The Visualizer

Illustrating interoperability via visualization of audit messages

Technical Report, April 2011

A FLEXIBLE SOLUTION

The MARC-HI Visualizer version 3.0 has the ability to visualize nearly any infrastructure where standard RFC3881 messages are used for auditing.

The visualizer uses XML based messaging and provides an API that allows integrators to build custom viewers, or to create new diagrams.

NEED FOR VISUALIZATION

It is often difficult for users and developers to conceptualize what is occurring within an enterprise system:

- Users typically expect software to have a user interface or visual representation to illustrate status which many enterprise systems lack

- It is often difficult to understand how information is transmitted between systems

Since the interoperable enterprise systems integrate many applications, visualization facilitates understanding of various vendor products within system.

Visual representation of many infrastructures

The MARC-HI Visualizer is used to present a graphical display of healthcare transactions that rely on a variety of information technology infrastructures. Originally the Visualizer relied on proprietary messages to highlight the diagram being displayed. The representation was fixed in terms of display options and the type of messaging that was understood. This restricted the usefulness of the application to the Canadian EHRs.

After the initial success of the Visualizer at the COACH eHealth 2008 conference, it was realized that the technology of visualization could be applied to other healthcare architectures. Work began on allowing customization of the displayed diagram and the usage of RFC3881 (or ATNA) messages. This updated version was demonstrated at the eHealth 2009 showcase in Quebec City, QC and released as Visualizer 2.0.

Today, Visualizer version 3.0 supports RFC3881 and ATNA messages exclusively and has the capability of visualizing any infrastructure including Canadian EHRs and IHE infrastructures. Because of its adherence to standard logging messaging protocols, the Visualizer diagrams presented to users can represent nearly any system. The software also has the ability to allow multiple views of the same infrastructure, allowing users to focus on different aspects of the EHRs within a large enterprise setting.

Visualizing RFC3881 Messages

The MARC-HI Visualizer is designed to interpret standard audit messages and illustrate the communication to end users.

Many systems that currently deployed within the health enterprise are required to produce an audit trail that describes the actions taking place within the system.
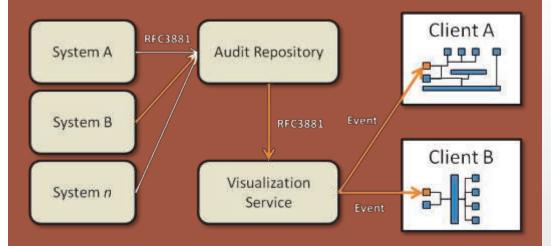
Audits are usually generated whenever patient information is created, updated, disclosed, or whenever a system is accessed.

RFC3881 provides a standardized schema for the auditing of clinical events. The Audit Trail and Node Authentication (ATNA) standard published by IHE is based on RFC3881 and identifies a standard set of codes and events that must generate an audit message.

Broadcasting the Event

End users use visualization clients to view diagrams which represent nodes or applications within the system. The client is responsible for connecting to the visualization service. Once connected, the visualization client acts as a subscriber for all events that are passed through the service.

When an audit is received by the visualization service, it is interpreted and converted to a visualization event message. The visualization service publishes this message to all active clients.

A PVR for the EHRs

The default MARC-HI visualization client runs in a web browser using Microsoft Silverlight. At any time, users can log into the Visualizer client with a web browser and see live traffic.

The default Visualizer client acts like a PVR for any infrastructure. It can operate in live mode, or can be used to record live traffic from the Visualization service.

These recorded sessions can be saved locally, or used as a captured demonstration of the enterprise environment.

A recorded session is not restricted to one particular diagram. This allows a scenario to be played back using a variety of schematic diagrams.

Forwarding for visualization

Visualizer 3.0 is a loosely coupled client/server architecture. In many environments, systems within the infrastructure will send their audit messages to a dedicated audit repository .

The audit repository is responsible for the storage of the audit information. When the Visualizer is employed, the audit repository will forward the audit to the visualization service via a separate interface.

The client interprets the data in the visualization event message and correlates the source identifier with a node on the current diagram. Usually, the source identifier triggers an animation within the diagram.

The Visualization Message

The visualization message is structured in XML and contains a sequence number, audit timestamp, the Identification number of the audit source, and an optional display name for the source.
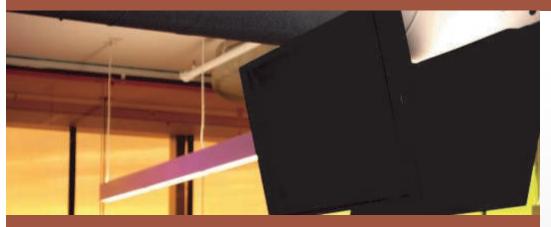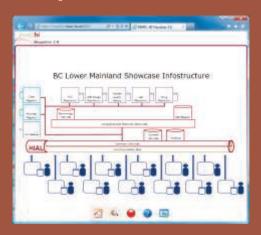
Pick a view, any view...

When a client receives an event message, it scans the currently loaded diagram for an animation with the same key as audit source.

Alternatively, an animation can be setup to be triggered regardless of the source identiier. This allows developers to quickly test their diagrams in the visualization client.

Since the client is not bound to a particular diagram, different clients can load different views and subscribe to the same events.

This provides a mechanism to load custom diagrams that illustrate how one particular product or component participates in the infrastructure.
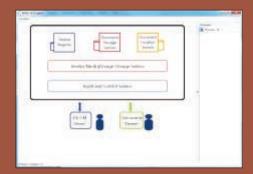
Write your own client

Creating custom clients for the Visualizer is accomplished by listening on the specified TCP port for visualization events.

To ease the task of creating custom clients, the Visualizer includes a .NET API that allows developers to connect and subscribe to events.

Using the API also makes it possible to create custom, branded clients that access the visualization service.

Demonstration Client

The MARC-HI hosts a live client which can be used to view current activity in our reference implementation. The live demo can be accessed at: http://visualizer.marc-hi.ca:8080/

CUSTOMIZATION
Creating new Diagrams

All diagrams that are used in the Visualizer since version 2.0 are WPF XML Application Markup Language (XAML) files.

New diagrams can be created by modifying existing XAML code, or using an XAML editor like Microsoft Expression Blend or Microsoft Visual Studio 2008/2010.
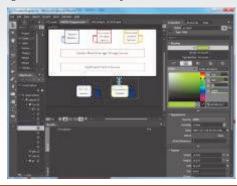
Once created, these new diagrams can be loaded by the Visualizer clients.
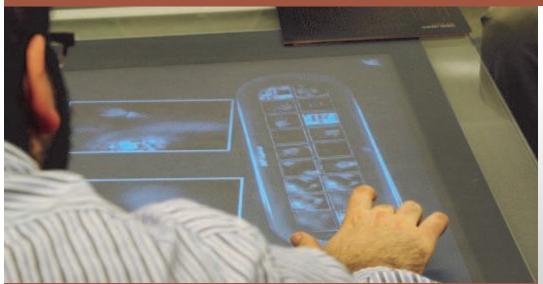
Creating Custom Diagrams

Q: How can custom infrastructure diagrams be created?

Diagrams that are loaded into the Visualizer clients are XAML diagrams. Creating custom diagrams can be accomplished by using a text editor directly on the XAML file.

More complex diagrams can be created using Expression Blend. Designers can graphically construct Visualizer diagrams and complex storyboards. For example, one could construct a storyboard animation that changes the text of an object upon receiving a message.

Next Steps and Upcoming Features

Documentation

The Visualizer team is current working on improving the setup and deployment instructions for the MARC-HI visualizer.

Visualizer Team

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Download:
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