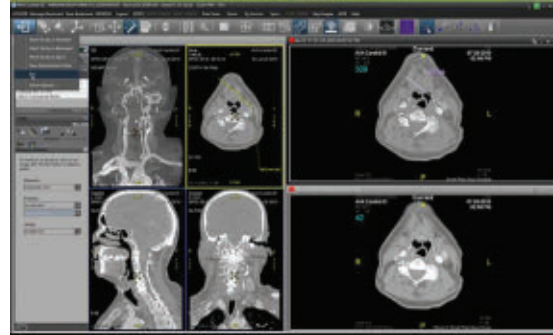


GE Healthcare

CT  
clarity



THE MAGAZINE OF CT • APRIL 2013

Universal Viewer and AW Server:  
Connectivity and Integration  
for Patient Care



imagination at work

\*Trademark of General Electric Company.

# A Tale of Three Hospitals

How thin-client technology is streamlining clinical workflow and enhancing patient care



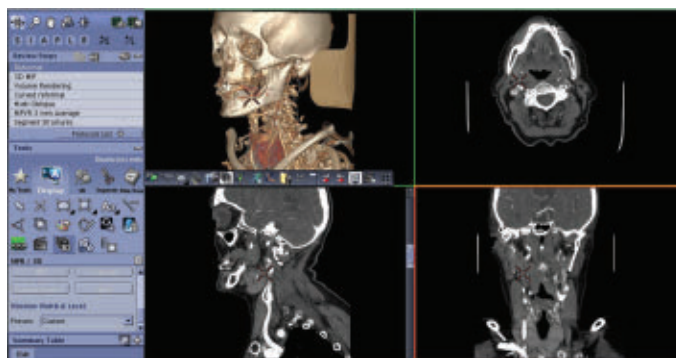
For more than 20 years, GE's AW Workstation engineers have developed diagnostic applications that have led to a robust clinical workstation across all areas of care—oncology, cardiac, neurology, gastroenterology, orthopedic, and vascular. Radiologists' and clinicians' desire for a deeper understanding of pathological processes has led to a shift from to an anatomical approach to medical imaging, to one that includes functional and quantitative analysis. This approach to diagnostic imaging has led to an explosion in the quantity of data clinicians must review, manage, and interpret. Recent information technology advances can help address the challenges of managing large image datasets by offering new opportunities for the mobility

of data, remote consultations, and access to information from virtually anywhere there is an available Internet connection.

Embracing these advancements, the AW team developed a thin-client-based server that allows access to the AW advanced applications from PCs streaming computed data from a centralized server. This new model is changing the way radiologists and clinicians work, analyze CT images, report cases, and collaborate with other physicians and hospitals.

## Odense University Hospital

At University Hospital of Odense, Denmark's third largest city, post-processing CT images on AW Server helps neuroradiologist Jorgen Nepper Rasmussen, MD, evaluate and diagnose patients. "With AW Server we have the ability to reformat or view images from different angles right on PACS workstations. This provides flexibility and leads to higher diagnostic confidence."



**Figure 1.** With AW Server, Dr. Rasmussen can reformat or view images from different angles.



“We are processing more CT angiographies because it is so easy to perform no matter where we are located.”

*Dr. Jorgen Nepper Rasmussen*

Dr. Rasmussen explains that Odense Hospital has five CT systems installed in different areas. “Before we implemented AW Server, we had to go to the workstation closest to the scanner to perform our reformations. This is a large hospital, and that would often take a lot of time.” While he would be bound to the AW to perform the additional image analysis on complex cases, he now enjoys more freedom with advanced processing software and applications available as a thin-client solution.

With the thin-client AW Server, GE’s advanced CT post-processing software is available on PACS workstations throughout the hospital and even at the physician’s office and home PCs.

“We are processing more CT angiographies because it is so easy to perform no matter where we are located,” he explains. Continued enhancements to internet access, such as higher speed, further promotes the use of the software applications that reside on the server.

He also believes he is doing more advanced analysis with the AW Server than he did before when the software resided only on a dedicated workstation. While he would perform basic reformats prior to AW Server implementation, now he performs more complex reformats.

There is an economic and patient-care value to this, Dr. Rasmussen adds. “We can extract more information from the images we acquire, so we don’t need large volumes of images or repeat studies.” Plus, he can perform reformats at home, and travels less to the hospital in the evening for some emergency cases.

The AW Server also offers collaborative platforms to hospitals and doctors. Other hospitals in the area are sending their cases to Odense. “They don’t perform as many CTAs as we do, and the clinicians may not have the same experience as us,” he explains. On occasion, other hospitals will send images acquired from various CT systems to Odense and these images are reformatted on the GE AW Server.

“AW Server’s collaborative platform works very well for us,” Dr. Rasmussen says. “As a teaching hospital we train clinicians and radiographers to conduct reformats and provide more confident diagnosis and patient care. AW Server provides the tools necessary to achieve this.” ■



**Jorden Nepper Rasmussen, MD**, is Chief Neuroradiologist in the Department of Radiology at Odense University Hospital. Dr. Rasmussen has extensive experience in the areas of CT imaging and intervention with a special interest in thrombolysis and trombectomi.

**The Odense University Hospital (OUH)** is one of Denmark’s largest teaching hospitals with 1,300 beds. The hospital comprises 50 clinical departments located at Odense and Svendborg. The radiology department performs approximately 250,000 exams each year. Odense University Hospital is the workplace of 10,000 medical professionals including 1,300 doctors and 3,800 nurses, while 4,000 medical students complete their clinical rotations at OUH every year.



## Radiology Associates of Ridgewood and Waldwick

Thin-client technology is enabling the radiologists of Radiology Associates of Ridgewood (NJ) to perform advanced image analysis and post-processing from remote locations with the speed and functionality similar to a dedicated workstation. The group recently implemented the AW Server at their office and in the local hospital for which they read—The Valley Hospital (Bergen County, NJ).

According to Edward Lubat, MD, Managing Partner, the group has long used the AW for reading advanced imaging studies. “We had two workstations in the reading room at the hospital, and one in our office,” he explains. “If more than two radiologists needed the AW at the hospital, then we had an issue.”

With the growth of higher-end CT studies at the hospital, particularly CT angiography (CTA) of the head and body, the issue became more pronounced. “The AWs were in the body reading room, so our neuroradiologists would have to get up and walk down the hall. The problem was the body radiologists would often already be on the AW.” This also caused numerous radiology reading interruptions throughout the day, limiting clinical efficiency.

