Global Connectivity

George Markowsky, Chair
Department of Computer Science
Department of Mathematics & Statistics
University of Maine
Connectivity & The Atkins Report

• (p. 35) Networks -- A major shift in computing has come from the practical availability of high-bandwidth data networks. Network connections up to 45 megabits are easily available, connections over 155 megabits/s are still aggressive, and some research institutions are beginning to connect at 2.5 Gb/s and faster.
The Picture for Field Science is not that Rosy

• Just concluded an NSF-sponsored workshop between OPP (Office of Polar Programs) & CISE entitled -- Polar Science and Advanced Networking

• Connectivity is a real issue for polar research programs

• Antarctica & the Arctic are continental in size with marginal connections to the rest of the world
The Land that Connectivity Forgot
Another Land
that
Connectivity
Forgot
HPWREN connected topology agenda

Backbone/relay node

Science site
Researcher location
Education site
Incident mgmt. site

http://hpwren.ucsd.edu

December 2002

UCSD
SDSC
to
SCI
SDSU

to CI and PEMEX

http://hpwren.ucsd.edu
December 2002
The LTER Network

- AND = Andrews Experimental Forest
- ARC = Arctic Tundra
- BES = Baltimore Ecosystem Study
- BNZ = Bonanza Creek
- CAP = Central Arizona Phoenix
- CDR = Cedar Creek Reserve
- CWT = Coweeta Hydrologic Lab
- FCE = Florida Coastal/Everglades
- GCE = Georgia Coastal Ecosystems
- HBR = Hubbard Brook
- HFR = Harvard Forest
- JRN = Jornada Basin
- KBS = Kellogg Biological Station
- KNZ = Konza Prairie Reserve
- LUQ = Luquillo Experimental Forest
- MCM = McMurdo Dry Valleys
- NET = Network Office
- NTL = North Temperate Lakes
- NWT = Niwot Ridge
- PAL = Palmer Station
- PIE = Plum Island Estuary
- SBC = Santa Barbara Coastal
- SEV = Sevilleta
- SGS = Shortgrass Steppe
- VCR = Virginia Coast Reserve
Communications and Networking for Field Biologists: What we would like to have
Integrated system for seamless local area (50-100 mile radius) and global communications and networking
Motivation

The Problem
• Long term observed rise in sea level
• Devastating consequences of sea level rise on populated coastal areas

The Need
• Accurate determination of mass balance (the net gain or loss of glacial ice)
• Establish a better understanding of internal dynamic processes that control mass balance

The Approach
• Design and develop intelligent radar sensors for polar ice sheet measurements
• Implement a mobile data collection system that relies on robotics and innovative information technology.
Record-setting Ozone Hole

 Antarctica's ozone hole has expanded to cover an area three times larger than the United States.

Sept. 8, 2000 -- A NASA spectrometer has detected an Antarctic ozone "hole" (what scientists call an "ozone depletion area") that is three times larger than the entire land mass of the United States - the largest such area ever observed.

The "hole" expanded to a record size of approximately 28.3 million square kilometers on Sept. 3, 2000. The previous record was approximately 27.2 million square km on Sept. 19, 1998.

The ozone hole's size currently has stabilized, but the low levels in its interior continue to fall. The lowest readings in the ozone hole are typically observed in late September or early October each year.
Connectivity was also an issue cited in this earlier workshop that brought together field scientists and homeland security researchers.
Global Connectivity Needed for

- Scientific Research
- Education
  - Distance education & connection to field scientists needs more emphasis
- Governmental Uses
- Telemedicine
- Public
- Homeland Security
- Economic Development
Global Connectivity

• Not so hot -- just ask Guy Cormier and others here

• I propose that the EPSCOR states rally around an effort to bring a true global network into being that provides ubiquitous connectivity so that a researcher or educator can get reasonable connectivity anywhere in the world!
(ES 2) The emerging vision is to use cyberinfrastructure to build more ubiquitous, comprehensive digital environments that become interactive and functionally complete for research communities in terms of people, data, information, tools, and instruments and that operate at unprecedented levels of computational, storage, and data transfer capacity.
Austrian Navy Lieutenant Karl Weyprecht after a cruise in the Barents Sea aboard TEGETHOFF became convinced that scientific study should take preference over exploration and began a campaign that led to the International Polar year (IPY) from 1881-1883. This was followed by a second polar year during the years 1932 to 1933 that was significantly reduced due to the worldwide depression during these years (www.arctic.at). The third IPY evolved into the International Geophysical Year (IGY) 1957-1958 with a broader geographical scope.

June 24-26 an international symposium on Perspectives of Modern Polar Research, was convened in Bad Durkeim, Germany to celebrate the 175th anniversary of the birth of Georg von Neumayer. Arising from the participant discussions was a strong consensus that a program should be formulated to commemorate the 125th anniversary of the IPY (International Polar Year) in 2007.
Following a suggestion by NAS member Lloyd Berkner, the International Council of Scientific Unions in 1952 proposed a comprehensive series of global geophysical activities to span the period July 1957-December 1958. The International Geophysical Year (IGY), as it was called, was modeled on the International Polar Years of 1882-1883 and 1932-1933 and was intended to allow scientists from around the world to take part in a series of coordinated observations of various geophysical phenomena. Although representatives of 46 countries originally agreed to participate in the IGY, by the close of the activity, 67 countries had become involved.
ISTY 2007

• We should have an *International Science & Technology Year* in 2007 to support all field science

• We need to start now so that by 2007 we can have a truly global network in place to support ISTY 2007

• The EPSCOR states should be the stewards of this effort! Adopt a pole and/or an island!
Information

• Temporary working website for Polar Science and Advanced Networking Workshop
  • http://www.cs.umaine.edu/~gm
• Website for Sensor Networks Workshop
  • http://homeland.maine.edu/anywhere.htm
• My website:
  • http://www.cs.umaine.edu/~markov