

Welcome CAP Executive Board



CAP Leadership 2009 - 2010



**CAP Chairman:
Danny Brown, Ph.D.
VP Technology Development,
Cymer**



**CAP Vice Chairman:
Anton Monk, Ph.D. UCSD '94
VP Engineering,
Entropic Communications**

Welcome Distinguished Alumnus

Junling Sun, Ph.D. SE '93

President and Executive Director

Sun Engineering Consultants International, Inc.

and

President, UCSD Alumni Association, China.

Welcome Distinguished Students

- **Jacobs School Scholars and Fellows**



- **President: Stephan Kemper, CSE '10**



- **External Liaison: Alice Huang, ME '10**



- **President: David Waltzman, ME '10**





TESC
Triton Engineering Student Council

Stephan Kemper, President, CS '10

wkemper@ucsd.edu

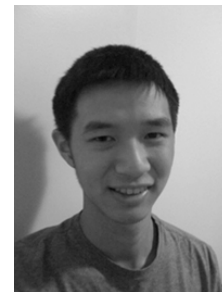
<http://tesc.ucsd.edu/>



enspire

2010

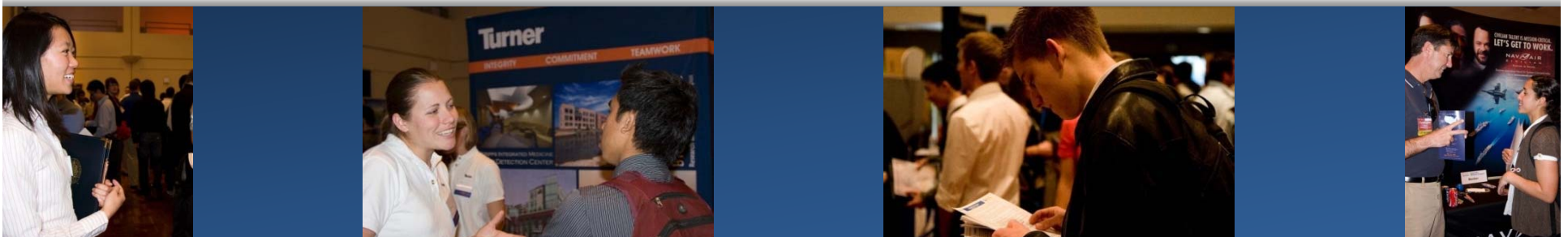
- February 17, 2010
- 420 eighth-grade students
- Over 200 UCSD volunteers
- Dozens of research labs
- Two mad scientist organizers
- One crazy fun event!



- February 19, 2010
 - PC West Ballroom
 - 9:30 AM – 3:00 PM
- Registration is closed!
- Special CAP offer: **FRIDAY**



<http://tesc.ucsd.edu/decaf/registration>





- DERBY IS FUN
- 258 team members in 47 cars
- DERBY IS FUN
- 2000+ spectators
- DERBY IS FUN **NOT NEW!**
- Coincides with Sun God Festival **NEW!**



<http://tesc.ucsd.edu/derby>





Tau Beta Pi

The Engineering Honor Society

Integrity and Excellence in Engineering

External Liaison: Alice Huang, ME '10





Tau Beta Pi

The Engineering Honor Society

Integrity and Excellence in Engineering

Overview

- California Psi Chapter est. 1994
 - Junior/senior-standing students
- Activities
 - Tutoring, Mentoring
 - Community Service, Outreach
 - Undergraduate & Graduate scholarships





Tau Beta Pi

The Engineering Honor Society

Integrity and Excellence in Engineering

Upcoming Event



- **Saturday, April 17, 2010**
- **Goals:**
 - Encourage higher education in sciences
 - Promote sustainability & alternative energy
- **Activities**
 - Design Competition (Windmill), Lab Tours
 - Lunch, Keynote speeches, UC application workshop
 - Student/Professional organization fair





Tau Beta Pi

The Engineering Honor Society

Integrity and Excellence in Engineering

2009 ThinkGREEN! Sponsors: Thank you!

- Event Funding:
 - ❖ SAIC
- Keynote Speaker: Dr. Don Czechowicz (GA)
- Industry Fair:
 - ❖ SAIC
 - ❖ SPAWAR
 - ❖ General Atomics



ASME UC San Diego

President: David Waltzman, ME '10

▣ **Two facets**

■ **Pre-professional**

- ▣ 5 competitions
- ▣ 2 tours of industry
- ▣ Activities with 5 other professional societies

■ **Competition Teams**

- ▣ Bullet Cycles
- ▣ Triton Robotix
- ▣ Human Powered Submarine



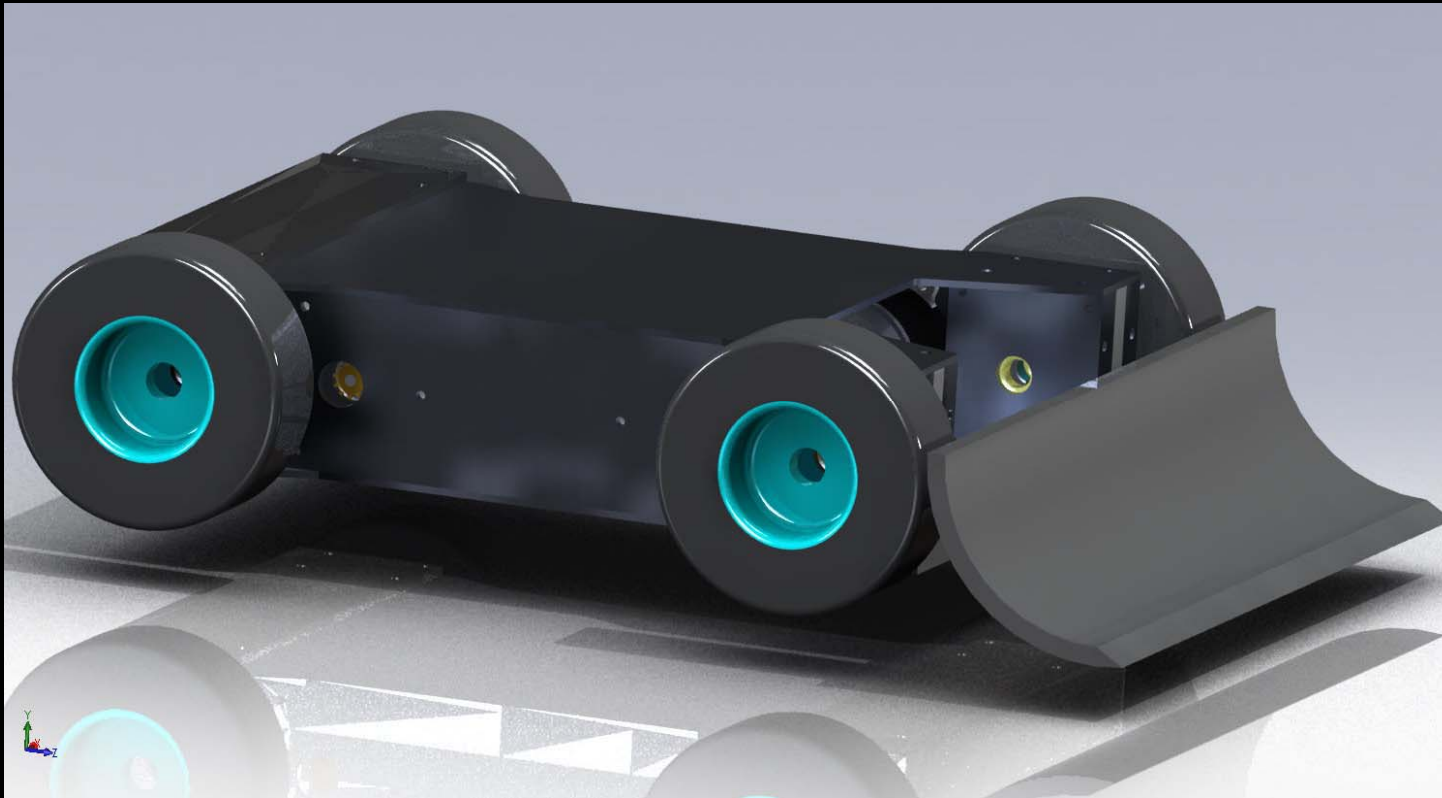
▣ **Over one-third of mechanical engineering students have participated in an event this year**

BULLET CYCLES

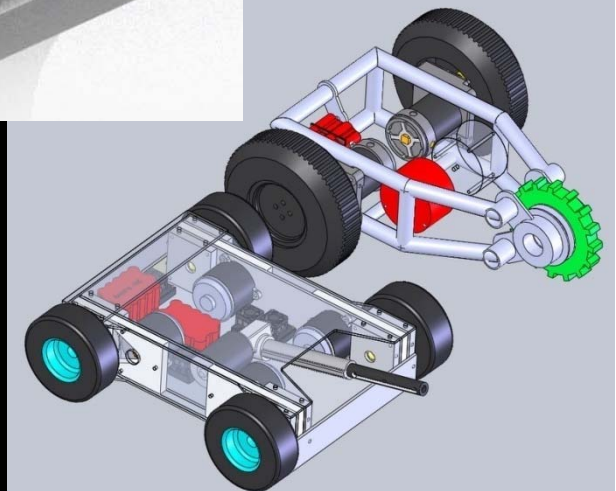
- ▣ Two wheels
- ▣ Recumbent position
- ▣ Front Steering
- ▣ Rear Power