In July 2010, AW Server was implemented throughout The Valley Hospital, the Radiology Associates’ offices and even at the radiologists’ home offices. With AW Server, advanced

processing applications that were formerly only available on the AW are now available on every connected PACS workstation. Even PCs in the CT room have access to advanced applications.

With access to advanced post-processing from any connected PC or workstation, Dr. Lubat has seen an increase in conducting these type of studies during the evening hours. “Each night that I am on call, I typically have one or two CTAs from the ER,” he explains. “With this capability to process the images remotely, we are utilizing 3D modeling more often in the evenings.”

In fact, Dr. Lubat notes that the volume of CTA studies being conducted annually is increasing by approximately 10% each year—from 1,977 in 2008 to just under 2,600 in 2011. “These are good, worthwhile studies to conduct, and with the AW at our fingertips, we have an efficient and easy way to analyze the imaging data.”

The software is available wherever needed and further facilitates clinical workflow. Dr. Lubat even points out that a leading cardiothoracic surgeon is performing review and analysis using AW Server tools on his office PC. “The responsiveness of AW Server is very good in the reading room, office, and at home,” notes Dr. Lubat. “No one needs to go to the stand-alone workstation anymore.” The software is accessible to technologists who have shown interest in performing 3D modeling; their reformations and processing is then saved using the “save state” feature so the radiologist or clinician can review.



“With this capability to process the images remotely, we are utilizing 3D modeling more often in the evenings.”

*Dr. Edward Lubat*



**Figure 2.** This is an evaluation of a thoracic aortic aneurysm. The model had already been built by the technologist. The centerline and sections were edited and measurement points deposited. There are five windows: a volume rendering of the segmented aorta; a curved reformat; a long and a cross section to the centerline; and a lumen view.

Dr. Lubat also finds the “save state” feature on AW Server useful when conducting his own post-processing. He can build the 3D model, save the images, go into PACS and read them. Sometimes, however, he discovers something on the source data that he didn’t notice in the model, and therefore wants to revise the 3D model. With the “save state” feature, he doesn’t have to repeat that 3D modeling work—which can take time to complete. Rather he simply goes back to the save state, makes his edit, and then resumes.

The bottom line is greater efficiency when radiologists don’t get up and move to the dedicated workstation. With AW Server, images are distributed everywhere, simplifying workflow and enabling higher clinical productivity. ■

**Edward Lubat, MD**, is Managing Partner of Radiology Associates of Ridgewood, P.A. and former Director of Diagnostic Imaging at The Valley Hospital in Bergen County, NJ, US. Dr. Lubat completed his residency and fellowship training at New York University Medical Center, where he also served for two years as Assistant Professor of Clinical Radiology in the abdominal imaging division. He specializes in body, musculoskeletal, and nuclear imaging.

**Radiology Associates of Ridgewood, P.A.** is a 16-member group that performs approximately 300,000 procedures each year, serving The Valley Hospital in Ridgewood, NJ, US and a full service outpatient imaging center in Waldwick, NJ, US.



### Son Espases University Hospital

At Son Espases University Hospital on the picturesque Balearic island of Mallorca in Spain, gone are the days when Carolina Nieto-García, MD, would read 20 or more radiographic films to

report a thoracoabdominal CT. Modern CT systems generate hundreds—even thousands—of images for each study. With the volume of data presented to clinicians, image post-processing is an essential diagnostic tool, she says. Yet with 40 radiologists and four CT workstations, accessibility to these software tools was limited, resulting in a delay in reading and reporting, particularly for the most complicated cases.

“I always hoped to have a single workstation that integrated all the possible tools a radiologist may need—clinical records, images, and post-processing applications—to improve our performance,” says Dr. Nieto-García. Today, her wish is a reality with the implementation of the AW Server on the hospital’s PACS workstations.

“The arrival of AW Server brought the ability to perform post-processing at individual workstations, and gave us the added benefit of remote access, removing the need to travel to the hospital just to check images while on call,” she adds.



“The arrival of AW Server brought the ability to perform post-processing at individual workstations, and gave us the added benefit of remote access, removing the need to travel to the hospital just to check images while on call.”

*Dr. Carolina Nieto-Garcia*

As an interventional radiologist, Dr. Nieto-Garcia finds great value in multiplanar reformat (MPR) of vascular studies to either plan an intervention or provide pre-surgical planning advice to surgeons. With a large volume of vascular studies performed in her institution, many of which require extensive processing and analysis, Dr. Nieto-Garcia finds she is saving time and increasing the number of reconstructions.

“Above all, I was able to do it easily from my own office, with no queues or pressure from anyone else needing to use the same workstation,” she says.

With the ability to read remotely, Dr. Nieto-Garcia sees new opportunities to consult on therapeutic decisions even when she’s not physically present in the hospital. “This has made it possible for clinicians throughout the Balearic Islands to consult us,” she explains. “The smaller hospitals in Menorca or Ibiza rely on us to help them treat some of their patients.”

The positive impact of remote consultation is also felt by patients. While complex cases still require a patient transfer to Son Espases, Dr. Nieto-Garcia notes that a significant number of cases, such as draining an abdominal abscess percutaneously, can be performed right on site. By sharing information and expertise, resources are optimized and decisions made wisely based on the availability of clinical imaging data, she adds.

“A common phone consult involves reviewing the indications for a certain procedure, and evaluating the images to see if the procedure in question is technically feasible,” she explains. “Now we just open the laptop and have access not only to the images but also to MPR reconstructions. The patient doesn’t move from his/her bed, the surgeon has a quick response to questions from the radiologist and, last but not least, we don’t have to commute to the hospital, which significantly improves the radiologist’s quality of life.”

With continued advances in technology, Dr. Nieto-Garcia sees a future where mobile devices—smartphones and tablets—will also be utilized for viewing, manipulating, and consulting by accessing AW Server.

“AW Server implementation across our workstations and computers is one of the major advancements in our hospital since we installed PACS,” she says. “With AW Server, we have access to all the imaging, regardless of the modality, from every location where there is a computer and internet access. These factors significantly facilitate the process of reporting and create a more dynamic patient care environment. Radiologists can view, process, and report images more quickly, so patients get their results sooner.” ■

Dr. Nieto-Garcia acknowledges the assistance of Aisling Snow, MD, radiologist, on this article.



