

The Path to Vendor Neutral Archiving

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Archiving capabilities and vendor neutrality are relatively simple concepts to understand, but the overarching clinical, business, and operational benefits of a vendor neutral archive (VNA) are less intuitive. The versatility of a VNA solution can be leveraged as a cornerstone of an overall enterprise imaging strategy and further. A VNA offers value to a range of initiatives from a simple archiving solution to a complete Enterprise Imaging Transformation™.

There are a variety of business and operational benefits a VNA offers to help healthcare organizations competitively respond to current and emerging market forces. Despite these benefits, obtaining executive or senior management buy-in for a VNA solution can be daunting. Healthcare is dealing with changes and impending deadlines around Meaningful Use, ICD-10, and Accountable Care Organizations (ACOs). Any new initiative must contain robust communication and buy-in components for it to be successful. This article clearly delineates the value of a VNA technology and outlines the key components of a successful business strategy.

Leveraging a VNA

With an onslaught of regulatory, reimbursement, and consumer pressures, scale matters more than ever in healthcare. Mergers and acquisitions allow organizations the ability to offer a larger variety of services across the care

continuum and an opportunity to efficiently leverage both existing and centralized infrastructure to capture additional patients at marginal costs. However, two major challenges emerge: how to integrate newly acquired sites with existing facilities and how to effectively manage increasing volumes of studies. This is where a VNA offers optimum value. A VNA offers a vendor neutral and hardware agnostic solution to integrate newly acquired sites with existing platforms.

A VNA is also an important option when replacing legacy PACS. It can provide the platform to support longitudinal medical records, with images, from studies conducted across multiple departments and facilities, while archiving and managing studies centrally. PACS run in a structured environment, to address the workflow of radiology and cardiology where DICOM data dominates. A VNA allows an enterprise to integrate beyond DICOM without imposing radiology or cardiology workflows on other departments and offers providers a more complete imaging record.

A VNA drives optimization across an organization's enterprise imaging operations. An integrated solution will provide the appropriate staff access to information on demand on any secured device. A VNA will aggregate all image data and is not dependent on clinical systems. Upon adopting a VNA, users will experience an exponential improvement in performance once the VNA becomes the horsepower behind accessing and viewing

image data. Integration and interoperability are keys to managing, storing, and distributing medical images within and outside of a healthcare system.

A VNA offers enhanced image life-cycle management (ILM) capabilities. Typical storage devices can only determine when an object was created and when it was updated and accessed, they do not know what the object is (eg, mammogram) and cannot create rules for how to best manage the object long term. By contrast, a VNA knows what the object is, and that it has a unique retention policy. Depending on the clinical information, a VNA can determine where to move those data, or whether to compress them or delete them.

Financial risk is tied much more closely to delivery models than in the past. Successful healthcare organizations will need to substitute value for volume and focus on caring for populations rather than singular episodes. ACOs, patient centered medical homes (PCMH), and other emerging models share a common goal that is to better deliver care to achieve optimal health outcomes while reducing overall costs. Implementing the right technology across an enterprise can support an organization's journey towards these models and managing risk.

Population health management is highly dependent on aggregating data and driving analytics that help identify care solutions and risks. A VNA offers interoperability between content management systems and clinical systems to

provide this level of support and provides the platform for data mining in business intelligence, imaging analytics, and the visualization tools associated with metrics and measurement.

With significant market pressures such as regulation, aging populations, and increasing prevalence of chronic disease, value-based payment models and other forms of alternative care delivery models are rapidly gaining popularity among payers and providers alike. A successful healthcare organization of the future will begin responding to the market dynamics today by becoming more operationally agile and technologically integrated. Organizations will need to easily exchange data within their enterprises, via an HIE, and with an ACO.

To meet market challenges, specifically within imaging, leaders will need to implement standards-based solutions that allow simplified access to images, effective workflow managers, analytics capabilities, and scalability across all in-house and external departments and modalities. A VNA has the potential to serve as a pathway for providers to access patient imaging data, or all patient data if configured as a cross-enterprise document (XDS) sharing repository.

