PACS

Picture Archiving & Communication System

اطلاع رسانی پیوند داده‌ها

Technical Catalog

2022

ABOUT COMPANY

“EPD Co. Ltd.” group is the Iranian company based on largest providers of eHealth solutions such as PACS in IRAN with a great team consisting of health informatics experts, Radiologists and physicians.
Backed by more than 25 years in the medical software industry, our company delivers products, capabilities and services that power thousands of customer sites worldwide.

Our scalable medical imaging solution are competitive in terms of quality and price. We’re focused on delivering a best-in-class PACS solution that improves provider efficiency, decreases the cost of healthcare, and improves the overall health of populations.

www.epd.ir

- **+57 Employees**
- **+30 eHealth Solutions**
- **32 University**
- **+300 PACS Installed**

ABOUT
EPD PACS

Designed to bring simplicity to complex environments, EPD PACS provides hospitals, imaging centers, and teleradiology organizations with a robust platform for storing, retrieving, and routing medical images. Combining secure communications and compression technology, our PACS software ensures radiology image and patient data integrity, while providing high-availability of electronic images at any time, from any location, and for any case.

SCALABLE

Suitable for any size of healthcare facility

RELIABLE

A reliable and effective solution for medical imaging

COMPETITIVE

Competitive with other available solutions in terms of quality and price

SECURE

High level of security and data protection compliance

Accessibility: Web-based App

Environment: LAN/ WAN/ Internet,

Programming: C++, C# .Net Core

Deployment Model: Local, Hybrid, Cloud

Database: MySQL, MariaDB

Device Support: Mobile, Tablet, PC

Standards: DICOM 3.0, HIPAA, HL7

Certificates: ISO 9001, ISO 10004, OWASP 10 (for PACS)

What type of modalities can be connected to PACS

- Magnetic resonance (MR)
- Digital radiography (DR)
- Angiography (XA)
- Mammography (MG)
- OPG (PX)
- Dental (OT)
- Ultrasound (US)
- EKG (wave form data)
- Secondary capture (SC)
- Endoscopy (ES)
- Computed tomography (CT)
- Digital radiography (DR)
- Phosphor plate radiography, (Computed Radiography or CR)
- Dynamic Digital Radiology (DDR)
- Nuclear Medicine imaging (NM)
- Positron emission tomography (PET)
- Radiologic Fluoroscopy (RF)
- …

How to connect the modality to PACS

To receive images from modalities, it needs to register AEC PACS information to modality. The required information is only three that are "IP Address", "Port Number", and "AE Title".

EPD PACS PRODUCTS

Duo to the various needs of our customers and seeking technology upgrade we produce different PACS system in different platforms, each one has it's one usage. From Stand alone Diagnostic workstation under the windows platform up to the Enterprise PACS.

Local PACS

Web base product for small to big Medical centers with multiple modalities and users.

Cloud PACS

Software as a service (SaaS) application mainly for very small medical centers up to the medium size.

Hybrid PACS

Very high-level solution for centers with need a very stable and fast speed Internet connection

Enterprise PACS

The most ideal solution for integration of data in group of medical centers mainly in one organization or region.

Diagnostic Mini-PACS

Advance windows base app for single usage or in addition to enhance the quality of our other PACS solutions

Local EPD PACS

Local PACS is an entry level of installing PACS in any clinic or Hospital. This web base system is installed only on the Linux based server and all kind of clients and DICOM modalities can be connected to it.

Local PACS is a regular web base PACS, after setting the valid IP address and internet connection via the LAN/ WAN/ Internet and all clinicians and patients can see their images via the internet by there access level.

Ease of usage

All the users do not need to installed any kind of software's in their system, and they can see and process the DICOM images in any devices like Mobile, Tablet or PC with any OS like windows, IOS, android and Linux, via a LAN, WAN or Internet.

Implementation

Implementation and setting the server is down by our engineers. Then adding any kind of clients (PC, Tablet, Mobile) can do so simple by calling only a PACS URL.
Local AEC PACS can easily connect to the local RIS/HIS and RIS/HIS users can call and process the DICOM images directly from their own system.

Storage

By using the system and need for more space, we can add any kind of storage (HDD, NAS, SAN) to the PACS system for increasing the capacity of image storage. So you do not need to obtain the huge amounts of storage in the installation time, and you can increase the capacity by your growth.

Cloud EPD PACS

Replacing local PACS with cloud-based PACS can cut costs significantly, prevents servers, maintenance, storage overload. Offers easier access and facilitate communications.

The users feathers of Cloud-based PACS is like regular PACS but with a crucial difference: its storage and access are provided by cloud-based servers. Basically, by our cloud PACS service, we take care of hosting and maintenance of data for you. The DICOM cloud storage and its security are taken care of and access to the medical imaging data is available from anywhere with an internet connection.

Minimum Downtime

Using a standard data centers with standby servers and multiple data storage make service as safe as possible.
Load balancing PACS servers also ensure high availability and scalability for mission-critical application services.

Easy Implementation

Our cloud based PACS is independent of any infrastructure, hardware, or local software constraints. All that's needed is the installation of a gateway to connect your hospital or clinic DICOM modalities to the system. There is no need for specialty viewers, servers, or software contracts. No software installation is needed to view high-quality DICOM lossless images via any browser on any device connected to the internet.

Unlimited Storage

There is any limitation of storage in cloud. Duo to level of MOU, medical centers can obtain any amount of storage
By estimating of users needs in the future, all kind of the extension and image retention can be mentioned in the MOU.
Preparation stable high speed Internet connection, CPU, RAM, data backup, security and standby servers is our duty.

Hybrid Cloud EPD PACS

Easily manage capacity with a system that grows with your needs. This solutions guarantee a quick access, non-stop data protection, and 99.999% high availability of medical data by Integrating with AEC cloud service.

