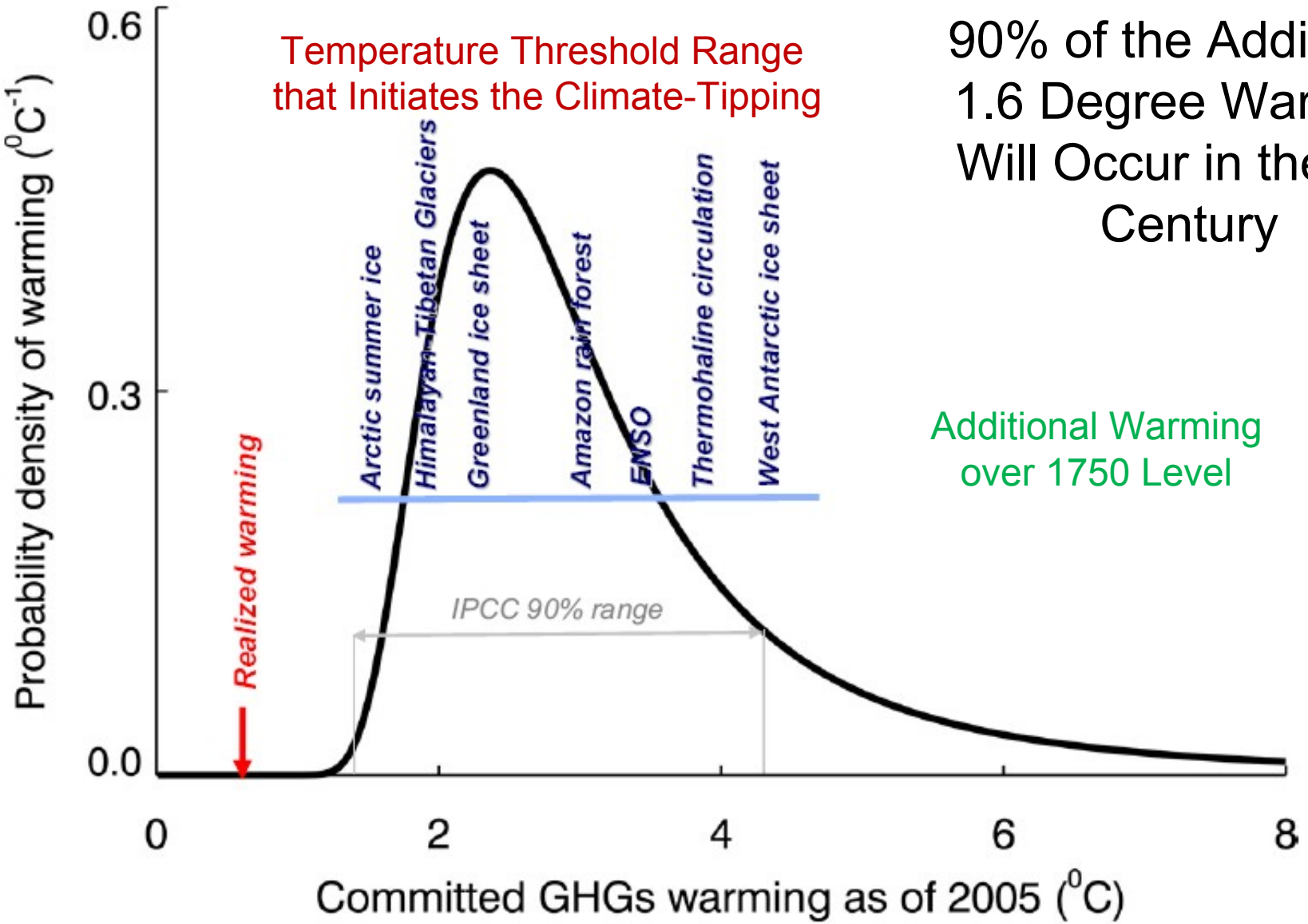
What I've Learned About "Green"

Invited Presentation to the
ON*VECTOR International Photonics Workshop
Calit2@UCSD
February 23, 2009

