eUnity Help

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Introduction

- About eUnity™
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- System Requirements
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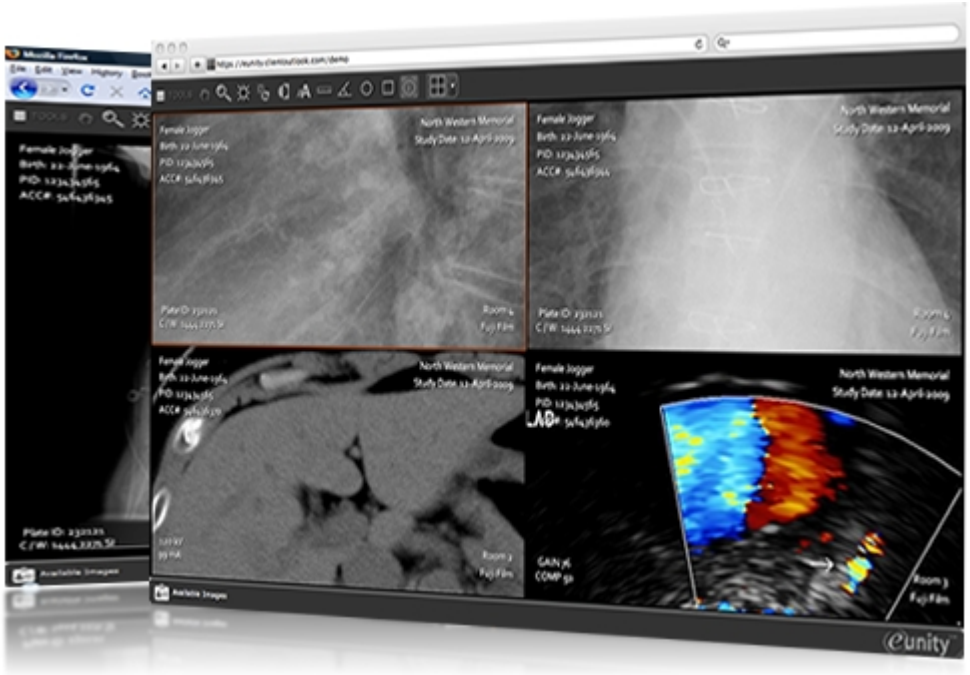
About eUnity

eUnity™ enables health care professionals to access, manipulate and collaborate in real-time over full quality medical images using any web-browser without installing client software. eUnity™ is a server-based solution that integrates with your existing hospital infrastructure. Once the eUnity™ server is installed, it connects to your PACS or VNA and displays DICOM images within the hospital, securely from remote locations, or as an integrated part of an EHR or portal system.

Feature Overview



Multiple PACS, One Viewer

Securely access full-fidelity DICOM images with unprecedented performance using nothing more than a common web-browser. Access multiple PACS & sites using eUnity™ as a universal viewer.

EMR Image Enablement

Integrate eUnity™ as a part of your EMR or clinical web portal. Users no longer need to look for dedicated PACS workstations; eUnity™ performs as well as installed PACS viewers – without the install.

Outstanding Performance

Supported by our unique server technology, the eUnity™ client is the fastest zero-footprint DICOM viewer available today; performing as well as installed software.

Multi-Platform

Using your favorite web-browser and OS, eUnity™ runs on Microsoft Windows®, Mac OS® and Linux® in Microsoft Internet Explorer, Mozilla Firefox, Apple Safari and more.

Intended Use

Canada

eUnity™ is a software application that displays medical image data and associated clinical reports. eUnity™ performs operations relating to the transfer, storage, display, and measurement of image data.

eUnity™ allows users to perform image manipulations, including window/level, rotation, measurement and markup.
The communication and storage components of the eUnity™ system are primarily DICOM communication over TCP/IP networks, digital image storage on computer hard disk drives.

It is the User's responsibility to ensure that eUnity™ is used with appropriate display hardware and that image type and quality are suitable for their intended clinical application based on the regulations and / or their professional association's guidelines pertaining to the anatomy and pathology being studied. Mammographic images and digitized film screen images must not be used for diagnostic interpretations.

When used on mobile devices, eUnity is for reference and referral only.

United States

eUnity™ is a software application that displays medical image data and associated clinical reports. eUnity™ performs operations relating to the transfer, storage, display, and measurement of image data.

eUnity™ allows users to perform image manipulations, including window/level, rotation, zoom, measurement and markup.

eUnity™ displays both lossless and lossy compressed images. For lossy images, the medical professional user must determine if the level of loss is acceptable for their purposes.

Display monitors used for reading medical images for diagnostic purposes must comply with applicable regulatory approvals and with quality control requirements for their use and maintenance.
Mammographic images and digitized film screen images must not be reviewed for primary image interpretations.

Australia

A device that displays medical image data and associated clinical reports. It performs operations relating to the processing or viewing of medical images.

Europe

eUnity™ is a software application that displays medical image data and associated clinical reports. eUnity™ performs operations relating to the transfer, storage, display, and measurement of image data.

eUnity™ allows users to perform image manipulations, including window/level, rotation, zoom, measurement and markup.

eUnity™ displays both lossless and lossy compressed images. For lossy images, the medical professional user must determine if the level of loss is acceptable for their purposes.

Display monitors used for reading medical images for diagnostic purposes must comply with applicable

regulatory approvals and with quality control requirements for their use and maintenance.

Other

Certification for other regions is pending. Please contact Client Outlook for more information.

Hardware and Platform Requirements

	Web		Mobile	
	Flash	**HTML5**	**iOS**	**Android**
Operating System	Windows 2000, Windows XP, Vista, Windows 7, Windows 8/8.1, Windows 10 Mac OS X 10.4+ (Intel)	Windows 2000, Windows XP, Vista, Windows 7, Windows 8/8.1, Windows 10 Mac OS X 10.4+ (Intel)	iOS 4.3+	Android 2.3+
Supported Browsers (While eUnity stores no patient information on the client machine, we do recommend closing the browser when finished viewing images.)	Browser running Flash Player v11.3+ (Note: Using the most recent Flash Player release is recommended.)	Safari 8+, IE11+, Firefox 28+, Chrome 39+	Not Applicable	Not Applicable
Hardware	Modern x86/x64 Consumer CPU 512 MB of RAM 256 MB of VRAM	Modern x86/x64 Consumer CPU 512 MB of RAM 256 MB of VRAM	iPhone 4S+, iPad 2+	ARMv7 processor with Vector FPU, Minimum 550MHz, ES2.0, H.264 & AAC H/W Decoders
App Store	Not Applicable	Not Applicable	Apple App Store	Google Play Store

Note: Some default browser configurations are known to improperly handle the HTTP/1.1 no-store cache directive and cache information to the local disk. During site validation the enterprise browsers and configurations should be validated to ensure patient data is not unexpectedly cached.

Client - Multi-Monitor

eUnity Web client has the capability to dynamically adjusts its UI to match Monitor bounds. Multi-Monitor mode is supported in IE embedded, only.

Platform Differences

There are a number of differences in supported features between eUnity clients on different platforms.

	Web		Mobile (iOS & Android)	
Feature	**Flash**	**HTML5**	**Tablet**	**Phone**
Navigate	✓	✓	✓	✓
Zoom Tool/ Pan	✓	✓	✓	✓
Invert	✓	✓	✓	✓
Flip and Rotate	✓	✓	✓	✓
Toggle Demographics	✓	✓	✓	✓
Linear Measurement	✓	✓		
Ellipse ROI	✓	✓		
Angle Measurement	✓	✓		
Freeform ROI	✓	✓		
Cobb Angle Measurement	✓	✓		
Line Annotation	✓	✓		
Arrow Annotation	✓	✓		
Freehand Annotation	✓	✓		
Text Annotation	✓	✓		
Spine Labeling	✓	✓		
Eraser	✓	✓		
Revert to Original	✓	✓	✓	✓
Study Information	✓	✓	✓	✓
Report View	✓	✓	✓	✓
View Format	✓	✓	✓	✓
Cine	✓	✓	✓	✓
Export	✓	✗		
Scout/ Reference Lines	✓	✓		

Triangulation Mode	✓	✓		
Link Series	✓	✓		
Paper Printing	✓	✗		
Collaboration	✓	✗	✓	
Keyboard Shortcuts	✓	✓		
Multi-Study Display	✓	✓		
Multi-Monitor Split Screen	✓	✗		

Documentation Warranty Statement

Characteristics of the products described in this publication can be changed at any time without notice.

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The information in this Knowledge Base is subject to change without notice.

Customer Requirements

DICOM Image Calibration Review

The methods used by existing modalities and new modalities (including any modality software updates) to determine medical image calibration values for subsequent measurements must be reviewed prior to clinical use within eUnity™. While this is a standard operating procedure for most hospitals, the requirement to do this is included in the documentation to highlight the risk associated with not maintaining these reviews; incorrect measurement values. See the table within the Calibration section for how calibration is determined based on the source data from the DICOM header of an image.

DICOM Waveform ECG Review

eUnity has partial support of DICOM Waveform SOP class 1.2.840.10008.5.1.4.1.1.9.1.2 (General ECG Waveform Storage). For this reason, a site review must be made of this object type prior to clinical use within eUnity™. Client Outlook Support & Maintenance team can work with your site administrator to validate this SOP class for your site.

DICOM Basic Text Structured Report and Encapsulated PDF Review

Due to the broad-scope of the underlying formats and wide-applicability in clinical work-flow of DICOM Structured Reports and DICOM Encapsulated PDFs, a site review must be made of these object types prior to clinical use within eUnity™. The requirement to do this is included in the documentation to highlight the risk associated with not maintaining these reviews.

Encapsulated PDF Constraints

- Lossy Presentation
  All Encapsulated PDF objects are presented as lossy regardless of the underlying format type. eUnity communicates this to the clinician via the "lossy indicator".

- Support for subset of PDF object types
  PDF objects can contain a wide variety of formats, including image formats such as PNG, JPEG, JPEG2K, as well as vector text and other vector objects. Certain formats, such as JPEG2K, are not supported if embedded in a PDF document.

Structured Reports Constraints

- In case of multiple associated reports with a given study, only the newest report will be displayed. This determination is based on comparing the Content Date (0008,0023), Content Time (0008,0033), Verification DateTime (0040,A030), and Observation DateTime (0040,A032) tags to derive the latest report.

Collaboration

While the collaboration server attempts to synchronize all clients there may be issues related to networking that prevent the same image from being displayed to all users, or the cursor location being represented equally to all clients. If using collaboration for a diagnostic consultation, always verify which image and feature is being discussed.

Hanging Protocols

Hanging protocols allow a rotation to be applied to the images within a series. Therefore, the images displayed may have a rotation applied. Check with your system administrator to see which hanging protocols with image rotations, if any, are configured.

CINE Module

When DICOM Cine Module is present, eUnity will attempt to play back the series at the specified frame-rate. If the frame rate cannot be achieved the frame rate label will turn red. If frames are dropped, a red CINE icon will be displayed to communicate this to the user.

Anti Virus Software

Anti Virus software or equivalent mitigation must be used to protect eUnity™ from downtime as a result of a virus or other malicious software.

Network redundancy

eUnity™ is not a primary storage system and may be sold as software only. Network redundancy, Manual Workflows, Back-up Systems and other risk mitigation are recommended and are the responsibility of the customer to implement and manage.

For example:

- for longer or planned delays, Users may use the PACS, modality or film to review medical images.
- daily backup procedures and or automated off site back-ups are the responsibility of the customer.

Server SSL Certificate

For privacy and security reasons eUnity™ must be run in https mode with a signed SSL certificate. The customer is responsible for obtaining a signed certificate from an authorized signing authority.

Browser Policies

For convenience some browsers store user names and passwords. eUnity does not limit this option, but when using any computer best practices and judgment should be followed before storing or remembering any authentication information.

Manufacturer Requirements

The manufacturer, installer, or importer will be responsible for the safety, reliability, and performance of the equipment only if:

- Installation, modifications, adjustments, changes, or repairs are performed by suitably qualified service personnel.
- The electrical installation of the site in which the equipment is used is according to an applicable safety standard (UL, CSA, or IEC/CDE).
- The equipment is used according to the intended use and instructions provided in the Installation Guide and Help Documentation.
- No software other than that which is distributed with this package or is sanctioned by Client Outlook Inc. will reside on the eUnity™ Server.

Image Display Tools

This section gives an overview of the main tools and features within the eUnity™ Client, demonstrates how to use the tools and gives further information about how these tools and features behave.

	Tool	Description
	Navigate	The Cursor tool allows Users to interact with the System's GUI. For example, User may select tools and navigate and interact with content.
	Zoom Tool/ Pan	The Mouse Wheel or other Host Display Device selection tool that permits scrolling will Zoom content (e.g. DICOM images.) Once Zoomed the left mouse button can be used to pan the content.
	Window and Level	The Window and Level Tool is used to change the window width and window center of an image's pixel data.
	Invert	The Invert tool inverts an image's channels.
	Flip and Rotate	The Flip tool will flip an image on its vertical axis.
	Toggle Demographics	View Ports may contain META data (e.g. patient and study related data.) The View Port Content Information tool may be used to toggle this information on and off. By default, the information will always be togged on.
	Linear Measurement	The Linear Measurement tool allows users to make length measurements.
	Ellipse ROI	The Ellipse ROI (Region of Interest) Measurement tool allows users to draw an ellipse. The Area, Perimeter, Size Average Hounsfield (HU) and Standard Deviation are presented in mm. Measurements are also denoted by the calibration source as provided within the DICOM image's header information.
	Angle Measurement	The Angle Measurement tool allows Users to make angle measurements.
	Freeform ROI	The Freeform ROI (Region of Interest) Measurement tool allows User to draw a freeform measurement. The Area, Perimeter, Size Average Hounsfield (HU) and Standard Deviation are presented in mm. Measurements are also denoted by the calibration source as provided within the DICOM image's header information.
	Cobb Angle Measurement	The Cobb Angle tool allows Users to measure angles using two separate, disjoint lines.
	Line Annotation	Line Annotation Tool allows users to draw a line.
	Arrow Annotation	Arrow Annotation Tool allows users to draw an arrow.
	Freehand Annotation	Freehand Annotation Tool allows users to draw a closed, freeform markup.
	Text Annotation	Text Annotation Tool allows users to apply some text to an image.
	Spine Labeling	Spine Labeling tool allows users to add specific spine-related labels to an image.
	Eraser	The Eraser tool allows Users to select and erase measurement and markup.
	Revert to Original	The Revert to Original Tool allows user to reset a series of images to its original state. (Note: Navigation is not reset)
	Study Information	Study Information panel presents associated reports, study information and a related studies list.

