Using Your CMMS to Help Manage Network Connected Medical Systems

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Manager, Clinical Engineering, UC Davis Health System
UC Davis Health System

- Level 1 Pediatric & Adult Trauma Center
- Licensed beds: 631
- ER visits: 58,023
- Clinic/office visits: 915,452
- Admissions: 31,025
- For year ending June 30, 2011
CMMS: Table of Contents

- UCDHS IT-connected device and network environments
- CMMS Introduction
- UCDHS’s CMMS (AIMS) and IT-related fields
- Other ways CE and IT work together to manage connectivity
Medical devices currently IT-connected:

- Over 200 Philips patient monitors via 30 central stations (some headless) in 20 ICUs plus other areas (e.g. 2 infusion centers, GI/endoscopy lab)
- Welch Allyn telemetry
- All imaging systems connected to PACS
- 7 cath labs
- GE Muse (ECG machines)
- ScottCare Holter
- 1500 wireless smart pumps
- GI/Endoscopy and ENT video clips
Connectivity Projects under development:

- Anesthesia Machine (OpTime and Anesthesia record keeping system)
- Telemetry upgrade (Cisco Wireless)
- Sim Suite/Capsule Technology connectivity development laboratory
- Ventilator interface
A VNO enables one physical network to be sliced up into multiple logically isolated networks where each segment can be independently managed and programmed to meet a variety of network requirements.

e.g. **Green=Clinical Life Critical (CLC)**, **Blue=Clinical General Purpose (CGP)**, **Gold=General Purpose (GP)**
Hemodynamic monitors sending central stations a constant stream of ECG and other real-time physiological data.

- Timely, reliable, low latency delivery of data for primary clinical alarms.
- Applications have only a few seconds to determine critical alarms including bedside, network and central station processing
- Relatively low bandwidth, very sensitive to latency and loss.
- FDA/AAMI standard for ECG alarms allots less than a 10 second period of time from the inception of a monitored patient alarm condition to audible/visual central station alarm
- At UCDHS, Clinical Engineering determines which networked patient care devices requires “Clinical Life Critical” (CLC) network designation
Network Environment

Legacy Network

- Ethernet (Philips Intellivue bedsides)
- Physically isolated patient monitor subnets
Network Environment
Legacy Systems

Philips CMS bedsides, SCC switches, SDN Proprietary Network
Data Flow from Bedside to EPIC EMR

Real-time data

Once per minute, HL-7 feed to interface engine

Data is “pooled” awaiting validation

Once validated, data shows on flow sheet and on the patients chart, and becomes part of the legal medical record.
## Wireless Environment

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
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<tbody>
<tr>
<td>Total Number of 802.11 APs</td>
<td>1130</td>
</tr>
<tr>
<td>Total Building Square Footage</td>
<td>Approx 2.5 million</td>
</tr>
<tr>
<td>Total Number of Buildings</td>
<td>23 of 88</td>
</tr>
<tr>
<td>Total Number of Floors (Maps)</td>
<td>68</td>
</tr>
</tbody>
</table>

- **3,000 Vocera Badges**
- **650 various PDAs (eg BCMA)**
- **180 MicroPaqs, currently private 802.11 FH and 802.11a private, (soon on Cisco 802.11a VNO)**
- **1450 wireless infusion pumps**
- **400 WoWs**
Clinical Engineering Perspective

Corrective and Preventive Maintenance Focus

- Hands on often (on-site or in shop)
- Both hardware and software tools, but often the software tools are on-board the device
IT Perspective:
Help-Desk and Change Management Focus

From ITIL Hero’s handbook, www.manageengine.com
What is a CMMS (Computerized Maintenance Management System)? A computerized DATABASE to manage all data aspects of a technology management organization including:

- Asset and Resource Management
- Financial Management
- Workflow and Workload Management
- Regulatory Compliance
CMMS: Asset and Resource Management

- Equipment Inventory Control
- Integrated equipment history
- Spare Parts Management
- Staff Management
- Equipment Replacement Analysis
- Other (recalls, incidents)
CMMS: Financial Management

- Cost of Service
  - By item
  - By department, equipment type etc
  - Overall cost of Service
  - Cost of Service Ratio (COSR)
- Internal Cost Control
- Billing
- Vendor Cost Management
- Budgeting
Workload & Workflow Management

- Scheduled Work
- Unscheduled Work
- Dispatch
- Response
- Followup/Escalation
- Completion
- Projects

- Workflow management
  - By skill set
  - By geography
  - By job type
  - By time of day/day of week/month of year etc
CMMS Modules

- Equipment Inventory
- Workorders
  - Scheduled Work
    - Procedures
    - Scheduler
  - Unscheduled Work
    - Dispatch
    - Followup
    - Escalation
- Vendor Management
  - Contracted vendor work
  - Non-contracted vendor work
- Parts
- Stock Parts
- Reports
- Utilities
How can a CMMS Help Manage Interconnected Medical Devices and IT Systems?