Components of an Enterprise Imaging Strategy

To understand how VNA fits into an overall enterprise imaging strategy it's important to first consider what that strategy should entail. A successful strategy can be complex including multiple moving parts with varying impact at any given time. However, carefully considering and optimizing the following components will help move an organization closer to its goal. Figure 1 is a visual representation of the components discussed below.

Organization

Emerging market forces will require enterprise-wide strategies for long term success including system interoperability. Corporate initiatives such as

procurement, system administration, and workflow/procedural standardization will help organizations begin to think globally about their enterprises.

Practice

An enterprise imaging strategy should include an open practice environment where consulting, collaboration, and referencing are encouraged among providers and patients.

Care

As the market shifts from fee-for-service to more value based payment models, employing a strategy that emphasizes quality over quantity will put an organization ahead of the pack.

Focus

With the advent of fee-for-quality and ACOs, providers and organizations as a whole are moving toward patient focused

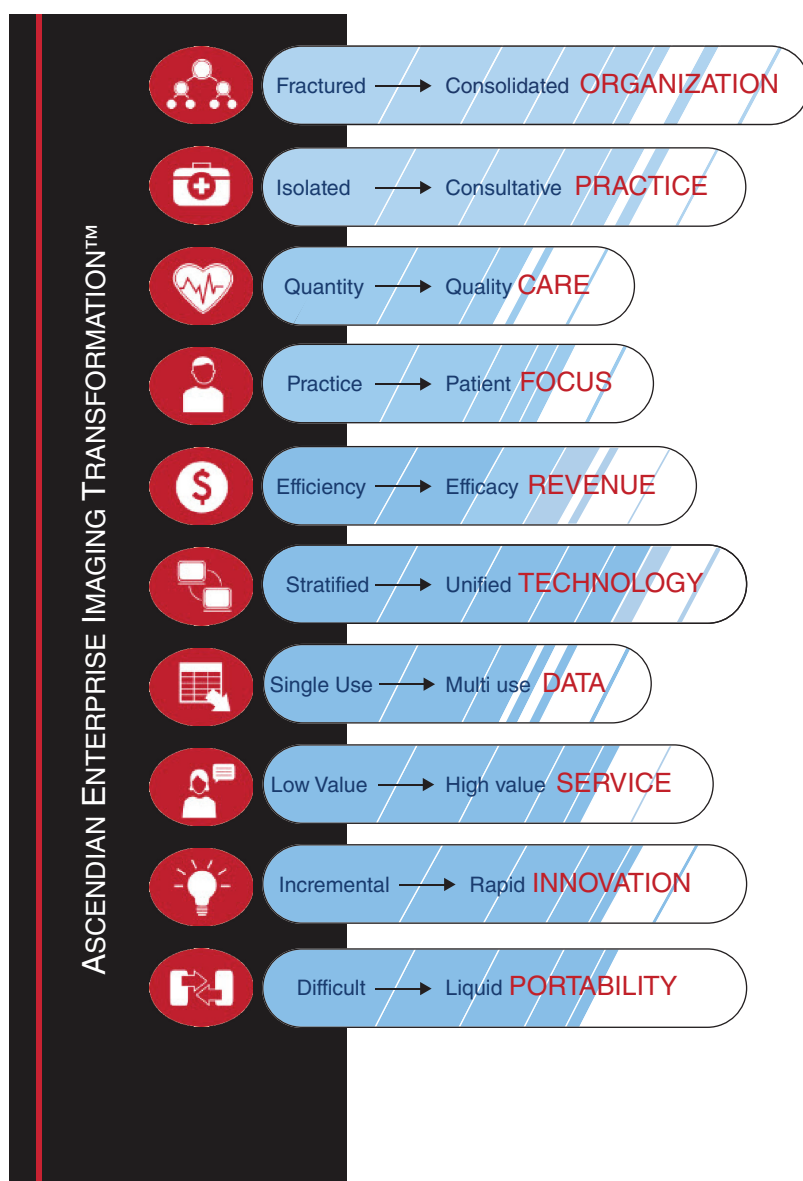


Figure 1 • Components of an Enterprise Imaging Strategy
Source: Ascendian Healthcare Consulting

business models. The emergence of wearables and smartphone apps is accelerating the move toward this focus.