	Tool	Description
	View Format	The View Format tool defines how content (e.g. DICOM images) is presented. There are a fixed set number of available View Formats available. View Formats are made up of one or more View Ports.
	Cine	Cine Tool allows a series of images to be displayed like a movie.
	Export	Export an image as JPEG or PNG
	Scout/ Reference Lines	Reference lines toggle helpful overlay lines when using triangulation or scout images.
	Triangulation Mode	Triangulation tool allows for navigation of orthogonal series.
	Link Series	Link Series tool allows for use of common features across multiple series.
	Paper Printing	Perform a paper print of the on screen images.
	Collaboration	Collaborate with another eUnity user.

Additionally, this section covers:

- Calibration
- Content (Series Tray)
- Lossy Image Display
- Keyboard Shortcuts
- Multi-Study Display
- Presentation States

Navigate

Users may navigate images within a study through a mouse wheel, with a left-click drag, or by using the up and down cursor key of the host PC's keyboard.

- Mouse Wheel Up: Scrolls images from a higher number image to a lower number image.
- Mouse Wheel Down: Scrolls images from a lower number image to a higher number image.
- Left-Click Drag Up : Scrolls images from a higher number image to a lower number image.
- Left-Click Drag Down: Scrolls images from a lower number image to a higher number image.

Refer to Keyboard Shortcuts for related keyboard commands.

Trouble Shooting: Some web browsers do not automatically give its content focus, and the mouse and keyboard interaction do not apply. In these cases click anywhere on eUnity™ and the mouse and keyboard will interact with your selections.

Zoom Tool / Pan

Users may zoom images within a study through their mouse wheel.

- Mouse Wheel Forward: Zooms images up.
- Mouse Wheel Back: Zooms images down.

Refer to Keyboard Shortcuts for related keyboard commands.

Once Zoomed the left mouse button can be used to pan the content.

The Zoom factor within the overlay information details the amount of zoom.

Trouble Shooting: Some web browsers do not automatically give its content focus, and the mouse and keyboard interaction do not apply. In these cases click anywhere on eUnity™ and the mouse and keyboard will interact with your selections.

Window and Level

Users may Window and Level an Image by selecting the Window and Level Tool, clicking and holding an image with the left mouse button and dragging the mouse up and down and left right.

Selecting the Reset Window and Level will reset the Window and Level to its initial presentation.

The Window Level Presets drop down provides access to site-level, modality specific Window Level Presets. The icon will only appear if there are presets available for the study being displayed. If a study contains multiple-modalities, the drop down will be populated with the presets matching the modality of the selected series. If the selected series has no presets the icon is disabled.

Note: Window / Level operation can be mapped to middle-mouse button or right-mouse button by the site administrator. This can be done for all eUnity users, or users of only certain groups.

Invert

Users can invert image channels by selecting the Invert tool. Reset Window and Level will not reset the invert state of an image.

When applied to a Waveform, Invert will toggle the color scheme between light and dark themes.

Flip and Rotate

Users can flip and rotate images within a View Box by selecting the Flip and Rotate Tools.

Toggle Demographics

Users can hide the demographic overlay information within a View Box by selecting the toggle demographics tool.

Annotation Tools

Annotation tools allow users to apply markup to an image but do not supply any measurement information. These markups are added, removed and edited in the same manner as the measurement tools. While annotations can be printed, they cannot be saved.

Users can apply a line annotation using the Line tool.

Using the mouse, a single left click starts the annotation and a second left click ends the annotation.

Annotations can be edited by selecting them to be active and dragging the associated handles.

Users can apply an arrow annotation using the Arrow tool.

Using the mouse, a single left click starts the annotation and a second left click ends the annotation.

Annotations can be edited by selecting them to be active and dragging the associated handles.

Users can apply a freeform annotation using the Freehand tool.

Using the mouse, a user can select a number of points for the freeform. Clicking on the first point selected, or double-clicking the mouse, ends the measurement.

Annotations can be edited by selecting them to be active and dragging the associated handles.

Users can apply text markup to an image using the Text tool.

Using the mouse, a user can select the initial placement. A text box will appear where the user can input up to 35 characters.

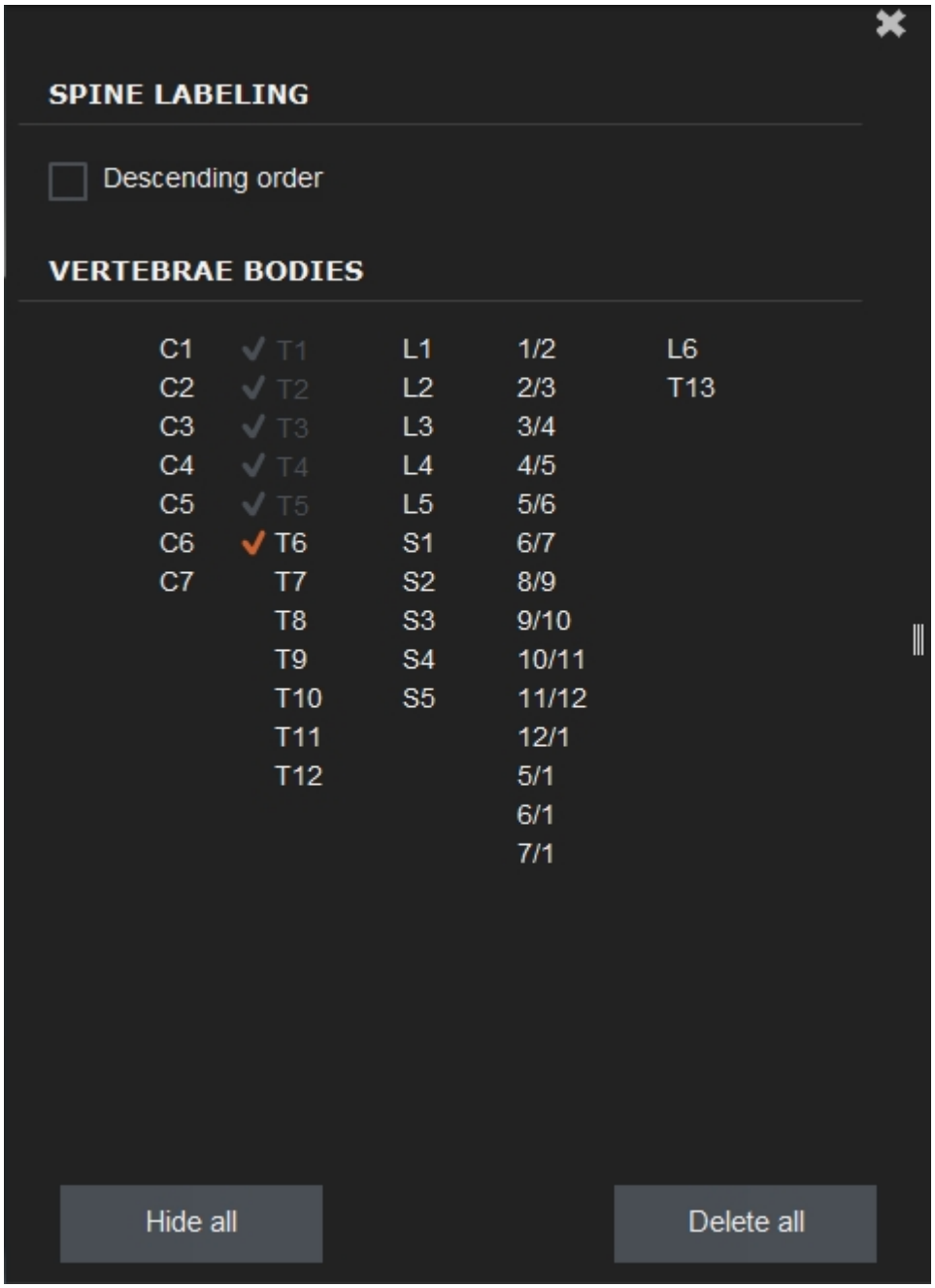
Note: The text annotation tool cannot be used in Full Screen Mode.

Text can be edited by double-clicking on that annotation and moved by dragging the text to a different point on the screen.

Users can apply spine labeling to an image using the Spine Labeling tool.

Upon selection of the tool, the Spine Labeling panel will appear to allow selection of specific labels. Choose

a label from the list and click on an image to place the label. Similar to other annotations, labels can be moved by clicking-and-dragging. For convenience, after placing a label the labels will automatically advance based on the order in the list. Labels can be removed by deselecting them in the panel window.



Measurement Tools

Users can apply a linear measurement using the Linear Measurement tool.

Using the mouse, a single left click starts the measurement and a second left click ends the measurement.

Measurements can be edited by selecting them to be active and dragging the measurement handles.

Values are shown with the units of mm and the source of the calibration within parentheses.

For more details on calibration please see the Calibration section.

Users can apply an ROI measurement using the Ellipse ROI Measurement tool or the Circle ROI Measurement tool.

Using the mouse, a single left click starts the measurement and a second left click ends the measurement.

Measurements can be edited by selecting them to be active and dragging the measurement handles.

Values are shown with the units of mm and the source of the calibration within parentheses. For more details on calibration please see the Calibration section.

Users can apply an angle measurement using the Angle Measurement tool.

Using the mouse, a single left click selects the vertex, the next two left mouse clicks select the other points of the angle.

Measurements can be edited by selecting them to be active and dragging the measurement handles.

Values are shown with the units of degrees.

Users can apply a Freeform ROI measurement using the Freeform ROI Measurement tool.

Using the mouse, user can select a number of points for the freeform ROI. Clicking on the first point selected, or double-clicking the mouse, ends the measurement.

Measurements can be edited by selecting them to be active and dragging the measurement handles.

Values are shown with the units of mm and the source of the calibration within parentheses. For more details on calibration please see the Calibration section.

Users can apply a Cobb angle measurement using the Cobb Angle Measurement tool. A Cobb angle is the angle formed at the intersection of the two lines, which typically intersect off-screen.

Users create Cobb angle measurements by drawing two line segments. Using the mouse, the first pair of left clicks draw the initial line segment; the second pair of left clicks draw the secondary line segment. A dashed line connects the two segments and the Cobb angle, presented in degrees, is anchored to the connecting line.

Measurements can be edited by selecting them to be active and dragging the measurement handles.

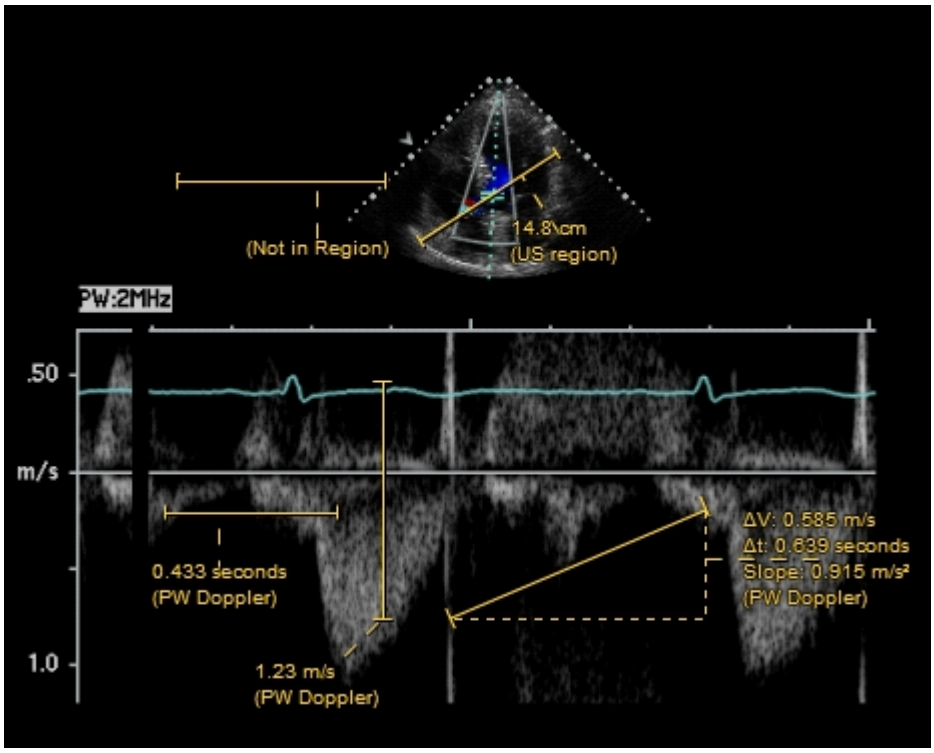
Values are shown with the units of degrees.

Users can erase measurements by selecting the eraser tool and left clicking on the measurement to erase.

US Measurements

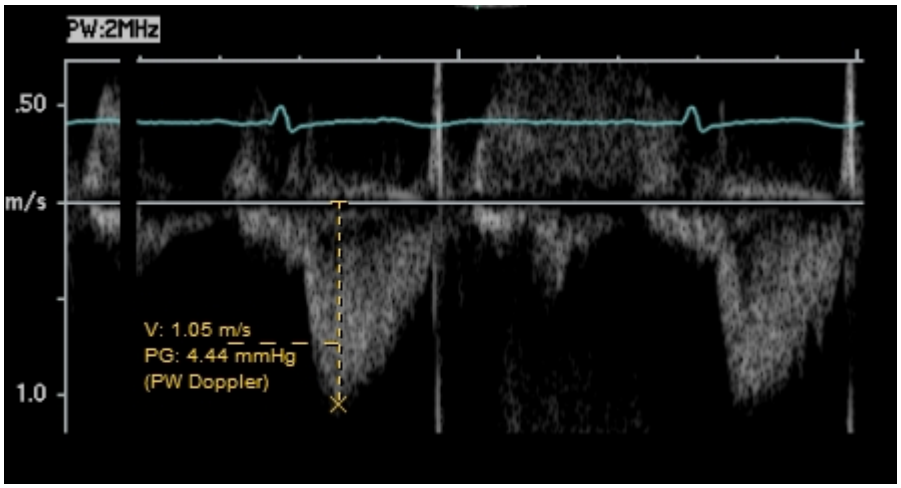
The following tools can be used to make Ultrasound measurements on images with the appropriate calibration information.

All calibrated Ultrasounds images can use the following standard linear measurements. Creation of these measurements follows the workflow detailed above. When a linear measurement is placed within a region that has two different axes (ie. units like time and velocity), it will show both units unless the measurement is parallel to one of the axes.

