

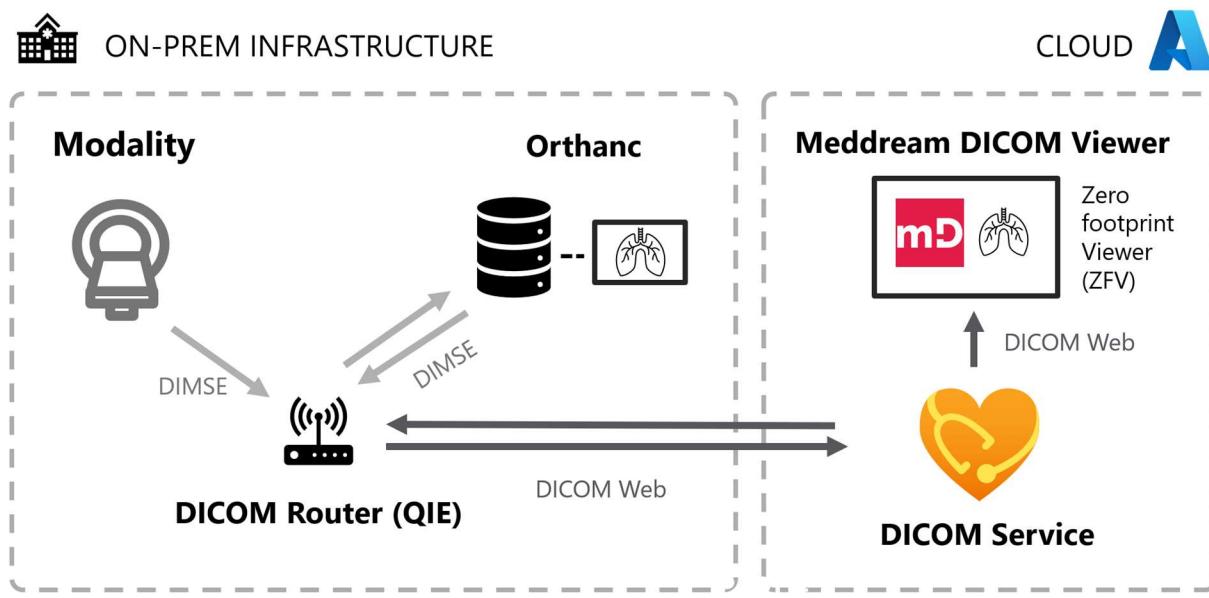
RSNA Workshop 1 – Student Instructions

Introduction

In this hands-on workshop, you'll start with an existing on-prem PACS and a set of modalities. Without disturbing your existing workflows, we'll add the required configurations and installations necessary to start moving to the cloud.

You'll install and configure an Azure Health Data Services DICOM service, an on-prem DICOM router, and a diagnostic zero footprint viewer.

By the end of the session, you'll have an environment that looks something like this:



The workshop will be divided into 4 parts/lessons.

Prerequisites

In this workshop, you will be provided access to an Azure subscription in which you have the owner role. This will allow you to deploy resources into a resource group. The process for acquiring credentials will be provided by the instructor.

The instructor will assign you a student number. You will use this to identify several resources that have been pre-created for you.

The instructor will also share a secrets file that contains a number of IDs, passwords, and secrets that are used throughout the workshop.

Part 1 – Deploy the DICOM service

In the first part of the workshop, you'll create an Azure Health Data Services workspace and then deploy the DICOM service.

In the Azure health ecosystem, the Azure Health Data Services workspace is a logical container for associated healthcare service instances. You can provision multiple DICOM, FHIR, and MedTech services in a single workspace to meet your solution needs. In this workshop, we'll only be deploying the DICOM service.

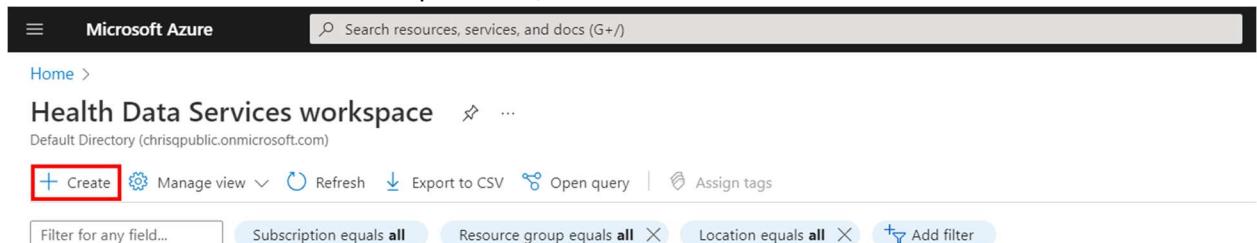
Deploy an Azure Health Data Services workspace – 10 minutes

1. Open the Edge browser and navigate to <https://portal.azure.com> in your browser.
2. Enter “Health Data Services” in the **Search resources, services, and docs** box. Select **Health Data Services workspace** from the list.



The screenshot shows the Microsoft Azure portal's search results for "health data services". The search bar at the top contains the query. Below it, a list of services is displayed under the heading "Services". The "Health Data Services workspace" item is highlighted with a red box. Other visible items include "MedTech service", "Service Health", "Azure API for FHIR", "DICOM service", and "SQL databases". Navigation links like "Home", "Create", and "Manage view" are also present.

3. On the Health Data Services workspace view, select **Create**.



The screenshot shows the "Health Data Services workspace" view in the Azure portal. At the top, there's a toolbar with "Create", "Manage view", "Refresh", "Export to CSV", "Open query", and "Assign tags". The "Create" button is highlighted with a red box. Below the toolbar, there are filter options: "Subscription equals all", "Resource group equals all", and "Location equals all".

4. Under **Resource group**, select **Create new** and enter a name for the resource group.

5. Enter a name for the workspace.

The screenshot shows the 'Create Azure Health Data Services workspace' form. The 'Basics' tab is active. In the 'Project details' section, the 'Subscription' dropdown is set to 'Visual Studio Ultimate with MSDN'. The 'Resource group' dropdown is set to '(New) rsna-demo', which is highlighted with a red box. Below it, there is a 'Create new' button. In the 'Workspace details' section, the 'Workspace name' input field contains 'rsnademo', which is also highlighted with a red box. The 'Region' dropdown is set to 'East US'.

6. Select **Review + create** to review the details for the new workspace. Select **Create** to create the workspace.
7. The workspace will be created in a few seconds. Select **Go to resource** to view the new workspace.

The screenshot shows the 'Healthcare.Apis-1668118196463 | Overview' page. The 'Overview' tab is selected. A message indicates 'Your deployment is complete'. Below this, deployment details are listed: Deployment name: Healthcare.Apis-1668118196463, Subscription: Visual Studio Ultimate with MSDN, Resource group: rsna-demo. To the right, deployment start time (11/10/2022, 5:09:59 PM) and correlation ID (122ea016-8f3b-4560-8855-9ebd3e4d4de3) are shown. At the bottom, there is a 'Go to resource' button, which is highlighted with a red box.

Learn more about Health Data Services workspaces: <https://learn.microsoft.com/en-us/azure/healthcare-apis/workspace-overview>

Deploy DICOM service

1. On the workspace overview, select **Deploy DICOM service**.

The screenshot shows the Microsoft Azure portal interface for a 'Healthcare.APIs-1668118196463' workspace. The left sidebar includes sections for Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Events, Properties, Locks, Networking, FHIR service, DICOM service (which is selected and highlighted with a red box), MedTech service, Metrics, Logs, Tasks (preview), Export template, and Support + troubleshooting. The main content area displays 'Essentials' information: Resource group (move) : rsnademo, Location : East US, Subscription (move) : Visual Studio Ultimate with MSDN, Subscription ID : abcdef01-2345-6789-0abc-def012345678, and Tags (edit). A status message indicates 'Status : Succeeded'. Below this, there's a promotional section for 'Bring your organization's health data into the cloud with Azure Health Data Services', followed by three service creation options: 'Create FHIR service', 'Create DICOM service' (which is also highlighted with a red box), and 'Create MedTech service'. Each option has a corresponding 'Deploy' button.