**Carolina Nieto-Garcia, MD**, is an interventional radiologist in the Vascular and Interventional Radiology Unit at Hospital Universitari Son Espases in Palma de Mallorca, Spain. Dr. Nieto-Garcia received her medical degree from the Autonomous University of Barcelona (Spain) and completed her residency in Diagnostic Radiology in Hospital Universitari Son Dureta.

**Son Espases University Hospital** is a new teaching hospital located in the capital city of Palma on the island of Mallorca, the largest of the four Balearic Islands. The hospital is the result of a 235 million Euros investment by the region and Spanish government to serve the region’s 330,000 inhabitants. Son Espases is also a reference hospital for residents of the three other Balearic islands. The facility provides routine, emergency, and specialized healthcare services and has 1,020 beds.



# Creating an Efficient Remote Reading Environment



Dr. Dai Kakizaki

The migration from analog to digital and the elimination of film has led to radiology groups creating remote reading rooms where radiologists read for more than one institution. In February 2010, Toda Central Medical Group (TMG) (Japan) opened a remote reading/interpretation center “Sai Teramedo”. The center reads for 15 facilities, including a screening center at Toda Central General Hospital, Atami Tokoro Memorial Hospital, and Shin Niiza Shiki Central General Hospital. Total monthly reading volume is: 421 CT; 351 MR; 2,140 general X-ray; 322 fluoroscopic; and 444 mammograms, for an approximate total of 3,700 cases. Two radiologists are staffed each day at Sai Teramedo and use the AW Server for reading medical imaging studies.

As leaders in 3D post processing and image review, TMG understood they needed a solution that would help grow their capacity, enhance radiologist productivity, and streamline workflow to reduce reading turn-around times. They turned to GE Healthcare and implemented the AW Server because it provides a thick/thin client application where advanced 3D post processing can be performed on a PC instead of only on a dedicated workstation.

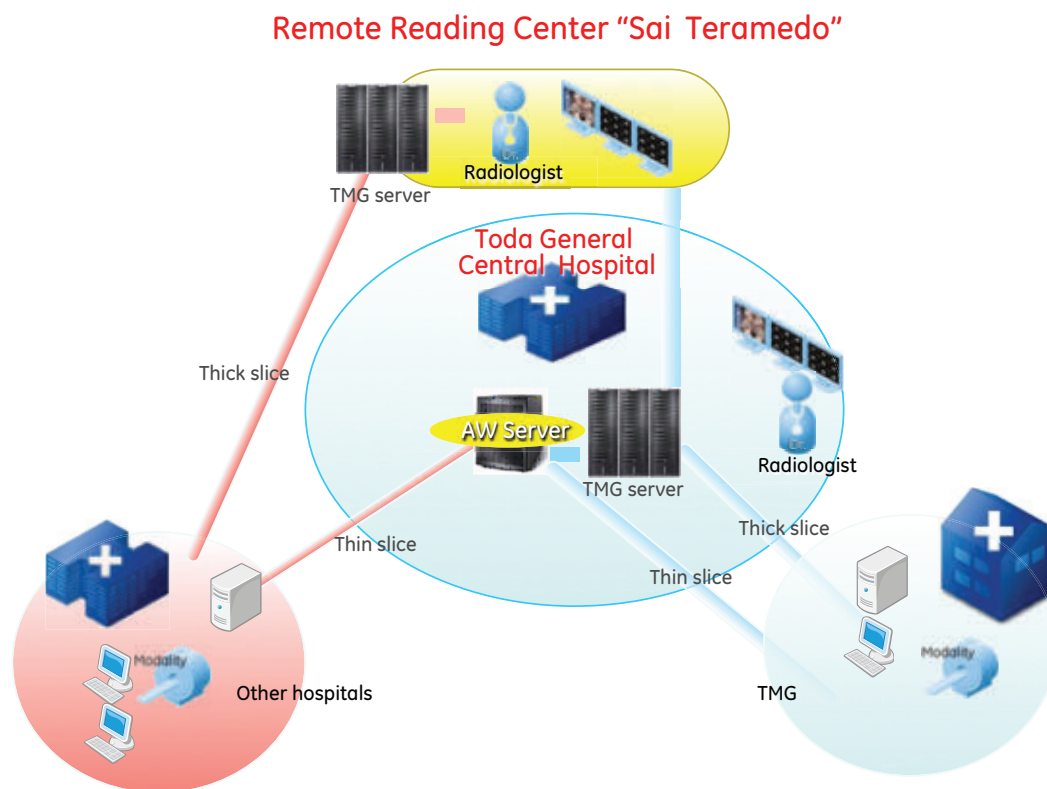
According to Dai Kakizaki, MD, PhD, Director of Sai Teramedo, the radiologists are more productive in the remote reading center as opposed to having one or two radiologists

staff each of the 15 hospitals. "If there is a large workload at one hospital, the remote reading can help with any overflow. With the centralized remote reading, we also have access to specialists and second opinions on difficult cases, when needed."

Additionally, with the new workflow driven by the AW Server, studies can be accessed in both the remote reading center and each hospital. All thin slice data is stored on the AW Server regardless of where it originated. Thick slice data from Toda Central General Hospital is stored on that hospital's PACS; all thick slice data from the other sites is stored at a second remote server.

## New workflow drives productivity

While the group expected that implementation of the AW Server would result in new efficiencies to workflow, they didn't anticipate discovering a new model for workflow. The AW Server converts virtually any compatible PC, laptop, or PACS desktop to a 2D, 3D, and 4D post-processing workstation. Thanks to integration with existing IT infrastructure, radiologists can share images in real time and perform all their tasks—diagnostic reading, reporting, dictation, and advanced image analysis—on a single desktop.



Several AW Servers are located at Toda Central General Hospital: seven in the CT/MR department, five in cardiology, two each in neuro and CCU, and one each in angiography, general X-ray, nuclear medicine, and the ICU. A 200 Mbit/sec network sends the thick slice data to the PACS server and the thin slice data to the AW Server at Toda Central General Hospital.



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“Our radiologists are simply just more efficient... everything they need to analyze, view, and report a study is available on one workstation.”

