

# Selecting and Deploying a Vendor Neutral Archive

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*Whitepaper*

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## Abstract

What is a Vendor Neutral Archive (VNA)? Why should one consider a VNA? How does an organization select and deploy a VNA? This paper will answer these questions and discuss the challenges and nuances related to achieving this goal.

In an ever changing medical imaging industry, the challenge of implementing a departmental PACS solution has evolved. As more and more healthcare enterprises plan for replacement of their legacy departmental PACS solutions (either with a newer generation replacement sibling from the incumbent vendor or by a solution from a completely new vendor), organizations are faced with tough tactical and strategic decisions.

Tactically, organizations must:

- Determine how they can migrate their existing imaging data within a reasonable time frame and at an acceptable cost while ensuring all related imaging data is included (i.e., presentation states, annotations, ROIs, etc.).
- Ensure the acceptance of the new solution by the end-user community, which often proves to be a difficult challenge.

Strategically, organizations must:

- Leverage this moment of change as an opportunity to invest in a solution that will eliminate having to relive this same migration challenge 5 to 7 years when the organization will once again be replacing the PACS is now planning to install.
- Consider the value of consolidating all medical image archives into one archive. It is very rare for one enterprise to have only one PACS. Most have multiple PACS built around the unique requirements of the specialty area (e.g. radiology, echo, cardiology, endoscopy, cath lab, etc.). Each PACS has its own unique archive, each requiring a separate archive migration when a PACS change is being considered.
- Envision the challenges of image enabling the enterprise EMR application. If medical image data is stored in each PACS domain, the customer must integrate the EMR with each PACS, and train the end users on the unique viewer associated with each PACS. These complications can add substantial time and cost to an EMR deployment. Centralizing image data in a single repository that can integrate with the EMR and present image data with a universal clinical viewer should be a strategic goal.

These tactical and strategic situations are compounded through the ongoing trend of consolidation across imaging centers and hospital systems growing through mergers and acquisitions. These trends

further propagate disparate PACS, accentuate the need for strategic medical image archives, and raise important operational questions. For example, how does an enterprise own, share, and provide access to their imaging data across multiple disparate PACS? Most times, the seemingly easy answer is to move forward with a “fork lift” replacement solution and enforce an enterprise PACS design across “all” departments. However, this approach is neither cost effective nor efficient. It is unlikely that a single enterprise-wide PACS will satisfy all specialties and prevent future image archive migrations that involve substantially larger volumes of image data.

Investing in a VNA is a strategic decision that should be made at either the inception of a new PACS (“green-field” opportunity) or when a replacement PACS decision is considered. Doing so enables healthcare providers to own their imaging data so they can decide how to share and access their medical image data across the enterprise.

## **The evolution of long-term archives from PACS vendors**

To appreciate the value of a VNA, it is helpful to understand the evolution of medical PACS. Over the past decade, most of the major radiology PACS vendors have acquired Cardiology PACS solutions, recognizing that managing imaging data was strategically important, regardless of departmental workflow challenges. Unfortunately, the acquired technology was significantly different from the incumbent PACS technology. Therefore, interoperability between the radiology and cardiology PACS solutions was not easy to attain. Listening to the market, these PACS vendors made significant investments in “integrating” their radiology and cardiology PACS solutions. “Integrating”, however, has been largely focused on the consolidation of the long-term archive. Some of these PACS vendors have been successful and the result has been the promotion of “enterprise DICOM archives”.

The concept of an “enterprise DICOM archive” is a significant improvement, but it actually doesn’t go far enough to address the strategic issues associated with long-term image ownership, image sharing and image access across the entire healthcare enterprise.

While PACS vendors have been busy integrating their own products, small and innovative companies have been focused on Enterprise Image Management and are building solutions to bring disparate PACS solutions together. Companies focused on Enterprise Image Management understand that the issue at hand is image and data management across the enterprise at department, hospital and regional levels. There is a business demand to connect disparate PACS solutions regardless of the PACS vendor.