2. Select **Add DICOM service**.

The screenshot shows the 'DICOM service' configuration page within the Azure portal. The top navigation bar includes 'Microsoft Azure' and a search bar. The breadcrumb navigation shows 'Home > Healthcare.APIs-1668118196463 | Overview > rsnademo > DICOM service'. The main content area features a 'Name' input field and a note stating 'No results.' Below these, there is a large red box highlighting the '+ Add DICOM service' button, which is positioned above a 'Refresh' button.

3. Enter a name for the DICOM service and select **Review + create**.

The DICOM service allows for standards-based communication with any DICOMweb™ enabled systems. It also allows organizations to inject DICOM metadata into a FHIR service to create a holistic view of patient data.

Your DICOM data set will be deployed to the Subscription and Resource Group of your existing Azure Health Data Services.

DICOM service details

DICOM service name *

my-rsna-demo-dicom

4. Select **Create** to create the new DICOM service.
5. The DICOM service will be created in a few minutes. Select **Go to resource** to view the new DICOM service.

Deployment name: Healthcare.Apis-Dicom.Service-1668118720726
Subscription: Visual Studio Ultimate with MSDN
Resource group: rsna-demo

Start time: 11/10/2022, 5:18:42 PM
Correlation ID: 66f264fc-dab8-44a7-990e-f66e9fec6333

Deployment details

Next steps

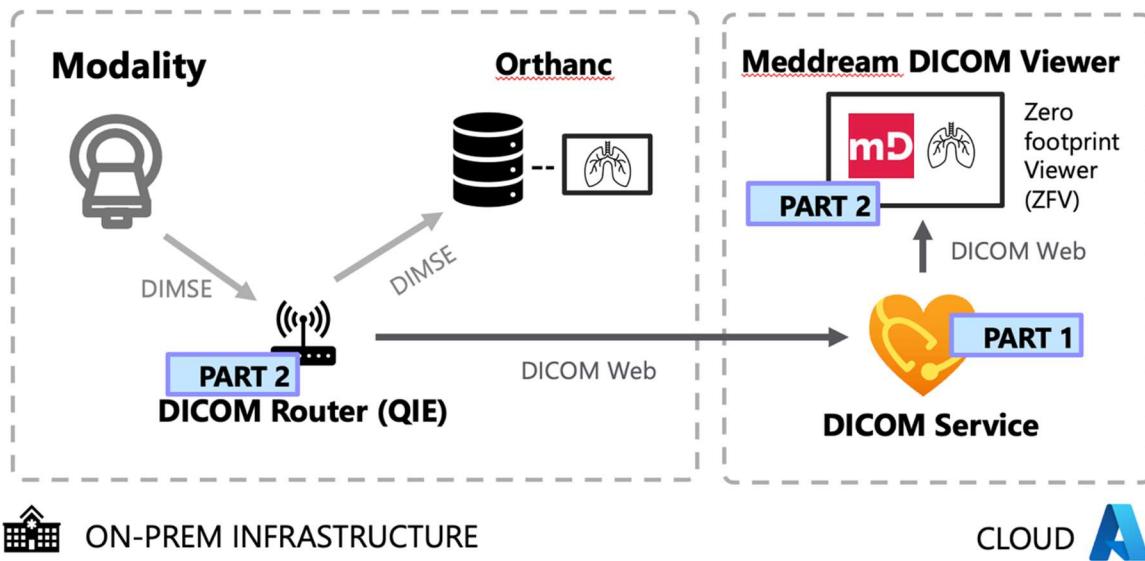
Go to resource

Success! You now have a new DICOM service instance running in a Health Data Services workspace. In the next part of the workshop, you'll connect the DICOM service to your existing network and upload some images.

Learn more about the DICOM service: <https://learn.microsoft.com/en-us/azure/healthcare-apis/dicom/>

Part 2 – Connect the DICOM service to your existing network

In this second part of the workshop, you'll familiarize yourself with a sample hospital imaging network and then connect the DICOM service to that network.



To simulate the hospital network, an Azure resource group has already been deployed for each student. This resource group, **rsna-workshop-studentN**, contains the following applications and services:

- **A PACS system containing sample DICOM images.** Orthanc (<https://www.orthanc-server.com/>) is the sample PACS system, with imaging data pre-loaded from the National Cancer Institute's Imaging Data Commons (<https://portal.imaging.datacommons.cancer.gov/>).
- **A DICOM router to route imaging data.** Qvera QIE (<https://www.qvera.com/hl7-interface-engine/>) is the DICOM router, and it is preconfigured with DICOM DIMSE to DICOMWeb conversions.
- **An instance of the DICOM service.** Just as in the previous part of the workshop, we have deployed the DICOM service to act as a cloud archive for imaging data stored in the PACS system. This second instance of the DICOM service has been preconfigured to communicate with a zero-footprint viewer.
- **A zero-footprint (ZFP) viewer.** Softneta medDream (<https://www.softneta.com/products/meddream-dicom-viewer/>) is the ZFP, and it is preconfigured to communicate with the DICOM service.

View images in the PACS

1. Open the Edge browser and navigate to <http://portal.azure.com>.
2. Select **Resource Groups** from the Azure services menu.
3. In the list of resource groups, select the pre-created resource group that matches your student number, for example **rsna-workshop-studentN**.
4. The overview page lists all resources in the resource group. Note the container instances for the applications listed above as well as additional storage and networking components needed to

simulate the network.

The screenshot shows the Microsoft Azure portal interface. The left sidebar contains navigation links for Home, Overview, Activity log, Access control (IAM), Tags, Resource visualizer, Events, Settings (Deployments, Security, Policies, Properties, Locks), Cost Management (Cost analysis, Cost alerts (preview), Budgets, Advisor recommendations), Monitoring (Insights (preview), Alerts, Metrics, Diagnostic settings, Logs, Advisor recommendations, Workbooks), Automation (Export template), and Support + troubleshooting (New Support Request). The main content area displays the 'Essentials' section for the resource group 'rsna-workshop-studentN'. It shows the subscription information (Subscription (move) : OTU WA CNE 100780, Subscription ID : a288bf3-9f47-423f-8488-222ef758c442, Deployments : 9 Succeeded, Location : East US), and a list of resources. The 'Resources' table has columns for Name, Type, and Location. Three specific resources are highlighted with a red box: 'contoso-orthanc-containergroup', 'contoso-qvera-containergroup', and 'jump-vm'. The 'Resources' table data is as follows:

Name	Type	Location
bootdiags077pqch3xdkiw	Storage account	East US
contoso-orthanc-containergroup	Container instances	East US
contoso-qvera-containergroup	Container instances	East US
ContosoVnet	Virtual network	East US
default-NSG	Network security group	East US
ifggxiot3nu22	SQL server	East US
jump-vm	Virtual machine	East US
jump-vm_disk1_b80b79a4da1f4db4b7733931881aff8b	Disk	East US
jump-vm_disk2_b83a1b204a5e4d6b92d4f3f4802443ac	Disk	East US
meddreamContainerGroup	Container instances	East US
myPublicIP	Public IP address	East US
myVMNic	Network interface	East US
qie_ifggxiot3nu22/qie	SQL database	East US
workspace077pqch3xdkiw	Health Data Services workspace	East US
dicom077pqch3xdkiw (workspace077pqch3xdkiw/dicom077pqch3xdkiw)	DICOM service	East US

5. Select the **jump-vm** virtual machine. We will connect to this virtual machine to simulate viewing the PACS from within the network.
6. Download the Remote Desktop RDP file.
 - a. Select **Connect** under the Settings section.