Triton Robotix: The Defender

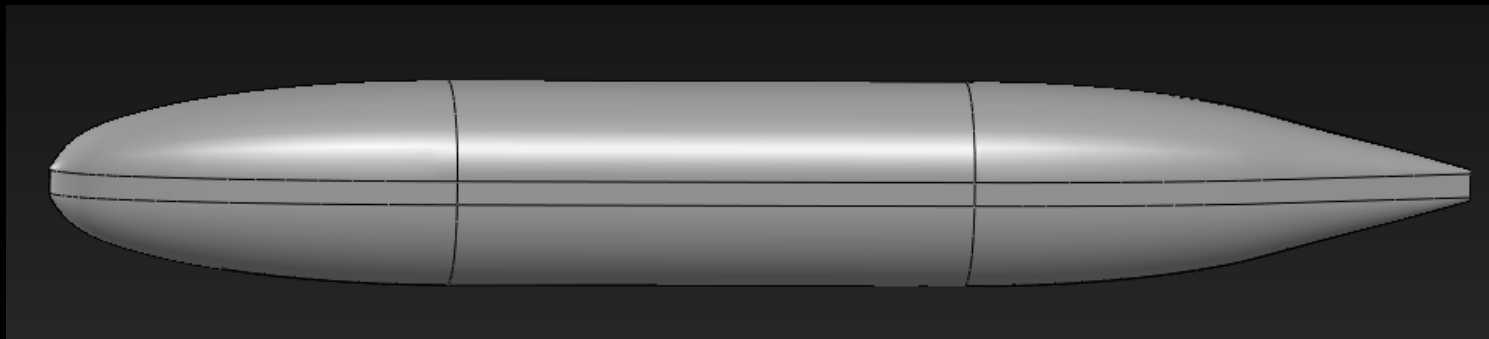
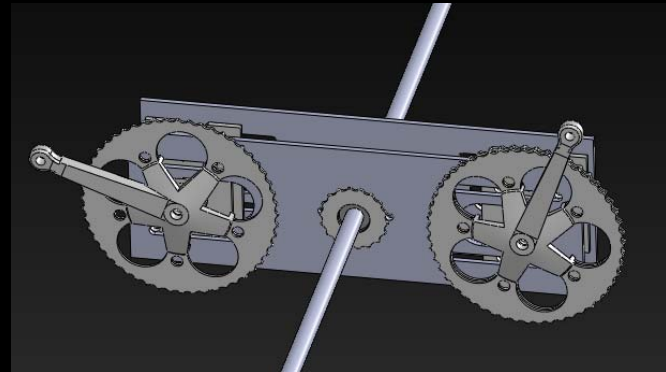


- Ranked 2nd in collegiate division last Spring
- 25% lower height profile than previous model
- Chain drive via ChainBox (patent pending)
- Modular weapons



UCSD HPS 2010 and Beyond

- ▣ Big Picture – Complete a two-man propeller submarine for race in 2011
- Where are we now
 - 3D Model is complete
 - We have potential sponsors for hull and steering surface materials



Welcome New CAP Member!



Dean's Report:
Jacobs School of Engineering
Dean Frieder Seible



Equal Opportunity/Affirmative Action & Diversity Awards 2010

Congratulations to our Jacobs School recipients!

Vice Chancellor Academic Affairs Recipient:

- Sonia Rosas – Engineering Student Services

University-Wide Recipients:

- Anne O'Donnell – Jacobs School CAP
- Undergraduate Engineering Professional Organizations:
 - National Society of Black Engineers
 - Society of Hispanic Professional Engineers
 - Society of Women Engineers

Principles of Community

Adapting

Valuing

Culture

Diversity

Dynamics of Difference

UC San Diego Ranking

#9

Breaking into the Top 10

The UCSD Jacobs School ranks **#9** in the world for engineering, technology and computer science.

Institute of Higher Education,
Shanghai Jiao Tong University, 2009



von Liebig Center leverages San Diego's innovation pipeline

Second Clean Tech Innovation Challenge

10+ applications
Three-\$50k Proof of Concept grants
Business Mentoring for one year
San Diego Focus

Lead Sponsors:



Kaplan Family Trust

Program Partners:



The Wireless Health Innovation Challenge

20+ applications
Three-\$75k Proof of Concept grants
Business Mentoring for one year
Southern California

Lead Sponsors:

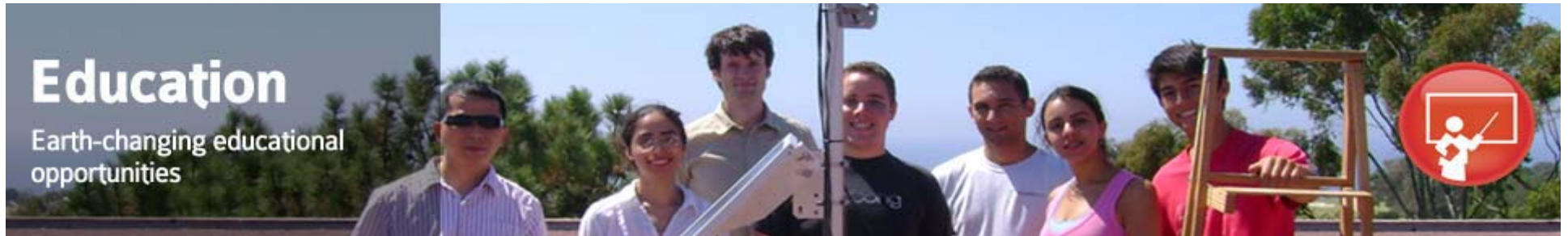


Program Partners:



Environmental Engineering Major

The next generation engineer **aware of** human **industrial activities** that impact **the environment** and **equipped** with tools to develop technologies **to enable sustainable economic growth**.

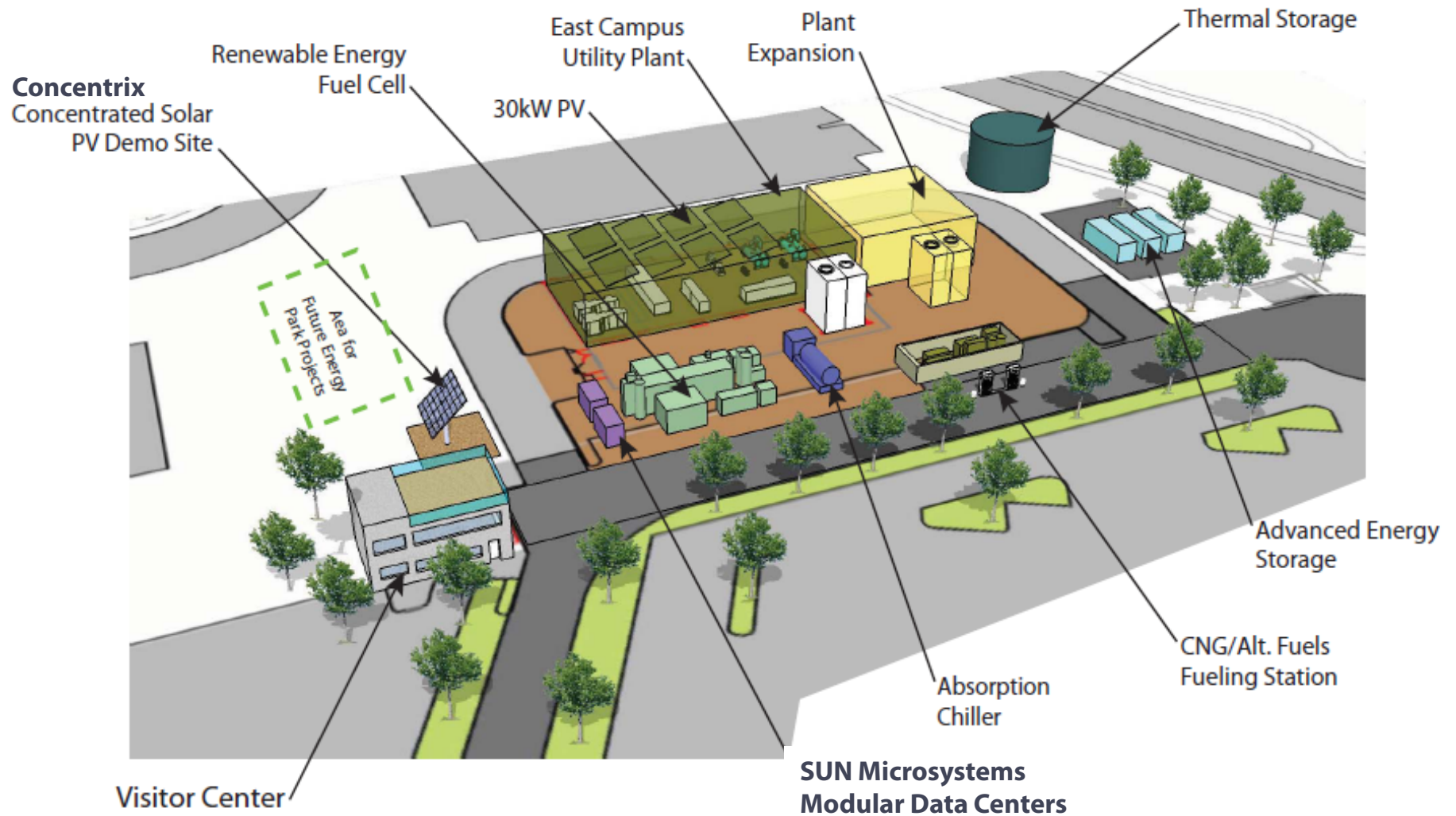


Core development in mechanics, thermodynamics, physics, chemistry, and mathematics

