



*"There is Spirit in everyone,
but it needs to be free!"*



Why should Tiani-Spirit's EHR be deployed on a Cisco Infrastructure?

We are frequently asked why it is necessary to run Tiani Spirit's -EHR -IHE Stack in the Network and on a Cisco platform. What is the real benefit behind this? Is it just marketing?

There are a number of issues that need to be considered.

In a typical deployment scenario common across many domains including e-government, e-banking and e-health, data is usually stored centralized in data centers. In the healthcare environment this may present a number of concerns.

Legal constraints

In many countries healthcare organizations cannot legally store clinical information outside their legal entity. In the United States, while healthcare organizations may legally store data externally, the healthcare organization is still legally responsible for the privacy of Protected Healthcare Information (PHI). The former case precludes a centralized architecture, and in the latter case centralizing the data store increases legal liability.

Reliable Network Connectivity

Frequently the network is not reliable. In many countries especially in rural areas of developing regions, and even in many areas of the US and Europe, the network potentially lacks resilience, which results in interruptions of physicians' work.

Network Bandwidth

Even if it is possible to establish a permanent network connection there is still a question of bandwidth. In many sites around the world we observed bandwidth jumps between 50Kbps and 1Mbps. This will dramatically impact the response times and latency of an EHR system.

Imaging

The vast majority of hospitals worldwide must deal with radiology imaging including CT, MRI, and ultrasound. Typical studies are very large and can grow up to multiple gigabytes per study. From both a scalability and bandwidth standpoint it typically isn't practical to centralize imaging repositories.

Latency

Low latency and a well-balanced load across the entire network is key to enabling consistent usability and response characteristics in any EHR project.



Offline Capability

There are many situations where the need to have a operational system without a network connection to a centralized data center is mandatory. One example would be a system deployed for military reasons in rural areas where no IP connectivity is available. Another example is in regions where no stable network is available. Under these situations a system can only fulfil the requirement for smooth usability if it offers offline capabilities.

Resolving these Issues

In 2008 Cisco launched a new technology, which allows services to run in a router. This technology is the Integrated Service Router (ISR). These routers are able to run services in a router blade achieving synergy between the network infrastructure and these services.

One basic requirement in the field of the EHR (Electronic Health Record) is to protect stored and transmitted data against generic security attacks, like intrusions, tampering, or misuse, which can affect the safety of patients. One of the main advantages of the ISR is that the entire environment on the router is ISO 27002 compliant (ATNA Secure Node). This makes it possible to easily deploy the solution in a facility without having concerns with data protection.

The ISO 27002 compliant router deployed in the edge (Facility) in conjunction with a data center is the right solution for resolving the issues outlined in this document.

Use Case: Legal restriction for aggregating data in the data center.

As described above, often it is not allowed or practical to store clinical data in a centralized data center. In that case data can remain at the source system and may be accessed via the XCA (Cross Community Access) Profile. The only information that needs to be published centrally is the information needed for the RLS (Record Locator Service).

The RLS is based on the PIX Manager profile. The PIX Manager provides the functionality to link different patients via patient demographic data and/or patient identifiers provided by the source systems based on weighted attributes to one logical patient. This Manager typically runs in the data center because, like yellow pages the demographics information is not critical clinical data.

If a linkage between patients of different domains occurs, a notification is dispatched to all the underlying patient related edge nodes/domains. This notification is used as synchronisation trigger between the PIX Manager deployed in the data center and the local deployed PIX Managers in the edge nodes. This results in a distributed/federated RLS system where each edge node knows all the foreign locations of a local patient where clinical data is available.

Every router node is related to a legal entity and can represent an affinity domain. Each request is passed through the SpiritGateway which offers a wide range of standard interfaces, the gateway applies business logic and acts as interceptor (à la façade pattern) for all transactions. The gateway requests policies based on the patient consent as well as policies based on the local, regional and national legal requirements. These policies are enforced against the requested resources (like healthcare documents) and only a filtered result is returned to the requestor. The SpiritGateway can



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be deployed either in front of the initiator or in front of the responder of a transaction. Also the mechanism of a *policy push* is supported where the policy of the initiator is sent within the request and the responder is using the policy of the initiator to enforce against its data.

Advantages

Since SpiritEHR runs on the edge component in a Healthcare provider of any size (GP, Pharmacy, Hospital, Clinic....) a project can start at the edge on a very small scale, on a secure node, without the large up front financial outlay on the 'Core' components required in a centralized model. The exchange may grow to whatever level is required incorporating additional edge devices and/or Cisco Unified Computing Systems, when that size platform is appropriate.

This architecture can scale to whatever size is required, with no single point of failure.

In the future the edge nodes will be able to cache all the data from the foreign nodes, which are related to a local patient. This approach will lower the network traffic dramatically since all the data is just transferred once over the wire and there will be no need to transport the data each time it is requested. Since this architecture acts as patient centric cache it is also possible to add such cache nodes in a later time frame of a project with the aim to increase the speed on certain points of the hierarchical deployment.

Statistically a patient visits the same facility or at least facilities that are related to the same region very often and does not usually switch between facilities distributed over the globe. Therefore the federated architecture leads to a "natural load balancing" where the majority of the requests can stay in a local environment

Still today many network providers are bound to copper wire. Replacing the whole network infrastructure is very expensive. To run the software on the network infrastructure based on the proposed approach will help to stretch the investment phase for building up a fibre optics network infrastructure to a reasonable time frame.

In the majority of all institutions there is a fixed budget to renew infrastructure components like routers in a time frame from 5 to 7 years. Since these infrastructure components can be reused for deploying software the cost savings for using the network as a platform in conjunction with all the other aspects are very high.

Summary

The advantages of running on a Cisco platform fall into three areas:

- D Compliance – Deploying on an ISO 27002 compliant router helps mitigate security concerns. SpiritEHR is a Cisco Validated Design (as the Cisco Medical Data Exchange). This insures the solution has been deployed, and tested on Cisco platforms and that deployment and testing documented insuring smooth implementation.
- D Scalability – SpiritEHR has been tested and deployed on a wide range of ISR routers appropriate for deployment in the smaller to mid-sized Healthcare Provider, and on large Cisco Unified Computing Systems appropriate for the largest Health Information Exchange.



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Distributing the intelligence throughout the network allows the ability to scale as large as is required with no single point of failure. Availability – By deploying the intelligence in the edge and throughout the network, a network or node failure will limit impact on the system providing very high availability.