- b. Change the **Port number** to **4545** and select **Download RDP file**.

The screenshot shows the Azure portal interface for a virtual machine named 'jump-vm'. On the left, a sidebar lists various settings like Networking, Connect, Disks, Size, Microsoft Defender for Cloud, Advisor recommendations, Extensions + applications, Continuous delivery, Availability + scaling, Configuration, Identity, Properties, and Locks. The 'Connect' option is highlighted with a red circle labeled '1'. In the main pane, under the 'RDP' tab, there's a warning about enabling just-in-time access. It shows the IP address as 'DNS name (jump-vm-yvhgkcbzmdw.eastus.cloudapp.azure.com)' and the port number as '4545', both highlighted with red circles labeled '2'. Below these fields is a blue button labeled 'Download RDP File' with a red circle labeled '3'.

- c. When the download is complete, open the **jump-vm.rdp** file to connect to the virtual machine.
7. Log in to the virtual machine.
- In the Remote Desktop Connection dialog, dismiss any warnings and click **Connect**.
 - When prompted to log in, select **More choices** then **Use a different account** to type your own credentials.
 - In the email section, enter ".\student" and then enter the **resource group admin password** provided by the instructor.
 - If prompted with a certificate warning, select **Yes** to connect.
 - Select **Accept** to accept the default privacy settings.
 - Select **Yes** on the Network flyout to allow the machine to be discoverable on the virtual network.
8. Populate the PACS with sample data.
- On the desktop, locate the file named "**1-preload-orthanc**" and double-click to run the script. This script copies sample DICOM data to Orthanc and will preload eight total studies for eight different patients.
9. Log in to the PACS.
- Open the Edge browser and navigate to <http://10.0.2.4:8042/> or use the "**Orthanc**" shortcut on the desktop. This is the local network address for Orthanc.
 - Enter "**student**" for both the username and password.
10. Browse to a series
- Select **All studies** to see the list of studies available in the PACS (Orthanc)

ORTHANC

Patient ID:

Patient Name:

Accession Number:

Study Description:

Study Date: Any date

- b. Select a study from the list to view the study details.

Orthanc

Anonymized - Knee (R)

PatientID: 0
StudyDate: Monday, January 1, 2007
StudyInstanceUID:

- c. Select a series from the list to view the series details.

orthanc » Patient » Study

Patient

Anonymized
PatientID: 0

Study

CT1 abdomen
StudyDate: Thursday, October 12, 2006
StudyInstanceUID:

?

ARTERIELLE
Status: Unknown
Modality: CT
Comments: CONTRAST
ProtocolName: ARTRENALES 12/Abdomen/Hx
SeriesInstanceUID:
SeriesNumber: 6168
PerformedProcedureStepDescription: CT1 abdomen

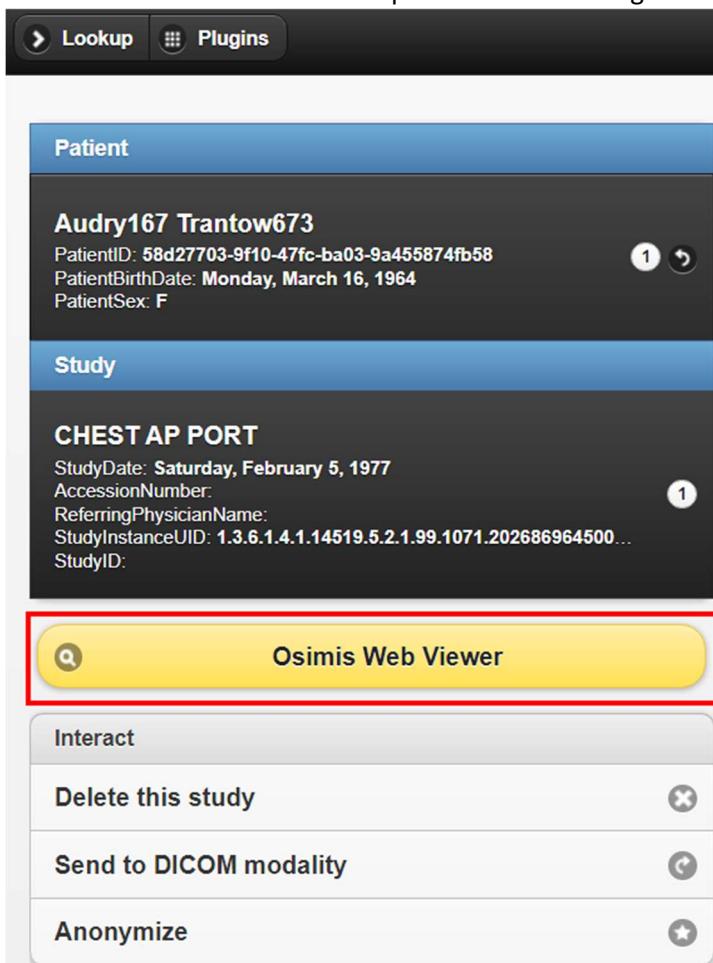
Interact

Delete this study
Send to DICOM modality
Anonymize

Access

Download ZIP
Download DICOMDIR

11. Select the **Osimis Web Viewer** option to see the image.



Simulate a new study from a modality

To simulate modalities that are producing new imaging studies, we will use a local script that sends DICOM data to the PACS. These new studies are from November 2022.

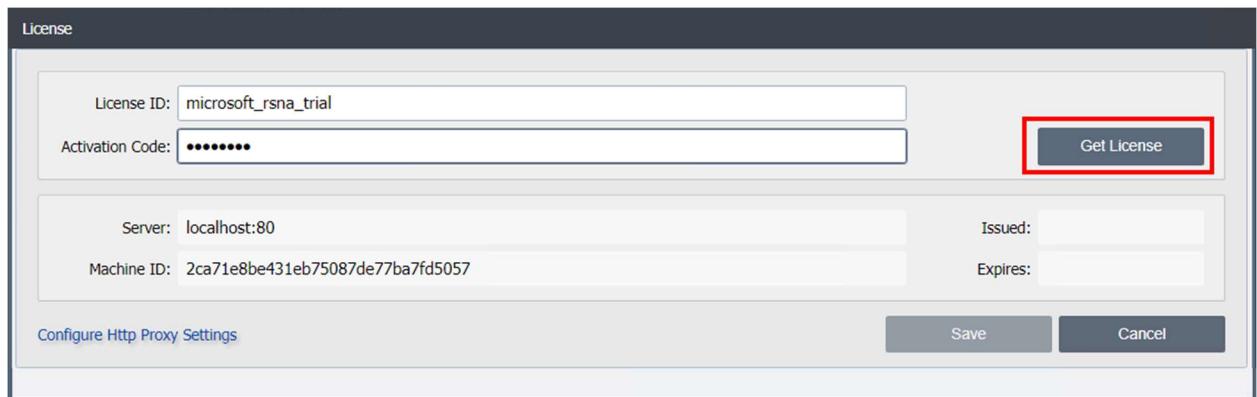
1. On the desktop, locate the file named "**2-modality-pushing-to-orthanc**".
2. Double-click the file to run the script and send the new study to the PACS.
3. Browse to the All Patients view in Orthanc to see the changes. Three patients will now have two studies, the latest of which is dated November 2022.