*Dr. Dai Kakizaki*

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Implementing the AW Server has impacted productivity and efficiency. “Our radiologists are simply just more efficient,” says Dr. Kakizaki. “They aren’t waiting for the dedicated workstations to be available, or moving to different systems to complete dictation and reporting. Everything they need to analyze, view, and report a study is available on one workstation.”

The full 3D environment is also available to the technologists and clinical specialists. For specialties, such as cardiology and neurology, with the AW Server the technologist can create 3D and MPR images, prepare measurements, perform tracking, and pre-stage the case so the clinicians can go right into reading and not waste time. This is referred to as “Save State” on the AW Server. The cardiologist or neurologist can then open the “Save State” on the AW Server and begin reading. For instance, they can then select the best angle from which they want to read, rotate the 3D images for a different orientation, or refine the measurements.

“With the ‘Save State’ feature, our radiologists can begin working at a more advanced state based on the technologist’s work,” says Dr. Kakizaki.

Technologist Masanobu Egawa at Toda Central General Hospital adds, “Before implementing the AW Server, 3D renderings and MPRs were made by two CT operating consoles and two



stand-alone AW workstations. Since the implementation of the AW Server, technologists are working less overtime to create 3D images. The AW Server can create 3D rendering independent of the CT console, which also enables us to continue scanning patients.” Radiologists can now view the 3D rendering and make adjustments on their PC/workstation without having to interrupt the technologist’s workflow.

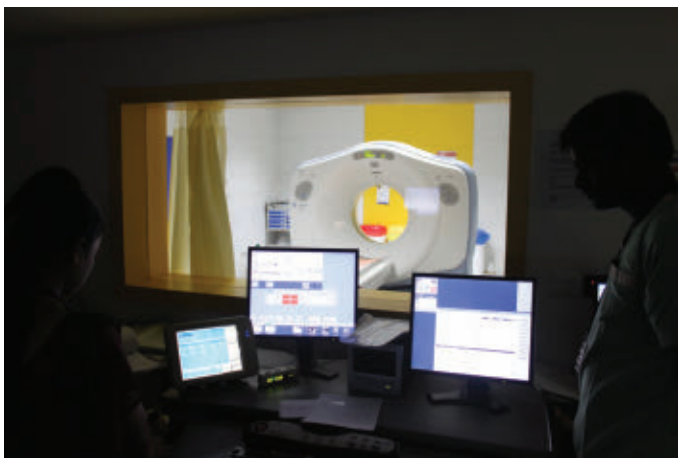
The result is a more efficient reading interpretation and the ability to implement a remote reading environment that allows the group to read for multiple institutions at one location and accept overflow from hospitals. ■

**Dai Kakizaki, MD, PhD** is the Director of Sai Teramedo, a remote reading center of Toda Central Medical Group (TMG) located in Japan. He earned his medical degree from Tokyo Medical University, where he later served as an Associate Professor. Prior to his current position, Dr. Kakizaki was the Radiological Department Manager at Tokyo Medical University Hospital. He is a member of the Japan Radiological Society and Japan Radiological Society Radiology Specialist and a counselor of the Japanese Society of Medical Imaging.

**Toda Central Medical Group (TMG)** is associated with 25 hospitals, six welfare institutions for the elderly, a clinic, a medical care center, and a home nursing station. Over 10,000 healthcare professionals are employed by Toda Central General Hospital and TMG.

# Radiology Workflow Redefined With AW Server

*By Mathew Cherian, MD, Chief of Radiology Services, Consultant Vascular & Interventional Radiologist, and N. Sumathi, MD, Consultant Radiologist; Kovai Medical Center & Hospital, Coimbatore, India*



CT Technologists at scanner console

In 2010, we decided to implement a high-end PACS to enhance our radiology workflow. Although we determined that the Centricity\* PACS-IW from GE Healthcare would fulfill most of our workflow requirements, we realized the need for an advanced image processing and analysis solution on top of it—particularly when working with images from high-end, multi-detector CT scanners. For instance, we were interested in advanced CT application capabilities, such as Volume Helical Shuttle for vascular and perfusion imaging. At that time, Centricity PACS-IW offered basic capabilities for volume rendering, vessel structure analysis, and perfusion capabilities. Therefore, we complemented our PACS with AW Server to fulfill all of our image processing needs.



Kovai Medical Center & Hospital, Coimbatore, India



Radiologists reading room

The addition of AW Server has revamped our throughput and enabled significant enhancements to the way we report. Vessel analysis, vascular intervention planning, and image reformatting have become much easier to perform with the addition of AW Server.

Daily patient workload at KMCH is typically 80 CT, 25 MR, and 10 PET cases. Prior to implementing AW Server, we had a single AW workstation that presented significant handicaps to our throughput and reporting. We have nearly 10 years of experience working on the AW and are very comfortable using it. We've realized over this period of time that AW is indeed a robust workstation. Now, with the addition of AW Server, we can take the 0.625 mm source image from the CT and push it to the AW Server for advanced analysis and reporting. Our AW Server allows our entire team of radiologists to report from wherever they are located—workstations, office PCs, laptops, and even remotely from home. The main advantage we've experienced with AW Server is the ability to do advanced image reformatting and reporting from any office or home PC. Most capabilities of AW, including planning a complex aneurysm treatment and vascular angiography studies, is now possible from virtually any computer with the addition of AW Server.

AW Server can also help reduce costs and provide benefits for multiple clinical specialists in the hospital. With an AW Server, we no longer require multiple workstations and hence, save the cost of these for the institution. Two examples of the multi-specialty use of AW Server in our facility are:

- The cardiologists collaborate with pulmonologists to plan valve placements in emphysema patients by studying the lung images on their PC that is connected to AW Server.
- The orthopedists are now able to more precisely plan their surgeries, as they are able to see fractures more clearly. This is extremely useful when treating complex fractures, such as in the pelvis. Additionally, the surgeons now have access to images on the PC in the Operation Theater (OT) to share the results and findings with the entire team.

The integration of PACS-IW with AW Server is a major productivity improvement in reporting at Kovai Medical Center & Hospital. ■

**Editor's Note:**

Dr. Cherian and Dr. Sumathi share their personal experience with the implementation of AW Server in their facility.



# AW Server and PACS Integration

An efficient path to diagnostic excellence at PeaceHealth Southwest



PACS is a powerful management tool, integral to enhancing Imaging departments' workflow and providing opportunities to improve radiologists' efficiency and productivity. AW Server applications offer a wealth of diagnostic information that can help clinicians deliver more precise, detailed information to referring physicians.

