Solution Brief

Electronic Health Records

Guidance on Migrating Electronic Health Records Systems to AWS

Intel, Deloitte, and Amazon Web Services (AWS) have an established joint record of success moving electronic health records (EHR) systems from on-premises solutions to the cloud. Customers realize benefits in improved costs, scalability, performance and agility.

In collaboration with:

aws Deloitte.

For several years, the adoption and refinement of electronic health records (EHR) technology has been a significant mission for healthcare providers worldwide. EHR systems have dramatically improved the mechanisms for managing and sharing patient information, enhancing patient care as well as access to information by clinical healthcare workers. However, most healthcare IT organizations first implemented EHR systems in existing on-premises environments, potentially enabling cost and other benefits by migrating EHR to a cloud IaaS model.

Migrating your EHR system to AWS Cloud provides many opportunities to modernize and optimize your deployment, which can help reduce the incidence of clinical staff burnout and increase patient satisfaction and safety. At the same time, this shift helps optimize regulatory compliance and overall TCO, while addressing a top-of-mind issue for every healthcare CIO — making their organizations more nimble and responsive. Studies have shown that efficiencies gained include a 25% reduction through application rationalization, as well as a 10-15% decrease in infrastructure spend.[1] These gains are enabled by factors such as just-in-time provisioning and right-sizing workload demands for compute and storage requirements.

The desire to leave behind the technical debt associated with legacy on-premises EHR is creating a mass modernization paradigm in this industry. Cloud-based implementations support broader transformation of healthcare IT that improves outcomes while reducing costs. The complexity and expense of transitioning EHR to the cloud lead many organizations to seek outside help mitigating the business and technology risk associated with the transition. To meet this need, healthcare domain specialists from Deloitte, AWS and Intel have developed a transformation practice aimed at ensuring efficiency and success for customers on this path.

Landscape of opportunity: Delivering EHR cloud benefits

On-premises implementations of EHR that were the gold standard for first-generation deployments have been successful at meeting regulatory requirements, enhancing access to patient information and improving the quality of care. At the same time, they miss out on a range of business and technology advantages provided by cloud-based approaches. Following is an overview of the main challenges that Deloitte, AWS and Intel are addressing for their joint customers by helping them migrate their EHR infrastructures to the cloud.

Optimize Compute Capacity | Reduce Cost from Data Copies | Relieve Staffing Pressure | Support Accelerating Release Cycles | Avoid Desktop Bloat

Optimize compute capacity.

Over-provisioning on-premises resources is standard practice to accommodate usage peaks, resiliency requirements and three-to-five year buying cycles. Production compute capacity is typically sized at 50% over production peak load based on a three-year capacity forecast. Disaster recovery requirements require duplication of those resources, bringing total spend to 3x the peak infrastructure level. AWS provides inherent elasticity and georedundancy to overcome the over-provisioning requirements of the past.

Reduce cost from data copies.

The trend is accelerating for more copies of data to be needed for usages that include cybersecurity, research and analytics. In fact, well-architected organizations often keep as many as 12 copies of their production data, making the cost-effective ability to scale out the environment more pressing with every passing year. Geo-redundant disaster recovery is particularly expensive; most organizations have a secondary data center facility with production-equivalent capacity and capabilities, tested annually. Traditional on-premises deployments limit the potential for fundamental change.

Relieve staffing pressure.

As on-premises resources multiply, so must the staff needed to implement and maintain them. That necessity can be challenging in competitive hiring environments, and it can also consume engineering resources that could better be applied to core business objectives.

Handle accelerating release cycles.

With quarterly release cycles for mainstream EHR software now a reality, many organizations struggle to keep pace with the demands of implementation, testing and go-live cycles. Cloud-based EHR implementations dramatically streamline ongoing maintenance and updates, reducing the cost, time and risk associated with them. Automation and modern practices such as DevOps are enabled by cloud-native workflows, which also provide for heavy repurposing of workloads during upgrades. Teams achieve greater stability by provisioning and de-provisioning instances, rather than upgrading in place, which simplifies rollback procedures to reduce risk.

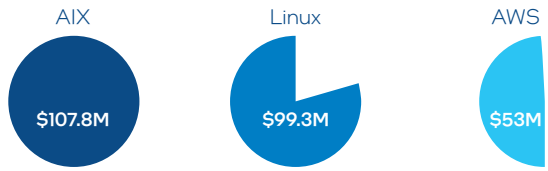
Avoid desktop bloat.

The virtualized desktop infrastructure (VDI) widely used as front-end technology for EHR solutions refreshes every three years on average, and headroom is typically purchased in advance of when it will actually be needed. It is therefore typically oversized by a factor of 2x-3x, including supporting infrastructure. Cloud implementations also avoid the common practice of piecemeal upgrades to the VDI server farm, which adds to the management complexity of on-prem resources.

Long-term savings on infrastructure spend

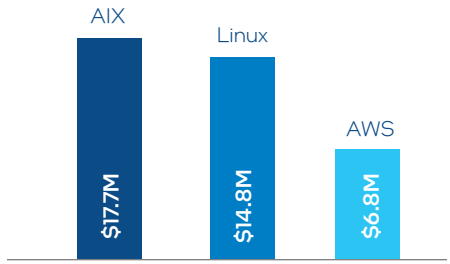
The Deloitte, AWS and Intel team begins each engagement by analyzing the on-premises EHR environment to build the business case for cloud migration. This analysis is based on the costs of running EHR on-premises or in a co-location facility versus on AWS. Typical cost savings seen across customer engagements amount to a 20%-50% reduction in infrastructure spend.[2]

In one sample engagement, a 12-hospital organization's seven-year strategic case considered moving from on-prem systems running AIX to on-prem Linux as well as Linux on AWS. Analysis reveals that while shifting to Linux improved cost efficiency, the full opportunity required migrating to the cloud as well. That full modernization reduces spend through automation and use of the latest cloud tools. In this engagement, the business case identifies potential for $54.8 million in savings over the seven-year period, a reduction of more than 50% for infrastructure spend versus the on-prem AIX case.



