MAIA

# E-Health: Lab2
# PACS & Visualization

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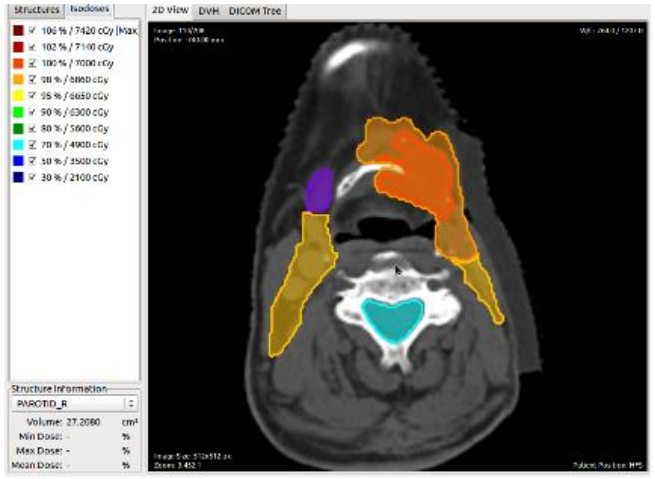
# Aim

- Understand the PACS (DICOM network) main instructions
- Install and deploy a PACS system
- Test its main functionality
- Link a PACS with a visualization tool.
- Evaluate Visualitzation software: windowing and measuring.

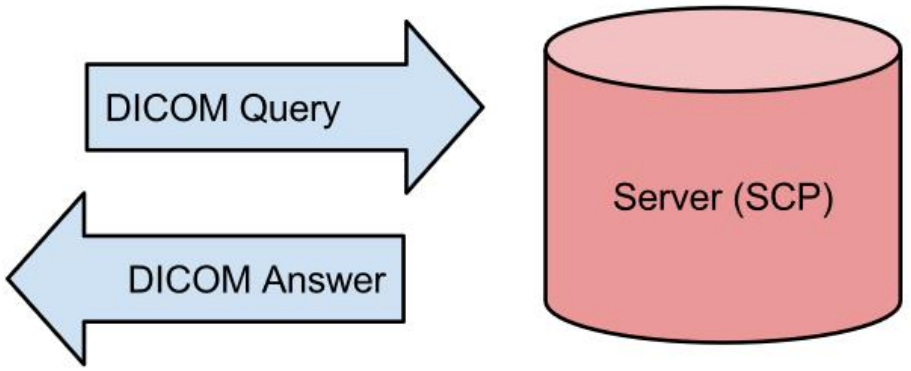
- Software:
  - Orthanc: Free PACS server
  - Ginkgo CADx: Viewer (to be connected to the PACS).

# PACS (DICOM network)

- **Basic actions in the DICOM network protocol**
  - **Test the connection** between two devices (C-Echo).
  - **Send images** from the local imaging device to a remote device (C-Store).
  - **Search the content** of a remote device (C-Find).
  - **Retrieve images** from a remote device (C-Move).
- SCU / SCP / Commands



Client (SCU)