Our hybrid solution enables you to centrally manage massive volumes of file data and scale capacity on-premises to the cloud. Hybrid PACS is fully managed and maintained by our support. There is no need to hire additional IT staff for cloud management.
Hybrid PACS is combination of local and cloud PACS it can acts as a Vendor Neutral Archive (VNA). All new data remains in local PACS and all of them be transfer to the cloud PACS for their secure and high speeds internet access. Your data is stored local and multiple copies of your data are safely stored at reliable datacenters via the cloud access.

Offsite storage

Multiple copies of all your data are safely stored at reliable datacenters. Storage period is as long as agreed in the MOU. For all customers automatic offsite backup/distaste recovery is included.

Local Storage

Newly acquired images are stored locally and in the cloud simultaneously . This guarantees superfast viewing over the local network inside your hospital or center. The system will detect automatically when the local storage gets full and will automatically create space for new images by removing the oldest images from your local hard drive. Multiple copies of the data will be stored on our offsite servers and will remain available in Hybrid PACS.

Implementation

In order to receive the images from the modalities only the AEC PACS Server software needs to be installed on a computer or server that is connected to the same local network as the modality.
In most cases AEC Hybrid PACS can be installed on a PC with at least Xeon CPU, 16 GB RAM, and 4TB HDD. in In the growth of system you less needs to obtain new hardware’s in your local system.

Enterprise EPD PACS

Our Enterprise PACS is a collection of at least two local (EPD or other) PACS by which all the users have only one entry point and security and managing of system can be incises.

In this solution, all local Hospitals/Clinics PACS in one region or one organization, can be connected to the single Enterprise PACS and users can seek the patient images in all the connected systems from only one entry point. Clinician can compare all images of one patient in the deferent places with each other.

Image aggregation

By this solution without needs to physical storage of images in the Enterprise PACS, all the images be integrated and users by there privilege access via a single point of entrance, can see, compare and process all the images on that territory.
It can significantly increase the quality of care and reduce the cost of obtain the re imaging.

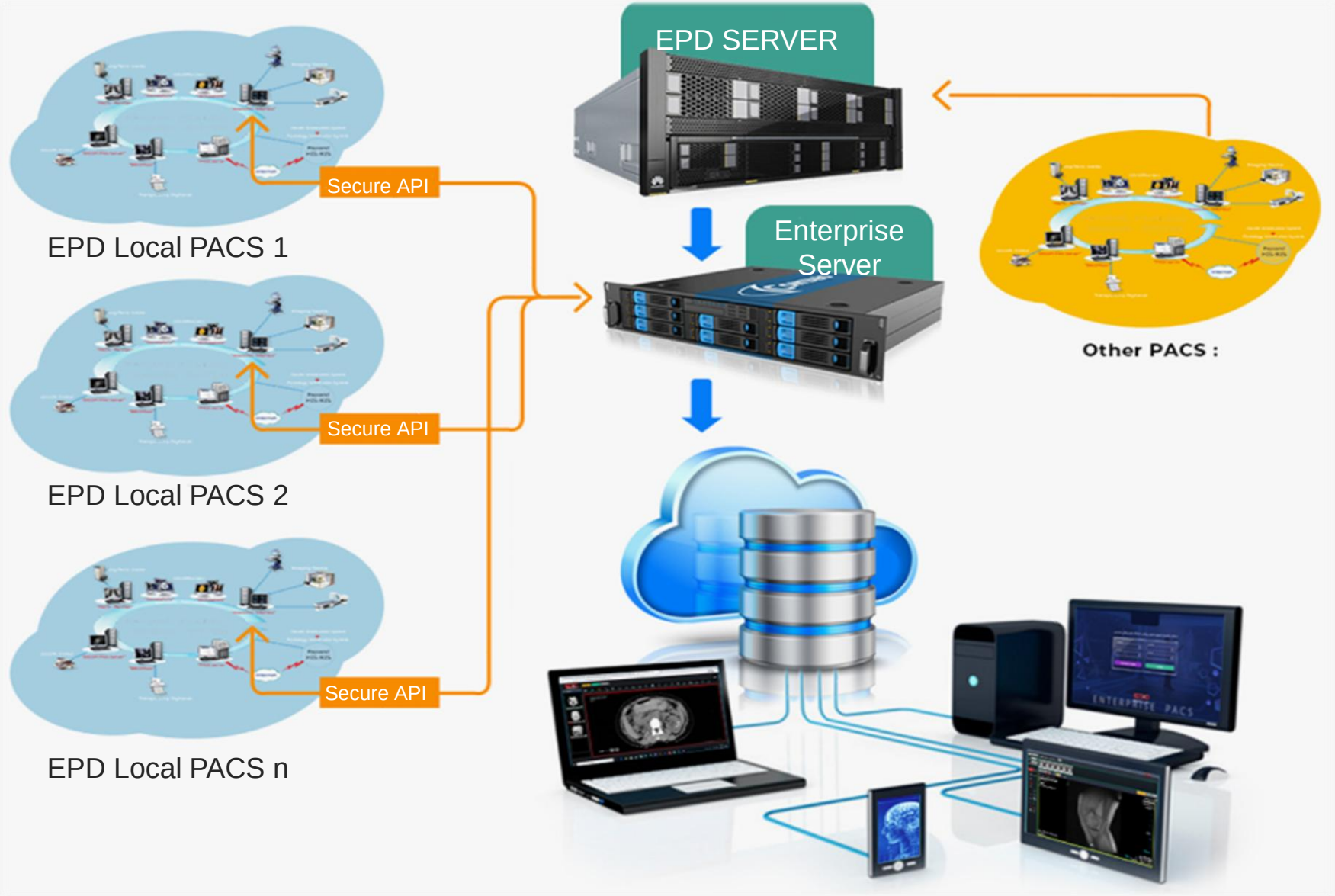
Easy Implementation

Implementation and setting the enterprise server is down by our engineers. Then adding any kind of clients (PC, Tablet, Mobile) can do so simple by calling a PACS URL. There is no need for special viewers, servers, or software contracts. No software installation is needed to view high-quality DICOM lossless images via any browser on any device connected to the local internet or internet

Unlimited Storage

By using the system and need for more space, we can add any kind of storage (HDD, NAS, SAN) to the PACS system for increasing the capacity of image storage. So you do not need to obtain the huge amounts of storage in the installation time.

