The Computing Community Consortium: An Update

Ed Lazowska
Bill & Melinda Gates Chair in Computer Science & Engineering
University of Washington
Chair, Computing Community Consortium
GENI Engineering Conference
July 2009

http://www.cra.org/ccc/
This morning ...

- **Quick background on the Computing Community Consortium**

- **Principal activities since October 2008**
  - Transition Team white papers
  - Library of Congress symposium
  - Computing Innovation Fellows project

- **Current**
  - Computing research and health care
  - Computing research and energy

- **NetSE Research Agenda**
The Computing Community Consortium

- A cooperative agreement between NSF and CRA
- Catalyze the computing research community ...
  - to envision long-range, more audacious research challenges
  - to build momentum around such visions
  - to state them in compelling ways
  - to move them towards funded initiatives
  - to ensure “science oversight” of large-scale initiatives
Internet, Mobile Phones Named Most Important Inventions

By PHYLLIS KORKKI
Published: March 7, 2009

In response to the shouted-out question, “What are some of the greatest inventions of all time?” nearly everyone in a recent informal survey gave the following answers: the wheel, the engine, the ballpoint pen, diapers and the cheese Danish.

Life Changers
The top innovations of the last 30 years, according to judges at the Wharton School of the University of Pennsylvania, were:
1. Internet, broadband
2. PC and laptop computers
3. Mobile phones
4. Fiber optics
5. MRI, CAT and CT scans
6. Magnetic resonance imaging
7. Microprocessors
8. Fiber lasers
9. Office software
10. Laser/robotic surgery
11. Open-source software
12. Light-emitting diodes
13. Liquid crystal display
14. GPS devices
15. E-commerce and auctions
16. Media file compression
17. Nanotechnology
18. Photovoltaic solar energy
19. Large-scale wind turbines
20. Internet social networking

A panel of eight judges from the Wharton School of the University of Pennsylvania was required to go back only 30 years — not to the dawn of history — when asked a similar question. So their answers, of course, were very different.

In the survey, the Internet was voted the biggest innovation of the last three decades, followed by computers, mobile phones and e-mail. The survey was sponsored by Knowledge@Wharton, the school’s business publication, and Wharton’s “Nightly Business Report.”

Good, important choices all, but for classic, long-lasting appeal, they still can’t beat the wheel. PHYLLIS KORKKI
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4. E-mail
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6. Magnetic resonance imaging
7. Microprocessors
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The Count

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Imagine spending a day without information technology

- A day without the Internet and all that it enables
- A day without diagnostic medical imaging
- A day during which automobiles lacked electronic ignition, antilock brakes, and electronic stability control
- A day without digital media - without wireless telephones, high-definition televisions, MP3 audio, DVD video, computer animation, and videogames
- A day during which aircraft could not fly, travelers had to navigate without benefit of GPS, weather forecasters had no models, banks and merchants could not transfer funds electronically, factory automation ceased to function, and the US military lacked technological supremacy
Imagine spending a day without information technology.

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- A day during which automobiles lacked electronic ignition, antilock brakes, and electronic stability control.
- A day without digital media – without high-definition televisions, MP3 audio, computer animation, and videogames.
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The future is full of opportunity

- Creating the future of networking
- Driving advances in all fields of science and engineering
- Revolutionizing transportation
- Personalized education
- The Smart Grid
- Predictive, preventive, personalized medicine
- Quantum computing
- Empowerment of the developing world
- Personalized health monitoring => quality of life
- Neurobotics
- Synthetic biology
November-December: Transition Team white papers

Computing Research Initiatives for the 21st Century

Fundamental Research in Engineering (Word version)
(Ed Lazowska, University of Washington and Peter Lee, Carnegie Mellon University)

Information Technology R&D and U.S. Innovation (Word version)
(Peter Harsha, Computing Research Association, Ed Lazowska, University of Washington, and Peter Lee, Carnegie Mellon University)

Re-Envisioning DARPA (Word version)
(Peter Lee, Carnegie Mellon University, and Randy H. Katz, UC Berkeley)

Unleashing Waves of Innovation: Transformative Broadband for America’s Future (Word version)

Infrastructure for eScience and eLearning in Higher Education (Word version) (Unattributed PDF)
(Ed Lazowska, University of Washington, Peter Lee, Carnegie Mellon University, Chip Elliott, BBN Technologies, and Larry Smarr, UCSD)

