JOHNS HOPKINS
MEDICINE

TECHNOLOGY TRENDS AT JOHNS HOPKINS

Spring 2013

The future of Scientific computing at The Johns Hopkins University

- Information is located at the following SharePoint site:
- **SharePoint site: https://collaborate.johnshopkins.edu/sites/SuperComputing/default.aspx**

EARLY ACTIVITY - 2011

- Initial committee formed to study scientific computing direction at Hopkins in Spring, 2010
- Subcommittee formed dealing with infrastructure and computing requirements
  - Vasan Yegnasubramanian (SoM)
  - Lee Watkins (SoM CIDR)
  - Mark Robbins (KSAS)
  - Alex Szalay (KSAS)
  - Fernando Pineda (BSPH)
  - Mike McCarty (IT)
  - Ken Church (WSE)

Recommendations

- White Paper describing future requirements for Scientific Computing published June 2011
- Recommendations concluded that solution should:
  - Be close to campus or fiber pathways
  - Have available up to 10 MW power for expansion
  - Be designed in a modular fashion and be “GREEN”
  - Be economically feasible with low cost of entry
  - Be flexible and expandable
  - Provide a sustainable funding model

Recommendations

JOHNS HOPKINS MEDICINE

- Support a variety of computing requirements (genomic research, large scale image/video processing, parallel processing applications)
- Support massive amounts of CPU, GPU and storage
- Low cost of entry for new faculty
- Two clusters 600 – 750 kW each
  - One parallel environment
  - One computational cluster
- Massive storage arrays

State Funding

The State of Maryland believes that scientific computing holds great opportunity for the future of Maryland.

- **With the potential for State funding of up to $30M over a multi-year period, we were asked to provide some cost information coupled with potential locations, design and a high level project plan.**
- **The timing was serendipitous given the state of the Hopkins white paper and engineering review.**
- **An initial tranche of $3M was approved for fiscal 2013 with strong advocacy in the legislative leadership for approval of an additional $12M in fiscal ‘14 with a final tranche of $15M in fiscal ‘15.**

Current Status

- **Vendor selection has been narrowed to two vendors that can best meet our needs for both modular facility and computing requirements. Faculty committees from both UoM and Hopkins are meeting to:**
  - **Develop computing platform design (systems, storage, memory, etc.)**
  - **Recommend a solution to executive leadership that meets the funding requirements and contains a plan for cost recovery**

Next Steps (continued)

- Continue with engineering work and begin final site design
- Perform site work starting June 2013
- Finalize equipment design and orders winter 2013
- Complete site work winter 2013
- Equipment delivery and set up May/June 2014
- Facility live July 1, 2014

Our New Clinical Environment

USING TECHNOLOGY TO IMPROVE PATIENT OUTCOMES AND SUPPORT OUR CLINICAL STAFF

Stephanie Reel
Mike McCarty
Steven Mandell

THE JOHNS HOPKINS HOSPITAL

Shared Floors contain:

total of 33 new state-of-the-art operating rooms, including:

- **14 neurosurgery and general surgery**
- **10 for pediatrics**
  - **6 cardiac**
  - **3 obstetrics**

Adult and pediatric prep and recovery

Our New Clinical Environment

Where do we start…

Industry Standard Technology – In the walls

- In 2006, we were asked to plan the infrastructure and systems to ensure the new hospitals are:
  - Wireless
  - Filmless
  - Paperless
  - And the infrastructure should satisfy our needs through 2017 ! ! !

Defining our future

Base systems were already in place with numerous improvements planned. Hundreds of meetings were held with clinical staff to determine how we could provide a positive impact on their operations. We set up numerous demonstrations of technology and worked with various groups to develop changes in work flow.

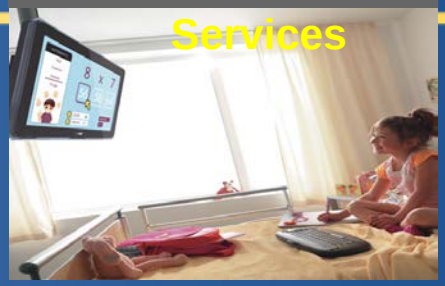
By the numbers…

Data Cables	~17,500 or 411 miles!
Active Data Ports	~14,000 with 1,000 available
2,500 Public Workstations	4,600 across the entire hospital
Voice & TV Cables	~6,500 or 185 miles!
Fiber	~ 315 miles of fiber strands!
Wireless Access Points	> 750 (including elevators)