Add a DICOM router to the network

Connecting the DICOM service to the existing network requires the configuration of a DICOM router, here we are using Qvera Interface Engine (QIE). The configuration will send new imaging from modalities to the DICOM router which will then send that data to both the PACS and the DICOM service.

1. Navigate to <http://10.0.1.4:80> or use the "**QveraInterfaceEngine**" shortcut on the desktop. This is the local address for QIE.
2. When prompted to log in to QIE, use the default admin credentials and select **Login**.
3. When prompted, change the password to one you can remember.

4. When prompted, input the **License ID** and the **Activation code** provided by the instructor and select **Get License**.



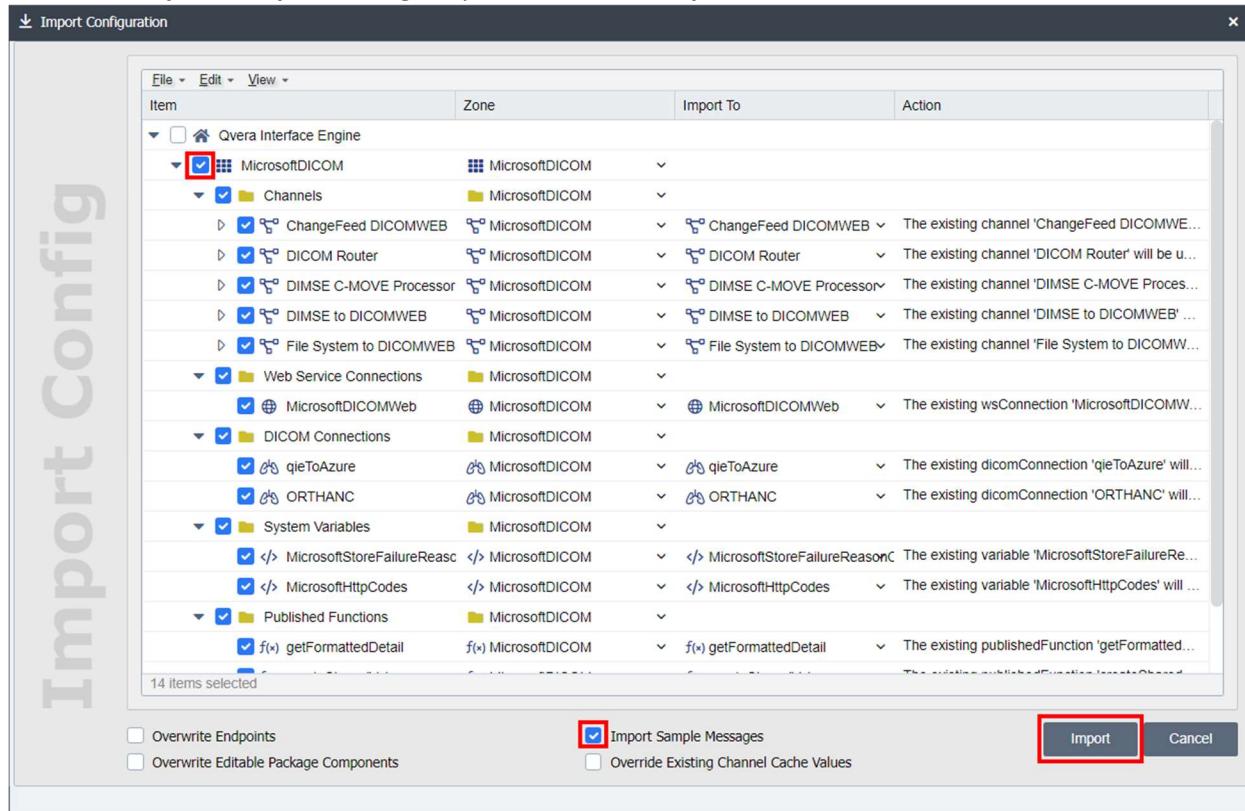
5. Select **Save** on the License dialog and select **OK** on the About screen.
 6. Import the router configuration. This configuration contains the default routing rules for the simulated network and some functions specific to the DICOM service.

- a. From the top menu bar, select **Application > Import Configuration**.

The screenshot shows the QVERA interface. On the left, the Application menu is open, with 'Import Configuration' highlighted by a red box. The main window displays the QVERA logo and a 'Global Settings' sidebar with various connection and status options.

- b. In the Open QIE Configuration File dialog, use the ellipsis (...) button to select the configuration file. Browse to the **desktop** and select **qie_MicrosoftDICOM_20221123.qie**. Select **Open** to open the config file.
 c. In the Import Configuration dialog, select the **checkbox next to the MicrosoftDICOM** zone to import all channels.

- d. Select the **Import Sample Messages** option and select **Import**.



7. Configure the web service connection. This enables the router to communicate with the DICOM service.

- a. Select the **MicrosoftDICOM** zone to expand the zone details.

The screenshot shows the QvΣERA Interface Engine interface. At the top, there is a navigation bar with 'Application', 'View', and 'Help' menus, followed by back and forward arrows. Below the navigation bar is a 'Home' button and a '+' button. The main area is titled 'Global Settings'. On the left, there is a 'Navigation' sidebar with a search bar for zones. The 'Global Settings' section is expanded, showing the following items:

- Home
- Global System Status
- Global Web Svc. Connections
- Global Database Connections
- Global DICOM Connections
- Global System Variables
- Global HTML Forms
- Global Mappings
- Global Functions
- Global Certificates

At the bottom of the navigation sidebar, there are three zones listed: 'Default Zone', 'MicrosoftDICOM' (which is highlighted with a red box), and 'System Administration'. Below these zones is a statistics table:

rcvd	in	prc	out	err	comp
0	0	0	0	0	0

- b. Select **Web Service Connections** and then **MicrosoftDICOMWeb**.

The screenshot shows the MicrosoftDICOM - Web Service Connections interface. On the left, there is a navigation pane with the following items:

- Search for zone (F3)
- Global Settings
- Default Zone
- MicrosoftDICOM (selected)
- Channels
- Zone Status
- Web Service Connections (highlighted with a red box)
- Database Connections
- DICOM Connections

The main area is titled "Web Service Connections". It has a toolbar with New, Delete, Manage, Save, Cancel, Find Usages, and Clear Cookies buttons. A search bar says "Enter filter text". Below it, a list shows "Web Service" and "MicrosoftDICOMWeb" (highlighted with a yellow box). To the right, there are two sections: "Name and Description" and "Connection Information".

Name and Description

Name: MicrosoftDICOMWeb

Description: Endpoint URL: [Portal > DICOM Service > Service URL]
Username: [Portal > App registrations > YourApp > Application (client) ID]
Password: [Portal > App registrations > YourApp > Certificates & Secrets > Client]

Connection Information

Type: REST Web Service (Encoded Content)

- c. In the **Endpoint URL** box, enter the **DICOM service URL**. You can find the URL in the Azure portal by browsing to Resource Groups > rsna_workshop_studentN > DICOM Service > Overview > Service URL. Tip: the service URL will be in a format like,

<https://rsnaworkshop1-mydicom.dicom.azurehealthcareapis.com>

The screenshot shows the 'Connection Information' dialog box for a REST Web Service. The 'Type' is set to 'REST Web Service (Encoded Content)'. The 'Host' field is empty, 'Port' is 80, and 'Location' is also empty. The 'Use HTTPS' checkbox is checked. The 'Endpoint URL' field contains '[Portal > DICOM Service > Service URL]' and is highlighted with a red box. Below it are three checked checkboxes: 'Manually set the endpoint URL', 'Allow concurrent calls to this web service', and 'Enable cookies for this web service.' A button for 'Static HTTP Headers (0)' is shown, with a note below stating 'Static HTTP headers will be sent with every outbound call'. The 'SSL' section shows 'TLS Version: Support all (JVM TLS defaults)' and 'Trust Policy: Trust All Certificates'. Under 'SSL', there are two unchecked checkboxes: 'Require client authentication' and 'Override cipher suites for this connection'. The 'Authentication Protocol' section shows 'Authentication: OAuth2 with Credentials' and 'Method: POST'. The 'Username' field contains '[Portal>App registrations>You]' and the 'Password' field contains '****', both highlighted with a red box. The 'Auth URL' field contains '[Portal>App registrations>Endpoints>Auth 2.0 authorization (v2)]'.

