Eco Computing
Improving Data Center Energy Efficiency

Lou Marchant
US SPARC Product Boss
DC Ambassador Board Chair
Sun Microsystems, Inc.
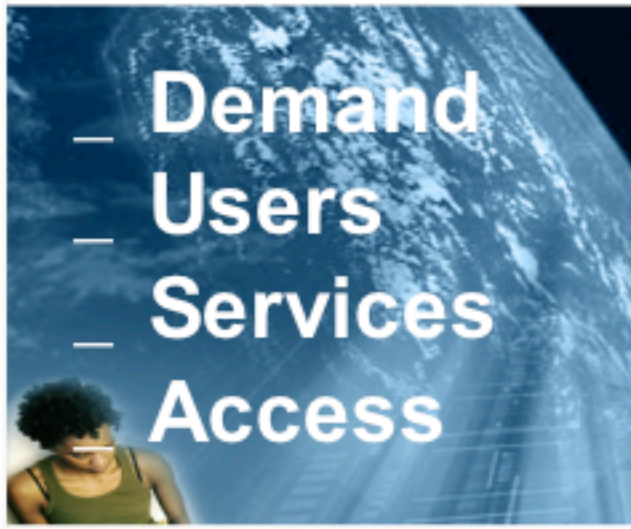Lou.marchant@sun.com

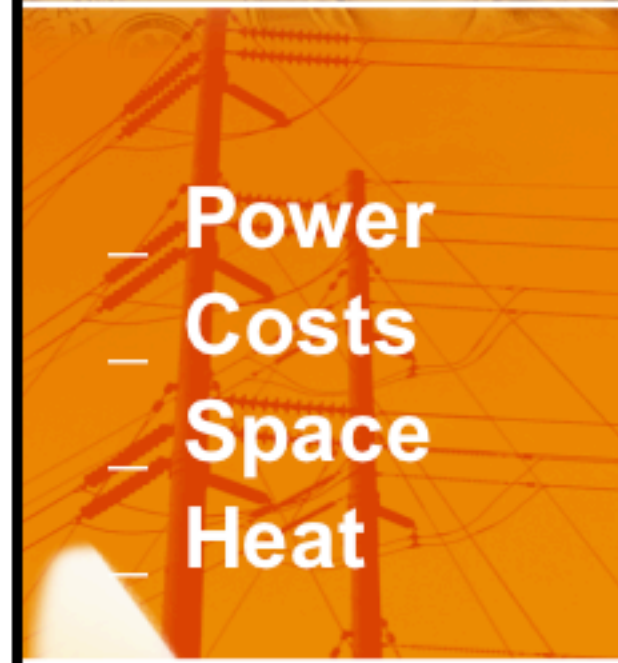Save earth it's the only planet with chocolate.

The Eco Challenge

Growing Demand, Shrinking Resources
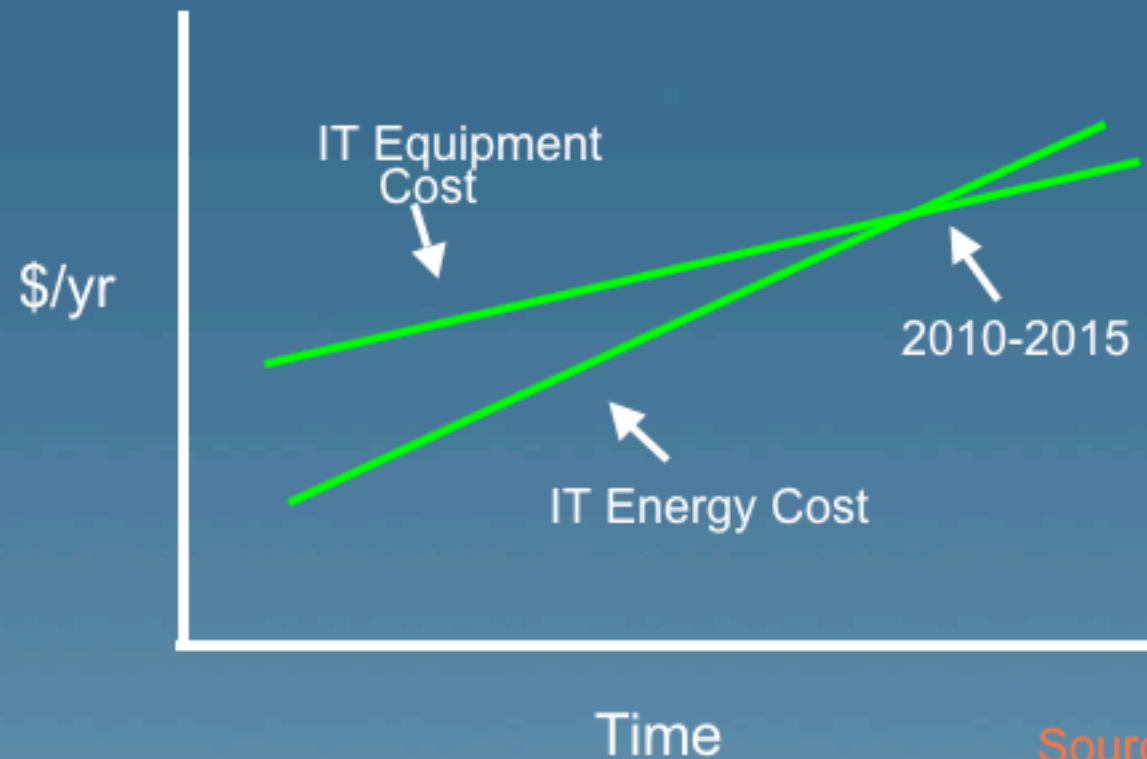
Demand
- Users
- Services
- Access

