HealthGrid

HL7/ OMG Interoperability Workshop
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Ms. Mary Kratz
Special Advisor to the Director, Broadband Medical Networks
Telemedicine & Advanced Technology Research Center (TATRC)

Yannick Legre, PhD
President HealthGrid

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Agenda

- Mary Kratz
  - Stating the Problem
    - Stroll thru history
    - Rise of the Modern Paradigm
  - Transforming the Paradigm
  - Renewal of the Compact
    - Gov, Industry, Academia
- HealthGrid by Yannick Legre
- Discussion, Q&A
Stating the Problem:

Interoperability!
Aspects of Interoperability

- Semantic
- Information
- Computational
- Technical
- Social Anthropology
  - Human capacity building
  - Policy, ethics and regulation
Look at yesterday and today

Medicine used to be simple, ineffective and relatively safe. Now it is complex, effective and potentially dangerous.

- Sir Cyril Chantler, Lancet 1999
Eschatological Approach of Health Paradigms

G O D

T R U T H
Genes, molecules, virus

G O D T R U T H

GLOBAL INFORMATIO N SOCIETY

GLOBAL INFORMATIO N

ERRORS

RECONCILIATION

FAULT/PUNISHMENT

RECOVERY

Slide Courtesy Jean-Claude Healy, WHO
A Personal History
Aspects of Interoperability

- Semantic
- Information
- Computational = market
- Technical
- Social Anthropology
  - Human capacity building
  - Policy, ethics and regulation
Aspects of Interoperability

- Semantic
  - Information = leverage HL7
- Computational
- Technical
- Social Anthropology
  - Human capacity building
  - Policy, ethics and regulation
RM/ODP Viewpoints

- **Enterprise** Viewpoint is concerned with the purpose, scope, and policies governing the activities of the specified system within the organization of which it is a part;

- **Information** Viewpoint is concerned with the kinds of information handled by the system and constraints on the use and interpretation of that information;

- **Computational** Viewpoint is concerned with the functional decomposition of the system into a set of objects that interact at interfaces - enabling system distribution;

- **Engineering** Viewpoint is concerned with the infrastructure required to support system distribution;

- **Technology** Viewpoint is concerned with the choice of technology to support system distribution.
Not Useful

What did he say?

Encapsulation

Behavior

Interface

Polymorphism
Roadmap

Network Health: Prescriptions for the Internet

- National Research Council Report
- National Academy Press
Enormous Bandwidth
Lambda Networks
Time Needed to Move Brain Images Across the Internet

Voxel size: 1 mm
Imaging Technology: Current color MRI
Data generated: 4.5 Megabytes

643 seconds  56 Kbps Modem
36 seconds  Broadband Internet
0.4 seconds  Typical LAN
0.006 seconds  Internet2 (5.6 Gbps)

Slide courtesy BIRN
Time Needed to Move Brain Images Across the Internet

Voxel size: 10 µm
Imaging Technology: Current color fMRI
Data generated: 4.5 Terabytes

178,571 hours  56 Kbps Modem
10,000 hours   Broadband Internet
100 hours      Typical LAN
1.8 hours      Internet2 (5.6 Gbps)

Slide courtesy BIRN
Time Needed to Move Brain Images Across the Internet

Voxel size: 1 µm
Imaging Technology: Near-future color fMRI
Data generated: 4.5 Petabytes

1,062,925.17 weeks  56 Kbps Modem
59,523.8 weeks     Broadband Internet
181.7 weeks        Typical LAN
10.6 weeks         Internet2 (5.6 Gbps)

Slide courtesy BIRN
Rise of the Modern Paradigm

http://www.nas.nasa.gov/Pubs/NASnews/97/09/ipg_fig1.html

System Users
Scientists and engineers using computation to accomplish NASA missions in aeronautics, earth sciences, space sciences, and air and space operations.

Intelligent Interface
A knowledge-based environment that offers users guidance on complex computing tasks.

Cluster Operating System
The software which coordinates the interplay of computers, networks, and storage.

Supercomputing
Heterogeneous collection of high-performance computer hardware and software resources.

Networking
The hardware and software that permits communication among distributed users and computer resources.

Mass Storage
A collection of devices and software that allow temporary and long-term archival storage of information.
Transforming the Paradigm
Grand Challenge: CyberInfrastructure

Modeling, Simulation, Visualization, Software Frameworks, Databases, Networking, Grids

Courtesy: Peter Hunter, University of Auckland
“6 s approach” in e-Health

Healthcare Systems

(Hospital, Patient Treatment, Doctors, etc.)

1 σ

3 σ

Policies

Public Health Risk Management

Home care monitoring Continuity of Care

Professional Risk Management

Early detection

Personal Risk Management

Genetics Biomedic Risk Manag.