- d. In the virtual machine, browse to the **desktop** and open the **passwords.txt** file or the secrets file provided by the instructor (don't try this at home!). This file contains values you'll need in the following three steps.
- e. In the **Username** box, enter in the **Application ID** from the password file. This is the Azure Active Directory app registration that will be used by the router to authenticate to the DICOM service.
- f. In the **Password** box, enter in the **Client secret** from the password file. This is the client secret that is used to generate authentication tokens. Normally, you should never share or write down this secret.
- g. In the **Auth URL** box, enter in the **Auth URL** from the password file.
- h. From the menu bar, select **Save** to save the web service connection.

- i. Test the connection by selecting the **Test OAuth** button (you may need to scroll down). In the test log, you should see a 200 OK response and “Bearer” token returned by the service.

Web Service Connections

+ New Delete Manage

Enter filter text

Web Service

MicrosoftDICOMWeb

Save Cancel | Find Usages Clear Cookies

TLS Version: Support all (JVM TLS defaults)

Trust Policy: Trust All Certificates

Require client authentication

Override cipher suites for this connection

Authentication Protocol

Authentication: OAuth2 with Credentials Method: POST

Username: fd1caac5-b104-4709-8bbf-747 Password: [REDACTED]

Auth URL: https://login.microsoftonline.com/72f988bf-86f1-41af-91ab-2d7cd011db47/oauth2/v2.0/token

Content-Type: application/x-www-form-urlencoded

Payload:
grant_type=client_credentials
&client_id={ws-user:self}
&client_secret={ws-pass:self}
&resource=https://dicom.healthcareapis.azure.com

Token Path: /access_token

Token Refresh: Refresh when token expires

Include Basic Authentication in Header? Static OAuth2 HTTP Headers (0)

Static OAuth2 HTTP headers will be sent with every OAuth2 authentication call

Test OAuth

Test Log, Caches and Script Variables

Timestamp	Level	Message
2022-11-18 19:42:46.174	Debug	Rest Response: Status: HTTP/1.1 200 OK Response Time: 470ms Headers: Cache-Control: no-store, no-cache Pragma: no-cache Content-Type: appl...
2022-11-18 19:42:45.704	Debug	Rest Request: URL: https://login.microsoftonline.com/72f988bf-8ef1-41af-91ab-2d7cd011db47/oauth2/token Request Method: POST Call Creation Tim...