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

The Planet is Already Committed to a Dangerous Level of Warming

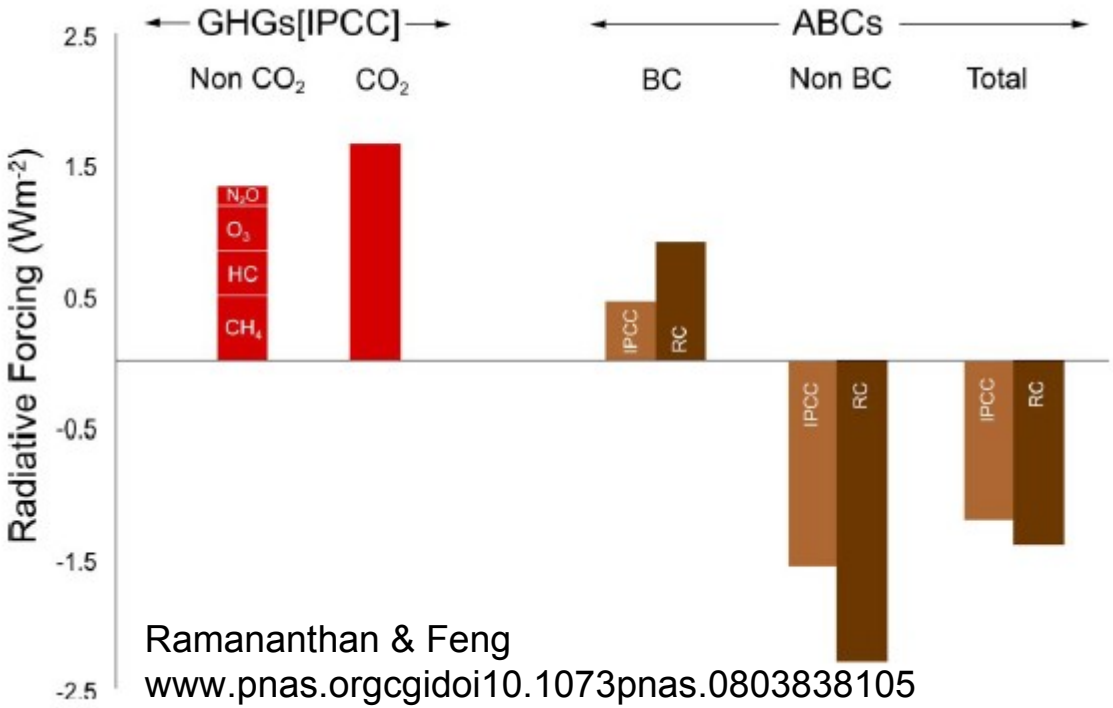


90% of the Additional 1.6 Degree Warming Will Occur in the 21st Century

Additional Warming over 1750 Level

V. Ramanathan and Y. Feng, Scripps Institution of Oceanography, UCSD
September 23, 2008
www.pnas.orgcgidoi10.1073pnas.0803838105

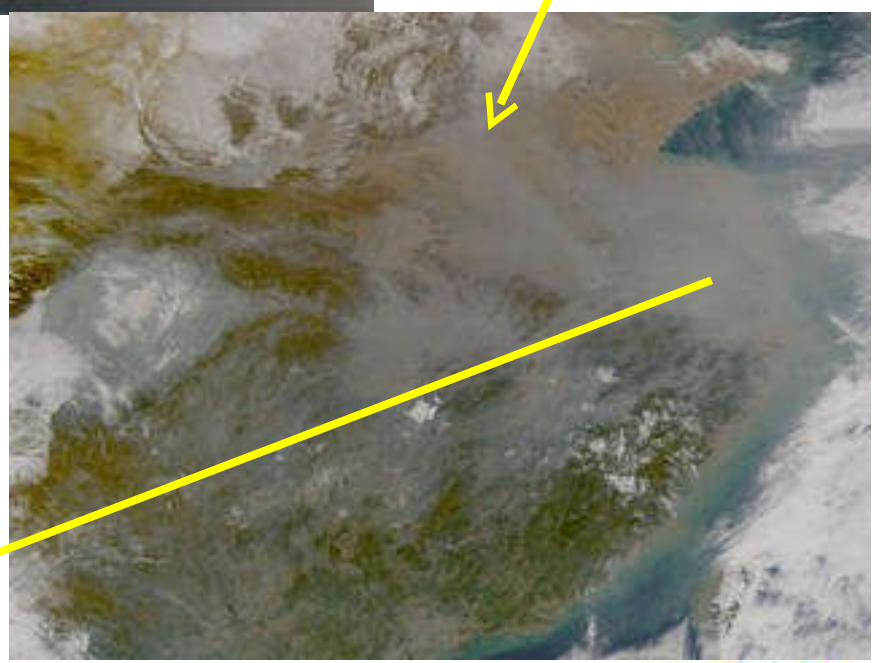
Atmospheric Aerosols Cool Climate—Cleaning Air Pollution will Accelerate Warming!