Gartner estimates that:

"by 2008, 50 percent of current data centers will have insufficient power and cooling capacity to meet the demands of high-density equipment"[†]

"energy bills traditionally have accounted for less than 10% of an overall IT budget but soon could account for more than half"[‡]

Power
- Costs
- Space
- Heat

Source: [†]http://www.gartner.com/it/page.jsp?id=499090

Economic Impact

$/yr

IT Equipment Cost

2010-2015

IT Energy Cost

Time

Increasing power density is shifting the balance of cost

Greenhouse Gas Emission Trends

- GHG emissions increased 70% from 1970 to 2004
- Energy supply sector rose the sharpest (145%)

The Drive for Energy Efficiency: Prepare for Legislation

- US House of Representatives
  - > H.R. 5646: To study and promote the use of energy efficient computer servers in the United States

- EU Commission
  - > Energy Efficiency Action Plan to reduce energy consumption ¤100B by 2020

First Short Term Data Center Energy Solutions

> Reduce Computer Equipment Consumption
  - EOL Unused Systems
  - Consolidation and Virtualization
  - Technology Refresh

Eliminate Unused Systems

- Studies at Sun and another major computer manufacturer
- Aged servers with no use still in data centers
- 8%-10% of servers studied had no identifiable function
  - 150 of 1800 in one study
  - 354 of 3500 in another study

- At Sun, systems were turned off, kept in place 90 days
- If no complaints after crossing quarter boundary, removed

> 8%-10% of IT equipment load
> 11%-14% of total load
> 90 days or less to implement