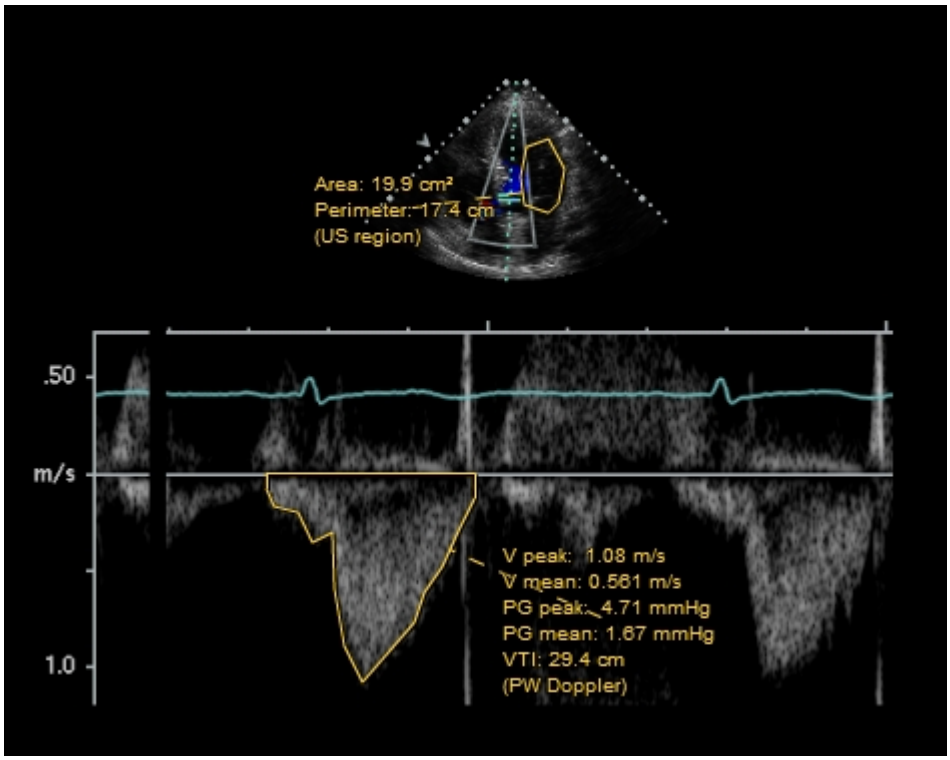


A special case exists for velocity-time Doppler Ultrasound regions. In this case, a single click will create the measurement by automatically snapping the other end-point to the zero-velocity axis.

- Moving the automatic end-point off the zero-velocity axis will transition the measurement into a standard Ultrasound linear measurement.
- Moving the user selected point will keep the automatic end-point locked, sliding it along the zero-velocity axis.



The Freefrom ROI tool can be used to calculate the Doppler Envelope for velocity-time regions. ROIs will be locked to the zero-velocity axis and points can be added along the envelope. A double-click will end the ROI creation.



Revert to Original

Users can revert a series to its original presentation by selecting the Revert to Original tool.

Study Information

The Study Information button opens a panel containing information grouped into tabs. Currently supported tabs include: Report tab, Study Details tab and the Study List tab.

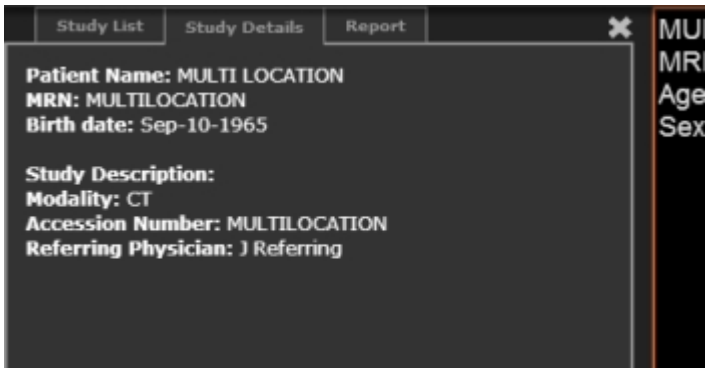
Each of the tabs is made available based upon configuration settings and the availability of integrating systems. If none of the tabs are available, the Study Information button is not displayed.

Report Tab

If eUnity™ has been configured to retrieve report information from a report system/archive, the report text for the currently selected study appears in this panel.

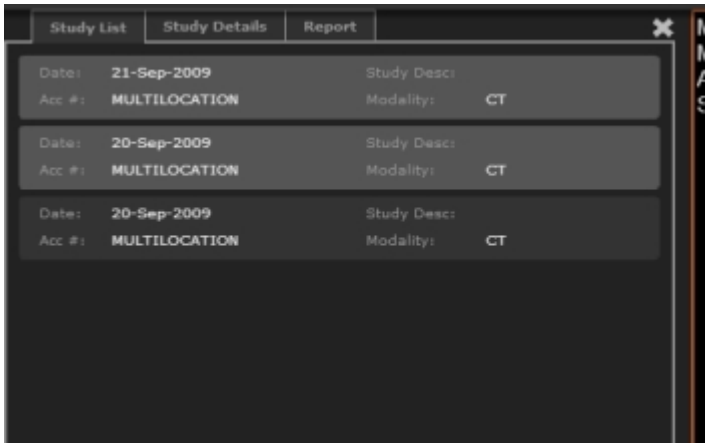
Study Details Tab

The study details section displays some generic information regarding the selected study and any study comments for the currently selected study.



Study List Tab

The study list panel displays a list of other studies for the patient in view. Additional studies can be loaded into view by clicking on items in the list. There is a limit to the number of studies that can be loaded at one time. The limit is four, so selecting additional studies will swap out one of the other studies in view. See Multi-Study Display for more information.



View Formats (Single & Multi-Monitor Mode)

User may select to present content (e.g. DICOM images) from within a set number of available View Formats. View Formats are made up of one or more View Ports.

Screen Layouts

Screen layouts are grouped into three categories:

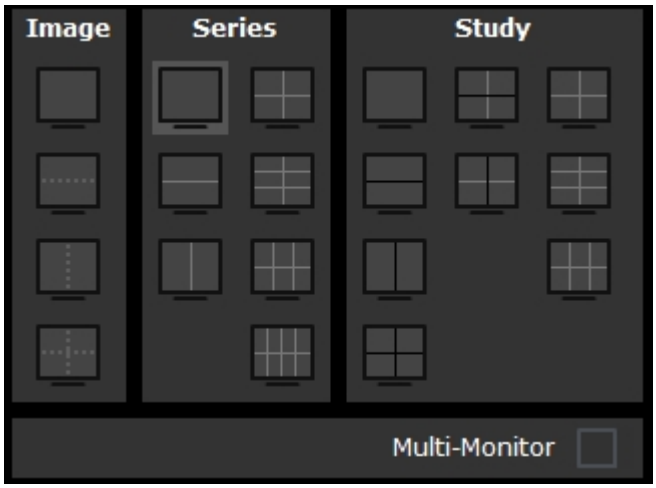


Image: These layouts display one or more images from a single series and are also referred to image tile layouts. The dotted lines represent images within the same series.

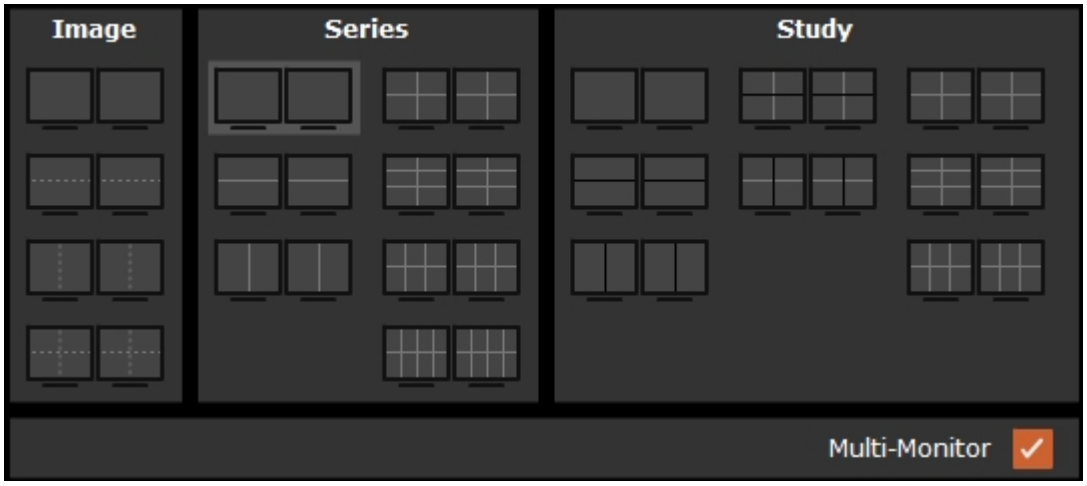
Series: These layouts display more than one series from a single study. The grey lines represent series within a single study.

Study: These layouts display more than one study and are also referred to as multi-study layouts. The black lines represent different studies.

Multi-Monitor: If Multi-Monitor mode is enabled by the Site Administrator, the screen layout drop-down will provide an optional 'Multi-Monitor' check-box. When selected, the eUnity view will enter Multi-Monitor mode in which top and bottom tool-bars are duplicated across the specified number of monitors. Specialized multi-monitor layouts will become available.

Multi-Monitor Screen Layouts

If Multi-Monitor mode is enabled by the Site Administrator, screen layouts will match the number of configured monitors. The chosen view format will duplicate on each monitor.



For example:

Selecting a **Image** 2x2 (2 columns, 2 rows) view format with two monitors enabled will give an effective view format of **Image** 4x2, since each monitor will display a **Image** 2x2 view format.

Furthermore, an **Image** view format implies each monitor will display a different Image from the same series.

2x2 image tiles per monitor / Single series across all monitors

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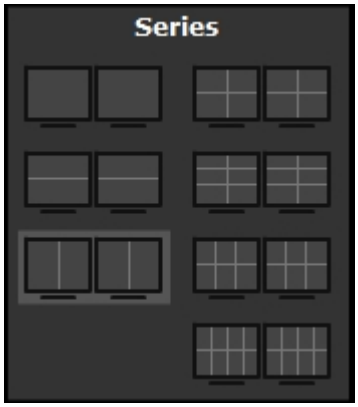
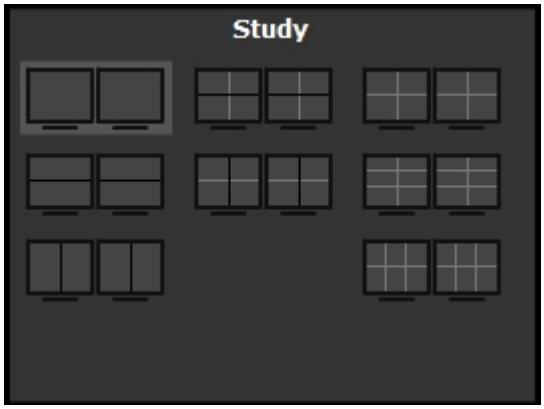
Selecting a **Series** 2x1 (2 columns, 1 row) view format with two monitors enabled will give an effective view format of **Series** 4x1, since each monitor will display a **Series** 2x1 view format. Furthermore, a **Series** view format implies each monitor will display a different series from the same study.



2x1 series per monitor / Single study across all monitors

Selecting a **Study** 1x1 (1 column, 1 row) view format with two monitors enabled will give an effective view format of **Study** 2x1, since each monitor will display a **Study** 1x1 view format. Furthermore, a **Study** view format implies each monitor will display a different study.

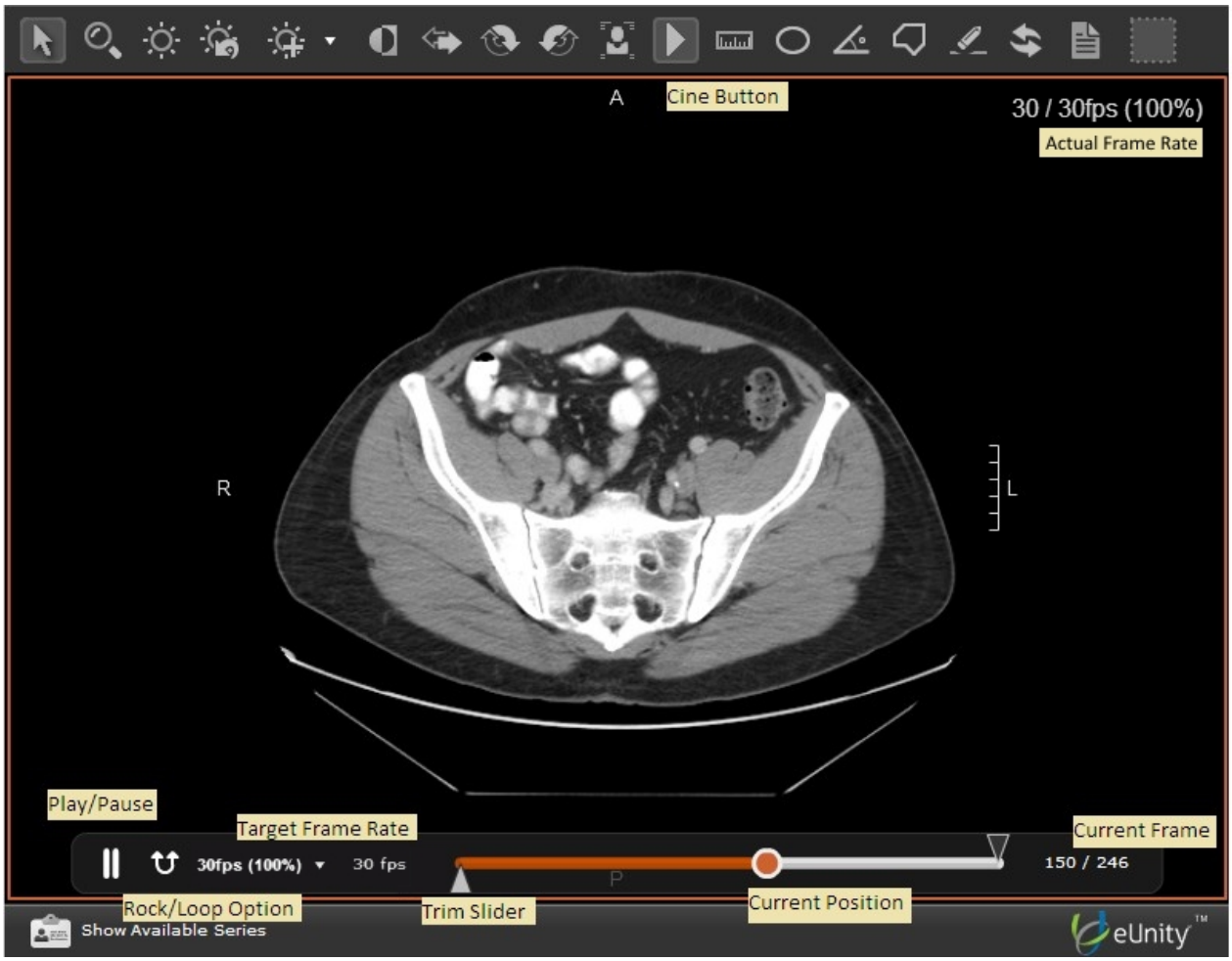


1 study per monitor

Cine

The Cine Tool allows playing a series of images like a movie. The target frame rate can be selected and images will be displayed at that frame rate. Only one series at a time can display a Cine movie. When another series is selected, Cine begins playing for the new series. A series must contain more than one image to activate the tool.