Ramananthan & Feng
www.pnas.orgcgidoi10.1073pnas.0803838105







NASA satellite image

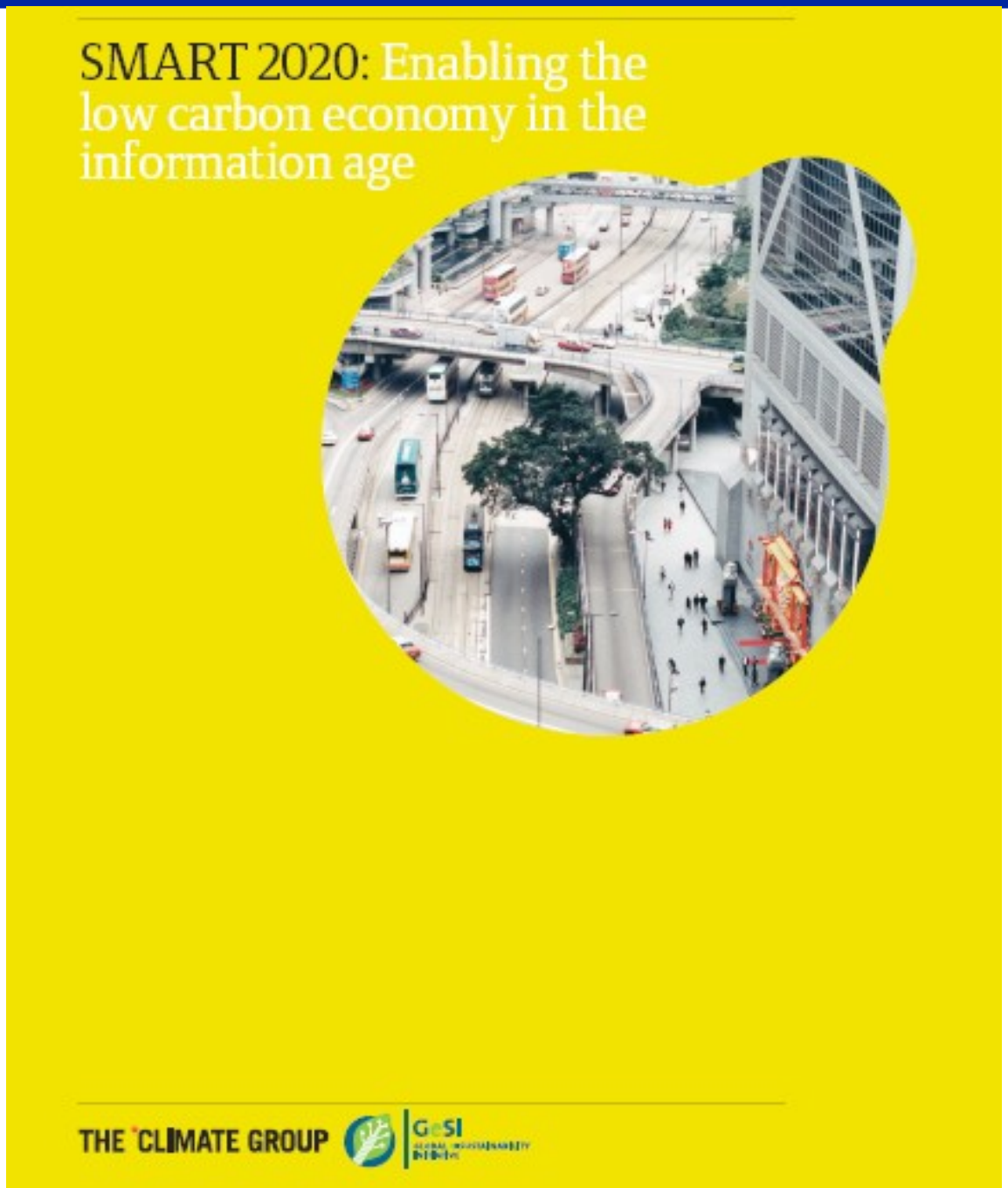
Outside Beijing 11/9/2008



The IPCC Recommends a 25-40% Reduction Below 1990 Levels by 2020

- On September 27, 2006, Governor Schwarzenegger signed California the Global Warming Solutions Act of 2006
  - Assembly Bill 32 (AB32)
  - Requires Reduction of GHG by 2020 to 1990 Levels
    - 15% Reduction from 2008 Levels
    - 4 Tons of CO_2-equiv. for Every Person in California
- The European Union Requires Reduction of GHG by 2020 to 20% Below 1990 Levels (12/12/2008)
- Australia has Pledged to Cut by 2020 its GHG Emissions 5% from 2000 Levels via the World's Broadest Cap &Trade Scheme (12/15/08) [~5% Below 1990 Levels]
- Neither the U.S. or Canada has an Official Target Yet
  - President Elect Obama Has Endorsed the AB32 2020 Goal

ICT is a Critical Element in Achieving Countries Greenhouse Gas Emission Reduction Targets



ICT is a Key Sector in the Fight Against Climate Change

Applications of ICT
could enable emissions reductions
of 7.8 Gt CO_2e in 2020,
or 15% of business as usual emissions.
But it must keep its own growing footprint in check
and overcome a number of hurdles
if it expects to deliver on this potential.



ICT Industry is Already Acting to Reduce Carbon Footprint

Sun's 'portable' Blackbox data center

Company unveils new one-box data center

Sun Microsystems' CEO Jonathan Schwartz showed off the company's new "Project Blackbox" in a Menlo Park, Calif., parking lot Tuesday. Sun says the gear is not only preassembled, but it's tough and arrives ready to run.



Buying Green

updated 10:47 a.m. EST, Wed November 28, 2007

Google pushes 'green' power initiative

Intel Becomes Largest Purchaser of Green Power in the U.S.