http://book.orthanc-server.com/dicom-guide.html#dicom-echo

# PACS (DICOM network)

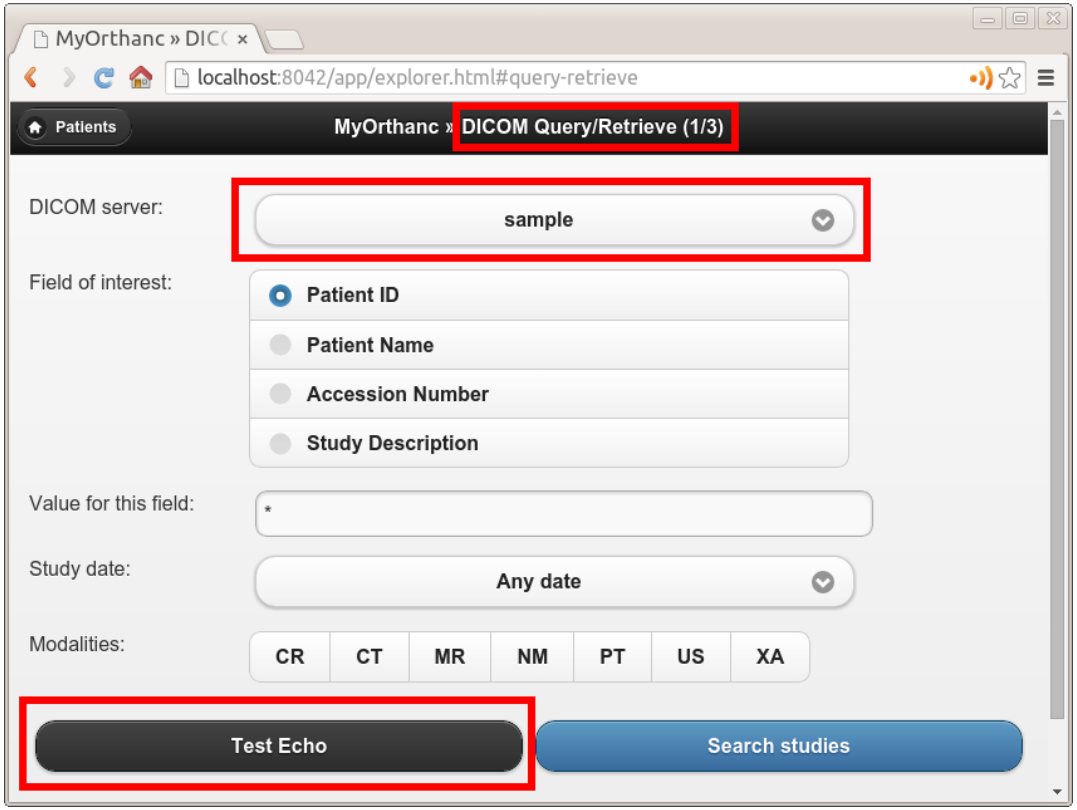
- **Parameters of the DICOM server**
  - IP address
  - TCP port (DICOM is 104 but Orthan uses 4242).
  - Application Entity Title (AET). Unique identifier inside the intranet (alphanumeric and less than 16 chars).
- DICOM server configuration
  - *DicomServerEnabled* must be set to true. (default)
  - *DicomAet* must be set to the AET (default: ORTHANC) .
  - *DicomPort* specifies the TCP port of the DICOM server (4242).
- Each Client/server will have a different IP and AET.
  - See C:\Orthanc\Configuration\orthanc.json
- In Orthanc each server/client should be indicated in the *Modalities* section of the configuration file.



http://book.orthanc-server.com/dicom-guide.html#dicom-echo

# Orthanc

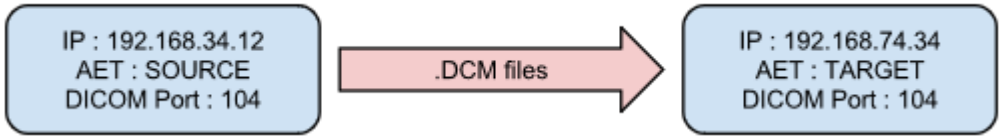
- **C-Echo** (test connectivity)
  - Ping the ip address to check TCP connectivity
  - Use the C-Echo from the client to the server to test DICOM connectivity.