If the Cine Module is present, eUnity will attempt to play the series at the frame rate specified in the header.



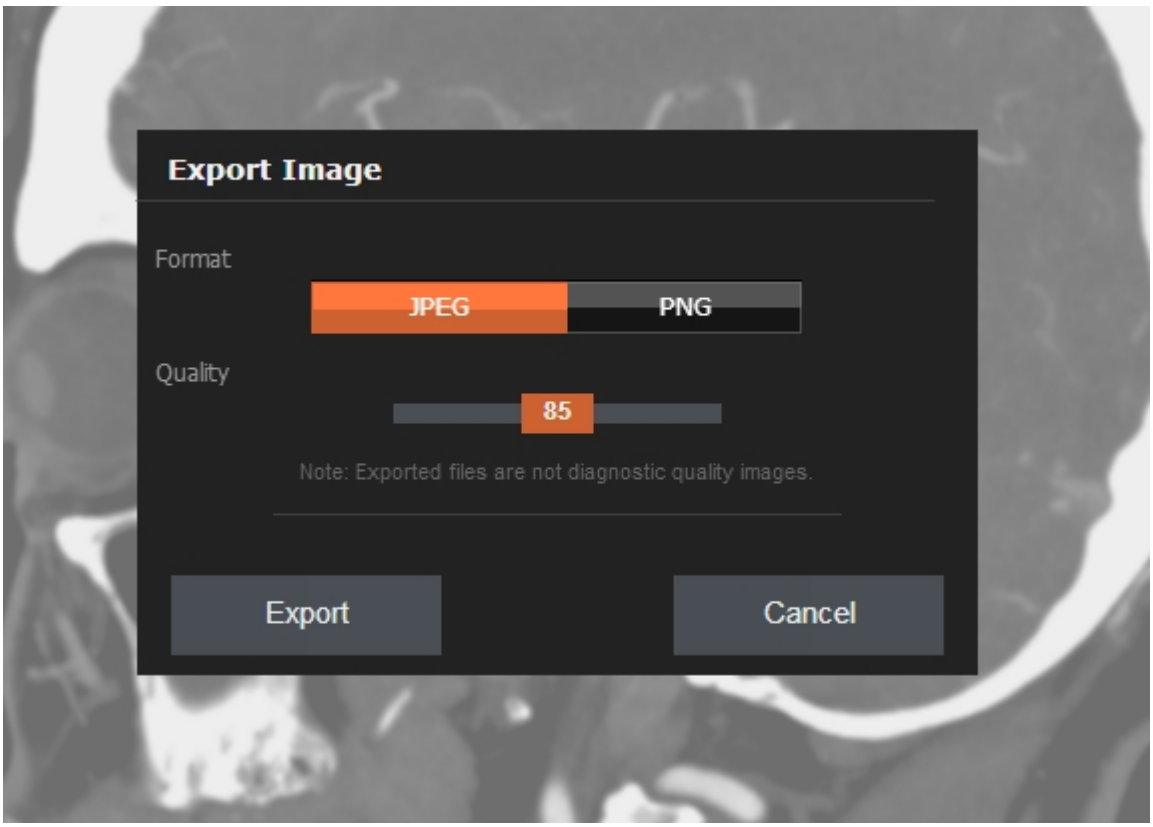
Play/Pause	Starts and stops the playing of the Cine Tool.
Rock/Loop	Toggle between looping over the images or rocking back and forth.
Target Frame Rate	The target frame rate for displaying images.
Actual Frame Rate	The actual frame rate is displayed next to the target. Actual frame rate is affected by a number of factors including the power of the client machine, memory and data transfer rates.

Trim Slider	Trim sliders allow for manual setting of the start and end points.
Current Position	The position of the current frame on the display slider.
Current Frame	Textual identification of current frame position within the displayed series.
Actual Frame Rate	The actual frame rate of the playing series. If actual frame rate doesn't match the target frame rate, this label is red. If frames are dropped, a red CINE icon will display.

Note: **If the frame rate cannot be achieved the frame rate label will turn red. If frames are dropped, a red CINE icon will be displayed to communicate this to the user (see below).**

Export Image

The export image tool allows the user to export the selected image in JPEG or PNG format.



To export an image click on the desired format then click Export. When exporting as a JPEG, the Quality slider can be used to configure the image quality.

Note: Exported files are not diagnostic quality images.

Calibration

The following table details how calibrations are determined based on the source data from the DICOM header of an image.

Calibration Type Found	Used (Yes / No)	Meaning
(3D)	Yes	Calibration for a 3D modality (like CT and MR), using the Pixel Spacing field. This should be a correct calibration for all patient anatomy.
(fiducial)	Yes	For an X-Ray projection modality (like CR or XA), the Pixel Spacing field has been used, along with a Pixel Spacing Calibration Type field which describes this calibration as “FIDUCIAL”. This means that a calibration has been done on the modality to some fiducial marker within the X-Ray image.
(geometry)	Yes	For an X-Ray projection modality (like CR), the Pixel Spacing field has been used, along with a Pixel Spacing Calibration Type field which describes this calibration as “GEOMETRY”. The beam geometry has been used by the modality to get an approximate calibration for anatomy in the view. Alternately, for Enhanced XA SOP Classes, the Object Pixel Spacing In Center Of Beam may have been used, which is also an automatic geometry-based calibration.
(imager)	Yes	For an X-Ray projection modality (like CR or XA), Imager Pixel Spacing (the detector plate pixel spacing) has been used. No Estimated Radiographic Magnification Factor has been found to correct it. It is possible that a Pixel Spacing field also exists, but if it does, it was found to be the same as Imager Pixel Spacing. Pixel Spacing is then ignored as just being a duplicate of Image Pixel Spacing.
(imager/ERMF)	Yes	For an X-Ray projection modality (like CR or XA), both the Imager Pixel Spacing and the Estimated Radiographic Magnification Factor fields have been used. The calibration divides out the Estimated Radiographic Magnification Factor, providing a measurement that is closer to correct for the anatomy in the image, compared to the Imager Pixel Spacing (the plate dimensions) alone. It is possible that a Pixel Spacing field also exists, but if it does, it was found to be the same as Imager Pixel Spacing. Pixel Spacing is then ignored as just being a duplicate of Image Pixel Spacing.
(nominal scanned)	No	Nominal Scanned Pixel Spacing (pixel dimensions on a piece of scanned film) is not based on any anatomy or detector calibration and is therefore not used by the viewer. The text (unknown) will be displayed with measurements in pixels.
(presentation state)	Yes	The currently-used presentation state for the image has a calibration value in the Presentation Pixel Spacing field, for a non-3D modality. Note: Whether this is calibrated to a fiducial maker, the dimensions on the plate, or includes a geometric Estimated Radiographic Magnification Factor is unknown.
(presentation state 3D)	Yes	The currently-used presentation state for the image has a calibration value for a 3D imaging modality (like CT, MR, and NM) value in the Presentation Pixel Spacing field. This should be a correct calibration for all patient anatomy.
(unknown)	Yes	The calibration type is unknown, and the modality is not a known 3D modality (like CT and MR), nor a projection modality with Imager Pixel Spacing information (like CR). If measurements are in mm, a Pixel Spacing field was found, but without any Pixel Spacing Calibration Type field to explain it. This

Calibration Type Found	Used (Yes / No)	Meaning
		often happens for Secondary Capture images. If the measurements are in pixels, then no calibration information exists
(unknown recalibration)	Yes	For an X-Ray projection modality (like CR), the Pixel Spacing field has been used, but it doesn't match the Imager Pixel Spacing field. This indicates a recalibration in the modality, but there is no Pixel Spacing Calibration Type field to explain why this recalibration occurred.
(US region)	Yes	The Calibration comes from an Ultrasound Calibration Region in the DICOM object. These are usually set by the modality and should be correct.
(CW Doppler)	Yes	A subtype of US Region calibration representing Continuous Wave Doppler.
(PW Doppler)	Yes	A subtype of US Region calibration representing Pulsed Wave Doppler.

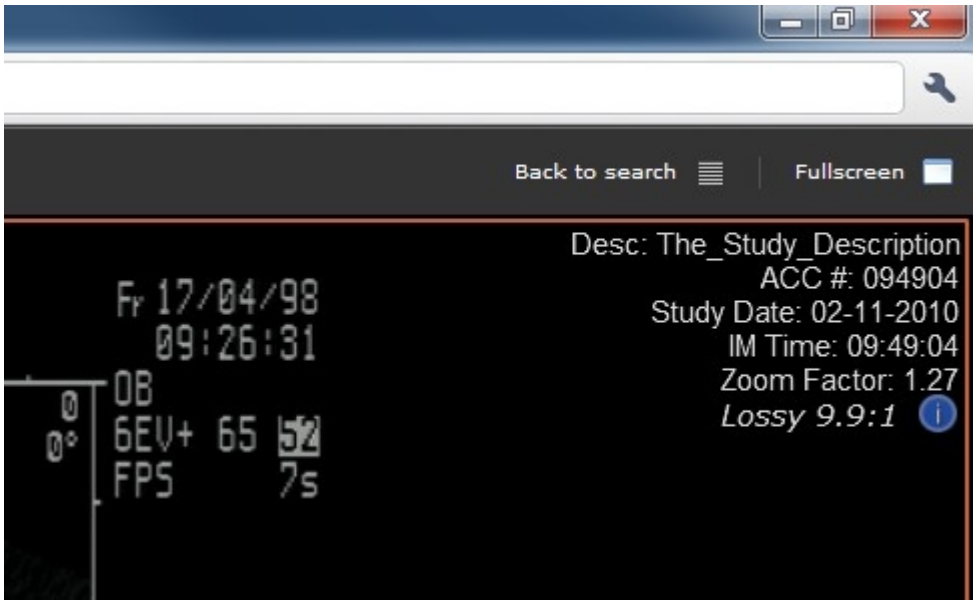
Content (Series Tray)

User may select to view content through opening the Show Available Series View and dragging the content of interest to a View Port.

The series highlighted in Orange is the series that is currently active, the series highlighted in blue are series that are visible and not active in other View Ports and the folded corners in the upper right denote what series have had at least one image viewed.

Lossy Image Display

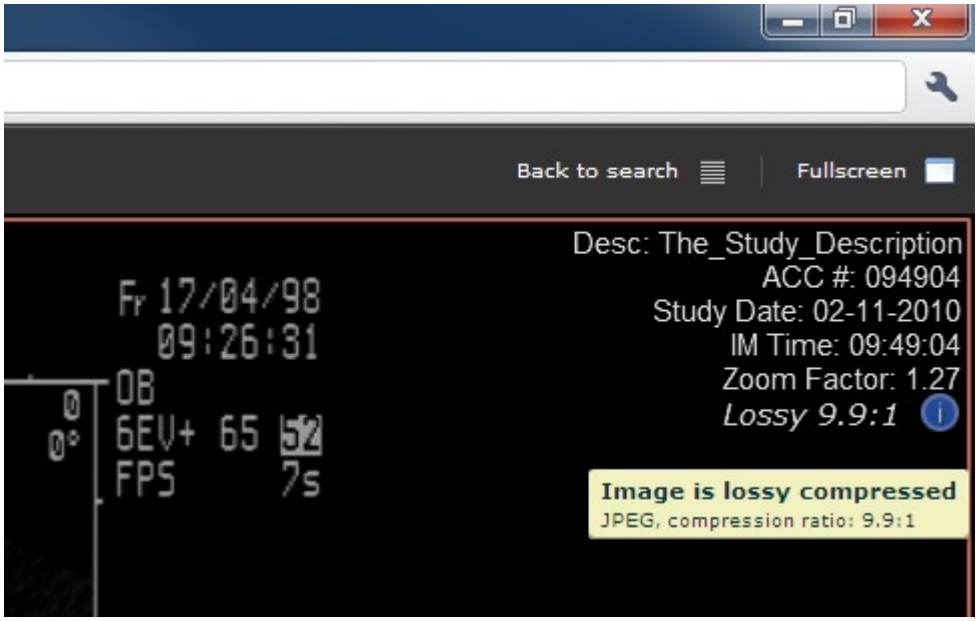
Lossy images are displayed with a special icon in the demographics that identifies the image data as lossy and summarizes the compression ratio.



By hovering with your mouse over the icon, a tooltip is displayed with some additional lossy information:

- The type of image compression
- The compression ratio
- Derivation description, if one exists

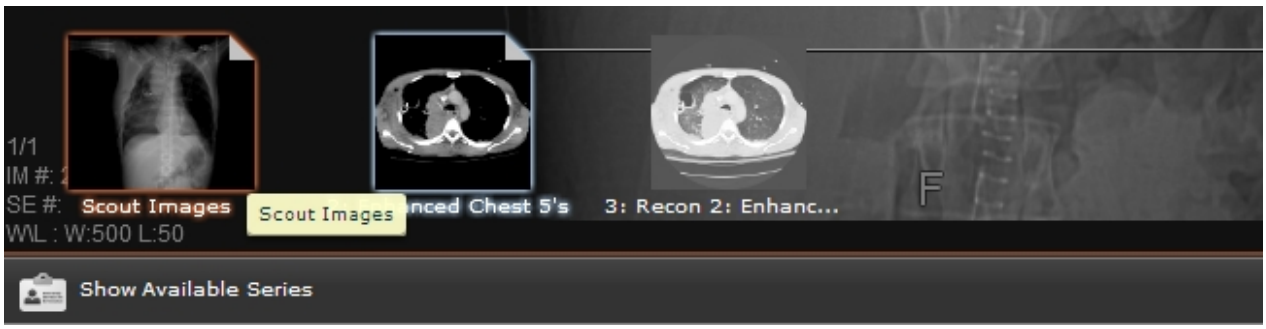
Note: For some images there may exist multiple compression types and ratios. In this case, the tooltip will list all know type/ratio combinations.



Scout/Reference Lines

Scout/Reference Lines display is triggered by selecting the reference lines tool and by turning on triangulation.

All the scout images in a study are combined into a single series and placed at the start of the series tray. If this series exists, there are scout images to be viewed.



To display scout images, load a multi-series view format and drag in the scout series. If another series in the study corresponds up with the displayed scout, three lines will appear on scout image.