Company Tops EPA Green Power Partner List, Vows to Drive for Greater Efficiency While Spurring Growth in Renewable Market

How Microsoft is going green

Biodiesel trucks, solar-powered data centers are just a couple environmentally friendly track

By John Fontana , Network World , 01/09/2008

IBM Project Big Green

Big Green Banner

Project Big Green is a $1 billion investment to dramatically increase the efficiency of IBM products. New IBM products and services,

Application of ICT Can Lead to a 5-Fold Greater Decrease in GHGs Than its Own Carbon Footprint

While the sector plans to significantly step up the energy efficiency of its products and services, ICT's largest influence will be by enabling energy efficiencies in other sectors, an opportunity that could deliver carbon savings five times larger than the total emissions from the entire ICT sector in 2020.

--Smart 2020 Report

Major Opportunities for the United States*

- **Smart Electrical Grids**
- **Smart Transportation Systems**
- **Smart Buildings**
- **Virtual Meetings**

*** Smart 2020 United States Report Addendum**

www.smart2020.org

Smart Electrical Grids

"That means updating the way we get our electricity
by starting to build a new smart grid that will save us money; protect our power sources from blackout or attack; and deliver clean, alternative forms of energy to every corner of our nation."
---President-Elect Obama

Smart energy grids would allow real-time monitoring of a customer's energy use through Internet technology. Proponents of a national smart grid say it would likely result in decreased electricity use, allow energy companies to more efficiently distribute electricity, and encourage homeowners to install alternative energy generators such as solar panels and sell their excess energy back to the grid.

