Announcing
Unified integrate Electronic Healthcare Record™

U*EHR Beta Release

“Plan B” – The fastest, most-affordable and least-risk solution for achieving a Joint Unified Modernized iEHR that leverages already existing DOD and VA technologies into a fully open source, open product line architecture

“Senior Defense Health Agency officials and the Director, Telemedicine and Advanced Technology Research Center (TATRC), U.S. Army Medical Research and Materiel Command, reviewed the results of the CRADA and have determined that the CRADA research objectives have been met” – February 11, 2014

Presentation to
Open Source Electronic Health Record Agent (OSEHRA) World Summit
September 5, 2014

By Philip Newcomb, CEO, The Software Revolution, Inc. (TSRI)
2011 Stevens Award Recipient “for the automated modernization of the European Air Traffic Management System (EATMS)”
Unified iEHR™

Key Success Drivers

TSRI’s 100% Automated Cross-Compiler Translates, Refactors, Optimizes and Documents Multiple System with 0 defects at 2.5 Million Lines of Code Per Hour

Unify Systems

Unify Data

Enable SOA

SOA-Enabled iEHR

EGL Features

ADM Features

iEHR Features

UI Features

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The Software Revolution, Inc. (TSRI) – 11410 NE 122nd Way Suite 105, Kirkland, WA 98034-6931
### Modernization Options

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Tried Repeatedly from 2001 to 2011 and has always failed.</td>
<td>Demonstrated Unified VA/MHS iEHR developed by TSRI under CRADA (at no cost to the government) and Rapidly Evolve and Unify with VistA – Available Now</td>
<td>Throw Away Current Systems and Patient Record. Pay Commercial Vendors $30 Billion to redevelop EHRs. (Highly Costly &amp; Deeply Flawed)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>10-year development and deployment cycle</th>
<th>1 to 2 year deployment cycle</th>
<th>5 to 7 year Replacement and Redevelopment Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>$28 Billion (according to DoD and VA estimates for GAO and OMB)</td>
<td>Estimated $57 Million Total Annual Subscription Fees for 57 hospitals + One Time Enterprise License Fee</td>
<td>$20.7 Billion (207 hospitals in the VA and DoD 207 * 100M/each)</td>
</tr>
<tr>
<td>Rewrite</td>
<td>Rewrite solution requires 8 years longer than Conversion</td>
<td>According to Standish Group studies modernization reduces O&amp;M by 60%/annum to 80%/annum.</td>
<td>COTS solution requires 4 to 6 years longer than automated conversion</td>
</tr>
<tr>
<td>Rewrite incurs $54 Billion O&amp;M Costs ($5.4 Billion * 10 years) and $34 Billion in development Costs</td>
<td>Conversion saves $3 Billion to $4 Billion/annum in O&amp;M cost reductions within 2 years at VA and DoD.</td>
<td>COTS incurs $27 Billion ($5.4B * 5 years) to $37.8 Billion ($5.4B * 7 years) in O&amp;M costs and $20.7 Billion for 207 VA and DoD Hospitals</td>
<td></td>
</tr>
<tr>
<td>Rewrite Costs $88 Billion</td>
<td>Saves $18 Billion to $36 Billion over 6 years (assuming 60% O&amp;M reduction) to $36 Billion for 9-years (assuming 80% O&amp;M reduction)</td>
<td>COTS costs $47.7 Billion to $58.5 Billion and can not eliminate existing legacy EHR systems</td>
<td></td>
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<tr>
<td>Technology will be obsolete before it is completed because of rigidity of DoD acquisition cycle for systems of this size and complexity and the length of the development cycle.</td>
<td>Modernize IHS, DoD, VA with single Push-Button Conversion Solution. Conversion requires 1 hour processing time. 20 minutes to compile-ready.</td>
<td>EPIC, Cerner and McKesson are proprietary technologies. EPIC is written in 25 million lines of obsolete 32-bit VB6, a language for which Microsoft ended support in 2005, and extended support ended in 2008.</td>
<td></td>
</tr>
<tr>
<td>Success Rate is 4% Average overrun rate is 44%</td>
<td>Industry Average success rate 53% (TSRI 100%) Average overrun is 34% (TSRI &lt; 5% overrun)</td>
<td>Success Rate is 34%. Average schedule overrun is 47%</td>
<td></td>
</tr>
<tr>
<td>Architecture will be out dated by the time construction is completed</td>
<td>Open architecture cloud-based SAAS and associated HW and Platform benefits.</td>
<td>COTS LOCK will compromise VA and DoD with proprietary obsolete iEHR architectures</td>
<td></td>
</tr>
<tr>
<td>Builds two stove pipe modernized systems without fixing interoperability and data interchange problems.</td>
<td>Achieves interoperable unification and supports interchange of data in automatically unified system.</td>
<td>Rube Goldberg solution that welds on obsolete 3rd party proprietary COTS technology without fixing interoperability or data interchange problem… Three (3) Decoupled Patient Records</td>
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</tr>
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</table>