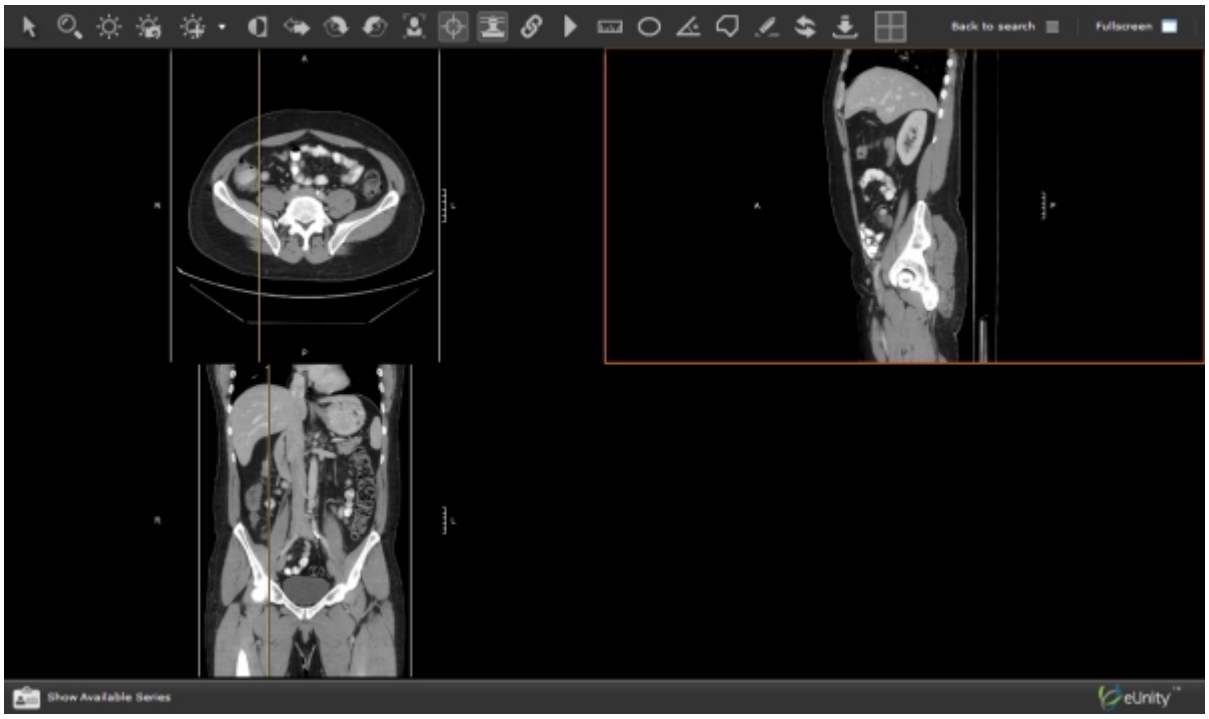
- Two white lines indicate the intersection of the first and last image of the series,
- A single yellow line represents the currently displayed image in the series.

If a series is selected, the lines on the scout represent the selected series (orange highlighting). If no lines

appear, then the selected series does not correspond with the displayed scout.

Users can navigate using the scout image by clicking on the displayed scout image. The corresponding series will navigate to the selected point.

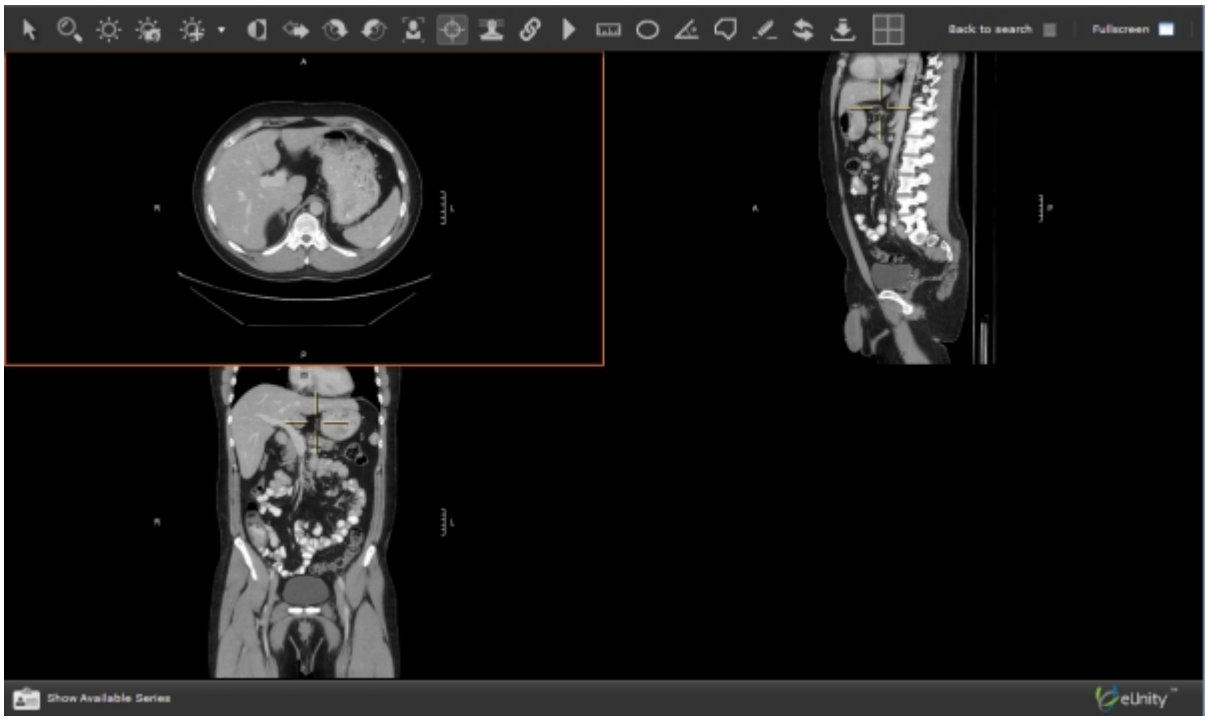
If there are multiple scout images, users can navigate through the series using standard navigation commands.



Triangulation

The triangulation and reference line features work hand in hand.

When viewing multiple series from different planes, the triangulation tool can be activated by clicking the triangulation button. Left-clicking and dragging on a series will display a cross-hair overlay on the other series in view. The cross-hair overlay indicates the corresponding point on the different planes.



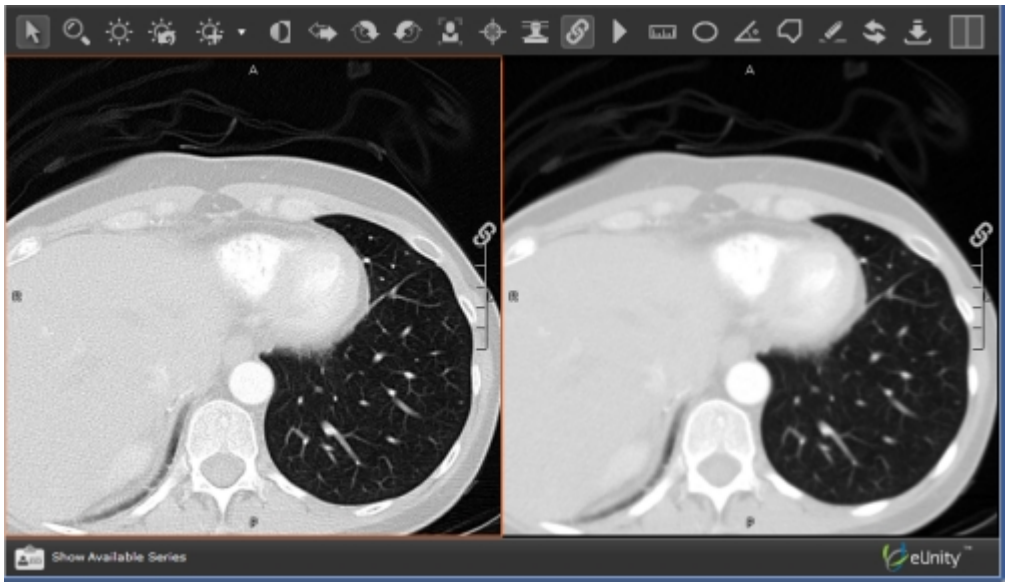
Link Series

Linking series allows one to perform a set of common operations (Navigate, Window and Level and Zoom Tool / Pan) on a group of series. Just click the link series button to automatically link the series in view. Series can be linking both within and across studies.

Simplicity

Many PACS implementations choose to support linking of the individual operations separately therefore each stack can be included or excluded from a particular operation. They can support multiple linking groups where different sets of series can be groups together (linking the navigation of all of the axis and a separate group linking all of the coronals).

This implementation was seen as too complex for the average user. Therefore we choose instead to create a single link group for all operations then use common sense series differentiators to create separate linking groups behind the scenes or 'Smart Linking'.



Smart Linking

In order to provide a simple linking action eUnity groups together by specific operation. For example, when linking navigation groups together it does not make sense to link two series of different planes – therefore we create different linking groups for each plane. When linking for the purposes of Window Level we group by modality and localizer type.

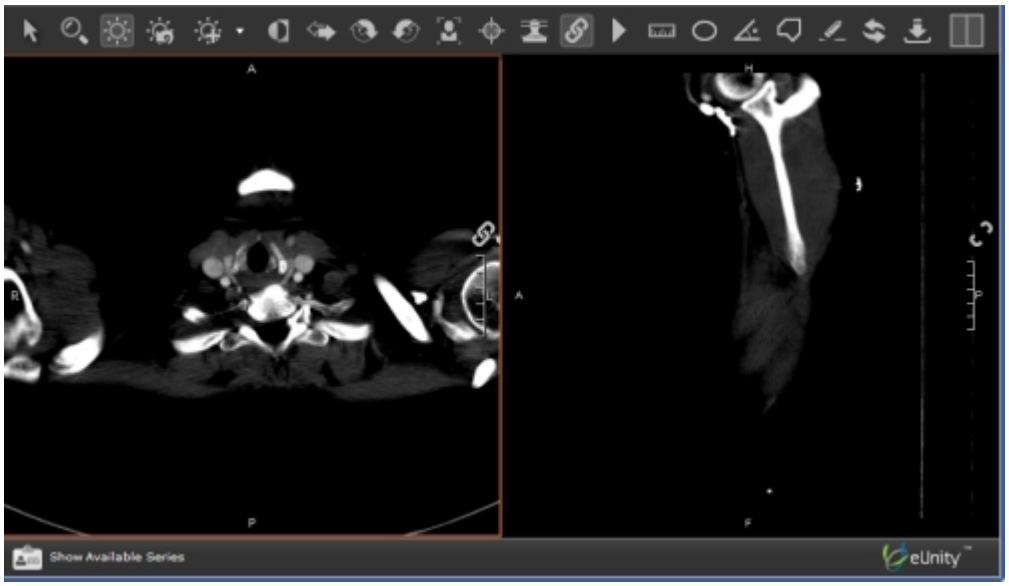
Navigation

Navigation linking groups by image plane, therefore images of different orientations will navigate separately from other orientations. Also, images without a plane will be linked under a separate linking group. If a linked series stack does not have a slice close to the navigating series location then a broken link will be displayed.

If a series contains multiple planes we search for the closest slice of the same orientation to the navigating series. If none is found the link is displayed as broken.

NOTE: The broken link only corresponds to a broken navigational link when that stack is out of synch with the selected series stack.

When linking is turned on the current navigation position is used from each on screen series and navigation is then relative to this point. However, when linking is turned on for series' that share frames of reference the navigational positions of these series will jump to match the currently selected series.



Zoom and Pan

Zoom and pan linking group images by orientation and treat images of other orientations as a separate group. The position of pan is in fractional coordinates therefore images of different sizes may be zoomed and panned within the same group.

When linking is turned on the current zoom factor and panning position is used from each on screen image. Zooming and panning of the images is then relative to the selected image.

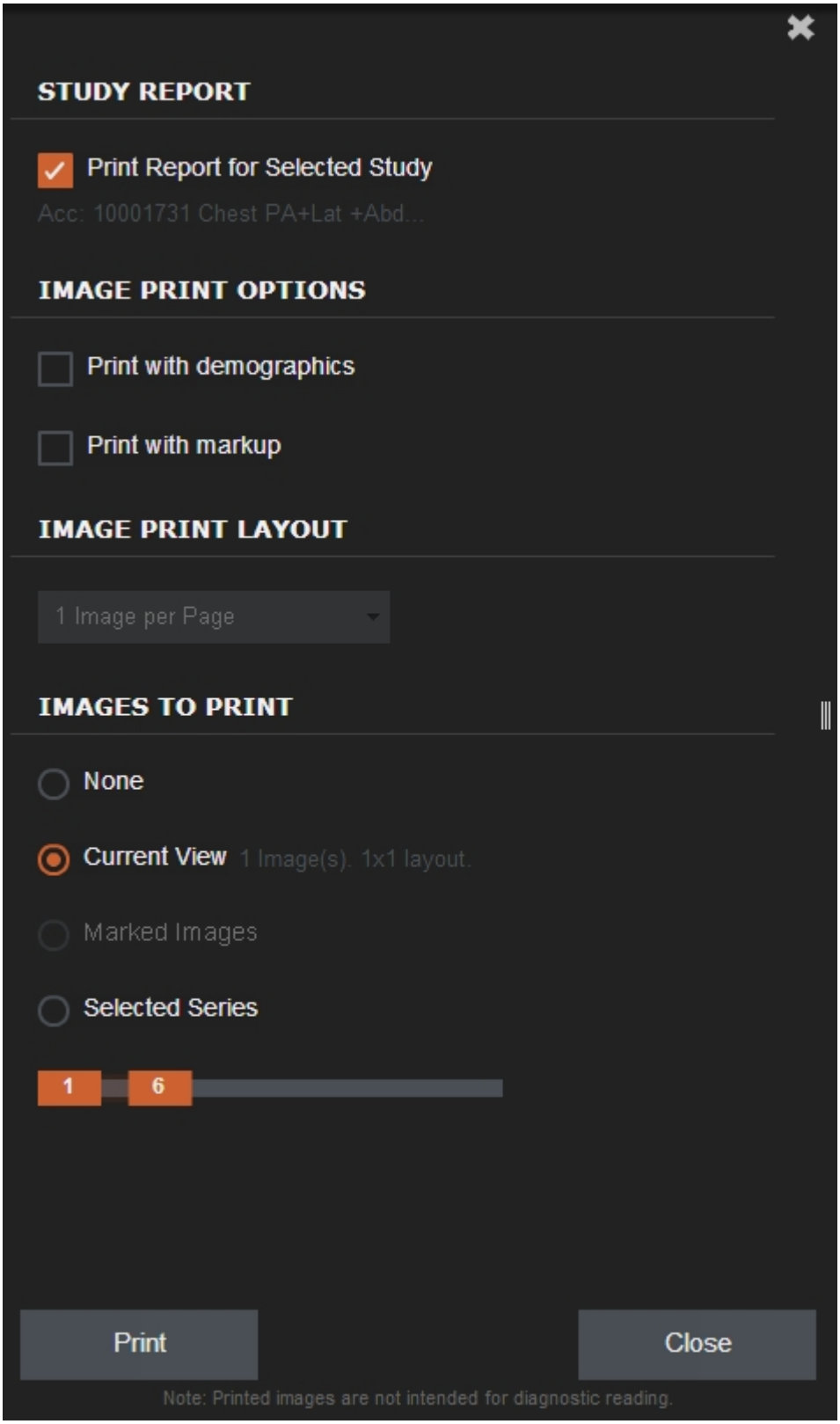
Window Level

Window level linking will group series by modality and localizer type. Therefore only images of a specific modality will be window leveled together.