Revenue

New models of care require optimizing efficacy, as reimbursements are contingent upon outcomes, non-duplication of services, and reduced readmissions.

Technology

Healthcare IT implementations are shifting towards unified enterprise-wide initiatives to realize better workflow automation and enterprise-wide analytics capabilities. A key technology consideration is interoperability. Interoperable applications and systems improve the exchange, reuse, analysis, and visibility of health information.

Data

Historically, entities have utilized data for singular uses (reporting, treating, etc). Multiple primary and secondary uses are now the norm (analytics, population health, etc). Coupled with a consolidated enterprise imaging platform and analytical tools, robust data provides visibility into operational efficiencies, strategic analysis, and better outcomes.

Service

Patient experience is quickly becoming a priority in healthcare. As market focus shifts towards the patient, experience and customer service will increasingly be a point of competitive advantage.

Innovation

The ACA and emerging technologies have provided an environment for speed to market innovation. The market will reward organizations that think outside the box on issues of care delivery, revenue, technology, and other aspects of care and business operations.

Portability

Organizations building an enterprise imaging strategy should move toward increased data liquidity. Easily shared data offers a patient centric approach as seen in the growth in patient portal

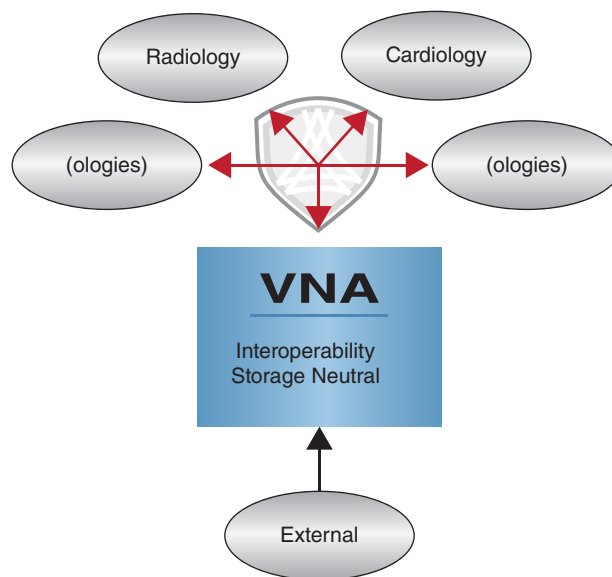


Figure 2 • Source: Ascendian Healthcare Consulting.

solutions via the electronic medical record (EMR).

Implementing a VNA touches a number of these components. A VNA allows standardization of workflows and streamlines how data is captured, stored, retrieved, and analyzed. It can transform the way a practice operates by opening new paths to collaboration, data sharing, and consultation. A VNA can better capture and measure performance so areas requiring additional support can be identified and care quality can be improved. In terms of data, a VNA gets the organization closer to taking advantage of the massive benefits gained by mining and analyzing data. Benefits such as clinical knowledge discovery and process improvements are all possible with VNA. Implementing a VNA is a major step toward data liquidity. The VNA is able to bring disparate data elements together into a single manageable patient record that can easily be shared among providers inside and outside of the organization.

Understanding Incremental Functionality

Obtaining full buy-in from the executive team requires knowledge of a VNA's

specific function and how each function contributes to the organization's overall goals. Below are a few examples of a VNA's features and benefits. See Figure 2.

Central Image Storage Management

A VNA provides a single storage management strategy regardless of the number of clinical systems (PACS or otherwise) an organization employs. A key feature of a VNA is the ability to store images regardless of format: DICOM and non-DICOM. This provides the best solution for long term longitudinal patient jacket image availability with the least amount of latency.

