ProForma Healthcare Solutions

A Silver Lining in the Healthcare Cloud

Healthcare Innovations to prepare software solutions for Cloud Computing

Author(s)	John F. Ellingson, Partner, ProForma Healthcare Solutions, LLC
Co-Sponsor	Philip Weintraub, Partner, Healthcare Management Advisors, LLC

The Abstract

Cloud Computing has tremendous potential to change the way we design, develop, test and deploy innovative software solutions in a faster, more efficient, affordable and integrated manner than is present in the healthcare industry today. The ability to access processor hungry applications on your iPad as you need them or move data from one compatibility construct to another or even to integrate several solutions together to serve the patient's diverse set of medical interventions is a fundamental need of all integrated care organizations. However, in today's world, the major software providers and proprietary hardware manufacturers in the industry have prevented the institution of standards and promoted a highly fractious environment for innovation. The result of this is that specialized algorithms and applications of many purpose built solutions require complex and expensive supercomputers to perform at their intended levels of functionality. These are multi-million dollar pieces of computing equipment few rural hospitals can afford. The purpose of this paper is to examine the benefits of providing access to these advanced applications for a larger population of scientists, physicians and researchers connected to rural healthcare providers through a cloud computing network and provide an innovation center where new telemedicine and medical applications can be developed. To do so could dramatically bring down the costs of healthcare IT and provide needed technology solutions for millions of rural Americans whose healthcare options are fading.

The Argument

We recognize that cloud computing has several unique challenges in the healthcare industry. Virtualization of resources such as processing, network bandwidth and storage are not sufficiently well advanced for most applications to provide the price/performance the Cloud could offer today. And, most healthcare applications optimized for only one proprietary hardware stack will not run efficiently on the Cloud. So, while the objectives of cloud computing are noble and will doubtlessly have a profound effect on the discovery processes at large, well-funded institutions, in its present form it will do little to meet integrated healthcare's need to "connect" rural end-users to the main axis of innovation… an eco-system of healthcare technology innovation that converts concepts into field-ready solutions.

To capture healthcare innovation on a grand scale, a few things must occur. The shift from designing applications for monolithic super computing platforms to more efficient and cost-effective High Performance Computing (HPC) clusters must happen. This enables an application-centric approach to the entire Integrated Healthcare Eco-System that can provide the linkage to the Cloud for healthcare stakeholders of every size. To facilitate such a shift, we need to create an environment where HPC processes and standards that optimize turnkey solutions can evolve so that all stakeholders can take full advantage of this computing power (e.g. Apple – We have an app for that, the Android platform). Consistent with any new environment, the software developers' toolkit must include an automated code conversion appliance for fast development of new Cloud deployable applications as well as the conversion of thousands of existing legacy healthcare applications, enabling them to scale and deliver to their fullest potential. And, the specialized needs of high resolution image and visualization data transfer and storage must be met. Finally, hardware manufacturers of C-Scan, MRI and other data rich diagnostic equipment like GE, Siemens, Philips, Toshiba and others, must open their proprietary databases to allow a seamless flow and fusion of information in a patient centric world.

Europe and Asia are already creating the means to harness innovative HPC environs like that described above for Green Testing, Automotive, Aerospace and the Computer Industries by using Patent Boxes. Profits from patented products that are developed and sold from within these "boxes" can be tax-free. Large hardware manufacturers are partnering with software developers to take advantage of this opportunity to bring new jobs and skills to remote locations. Why not provide the same advantage for our healthcare industry by using Innovation Clouds in rural America?

By establishing Innovation Clouds within the next evolution of data and co-location centers, Converging Technology Centers (CTCs), rural markets become sources of medical innovation and research. To be successful, these centers must be structured to address the biggest impediments to HPC adoption by the industry:

- For end-users, clusters are still hard to use and manage

- System management & growing cluster complexity
- Power, cooling and floor space are major issues
- Third party software costs
- Weak interconnect performance at all levels
- Applications & programming — Hard to scale beyond a node
- RAS is a growing issue
- Storage and data management are becoming new bottle necks
- Lack of support for heterogeneous environment and accelerators
- Application Integration is becoming the #1 roadblock
- Better management software is needed
- HPC clusters are hard to setup and operate
- New buyers – require "ease-of-everything"
- Parallel software is missing for most users
- Many applications will need a major redesign
- Multi-core will cause many issues to "hit-the-wall

IDC Survey of End Users, 2009

Centrally managed, we can meet these challenges. CTCs in a few remote and hardened locations that are connected to the high speed infrastructure and to skilled resources who co-locate with Independent Software Vendors (ISVs) and hardware partners to create turn-key solutions for the industry. This new capability has the potential to deliver the robust and the rich Cloud solutions that end-users require, even on their iPads, without the acquisition, integration or management of costly and complex proprietary supercomputer hardware.