Source: ComputerWorld Government 1/9/09

The Commercial Market for High Resolution Teleconference Systems in Rapidly Expanding

Changing the Way We Work, Live, Play and Learn

- 320 Cisco TelePresence

  major cities globally
- US/Canada: 101 CTS 3000, 79 CTS 1000, 3 CTS 3200, 13 CTS 500
- APAC: 24 CTS 3000, 20 CTS 1000, 3 CTS 500
- Japan: 5 CTS 3000, 2 CTS 1000, 1 CTS 500,1 CTS3200
- Europe: 30CTS 3000, 19 CTS 1000, 1 CTS3200, 5 CTS500
- Emerging: 13 CTS 3000, 1CTS1000

- 216K TelePresence meetings scheduled to date.
- 48% Average Utilization
- 279K hours (average meeting is 1.25 hrs)
- 22K+ meetings with customers to discuss Cisco Technology over TelePresence

- 31K+ meetings avoided travel
- Conservative estimate of cost savings:
  - ~$278M to date
- Cubic meters of emissions saved: 90 million
- Equal to >15,500+ cars off the road



Uses QoS Over Shared Internet ~ 15 mbps

Source: Cisco-Updated January 5, 2009

Using High Definition to Link the Calit2 Buildings: Living Greener



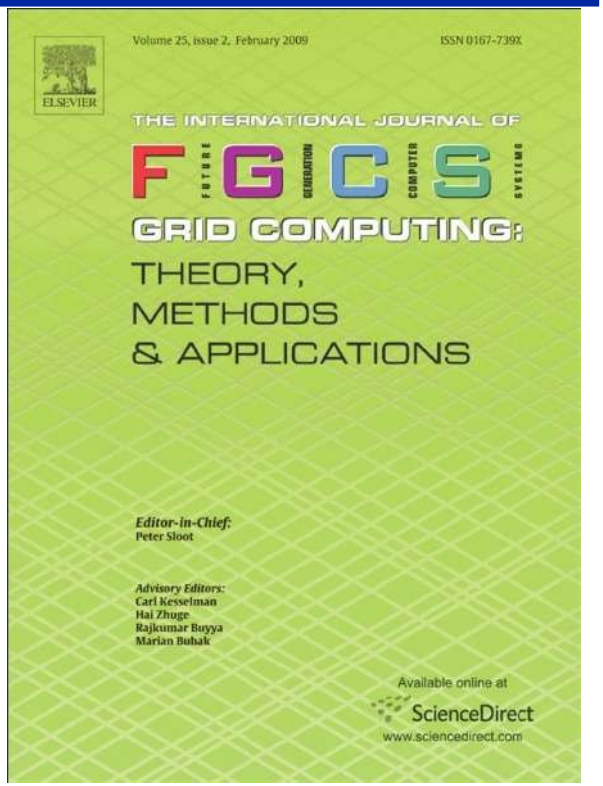
une 2, 2008

HD Talk to Australia's Monash University from Calit2: Reducing International Travel



The OptIPuter Creates an OptIPlanet Collaboratory: Enabling Data-Intensive e-Research





"OptIPlanet: The OptIPuter Global Collaboratory" – Special Section of Future Generations Computer Systems, Volume 25, Issue 2, February 2009