- **Twenty-First Century Energy Technologies**
- **Environmental Engineering and Policy**
- **Flow and Transport in the Environment**
- **Fluid-Solid Interactions in Environment Engineering**
- **Environmental Engineering Laboratories I, II**
- **Environmental Biology**



Energy Park



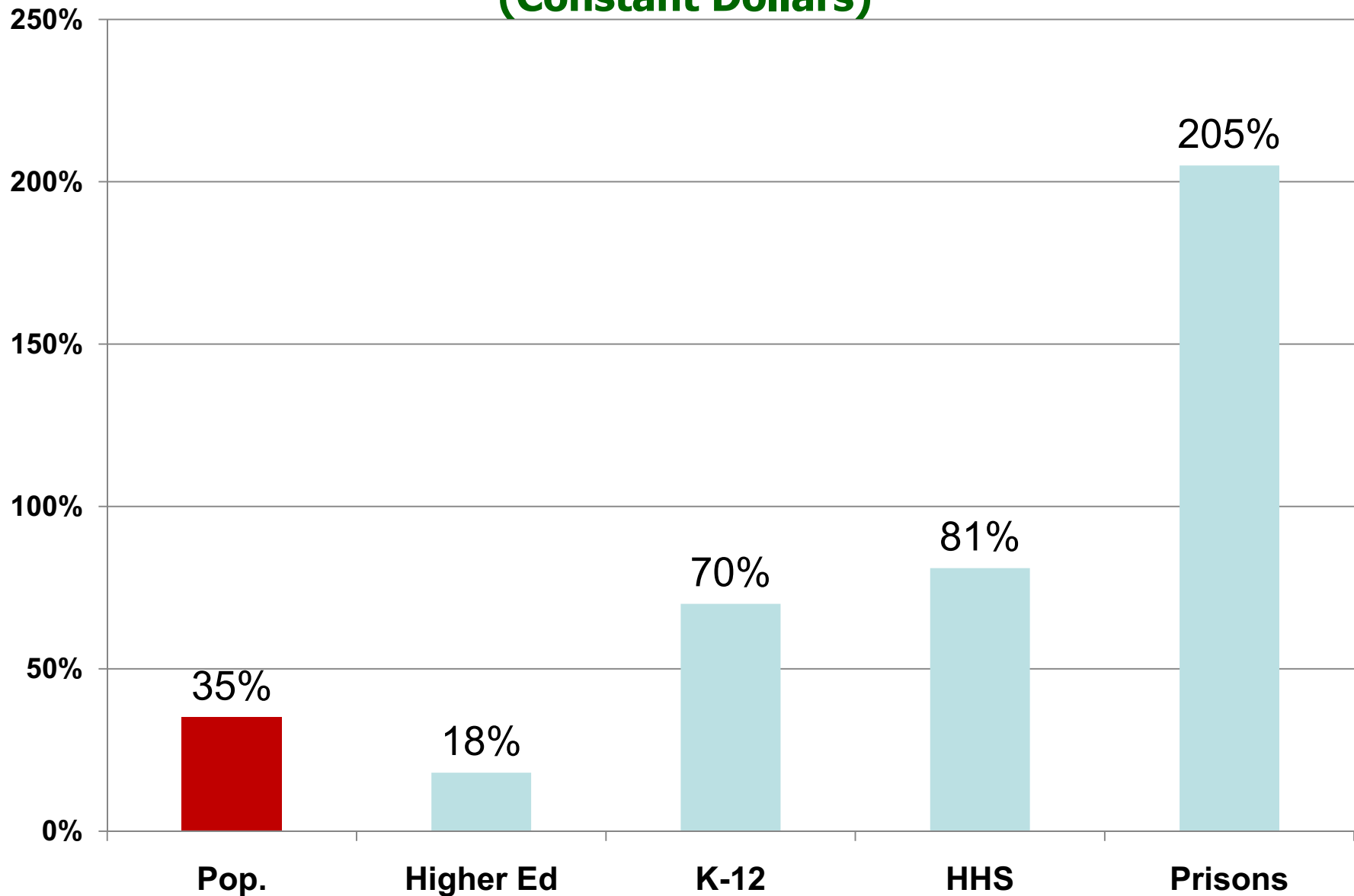
*This plan includes projects envisioned for the East Campus Energy Park. Actual projects and sites may vary.
Prepared by UCSD Physical Planning 01-12-10 <F:\East Campus\Energy Park\Concept Plan\energy park 3D 01-12-10.ai>

**UCSD East Campus Energy Park
Conceptual Development Plan**

Budget Challenges

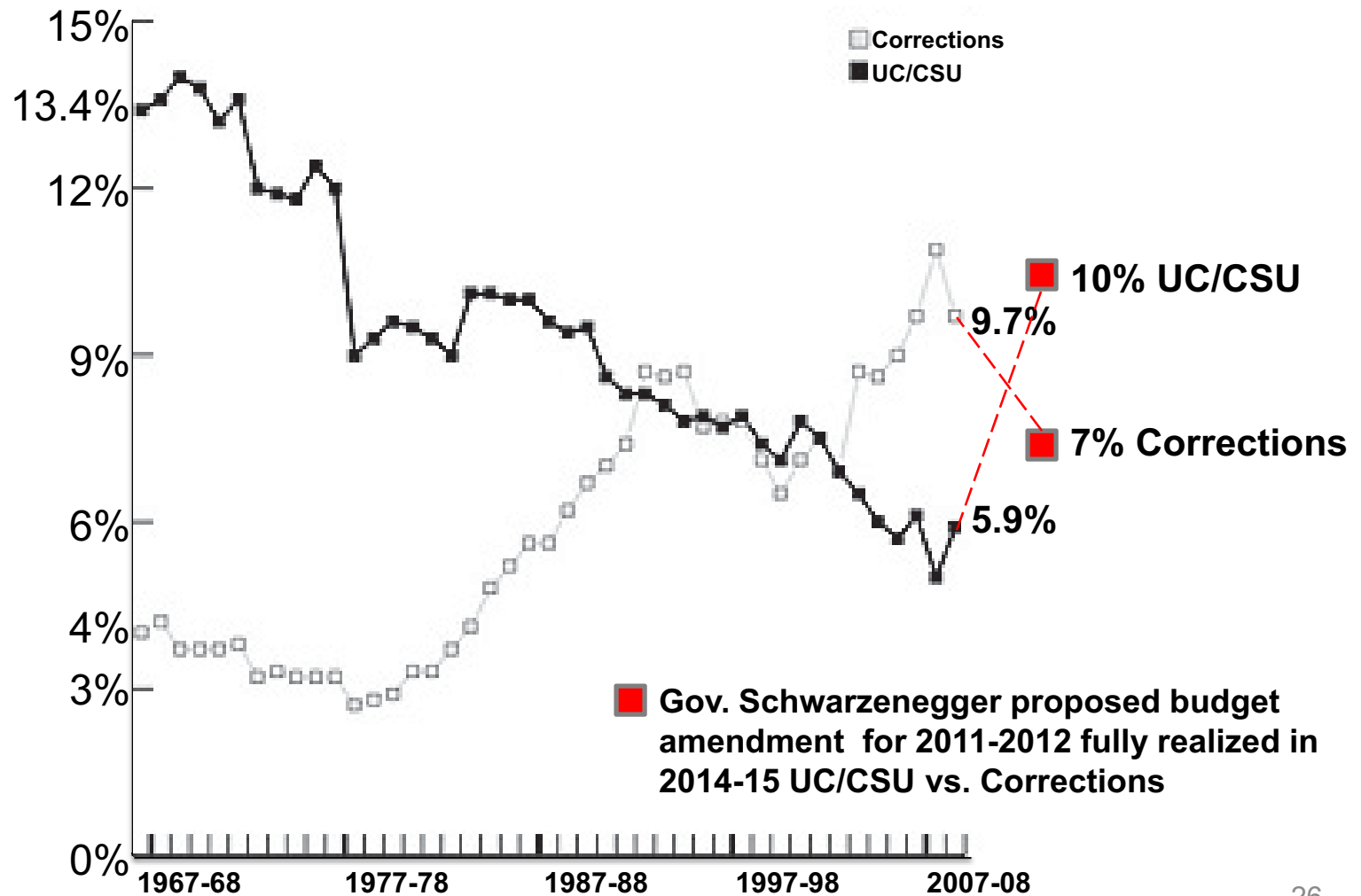


California Population vs. Growth in General Fund Spending on Four Large State Programs, 1984-2004 (Constant Dollars)