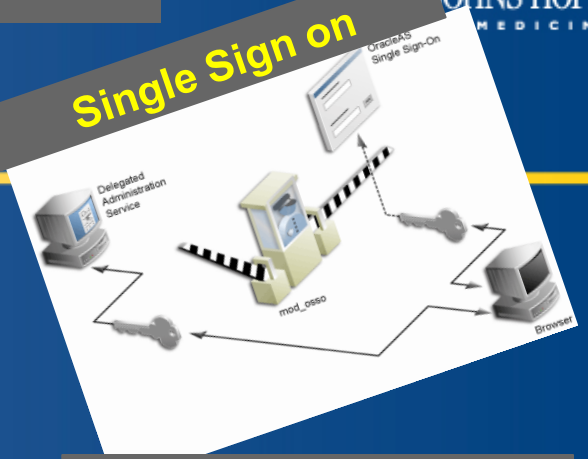
ALL THIS TECHNOLOGY, LETS PUT IT TO GOOD USE!

Real Time Location Services

TIGR Interactive Patient Services



Single Sign on



Proximity Badge

PING

Microsoft .net

Active Directory

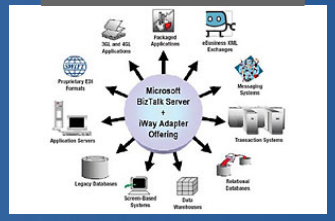
Cellular Devices &

Nurse Call

Allscripts

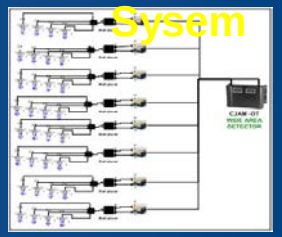
VOIP

Biz Talk



Hopkins cloud

Distributed Antenna Sysem

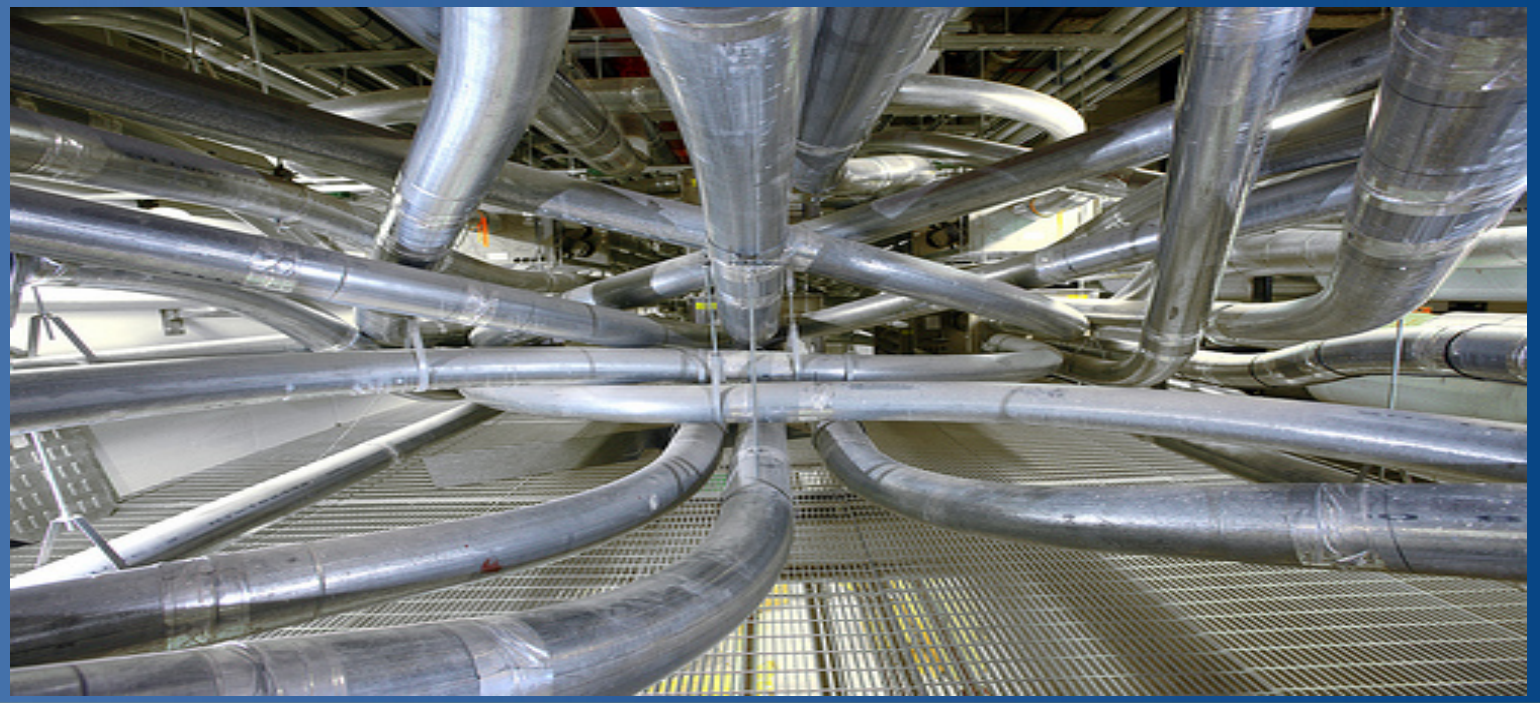


Our New Clinical Environment

COMMUNICATIONS

1.6 million square feet - finding people is a challenge…

In fact, the entire building is confusing ! ! !