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## "Plan B" U/EHR Modernization ROI Analysis

<table>
<thead>
<tr>
<th>Funding Requirement</th>
<th>FY14</th>
<th>FY15</th>
<th>FY16</th>
<th>FY17</th>
<th>FY18</th>
<th>FY19</th>
<th>FY20</th>
<th>FY21</th>
<th>FY22</th>
<th>FY23</th>
<th>FY24</th>
<th>Total</th>
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<tbody>
<tr>
<td><strong>DOD IT Status Quo</strong></td>
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<tr>
<td>VA IT Budget (Billions)</td>
<td>$3.20</td>
<td>$3.26</td>
<td>$3.33</td>
<td>$3.40</td>
<td>$3.46</td>
<td>$3.53</td>
<td>$3.60</td>
<td>$3.68</td>
<td>$3.75</td>
<td>$3.82</td>
<td>$3.90</td>
<td>$38.94</td>
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<tr>
<td>DoD IT Budget (Billions)</td>
<td>$1.40</td>
<td>$1.43</td>
<td>$1.46</td>
<td>$1.49</td>
<td>$1.52</td>
<td>$1.55</td>
<td>$1.58</td>
<td>$1.61</td>
<td>$1.64</td>
<td>$1.67</td>
<td>$1.71</td>
<td>$17.04</td>
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<tr>
<td><strong>Plan A - VistA Rewrite (VA supplemental budget request)</strong></td>
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<tr>
<td>VistA Evolution (Billions)</td>
<td>$1.000</td>
<td>$1.020</td>
<td>$1.040</td>
<td>$1.061</td>
<td>$1.082</td>
<td>$1.104</td>
<td>$1.126</td>
<td>$1.149</td>
<td>$1.172</td>
<td>$1.195</td>
<td>$1.219</td>
<td>$12.17</td>
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<tr>
<td><strong>Plan C - COTS Acquisition - (DoD supplemental budget request)</strong></td>
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<tr>
<td>DoD COTS (Billions)</td>
<td>$0.120</td>
<td>$0.122</td>
<td>$0.125</td>
<td>$1.857</td>
<td>$1.894</td>
<td>$1.932</td>
<td>$1.971</td>
<td>$2.010</td>
<td>$2.050</td>
<td>$2.091</td>
<td>$2.133</td>
<td>$16.307</td>
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<tr>
<td><strong>Total Cost of DoD and VA Current Plans (including supplements for VistA Evolution and COTS Acquisition)</strong></td>
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<td>$84.45</td>
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<tr>
<td><strong>Automated Conversion Alternative + Transition of DoD and VA Software Maintenance to Open Source - &quot;Plan B&quot;</strong></td>
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<tr>
<td>VA IT Budget with 60% O&amp;M reduction*</td>
<td>$3.20</td>
<td>$3.26</td>
<td>$1.31</td>
<td>$1.33</td>
<td>$1.36</td>
<td>$1.39</td>
<td>$1.41</td>
<td>$1.44</td>
<td>$1.47</td>
<td>$1.50</td>
<td>$1.53</td>
<td>$19.20</td>
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<tr>
<td>DoD IT Budget with 60% O&amp;M reduction*</td>
<td>$1.40</td>
<td>$1.43</td>
<td>$0.57</td>
<td>$0.58</td>
<td>$0.59</td>
<td>$0.61</td>
<td>$0.62</td>
<td>$0.63</td>
<td>$0.64</td>
<td>$0.66</td>
<td>$0.67</td>
<td>$8.40</td>
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<tr>
<td>Conversion and Deployment + Annual Subscription Fees</td>
<td>$0.172</td>
<td>$0.033</td>
<td>$0.033</td>
<td>$0.034</td>
<td>$0.035</td>
<td>$0.035</td>
<td>$0.036</td>
<td>$0.037</td>
<td>$0.038</td>
<td>$0.038</td>
<td>$0.491</td>
<td></td>
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<tr>
<td><strong>Total Cost of DoD and VA Conversion plus 10 year IT Operations with O&amp;M cost reduction of 60% per annum over 8 years)</strong></td>
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<td>$28.09</td>
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<tr>
<td><strong>Total 10 year IT Cost Savings - (assuming conversion and UEHR deployment in 2015/2016 with accelerated 60% O&amp;M Reductions over 8 years)</strong></td>
<td></td>
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<td>$56.36</td>
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</table>