Shared Lab Services
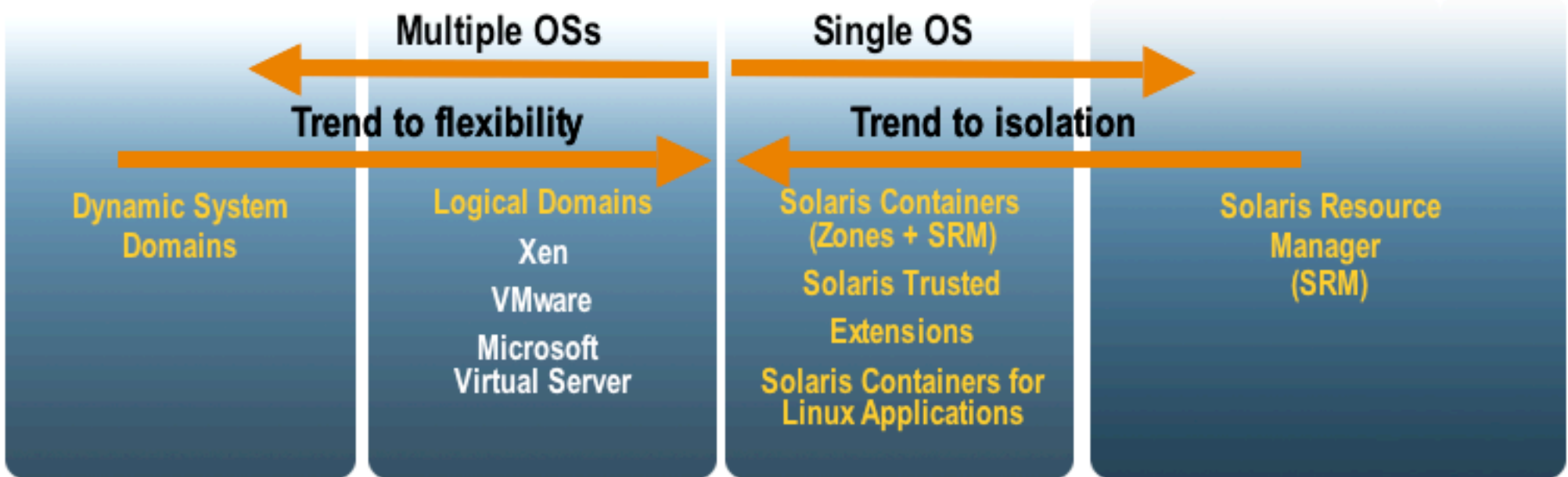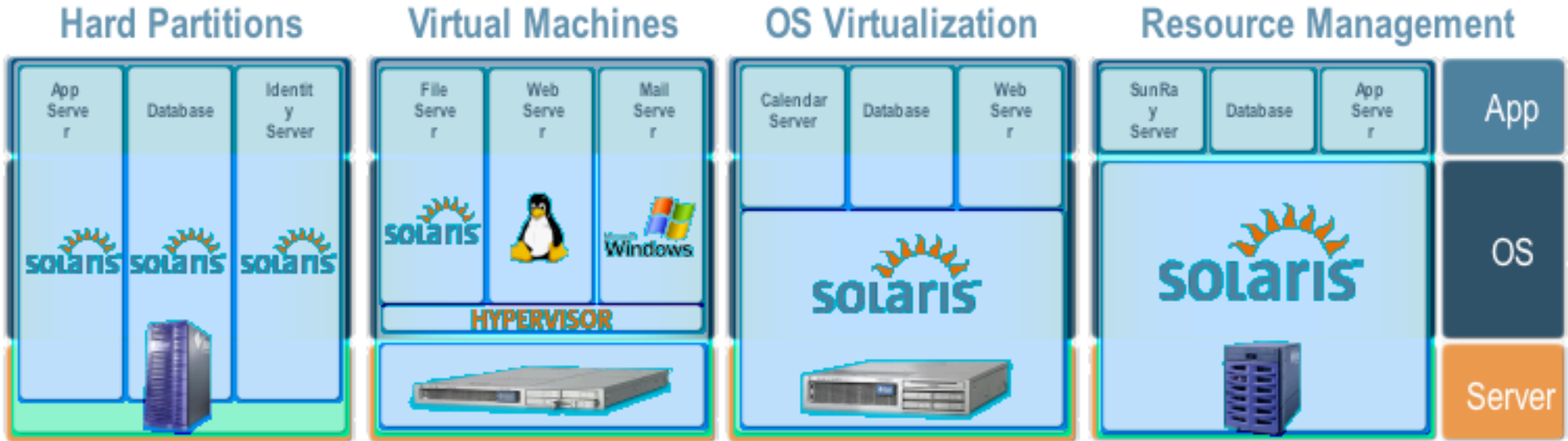## Hardware Replacement Program

09/30/2006
This picture shows 20% of the hardware that was replaced from the SLS hardware replacement program initiated for phase I of the Newark, CA campus closure. For more information contact: dean.nelson@sun.com

Can You Guess What This Is?

Industry Leading Server Virtualization

Hard Partitions	Virtual Machines	OS Virtualization	Resource Management

App Server	Database	Identity Server		File Server	Web Server	Mail Server		Calendar Server	Database	Web Server		SunRay Server	Database	App Server		App
solaris	solaris	solaris		solaris	(Linux)	Windows		solaris			solaris			OS
				HYPERVISOR											Server

Multiple OSs → **Single OS**

Trend to flexibility → **Trend to isolation**

Dynamic System Domains

Logical Domains

Xen

VMware

Microsoft Virtual Server

Solaris Containers (Zones + SRM)

Solaris Trusted Extensions

Solaris Containers for Linux Applications

Solaris Resource Manager (SRM)