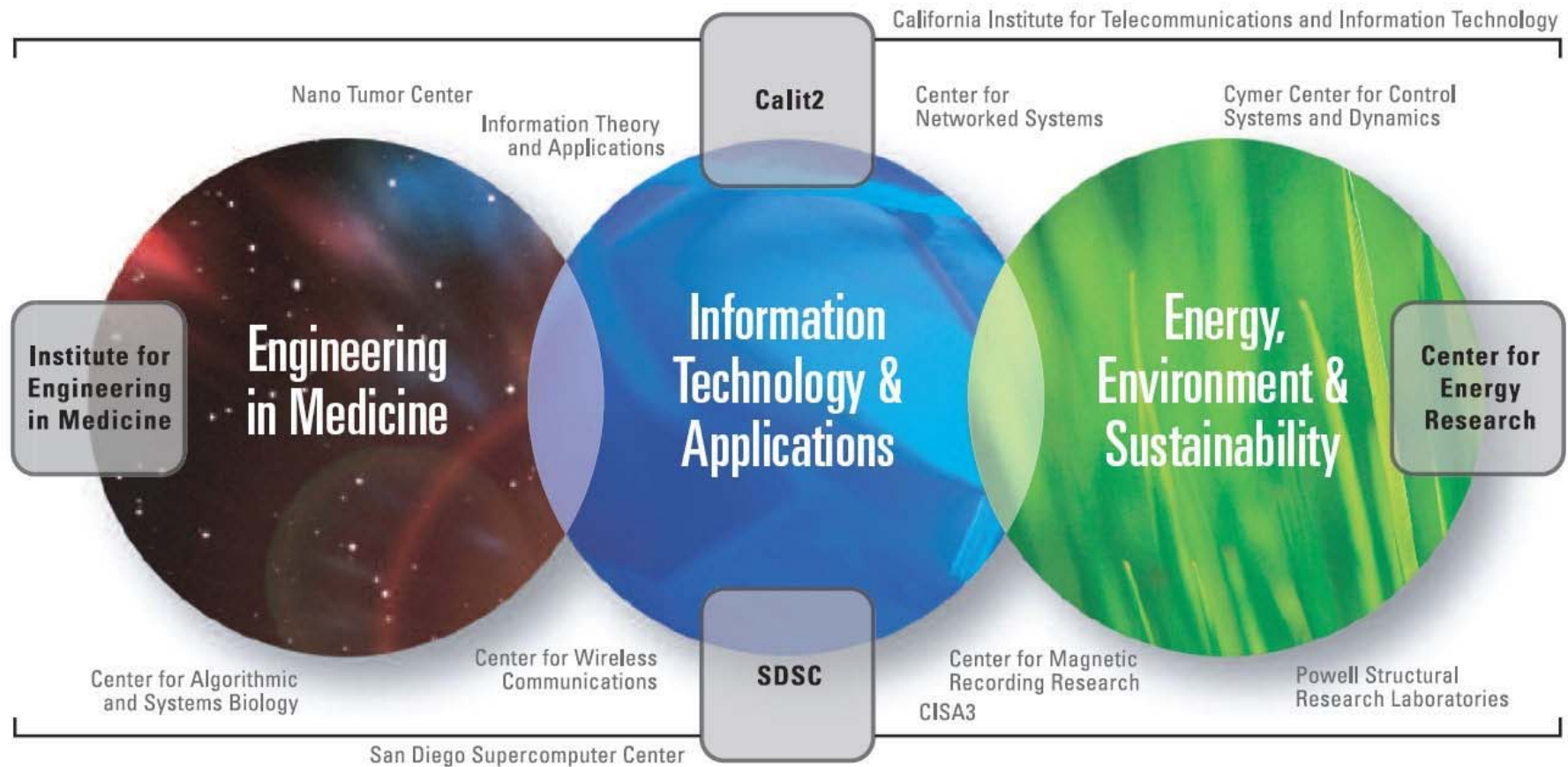
State Support for UC Operations have been Declining for the Past 25 Years

State general funds: UC/CSU vs. Corrections



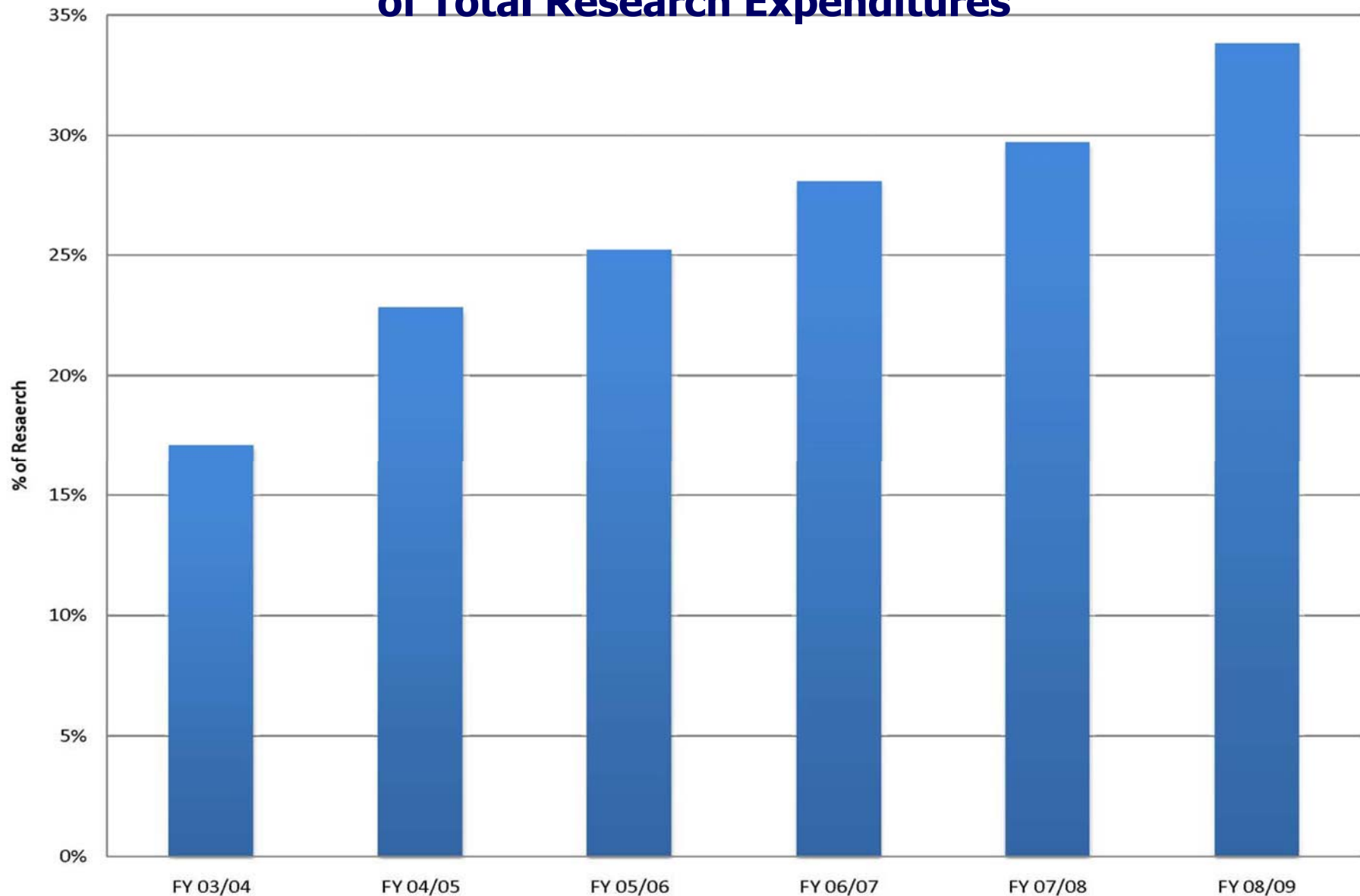
*Sources: CPEC Fiscal Profiles, 2008; Dept. of Finance budget documents