Innovation in Networking (Word version)
(Nick McKeown, Stanford University, Guru Parulkar, Stanford University, and Jennifer Rexford, Princeton University)

Big Data Computing (Word version)
(Randal E. Bryant, Carnegie Mellon University, Randy H. Katz, UC Berkeley, and Edward D. Lazowska, University of Washington)

Security is Not a Commodity: The Road Forward for Cybersecurity Research (Word version)
(Stefan Savage, UC San Diego, and Fred B. Schneider, Cornell University)

Surface Transportation 3.0 (Word version)
(Sebastian Thrun, Stanford University, and Henry Kelly, Federation of American Scientists)
Robotics (Word version)
(Rodney Brooks, MIT)

The Ocean Observatories Initiative (Word version)
(John Delaney, University of Washington, John Orcutt, Scripps Institute of Oceanography, and Robert Weller, Woods Hole Oceanographic Institution)

Quality of Life Technology (Word version)
(Howard Wactlar, Carnegie Mellon University, and Takeo Kanade, Carnegie Mellon University)

P4 Medicine (Word version)
(Larry Hood, Institute for Systems Biology, and David Galas, Battelle Memorial Institute)

"Smart Grid": R&D for an Intelligent 21st Century Electrical Energy Distribution Infrastructure (Word version)
(Randy H. Katz, UC Berkeley)

Quantum Computing (Word version)
(Scott Aaronson, MIT, and Dave Bacon, University of Washington)

Synthetic Biology (Word version)
(Drew Endy, Stanford, and Ed Lazowska, University of Washington)

Computer Architecture (Word version)
(David Patterson, UC Berkeley)

Cyber-Physical Systems: A National Priority for Federal Investment in Infrastructure and Competitiveness (Word version)
(Janos Sztpanovits, Vanderbilt University, and John Stankovic, University of Virginia)

Post your comments on the Computing Community Consortium blog!
Unleashing Waves of Innovation
Transformative Broadband for America’s Future

Version 15: March 22, 2009

Executive Summary

A forward-thinking National Broadband Strategy should focus on the transformative power of advanced networks to unleash new waves of innovation, jobs, economic growth, and national competitiveness – and to create new tools to deliver health care, education, and a low carbon economy. ARRA broadband decisions should target high-impact investments with those criteria in mind. They should seek to rebuild U.S. global leadership in networking – and the economic innovations that networking can create. Broadband investments should “pull from the future.”

A proven track record of innovating in networking and its applications, of deploying and continually upgrading advanced networks, and of extending those networks to the unserved and underserved across our nation, lies not with telephone or cable companies, nor with most state governments, but with our nation’s colleges and universities and the state, regional and national research and education networks that this community has built, in many instances forged through partnerships with telecommunications providers and state agencies to achieve these goals. A National Broadband Strategy should begin with America’s colleges and universities and the state, regional and national research and education networks that connect them and extend to
January: CCC Council renewal

- **Chair**
  - Ed Lazowska

- **Terms expire 2012**
  - Stephanie Forrest
  - Chris Johnson
  - Anita Jones
  - M. Frans Kaashoek
  - Ran Lebeskind-Hadas
  - Robin Murphy

- **Terms expire 2011**
  - Bill Feiereisen
  - Susan Graham (v ch)
  - Dave Kaeli
  - John King
  - Peter Lee
  - Bob Sproull

- **Terms expire 2010**
  - Dick Karp
  - Andrew McCallum
  - Beth Mynatt
  - Fred Schneider
  - David Tennenhouse
  - Dave Waltz

- **Rotated off**
  - Greg Andrews
  - Karen Sutherland
March: Library of Congress Symposium

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Computing Research That Changed The World
Agenda

- Game-changing advances of the recent past
- Advances that are on the horizon, and what will be needed to achieve them
- Lessons that can further increase the already remarkable effectiveness of the IT R&D ecosystem
- Synthesis (and some demonstrations)
Session 1: The Internet and the World Wide Web  

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Discussion by the speakers of future challenges and synergies
Why We’re Able to Google™