How Enterprise PACS works



Diagnostic Workstation

EPD PACS

Diagnostic workstation is a windows base Mini PACS, which can install in any windows 7, 10 or 11 and connect to the local PACS and any kind of modalities.

Mini PACS can work stand alone or be a part of our other PACS solutions. User can install this software in it's own system in clinic, Hospital or home. For direct connecting to the Local PACS, or modalities the user must have the permission and special setting. The local storage can keep the images for restricted time.

Special features,

This Windows-based systems has special features like: work stand alone, support 4 monitors simultaneously, MPR, DICOM coding show, color mapping, advance paper printing, DICOM voice recording & some other features.
This system can connect to the any kind of DICOM modalities or PACS via the LAN/WAN

Easy Implementation

This software has installation exe, which enable you to install it in any PC with windows 7, 10 or 11 operational system. For working the system it must be registered or use a dongle.

Limited Storage

Basically, mini PACS is not designed for huge storge of data, and its storage is limited to the capacity of one of your local drivers.
You can backup of your data by your self.

HIS-RIS INTEGRATION

PACS systems require pertinent data from other medical information systems for effective operation. Among these systems, data from the hospital information system (HIS) and the radiology information system (RIS) is very important. Many functions in the PACS server and archive rely on data extracted from both HIS and RIS.
AEC PACS can be fully integrated with HIS and RIS, as well as other medical information systems such as electronic patient record (EPR), electronic medical record (EMR) or DICOM work list.

Orders from HIS go automatically to modalities

The HIS driven workflow will support orders given in the HIS to be automatically transferred to the AEC Modality Worklist (MWL). This ensures smooth operations and reduces errors by retyping name, patient ID etc. After the patient is registered in the HIS, the patient is scheduled in the HIS and the requested procedure information (including name and patient ID) is automatically transferred to the EAC Modality WorkList (MWL).

Reports are automatically synchronized between PACS and HIS

The AEC PACS solution has an inbuilt small part of RIS functionality that enables you to not only view the images but also to do reporting in the same place. Radiologist can see the lists of cases needing reporting directly in AEC PACS. They can then directly do the reporting in AEC PACS. They do not need to access the HIS for doing their reporting. Once the report has been signed off, the report is automatically made available for users.
We can transfer the SR reports to the RIS/HIS via special API.

Open image direct from HIS and EMR

From the patient file in the HIS or EMR, the user can directly click to open the patient images without the need for a second login on the PACS. Referring physicians and doctors in other hospital departments will benefit greatly as they will have access to the images of the patient via the HIS, without the need to login to the PACS.

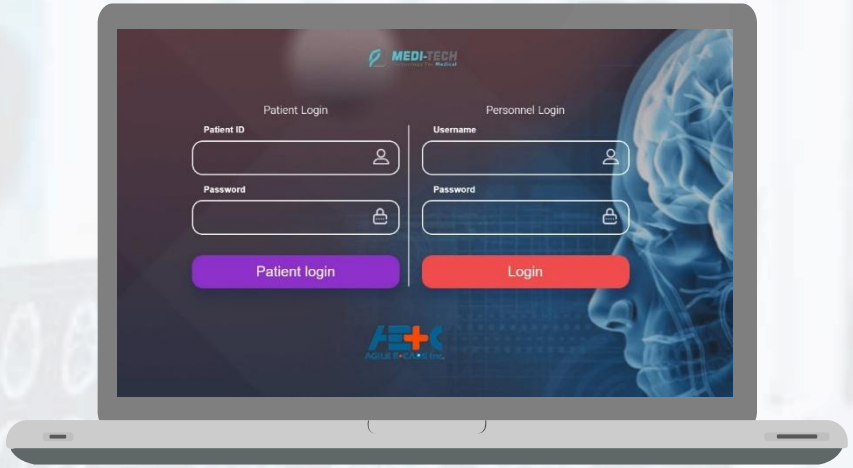
One Direction Vs Bidirectional

In one direction, patient ID transfer from RIS/HIS to the PACS and then they get a desired studies in the DICOM web browser app.
In bidirectional connection, the HIS/RIS send group of data via a DICOM directory app, to the modalities and this date be integrated with the images and stored in the PACS.
This app reduce both the human’s error and Technician’s work loads.

WEB-BASED VIEWER

AEC Web-based Viewer provides clinicians access to study information, clinical reports and images when and where they need it. The mobile version of our web-based viewer is available to users who access the viewer via mobile. It delivers simple, secure access to imaging results from any devices, such as a tablet ,smartphone, or PC. Referring physicians, surgeons, clinicians and technologists can view patient and study details, clinical reports and images quickly when and where they need it. Images can be accessed by patients when they are given an access to the platform.