The integration of the PACS workflow with the flexibility of the AW Server streamlines radiologists' access to advanced image processing tools, thus, enhancing the viewing and processing capabilities of PACS. This represents a new paradigm in the way clinical images are processed and managed. GE has the expertise that healthcare providers seek to transform their workflow and gain efficiencies.

## Case in point: PeaceHealth Southwest Medical Center

PeaceHealth Southwest Medical Center (Vancouver, Wash.) is the region's healthcare leader and steward for 155 years. PeaceHealth Southwest is a not-for-profit, 450-bed, medical institution providing a full-range of outpatient and inpatient diagnostic, medical, and surgical services to residents of Clark County, Washington and the surrounding communities. The Center's imaging management system is powered by a non-GE, third-party PACS.

The PACS/AW Server integration was envisioned as a result of the recent acquisition of a new GE CT scanner along with an AW Server. For PeaceHealth Southwest, this was the ideal time to leverage workflow and image processing benefits by integrating PACS with the new AW Server.

“Before we started, we went through a technical review with the GE integration team,” says Tom McCloskey, PACS Administrator at PeaceHealth Southwest. “We found that the GE team had facilitated successful integrations for a number of healthcare facilities and PACS vendors around the world. We were confident they could do it for PeaceHealth Southwest.”

### Seamless integration with third-party PACS

The integration process was seamless and required minimal direct interactions between GE’s integration team and the customer to point out all available resources and information. It took very little time to convey to the PeaceHealth Southwest team the information required for their exchange with the facility’s PACS provider.

Eugene Charleston, Lead GE AW Integration Engineer, “Based on our experience with integrations, we’ve been able to simplify our process considerably, and many PACS vendors are now familiar with our integration capabilities,” Charleston says. “We’ve condensed the instructions down to a two-page, comprehensive step-by-step guide. And, major PACS vendors already have procedures in place to make integration happen quickly.”

Although situations may vary, it took only an hour to complete the PeaceHealth Southwest AW Server integration with a non-GE, third party PACS. “The instructions we got from GE were clear and concise; it was really a painless process,” McCloskey explains. PeaceHealth Southwest is now equipped with the power, flexibility, and diagnostic utility of an integrated PACS/AW Server system.

### The integration decision: A look behind the scenes

Once everyone at the site signs up for AW Server/PACS integration, getting it done often goes as smoothly as the PeaceHealth Southwest process described here.

“GE Healthcare has experience integrating AW Server with PACS from many different vendors,” says Charleston. “We have confidence that we can integrate the AW Server with just about any PACS out there.”

Clinicians are enthusiastic about integrating the two technologies. They understand and appreciate the benefits they’ll realize. But there’s another department in which a dialogue needs to be established. “In many healthcare institutions, the IT department is the gatekeeper,” says Charleston. “Getting the IT department and the PACS administrator involved early is essential.”

An IT department may be reluctant to integrate its PACS with AW Server for a variety of reasons. “In any case, it’s important to reassure the PACS vendor, Hospital IT team, and clinicians that GE Healthcare has a history of successful AW Server/PACS integration,” notes Charleston. “Also, the fact that GE has all the integration documentation publically accessible online goes a long way to securing a positive outcome.”

### A clear choice

By choosing AW Server/PACS integration, users can benefit from two key advantages: A versatile product in AW Server and a knowledgeable team with a history of successfully integrating a variety of PACS.

Integration is making a difference for the clinicians at PeaceHealth Southwest. It can make a difference in other practices, too. ■

“We found that the GE team had facilitated successful integrations for a number of healthcare facilities and PACS vendors around the world. We were confident they could do it for PeaceHealth Southwest.”

*Tom McCloskey*





# GE AW Server Facilitates Large Cross European Cardiac Study

The EVINCI (EValuation of INtegrated Cardiac Imaging) study is a multi-center, multi-country prospective clinical trial evaluating the impact of multi-modality cardiac imaging for the detection and characterization of Ischemic Heart Disease (IHD) in patients identified with intermediate pre-test likelihood of Coronary Artery Disease (CAD). Seventeen hospitals across nine European countries participated in the three-year, 700-patient cohort study that began in 2009 (Table 1). The study was organized by International Coordinator Danilo Neglia, MD, PhD, from Fondazione G. Monasterio CNR/Regione Toscana and CNR Institute of Clinical Physiology (Pisa, Italy), with assistance from Co-Coordinators Professor Juhani Knuuti, MD, from Turku PET Centre (Turku, Finland), and Professor S. Richard Underwood, MA, BM, BCh, MD, FRCP, FRCR, FESC, FACC, from Royal Brompton Hospital and the National Heart & Lung Institute, Imperial College School of Medicine (United Kingdom).

Funded by the European Commission and initially designed within the European Society of Cardiology (ESC) Working Group on Nuclear Cardiology and Cardiac CT, results from EVINCI will hopefully be announced at the European Society of Cardiology annual Meeting in September 2013. These results could provide a guidance on the use of cardiac non-invasive imaging—also providing a basis for a dedicated educational tool—and the role of integrated anatomical-functional imaging in diagnosis. It is anticipated that this three-year European trial will define the most cost-effective strategy for diagnosing patients with IHD among those with suspected CAD.

Preliminary findings released in June 2012 demonstrate that the prevalence of “functionally significant” CAD in patients with chest pain symptoms and intermediate likelihood of disease (based on current clinical predictive models) is lower than expected in Europe. In more than 60% of the cases examined, an accurate non-invasive screening could avoid unnecessary and costly invasive procedures.



## “With the AW Server, we could easily review CT and CTA images, and perform some fusion imaging with PET.”

*Dr. Danilo Neglia*

Throughout the duration of the trial, GE Healthcare loaned the use of AW Server to the coordinating center of the study located in Pisa, Italy. The AW Server was utilized to receive and store multi-modality imaging raw data from participating centers, thus functioning as a “digital bank” to allow access to multi-modality images and advanced fusion capabilities, a relevant aspect of the EVINCI study. A total of 1,887 studies used in the clinical trial are stored on the AW Server. The breakdown by procedure is listed in Table 2.