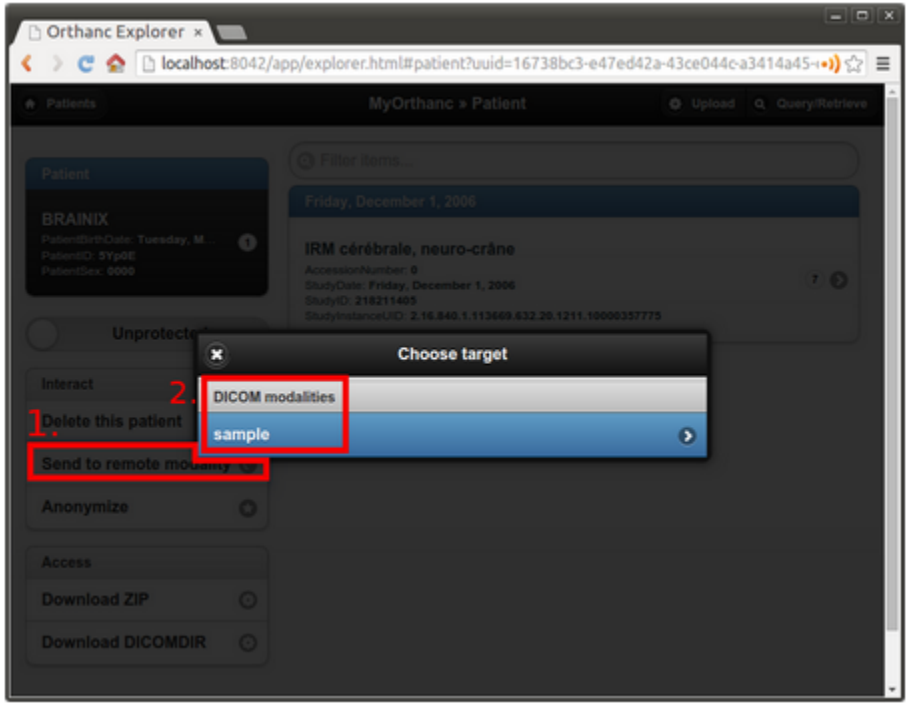



http://book.orthanc-server.com/dicom-guide.html#dicom-echo

# Orthanc

- **C-Store:** Send images to a server
  - Use orthanc explorer to send files at any level patient, studies or series.

