White Paper

The Vista-Cerner Transformation Engine (VCTE)

A cost effective and risk mitigating solution to transparently deliver veteran's health data to consuming applications during the Vista-to-Cerner transition

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1. Executive Summary

The US Department of Veterans Affairs is modernizing its infrastructure. As part of this, it is gradually switching to a different back-end system. These back-end changes are going to affect many applications that veterans, administrators, and medical professionals regularly use. The VA must keep these critical applications running while this migration occurs.

This White Paper details a strategy to keep many existing customer-facing Veterans Health applications smoothly running while the VA modernizes and swaps out the back-end data stores and begins to establish the next generation Electronic Health Record (EHR). We will introduce a design concept called ***VistA Cerner Transformation Engine (VCTE)*** for that purpose.

Many of these critical VA applications obtain back-end veteran health information from VistA Integration Adapter (VIA) web services. VIA, in turn, obtains its information from 130 VistA back-end systems. To keep the critical applications from breaking, it is proposed that VIA be modified and modernized to deliver veterans' health information from both the old and new back end systems. This can be done in such a way that the front-end systems would be completely oblivious to the changes during the interim backend migration period. The idea is that VIA delivers identical results to its consuming front-end clients regardless of whether the health information comes from the old VistAs or new Cerner systems.

With VIA delivering identical results, no front-end software changes would be necessary to keep these critical front-end systems in operation. This approach would reduce costs and minimize the risk of service interruptions. The alternative of developing separate custom solutions for each front-end app would increase overall costs and risks.

It is expected that many of the front-end applications will ultimately be retired in favor of its Cerner counterparts. However, during the transition, the VA will be required to continue to provide services to its Veteran heroes and families as efficiently as possible. We believe the proposed approach will be a cost-effective solution and offer risk mitigation in the long-term transition to the future VA HER modernization effort.

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2. The Problem

The US Department of Veterans Affairs plans to migrate its distributed Veterans Health VistA Systems to the Cerner's MHS Genesis solution. "This is a very risky, complex implementation," according to the former Secretary of Veterans Affairs. "We're going to go from 130 instances to a single, virtual instance in the VA." [1] This $16 Billion, 10-year project gradually retires the VA's VistA health systems.[2, 3]

During this transition period, the VA cannot simply cutover to the Cerner MHS Genesis solution. Veterans, VA health care providers, and administrative staffs rely on many existing web applications and mobile solutions that use VistA data. The complexity of this situation is well-understood and evolving into a strategic vision to guide this process. According to the former VA OI&T Executive in Charge Scott Blackburn:

> The way I'm envisioning the future is if people want to go to MyHealtheVet or Vets.gov, it's going to end up going back to the same place. They still go to the URL that they're familiar with, and whether they're going to be on a Cerner system or some kind of VistA based system for their experience, they still click.[4]

Furthermore, the VA plans a geography-based rollout of the Cerner MHS solution. This rollout will begin in the Pacific Northwest "to mirror Department of Defense (DoD) EHR modernization efforts." [4]

A potential problem with a geography-based rollout is that numerous software engineering teams may have to upgrade existing software applications to use Cerner MHS Genesis data sources in some geographies and VistA data in others. If the VA were to directly upgrade end-user applications to achieve the seamless experience alluded to above, then numerous new contracts and options would need to be exercised. Separate contracts and resources would be needed for new development in current applications including TBI, VAR, MSE, MOVE!, ADERS, BMS, NUMI, SPSS, PHSR, SPACE, AHOBPR, FtP, AVITracks, CareT, MUET, PVA, EFR and others.

An approach that involves separate contracts to upgrade individual VA end-user applications to support Cerner MHS has disadvantages. The financial cost to separately upgrade existing VA software solutions is high. From a technical risk

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perspective, the migration of VA-knowledgeable software engineering teams away from legacy VistA skill sets towards the skills required by Cerner MHS is significant and cannot be assumed as a given. (You can't just switch a Mumps developer to Java and hope for the best.) Furthermore, upgrading each separate software solution increases the complexity of each solution – as each solution requires new development to upgrade the solution to support two different sources of health data (VistA and Cerner MHS).