stopglobalwarming.org
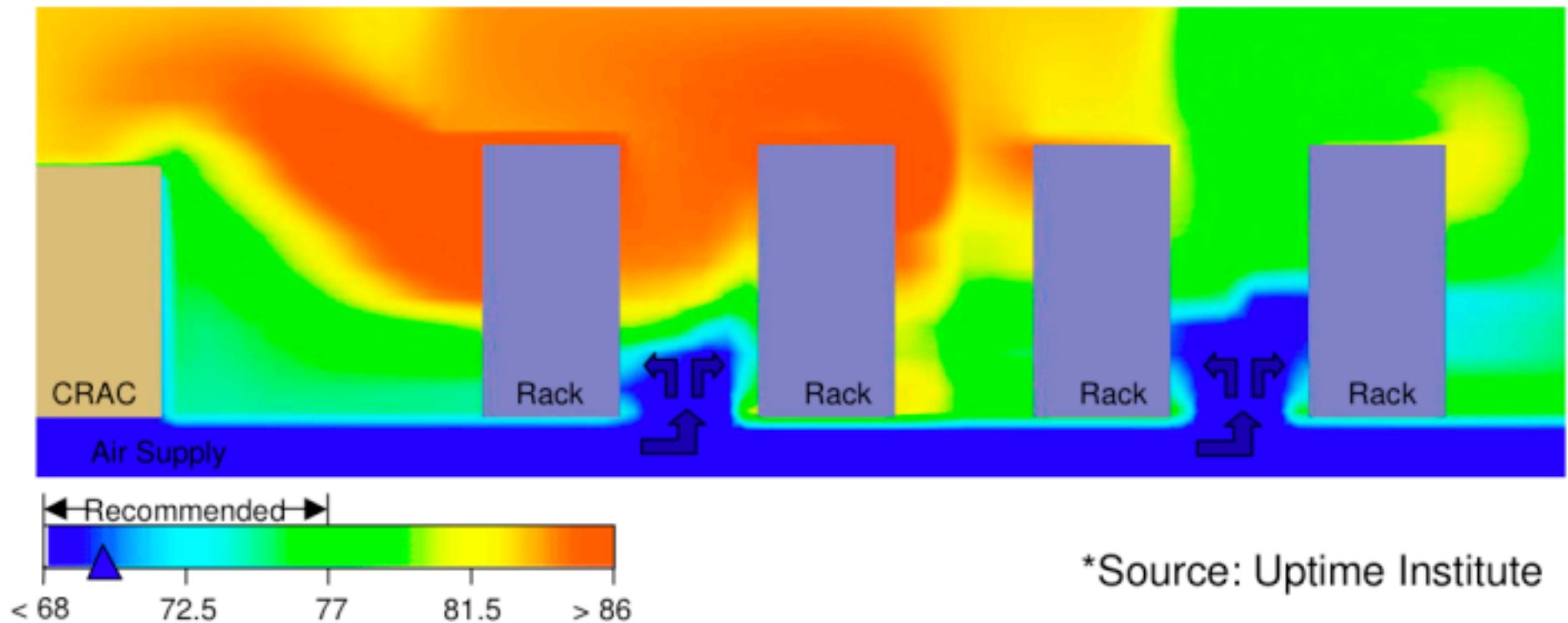
- Join the 880,106 supporters of the Stop Global Warming Virtual March on Washington DC, and become part of the movement to demand our leaders freeze and reduce carbon dioxide emissions now!

Second Short Term Data Center Energy Solutions

Cooling Technologies

Not enough Cooling for High Loads

*Source: Uptime Institute

Short Term Solutions

- Data Center Commissioning
  - Sun's Managed Environmental Services
  - Detailed inspection and measurement of data center
  - Identifies operational problems
  - Studies show average 15% building energy savings*

  - Clogging holes and correct placement of vented tiles
    - Can account for as much as 20% of cooling load
    - Can be implemented in a matter of weeks

  - Check data center A/C setpoints
    - 4% energy for each degree F

* - Lawrence Berkeley Labs/DOE study of 150 building commissioning projects

Third Short Term Data Center Energy Solution

Local Power Generation

Courtesy of International Fuel Cells, LLC

Getting to Green

Do you have teenagers?

Fourth Short Term Data Center Energy Solution

Organizational Changes

Split Incentives - Consumers/Suppliers

- Many organizations disconnect electric consumption from energy budget
  - CIO one of largest consumers of energy
  - VP of Facilities pays bill

- Align spending with budget responsibility
  - Give CIO electric budget
  - Give Facilities IT capital
  - Sun's NWK consolidation done with Facilities money

Recycle

Developing Countries - Dumping Grounds

- Monitors 8 pounds of lead

- Plastics- flame retardants and cadmium

- 500 containers enter Lagos, Nigeria a month
  - > 800 computers per container
    - >400,000 systems per month

The Basel Action Network

Sun eWaste and HazMat Leadership

- > 50% enters re-manufacturing
- All metal and plastic recovered
- Less than 5% enters waste stream
- Fully RoHS compliant
- Ready for next regs

European WEEE Directive
sets target that 65% of IT equipment must be recycled*

Thank You

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