ0eXBliJogIndhcm5pbmciLCAiZm9yZWNhcnREYXlziJogNjAsICJyb2lwYXx1ZSI6IDQuODQ0NjE2Mjk5ODAwNjYxLCAicmVwb3J0TG9jYXRpb24iOiAiLi90ZXN0L2dyYXB0LnBuZyJ9" warning
```

Base64 JSON Decoded:

```
{
  "type": "warning",
  "forecastDays": 60,
  "roiValue": 4.844616299800691,
  "reportLocation": "./test/graph.png"
}
```

Failure Hook

What's in the event:

- What type of event it is (warning or failure)
- The region of interest value

- The corresponding machine's report location

An example of what an execution would look like:

```
C:\\Path\\To\\Executable.exe "eyJ0eXBldjogImZhaWx1cmUiLCAicm9pVmFsdWUiOiA0Ljg0NDYxNjI5OTgwMDY5MSwgInJlcG9ydExvY2F0aW9uIjogIi4vdGVzdC9ncmFwaC5wbmcifQ==" failure
```

Base64 JSON Decoded:

```
{
  "type": "failure",
  "roiValue": 4.844616299800691,
  "reportLocation": "./test/graph.png"
}
```

Other Resources:

- [The CTQA Hook Notifier Example Project](#)

Uninstallation

1. Run "CTQA.exe" (in the folder where you installed CTQA) and, when the interface appears, click the "Uninstall Service" button. Agree to all prompts to allow for proper uninstallation. This will remove both the "CTQA" and "CTQA-Weekly" tasks from Windows' scheduled tasks.
2. You may now delete the contents of the CTQA's installation directory. Don't forget to back anything up that you want to keep. FYI: Reports are stored under the reports folder and data is stored under the data folder. The reports folder, however, can be in another location, if specified under the config. Double check the config if you're not sure where it's currently stored.

CTQA should now be uninstalled.