When linked the window level of the selected series is applied to all linked series. There is no offset introduced as with navigation and zoom pan linking.

Paper Printing

The paper print tool allows users to print the study report, the selected image or a set of images.



To begin a print job, click the Print icon, select the desired settings, and then click Print.

Study Report

This section allows you to print a report for the selected study. Selection is denoted by an orange border around an image, however an identifying label will also detail which study report will be printed.

Note: Printed reports are labeled with the account name of the user who printed report, as well as the date it was printed on.

Options

The options section controls which attributes of the images will appear on a print out.

- When selected, Print with demographics includes the demographic information.
- When selected, Print with markup includes all annotation and measurement markups.

Content

The content section controls which image(s) will be printed. A maximum of twenty-four images can be included in a single print job.

There are three content options:

Current View

The current view option prints images as they are currently laid out on screen. A short description will appear next to this option indicating the number of images and layout.

Marked Images

When images have been marked within the viewer, users have the option to print the set of marked images. In the event that more that twenty-four images are marked, the first twenty-four images selected will be printed. To mark an image, right-click on an image and choose 'Mark Image'. Marked images are presented with a star overlay to indicate that they are marked.

Selected Series

Print images from the currently selected series. The range selector can be used to choose the subset of images (up to twenty-four images) to be printed.

Layout

Layouts are presented in a per page format with the option to print 1, 2, 4, 6, 8 or 12 images per page. When using the Current View option, the print layout will automatically be assigned to match the current screen layout.

After clicking print, the Operating System print dialog will appear to allow selection of a printer and access to standard print options such as Portrait or Landscape orientation.

Note: Printed images are not intended for diagnostic reading.

Collaboration

Collaboration is a powerful feature that lets individuals share their screen with other participants, across all supported eUnity platforms (web-browser and mobile devices).

Note: As no patient data (including images) pass through Collaboration Services, each participant needs to independently log into eUnity in order to start or join a collaborative session (see "Starting a session" and "Joining a session"). Guest access is currently not supported.

Warning: While the collaboration server attempts to synchronize all clients there may be issues related to networking that prevent the same image from being displayed to all users, or the cursor location being represented equally to all clients. If using collaboration for a diagnostic consultation, always verify which image and feature is being discussed.

Starting a session

To start a collaboration session, log into eUnity, open desired study or studies, and toggle the collaborate button to the 'on' position. When the connection indicator has turned to green, the session has started and any changes made to the study are now being shared.

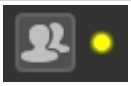
Joining a session

To join an existing collaboration session, log into eUnity, open the study or studies that are being viewed by other participants, and toggle the collaborate button to the 'on' position. When the connection indicator has turned to green, you have joined the session and your view should synchronize to that of the other participants

Leaving a session

To leave a collaboration session, toggle the collaborate button to the 'off' position. When the connection indicator has turned to red, you have successfully left the session. Anything you do from that point is no

longer being shared to other participants.

Collaboration Icon	State	Description
	Not Connected	Collaboration is not yet connected or has failed to connect.
	Attempting to Connect	Collaboration is attempting to connect to the collaboration server.
	Connected	Collaboration is connected and working.

Collaborating

When collaborating, changes made to your view will be sent across to other participants. Similarly, changes made by other participants will be applied to your view. This includes cursors, markup, layout, thumbnail bar up/down and image manipulation such as Window/Level and Invert. See below for the full list of shared actions.

Shared Actions

The following actions are shared to (and from) other participants:

- Navigate
- Pan/Zoom
- Window/Level
- Invert
- Flip/Rotate
- Triangulate
- Reference Lines on/off
- Link Series
- Cine
- All markup
- On mobile devices, markup creation disabled, however mobile-based participants can still see markup created by desktop-based participants.
- Report & Study Info on/off
- Revert
- Layout
- Current on-screen studies/series/images
- Thumbnail tray up/down/pinned
- Cursors

Keyboard Shortcuts

The following are default keyboard shortcuts are available in eUnity.

Note: These default may vary depending on the group you are part of, or may have been redefined by the site administrator.

Keyboar Description

d Combination	
Modes	
W	Toggle Window-Level Mode
Z	Toggle Pan/Zoom-Level Mode
N	Toggle Navigate Mode
T	Toggle Triangulation/Cursor Mode
L	Toggle Linear Measurement Mode
E	Toggle Elliptical ROI Measurement Mode
F	Toggle Free-form ROI Measurement Mode
A	Toggle Angle Measurement Mode
B	Toggle Cobb Angle Measurement Mode
C	Toggle Circle Measurement Mode
Image Navigation Tools	
Cursor Key Up	Scrolls images from a higher number image to a lower number image.
Cursor Key Down	Scrolls images from a lower number image to a higher number image.
Home	Returns the active View Box to the first image (lowest number image)
End	Returns the active View Box to the last image (highest number image)
Series Navigation Tools	
Cursor Key Left	Place the previous series in the active View Box.
Cursor Key Right	Place the next series in the active View Box.
Study Tools	
O	Revert study to original Window-Level and remove all markup.
P	Toggle Cine Mode
S	Toggle Reference Lines
K	Toggle Link Series
R	Show Report (if available)
M	Toggle Show/Hide Markup
SPACE	Toggle Cine Play/Pause
Window-Level Presets	
0 (zero)	Revert study to original Window-Level
1 ... 9	Apply Window-Level preset.
Zoom Tools	
+	Zoom in on the active View Box.

-	Zoom out on the active View Box.

Markup

Delete	Deletes the selected markup.

Multi-Study Display

Multi-study Ordering

There are currently two modes of behavior when displaying more than one study.

Strict Time Ordering On: Studies displayed in a multi-study layout are always ordered from newest study date to oldest from left to right. This time-based ordering is always maintained when new studies are brought into view.

Strict Time Ordering Off: Studies can be displayed in any order.

This ordering mode is configured at the site level.

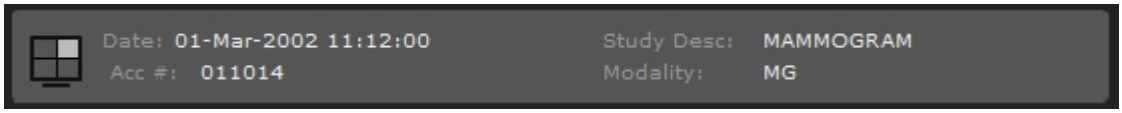
Multi-study layouts are identified by black boxes on the layout icon, which indicate a study cell (see View Formats). A study cell can only contain a single study. If a series is dropped into a cell containing a different study the entire study cell, including all enclosed series cells, will be changed to the dropped study.

The same study cannot be displayed in two different study cells. This restriction causes different behavior depending on the Strict Time Ordering configuration. If Strict Time Ordering is on, attempting to drag-and-drop a series for a study already on screen will only permit dropping into the existing study cell. When Strict Time Ordering is off, a series can be dropped into any study cell with the result that, if the study is elsewhere on screen, the studies will be swapped.

Loading studies from the Study List

Clicking on an item from the Study List will display that study in the first empty study cell. If there are no empty study cells, then the currently selected study will be replaced. If the selected item is not currently loaded into the viewer (i.e. available from the series tray) it will be loaded. When the maximum loaded studies limit is reached the currently selected study will be unloaded.

When a study is displayed, the on-screen location is indicated using an icon on the Study List item with a corresponding icon in the series tray for the matching study. For example, the icon below from the Study List indicates that “Study 4” is displayed in the upper right quadrant of the screen.



Presentation States

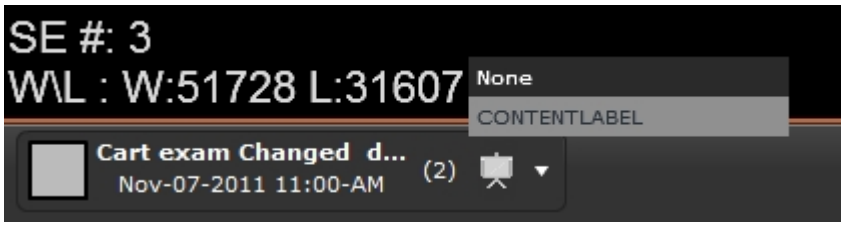
Presentation State Display

eUnity supports display of DICOM Greyscale Softcopy Presentation State (GSPS) and Color Softcopy Presentation State (CSPS) objects. These objects can alter the display of an image by changing window level, zoom factor or even by applying shutters or markup.

Selecting Presentation States

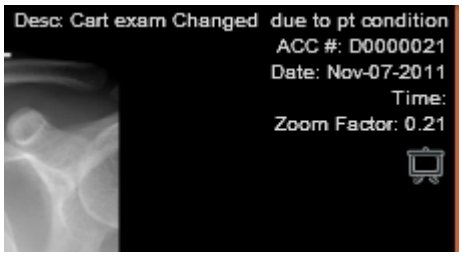
Presentation States (PS) are applied per study. When PS exist for a study, the Study Tab will include a PS context menu. By default, the newest PS will automatically be applied to a study. To activate or disable

PS, just select the desired entry from the context menu. The label displayed in the menu comes from the Presentation Name and may include one or more related PS instances.

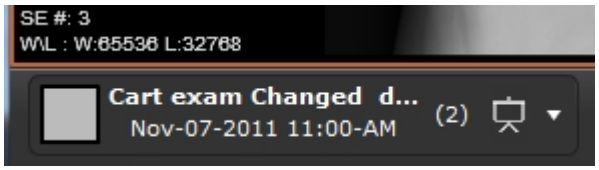


Identifying Images with Presentation Changes

Once a Presentation State is applied, it can sometimes be difficult to determine which images are affected. eUnity helps identify these images with a small PS indicator. The marker will appear in the upper-right corner of the on screen image whenever a PS applies to that image. If the PS does not apply, no marker will appear.



The study tab also provides an indication of whether a PS is applied to the study. The same marker will appear filled when a PS is applied and empty when no PS is applied.



Note: When exporting images, any PS-related markup will not appear on the image.

Search Tools

Users can access eUnity™ directly through a Uniform Resource Locator (URL) (i.e. a webpage address) or as an embedded image viewer within another portal system (e.g. a hospital's internal portal website, Electronic Medical Record (EMR), Electronic Patient Record (EPR), etc.).

User must have a valid user account to log into the System. Once the System successfully authenticates a User they will be presented with a GUI that allows them to view medical images they have access too.

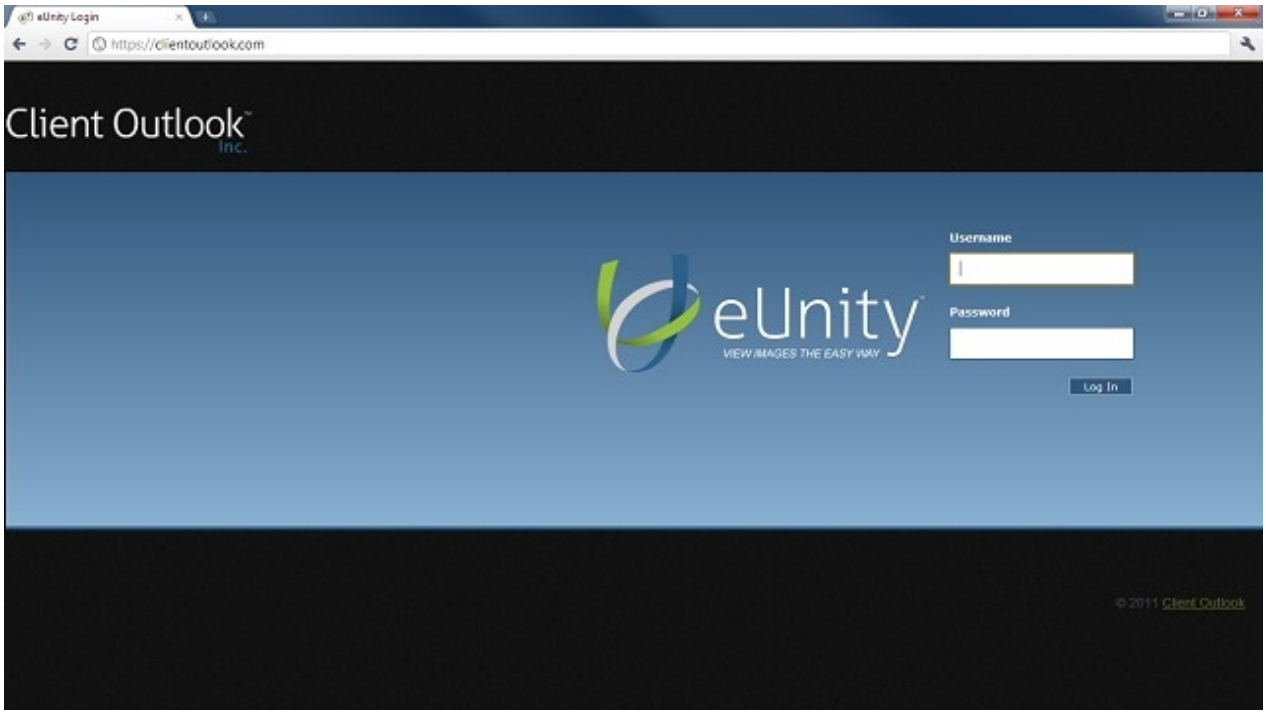
- Authentication
- Searching
- Remote Search
- Search Validation
- Display Studies
- Display Remote Studies

Authentication

At the eUnity™ login screen:

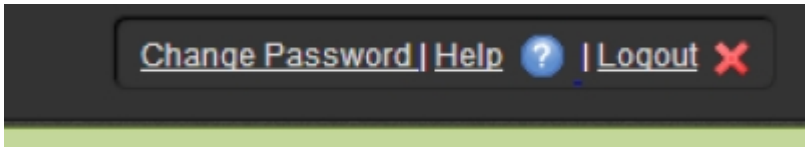
1. Type your User ID and Password.
2. The password is case-sensitive. If you cannot login, check whether Caps Lock is enabled on your keyboard.
3. Click Login.
4. The Search area will be presented and you can begin using eUnity™.

Note: eUnity™ supports Secure LDAP, RADIUS and local authentication. Configuring LDAP and RADIUS allows Users to log on using their enterprise Username and Password when signing into.