To summarize, the VA strategy to seamlessly modernize the VA's web applications infrastructure to support both VistA systems and the Cerner-based MHS solution in a geography-specific way is fraught with risk and high costs.

3. The Solution

The solution to the problem of upgrading dozens of VA applications is to take the former VA OI&T Executive in Charge's vision one logical step further. In the vision described above, people still go to the same familiar URL – without knowing whether the information originates from a modernized Cerner MHS system or from a VistA-based system. It is proposed that not only do the people not know where the information originates, but the consumer facing applications themselves don't know where the information is coming from. That is, the underlying applications just call the same web service endpoints– and the magic of deciding where Veteran patient data originates is completely hidden from them.

For example, imagine that the Veterans Appointment Request App (VAR) gets its Veteran Health information comes from both Cerner MHS and VistA. Veterans' health information from the Portland, Oregon would come from Cerner MHS Genesis systems and information from Albany, New York would originate from VistA. This geography-based switch would not have to be implemented by the VAR development team. In fact, if it is implemented correctly, no changes to VAR code or configurations would be necessary. The VAR development team may not even be aware the change in production. If you multiply this example scenario by the number of web and mobile applications that would require separate and independent upgrades, then the realized cost savings could be dramatic.

It is envisioned that the VistA Integration Adapter (VIA) would natively handle some requests and route other requests to the VCTE based on the request's

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geography. The VA would not have to upgrade every single user-facing application for the Cerner MHS modernization efforts. This solution offers considerable cost-saving over the alternative of upgrading all end-user facing applications. This solution reduces and consolidates technical risk. And it supports a gradual, stable Cerner MHS Genesis modernization effort. Cost-savings aside, this approach is a solution that would serve Veterans' interests better.

The trick, of course, is to transform Cerner MHS solutions into the XML format already delivered by VA applications like MDWS and VIA. This effort will be complicated – but this centralized effort will be preferable than 10+ separate VA programs trying to tackle this same problem independently.

This transformation engine also has the potential to be a business driver that leads to the creation of open source APIs presently sought by the VA. That is to say, the microservices that constitute the VCTE would also become open APIs with the potential for further internal/external team use.

Figures 1 and 2 below show the advantage of a VIA-Cerner solution. Integrating Cerner data with VIA has the potential to produce a 10-fold reduction in engineering efforts and significant cost savings over alternative approaches.