Security

The security structure of a clinical system can have significant gaps (especially as image data is linked to EMR/EHR systems via URL). A good VNA will have a robust security layer in compliance with both internal and external user access policies as mandated by the organization. A VNA consolidates access points and methods to allow for efficient access control and audit capabilities.

Disaster Recovery

In the event of a disaster a VNA can index metadata from a DICOM header and rebuild a database. The VNA manages

multiple copies and can manage them in multiple formats as required or desired by the organization (DICOM, compressed [lossy or lossless]). A VNA can be stored and managed locally as well as in the cloud for true disaster recovery of disparately located copies or across to separate data centers. A VNA can also act as a disaster recovery image viewer with zero footprint or DICOM compliant viewer in the event of ancillary imaging system failure or downtime.

Interoperability

Often within PACS, orders are manually created for each imaging set or instance. Sharing images creates “exceptions” in the system if, for example, a radiologist wants to view images from another site, clinic, or view a relevant prior. A VNA can pull metadata from the image object and automatically create an order as a workflow automation component so images are immediately associated with the patient jacket.

Data normalization is essential as sites/systems have disparity in nomenclature and other fields within DICOM. A VNA can normalize data via tag morphing and translation. This is important as the industry moves toward big data, analytics, informatics, and business intelligence. Standards and compliancy-based platforms such as VNA allow systems (EMR/EHR), devices (modalities/cameras/etc) and applications (such as viewers) to interoperate within designated healthcare technology standards.

Lifecycle Management

Highly available and high performing disk storage is expensive to purchase, maintain, and replace. A VNA provides ILM rules that can move images off expensive storage to cheaper media or even offsite for cloud-based long term archive storage. A VNA will include clinical rules to immediately move images that have low odds of review after initial diagnosis to cheaper storage options leaving high performance storage to be utilized for image data with high odds of secondary review.

Single Point of Integration

A VNA can provide a single outbound point of integration to an EHR, therefore eliminating management and support integration from multiple PACS environments. Performance is often improved, especially in larger organizations where PACS can struggle to keep up with demand. The VNA manages images and can scale much larger than the PACS. A VNA can also be leveraged as a single point of integration into an HIE and for enterprise analytics as opposed to having every disparate clinical system integrate to provide data up to these bridging solutions.

Simplified Data Viewing

Every PACS deploys its own viewer, both diagnostic and clinical (review). As a result, radiologists who read across sites/systems must use multiple PACS specific viewers. This is cumbersome and introduces risks for patients and the organization. The referring community is frustrated by PACS dependent enterprise viewers, as well as workstation, platform, and browser incompatibilities. From an organizational perspective, having to deploy multiple viewers is complex and costly for IT to support.

A VNA provides a single platform and with the right viewer simplifies image access from radiologist to referring physician using a single viewer (often zero or low footprint) and reduces incompatibility issues. In a PACS environment, physicians are often locked into a single viewer with pre-designated toolsets. In a VNA environment, more than one viewer can easily be utilized for additional toolsets and specialty viewing. A VNA's interoperability allows for attaching additional DICOM compliant viewers to suit specific needs. This feature offers physicians options without locking them into PACS specific viewers.

Common Misconceptions of VNA Implementation

As an organization considers the benefits of a VNA solution it's important to understand the limitations of the

technology and policy best practices. Below are some common misconceptions of a VNA implementation.

A VNA is not an enterprise content management (ECM) solution or a workflow manager. A VNA can easily support and integrate an organization for ECM and workflow management but does not offer services a typical ECM solution would provide, such as document management, Web content management, collaboration, search, and digital asset management.

Often, organizations mistakenly assume that a VNA implementation will eliminate all future migration costs. If a VNA is replaced, data will have to be migrated again and it's important to remember even an in-house migration will cost an organization money. Each new system that integrates into a VNA will undergo migration.