*Standish Groups estimates total O&M Reductions of 60% to 80% per annum post modernization. Bottom Line: Faster modernization achieves highest level of savings.
OSEHRA Abstract

The Unified integrated Electronic Health Record (UiEHR) is an open architecture fully automated modernization solution for healthcare that achieves seamless real-time interoperability and data interchange of the longitudinal patient record while meeting all applicable DoD open architecture, DODAF standards, and software quality assurance requirements.

- UiEHR is achieved by a perfect fidelity (non-distortive) cross-compiler that transforms MUMPS code into high performance Java/JEE at a rate of 2.5 Million lines-of-code per hour.

- The unified design and architecture iEHR is extracted into a TransformationBlueprint® and its model driven design is export into MagicDraw® for forward evolution using tools that adhere to OMG standards.

- In 2011, a CRADA was engaged with DoD and VA to auto-convert TC2 and VistA into a unified operational SaaS. On 2-11-2014 senior officials from the DoD and TATRC and VA, having witnessed the UiEHR, declared that the CRADA had successfully accomplished this goal.

- The UiEHR is presented and its strategic alignment with OSEHRA will be discussed.
Unified iEHR
“Push-Button” Conversion from Mumps to Java Cloud

1. The TSRI translation is a 100% push-button conversion. The translated code runs identically to the original. All user interactions, PF keys and other quirky behaviors are preserved.

2. No human intervention is required after conversion of the code to hand tune the code. Simply replace MUMPS with the JSE/JEE modules generated by the translator.

3. No operator retraining is required. Generated code deployed in private or public data centers as x86 SAAS hosted applications runs a web browser, on laptops or handhelds identically to the original MUMPS.

4. Original code and modernized code can interoperate and can be run at the same time. Performance of modernized code is better than MUMPS code, and is elastic and scalable in cloud-based PAAS/IAAS.

5. Translation is extremely accurate. Currently, a five sigma rate level of accuracy (less than 1 functional error per 100,000 lines of code translated) has been demonstrated. A seven sigma level of conversion to compilation and linkage has been demonstrated (less than 1 compilation error per 10,000,000 lines of code).

6. Conversion of Single Systems of 2.1 to 2.5 Million lines of code in 1 hour 20 min

7. Modernized Application database performance is equivalent or better than the original when tested on realistic test data.

8. Multiple Systems (e.g. FOIA VistA and Astronaut VistA) are unified automatically during a three hour Push-Button conversion process.

9. MUMPS can continue programming in MUMPS until they retire, while VistA sites redeploy modernized applications into data centers and into future IT architectures with modernized code and old MUMPS code can operating in parallel until the plug is pulled on the MUMPS.
Unified iEHR™ Benefits

The Unified iEHR™ moves legacy EHRs silos into Unified Cloud-based iEHRs. We have identified the following benefits.