- 100% Web-based (HTML5) Viewer
- Chrome, Adge, Firefox, Safari Available
- One or Two-factor Authentication
- Separate Doctor and Patient Login
- Zero-Footprint without Installation
- Server-side Rendering
- Various Image Display and Manipulation Tools
- Mobile Version

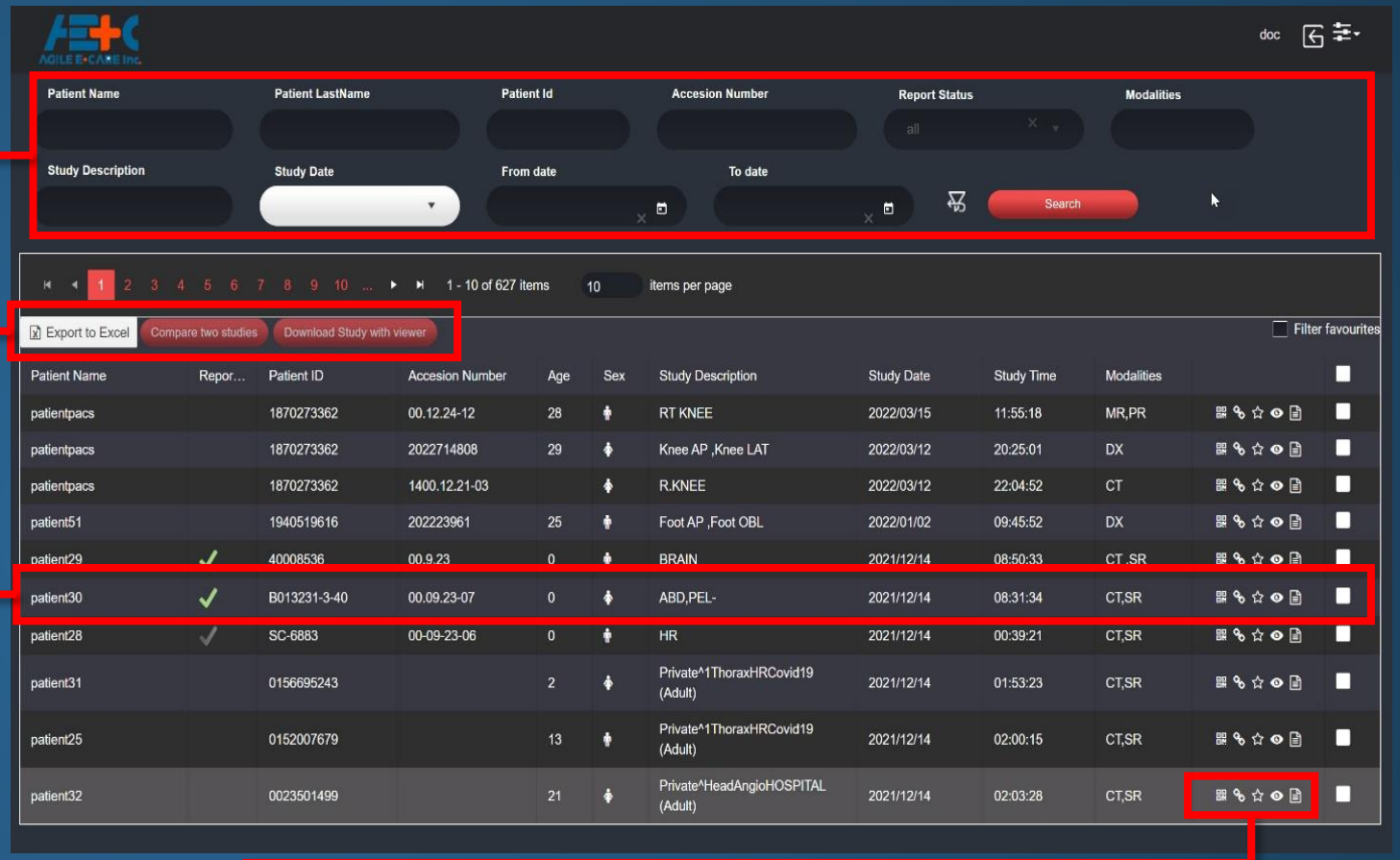


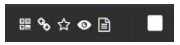
Web-based Viewer Homepage

The search page components include the patient's ID (electronic file number), patient's name and surname, National ID code, name of centers, report status, type of modality, and time efficiency. Also, there is a feature to filter the data based on the description inserted for the image (study description).

The permitted users are abled to export the reports in Excel format. Also the selected studies can be downloaded in compressed format and be used with an instant of Diagnostic viewer which will be included in the compressed downloaded file for offsite processing.

Following the search procedure, the desired studies will appear below the search box. Each row contains the relevant information of the study. If the report is registered in the system, a green tick is shown in the "Report" column. In this case, both the radiologist and the therapist will easily notice the existence of a recorded report for the patient.





You can see five icons and a checkbox option on the right side of the menu. The checkbox is designed to select the patient(s):

This is for displaying the QR Code with a print feature, which can be delivered to the patient. The patient can scan the QR Code to view the image.

It allows you to open the image of the patient in a separate tab so you can see and use the images of one or more patients in different tabs for various studies.

This icon is used to mark and highlight the favorite image.

By clicking on this icon you can view the relevant images.