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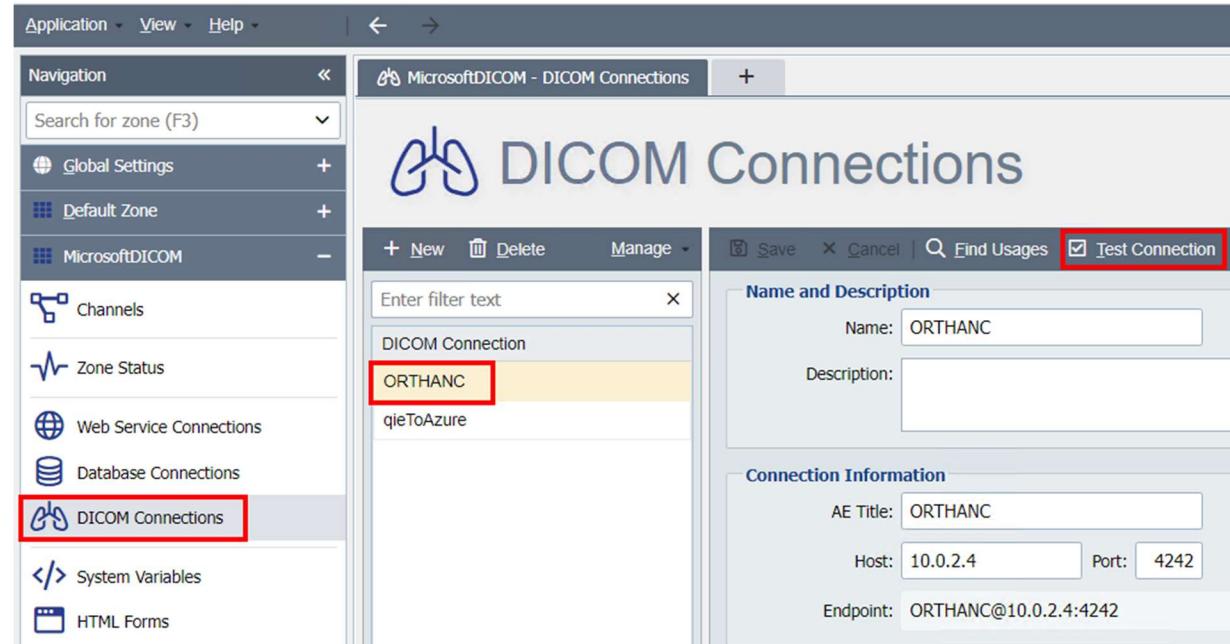
File Edit View Keyboard Shortcuts
5
6 Headers:
7 Cache-Control: no-store, no-cache
8 Pragma: no-cache
9 Content-Type: application/json; charset=utf-8
10 Expires: -1
11 Strict-Transport-Security: max-age=31536000; includeSubDomains
12 X-Content-Type-Options: nosniff
13 P3P: CP="DSP CUR OTPi IND OTRi ONL FIN"
14 x-ms-request-id: 7fed752b-7e72-4c7c-a2c4-0869ee242a00
15 x-ms-ests-server: 2.1.14167.14 - WUS2 ProdSlices
16 X-XSS-Protection: 0
17 Set-Cookie: fpc=AvIQs8Aek_1Pmcc2_YY44Z8w9LkhAQAAADXXCdsOAAAA; expires=Sun, 18-Dec-2022 19:42:46 GMT; path=/; s
18 Set-Cookie: x-ms-gateway-slice=estsfd; path=/; secure; samesite=none; httponly
19 Set-Cookie: stsservicecookie=estsfd; path=/; secure; samesite=none; httponly
20 Date: Fri, 18 Nov 2022 19:42:46 GMT
21 Content-Length: 1443
22
23 {"token type": "Bearer", "expires in": "86399", "ext expires in": "86399", "expires on": "1668886966", "not before": "1
[LF] Plain Text
line: 1 col: 1 (2,236 bytes)
OK Cancel

```

8. Test the connection to the PACS system (Orthanc). This ensures the connection from the router to the PACS system is working correctly.

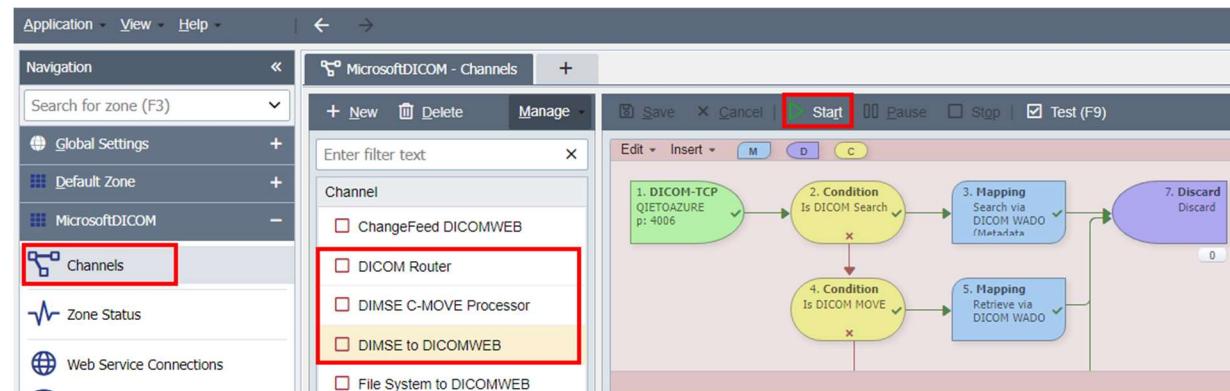
- a. Select **DICOM connections** from the MicrosoftDICOM zone.
- b. Select **ORTHANC** from the list of connections.

- c. Select **Test Connection**. Click **OK** in the Calling AE Title dialog to run the test. You should see a “Connection Successful” message.



9. Select the **Channels** view from the MicrosoftDICOM zone. This view displays the channels that define the rules for how to route data between the modalities, PACS, and DICOM service.

- a. Select the **DIMSE to DICOMWEB** and select **Start**. This channel maps the DIMSE CFIND and CMOVE commands and translates them into the appropriate DICOMWeb WADO and STOW commands.



- b. Select **DIMSE C-MOVE Processor** and select **Start**. This channel supports CMOVE operations.
 c. Select **DICOM Router** and select **Start**. This channel supports sending data from modalities to both the PACS and the DICOM service.

Send a study from the PACS to the DICOM service

With the router configuration complete, the routing capability can be used to send studies from the PACS to the DICOM service.

1. Open the Edge browser and navigate to Orthanc, <http://10.0.2.4:8042/>

2. Select **All studies** to see the list of studies.
3. Find a study for the patient named “**Jule**” and select it from the list to view the study details.
4. Select **Send to DICOM modality** action.

The screenshot shows the Orthanc interface. At the top, there are tabs for "Lookup" and "Plugins". Below this, the "Patient" section displays "Jule420 Schmeler639" with PatientID: 473c6a11-3ddb-4f72-911a-17e9911dc666, PatientBirthDate: Wednesday, August 28, 1985, and PatientSex: F. The "Study" section shows a study titled "CHEST AP PORT" with StudyDate: Thursday, June 2, 2011, and various accession numbers and referring physician information. To the right, a "Thursday, June 2, 2011" panel shows imaging details like AP, Status: Unknown, Modality: CR, and BodyPartExamined: PORT CHE. Below this is the "Osimis Web Viewer" section, which includes options for "Interact", "Delete this study", "Send to DICOM modality" (which is highlighted with a red box), and "Anonymize".

5. In the list of targets, select **QIETOAZURE** to send the study to the router, which will send to the DICOM service.

The screenshot shows a "Choose target" dialog. Under the "DICOM modalities" section, the option "QIETOAZURE" is highlighted with a red box.

6. After sending the study, a message about the queued job will be shown in Orthanc. A success message will be shown in the “general information” section.
7. Navigate to QIE
8. Select the **Channels** view and then select the **DIMSE to DICOMWEB** channel.
9. In the **Status** tab you will see a summary of the send operation. The number of completed items will match the number of instances in the study sent to the DICOM service. Any errors will also be listed. Selecting a box will allow the detailed messages to be viewed.

The screenshot shows the Orthanc "Status" tab. It displays a summary of the send operation with the following counts: Received: 355, Inbound: 0, Processing: 0, Outbound: 0, Errors: 0, and Completed: 353.

	Received	Inbound	Processing	Outbound	Errors	Completed
355	0	0	0	0	0	353

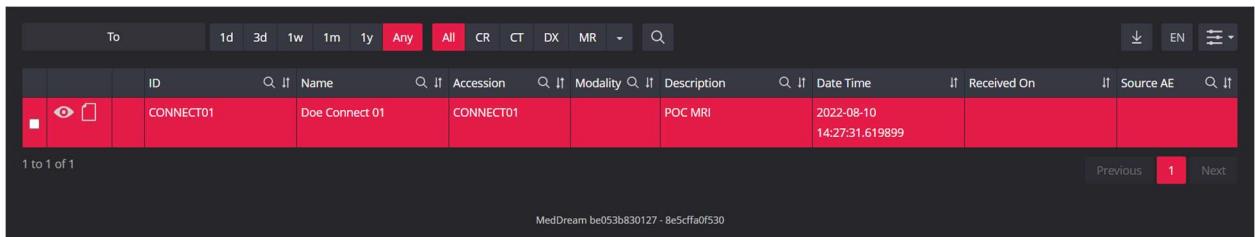
View a study in the DICOM service using a ZFP viewer

To view the studies sent to the DICOM service, you can use a zero footprint (ZFP) viewer. For this workshop, the medDream viewer has already been configured for you.

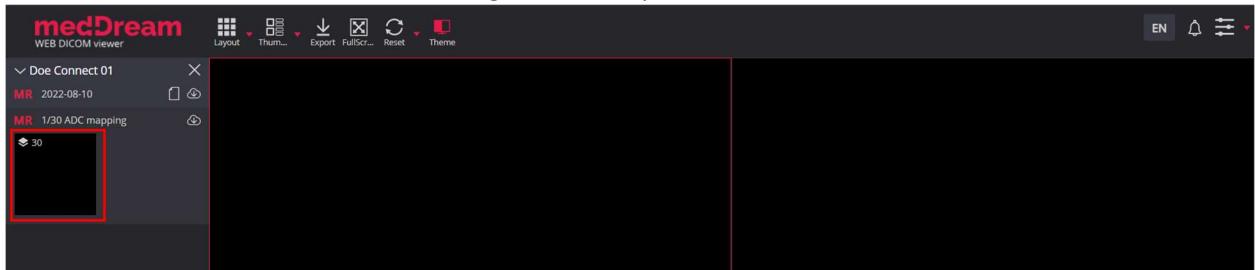
1. **Minimize** the Remote Desktop connection to the VM. This will allow you to test accessing the images outside of the simulated on-prem network.



