

Experiential Learning Using a Health Informatics Simulation Lab

Michael Kirshner, DDS, MPH | Jay Bockelman | Oregon Institute of Technology | Portland, Oregon

Introduction

- Training a skilled and experienced health informatics workforce is critical to realizing the full power of health information technologies
- An innovative baccalaureate-level academic program in Health Informatics at the Oregon Institute of Technology incorporates a computer Simulation Lab (SIM Lab)
- The SIM Lab includes real-world health information applications and technologies providing hands-on, case-based experiential learning and research opportunities for undergraduate students and faculty

SIM Lab

Purpose

- Provide applied experiential learning and research opportunities using real-world health care information technologies and virtual patient data
- Used by undergraduate-level allied health, computer science, software engineering, information technology and health informatics students

Aims

- Provide a test bed for student projects focused on solving real-world health care IT and informatics problems
- Develop and deliver formalized and mentored student projects utilizing SIM Lab capabilities and applications

Components

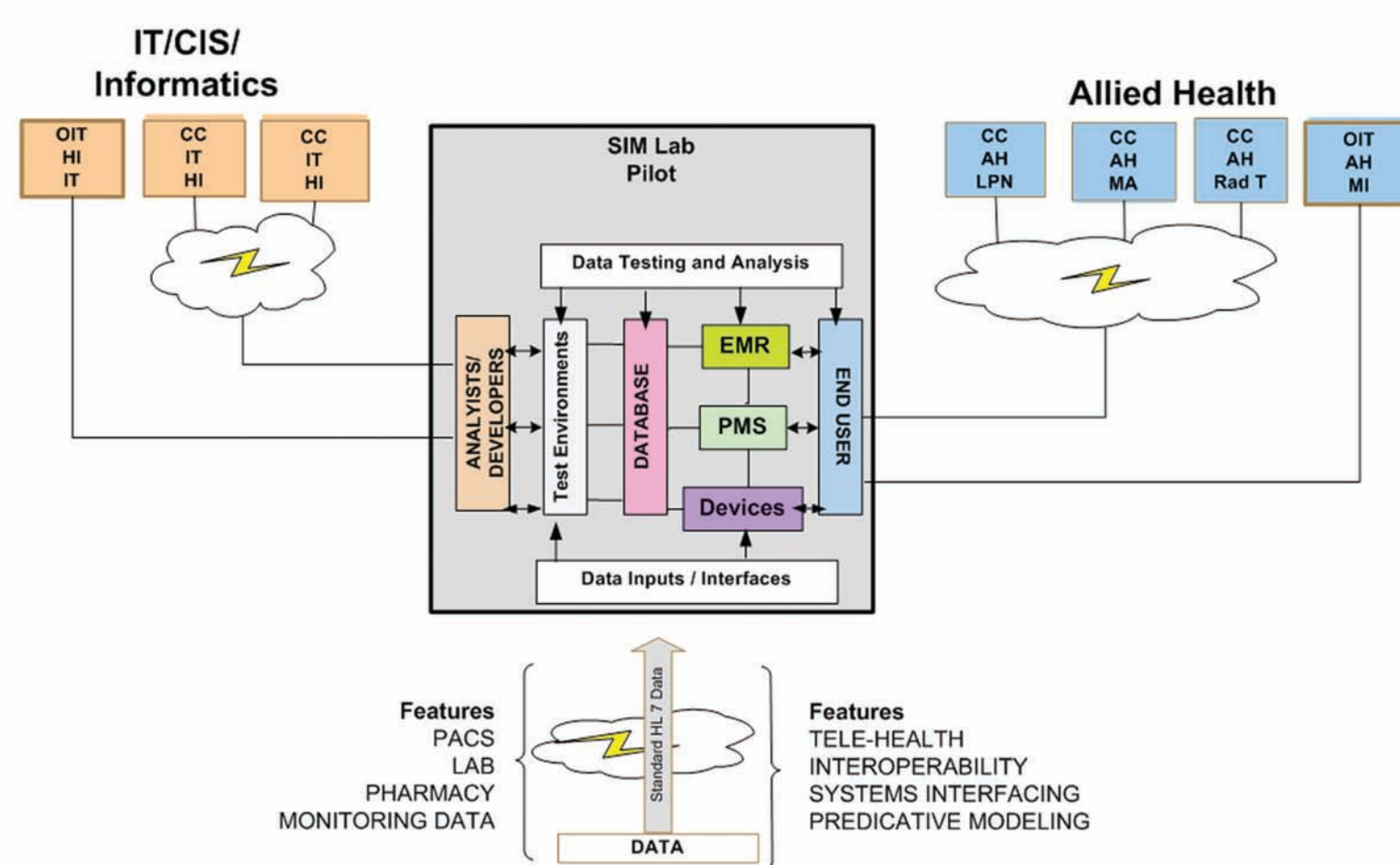
- GE Centricity: EMR & PMS
- Kryptiq: Patient Portal, Doc Management, Secure Messaging
- Welch Allyn: Propaq Patient Monitoring (USB)
- Nonin: Pulse Oximeter (Blue-tooth)
- MicroLife: Blood Pressure Recording (USB)