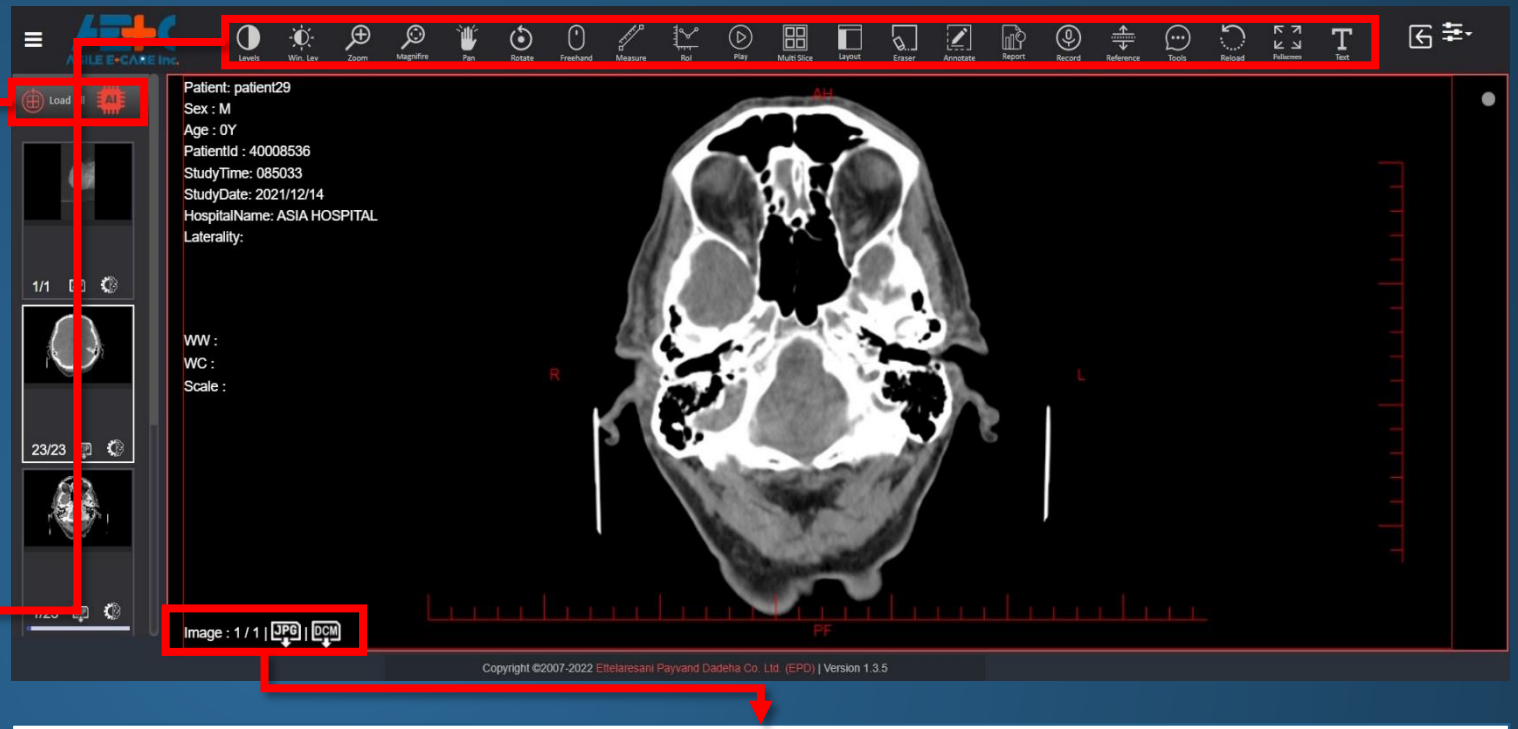
This icon is designed for direct viewing of the patient's report without the need to open his/her images.

Web-based Viewer Homepage

Image processing with various features can be done through the menu at the top of the page:

- Contrast: Changing the contrast and negate it
- Windows Level: Setting the Windows Level
- Zoom: Zooming in and out of the whole image
- Magnifier: Adjusting the zoom-in percentage
- Pan: Shifting (moving) to examine the desired area
- Rotate: Changing the angle or rotation of the image
- Freehand: Free drawing of the examined area
- Measure: Measuring the lengths (ruler) and angles
- Rol: Examining the image density (Hounsfield number)
- Automatic movement: Automatic display of group images
- Multi Slice: Display a series of images side by side
- Layout: Display up to 4 image groups
- Eraser: Deleting the items added to images
- Annotate: Inserting description to the image
- Report: Reporting writing
- Record: Recording audio reports
- Reference line: Comparing to find the location of lesion
- Tools: Brushing, inserting notes, and syncing images
- Reload: Resetting the processes back to the original
- Full Screen: Enlarging the program on the screen

Video tutorial link



At the top of the images menu, you can see two options: “Load all (images)” and “AI (recall)”. Pressing the “Load All” key will begin to load all images in order. The “AI” option is set to call the AI image processing capability, which will be explained independently.

It specifies that the displayed image is what number frame of this series of images and that the whole series consists of how many frames.
Downloading images in JPG format (if the user is authorized)
Downloading images as a DICOM file (if the user has authorized)

AI CAPABILITIES

The use of AI in medical imaging can be a great way to reduce the ever-increasing workloads of radiologists and clinicians, since AI is particularly effective in detection and segmentation of any irregularities in imaging data and providing radiologists/clinicians additional diagnostic confidence. Our product, as an AI-powered assistant for medical image interpreters, helps with developing solutions to handle diagnostic and workflow challenges faced by clinics.

AI-enhanced automated reporting

Through auto-filled structured-report-generation for records that are registered to PACS, and supporting them with detailed visual reports, the interpreter (radiologist) only needs to apply minimal adjustments (if any) and/or validate the report instead of generating whole text reports, which are time-consuming in most of the cases. This leads to the following value propositions:

- More accurate and less time-consuming readings especially in cases where there is a need for quantification
- A potential shift from active primary diagnostics due to a patient presenting clinical symptoms to a framework of proactive detection of medical illnesses.
- Helping with quality of readings and eliminating bias by providing a big picture about all possible conditions
- Improving work quality of healthcare human resources by empowering them in overloaded (night) shifts

AI for Diagnostic

Flagging Acute Abnormality system which leads to the following value propositions

- Improved workflow and reading time
- Positively influences downstream workflow pathways in a manner that leads to a reduction in hospital length of stay

- ✓ **Echo**
- ✓ **Skin cancer Detection**
- ✓ **Breast cancer detection**
- ✓ **Blood cell classification**
- ✓ **Stroke**
- ✓ **Stroke MRI segmentation & Brats MRI segmentation**
- ✓ **X-Ray**
- ✓ **Lung CT infection segmentation**

Automatic AI Sample Report (For brain stroke)

Intracranial Hemorrhage Indications

ICH **can be seen** in this non-contrast CT-Scan:

- *Epi/Extradural Hemorrhage* Signs: **None**
- *Intraparenchymal Hemorrhage* Signs: **Yes**
- *Intraventricular Hemorrhage* Signs: **Yes**
- *Subarachnoid Hemorrhage* Signs: **None**
- *Subdural Hemorrhage* Signs: **None**

Ischemic Stroke Indications

Final Impression: *There are no indications of Ischemic Stroke*.