Hospital	Country
Fondazione Toscana Gabriele Monasterio & CNR Institute of Clinical Physiology	Italy
Turku PET Centre, Turun Yliopisto	Finland
Royal Brompton & Harefield National Health Service Trust	United Kingdom
Universitaet Zuerich	Switzerland
Adademisch Ziekenhuis Leiden-Leids Universitair Medisch Centrum	Netherlands
Fundacio Privada Institut de Recerca de l'Hospital de la Santa Creu I Sant Pau	Spain
Instytut Kardiologii im. Prymasa Tysiaclecia Stefana Kardynala Wyszyńskiego	Poland
Assistance Publique-Hopitaux de Paris	France
Università degli Studi di Genova	Italy
Servicio Madrileño De La Salud	Spain
Università degli Studi di Napoli Federico II	Italy
Institut Catala de la Salut	Spain
Klinikum Rechts Der Isar Der Technischen Universitaet Munchen	Germany
Queen Mary and Westfield College, University of London	United Kingdom
Azienda Ospedaliero-Universitaria Careggi	Italy
Ospedale Versilia	Italy
Kliniken Des Landkreises Göppingen GGMBH	Germany

**Table 1.** Hospitals participating in the EVINCI study

The AW Server will be utilized in specific sub-analysis of the EVINCI data to evaluate whether multi-modality imaging of the same patient may help to get a final diagnosis of functionally significant CAD, or to solve apparent incongruences between anatomical and functional images, explains Lead Investigator Danilo Neglia, MD, PhD. “With the AW Server, we could easily review CT and CTA images, and perform some fusion imaging with PET,” he says.

GE continues to work with the EVINCI study group to improve connectivity to the AW server and access to advanced multi-modality visualization capabilities.

GE has also offered support to the EVINCI Health Economics Team, and was the exclusive industrial sponsor for eduCAD, a new Web-based educational tool for multi-modality cardiac imaging.

With the eduCAD online educational tool, young European radiologists and cardiologists can assess and visualize multi-modality images of several clinical cases selected from the EVINCI study. They can provide their own image assessments, and then compare that opinion with the experts’ evaluations. eduCAD offers an opportunity for clinicians to obtain training in the appropriate use of multi-modality imaging for the diagnosis of Ischemic Heart Disease and select a diagnostic pathway on the basis of clinical evidence and appropriateness criteria. They can also join discussion forums section and even contribute clinical cases to the eduCAD team. This interactive tool is available on the ESC website at: (<http://www.escardio.org/communities/Working-Groups/EVINCI/Pages/eduCAD.aspx>) or directly to <http://www.educad.org>. ■

Procedure	# of exams on AW Server
CTA	586
ICA	356
SPECT	361
MR	161
PET	131
US	292
Total exams	1,887

**Table 2.** EVINCI studies stored on AW Server



# GE Healthcare's Universal Viewer: Where Imaging Comes Together



To view video, visit [tiny.cc/cts131](https://tiny.cc/cts131)

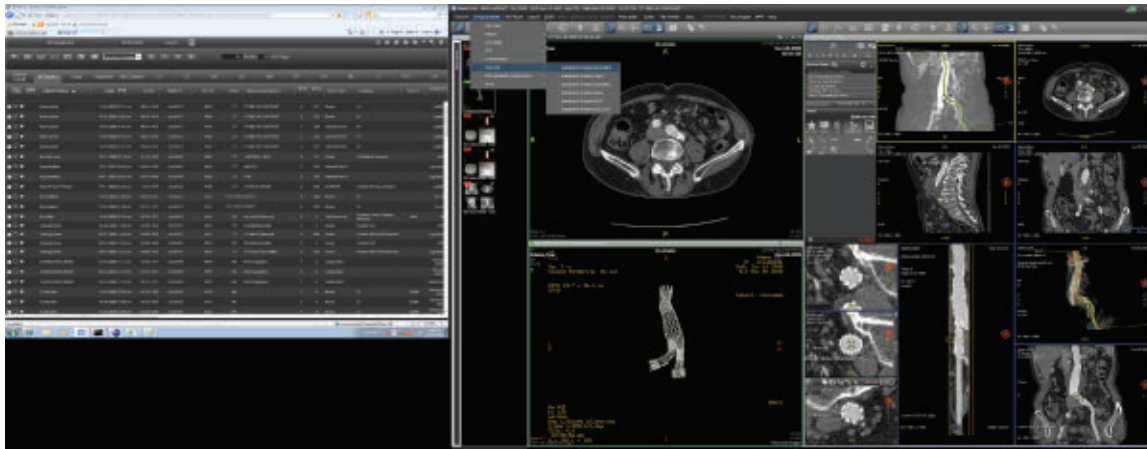
Radiologists today have more patient information available at their fingertips to deliver an informed diagnosis. However, this information and the tools to process the data are often contained in different systems. This requires the radiologist to access separate workstations and databases, which can often negatively impact their efficiency, report turnaround times, and their ability to achieve higher patient throughput.

In collaboration with a third-party imaging contract research organization<sup>1</sup>, GE Healthcare conducted a survey of radiologists to better understand their experiences and perceptions concerning workflow inefficiencies. The respondents noted four key issues impacting their productivity: exiting one application to access another; lack of PACS integration with voice recognition software; lengthy post-processing times; and insufficient automation of hanging protocols.