$54.8 million savings with an all-in strategy over seven years[3]

Disaster recovery benefits are also substantial, enabled by the ability to shut down infrastructure while in replicate-only mode. For this engagement, that ability provided a **62% cost reduction** for disaster recovery by moving it to AWS.[3]



62% savings for EHR DR workloads on AWS[3]

Ransomware attacks are on the rise, and the ability to respond to them quickly and effectively is an important topic in enterprise security organizations worldwide. Cloud resources typically offer more robust security and redundancy than on-premises systems, providing advantages in terms both of preventing and responding to ransomware attacks.

Increased agility is another primary outcome, with the ability to **stand up infrastructure and environments 94% faster**.[4] These implementations also benefit from **3x-5x higher availability** than with other cloud providers.[5]

Performance leadership for EHR in the public cloud

Ongoing advances in capacity and scalability follow the cadence of technology advances, including **587% growth** in scalability over the last four and a half years on Intel® Xeon® processors.[6] The performance engineering team continually refines its infrastructure guidance for optimal results with various solution architectures and cloud resources. These include design patterns termed SMP (for "Symmetric Multi-Processing") and ECP ("Enterprise Cache Protocol") for differential scalability requirements. SMP converges the database and application server onto a single cloud instance. ECP is a multi-tier architecture that deploys the database on a dedicated cloud instance, enabling the application server to scale independently to multiple instances.

A broad range of reference architectures for EHR on AWS provides scalability for organizations from small to very large. To quantify that scalability, the performance team uses GRefs (global references), the basic work unit for the IRIS data platform used by leading EHR vendors. At the high end, validation of an ECP reference architecture using **R6in** instances based on 3rd Gen Intel Xeon Scalable processors for the ODB (operational database) combined with 4th Gen Intel Xeon Scalable processors for Cogito achieves **55 million GRefs**, making this range of reference architectures more than capable of supporting the majority of healthcare organization deployments in the world today.

The largest portion of compute typically required by an EHR deployment is to support desktop virtualization (often Citrix) tiers. This tier is the key interface between clinicians and the EHR and is delivered via workstation and other types of clinical devices. Increasing the density of clinical sessions supported per compute instance (and consequently reducing the cost per session) is therefore an important success metric for cloud EHR deployments. AWS **R7i** instances based on 4th Gen Intel Xeon Scalable processors improve session-per-instance density for the desktop virtualization and web tiers. In fact, leveraging R7i instances **increases sessions density by 81%** over prior M6i instances.[8]

Take the next step

Migrating EHR systems to the cloud delivers immediate and enduring cost benefits as well as the agility and scalability of modernized infrastructure. Deloitte, AWS and Intel offer a deep bench of experience and established leading practices to guide your EHR cloud adoption. AWS-hosted EHR optimizes user experiences to avoid clinician burnout and increase patient safety and satisfaction, all while improving the bottom line.

Please email Eric Foote at ericfoote@Deloitte.com for additional information or to schedule a call.

Reference Architecture	CPU Generation	Scalability in GRefs/s #[7]	Size of Organization
ECP on r6in.32xlarge / m6i.16xlarge app servers	3rd Gen Intel® Xeon® Scalable processor	55 million	Extra Large
ECP on r6in.32xlarge / r6in.16xlarge app servers	3rd Gen Intel® Xeon® Scalable processor	42 million	Extra-Large
ECP on m6i.32xlarge / m6i.16xlarge app servers	3rd Gen Intel® Xeon® Scalable processor	26 million	Large
SMP on u-6tb1.56xlarge	3rd Gen Intel® Xeon® Scalable processor	23 million	Large
ECP on r5b.24xlarge / r5b.8xlarge app servers	2nd Gen Intel® Xeon® Scalable processor	18 million	Medium/Large
SMP on m6i.32xlarge	3rd Gen Intel® Xeon® Scalable processor	12 million	Medium
SMP on r5b.24xlarge	2nd Gen Intel® Xeon® Scalable processor	8 million	Small/Medium

Source: Data compiled by AWS.

More Information

AWS Healthcare Solutions

Deloitte Health Care

Intel Healthcare and Life Sciences Technology Solutions

Solution provided by:

[1] Based on data from more than 20 Deloitte-led business cases and several Epic-on-AWS implementations.
[2] 50% reduction in infrastructure spend is achieved by moving the EHR disaster recovery environment to AWS.
[3] Data compiled from an actual Deloitte Consulting client business case.
[4] Based on actual implementation times on Deloitte engagements.
[5] Downtime Tracker indicates AWS has 3X to 27X less downtime hours in 2022 over other major CSPs.
[6] Data compiled by AWS. See chart on page 3.
[7] Per Epic's validation process.
[8] AWS increase in session density moving from M6i to R7i based on data provided by Tufts Medicine.
Performance varies by use, configuration and other factors. Learn more on the Performance Index site.
Performance results are based on testing as of dates shown in configurations and may not reflect all publicly available updates. See backup for configuration details.
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