ELECTRICAL ENGINEERING CAREER OPPORTUNITIES WHICH PATH SHOULD I CHOOSE?

Renita Anderson,

Director

Division of Network Systems and Telecommunications

ENDLESS ENGINEERING OPPORTUNITIES

Robotics

Medical Devices and Equipment

Biomedical Custom Instrumentation

Signal Processing - multi dimension imagery

Automation

Research and Development

Simulation Tools

Lighting

Audio Visual Tools

Computer Aided Design

Develop and Publish Specifications

Security Systems

Architecture

Technical Writer

Software Development

AVIONICS AIRCRAFT TESTING

- Naval Rotary Wing Aircraft Test Squadron
- Avionics/Mission and sensors include the broad spectrum of mission systems and RF sensors including the Antenna Testing Laboratory Automated System, the Ship/Shore Communications and Electronics System team. The Combat and Communication Systems team designs, integrates and tests communication systems.

ROTARY WING AIRCRAFT

The CH-46 is the Marine Corps all-weather, day-or-night assault transport of combat troops, supplies and equipment.

The mission of the VH-60N is the executive transport of the President, Vice President and other dignitaries.

TYPES OF AIRCRAFT SYSTEMS TESTED

- This includes providing system engineering, integration, design, analysis, prototyping, tests, evaluation, and integrated support engineering services and products related to many aircraft systems:
- Mission computers/processors
- Radio communication
- Navigation
- Controls
- Displays
- Mission sensors
- Instruments
- Antennas

ENVIRONMENTAL TESTING

- **Electromagnetic Environmental Effects (E3) Research, Development, Test, and Evaluation**
  - Electromagnetic Interference (EMI) detection
  - Mobile Electromagnetic Compatibility (EMC)
  - Electromagnetic Vulnerability (EMV)
  - TEMPEST
  - COMSEC
  - Precipitation Static (P-STATIC)
  - Electrostatic Discharge (ESD)
  - Lightning strikes

ANECHOIC CHAMBER TESTING

TRANSITION FROM AVIONICS TO SATELLITE TELECOMMUNICATIONS

SPACE COMMUNICATIONS

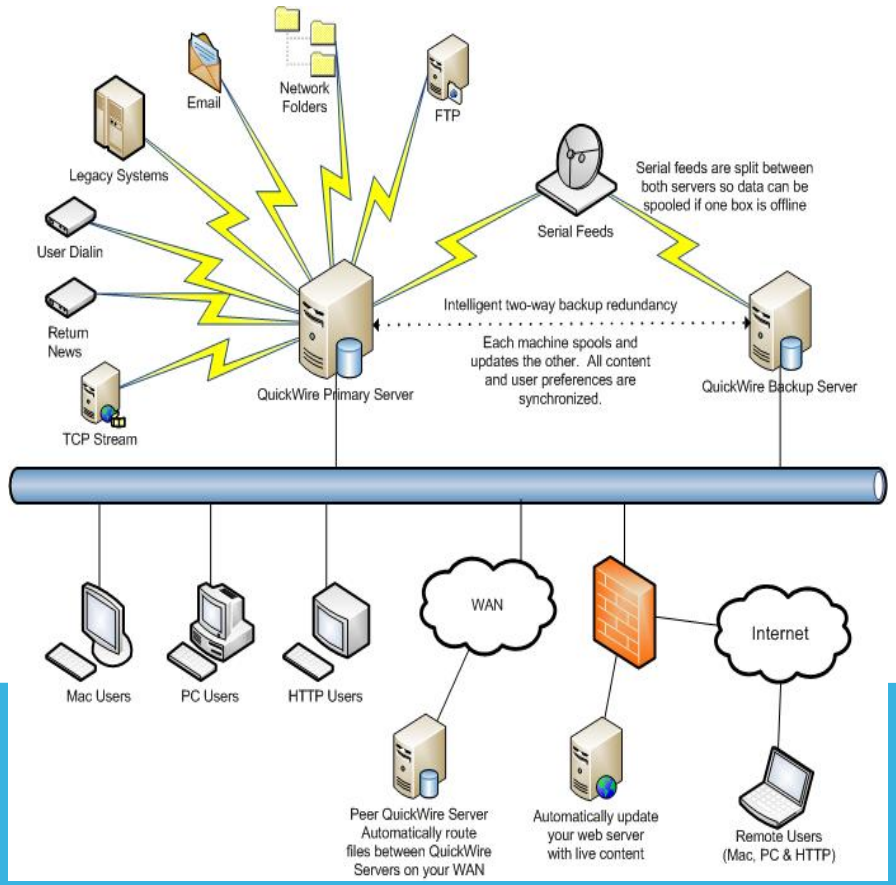
- The Space Network (SN) is a data communication system comprised of a constellation of Tracking and Data Relay Satellites (TDRSs) and various ground terminal complex employing high-gain microwave antennas. The combination of elements comprising SN allows 24 hours per day support to customers including global telecommunication services for telemetry, tracking, and command between low earth orbit (LEO) spacecraft and customer control and data processing facilities.