Research Focus Areas



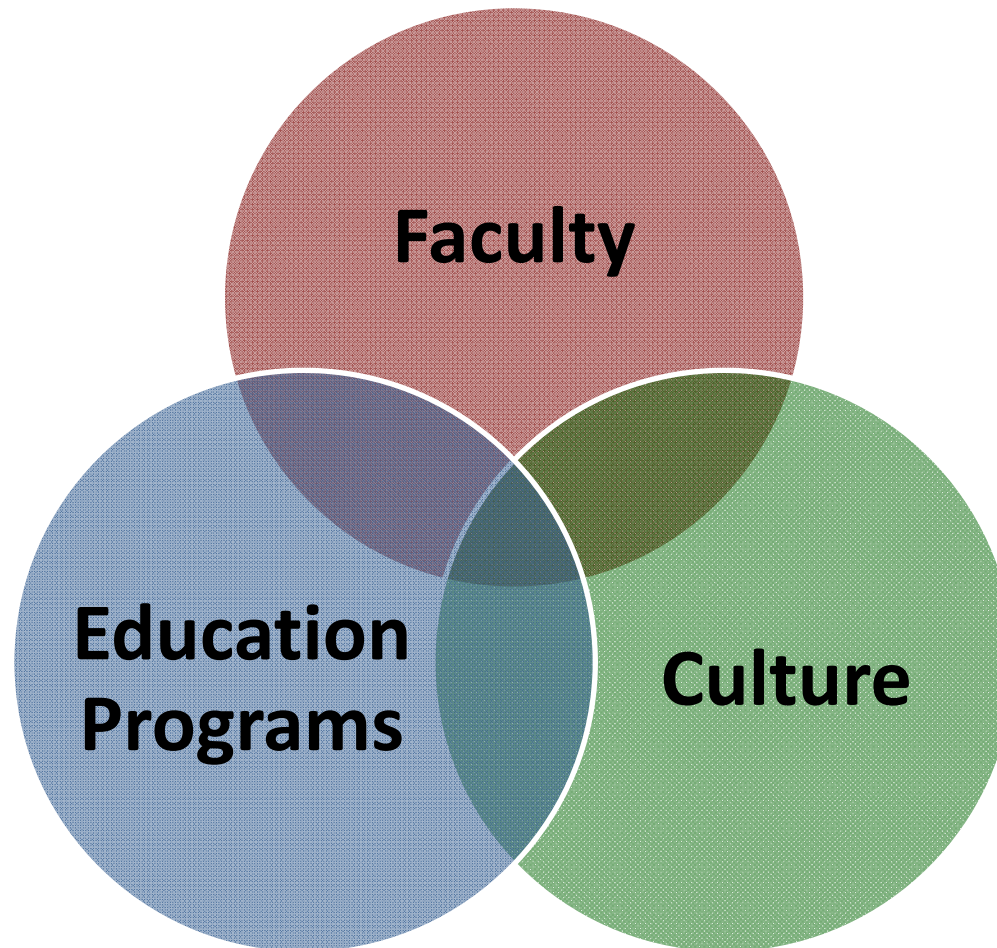
Jacobs + Industry = A Great Team!

Jacobs School Research Funding from Corporations as Percentage of Total Research Expenditures

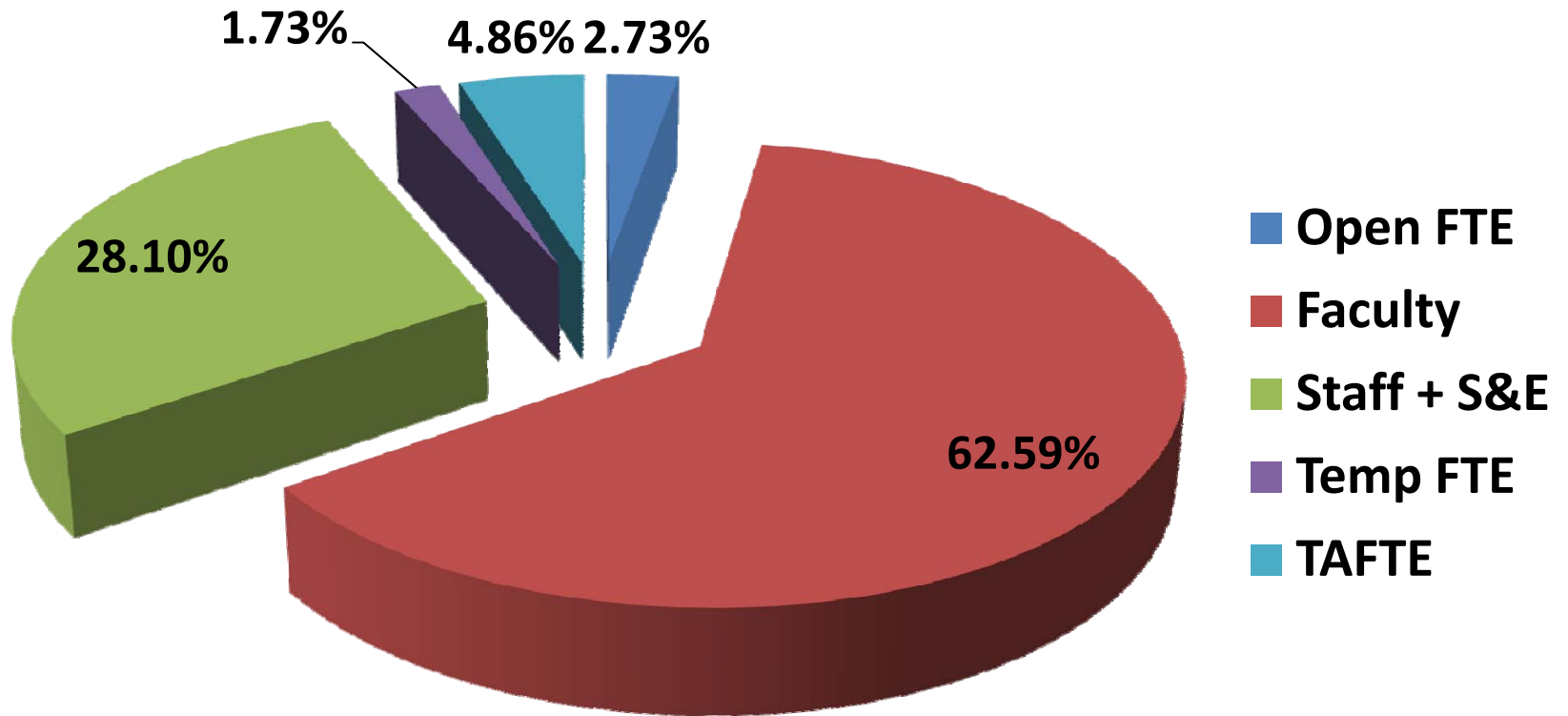


Budget Challenges

Need to Preserve 'The Academic Core'



\$36M Budget of Jacobs School of Engineering



Challenge: Create plans to cut 10%, 15% and 20%

Brainstorming Session (aka *Speed Geeking!*)

**What would you do if you were
Dean of the Jacobs School of Engineering
in this economic climate?**

How would you fill the shoes?



Faculty Presentation
Tajana Simunic-Rosing
Assistant Professor
Computer Science and Engineering



Energy Efficient Computing

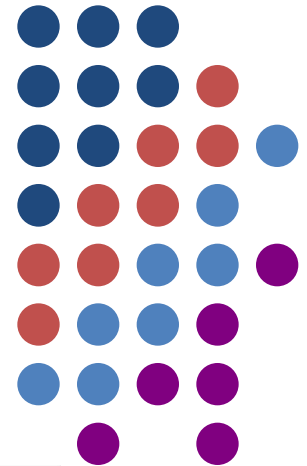
Energy Efficient Computing

Prof. Tajana Šimunić Rosing
Dept. of Computer Science

System Energy Efficiency Lab



seelab.ucsd.edu



QUALCOMM



Texas Instruments Inc.