There is nothing wrong with PACS vendors developing a technology and marketing a strategy that encourages healthcare organizations to invest in a single PACS vendor solution. However, if healthcare organizations choose to adopt a single PACS enterprise solution, they must address the following challenges:

1. A single PACS workflow solution across all imaging departments will most likely result in end-users dissatisfaction due to lost functionality and challenges related to the adoption of generic multi-department workflows.
2. Departmental and specialty physicians often prefer a specific PACS. There is not a single PACS solution on the market today that is accepted across all departments and specialties. The unique requirements of many specialties results in specialty PACS being implemented.
3. Preparations for the next long-term image archive migration should begin immediately because the need for an archive migration is inevitable. Ensuring that all image data can be exported, including presentation state and annotations, is an integral part of image migration planning. The expert knowledge of how to accomplish a successful image migration typically rests with the incumbent PACS vendor (aka: the vendor who's PACS is being replaced). Accessing image data with a potentially non-cooperating incumbent vendor requires specialized third-party professional service skills, time, and money. In many cases, when users are not able to access the "know how" skills to complete a complex image migration, key image data is forfeited.

A vendor-neutral solution solves these challenges, not by replacing client-facing PACS workstations, but through interoperability and consolidation of long-term image archives across disparate PACS solutions. A VNA enhances healthcare enterprise's current PACS investments and enables the propagation of best-of-breed departmental PACS solutions. Most important, the enterprise retains the ownership of its image data and can establish the protocol for sharing and accessing image data.

## Why do customers buy archives from their PACS vendor?

Most PACS vendors would like to sell and implement their long-term solution with every customer, typically offering the following value propositions (possibly others):

1. Supportability – One vendor servicing the entire PACS (including the long-term archive) is more effective and delivers better MTTR and MTBF.
2. Cost Savings – One vendor can provide more savings to the customer because of higher purchase volumes.
3. Integration – A single solution from one PACS vendor provides for better integration and more efficient workflow.

When evaluating an enterprise-wide PACS solution, consider the following:

1. Supportability – Long-term image archives are comprised of software and hardware. The software is supported by one vendor, the hardware by another, and it is a rare situation when one vendor supports it all. Replacing the PACS vendor on the software support with a VNA is an even swap. It is a rare occurrence that long-term archive software causes problems in a PACS environment. Most long-term archive problems are hardware related.

2. **Cost Savings** – Most healthcare IT departments have preferred compute, network and storage vendor contracts that include attractive discounts. Allowing a customer to purchase their preferred hardware under their preferred vendor contracts will save money and typically will retire long-term volume commitments. Competitive negotiations on long-term archive software and related software support will yield the best market price and save the customer money.
3. **Integration** – Most “enterprise DICOM archives” supplied by PACS vendors use the same industry standards to move image data that a VNA uses: DICOM commands. If the PACS vendor states that there are additional “special” add-on values, the user should be concerned as this is a strong indicator that the vendor’s “enterprise DICOM archive” is a proprietary solution.

Additional reasons a PACS vendor may want your healthcare organization to purchase a PACS-centric archiving product:

1. **Revenue (tactical)** – Vendors make money selling long-term archive software (minimal), related hardware (lots) and on-going support and maintenance (profitable). Significant hardware revenue will motivate most vendor sales representatives who can then apply hardware sales to reaching sales quotas. And from a business perspective, more revenue, even if revenue with low profit (hardware), is good for revenue-challenged businesses.
2. **Switching Costs (strategic)** – PACS vendors do not offer true vendor-neutral solutions. Said differently, PACS vendors are not VNA vendors. It is rare for a user to operate a PACS from “PACS vendor A” while using a long-term archive from “PACS vendor B”, when no PACS from “vendor B” is in operation at the customer’s site. In many cases, PACS sales representatives are able to convince the customer to migrate all image data from the incumbent PACS vendor’s long-term archive to the new PACS vendor’s long-term archive to ensure effective PACS vendor support. And, as previously noted, migrations are costly and time-consuming projects. Securing a PACS long-term archive is a strategically important sales goal because it virtually handcuffs the customer to a specific PACS or to the incumbent PACS vendor’s replacement product.

## What is a Vendor Neutral Archive?

Market demand is growing for Vendor Neutral Archive (VNA) solutions. “Enterprise DICOM archives”, as discussed earlier, are the response of a PACS vendor’s proprietary storage solution. A VNA is a vendor neutral and industry standards-based archive solution with advanced management tools and key functions.

Understanding the value of a VNA begins with understanding the key features and functions of this proven approach.

- **DICOM Storage** – Storage of imaging data in its native DICOM-standard format to enable the highest level of integration with disparate PACS solutions.