2. Navigate to medDream.
 - a. Open the Edge browser and navigate to <http://portal.azure.com>.
 - b. Browse to the resource group matching your student number.
 - c. Select the **meddreamContainerGroup** from the list of resources.
 - d. On the Overview page, copy the **IP address (Public)**.
 - e. Open a new browser tab and paste in the IP address, adding “**:8080**” to the end of the address.
3. Login using “**student**” as the username and password.
4. In the default view, all studies available in the DICOM service are listed. Find the study sent from the PACS and **select** it to view on the web.



5. **Select** a series from the left menu or drag to the viewport to view it.



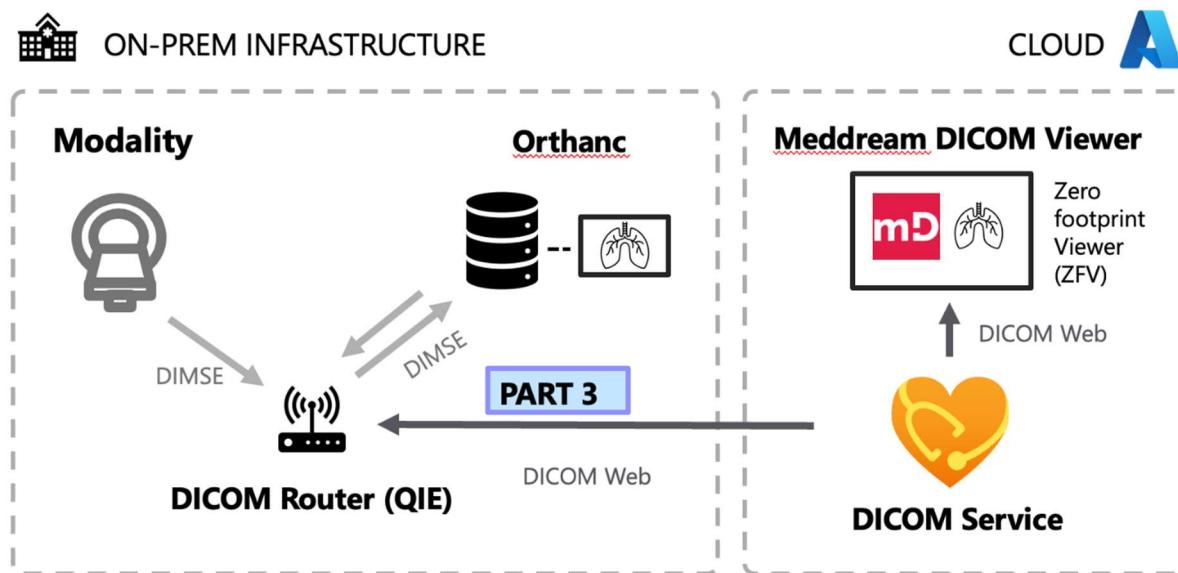
Simulate a new study from a modality, view it on the cloud

Now that the DICOM router is configured, another simulation of a new study from a modality can be performed. This time, the study will be routed to both the PACS and the DICOM service.

1. On the desktop, locate the file named “**3-modality-pushing-to-qie**”.
2. Double-click the file to run the script and send three new studies to the DICOM router.
3. Browse to one of the three new studies in Orthanc to see the changes were sent to the PACS.
4. Minimize the Remote Desktop connection to the VM.
5. Navigate to medDream again and you should see the new studies in the list, demonstrating that they were also sent to the DICOM service.

Part 3 – Search the cloud for historical priors

Connecting the DICOM service to an on-prem PACS system provides value beyond just the ability to store imaging data in the cloud for backup and archival purposes. In this section, you will learn how the DICOM service can act as an extension of the PACS. To demonstrate this, we have pre-loaded the DICOM service with some historical patient data.



Migrate historical priors from the archive

1. On the desktop, locate the file named “**5-migrate-archive**”.
2. Double-click the file to run the script and send eight studies to the DICOM service.
3. Minimize the Remote Desktop connection to the VM.
4. Navigate to medDream again and you should see the new studies in the list. You can choose a patient (i.e. “Jule”) and see there should be two studies available in medDream (dates of 1994 and 2011) which differs from the studies available in Orthanc (dates of 2011 and 2022).

Retrieve historical priors in the PACS

1. Open the Edge browser and navigate to Orthanc, <http://10.0.2.4:8042/>
2. Select the **Query/Retrieve** option from the upper right menu bar.

A screenshot of the Orthanc web interface. The top navigation bar includes 'Lookup', 'Plugins', 'orthanc > Lookup studies', 'Upload', 'Query/Retrieve' (which is highlighted with a red box), and 'Jobs'. The main content area features the Orthanc logo.

3. Ensure QIETOAZURE is selected in the DICOM server box and select **Search studies**. You can also narrow down your search by selecting a field of interest and entering in a value to search – for

example, use the patient “Jule” again.

The screenshot shows the Orthanc DICOM Query/Retrieve interface. At the top, it says "orthanc » DICOM Query/Retrieve (1/4)". The "DICOM server:" field contains "QIETOAZURE" and has a red box around it. Below it, "Field of interest:" has "Patient ID" selected (radio button is checked). There are four other options: "Patient Name", "Accession Number", and "Study Description". Under "Value for this field:", there is an empty input field. Under "Study date:", there is a dropdown menu set to "Any date". Below these, "Modalities:" includes CR, CT, MR, NM, PT, US, XA, DR, DX, and MG. At the bottom, there are two buttons: "Test Echo" (disabled) and "Search studies" (highlighted with a red box).

4. Every sample patient has a prior that's been preloaded into the DICOM service – **select the arrow** to the right of any of these studies. For “Jule” select the study from 1994.

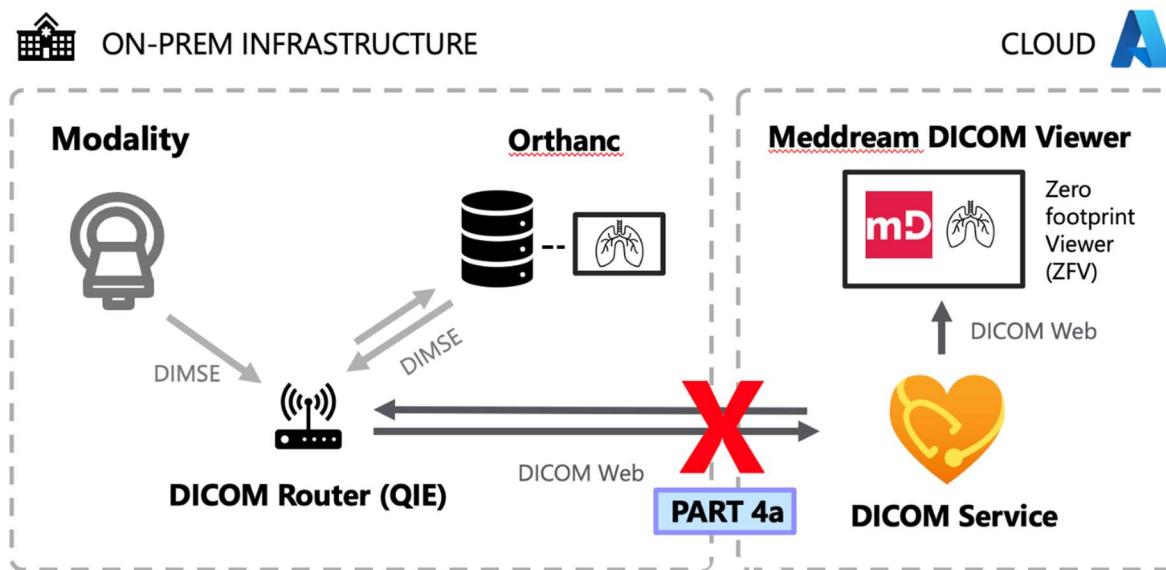
The screenshot shows the Orthanc DICOM Query/Retrieve interface with the results of the search. At the top, it says "orthanc » DICOM Query/Retrieve (2/4)". The results table has a header row with columns for "Filter items..." and "Actions". The first result is for accession number 473c6a11-3ddb-4f72-911a-17e9911dc666, patient Jule420 Schmeler639, born 19850928, sex F, and study date Thursday, June 2, 2011. The second result is for the same accession number, patient, and birth date, but with a different study date: Wednesday, February 23, 1994. A red box highlights the "Actions" column for the second study, specifically the arrow icon next to the study date.

5. Keep ORTHANC as the target and select **Retrieve**.
6. Go back to the Orthanc home screen (select the **Lookup** option from the menu bar) and perform a local search to see the study is now available locally. If you retrieved the study for Jule, there should now be three studies – the original available in the PACS (2011), the study created by the simulated modality (2022), and the prior retrieved from the DICOM service (1994).