Google



National Institutes of Health
The Nation's Medical Research Agency



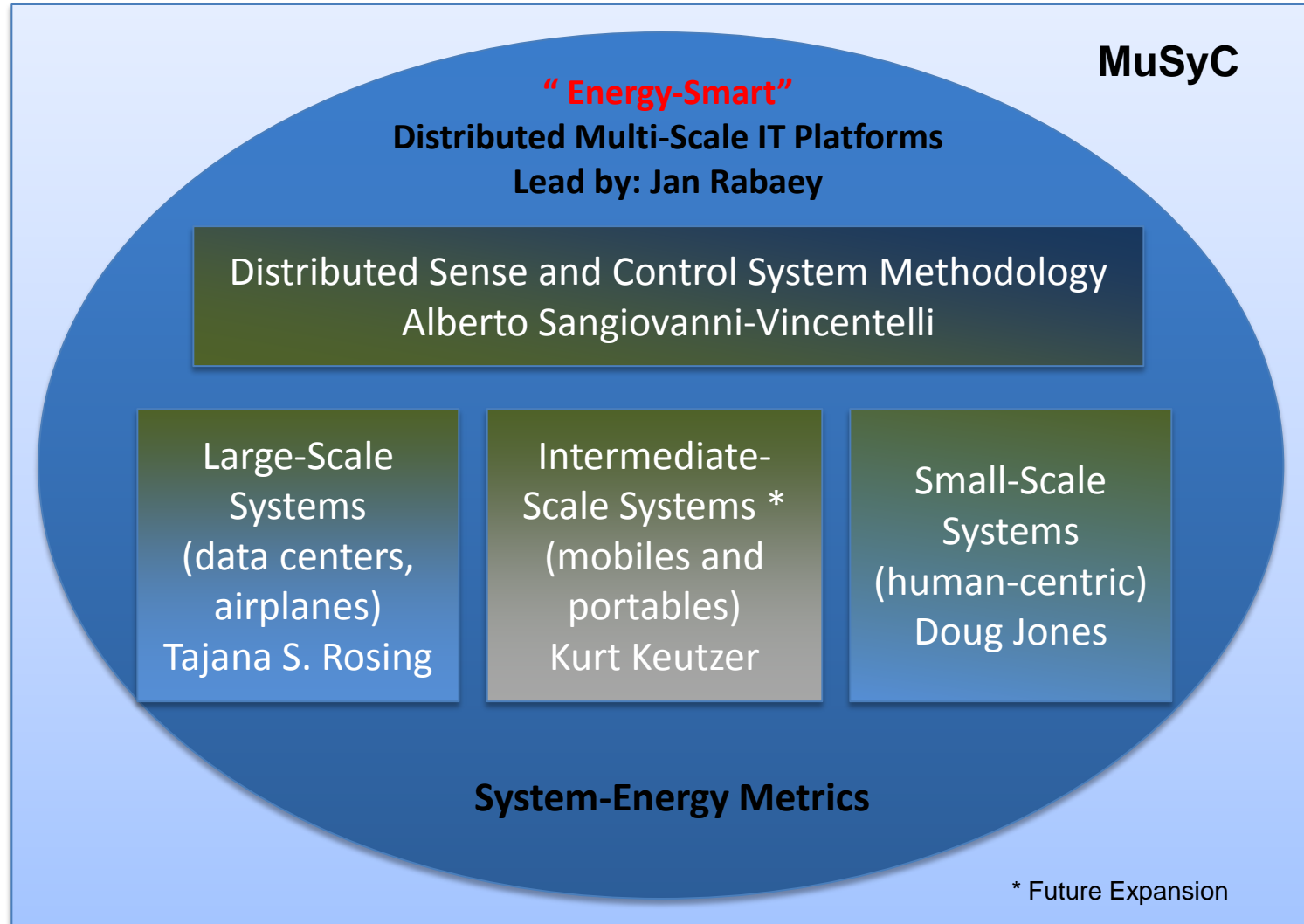
Future of IT



- Energy consumption is a critical issue:
 - Wireless systems: maximize battery life, optimize energy harvesting
 - High performance systems: minimize operational costs

MuSyC center

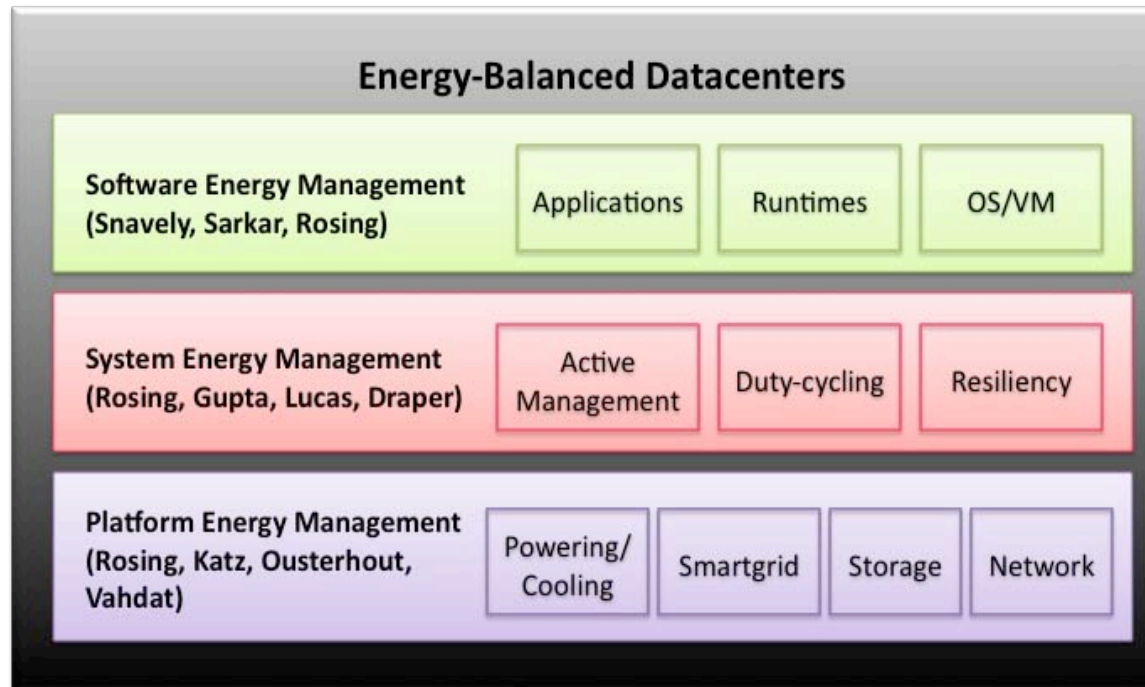
funded by DARPA and corporations





MuSyC: Large scale systems

- Goal:
 - Develop a multi-scale *energy management solution* to monitor, model and manage energy across a spectrum of heterogeneous devices and hierarchy levels in large scale datacenters
- Team (UCSD, Stanford, UCB, USC, Rice U.)
 - Software, system and platform energy management



Power and thermal management



NSF Project GreenLight

- Green cyber-infrastructure in energy-efficient mobile facilities
- Closed-loop power and thermal management

Dynamic power management (DPM)

- Optimal DPM for a class of workloads
- Machine learning to adapt
 - Select among specialized policies
 - Use sensors and performance counters to monitor
- **Measured energy savings of up to 70% per device**

Dynamic thermal management (DTM)

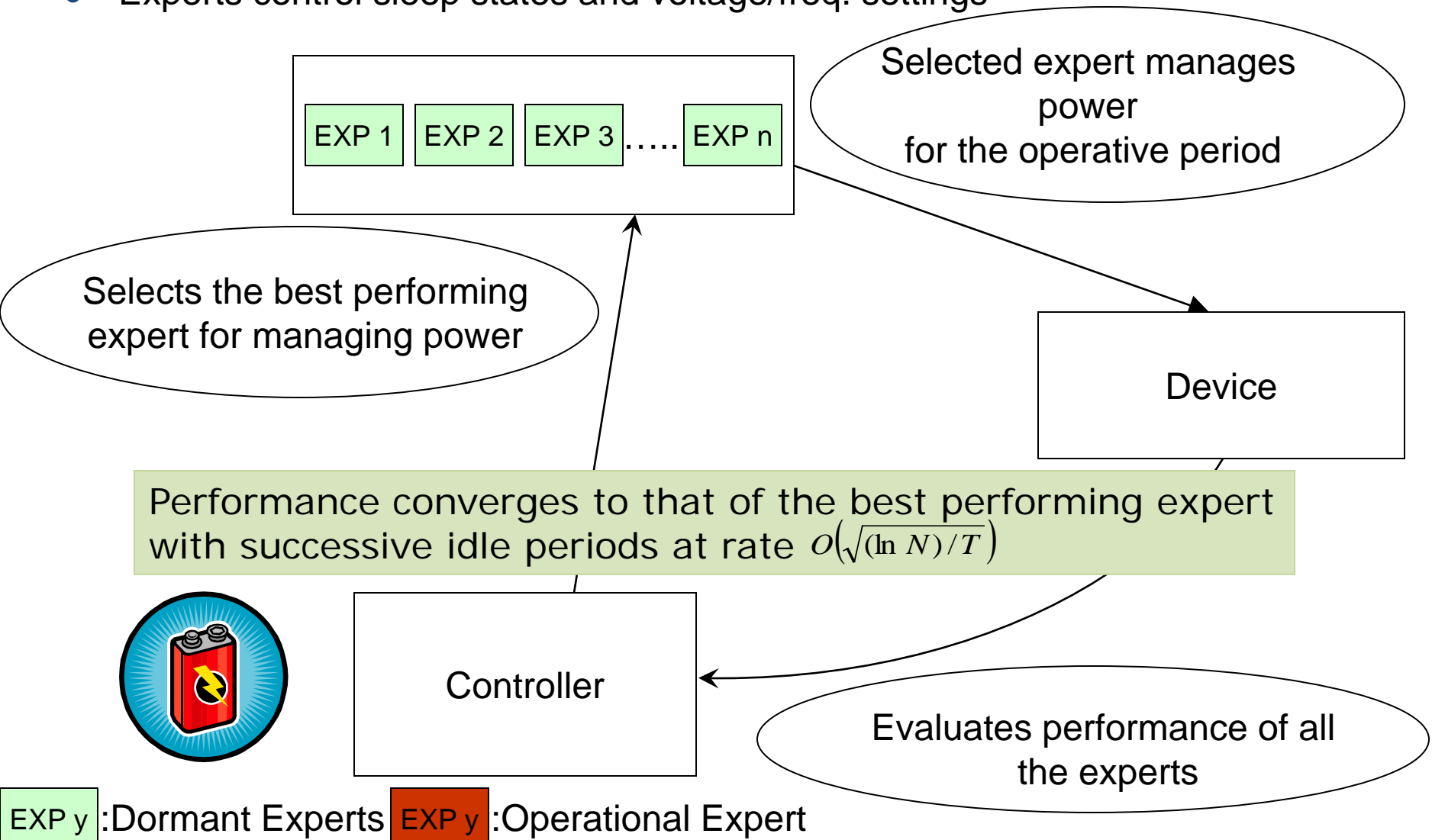
- Workload scheduling:
 - Machine learning for dynamic adaptation to get best temporal and spatial profiles with closed-loop sensing
- Proactive thermal management
 - **Reduces thermal hot spots by average 60% with no performance overhead**