Like PACS, VNA downtime does occur. However, and unlike downtime associated with PACS, a VNA's inclusion within a stratified architecture allows for a modular approach when addressing the organization's platform maintenance and updates. Therefore, separate components of the platform can be managed individually without impacting other services running within the platform. In addition, a strong VNA architecture can provide high availability across multiple platforms that can reduce operational and, ultimately, care disruption.

A VNA solution's ROI is most realized once it becomes an enterprise platform (including ologies outside of radiology and cardiology). This means governance must include leadership from other departments and specialties.

VNA solutions are more differentiated by vendor than PACS—by a significant factor. If a VNA is acquired that does not offer the core services an organization requires, the organization will be locked into a product that underperforms. Engaging an expert will help ensure the current environment is fully understood, options are provided, and that the right solution is selected. The key is choosing the right vendor for the right reasons.

Building a Business Case

VNA as a medical image-object management solution provides an incredible business opportunity, but many healthcare organizations find it difficult to define the requirements, benefits, and costs in a manner that justifies the investment. Some organizations may have resource constraints for assessing the needs of a new technology, let alone resource availability for procurement and implementation. This may be the result of factors including existing long term contracts, legacy systems, opportunity costs, and capital and operational costs of standing up an EHR. Despite resource constraints, organizations that value preparedness and creativity recognize that a VNA offers a potential ROI, and the benefits of this technology can be ultimately connected to better patient care. Leaders of these organizations realize they will soon be confronted with a slew of market pressures, such as:

- Mergers and acquisitions
- Modernization alternatives
- PACS replacement
- Centralization
- Support simplification
- Increased user (referrer and patient) satisfaction
- Greater integration (EHR and HIE solutions)

The versatility of a VNA solution offers options to resource and cash constrained healthcare organizations. Implementing a VNA does not necessarily require a total overhaul of a medical imaging department. Moving to a VNA is not necessarily a decision to move away from PACS.

Generally, an organizational strategy to remain PACS centric is a simpler solution and endeavor. However, overall long term costs tend to be higher with this option. Organizations without a strong in-house IT department or an immature IT department may choose to remain PACS centric. Moving away from a PACS centric model is more complicated, but

can reduce overall long term costs. This approach is more accommodating to organizations with mature IT departments with domain expertise in-house to manage the complex environment.

With features such as consolidation, interoperability, and data liquidity, a VNA can mitigate future legacy system investments and costs. Rather than expanding multiple legacy systems with redundant software solutions to provide similar capabilities, a VNA's modular design allows departments to exploit or share features and functionalities of other existing platforms within the enterprise. For instance, the functionality of end-of-life viewers for legacy platforms may be consolidated within a single enterprise viewer platform. Therefore, reducing future system refreshes, support overhead, and licensing costs. Also, VNA mitigates costs associated with maintenance and support of proprietary and inflexible storage methods deployed within common PACS environments. Collapsing all imaging platforms into a single archive reduces the need for excessive support, maintenance, and redundant hardware costs to support multiple systems.

VNA Options

VNA options are as diverse as their clients. There are three levels of VNA products available in the market, each uniquely leveraging existing infrastructure.

Level 1: PACS Neutral Archive (PNA)

PNAs are simply third party DICOM archiving solutions allowing for storage of DICOM specific image data from multiple PACS. They usually lack the ability to store non-DICOM data. They also lack ILM and Web services to publish the data to an HIE.

Level 2: Imaging System Neutral Archive

Imaging System Neutral Archive, sometimes referred to as a Hybrid VNA, archives all types of imaging objects from all type of imaging systems. This solution then converts objects to DICOM or XDS compliant formats. Imaging System Neutral Archives offer the following basic core abilities:

- Web services for header/database index publication
- Certified hardware virtualization
- Hardware agnostic implementation option
- ILM
- Routing/prefetch rules
- Data normalization tools
- Native DICOM and non-DICOM object archival in native format
- Single patient record across all disciplines
- Ability to utilize best-of-breed DICOM viewers from a third party

Imaging System Neutral Archives are capable of storing non-DICOM objects; however, once ingested and converted to a compliant format, imaging data cannot be retrieved and utilized by the native clinical system.