SATELLITE COMMUNICATIONS

- The ground segment ensures uninterrupted communications between the customer spacecraft and the customer control center. The ground terminals provide the hardware and software necessary to ensure uninterrupted communications between the customer spacecraft and the ground network interface to the customer control center.

TRANSITION FROM SATELLITE TO GROUND COMMUNICATIONS

The TDRS (Tracking & Data Relay Satellite) tracks earth-orbiting spacecraft, including the Shuttle, and transmitting their data back to Earth.



Wide Area Network Topology

NIH NETWORK

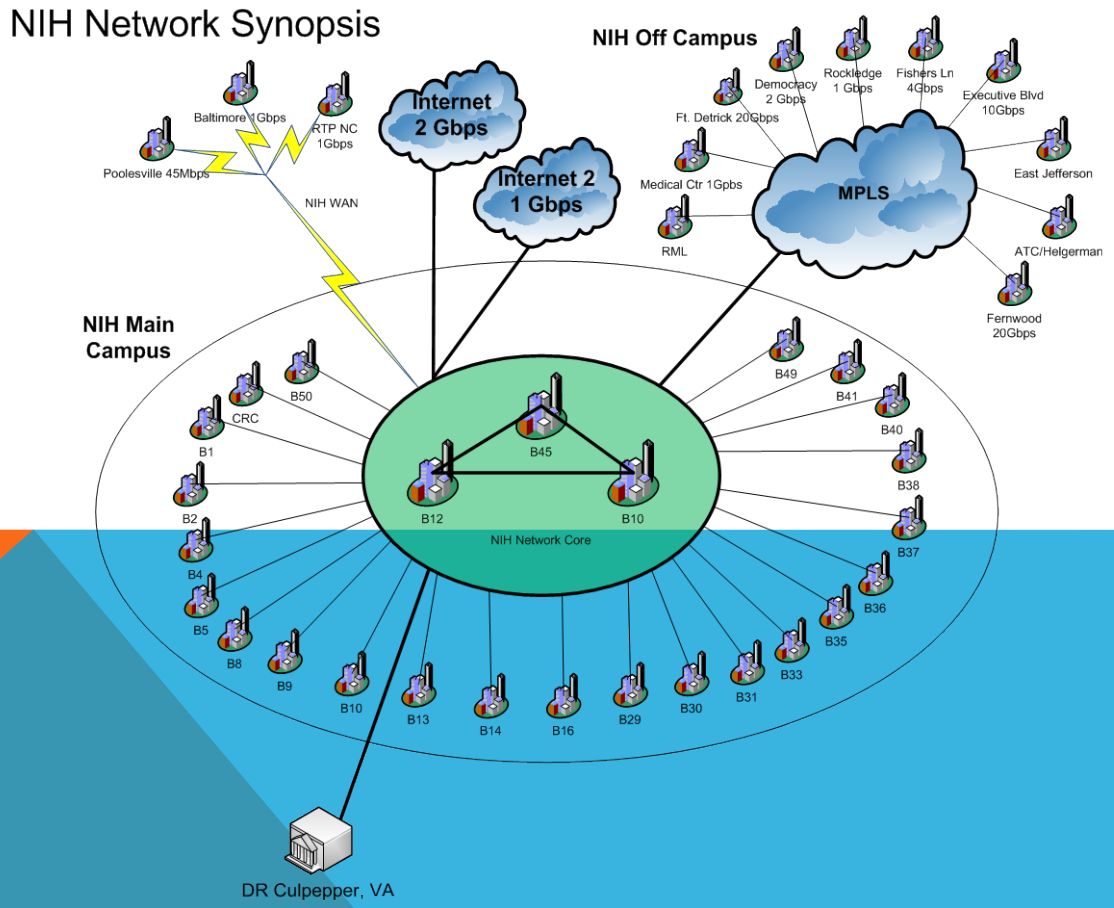
•NIH networks provide access to information and information management assets:

- 42,000 users
- across approximately 100 buildings

•NIH has grown in terms of number of locations by almost 19 percent, from 78 buildings and facilities in 2008 to 93 buildings in 2012.

•As dedicated network location growth increases, cost and network management complexity increase.

NIH has 5 core rings, which provide all network services for all of NIH, campus and off-campus. The 5 core rings are located on the NIH Main Campus provided by 3 separate buildings. These logical rings provide the core routing and the dual redundant switching networks for all of NIH network.



THE NIH NETWORK SUPPORTS 4 KEY BUSINESS AREAS

- Building-to-Building Connectivity – Approximately 100 buildings on and off the NIH main campus.
- Access to External Research Resources and the Public – Access to the Internet & Internet 2.
- Connectivity for Remote Access for NIH Employees – Over 15,000 NIH employees are authorized users for Remote Access
- Connectivity for Mobile/Wireless – On average 20-30 percent coverage in each NIH building

NETWORK DESIGN DRIVERS

- Access to scientific applications, high performance computing capabilities, and telemedicine each require NIH's scientific communities to upload and download large files in a timely manner. These applications are central to enabling biomedical and scientific research (e.g., genomics, proteomics, imagery, etc.) drive the greatest demand for network services.
- As such, network links between devices that generate biomedical/scientific data and the devices that store this data; and the links between these storage devices and other locations that need the data to perform computations require significant capacity.