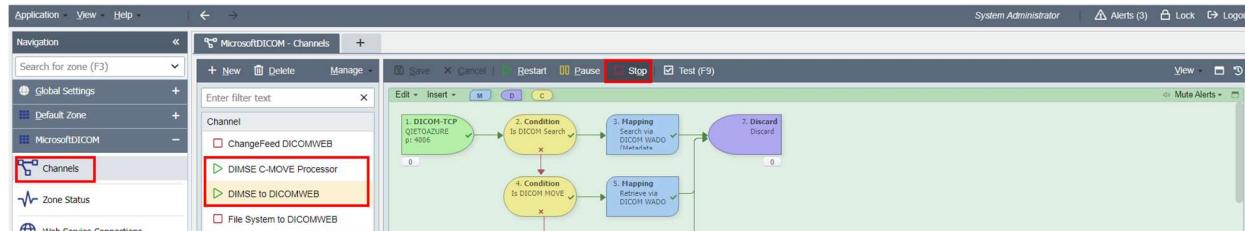
Part 4 – Simulate outages

A cloud-based medical imaging archive like the DICOM service provides unmatched availability and resiliency. Even still, there may be situations where access to the cloud is unavailable. In this section, you'll see how imaging data availability is boosted by the DICOM service.

Simulated internet connectivity outage



1. Open the Edge browser and navigate to QIE, <http://10.0.1.4:80>
2. Stop the channels processing DICOM DIMSE events.
 - a. Under the MicrosoftDICOM zone, select **Channels**. Select the two active channels (**DIMSE to DICOMWEB**, **DIMSE C-Move Processor**) and select **Stop** for each.



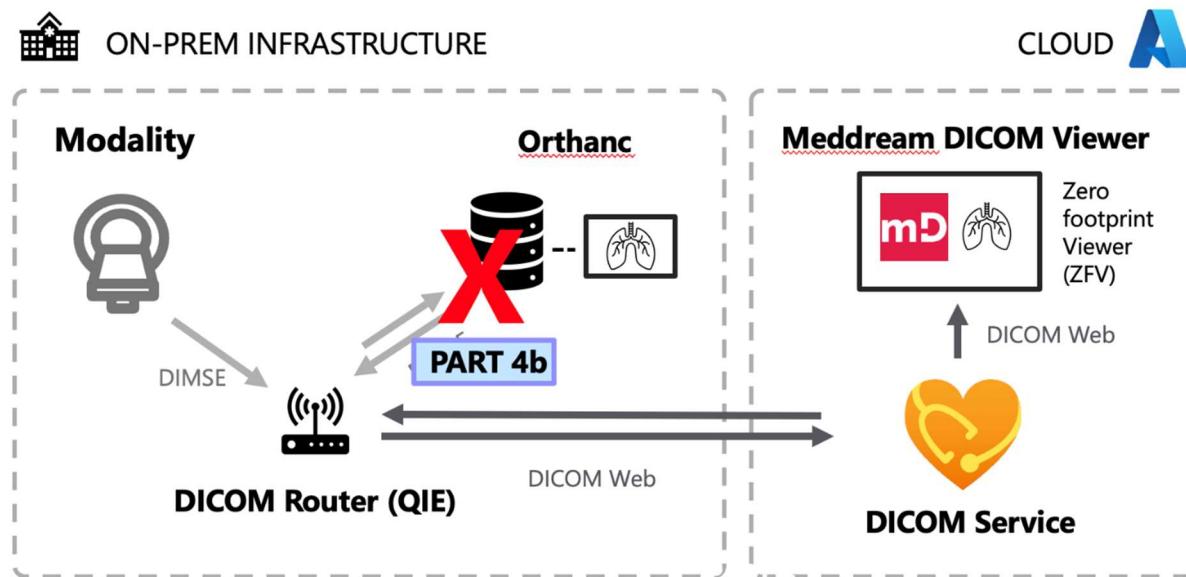
3. Navigate to Orthanc, <http://10.0.2.4:8042/>
4. Select the **Query/Retrieve** option from the upper right menu bar.



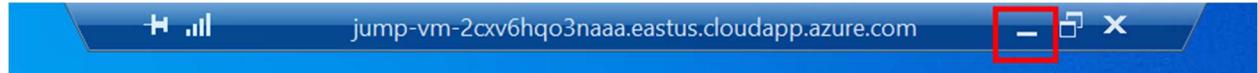
5. Select **Search studies** to retrieve studies from the DICOM service. The operation should result in an error as the C-FIND operation is unable to access the DICOM service. This is expected in the outage scenario.

- Return to the Orthanc home screen and perform a local search to see that studies are still available locally.

Simulated PACS outage



- Minimize the Remote Desktop connection to the VM. This will allow you to test accessing the images outside of the simulated on-prem network.



- Navigate to the Azure portal, to <https://portal.azure.com>
- Browse to the resource group corresponding to your student number (i.e. **rsna-workshop-studentN**).

4. In the resource group, select the container that is running Orthanc, **contoso-orthanc-containergroup**.

The screenshot shows the Microsoft Azure Resource Group Overview page for 'rsna-workshop-studentN'. The 'Essentials' section displays the subscription information (Subscription (move) : OTU_WA_CNE_100780, Subscription ID : [REDACTED], Tags (edit) : Click here to add tags), deployment status (Deployments : 9 Succeeded), and location (Location : East US). The 'Resources' section lists 15 resources, including 'contoso-orthanc-containergroup' which is highlighted with a red box. The table includes columns for Type, Storage account, Container instances, Location, and three-dot ellipsis buttons.

Type	Storage account	Container instances	Location	
Virtual network			East US	...
Network security group			East US	...
SQL server			East US	...
Virtual machine			East US	...
Name ↗	Type ↗	Location ↗		
bootdiags77pqch3xdkiw				...
contoso-orthanc-containergroup				...
contoso-qvera-containergroup				...
ContosoNet				...
default-NSG				...
ifqgkot3nu22				...
jump-vm				...

5. Select **Stop** to stop the container instance that is running Orthanc. You can optionally reconnect to the VM to validate that Orthanc is no longer running.

The screenshot shows the Microsoft Azure Container Instances page for 'contoso-orthanc-containergroup'. The 'Overview' tab is selected. The top navigation bar includes 'Search', 'Start', 'Restart', 'Stop' (which is highlighted with a red box), 'Delete', and 'Refresh'. The 'Essentials' section shows the resource group (rsna-workshop-studentN), status (Running), and location (East US).

6. Navigate to medDream.
7. In the default view, all studies available in the DICOM service are listed. Find a study and **select** it to view on the web.

The screenshot shows the medDream application interface. At the top, there is a search bar and filter options (To, 1d, 3d, 1w, 1m, 1y, Any, All, CR, CT, DX, MR, Q, If). Below is a table with columns: ID, Name, Accession, Modality, Description, Date Time, Received On, Source AE, and Q, If. A single row is selected, showing 'CONNECT01' as the ID, 'Doe Connect 01' as the Name, 'CONNECT01' as the Accession, 'POC MRI' as the Description, '2022-08-10 14:27:31.619899' as the Date Time, and empty fields for Received On and Source AE. The bottom of the screen shows the footer text 'MedDream be053b830127 - 8e5cffa0f530' and navigation buttons for 'Previous', '1', and 'Next'.

Congratulations!

You've completed the workshop! As a quick recap, you learned the following:

- How to use the DICOM service immediately with your organization's data
- The basics of deploying and configuring:
 - an Azure Health Data Services DICOM service,
 - an on-premises DICOM router for transferring images to the cloud e.g. QIE DICOM router
- How to access imaging studies stored on the cloud
- How the cloud supports your organization's operational integrity in the event of an outage
- The broader benefits of moving imaging data estates to the cloud

Feedback

Thank you for your participation. Please take a 4-question survey for further engagement and feedback.



<https://forms.office.com/r/xNGzqg8d7r>