- **Enterprise Image Viewing Enablement** – A clinical viewer built on zero-footprint, low-profile web technology to image enable the enterprise through a consolidated and simplified mechanism. No longer should an organization require separate web viewers for each disparate PACS solution.
- **Departmental Awareness** – Ability to associate imaging data to departmental origins to ensure duplication is not an issue, to enable updates of patient and exam information, and to simplify the next departmental PACS replacement.
- **HL7 Interface Support** – To maintain DICOM attributes relating to patient and exam information
- **Storage Neutral** – Enable existing storage infrastructure (EMC, HP, IBM...) and strategies (HSM...) to be leveraged, regardless of the vendor and solution.
- **DICOM Normalization** – Provide for harmonization of image data when transferring images between PACS solutions to support DICOM attribute translation (e.g., study descriptions, exam codes, modality codes), storage class conversion, compression, and the conversion of non-DICOM artifacts to DICOM.
- **Imaging Integration Workflow** – Provide advanced rules-based image routing and pre-fetch workflow.
- **Accessibility** – Support DICOM Query/Retrieve requests from your existing departmental PACS solutions and the ability for an administrator to push data from the VNA to a newly installed departmental PACS solution or to support a physician’s request.
- **Watermark Management** – With human interaction and confirmation, provide the ability to identify imaging data that may be candidates for purging.
- **Patient Matching Support** – In conjunction with DICOM normalization, provide the ability to manage or query for patient unique identifiers and update the appropriate DICOM attributes when moving images across disparate PACS.
- **Archive Management** – A VNA’s core competency is managing the storage and movement of images across disparate PACS. With this competency, the solution should provide a comparable set of administrative tools for monitoring transactions, auditing DICOM normalization, browsing the archive, scheduling of DICOM sends, managing rules, and more.
- **Support of PACS Conversions** – When converting to a new PACS, it is important that the VNA include the special utilities that enable users to inform the new PACS about patient image data that is already stored in the archive and is accessible to the new PACS. In some cases, the new PACS will need to be populated with image data from the archive for testing purposes. These tools make it much easier for enterprises to implement a new PACS.

A subset of the features described above are likely available in PACS vendor provided “enterprise DICOM archives”. The ability to solve the complexities of disparate PACS integrations, however, is enabled through the additional features and functions provided by a VNA solution. These key features enable patient data and image ownership and deliver the ability to share and provide access to imaging data across an enterprise, regardless of current or future PACS decisions.





## DICOM Attribute Normalization

If a radiologist, cardiologist or other specialty physician was asked about the clinical outcomes he or she would like to see related to implementing a VNA, the list would likely include the following:

- The ability to access image data without the direct involvement of the PACS
- The ability for historical image data to be moved into the current PACS, without regard for the originating PACS, and have the imported study hang as a relevant prior by the current PACS
- The ability to proactively and systematically have historical images fetched to the current PACS system, without regard to the originating PACS
- The ability to auto-route specialty procedures or procedures performed off hours to the most appropriate site, department, and PACS

To accomplish any of these outcomes, a consolidated view of the imaging data is required. This can be provided by implementing a VNA. Once a consolidated view has been attained, the ability to move the images from one PACS system to another is required. This feature is also standard across most PACS through the use of DICOM commands. However, once users start asking for the images to be imported such that hanging protocols may be appropriately leveraged, the need for DICOM attribute normalization is required.

In the most likely scenario, disparate PACS system dictionaries are not synchronized, resulting in a need to update certain DICOM attributes within each study to ensure the most appropriate hanging protocol is leveraged. For example, in order for certain hanging protocols to work effectively, study descriptions, modality types, and body part naming must be the same in both the source and destination PACS. The likelihood that two enterprises have coordinated these encoding protocols is low. Additionally, patient MRN and study accession numbers must be unique and given that the studies are coming from different systems, there is risk of conflict. If any of these concerns are valid, then DICOM attribute normalization is required as a product extension to a VNA.

To build on the concept of DICOM attribute normalization, more advanced features of some VNAs will additionally be provided to convert non-DICOM objects to DICOM, to compress imaging data, to convert storage classes, and in many cases, most importantly, custom converters for translating proprietary PACS vendor presentation state and annotations to standard DICOM.

## Imaging Integration Workflow

PACS integration must also address clinical workflow management and the integration of workflows across disparate PACS implementations. How does a healthcare organization implement Imaging Integration Workflow? How does the organization gain the ability to route images to where staff is

available off hours or the ability to route images at either a study or series level to a specialist when a particular procedure type is performed? Or, how does the organization gain the ability to pre-fetch historical images, regardless of the originating PACS, or regardless of where the images are currently stored hours before a procedure is performed to ensure physicians have the historical data that they need? These considerations — and others — are components of Imaging Integration Workflow.