Infarctions*: *(To be validated)

- *Anterior Cerebral Artery Infarct*: **None**
- *Middle Cerebral Artery Infarct*: **None**
- *Lacunar Infarct*: **None**
- *Basal Ganglionic Capsular Infarct*: **None**
- *Posterior Cerebral Artery Infarct*: **None**
- *Cerebellar Infarct*: **None**
- *Brainstem Infarct*: **None**

Large Vessel Occlusion (LVO): **None (To be validated)**

Loss of Grey-White Matter Differentiation: **None (To be validated)**

Lesions

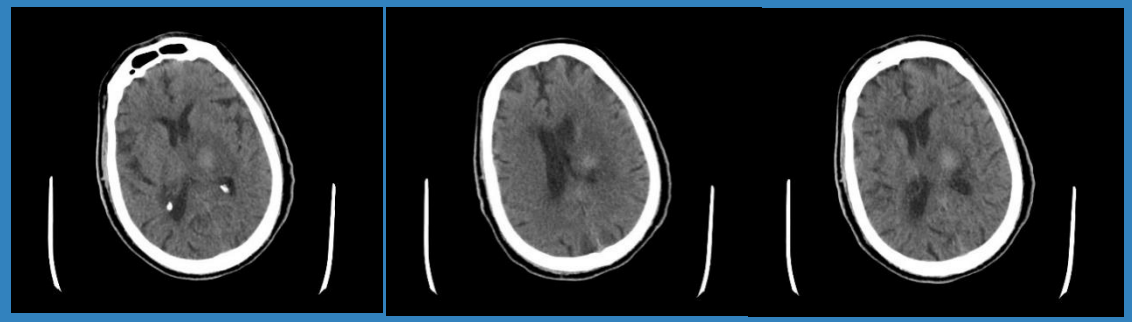
There is no evidence of hyper/hypo-densities. **(To be validated)**

Fracture Findings

There are no signs of fracture. **(To be validated)**

Midline Shift Findings

There are no signs of midline shift. **(To be validated)**



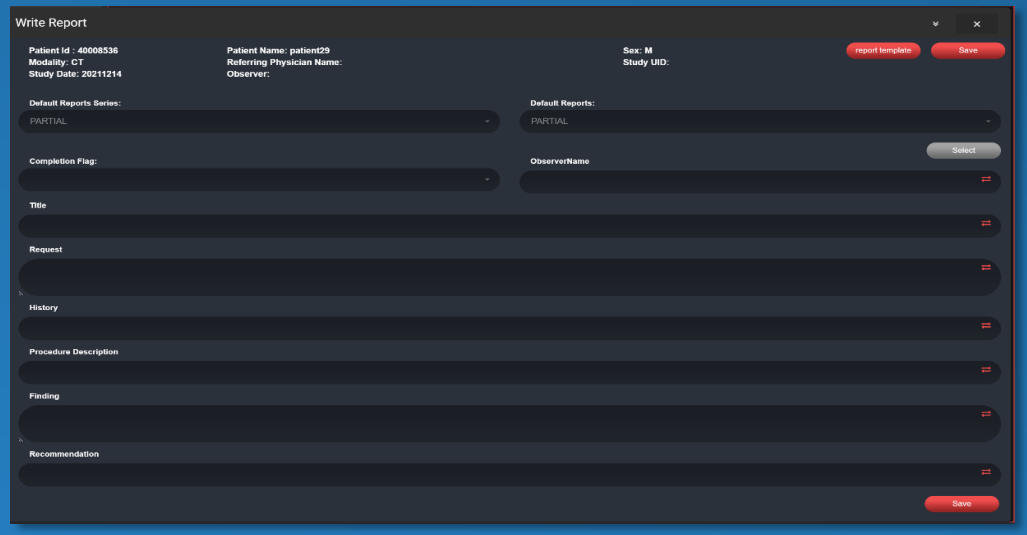
WRITING REPORTS

Recording the reports is known as one of the most important needs of the program. In this section, authorized users can submit a textual report for the patient or confirm the report typed by the secretary. After the report is confirmed by the radiologist, it can no longer be edited, and in case of need or even if an error happens, another supplementary report should be recorded and approved in addition to the initial report.
All system reports are recorded and displayed in the system as standard DICOM files and SR (Structural Report) format.