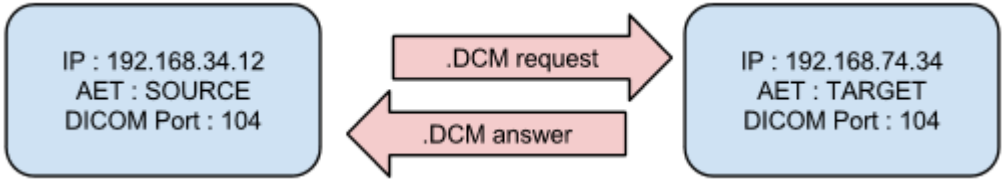


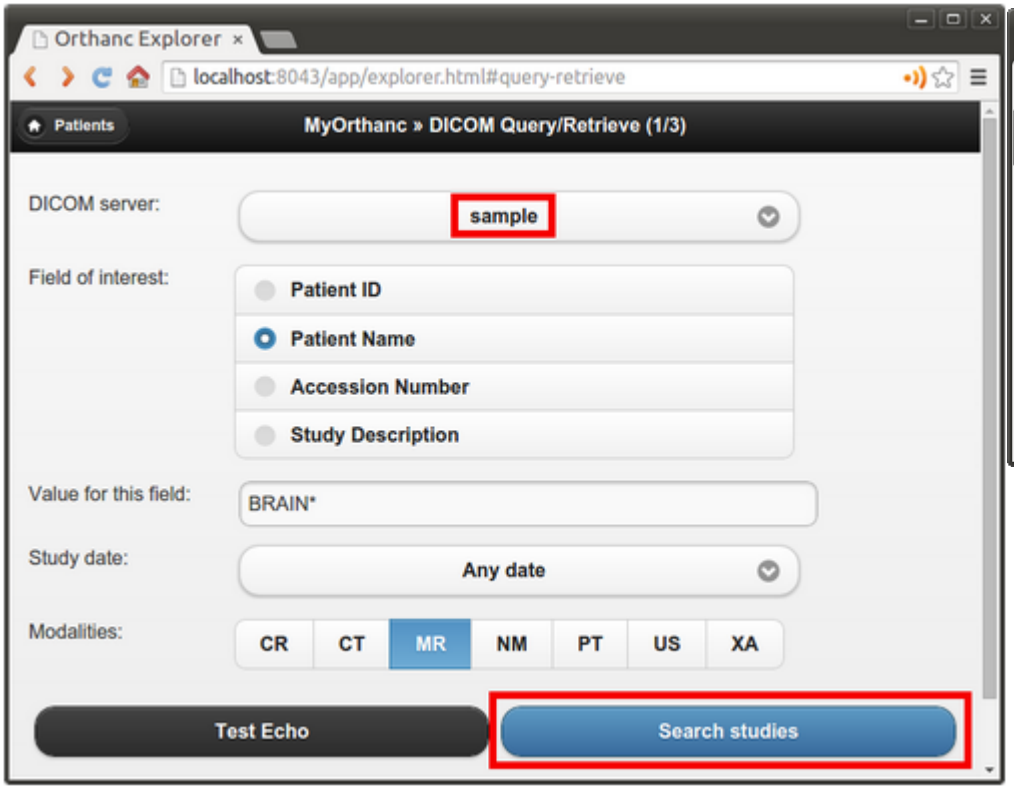



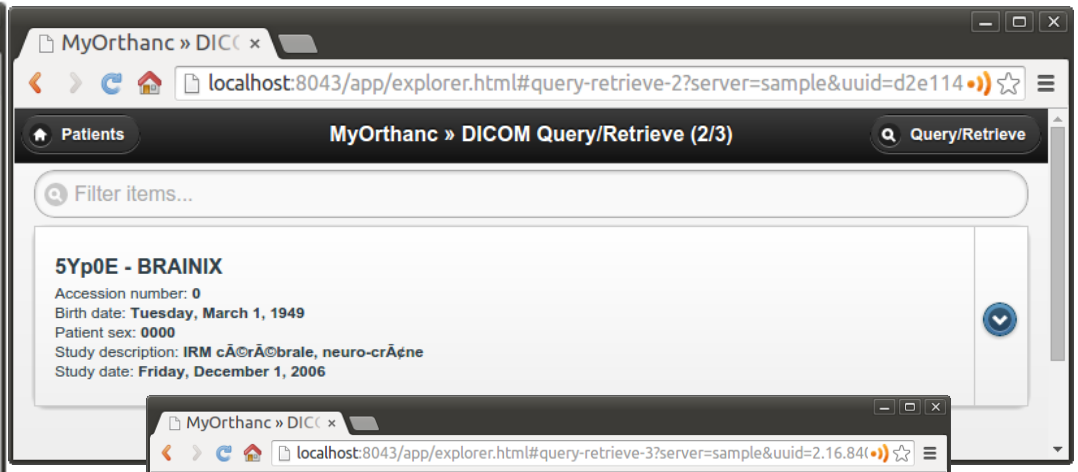

http://book.orthanc-server.com/dicom-guide.html#dicom-echo

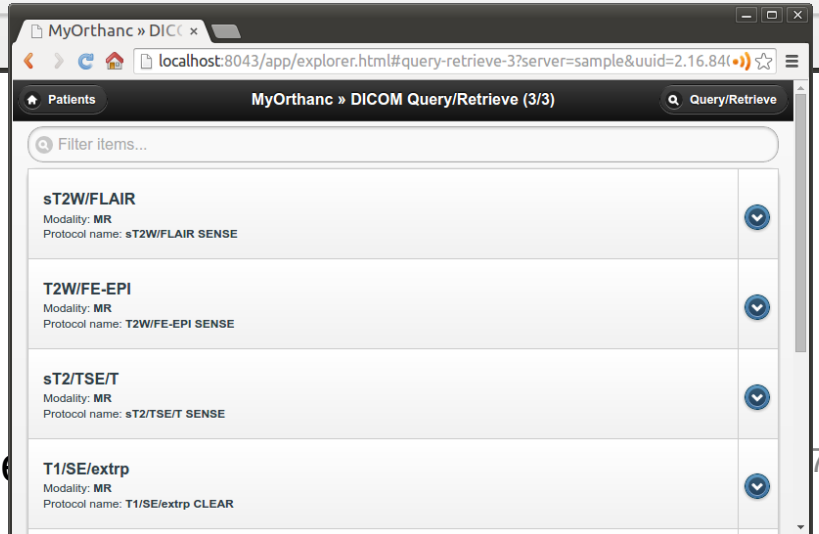
# Orthanc

- **C-Find:** Search a list of DICOM resources (wildcards)
  - Use orthanc explorer to send