Set up

Windows Server 2003, VMware, Windows Terminal Server, SQL Server Database

Access

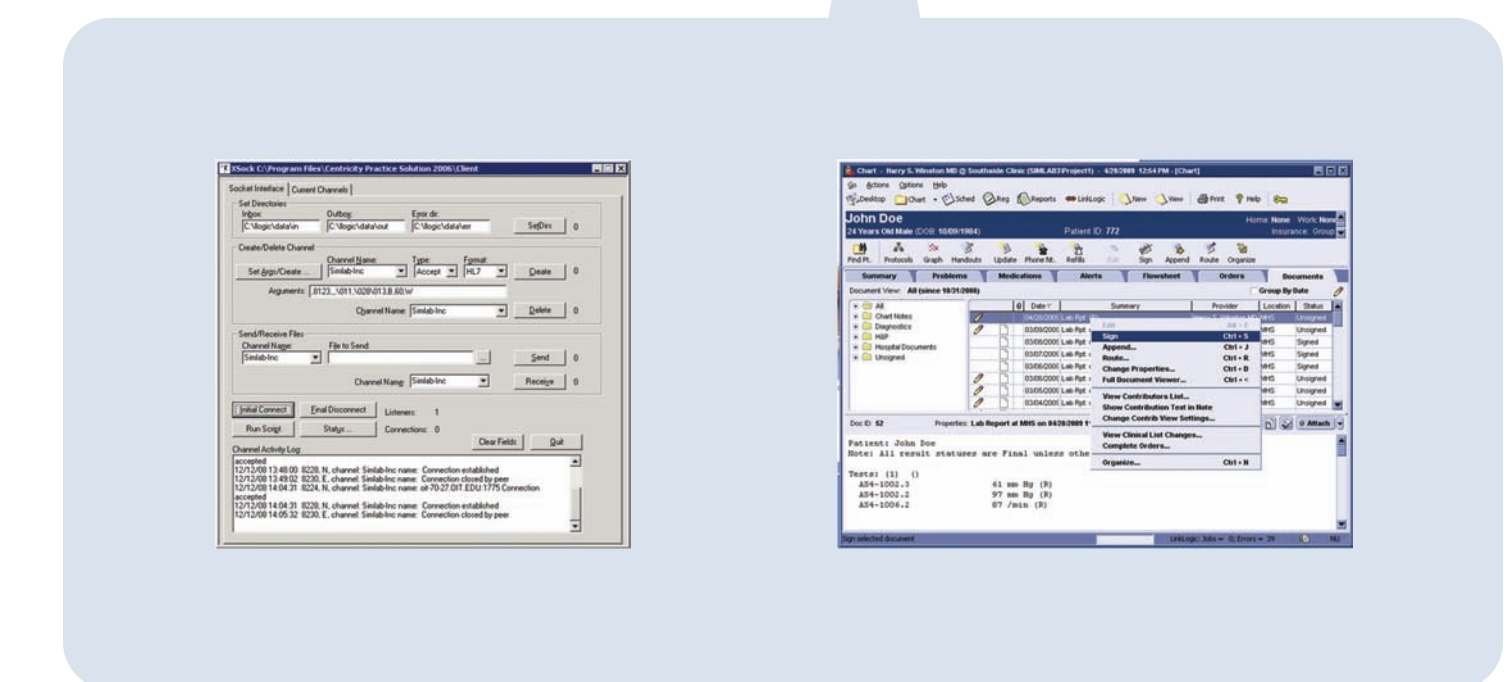
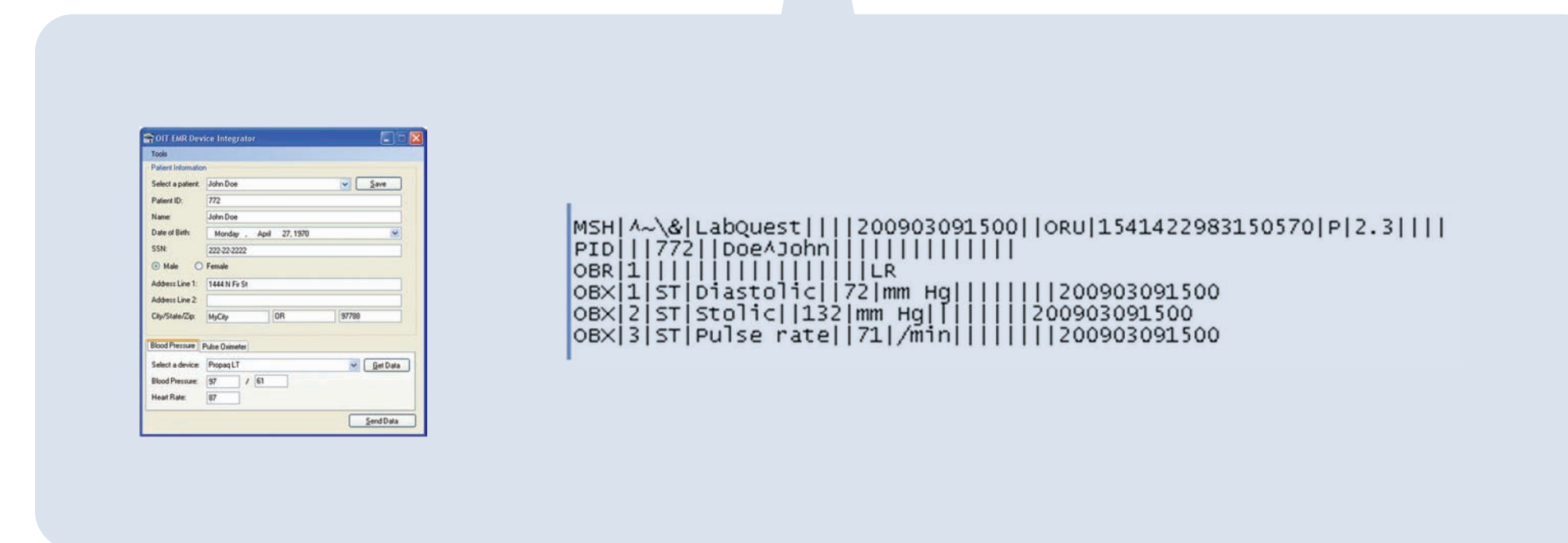
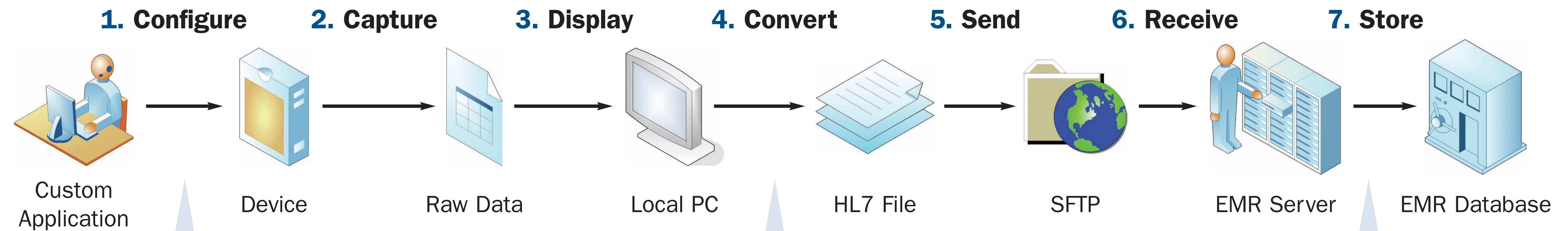
Remote via Windows Desktop



Experimental Learning

- Provide direct encounter and hands-on learning using real-world health IT
- Foster critical thinking, problem solving and project management skills
- Develop team-based communications and collaboration skills
- Address and manage chaos and crisis in a safe environment
- Encourage risk taking and leadership skills

Student Project: Biomedical Remote Monitoring Device Data Interface and Integration to EMR



Description

- This project will collect patient data from several monitoring devices, convert the data into HL7 format and securely transmit the data to an Electronic Medical Record system.