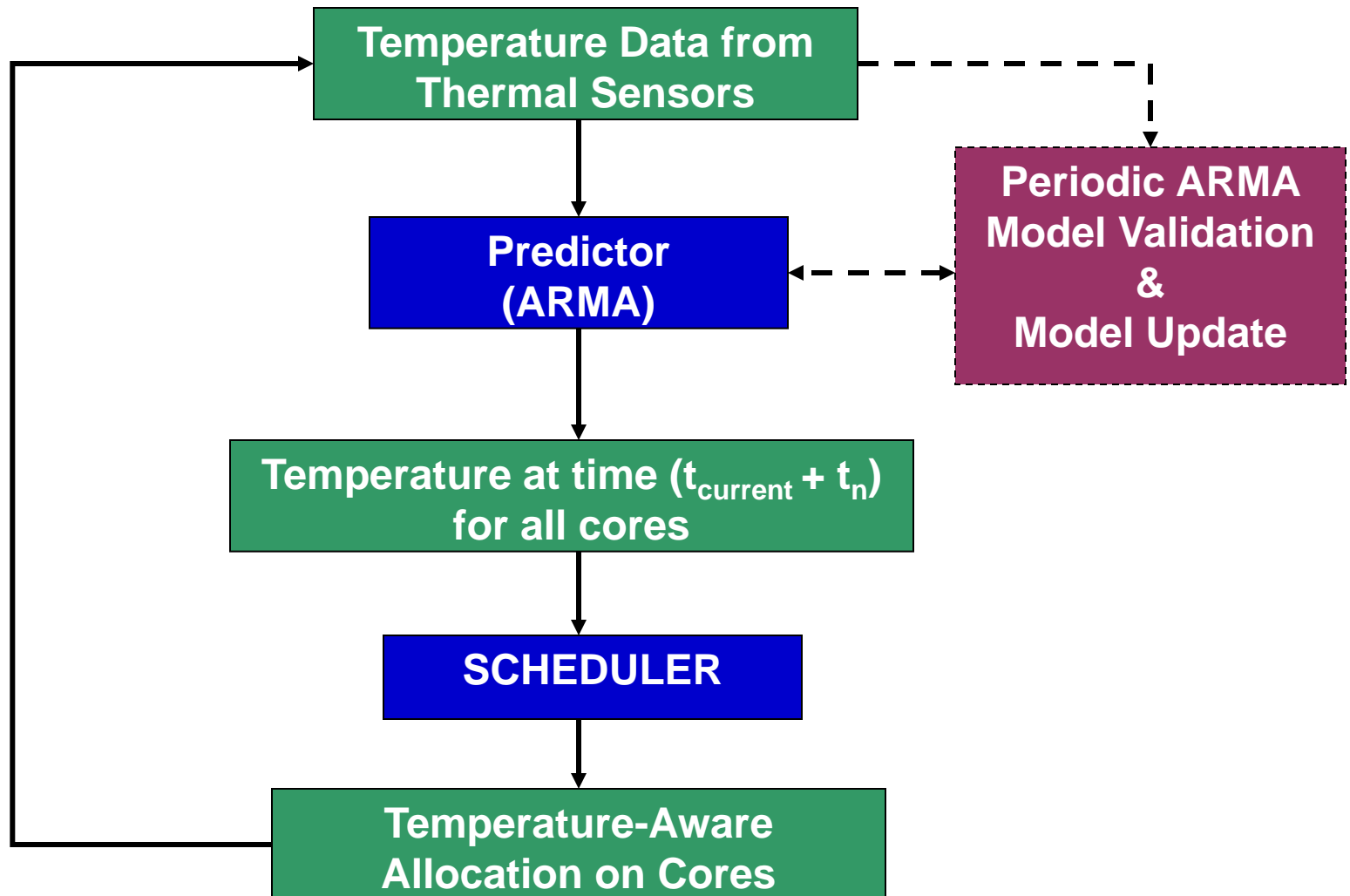
Online Learning for Power Management



- Measured large energy savings – up to 70% per device
- Experts control sleep states and voltage/freq. settings