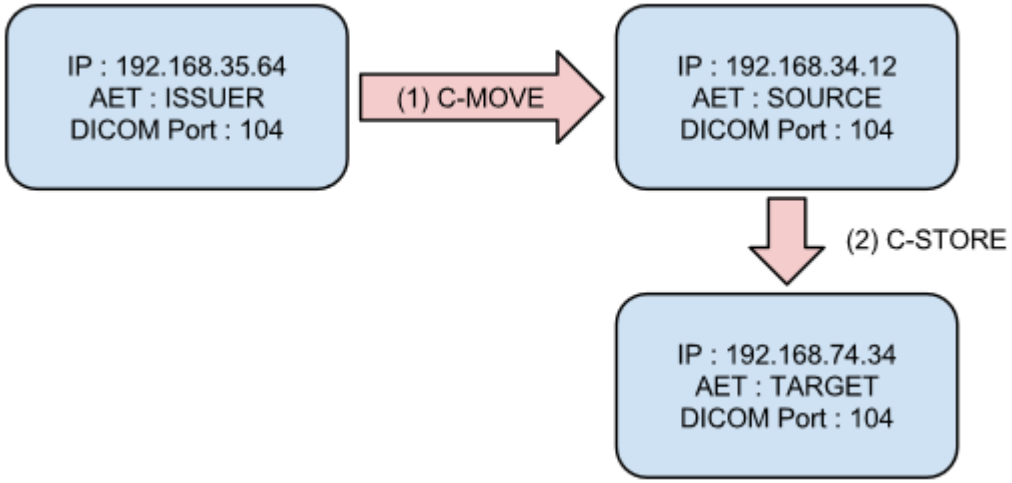






http://book.orthanc-server.com/dicom-guide

# Orthanc

- **C-Move:** Query/Retrieve
  - C-move can involve 3 imaging devices.