NIH LOCAL AREA NETWORK MANAGEMENT

- NIH manages approximately 70,000 LAN ports across all 28 Institutes and Centers.
- Center for Information Technology manages 21,682 of the ports, or 31% of NIH's Local Area Network requirements through the provisioning of Enterprise Network Services.
- Approximately 48,000 Local-Institute and Center managed ports across all the Institutes and Centers.

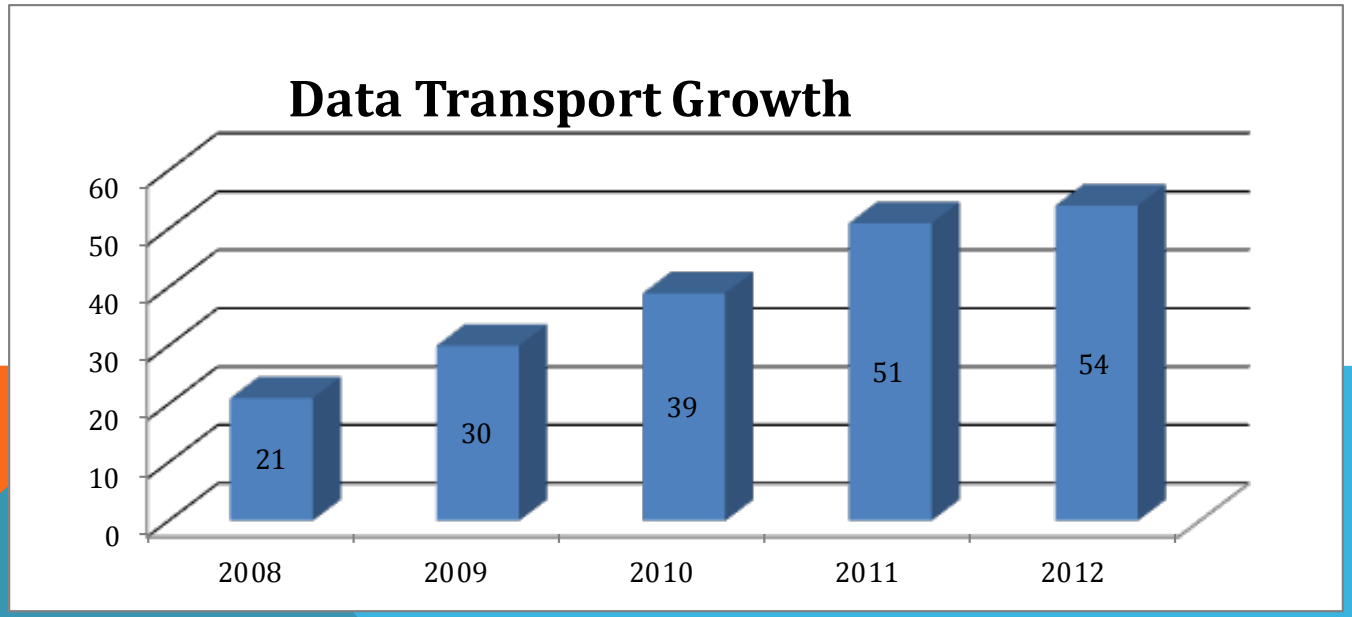
CABLING INFRASTRUCTURE

- Structured cabling systems provide the horizontal and vertical cabling to connect users and network devices for all voice and data requirements at the NIH.
- There are approximately 100 buildings (most are located on the NIH main campus) and fiber optic, copper and coaxial cable to interconnect the Information Technology infrastructure.

NETWORK GROWTH

From 2008 to 2011 the NIH core has grown from 21Gbps to almost 54Gbps - a 257 percent increase.

Drivers: Biomedical Research, Large multi-dimensional imaging, Social Media, Genome Sequencing, Streaming Video, Mobile Workforce, Global Partners



TELECOMMUNICATIONS

- **NIH Telephone Service**
  - 5ESS phone switch provisioning approximately 60,000 phone lines
  - Call Center
    - NIH hospital
      - Code Blue service
      - Signal Page service
    - Directory look up service for the NIH and general public
    - Public Health Service Commission Corp Information

TELECOMMUNICATIONS CONT'D.

- 911 emergency dispatch phone system
- 2-way push-to-talk radio service
  - Supports NIH Police Department emergency dispatch
  - Supports NIH Fire Department emergency dispatch
  - Supports Continuity of Operations Program
  - Supports facility maintenance operations
- NIH internal pager service

ENDLESS ENGINEERING OPPORTUNITIES.....

QUESTIONS?