Aims

- Investigate issues, challenges and requirements to design, develop and implement the collection and transmission of data from remote patient monitoring devices to EMR
- Integrate discreet data into the SIM Lab EMR for use by the doctor and patient
- Design, build and test a software interface that captures and connects data from the device and transmits it to a data server
- Understand the impact of regulatory, compliance, business and technology requirements

Learning Objectives

- Students will identify the core problem of a complex real-world healthcare problem
- Students will gain experience in decomposing a complex real-world healthcare problem, and design, implement, test and document a solution to this problem
- Students will learn healthcare regulatory, compliance, business and technology requirements
- Students will gain experience with an EMR application and learn data interfaces, standard protocols, rules, and patient data flow through the system
- Students will gain teamwork skills in completing this project
- Students will gain oral and written presentation skills

Problems to Solve

- How to get data off device? Drivers? DLL's?
- What is HL7? What is the correct HL7 format?
- Which layer to work with – Application, Transport? Network? Data Link? Physical?
- How to send secure data to EMR?
- How does EMR receive, read and store data?
- How much can be automated?

Operational Steps

- 1. Configure** - Configure a custom application to communicate with a specific EMR
- 2. Capture** - Medical device takes vital sign reading
- 3. Display** - Custom application polls the device, retrieves data and displays it
- 4. Convert** - Data is formatted into appropriate HL7 segments
- 5. Send** - Custom application creates a SFTP connection to EMR
- 6. Receive** - The EMR server accepts the connection
- 7. Store** - EMR monitors the IN folder for new HL7 formatted files
 - EMR reads and parses the file using a custom-created cross-reference file
 - Patient data is available for review in EMR by provider

Solutions

- Device vendor supplied DLLs.
- Wrote custom C++ Dynamic Linked Library (DLL) to capture data and display output in custom Windows® application
- Researched HL7 format required by EMR
- Used encrypted secure file transfer protocol (SFTP) for client and server-side data flow
- Wrote custom application which creates HL7 file ready to be read by EMR server
- EMR verifies input and places in database

Custom Software Application

- Application is configured with unique patient id identical to EMR
- Device is connected to PC via USB port.
- Application detects device and captures reading if available
- Prompts user to send data to doctor of record
- Creates HL7 formatted file
- Uses SFTP to securely send HL7 file to EMR server

Student Learning Outcomes

- Identify real-world HIT problem
- Create proof-of-concept solution
- Understand EMR and remote patient monitoring devices
- Program HL7 data formats
- Learn and apply HIPAA and secure data transmission protocols

Project Outcomes

- Acquired patient data from multiple remote monitoring device
- Formatted data into an EMR-compliant HL7 file
- Transferred this patient data to the Centricity EMR system as discreet data
- Demonstrated that data was accepted into the Centricity EMR and displayed in the patient's medical record
- Documented and presented their results in written and oral formats

Acknowledgements & Grant Support

- OIT SIM Lab student team: Steven Bloedel, Jason Hardesty, Brian Holm, Leonard O'Dell
- GE Centricity Vendor: Healthco Information Systems, Portland, OR
- Grant Funding: State of Oregon Department of Community College and Workforce Development - Interagency Agreement IAA0048. 2008

References

- Medical device integration is a critical (and an often overlooked) part of EMR planning... [cited December 11, 2008]. Available from URL: <http://charlesconradvaz.wordpress.com/2007/06/23/emr-and-device-integration/>
- Perlin JB and Gelinus LS, Electronic Health Records Workgroup Recommendations. 2008, American Health Information Community: Washington, DC. Available from URL: http://www.hhs.gov/healthit/documents/m20080115/09-ehr_recgs_itr.html
- Western Interstate Commission for Higher Education, A Closer Look at Healthcare Workforce Needs in the West: Health Information Technology [cited December 11, 2008]. Available from URL: <http://www.wiche.edu/sep/psep/workforceHIT.pdf>

Contact

OIT Health Informatics Program Director
Michael Kirshner, DDS, MPH
michael.kirshner@oit.edu