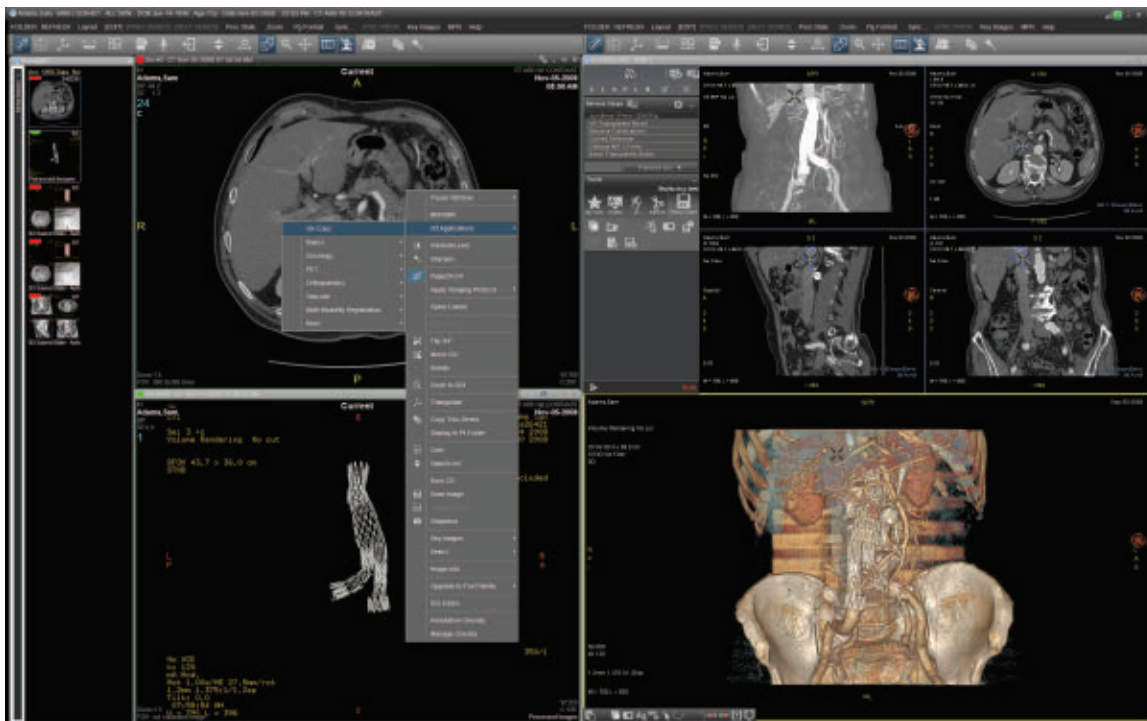
When queried about daily bottlenecks in workflow, the radiologists most often cited workstations dedicated to a single modality as the primary issue. They also noted difficulty in communicating with the electronic medical record and the creation of timely and relevant reports as taking the most time away from their primary reading and reporting duties.

## Responding to radiologists' needs

A new solution from GE Healthcare addresses the need for one workstation and one database to bring imaging and patient information together. Centricity\* PACS with Universal Viewer includes native advanced visualization capabilities plus 3-D post-processing tools powered by Advantage Workstation (AW). It provides a single source for MIP/MPR, PET-CT, vessel analysis, auto-bone removal, fusion, and registration across modalities for clinical workflow.



**Figure 1.** 3D Menu: AWSer advanced application selection from Universal Viewer drop down menu



**Figure 2.** Application selection: AWSer advanced application selection from Universal Viewer contextual menu

Enterprise-wide access is assured with the Universal Viewer’s zero footprint and Web client access, both utilizing a common Web-based user interface. It supports the industry’s migration toward community- and patient-centered workflows with EMR and mobile device (iPads®, smartphones) access.

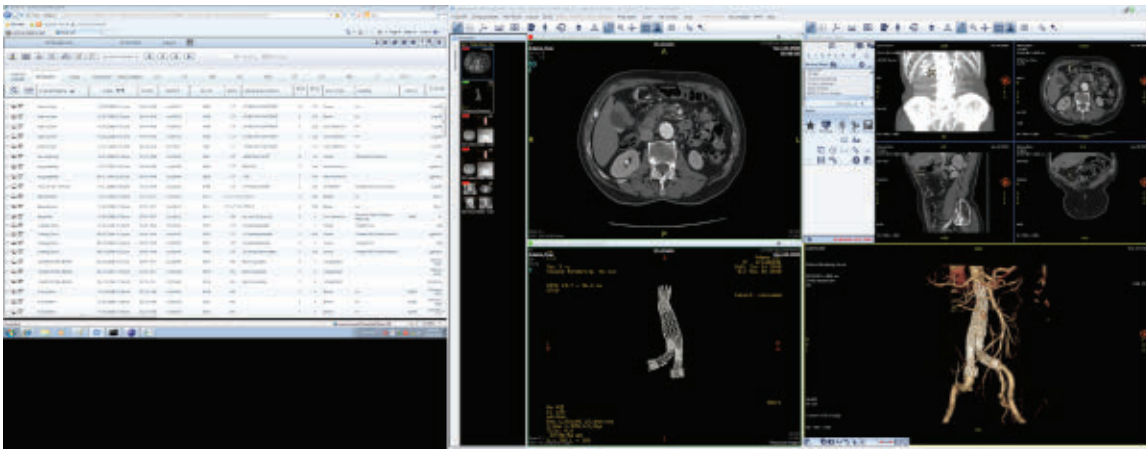
Universal Viewer, designed to work with Centricity\* PACS and Centricity PACS-IW, puts more clinical insight within reach to better inform and streamline diagnosis, including;

- Smart hanging protocols that give users the option to apply case-based reasoning techniques, including machine learning algorithms, image analytics, and text mining for automating exam setup.
- A breadth of advanced visualization applications powered by GE’s leadership in advanced applications. As GE continues its innovation in additional applications, this will allow for differentiation versus other vendors. Breast imaging powered

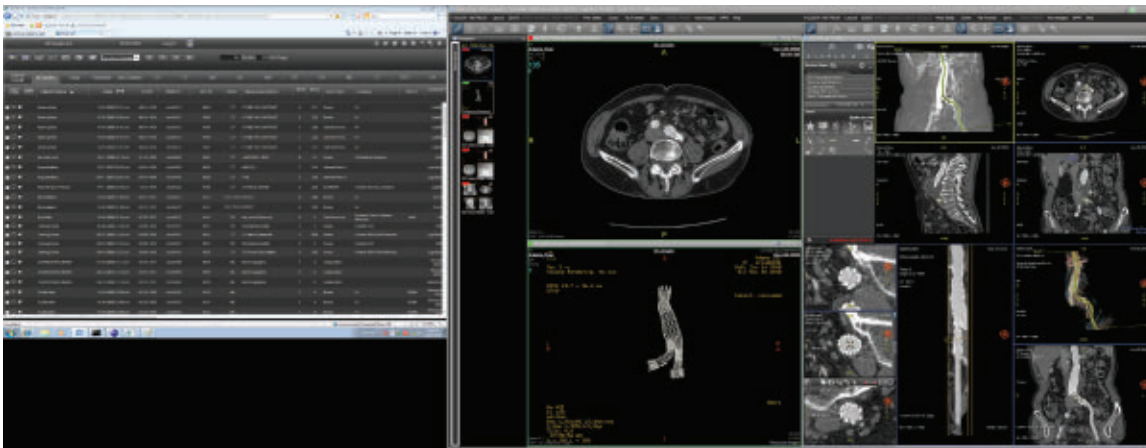
by IDI Mammo will allow staying ahead on specialized Mammo viewing within the Unified viewer.