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Figure 1

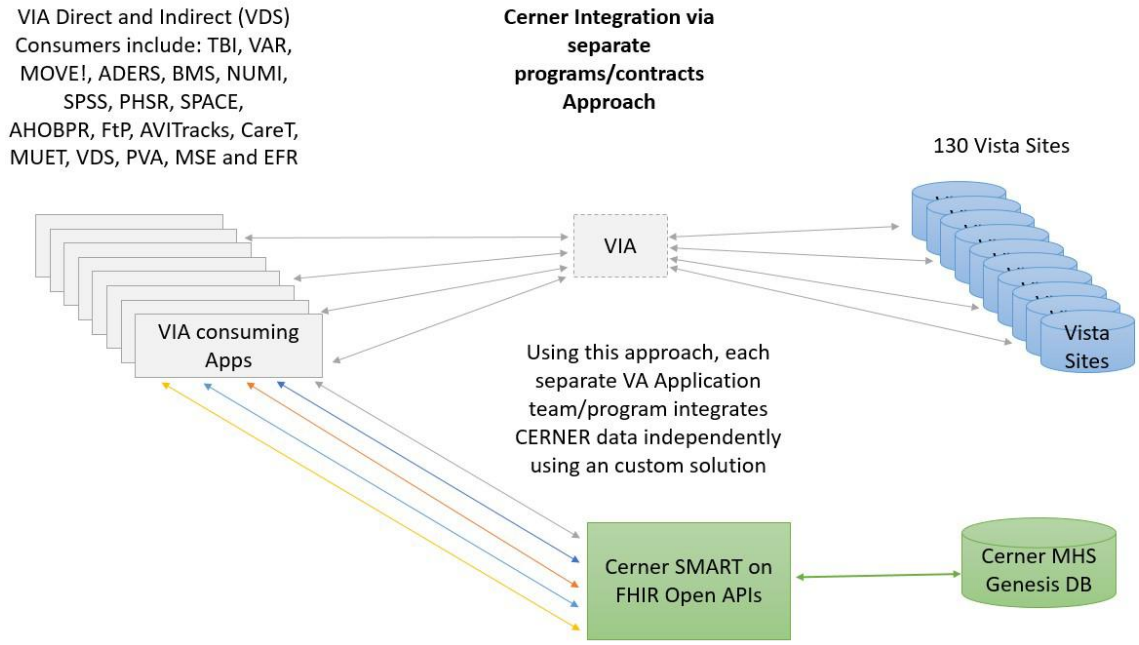
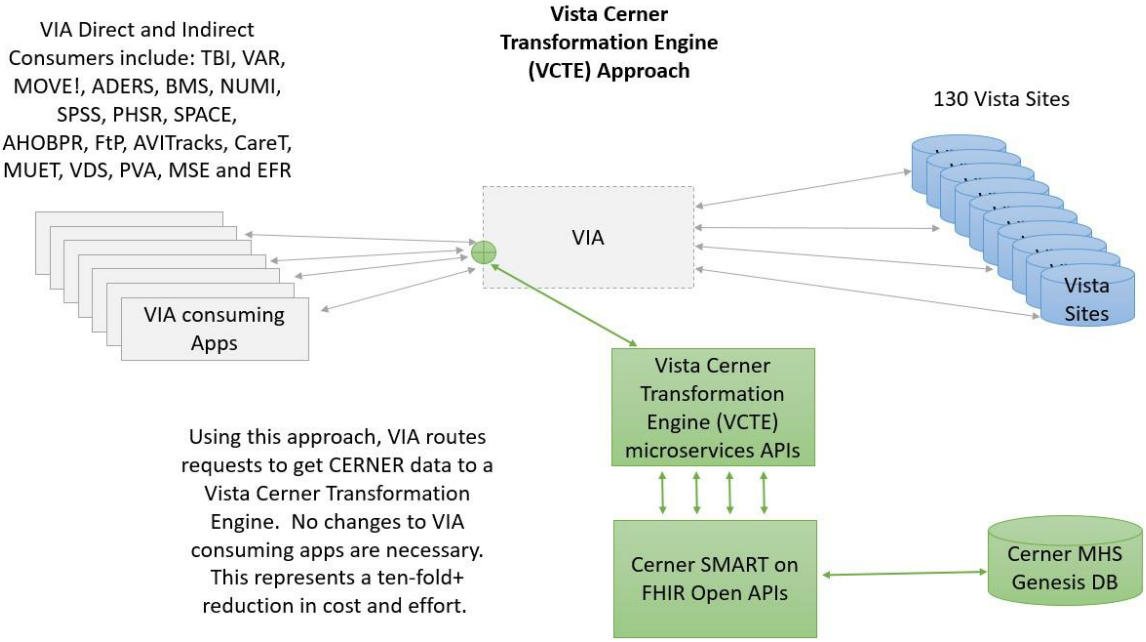


Figure 2



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4. Architectural Vision

VIA – The Ideal Switch

Where is the best location for a switch that abstracts the source of patient information? It's at or near the VA's Vista Integration Adapter (VIA). VIA is already the prime VA mechanism to transform HL7-formatted Vista RPC data into useable Veteran and patient information. A switch in or near VIA would route some requests to the Cerner Vista transformation engine and others to Vista. The source of patient information would become completely transparent to every direct and indirect VIA-consuming application.

The VIA application itself would be an excellent switch point that could direct requests to a much larger transformation engine. VIA already maintains the geographic routing information that is critical to the geography-based Cerner MHS rollout. That is, VIA already has configuration information for VA VISNs and VAMCs. Also, the modularized VIA architecture allows for the addition of a small switching module without affecting VIA's legacy RPC parsing components. Lastly, adding a switch within VIA would mean that VIA consumers would not have to change any code or endpoints.

Transformation Engine

The heart of the solution would be in the Vista Cerner Transformation Engine. A switch in or outside VIA would only represent a very small percentage (1-5%) of the solution. The transformation engine itself would be separate from VIA. This engine is envisioned as a set of microservices that transform Cerner data into the XML objects that would be consumed by front-end applications.