Some LDAP/Active Directory integrations allow changing a user's password from within eUnity™. This

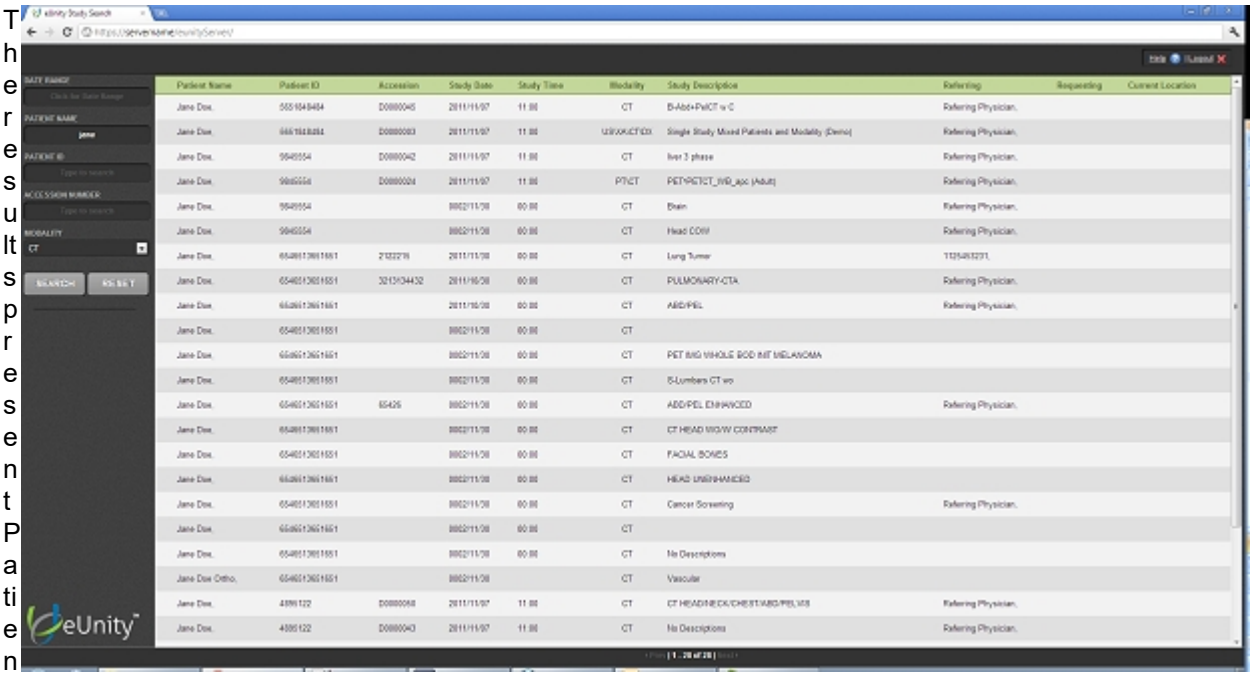
option is available from inside the search screen.



Searching

To find studies using eUnity™ Search, enter applicable criteria in any combination of the available search fields:

- Date Range,
- Patient Name,
- Patient ID,
- Accession Number and / or,
- Modality.



The results present Patient and Study information within the search results area. If there are multiple pages of information users can page through results using the Previous and Next buttons at the bottom of the screen. The default page sizes are set to 150.

The Date Range field can take a single day or two dates separated by a hyphen. The accepted date format is YYYY/MM/DD. Invalid formats will turn the box red. Alternatively, one can click the date range field and select a pre-configured default or choose a range using the date picker.

If needed, you may use the * (asterisk) wildcard character in search fields to broaden search results. For example, entering 123*5 in the Patient ID field returns all patients whose ID begins with 123 and end in 5. The wildcard character can be at the start or middle of the string. (Note: The Search does automatically place an asterisk at the end of patient name and patient id searches.)

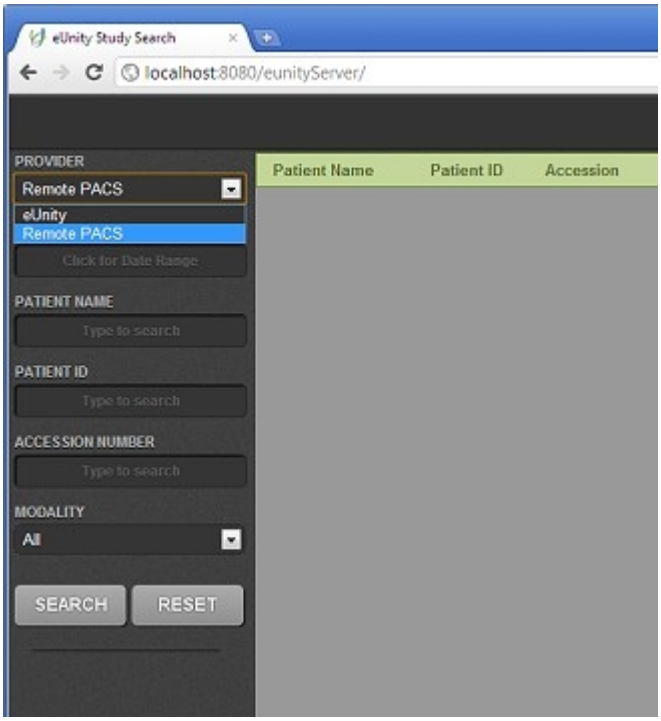
The returned results detail the following:

- Patient
  - Name,
  - Patient ID,

- Patient Location
- Study
  - Accession Number,
  - Date,
  - Modalities in Study,
  - Study Description,
  - Referring Physician,
  - Requesting Physician.

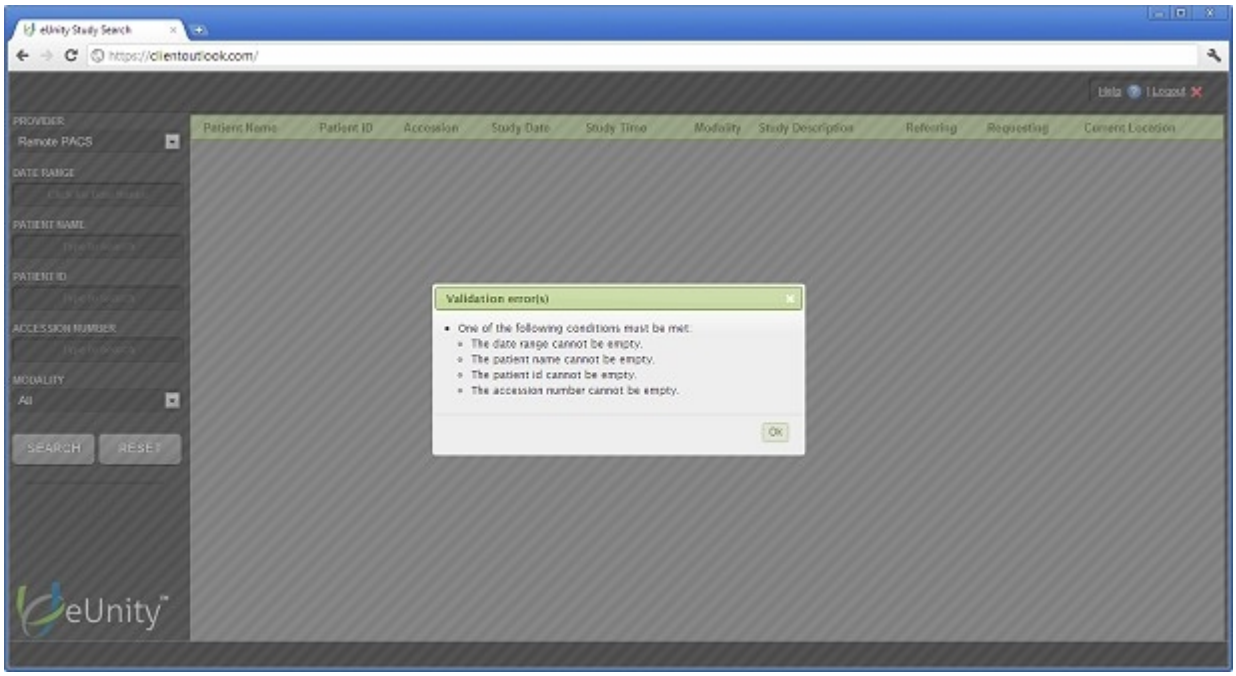
Remote Search

In some cases, eUnity™ is configured to search beyond the local eUnity™ system to a remote data source like a PACS. When multiple data sources are configured the user sees a drop down field (labeled Provider) to select the desired source for searching. If only one data source is available the drop down will not be visible.



Search Validation

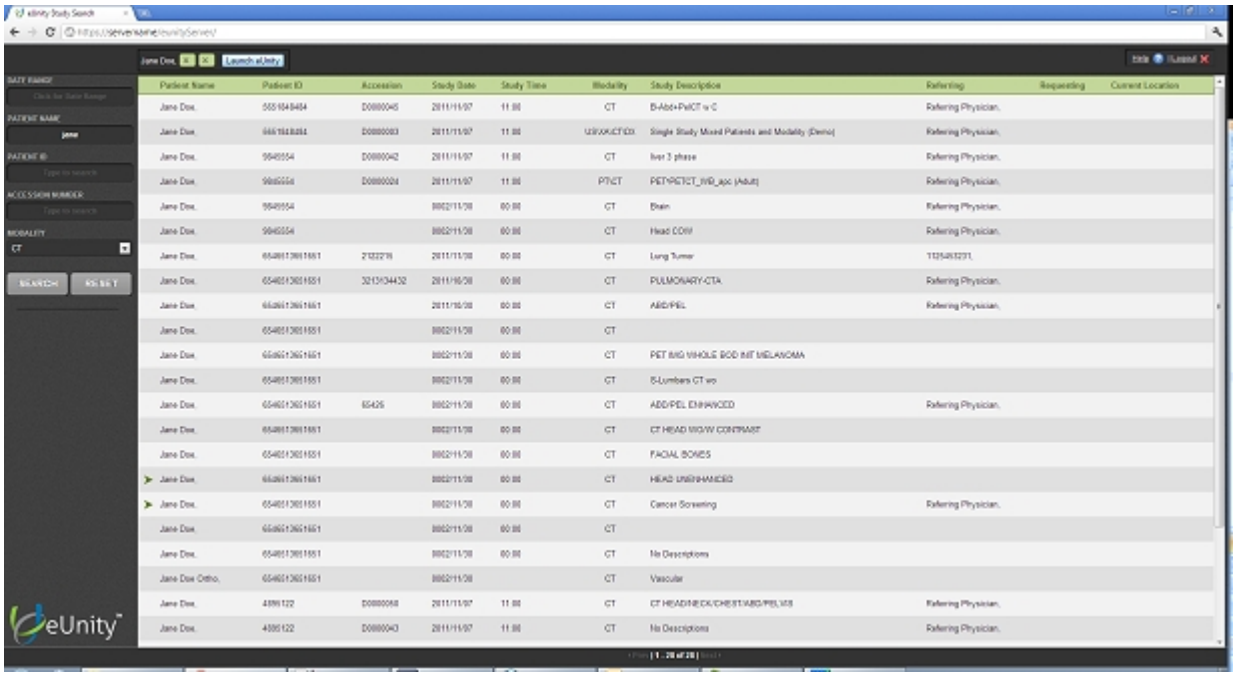
When searching there are configurable constraints. If the search does not meet the constraints a validation dialog will be displayed indicating what properties are required for a valid search. These constraints are site configurable and can be adapted to meet the needs of each site and data source.



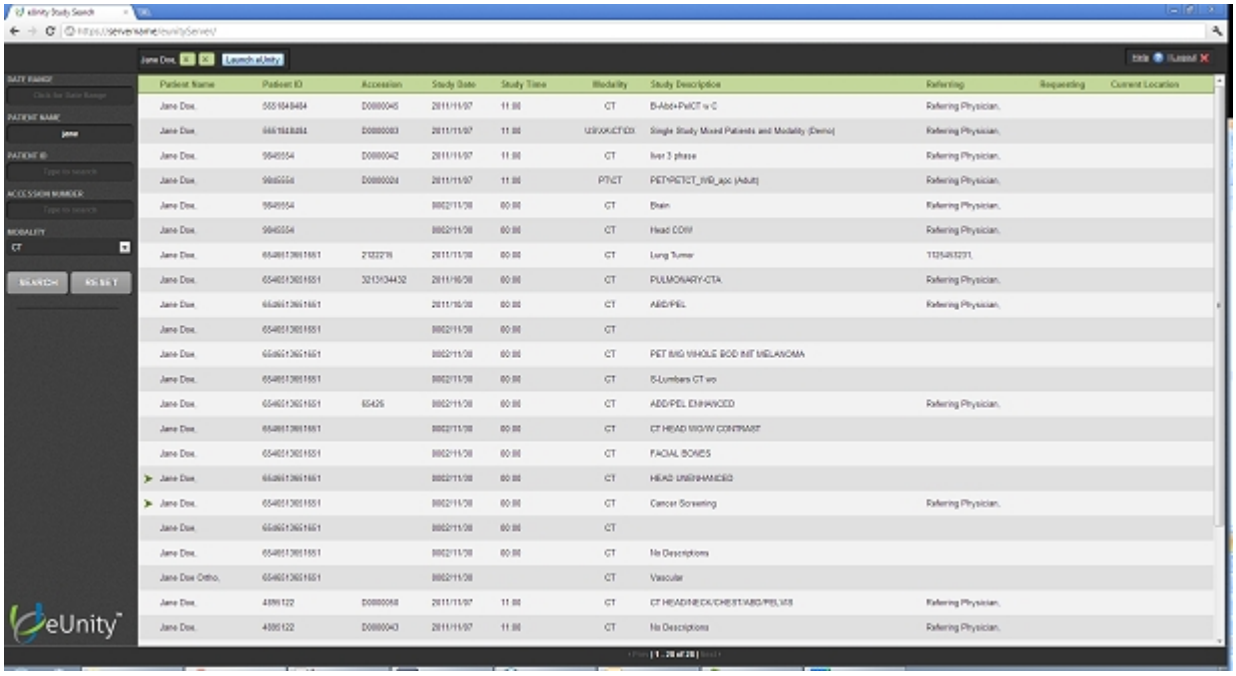
Display Studies

From the search results screen eUnity™ can quick launch a single study or compare two studies from the same patient.

To quick launch a study, click on any row in the list of results. This will immediately load the selected study into eUnity™ .



To compare up to four studies click on the '+' icon that appears when hovering over a row. This will add the study to the launch list displayed above the search results. Selecting additional studies will add them to the launch list. Click the Launch eUnity button to display the launch list in the viewer. When adding a study from a different patient the launch list will be reset; loading studies from different patients is not supported.