The Implications

Fundamentally, these solutions will be designed to get more processing speed from less equipment using massive parallelization. Large proprietary supercomputer vendors have shown significant reluctance to address parallelization standards because their answer to faster systems has always been to build a bigger and more costly system for their most demanding clients. For healthcare software developers in the Innovation Cloud, parallelization is important to ISVs because it enables developers to protect their software investments rather than be forced in to solutions with a short-term life. Only when standards for parallelization exist will it be possible to engage with HPC software developers to address licensing issues for the more flexible use of third-party code.

This is a paradigm shift the healthcare industry has been looking for. As Clayton Christensen's Innovator's Solution keenly points out, Disruptive Innovation starts where the market is underserved and the customer performance requirements are well below where the supercomputing industry seems to be focused on serving. The Cloud for solution access and the CTCs for solution development form key components of a platform for PPACA success in rural America.

Proliferating specialized IT solutions is just one critical element for rural US Healthcare Industry to survive and prosper under PPACA.

There is proven pent up double digit growth demand for new healthcare IT solutions. ISVs have new application designs for HPC delivery but capital markets are painfully tight and unwilling to fund their development. The New Economy has grown up and it is expected to deliver these new solutions fast and continuously. Success in this market is not about building self-contained and proprietary software products that are pushed off the back of the truck and leave healthcare stakeholders with a monumental integration task. The strategy today is not about creating intense rivalries among competitors with a win everything or lose everything game plan. In the near-term, your fiercest competitor may become your most important solution collaborator.

The inflexible pyramid-shaped organization has given way to an ACO-like network of partner-employees, external contractors, suppliers and customer collaborating on the optimal solution. And managing this intricate external network of solution development collaborators is as important as managing your internal operations. The acceleration of everything will continue…the speed of information, the speed of decision-making and the speed of acting upon those decisions. With everything on fast-forward, there is no place for bureaucratic response times. The Healthcare Industry cannot wait for standards to evolve somewhere else. There is too much at stake. This industry must lead this effort and drive adoption.

World industrial productivity and global competitiveness has been improved through the use of High Performance Computing (HPC) and this has been the subject of many studies by IDC, Gartner, the Council on Competitiveness, the Kaufman Foundation and others. Virtually all Fortune 500 businesses that have adopted HPC, now consider this technology indispensable to their competitiveness and corporate survival. Yet in the healthcare industry, from entry-level to high-end systems, HPC currently represents only about 3% of the overall US market.

The Next Steps

Building the CTCs will be a collaborative effort involving a rural telecommunications carrier, an HPC solutions provider and several ISVs, research institutions and ACOs. Connectivity to the NRL or Internet2 backhaul networks may qualify CTCs for FCC and HHS funding. Not every application is appropriate for cloud deployment and some will have a greater impact on rural health equity than others. A selection and prioritization process for ISV applications will be established by the CTC trustees. Early focus will be on advanced visualization, telemedicine applications and biomedical sensor data collection.

On a regulation and policy basis, the IRS must be willing to designate the Healthcare Innovation Cloud with a 5% maximum tax rate on licenses and royalties. It is critical to the success of rural healthcare model that this co-development within the Healthcare Innovation Cloud be recognized by the tax authorities just as is being done in the EU and Asia.

Additional partnering with research institutions could yield completely new research opportunities and intellectual property in the conversion of legacy research applications. Ultimately, the results of this collaboration will be incorporated into the non-proprietary standard healthcare libraries for all of the participants.

All HPC hardware will be optimized to run specifically with the applications. Special concern will be focused on the system efficiency and power management requirements of the highly specialized hardware. ACO, Telecom and Converging Technology Center partners are expected to participate in addressing the needs of the final solution. Non-cloud deployed hardware variations of solutions may be released to the field to meet customer needs and to allow for simultaneous testing in each prototype environment.

The balance of scaling and delivering potentially hundreds of healthcare applications must be carefully managed to foster innovation. This means that careful examination of the potential ISV partners is conducted and effective ground rules are created to allow competitors to collaborate and collaborators to compete. Our conceptual model uses a joint venture model between the ISV and the integrated healthcare teams to align expectations for IP co-development, product development, resource requirements and, ultimately, product support and licensing revenues. The structure of these deals can be very complex, however, ProForma has developed an extensive methodology to identify ISV partners and guide through the steps of application optimization for HPC and co-development within the "cloud". Each relationship will be monitored independently and in concert with all of the healthcare stakeholders to ensure that maximum benefits are being achieved for the end-users.

Contact Information

Contact information for the author:

John F Ellingson
ProForma Healthcare Solutions, LLC
Atlanta Office
Tel: 1-800-470-5870
e-mail: jellingson@proformahealthcare.com
www.pfhcs.com