### Legacy VistA-based EHRs

- Moving Silo’d Legacy EHRs From …
- Closed, Rigid Hardware Systems
- Perpetual SW License, On Premise Implementations
- Disjointed “Two Screen” PC vs Mobile User Experience
- Static & Backward-looking Management Planning Systems

### Unified iEHRs

- …Moving to Unified Cloud-based iEHRs
- Software & Services-led Open Architectures
- SaaS/Cloud-based Deployments
- “Anywhere Access” with Seamless User Experience & Capability
- Real-time Decisioning & Optimization Through Advanced Analytics
The **Unified iEHR™** can create a world in which there are no barriers between electronic healthcare record (EHR) management systems, and healthcare IT becomes seamless worldwide.

**Unified iEHR™**

**Cloud Unification Vision**

The **Unified iEHR™** can create a world in which there are no barriers between electronic healthcare record (EHR) management systems, and healthcare IT becomes seamless worldwide.
Unified iEHR Features
Supports Seamless CPRS Integration

- Transformed VistA variants are expressed in Java that is 100% Compatible with the CPRS User Interface
- Clinicians simply Launch the CPRS interface they are familiar with.
- In the background the Transformed Java VistA application runs in a webserver on a cloud servers
- Apache webserver (open source) was used for this demo.
- Transformed VistA is compatible with any webserver: Websphere, IIS
- UiEHR can be migrated to Websphere in a few days.

Simply select the version of UiEHR supporting that platform and go
Unified iEHR Features
UI Exhibits Functional Equivalent as Web Service

- The VT100 UI is 100% replicated as a web service
- The VistA variants can be run anywhere
- Runs in any kind of device that supports a browser User Interface
- i.e. It can run on iOS, Desktop, Android devices.
- Web services can easily be extended with enhanced capabilities, such as this play replay capability that has been created to support crowd sourced testing.
- Hundreds of testers can test the deployment simultaneously.
- Each tester has his own sandbox.

Java Based Cloud VistA Assimilated into a custom Cloud.
Unified iEHR Features
Eclipse as IDE for Compilation and Testing

- The transformed application is running as Java inside of Eclipse, the most advanced and widely used Interactive Development Environment in existence.
- TSRI transforms the 2.2 to 2.5 Million lines of MUMPS in FOIA VistA and Astronaut VistA in a little over an hour for each system.
- Eclipse compiles the translated VistA in about 20 minutes.
- Testing? Test scripts ‘pass’ for 70% of Meaningful Use Stage 1 Test Scripts for Astronaut as Java.
- Isolated and resolved 40 errors during achievement of Meaningful Use Stage 1 to 70% ‘Pass’ Testing.

Converting Mumps to Java. Then it runs ‘like’ Mumps always has.
Unified iEHR Features
Integrated Bug Reporting (using Bugzilla)

- Bug reporting is integrated into the uiEHR when running in testing modes.
- Recordings and Execution traces can be attached to the bug reports to allow easy replication of errors.
- Meta data is extracted during the execution of the derived Java code to allow easy replication of data and identification of call within a call tree to the point of error.
- Bugs can be linked to the source of error in the derived UML models of the transformed systems.

This is Java UiEHR!
Unified iEHR Features
Translation Traceability Using Transformation Blueprints

- Side-By-Side views of MUMPS and EGL

In the MUMPS the numbers 72, 79.1, 1 and 4 correspond to these Data Items in Java/EGL

EGL/Java Right of Screen

Mumps Left of Screen
Unified iEHR Features
Translation Traceability Using Transformation Blueprints

- Derived design model of EGL derived from MUMPS

We chart the Mumps, the EGL, and through into Java.
Unified iEHR Features
Translation Traceability Using Transformation Blueprints

- Derived Class Diagrams of EGL/Java Data Structures derived from MUMPS database

Our charts can extend deep into the physical code and identify everything from duplicate to never used code that makes up an Original Mumps system.
2004 - 2018 Unified iEHR™ Architecture
Horizontal EHR Assimilation & Vertical Tool Integration

Vertical UiEHR Tools and Technology Integration

Horizontal HIT Technology Integration

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Unified iEHR
Join the UiEHR Model-Driven Open Source Health IT Revolution

- Indicate on the sign up sheet if you would like a copy of your own UiEHR instance (or give me an email/business card).
  - You will be sent instructions and you can set up and run your own electronic healthcare system within minutes.

- Join the UiEHR Model Driven Engineering Community and become part of a Model-Driven Standards-Based Open-Source Health IT Software Revolution