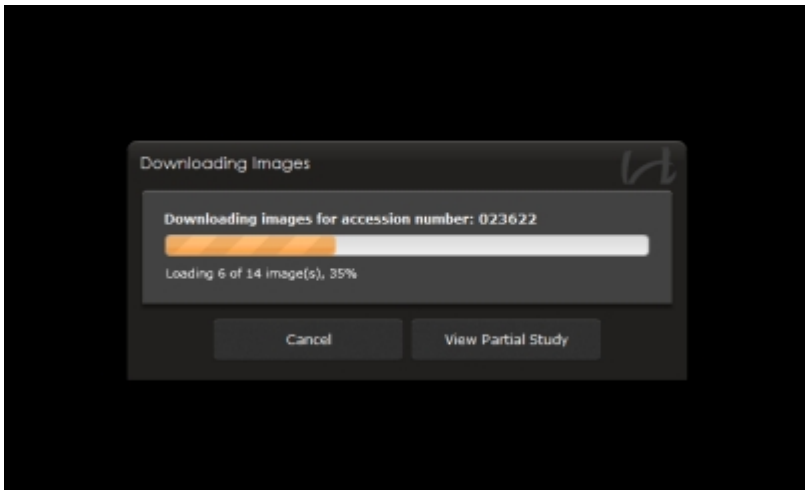
Display Remote Studies

Depending on the eUnity™ integration with your DICOM archive, a full DICOM retrieve may be required before viewing a remote study. When this is the case, eUnity will display the following information.

Downloading Images

This dialog provides feedback on the state of the retrieve job. As images for the study arrive, the progress bar will approach 100%. When the retrieve job is complete, the dialog will disappear and the full study will be displayed.

Clicking 'Cancel' will return to the worklist; clicking 'View Partial Study' will display the study data that has already been transferred. In this case the study will be missing some images.



View Partial Study

When selecting the 'View Partial Study' option, the user will be required to acknowledge the following warning before the partial study is displayed.

Mobile Tools

eUnity™ can also run on mobile devices as an installed application. Visit the App store or market for your device to download and install the application.

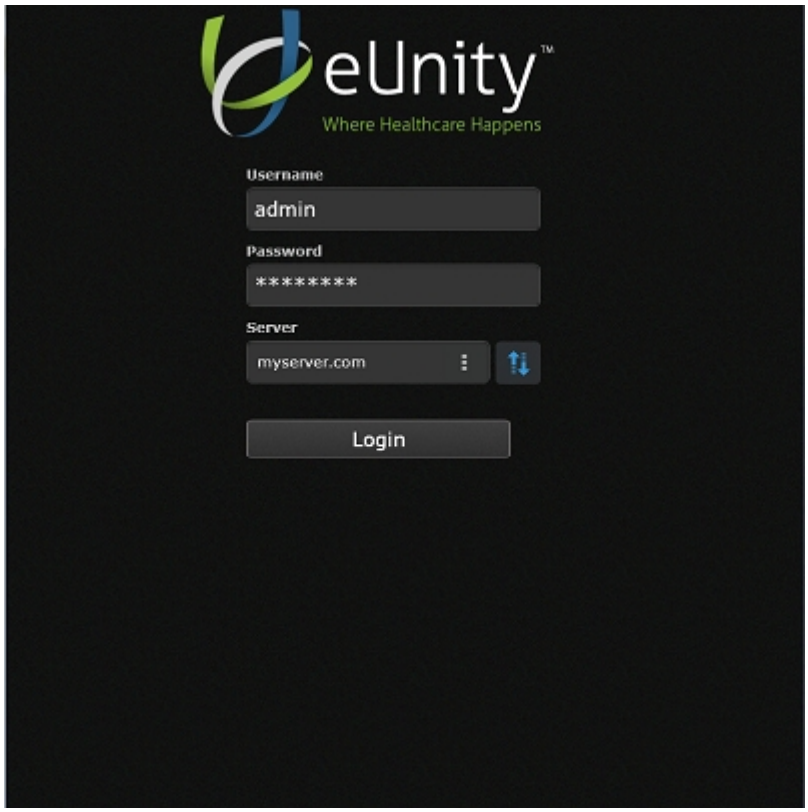
In order to use the application a configured eUnity™ Server instance is required. eUnity™ is not intended for diagnostic interpretation on mobile devices.

This section covers:

- Mobile Authentication
- Mobile Search
- Mobile Viewing
- Mobile Display Layout

Mobile Authentication

Mobile Authentication



The mobile login requires three pieces of information:

- user name
- password
- server

The user name/password are your standard eUnity™ login credentials.

Since the installed mobile application might connect to different eUnity instances the server must be specified. The server can be entered a number of ways and resolves to the following:

- hostname --> *https://hostname:443*
- hostname:8443 --> *https://hostname:8443*
- http://hostname -> *http://hostname:80*
- http://hostname:8080 -> *http://hostname:8080*

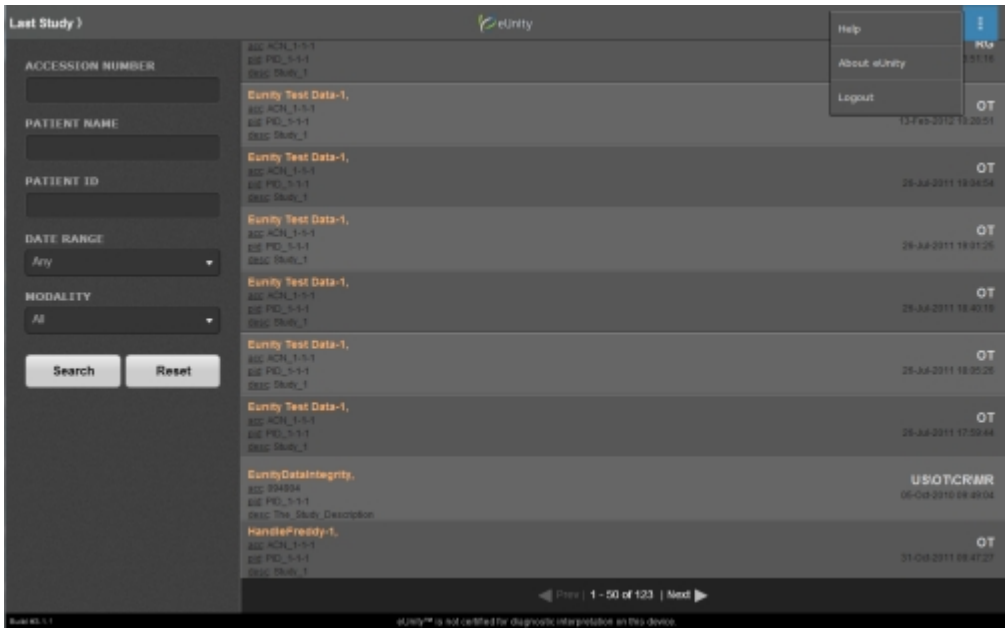
When left unspecified, the default access will always resolve to *https* on port 443.

Server Check

To validate the server is properly configured click the server check button. A green check means the server is configured properly, while a red 'x' indicates the server is not correctly configured. Note: This only checks the server configuration and does not include user name/password in the check.

Mobile Search

Mobile Search



The mobile search provides many of the same options found in the desktop search. It is also subject to the same constraints that provide for a more targeted results set.

When a search is performed, the results will be displayed (50 per page). Users can swipe up and down to scroll through the list. Tapping the Next or Prev button will advance to the next page of results.

When a tablet is held in landscape mode the search fields will be displayed. When held in portrait mode only the results will be shown.

Display A Study

To display a study, tap on any row in the results.

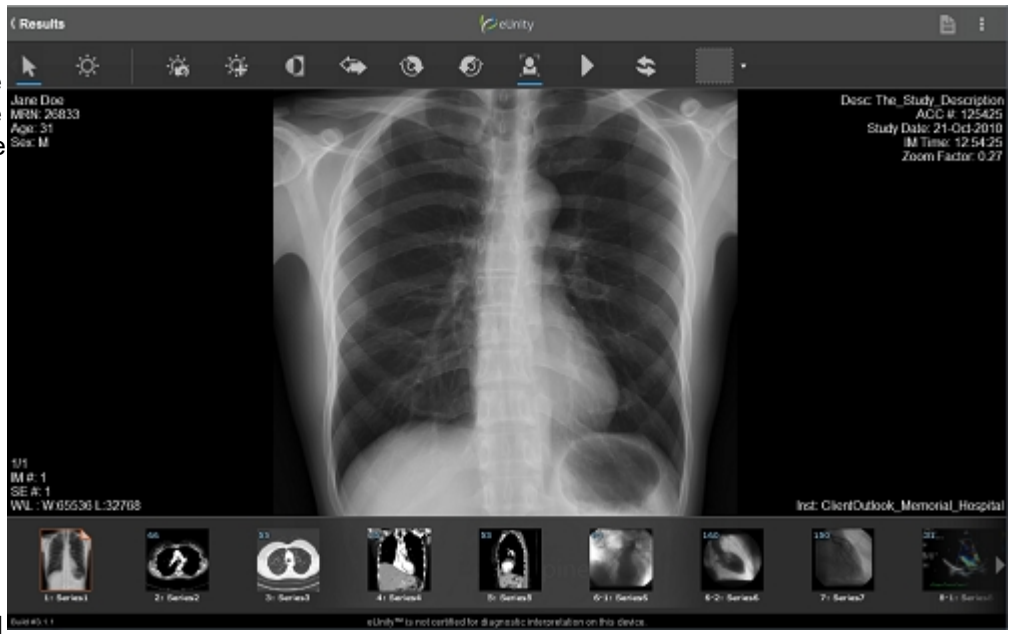
Logout

Tap the 'Logout' button available in drop down at the top-right of the application. This will return you to the login screen.

Mobile Viewing

Mobile Viewing

Once the study is launched in the viewing portion of the application, tools are presented across the top while the series tray is displayed on the bottom.



Users can single tap in the middle of the screen to bring up, or hide, more options. On the tablet this will include the top toolbar and the series tray. On the phone this displays pan and window/level mode selection.

Tools

Please refer to the standard tool documentation for tool descriptions. Note: Not all tools are available on mobile devices.

Navigation Zones

In all modes there is a special, one inch, navigation zone on the left and right border of the viewing area. These zones are not visible but remain active at all times when viewing a study. Inside these zones certain touch commands will perform navigation functions instead of their regular operations. This is to provide easy access to navigation no matter what mode is active.

When viewing multiple images and/or series on the screen (see Mobile Display Layouts), each view port has it's own navigation zone. When viewing multiple images from the same series, navigation performed in one of the view-port navigation zones will be applied to both images. When viewing multiple series, navigation performed within one view port will apply only to that series.

Touch Commands

One Finger Tap

- On the top toolbar: selects a tool.
- In the viewing area: hides/shows series tray and toolbar.
- In the series tray: will swap series in display.
- At the bottom of a navigation zone: will move forward one image; in the top backward one image.

Touch Drag Up/Down

- In a navigation zone: will navigate forward and backward through the image stack.

Pinch Zoom

- In the viewing area: will zoom in on the displayed image.

Touch Drag Multi-Direction

- When window level tool is active will modify window level values.
- When cursor (pan) tool is active and image is zoomed, will pan the image.

Touch Pan

- When zoom mode is enabled, pressing and dragging will pan the image around the viewport.
- When window level is enabled, pressing and dragging will modify the window center and width values.

Mobile Display Layouts

NOTE: Mobile layouts are available for tablet versions only. When run on a phone, eUnity will always display in the Image 1x1 format.

User may select to present content (e.g. DICOM images) from within a set number of available View Formats. View Formats are made up of one or more View Ports.

Image View Formats

Image 1 x 1 (same as series 1 x 1)

- View one image or one series on the screen.

Image 2 x 1

- Two images from the selected series are displayed side by side in two separate view ports. The image on the right of the screen is one image or one frame higher than the image on the left of the screen. As you scroll through an image stack, both images will increment.

Image 1 x 2

- Two images from the selected series are displayed on the top and bottom of the screen in two separate view ports. The image on the bottom of the screen is one image or one frame higher than the image on the top of the screen. As you scroll through an image stack, both images will increment.

Image 2 x 2

- Four images from the selected series are displayed on the top and bottom of the screen in four separate view ports. The image on the bottom of the screen is one image or one frame higher than the image on the top of the screen. As you scroll through an image stack, both images will increment.

When applying tools (e.g. zoom, pan, rotate, etc.), the tool will be applied to all image view ports.

Series View Formats

Series 2 x 1

- Two different series from the series tray can be displayed side by side in two separate view ports.

Series 1 x 2

- Two different series from the series tray can be displayed on the top and bottom of the screen in two separate view ports.

Series 2 x 2

- Four different series from the series tray can be displayed on the top and bottom of the screen in four separate view ports.

Series 4 x 2

- Four different series from the series tray can be displayed on the top and bottom of the screen in eight separate view ports.

Note there are two ways to view a series:

1. Tap to highlight the desired view port and then tap the series that you want to view in the in the series tray.
2. Press the series in the series tray and drag it to the desired view port.

When applying tools (e.g. zoom, pan, rotate, etc.), the tool will be applied only to the selected (highlighted) view port.

Contact Us / Regulatory

eUnity

For the specific release version number click the eUnity™ logo located in the eUnity™ Image Viewer.

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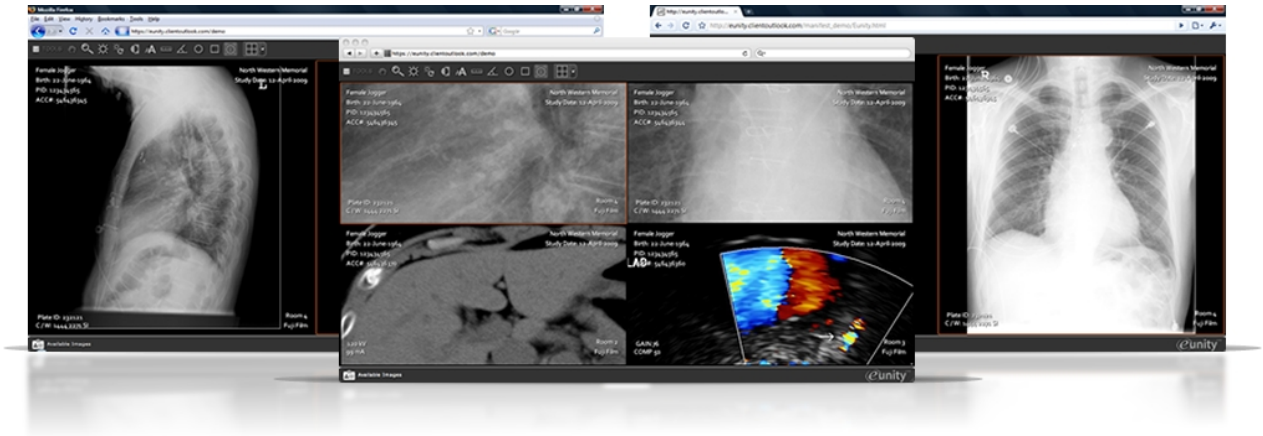
About Client Outlook



At Client Outlook we build innovative IT solutions that provide Health Professionals with secure access to the information they need at the point of care. Our initial offering, eUnity™, is a server-based product. Once installed, clinicians access medical images using eUnity™ universal viewer through their favorite web-browser; regardless of their location and with no client software to manage. eUnity™ does all this real-time and keeps medical images where they belong, with the PACS they reside on. This ensures clinicians are viewing the most up to date medical data.

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