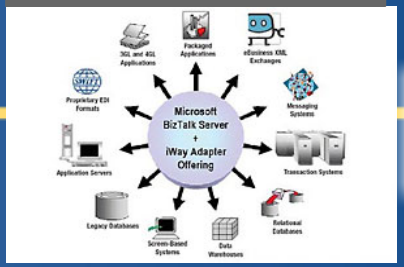
IMPROVING PROVIDER COMMUNICATIONS

Our New Clinical Environment

Active Directory

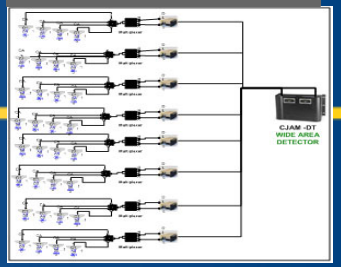
Cellular Devices & Pagers

Biz Talk

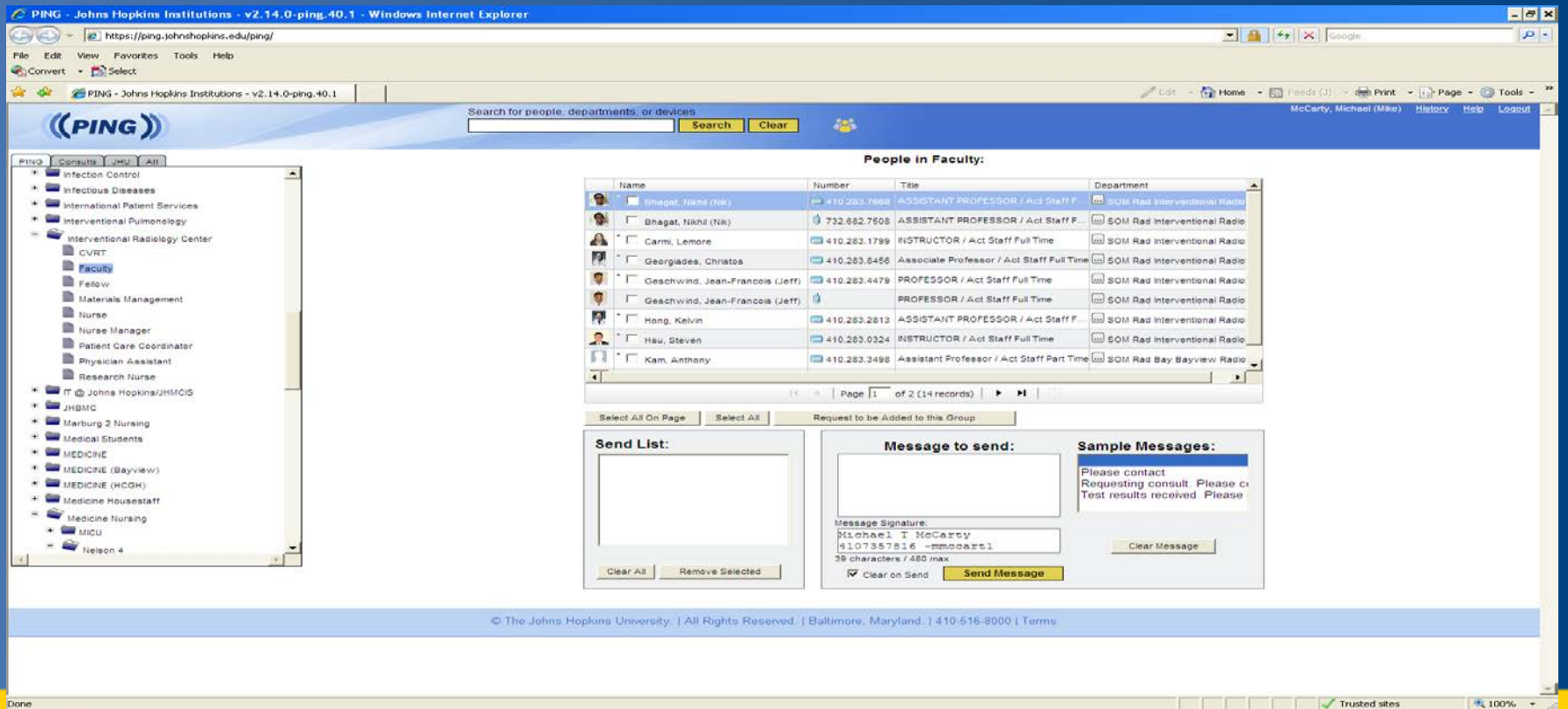


Microsoft .net

DAS



Provider Instant Notification Gateway "PING"



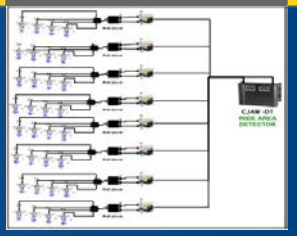
COMMUNICATIONS

Our New Clinical Environment

1.6 million square feet finding people is a challenge…

Cellular Devices

DAS



PING

Microsoft .net

Allscripts

Identify the right person, reach them rapidly…

- Communications device based upon personal preference
- Consult orders from Allscripts to physicians
- Distribute notifications, orders, alarm alerts
- Support both voice & text
- Caregiver to/from patient
- Amongst nurses
- Amongst physicians
- Physicians to/from nurses

COMMUNICATIONS BETWEEN PATIENTS AND CAREGIVERS

Our New Clinical Environment

Nurse Call

Patient Monitor

The illusive "SINGLE" device

- Using a single device to receive all messages and alarms remains in the future for Hopkins. Concerns include:
  - Alarm fatigue resulting in missed critical alarms
