Keeping Europe at the Leading Edge of Science

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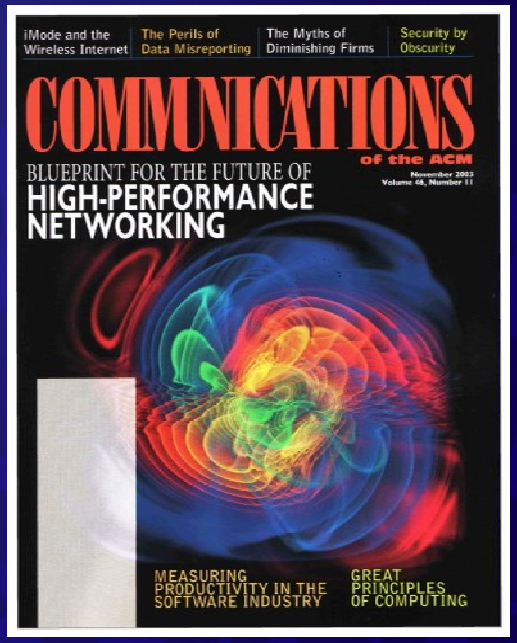
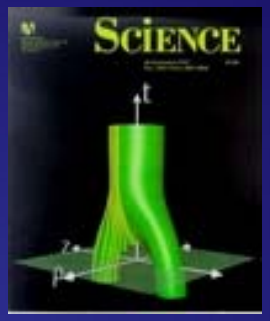
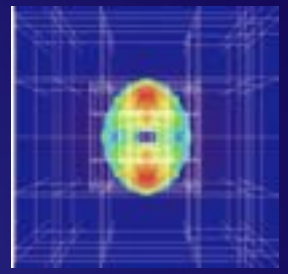


Data-Driven Multiscale Collaborations* for Complexity

Great Challenges of 21st Century

- HPC began the revolution, but it continues in 4 dimensions!
  - Multiscale Collaborations
    - General Relativity, Particles, Geosciences, Bio, Social…
    - *Data need to be shared in collab…*
  - Science and Society being transformed by CI and Data
    - Compute, data, network volumes grow 9-12 orders of magnitude in just over two decades
    - Completely new methodologies
    - *HPC previewed fundamental shift to data-driven science: will be different*
- Science needs place requirements on networks and data access





*Small groups still important!

Trends in Data Growth

- Square Kilometer Array
  - 3000 radio receivers, 1 km^2 area!
  - 19 countries! Possibly beginning in 2013, operational 2020
  - Data: exabyte per week! Analysis: Exaflops!
- Comparative Metagenomics
  - DNA sequencing of entire families of organisms
  - Already hundreds of TB, thousands of users
- HD Collaborations and Optiportals
  - Multichannel HD, gigapixel visualizations
- Petascale-Exascale simulation
  - They generate peta-exabytes per simulation!

camera
Marine Microbial Ecology

What is needed

- End-to-End networking capabilities
  - Connections between countries, from facilities to labs and campuses
  - Consider joints projects from EU to US desktops!
- More focus on scientific applications that drive networking
- Policies that encourage data sharing
- Example NSF Activities
  - IRNC program
  - SDCI
  - Look for more in the future