evl electronic visualization laboratory

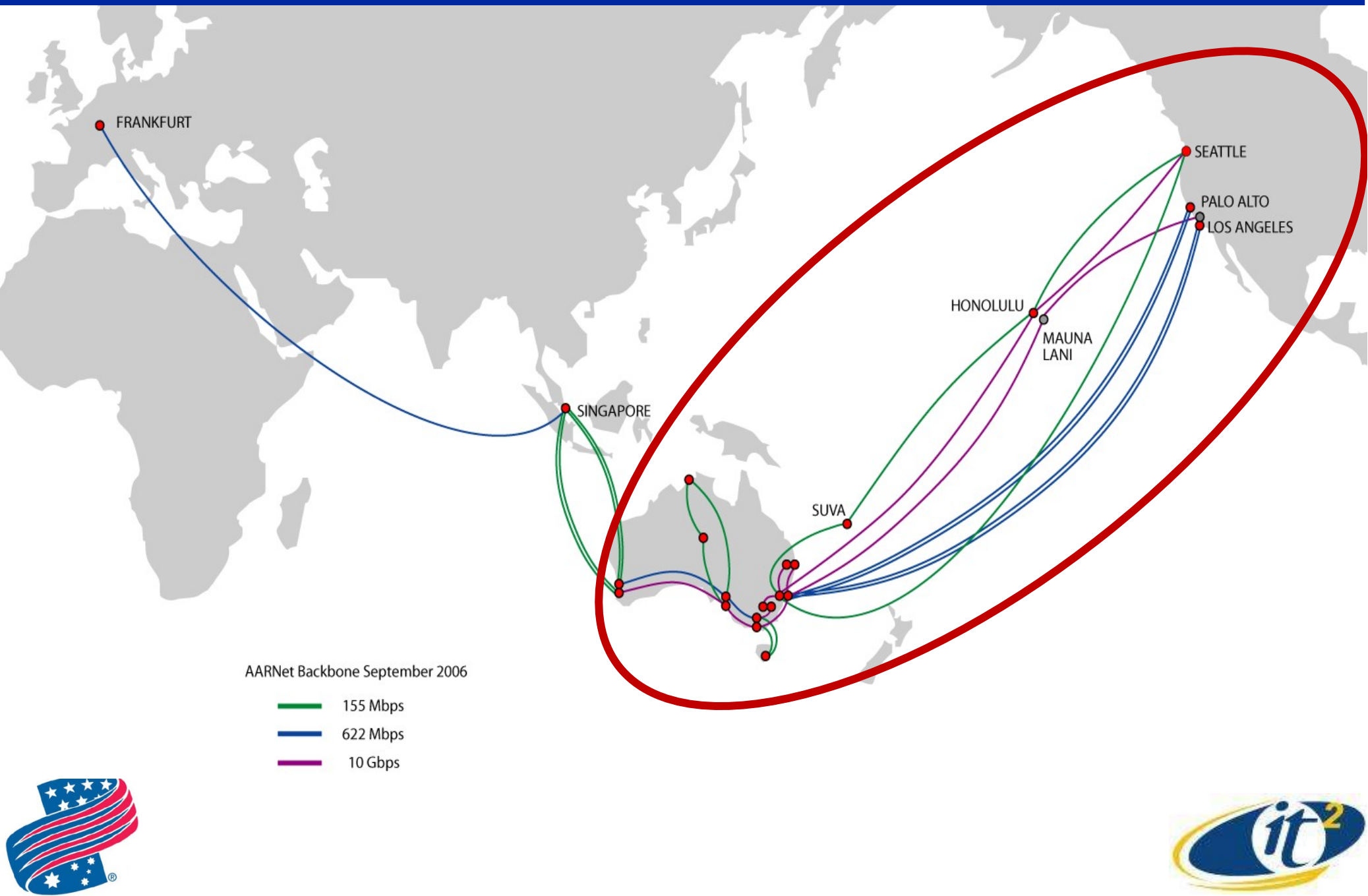
NSF

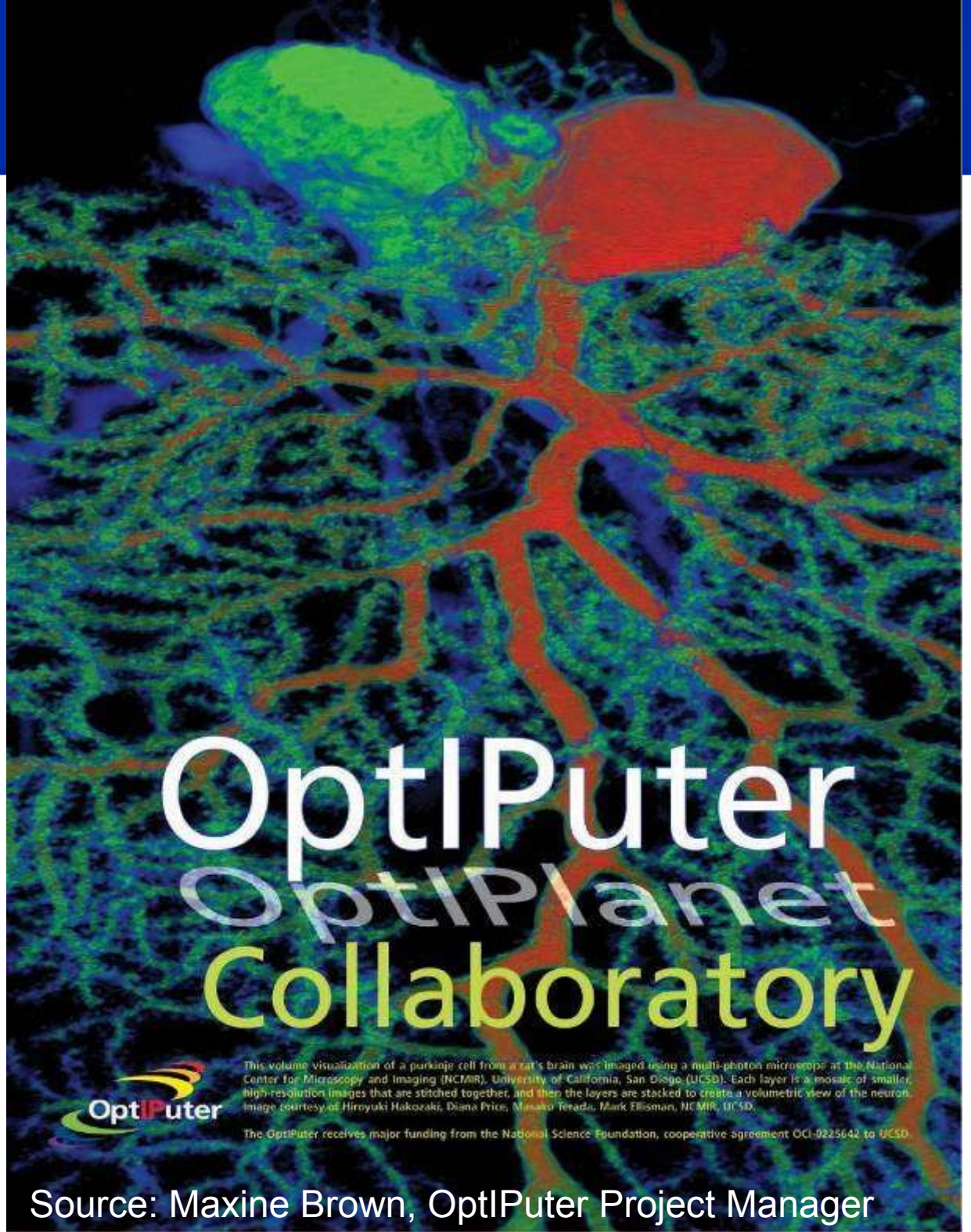
October 1, 2008
End of Six Year ITR

Calit2 (UCSD, UCI), SDSC, and UIC Leads—Larry Smarr PI
Univ. Partners: NCSA, USC, SDSU, NW, TA&M, UvA, SARA, KISTI, AIST
Industry: IBM, Sun, Telcordia, Chiaro, Calient, Glimmerglass, Lucent

it2

Coupling AARNet - CENIC/PW - CANARIE Optical Nets: An Australian-U.S.-Canada Green ICT Testbed





Source: Maxine Brown, OptIPuter Project Manager

Green Initiative:

Can Optical Fiber Replace Airline Travel for Continuing Collaborations?

Just in Time OptIPlanet Collaboratory: Live Session with NASA Ames from Calit2



From Start to
This Image in
Less Than 2 Weeks!