  - Message prioritization
- Improvements to middleware components offer promise for the future.
- Patient calls can now be sent directly to caregiver and transferred easily to others

IMPROVEMENTS FOR OUR PATIENTS

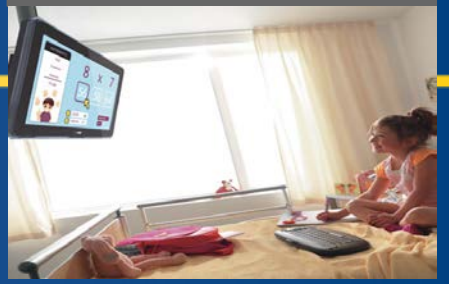
Our New Clinical Environment

Active Directory

Microsoft .net

Allscripts

TIGR Interactive Patient



Improving the Patient Experience

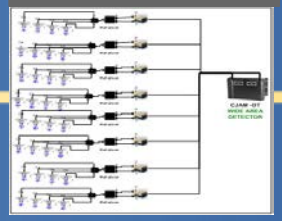
- Patient Portal provides the patient with the ability to directly access their information and share this information with other caregivers
- My Care Team provides a visual aid to the patient and their family as they deal with the many caregivers they may encounter during their stay

My CareTeam

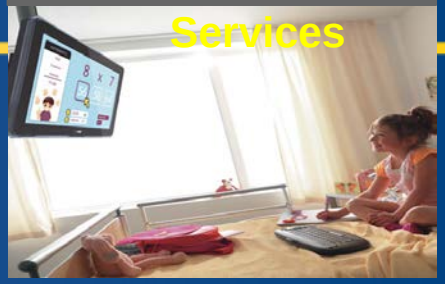
IMPROVEMENTS FOR OUR PATIENTS

Our New Clinical Environment

DAS



TIGR Interactive Patient Services



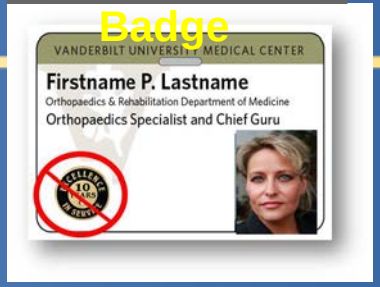
Improving the Patient Experience

- **Patient entertainment (disease specific information, TV, movies, games, order meals)**
- **Enhanced access to cellular services through DAS**
- **Faster WiFi access (GuestNet)**