Slide courtesy of Dr. Jean-Claude Healy, WHO
Participation Communities

- Participants in the web community are opening up their systems.
- When you lower the barriers to entry, interesting things happen.
- The players who figure this out will wield a great deal of economic power.
- Trend is being driven from the bottom up, by users.
Open standards allow and promote unexpected forms of innovation...

- IM
- Web Mash-Ups
- Podcasting
- DarkNet
- Blogs
- Wikis
- Gaming
- Google

Modern paradigm... anyone is a publisher!
Renewing the Compact:
Gov, Industry, Academia
**U.S. Army Medical Research and Materiel Command**

**Core Medical S&T Program Areas**

**Military Infectious Diseases**
- Medical readiness
- Vaccines
- Biotechnology
- Prophylaxis/treatment drugs
- Diagnostics/prognostics
- Vector control

**Combat Casualty Care**
- Lightweight medical equipment
- Medical C4ISR
- Trauma care
- Health monitoring and diagnostic technology

**Military Operational Medicine**
- Soldier selection and sustainment
- Soldier performance
- Warrior system modeling
- Health hazards protection
- Diagnostics/prognostics
- Health monitoring

**Medical Biological Defense**
- Vaccines/therapies
- Field-portable diagnostic systems
- Medical readiness
- Biotechnology

**Medical Chemical Defense**
- Medical management of chemical warfare casualties
- Medical readiness
- Drug prophylaxes/pretreatments
- Diagnostics/therapeutics

**Circumference Pie Chart**
- Military Infectious Diseases: 28%
- Combat Casualty Care: 9%
- Medical Biological Defense: 37%
- Medical Chemical Defense: 16%
- Medical Operational Medicine: 10%

**$1.5bn**
Mission

Apply physiological and medical knowledge, advanced diagnostics, simulations, and effector systems integrated with information and telecommunications for the purposes of enhancing operational and medical decision-making, improving medical training, and delivering medical treatment across all barriers.

The program scope is to identify, explore, and demonstrate key technologies and biomedical principles required to overcome technology barriers that are both medically and militarily unique.
TATRC is a network of “Best of Breed” public/private advanced medical technology partnerships.
To meet multiple training needs, TATRC is actively developing computer imaging technologies & telecommunications to achieve the most effective training possible.
TATRC Homeland Defense

Chemical/Biological/Nuclear Threat Detection

- MEMS Sensor System
  - High Sensitivity
  - Nanoliter Samples
  - Short Analysis Time
  - High-density Information
  - Low Cost

Typical of TATRC programs for threat detection is the MicroElectroMechanical sensor for detection of anthrax, developed through the Harvard Medical School Center for Integrating Medicine and Innovative Technology, the Draper Research Laboratory and MIT.
Telemedicine is the cornerstone of TATRC geriatric care, such as the home monitoring equipment being developed in collaboration with the Mercy Health System to improve the management of congestive heart failure.

Home Health Congestive Heart Failure Protocol base data collection.

**Parameters:**
- Blood Pressure
- Heart Rate
- Respirations
- Oral Temperature
- Heart and Lung Assessment with Stethoscope
- ECG
- Oxygen Saturation

Assessment of general appearance, pedal edema and mental status will be obtained through the video camera, as well as questions presented by the telemed nurse.
TATRC Broadband Medical Networking: State-Based Initiatives

- Linking regional TeleHealth programs
- National Health Information Infrastructure
  - Regional Health Information Organizations (RHIO)
  - Regional Optical Network (RON)
- Disaster Relief / Preparedness
- Advanced Distributed Learning
- Simulation Environments
- Advanced Visualizations
  - Gaming industry
  - Entertainment industry
- Ubiquitous Broadband (urban/ rural)
Grid Challenges

- Federation of databases (COAS)
- Content-based knowledge (TQS)
- Management of personal data (PIDS)
- Security (RBAC)
- Social Anthropology (Crazies ;-))
TATRC

Broadband Medical Network & GRID

- Computing GRID
  - Bio-patterning
  - Resources such as TeraGRID/ Supercomputers

- Data GRID
  - Biomedical Informatics (storage)
  - Terminology mediation (archive or google)
  - Informatics

- Knowledge GRID
  - Semantic Mining
  - Business intelligence

- Collaboration GRID
  - Teleconsultation
  - Telementoring
TATRC Broadband Medical Networks: What Defines the HealthGrid?

- Computational Models of the Human Body
- Epidemiological Networks
- Rx Grid (RxNorm)
- Biomedical Informatics (BIRN, caBIG)
- Veterinary Medical
  - Agriculture/Animal/Human vectors
- National Health Information Infrastructure
  - Electronic Health Records
Doing Business with TATRC

- MRMC Broad Agency Announcement (BAA 05-1)

- General process
  - Submit pre-proposal to MRMC/TATRC
  - Review for scientific and programmatic merit
  - Award funding
  - Project monitoring and accountability
Questions? More information?

- http://www.tatrc.org
- Mary Kratz
  mkratz@tatrc.org
  (mkratz@umich.edu)