Level 3: Full VNA

A full VNA offers the ability to archive and manage image data in DICOM and XDS compliant and native formats. In this VNA environment, non-DICOM and non-XDS objects can be managed without manipulation or intervention. Therefore, once ingested, imaging data can be retrieved and utilized by the native clinical system.

In addition to the features listed for an Imaging System Neutral Archive a full VNA offers the following basic core abilities:

- Single integration point for image enablement for all archiving clinical systems
- Unified fully integrated image viewer for DICOM and non-DICOM objects
- Ability to utilize best-of-breed DICOM viewers from a third party

A full VNA will provide you with a one-stop shop for all archiving needs and dissemination of all image data to EMR and HIE exchanges by default.

The ROI of these initiatives is complex and cannot be simply calculated as a five year projection. Rather, these initiatives are strategic in that they allow

an organization to better position themselves as leaders in the emerging health-care market and robust competitors in the evolving payment environment. Investing in a VNA should be viewed as an enterprise-wide patient care initiative that results in significant gains in data liquidity, interoperability, and future market position.

Case Study

Sentara Healthcare operates over 100 sites of care serving the residents of Virginia and northeastern North Carolina. Founded in 1888, the organization is growing and is recognized as one of the top integrated healthcare systems in the nation.

As a market leading integrated delivery network, Sentara sought to deliver superior patient care and expand. The organization considered a VNA solution to help them meet these objectives and to increase interoperability and connectivity among their current and future enterprise imaging initiatives. Sentara engaged a consulting partner to establish the foundations required for a successful business strategy and the supporting analysis, education, phased design, and deployment. Sentara's goal in procuring a VNA was to enhance their capabilities across clinical image data flow, workflow, and integration with their EHR solution. The effort required:

- Identifying the technical and functional requirements of an enterprise imaging platform, including an enterprise viewer.
- Developing and delivering education to technical, clinical, and executive leadership.
- Conducting a robust vendor selection process.
- Creating a design, build, migration, and implementation strategy that includes image enabling their EHR (EPIC).

Each of Sentara's ten hospitals had unique needs based on existing technology, processes, and organizational

requirements. The final VNA solution would need to provide disaster recovery capabilities and business continuity across the existing silos of data. It was important to articulate how each VNA solution under consideration would drive clinical integration, enterprise-wide image management, and sharing of images in a unified context. Key components of the planning phase included:

- Building a business case that demonstrates the value of VNA from a clinical, technical, and cost perspective.
- Understanding the technical and clinical impact of a VNA solution.
- Designing a strategy to provide enterprise image access from a single viewer while the VNA effort is underway.
- Shaping an implementation strategy that meets the demands of the organization's complex environment, including a migration strategy.

Today, Sentara's VNA harnesses enterprise medical data and provides an integrated system that allows physicians and medical professionals access to image data across its regional operations. Integration and interoperability are essential to Sentara's expansive operations and the management, storage, and distribution of digital medical images as well as other clinical content across its healthcare and hospital systems.

Conclusion

The decision to pursue a VNA is an important one that will demand resource allocation from personnel to assets to capital. This decision should be well informed and be in context with the larger organizational strategy and objectives—especially related to imaging. The role of the imaging director is critical in educating leadership around the costs and benefits of pursuing a more elegant and sophisticated platform for managing data.

The healthcare market continues to churn and there remain any number of possibilities of how care will be delivered,

facilities will be staffed, capital allocated, and revenue and reimbursement managed in the long term. The organization that develops an environment allowing for nimble tactics in meeting changing market demands will be best positioned for a competitive advantage in the future. A VNA that is well selected, designed, built, and deployed can serve as an important component in providing that opportunity. ☸

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