View from NASA Ames
Lunar Science Institute
Mountain View, CA

Virtual Handshake

HD compressed 6:1

Visit Yesterday by
Acting
NASA Administrator
Chris Scolese

Source: Falko Kuester, Calit2; Michael Sims, NASA

Green ICT MOU Between UCSD, Univ. British Columbia, and PROMPT



International Symposia on Green ICT

CUBIN

Symposium on Sustainability of the Internet and ICT

THE UNIVERSITY OF MELBOURNE

November 25 & 26, 2008, The University of Melbourne

January 22-23, 2009

Greening the Internet Economy

ICT & GLOBAL CHANGE

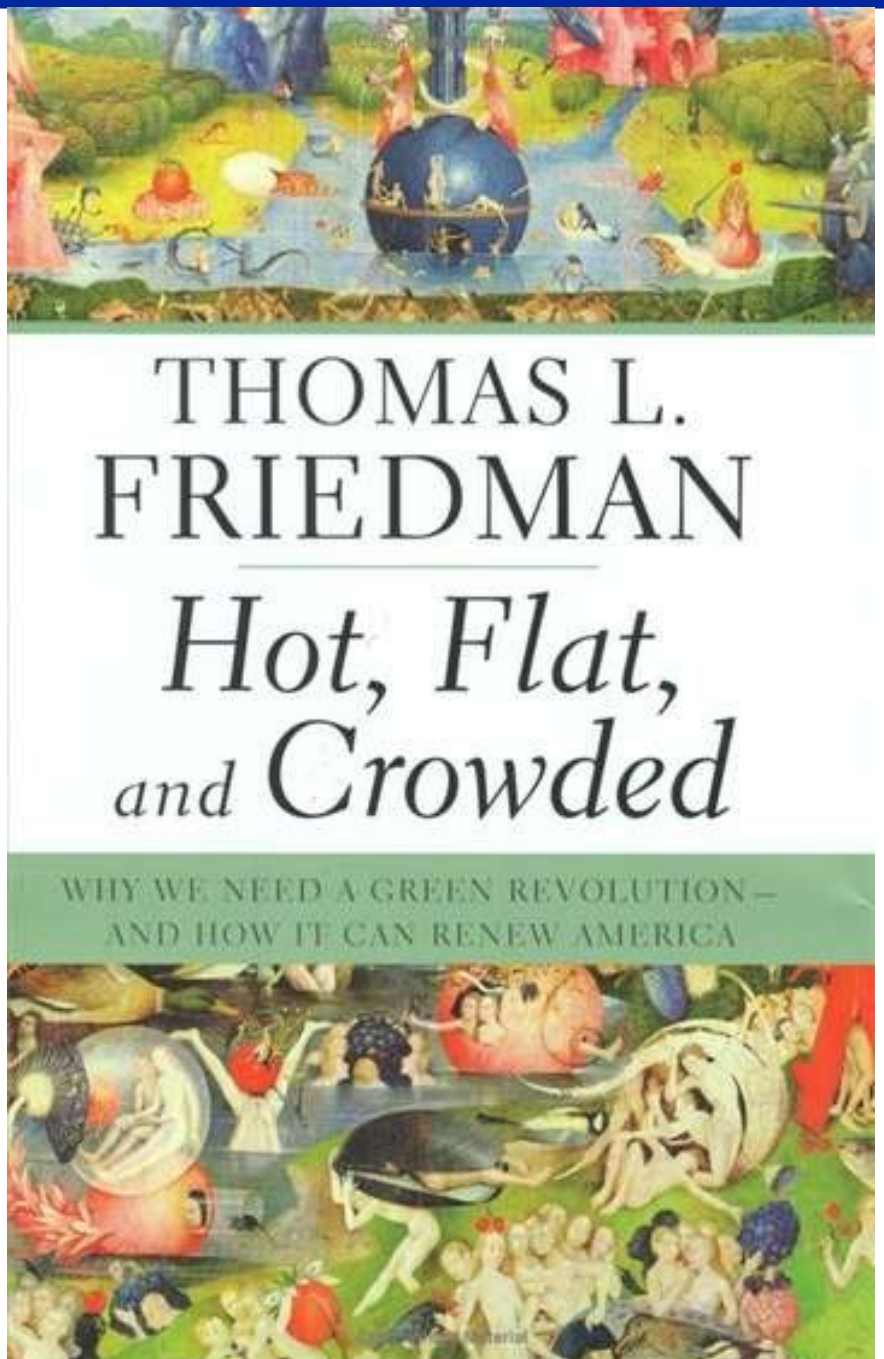


California Public Utilities Commission

Calit2

Co-Hosted By Calit2 & CPUC

"It Will Be the Biggest Single Peacetime Project Humankind Will Have Ever Undertaken"



UCSD is Going Green!



www.gogreentube.com/watch.php?v=NDc4OTQ1