There are two methods for inserting a report

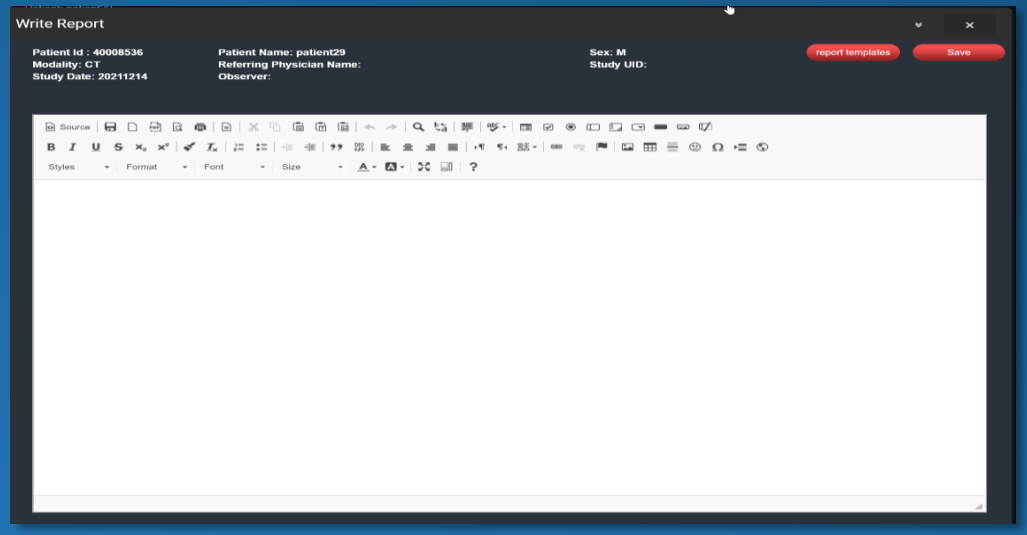
Method I : Advanced Report

It is a feature designed to insert the report in a full format. This section contains all the elements approved by the DICOM standard.



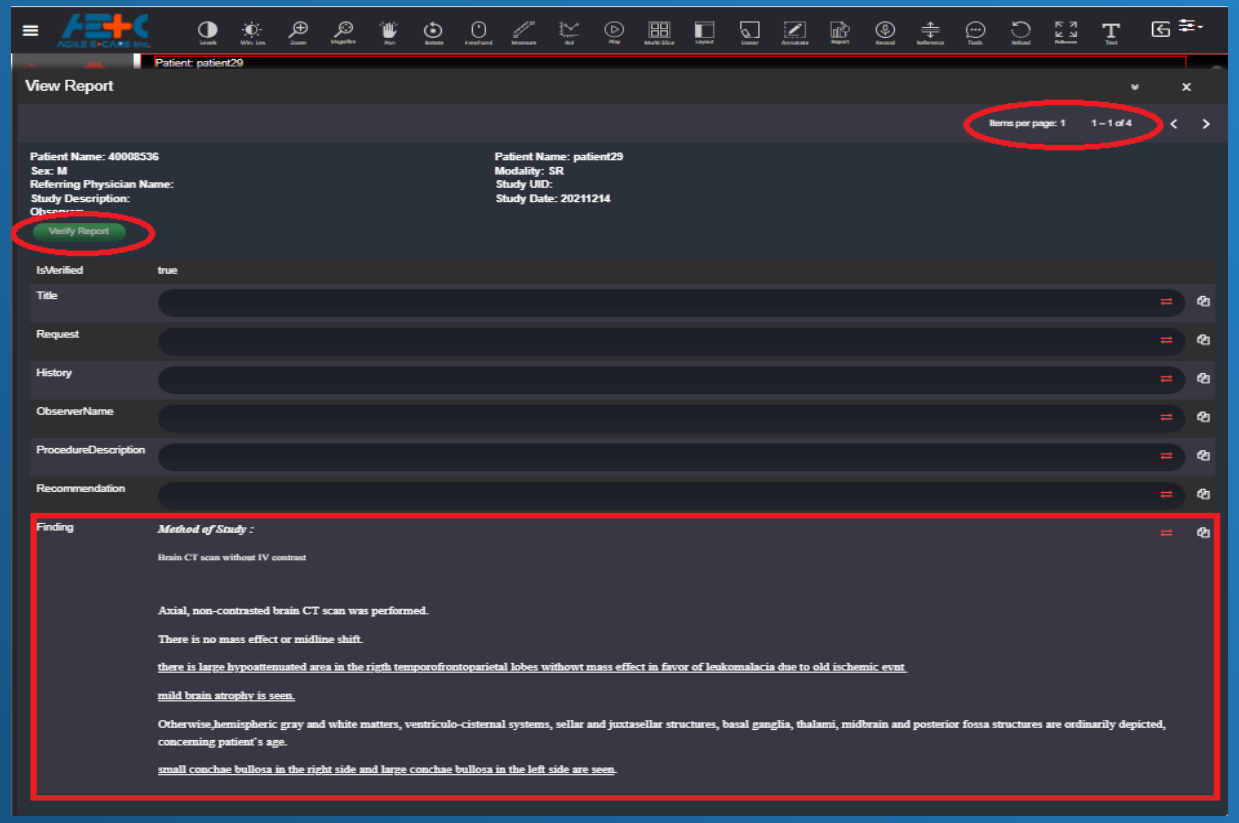
Method II : Write Report

It is a feature designed to provide simple reports with the ability to use features such as Word. In this mode, only the “Finding” information or the patient’s findings are recorded in the system.



In the system management panel, (access by authorize doctors from report section in main menu) there is a feature to record a set of default report templates for different modalities. If such pre-prepared reports are, saved they can be utilized to expedite the reporting process. Otherwise, the user will be able to create his desired templets that suit his needs

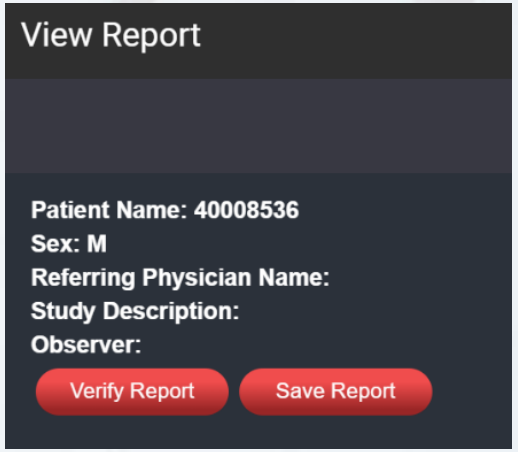
VIEW REPORTS



In the View Report option, you can view the report or reports recorded for the patient. For example, the top right indicates that the report is the first of four reports recorded for the patient.
The top left of the green menu indicates that the report has been verified by the radiologist and is final (Verified). At the bottom, the text of the report is inserted for the “Finding” section.