IMPROVEMENTS FOR OUR CLINICIANS

Our New Clinical Environment

Proximity Badge

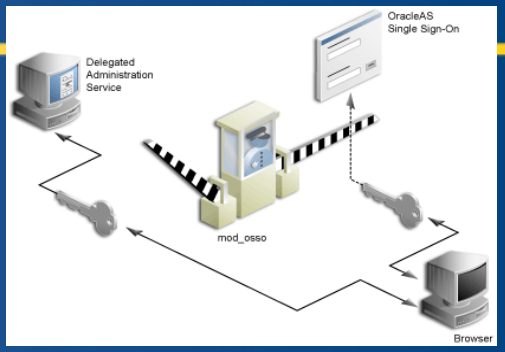


Active Directory

Hopkins cloud

Virtual Desktop

Single Sign on



Tap & Go

- Multi-factor (Felica cards & PIN)
- Active Directory
- Virtual Desktops
- Single Sign On

Improving Clinical Workflow

- Easier and faster access to systems
- Consistent interface from anywhere
- Maintain sessions across devices
- Supports IOS, Android & Microsoft

OPERATIONAL IMPROVEMENTS

Location based services

The installation of Real Time Location Services (RTLS) was designed to provide coverage for people and assets.

Improving Workflow

- RTLS enables:
  - Location of nurses in association with nurse call system
  - Location of portable equipment
  - Improved reaction to medical equipment recalls
  - Improvement to patient flow through clinics, ED, etc.

- In the future RTLS will be used to:
  - enhance patient transport services
  - improve clinic and workflow in various areas

Construction materials:

- Over 12,500 tons of structural steel
- 44,500 cubic yards of new concrete
- Enough copper wire (1,379 miles) to stretch between Baltimore and Miami
- 322 miles of electrical and cabling conduit - enough to make a round trip from Baltimore to Ocean City
- Over 4,000 plumbing fixtures
- 3.5 million pounds of sheet metal in the ductwork for heating, venting, and air conditioning systems
- 244,000 square feet of glass window walls and exterior windows, including 1,423 curtain wall panels weighing up to 1,800 pounds each
- Up to 1500 workers employed at project's peak

Locating Objects

- For our purposes, location services simply enables a system to be aware of the location of an object at a point in time. An object could be a person, piece of medical equipment, transportation equipment, etc.
- GPS, RFID and Infrared are technologies that we likely encounter often.
- Knowing the “location” of an object is important when there is a need to find or make contact with an object.

Tracking Objects

- Tracking an object implies following the path of an object.
- In order to track the path of an object…
  - Historical information must be captured to determine the route that an object followed as it moved.
  - There must be a reasonable number of points along a path that capture the objects location in order to determine the path being followed.
- Knowing the “path” that an object followed during its movement may be important to process improvement, enhanced security, determination of who may have come in contact with an object, etc.

When RTLS Has Issues

- **Both Infrared and RFID technologies utilize badges with electronic components that require power. These badges are not suitable when:**
  - Objects are submersed in liquids
  - Objects are subject to significant temperature fluctuations
- **Radio Frequency signals can be disrupted when the signal travels through liquids (blood, breast milk, etc.)**

Historical Information

- Product testing in Simulation Center
- Pilots in Weinberg and Nelson
- GE was determined to be “the” strategic Nurse Call system which (initially) could only be integrated with Versus.
- “Ownership” of RTLS determined to be in Materials Management (Bill Kennett)

The future…

- **With EPIC we will have information available in a more consolidated and much more useful manner:**
  - **A patients schedule can be optimized for their stay to include available time, scheduled procedures and tests and scheduled time for meals**
  - **We know about specific transport requirements for the patient (e.g. bariatric wheel chair)**
  - **We "could" know and automatically contact the closest transport person with a bariatric wheel chair and send them to pick up the patient for their next test….**

The Future Continued…

- **With the Hopkins RTLS system we could…**
  - **Track the location of Transport personnel**
  - **Track transport equipment by type and location**
  - **Associate transport personnel, their current assignment and equipment being used**
  - **The location of a patient and the location of their next scheduled event**

What might be possible…

- **Hmmmm, if we know**
  - **the schedule of tests**
  - **the patient's availability and location**
  - **the closest available transport person with the appropriate equipment**

What might be possible…

- Might we become more efficient?
- Potentially:
  - More efficient use of expensive nuclear test equipment
  - Schedule more inpatient testing each day
  - Reduce patient stay, increasing patient turnover
  - Perhaps reduce the amount of excess transport equipment
  - Improve the efficiency or transport personnel
  - Even improve patient satisfaction