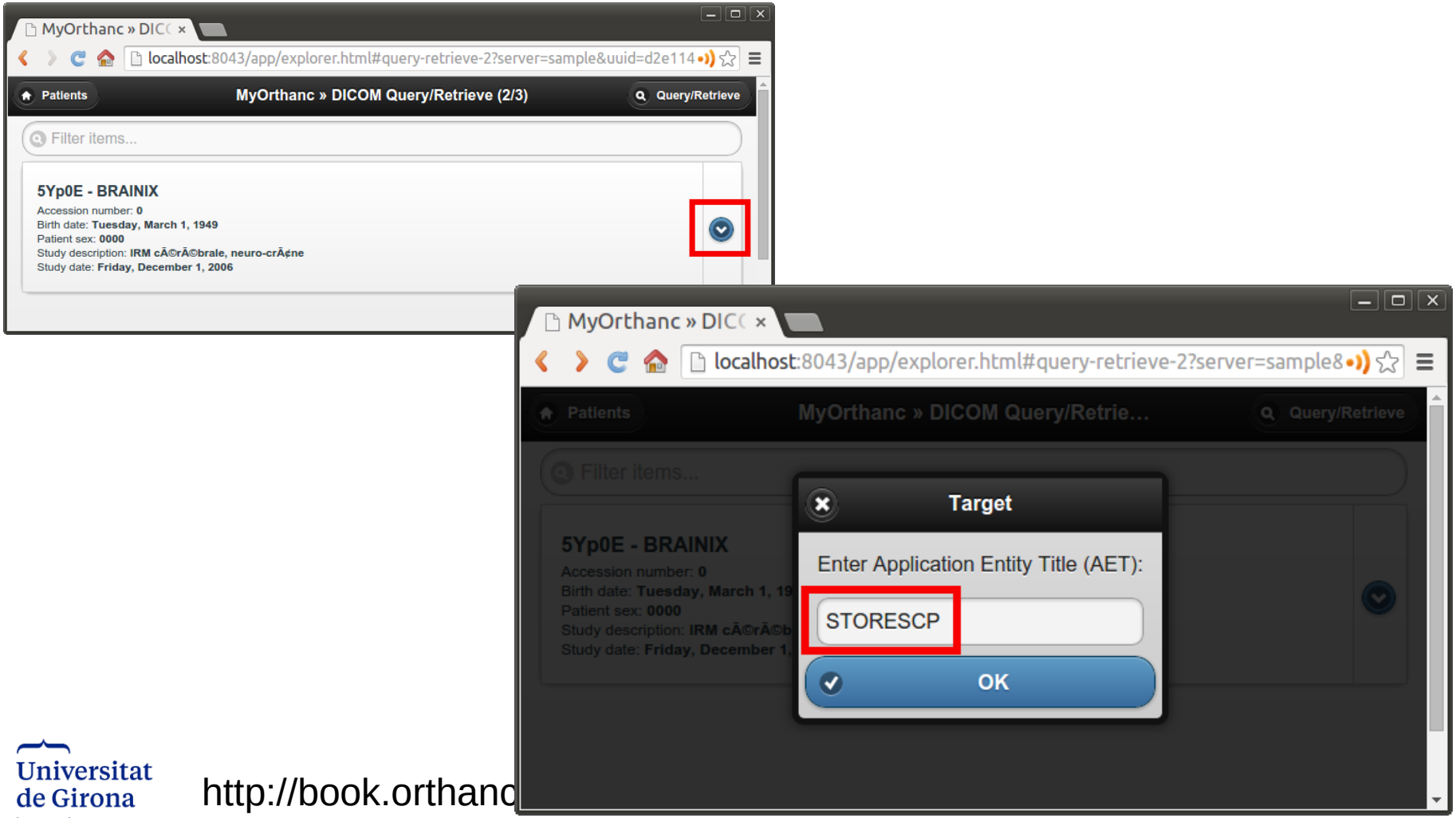

  - The **issuer** asks the **source** to send some images to another DICOM server (**target**)
  - In other words, is a C-Store between two remote DICOM servers
  - Query/Retrieve: issuer and target are the same.
  - Alternative command in DICOM: C-Get (not implemented yet).



http://book.orthanc-server.com/dicom-guide.html#dicom-echo

# Orthanc

- **C-Move (2):** Query/Retrieve
  - After a C-find, click on the down arrow and enter the AET of the target.



# Exercises: PACs

1. Donwload and install orthan. Check that it is working.

   https://www.orthanc-server.com/resources/2015-02-09-emsy-tutorial/index.html

2. Configure Orthan (IP, and AET and Modalities) and test the 3 commands: C-Store, C-Find and C-Move. You will need one machine to work as server and another one as client.

    1. Check C-Echo works fine with client-server
    2. C-Store: from a client send the data to the server.
    3. C-Find: retrieve list of patients from a server
    4. C-Move: similar to C-Store but specifyng the AET.

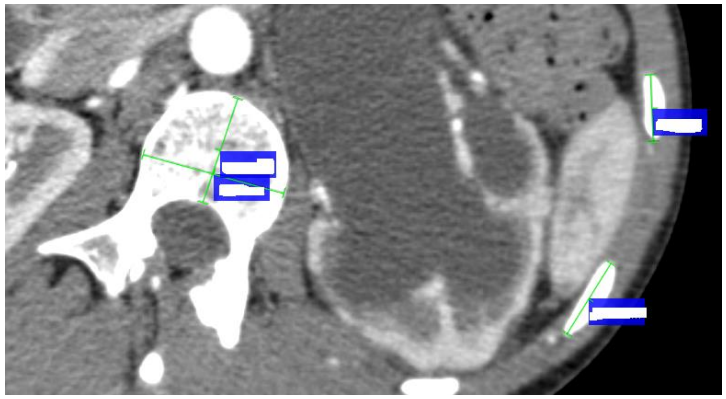
# Excercises: Viewer

3. Download a viewer and link it with the DICOM server.
   1. Use Ginko CADx (http://ginkgo-cadx.com/en/)
   2. Configure to work with Orthan

   http://book.orthanc-server.com/faq/query-retrieve.html#query-retrieve

Use any Orthan server or try visor.udg.edu (AET: VISOR)

3. With the CT data provided visualize at a maximum contrast the bones and soft tissue.
4. Measure the major axes of the vertebrae, and ribs. Relate this measurement to pixel size and number of pixels.



# What to submit

- Write down a short summary of your work, including:
  - Problems encountered and snapshots of the correct execution of all exercises (except 1).
  - Modifications in the default configuration of Orthan.