- Documentation of critical features, parameters, configuration (e.g., IP addresses, software revs)
- Links to drawings and other relevant documents
- Product Recalls (e.g. rev level recalls)
- Sharing of information with IT
### UC Davis’ CMMS Equipment Screen

#### Equipment Control

<table>
<thead>
<tr>
<th><strong>Information</strong></th>
<th><strong>History Log</strong></th>
<th><strong>PM Schedule</strong></th>
<th><strong>Information Services</strong></th>
<th><strong>Contracted Service</strong></th>
<th><strong>Document</strong></th>
</tr>
</thead>
</table>

#### Name Plate
- **Tag/Asset**: 20083001704
- **Description**: COMBO MAC/CARDIO
- **Type**: COMPUTERS
- **Serial No.**: SEA08110231GA

- **Manufacturer**: GE MEDICAL SYSTEMS (IMAGING)
- **Model**: XW8400
- **Model Name**: XW8400
- **Orig. Manufacturer**: GE MEDICAL SYSTEMS (IMAGING)

#### Administration
- **Building**: SESP (PAVILION)
- **Cost Center**: EPS LAB (9665)
- **Responsible Center**: EPS LAB (9665)
- **Risk/Inclusion Factor**: 01
- **Location**: 1P533

- **as of**: 05/09/2012
- **In Service**: 07/01/2008
- **Status**: ACTIVE-UCD[M6]

#### Purchase Information
- **Supplier**: GE MARQUETTE MED SYSTEMS PI
- **Ownership**:
- **Purchase Order**: 4408086505
- **Purchase Cost**: 82834.00
- **Estimated Acquisition Cost**: 

#### Service Information
- **Condition**: FULLY FUNCTIONAL
- **as of**: 07/01/2008
- **Site ID**: 

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#### Additional Elements
- **OK**, **Previous**, **Next**, **Undo**, **Save**
What fields does/should a CMMS contain to manage devices connected to IT?
What fields does/should a CMMS contain to manage devices connected to IT?

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<tr>
<th>Field</th>
<th>Value</th>
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<td>Network Drop Location</td>
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<td>IP Address</td>
<td>10.185.168.2</td>
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<td>Sub Net</td>
<td>CLC</td>
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<td>Router Location (1)</td>
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<td>Router Location (2)</td>
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<tr>
<td>Domain Controller</td>
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What fields does/should a CMMS contain to manage devices connected to IT?
What fields does/should a CMMS contain to manage devices connected to IT?

<table>
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<tr>
<th>HIPAA</th>
<th>Capability</th>
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<td>Logon Compliance</td>
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<td>Encryption</td>
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<td>Audit</td>
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</table>

![Image of HIPAA Webpage Dialog]

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What fields does/should a CMMS contain to manage devices connected to IT?
What fields does/should a CMMS contain to help manage devices connected to IT?
System button
System button: Brings up a list of inventoried products that make up a system

Optionally, identifies the system as “critical”
**Document button:**

### Name Plate
- **Tag/Asset:** 330059023
- **Manufacturer:** PHILIPS (CARDIAC AND MONITOR)
- **Model:** M1386E
- **Model Name:** M1386E
- **Serial No.:** 4703A07224
- **Orig. Manufacturer:** PHILIPS (CARDIAC AND MONITOR)

### Administration
- **Building:** DAVIS TOWER
- **Cost Center:** DT-3 UNIV BIRTHING CNTR (97)
- **Responsible Center:** DT-3 UNIV BIRTHING CNTR (97)
- **Risk/Inclusion Factor:** 02
- **Location:** 3775
- **as of:** 01/28/2010
- **In Service:** 06/14/2007
- **Status:** ACTIVE-UCD[MC]
- **as of:** 01/28/2010

### Purchase Information
- **Supplier:** PHILIPS PT MONITORING
- **Ownership:**
- **Purchase Order:** 4406961124
- **Purchase Cost:** 4576.00
- **Estimated Acquisition Cost:**

### Service Information
- **Condition:** FULLY FUNCTIONAL
- **as of:** 01/28/2010
- **Site ID:**
- **as of:** 01/28/2010
OB Trace-Vue Network Diagram
11th Floor: Welch Allyn Acuity
What else might CMMS track?

- Required open ports
- Interfaces (type, target IP address)
  - ADT (patient demographics and location)
  - AD (employee id info for authentication)
  - NTP (consistent network time)
  - I/E Interface engine
- EMR
- PACS
- More security info
- More standards info
Sharing Data: CMMS Connection to IT

- IT Department’s Device inventory has an ODBC connection to Clinical Engineering’s CMMS

- Any item with an IP address in the Clinical Engineering CMMS is also shown on the IT System’s Device Inventory under Clinical Device Data
**DHCP Infusion Pump Example from IT’s Device Inventory**

<table>
<thead>
<tr>
<th>Serial Number</th>
<th>Manufacturer</th>
<th>Model</th>
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</table>
Some healthcare organizations have “married” the two groups together, most have not

Whether reporting to the same boss or not, the need to work together, INCLUDING sharing data, has grown

We have many ways we are working together, but not under the same “boss”:
- Technology evaluation committees
- IT/Facilities working group
- Leadership meetings
- Education/Cross Training
All Philips central stations have redundant HL-7 test feeds to IT and Clinical Engineering.
Other Ways CE and IT Work Together

- Change management (CAB)
- Security and privacy
- Spectrum management
- Project planning
- Other project specific tasks such as testing
Some Challenges

- Neither HP Open View (IT’s documentation system) nor AIMS are designed to manage systems of systems well, particularly disparate systems.

- Culture is different
  - CE hourly union workforce that charges for its services
  - IT non-union and all overhead
  - CE’s clinical focus
  - IT’s project and help desk focus
  - Old buildings/legacy network (difficult to upgrade old infrastructure)

- Wireless’ ever-changing landscape
Questions?

Contact: Ted Cohen     Theodore.cohen@ucdmc.ucdavis.edu

Fourth Annual Medical Device Connectivity Conference & Exhibition

November 1-2, 2012, Joseph B. Martin Conference Center at Harvard Medical School, Boston, MA