- An intelligent work space, such as pre-fetching of patient data from within and outside the PACS and vendor neutral archive (VNA).
- Multimodality oncology workflow featuring the OncoQuant application powered by AW. Universal Viewer can help streamline oncology follow-up studies so users can spend less time retrieving studies and preparing exams and more time reading, reviewing, correlating and comparing CT, MR, PET/CT, and NM.
- Accessible anywhere there is an Internet connection. Radiologists will be able to read and interpret studies at multiple work locations, even in their office or at home. By implementing high-performing streaming, the Universal Viewer adapts to current conditions and delivers images to the desktop.





**Figure 3.** Universal Viewer user interface switch for bright room environment.



**Figure 4.** Vessel analysis: Vessel Analysis example displayed on Universal Viewer with AWServer AVA application

## Advanced clinical tools on a single workstation

With the AW Server and Universal Viewer, radiologists can preprocess studies and open up to three exams simultaneously. This reduces the time radiologists have to wait for studies to be ready for reading and provides the flexibility to switch between exams without closing them. It also helps streamline secondary review or consultation with a referring physician.

Fast, routine analysis of routine CT angiography (CTA) studies is simplified on the Universal Viewer with the Autobone and VesselIQ applications. These tools expedite the assessment process via automatic bone segmentation, zero-click tracking of most vascular studies, comprehensive one-click stenosis measurement and plaque analysis, and semi-automatic thrombus segmentation.

Rich, multi-modality 3D processing is possible with access to GE's Volume Viewer applications from the Universal Viewer. Features such as Radiology Information System connection, Post-Fetch, Dynamic Compare, Auto-Contour, and Auto-push for key images streamline 3D review. Additional capabilities ensure state-of-the-art 3D visualization and high-performance to help make image processing a stress-free component of routine workflow.

Integrated Registration further streamlines workflow when combining any two of the five major modalities (CT, MR, PET, SPECT, and X-ray Angiography). Users can load and register volume acquisitions from either the same or different modalities on-the-fly with the drag and drop feature.

For oncology studies, OncoQuant organizes and displays oncology data to facilitate quick review. The Oncology Review protocol and follow-up wizard simplify the assessment, characterization, and measurement of findings on the basis of morphologic criteria.

## One workstation, multiple applications

Universal Viewer is an intelligent imaging application that connects advanced visualization, provides extensive multi-modality imaging tools, image-enables EMR systems, and unlocks patient history from disparate systems to better inform and streamline diagnosis. All delivered in an easy-to-use, unified reading desktop. ■

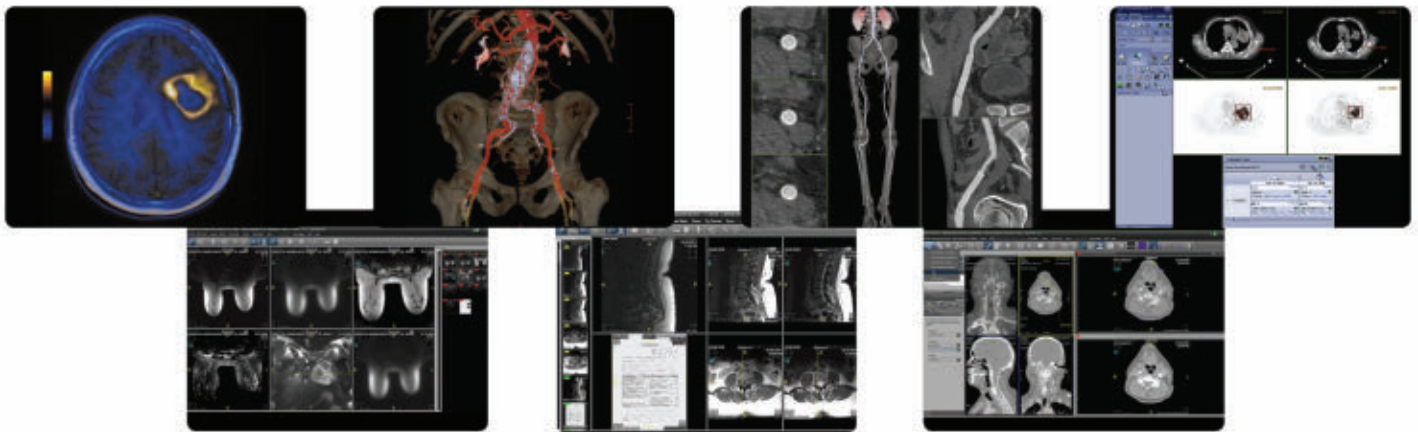
### Reference

1. Hillman B J. Radiologists' Burden of Inefficiency Using Conventional Imaging Workstations. Research conducted by ACR Image Matrix, Philadelphia, Pennsylvania in partnership with GE Healthcare. 2013.

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# Intuitively brings together 3D post-processing, breast imaging tools, and enterprise-wide access on a single desktop.



Featuring a single image repository across 2D and 3D studies, Universal Viewer intuitively brings together 3D post-processing, breast imaging tools, and enterprise-wide access on a single desktop, with a choice of Web-based and zero-footprint configurations.

- Intelligent productivity tools include smart hanging protocols that evaluate the study being displayed to determine the most appropriate method for it to be hung.
- Advanced visualization applications provide a seamless, single source for postprocessing of images. Native MIP/MPR and PET-CT tools along with vessel tracking, multi-modality fusion, 3D volume viewing, bone removal, and oncology, powered by AW are available.
- An advanced mammography workflow application supports screening and diagnostic workflows, displays multimodality images, and lets clinicians quickly access patient history and relevant priors.
- Universal Viewer's Web client provides radiologists, referring physicians, and other clinicians access to the system from any location. The study list serves as the hub of the work flows and is accessible by using just the browser, providing fast access to vital study and patient information stored in a PACS, RIS, EMR, and HIS. The viewer has the same look and feel in either Web client or zero footprint configurations. With zero footprint, Universal Viewer enables enterprise-wide image access without installing any software. It can be used on both Mac and PC, and accessed directly from each patient's record using single sign-on.

Centricity\* PACS and Centricity PACS-IW with Universal Viewer put clinical insight within reach to help healthcare systems and care teams deliver patient results efficiently.