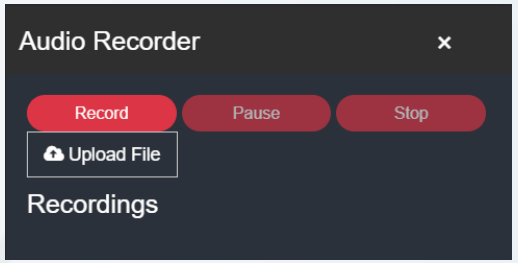
Approving and finalizing the report

If the report has not yet been finalized, it can still be edited.
If the report is approved and verified by authorized individuals (radiologists), it is no longer possible to edit or delete it due to the legal consequences of online reports.
More than one report can be recorded for a patient



Audio Reports

There are two options for recording audio files in the program.
Option I: It is a feature to record audio reports directly on the PACS server, in which case, the site's SSL feature should be enabled. Otherwise, direct recording will not be allowed due to security issues.
Option II: Uploading an audio file is another option, which is enabled in any circumstances.



PACS Admin
System Managements

PACS systems require deferent securities definition including access setting for users and modalities. In admin panel, administrator can see the health of system via the different logs.

System Definitions

In the admin panel, an administrator can set the following:

- Backup of database
- Define the user
- Give the privilege for see the studies from internet
- Download the studies
- Transfer the images to the standby server

Authorization

There are several access levels to the data, of which some embedded in the system such as access from RIS/HIS or patient login that is restricted to only one desired person.
When logging in to the system as an employee, admin must define the authorized employee and his/her access level form simple viewer to the verifier of reports.

The most important access level are:

- Viewers
- Operators (Image technician)
- Reporters (Radiologist Secretory)
- Verifier (Radiologist)
- Admin
- Modalities access

Logs

For security assessment, all the important action even sending a data from modalities to the server can be logged.

Some of most other loges are:

- Login & Logout (user name, IP address, browser, time, …)
- Unsuccessful login
- Any change of data
- New Images (patient)
- System Logs
- App logs

Other Features (1)

Patient CD:

In new modalities duo to a lot of images we can't print all the images, and in some centers instead of giving hard copy of images or with the hard copy they give all the patient DICOM images with the free viewer in a CD, (as a patient CD). The physicians can see studies with out need of connection to the internet.
This images can be up in the other PACSs

CD Robot Software:

CD robot Software is more cost effective and reliable solution than physical CD robots which is have a higher price .
Images are sent through modalities to The CD Robot Software, then images and patient Information are burnt on the CD.

SMS/Email:

Instead of giving radiology film or Patient CD to the patient (or include) Radiology center can send a SMS or Email to the patient include the URL address of his/her images, username & password for browsing the images. By this option we can eliminate radiology film and patient CD's.

Other Features (2)

Print Server

Duo to the patient request, some centers need to give a hard copy (DICOM or non DICOM) prints to the patient.
Print Server is the app which can send the new or old images from the PACS storage to the any kind of DICOM on ordinary printers for make a hard copy of selected images on radiologic or paper printers.
Note: All the paper prints has 8-bit data

DICOMMIZER :

For converting non DICOM images to the DICOM images such as legacy radiologic film or any other images, and store them in the PACS, we can use this app.

QR Code:

By scanning the QR code patient or miscellaneous therapists can access to the specific patient without need to have username or passwords. For security reason nobody can access to the other’s data.

Other Features (3)

Voice Recorder:

Radiologist can save his verbal report in the system by direct voice recording or upload his/her recorded voice in the PACS. Secretary can convert the voice to the drafted report.
Duo to security considerations for direct voice recording the serve must have been SSL support.

Send DICOM:

In many centers they have advance 3D software's with their modalities, especially whit any CT or MRI devices. This app can resend the images (especially the older images) to the device software's for advance rendering.

Portable viewer (Smart download):

In the case which radiologist want to go the any palaces with poor internet access, he/she can use a group downloads with a free AEC diagnostic viewer and then process all the studies and report them in offline mode.

Requirements

Mini PACS (Diagnostic Viewer)

OS: Windows 7,10, 11
CPU: Core I 5 or 7
HDD: 500 Gb up to 4 TB
RAM: 8 up to 16 GB
IO port: 1 GB

Local PACS (2 Servers)

OS: Linux
CPU: Xeon
Server 1, HDD : 250 Gb SSD + 4 - 20 TB SATA
Server 2 HDD : 250 Gb SSD
RAM: 16 up to 32 GB
IO port: 1 – 10 GB
Intranet/Internet Access

Enterprise PACS (2 Servers)

OS: Linux
CPU: Xeon
HDD: 250 Gb SSD or SAS
RAM: 16 up to 64 GB
IO port: 1 – 10 GB
WAN & Internet Access

Cloud PACS

OS: Linux
CPU: Xeon
HDD: Unlimited (Duo to MOU)

All the resources be supplied with us duo to the need for good performance via the official datacenters

Hybrid PACS

One local servers: (for each center)
OS: Linux
CPU: Xeon
HDD: 250 Gb SSD+ 2 - 20 TB SATA
RAM: 16 GB up to 32 GB
IO port: 1 GB + Internet Access

Cloud Server:
Like Cloud PACS requirements,