Many systems available today support these types of workflows within their departmental PACS solution. There are few solutions available in the market today that enable intelligent routing and pre-fetching of imaging data across disparate PACS. And there are even fewer that support this functionality in combination with DICOM Attribute Normalization. As discussed earlier, it is this last nuance that ensures the imaging data is properly received and understood by destination PACS so that images are associated with the appropriate patient and hanging protocols may be leveraged.

## Accessibility

How can a VNA simplify enterprise accessibility to your imaging data? Enterprise accessibility has two key attributes:

1. All patient image data, regardless of department (e.g., radiology, cardiology, endoscopy, RF, dental, echo, wound care, etc.), must be accessible from the enterprise EMR through a single DICOM, web-based, smart-client, clinical viewer application.
2. All medical image data, regardless of department, must be viewable and accessible by any PACS system.

A VNA provides the consolidation of imaging procedures performed across disparate PACS within the enterprise. With all image data now consolidated, a single clinical viewer, built using current web technology, can more easily image-enable the EMR. Separate web viewer integrations are no longer required for each disparate PACS system. Secondly, with a VNA the support of DICOM query/retrieve functionality provides another element of access that builds on data sharing with routing and pre-fetching. Now, each disparate PACS system can obtain the desired enterprise view of imaging procedures.

## Support of PACS Conversions

Understanding the desired clinical outcomes of a VNA, the next question whether a VNA can prevent future long-term archive migration challenges and lower the cost of switching to a new PACS in the future? VNAs are built to be PACS neutral. VNAs embedded capabilities are designed for effectively managing an archive and with their accompanying toolset, a user has the ability to browse, filter, and perform image data moves using industry standard protocols.

With a VNA, an enterprise's next departmental PACS replacement is much simpler. Populating the new PACS system with imaging data is simplified with the following steps:

1. Browse the VNA through an intuitive user interface.
2. Select one month of image data to be sent to the new PACS. Use this one month of image data for testing purposes.
3. Once testing is complete, clear the new PACS files, select the image data to be sent (e.g., all studies < 2 years old) to the new PACS.
4. Schedule a "send" of the selected data starting with the most recent procedures, based on a flexible user defined schedule.
5. Modify DICOM attributes to conform to the new PACS standards during the "send" phase.
6. Maintain audit records of studies that have been sent to the new PACS.

Although there may be more image data in the VNA than what was selected to be pre-loaded (e.g., studies older than 2 years), the addition of pre-fetching functionality provided with a VNA ensures that relevant priors are sent to the new PACS when orders or on-demand requests are received.

## Selecting and Deploying a Vendor Neutral Archive - Summary

The evolving healthcare enterprise market is driving the growth of VNAs. Key market drivers:

1. **Own, Share, Access to Image Data** – Image data archived in a PACS-dependent archive, is not owned by the healthcare organization licensing the PACS system. The healthcare organization has licensed the PACS, but access to, and sharing of, the image data are dependent on a) expert knowledge of the internal PACS and b) the healthcare organization's relationship with the PACS vendor.

Solution: Store image data in a VNA so that that can be shared and accessed in an open manner, using industry standard protocols, at the organization's discretion.

2. **Archive Migration Cost & Complexities** – Organizations considering moving away from their incumbent PACS must address costly and time consuming archive migrations. The possible loss of critical image data adds to user frustration.

Solution: Migrate the image data to a VNA. If you are going to migrate data once, ensure that you avoid having to do it a second time in the future. Partner with a PACS-neutral technology vendor who can help minimize the loss of critical image data.

3. **EMR Image Enablement Challenges** – Image enabling the EMR is complex and costly when dealing with multiple PACS. Complex integration testing involving all PACS vendors and the EMR

vendor takes time. The challenge of training clinicians on the different user interfaces of each PACS viewer slows adoption.

Solution: Deploy a VNA and a single DICOM web-based clinical viewer.

Organizations considering changing PACS technology and/or vendor or who are considering an initial investment in PACS are encouraged to build a strategy that consolidates long-term image archiving as a prerequisite to selecting the replacement or new PACS technology.

Organizations challenged with an image migration project, should partner with a firm that has the expertise to migrate the data to a VNA. Archive migrations are costly and time consuming, so the best approach is to migrate an image archive one time only.

When considering which VNA will best meet organizational requirements, healthcare enterprises must ensure that they select a product family that includes the appropriate tools that empower self-sufficiency and reduce or eliminate dependency on VNA professional services.

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