An Interim Solution

This solution is seen as a 'five-year' solution designed to minimize the disruption to existing VA end-user applications that already consume VIA and MDWS web services (directly and indirectly). As veteran health information migrates from 130 Vista systems to a single Cerner MHS system, these end user applications can continue to operate without disruption. This solution is not envisioned to be part

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of the long-term Cerner solution. This solution would only enable existing VA applications to operate without disruption as the VA gradually retires its Vista systems.

Using Microservices

The engineering effort and code changes to VIA will not be significant. Using a microservices approach, the monolithic VIA application itself will not grow significantly. Instead, a relative small amount of VIA code can be added to communicate with separate microservices which interface with Cerner's MHS Genesis data source(s). These microservices would be constructed on a completely modern technology stack (e.g. Docker) and not be limited to using WebLogic or older versions of Java that presently limit VIA.

No Endpoint Changes+ No Interface Changes + Identical Results = Success

Back in 2013, this author attempted to convince a skeptical and since-retired VA program manager that the small interface differences between the VIA and MDWS web services would be easily overcome by engineering teams. These minor differences were necessary to achieve the enterprise scalability offered by stateless web services. A technical demo was prepared – and "less than a day's work" was the honestly estimated level of effort expected for most engineering teams. The seasoned and skeptical VA program manager knew better. Five years later, work is still ongoing to make all MDWS-to-VIA transitions happen.

We have no intention of making this same mistake twice. For this approach to work, no changes would be made VIA endpoints. No interface changes would be made. The returned VIA results, regardless of whether they come from Vista or Cerner MHS, need to be identical.

Make no mistake - this work will be complex. It will be tricky to transform Cerner health data into VIA results. (But it won't be any worse than transforming HL7 text into Java objects.) VIA will not deliver the full wealth of data available in Cerner MHS systems. It will only deliver the data presently returned to VIA consuming applications. However, dedicated efforts from committed and talented Veterans Health Care IT professionals can make this happen. A resounding VIA-Cerner success will occur each time the VA switches over a VAMC or VISN to get its data from the centralized Cerner MHS solution – and no one notices.

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Risk Mitigation

This solution is based on the premise of a smooth and gradual migration to Cerner MHS Genesis data-sources one VAMC or VISN at a time. In the event of a temporary or permanent rollback, the switch in this proposed solution also present a single point where data sources could be rolled back by configuration to Vista in the event of operational or other issues.

Interoperability and HL7 FHIR

It will be important to ensure interoperability standards are utilized in any EHR modernization effort. Fast Healthcare Interoperability Resources (FHIR) promises to be an interoperability standard for improved utility of EHRs. Since FHIR utilizes an open API design, it has the potential to develop plug-and-play interfaces with any EHR and allow information to be directly imported into the health provider workflow, while eliminating the shortcomings in typical document-based exchange. From this perspective, the VCTE objective is to import Cerner's FHIR into the existing VIA/MDWS workflows.

We will design the VCTE to be compliant with Cerner's FHIR implementation. SMART on FHIR is the Open Source FHIR implementation used by Cerner. SMART on FHIR provides reliable, secure authorization for a variety of app architectures through the use of the OAuth 2.0 standard. When registering a SMART app with the Cerner EHR, you are able to run an app in Cerner's SMART on FHIR sandbox. It is envisioned that the VCTE will use a combination of Cerner's sandbox environments as well as extremely-light docker-basedVIA containers. This combination of Cerner APIs and docker virtualization enables the VCTE's rapid application development and testing.

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5. Summary

This ***VistA Cerner Transformation Engine (VCTE)*** solution could be realized by a combination of a partnership between the VIA team and a dedicated and knowledgeable project team familiar with the intimate workings of the VistA architecture. It is our belief that this technical approach is an order of magnitude smaller than the execution of separate implementations for each VIA-consuming application.

The VA is smartly migrating from the ~130 VistA instances to a single Cerner MHS Genesis solution on the back end. While it does this, VCTE represents a feasible, interim and cost-effective means of advancing EHR interoperability for many separate consumer-facing applications while the VA's exchanges and modernizes backend systems. VCTE also offers a risk mitigation option using an open standard API design. This is an endeavor worthy of further review.

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