Dr. Alfred Z. Spector
VP, Research and Special Initiatives
Google, Inc.
Internet and the World Web Panel, March 25, 2009
Computing Research that Changed the World
The Magic of the Cloud:
Supercomputers for Everyone, Everywhere

Prof. Eric A. Brewer
UC Berkeley
Human Computation

Luis von Ahn

Carnegie Mellon University
Session 2: Evolving Foundations

| Security of Online Information  | 10:40 - 12:00 |
| Barbara Liskov (Massachusetts Institute of Technology) |

| Learning to Improve Our Lives  |
| Daphne Koller (Stanford University) |

| Global Information Networks  |
| Jon Kleinberg (Cornell University) |

Discussion by the speakers of future challenges and synergies
Security of Online Information

Barbara Liskov
MIT CSAIL
March 2009
Learning
to improve our lives

Daphne Koller
Stanford University
Global Information Networks

Jon Kleinberg

Cornell University
Session 3: The Transformation of the Sciences via Computation  1:00 - 2:20

Supercomputers and Supernetworks are Transforming Research  
Larry Smarr (University of California, San Diego)

Computing and Visualizing the Future of Medicine  
Chris Johnson (University of Utah)

Zooming In On Life  
Gene Myers (Howard Hughes Medical Institute)

Discussion by the speakers of future challenges and synergies
Supercomputers and Supernetworks are Transforming Research

Dr. Larry Smarr
Director, California Institute for Telecommunications and Information Technology
Harry E. Gruber Professor,
Dept. of Computer Science and Engineering
Jacobs School of Engineering, UCSD
Computing and Visualizing the Future of Biomedicine

Chris Johnson
Scientific Computing and Imaging Institute
University of Utah
Zooming in On Life

Gene Myers
Group Leader
HHMI Janelia Farm Research Campus
Session 4: Computing Everywhere!  

Sensing Everywhere!  
Deborah Estrin (University of California, Los Angeles)

Pixels Everywhere!  
Pat Hanrahan (Stanford University)

Robotics Everywhere!  
Rodney Brooks (Massachusetts Institute of Technology and Heartland Robotics)

Discussion by the speakers of future challenges and synergies
Sensing Everywhere! from ecosystems to human systems

Professor Deborah Estrin
NSF Science and Technology Center for Embedded Networked Sensing (CENS)
UCLA Computer Science Department
destrin@cens.ucla.edu

... in collaboration with faculty, students and staff at CENS

We gratefully acknowledge the support of our sponsors, including the National Science Foundation, Nokia, Intel Corporation, Cisco Systems Inc., Sun Inc., Google, Microsoft Research, UC Micro, Crossbow Inc., T-mobile, Conservation International, and the participating campuses.

http://urban.cens.ucla.edu
Pixels Everywhere
Media Tech and How it Changed the World

Pat Hanrahan
Department of Computer Science
Stanford University
Robots Everywhere!

Rodney Brooks
Massachusetts Institute of Technology
iRobot Corporation
Heartland Robotics
**Evaluation Session: Moving Forward**

Discussion by the speakers and the audience of what factors made these achievements possible and what factors will accelerate future advances.

Moderators: Susan Graham (University of California, Berkeley) and Peter Lee (Carnegie Mellon University)
Walk to Madison Hall, James Madison Building, Library of Congress  5:00 - 5:30

Closing Session  5:30
April-July: Computing Innovation Fellows Project

The 2009 Computing Innovation Fellows have been selected!

Congratulations to everyone who was selected for a CI Fellow award!
We are contacting each of the awardees, to confirm acceptance of each award.

The deadline for acceptance is July 24, 2009, at which point we will fill any open award slots with people from the waiting list.

Information about the winners will be posted here at that time, including statistics on research area, gender, ethnicity, citizenship, etc.

Thank you for your interest in CI Fellows. The response has been tremendous!
For up-to-the-minute news on the progress of the selection process, check out the forum.
> 1200 prospective mentors
> 500 applicants
60 awardees
  > 40 distinct Ph.D. institutions
  > 40 distinct mentoring institutions
    85% academic, 15% industrial
  75% citizen or permanent resident
  40% female
  12% under-represented minority
Current

- Computing research and health care
- Computing research and energy
NetSE Research Agenda

Network Science and Engineering (NetSE) Research Agenda

A Report of the Network Science and Engineering Council

July 2009