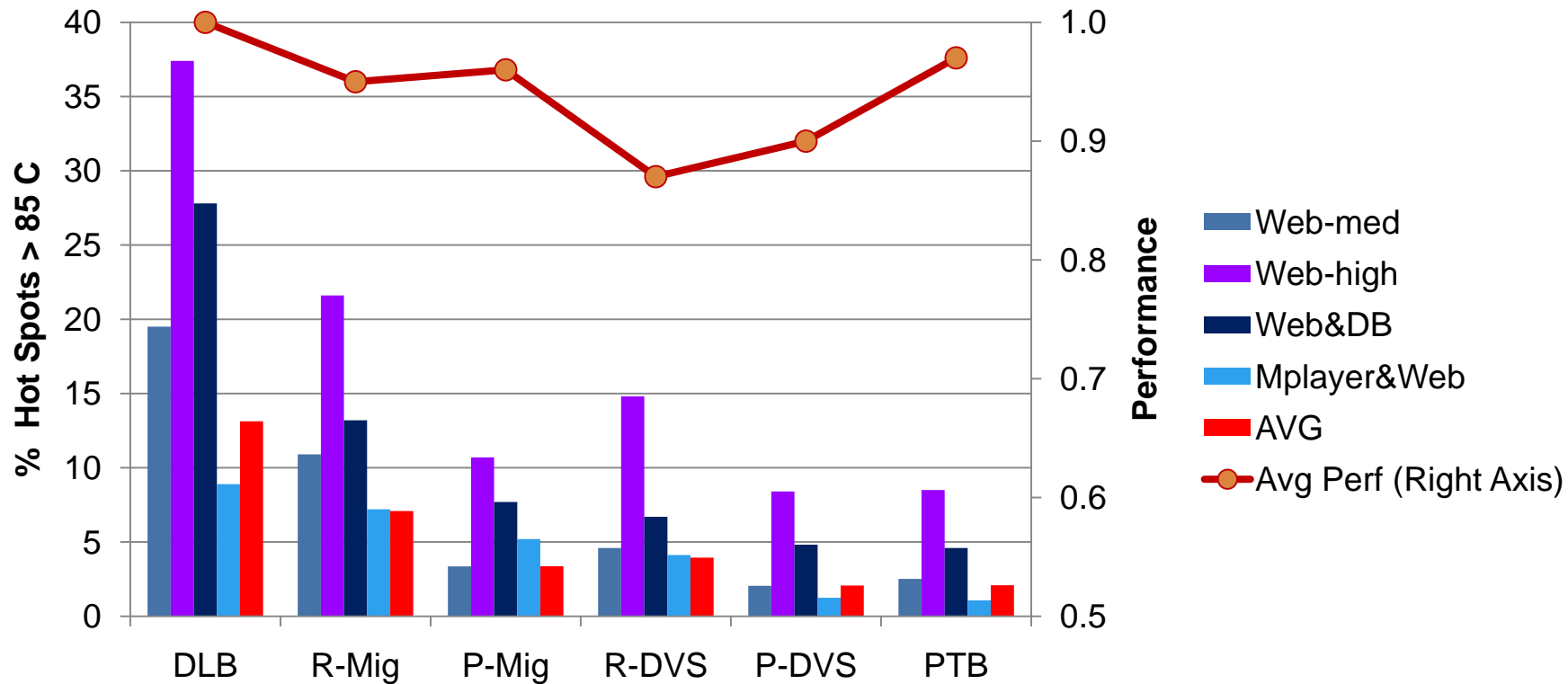
Proactive thermal management



Proactive vs. Reactive: Hot Spots



- PTB reduces hot spots by 60% over reactive migration

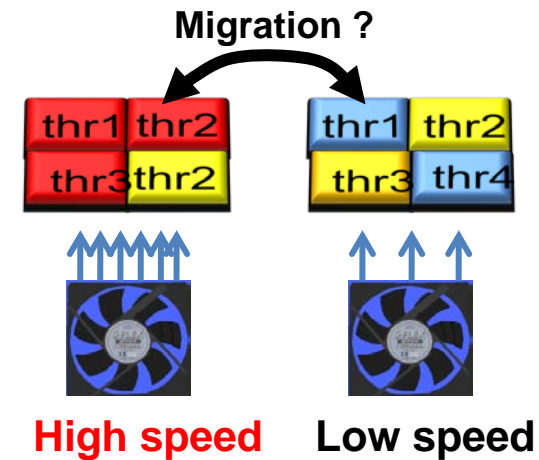
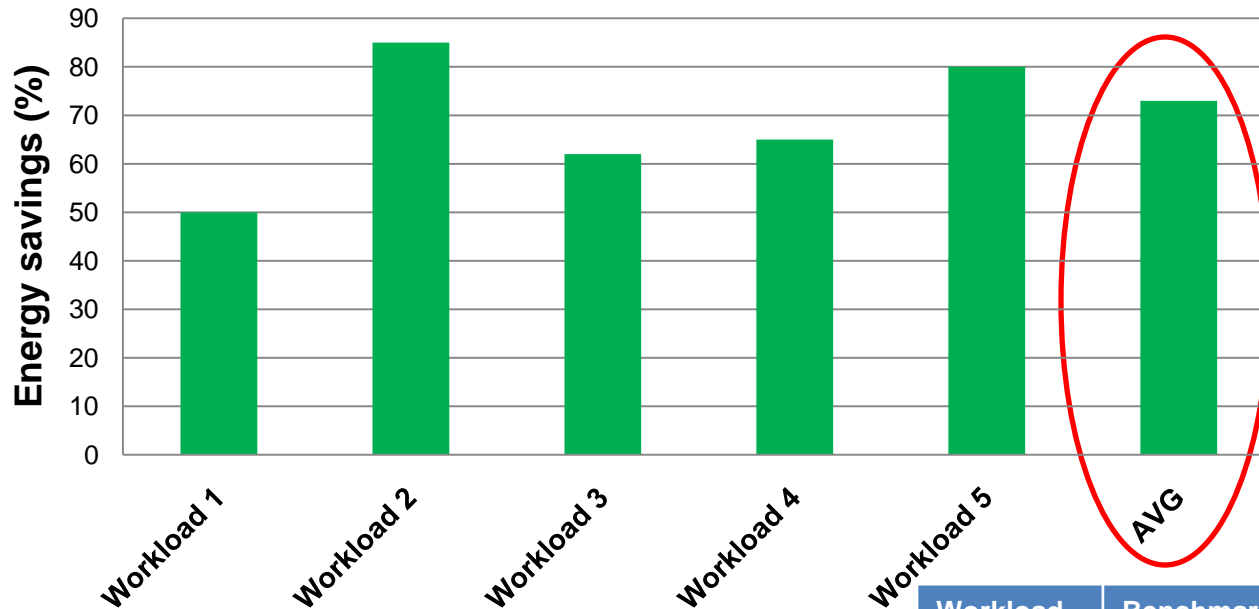


Cooling-aware management



Our contribution:

A cooling aware workload management strategy capable of 73% energy savings on average



Workload	Benchmarks (socket 1/socket 2)
1	{crafty+gzip+gcc}/{crafty+gzip+gcc}
2	{bzip2+gzip+swim+swim}/{crafty+gzip+gcc}
3	{bzip2+swim+gcc+gcc}/{bzip2+swim+gzip+gzip}
4	{crafty+crafty+swim}/{gzip+swim+swim}
5	{bzip2+bzip2+bzip2+bzip2}/{gcc+gcc+gcc+gcc}

Power/Thermal Management in Virtualized Environments



vGreen

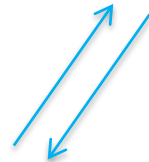
vgserv



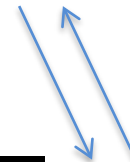
Objectives:

- ✓ VM Scheduling
- ✓ Power and Thermal Management

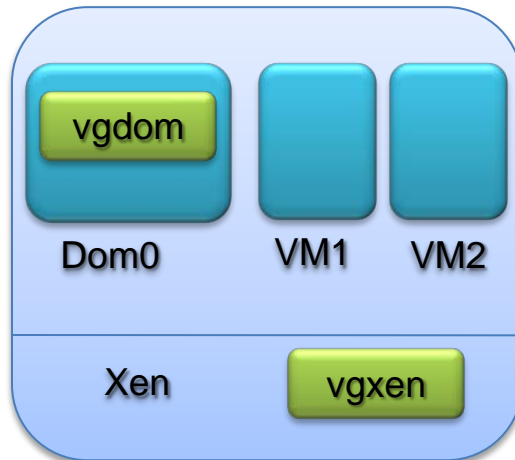
Updates



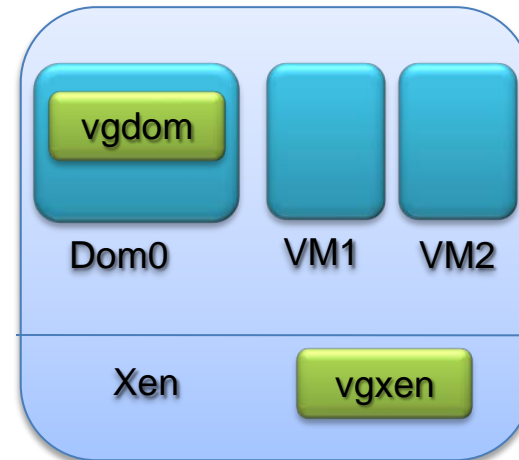
Commands



Updates

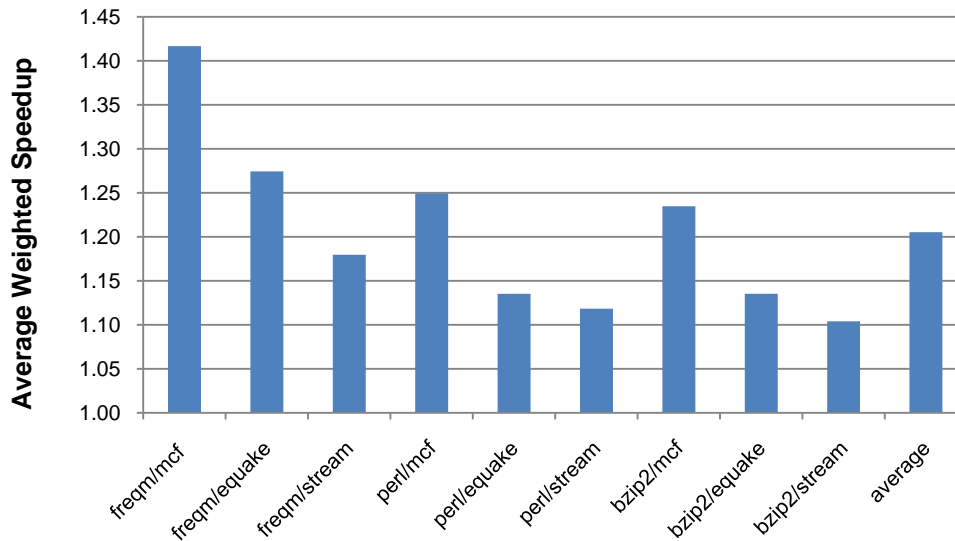
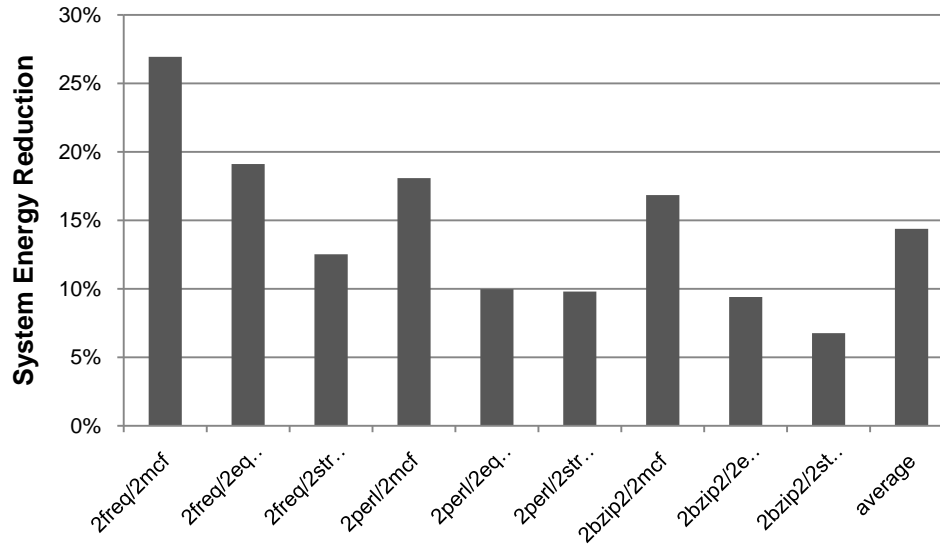


vgnode1



vgnode2

Server measurements



- ✓ Used combinations of SPEC and PARSEC benchmarks
- ✓ Testbed of two Intel Xeon servers running Xen
- ✓ Performed dynamic workload characterization and migration
- ✓ **High utilization:**
 - ✓ Ave. 15% energy savings
 - ✓ With 20% speedup



Heterogeneous Wireless Systems

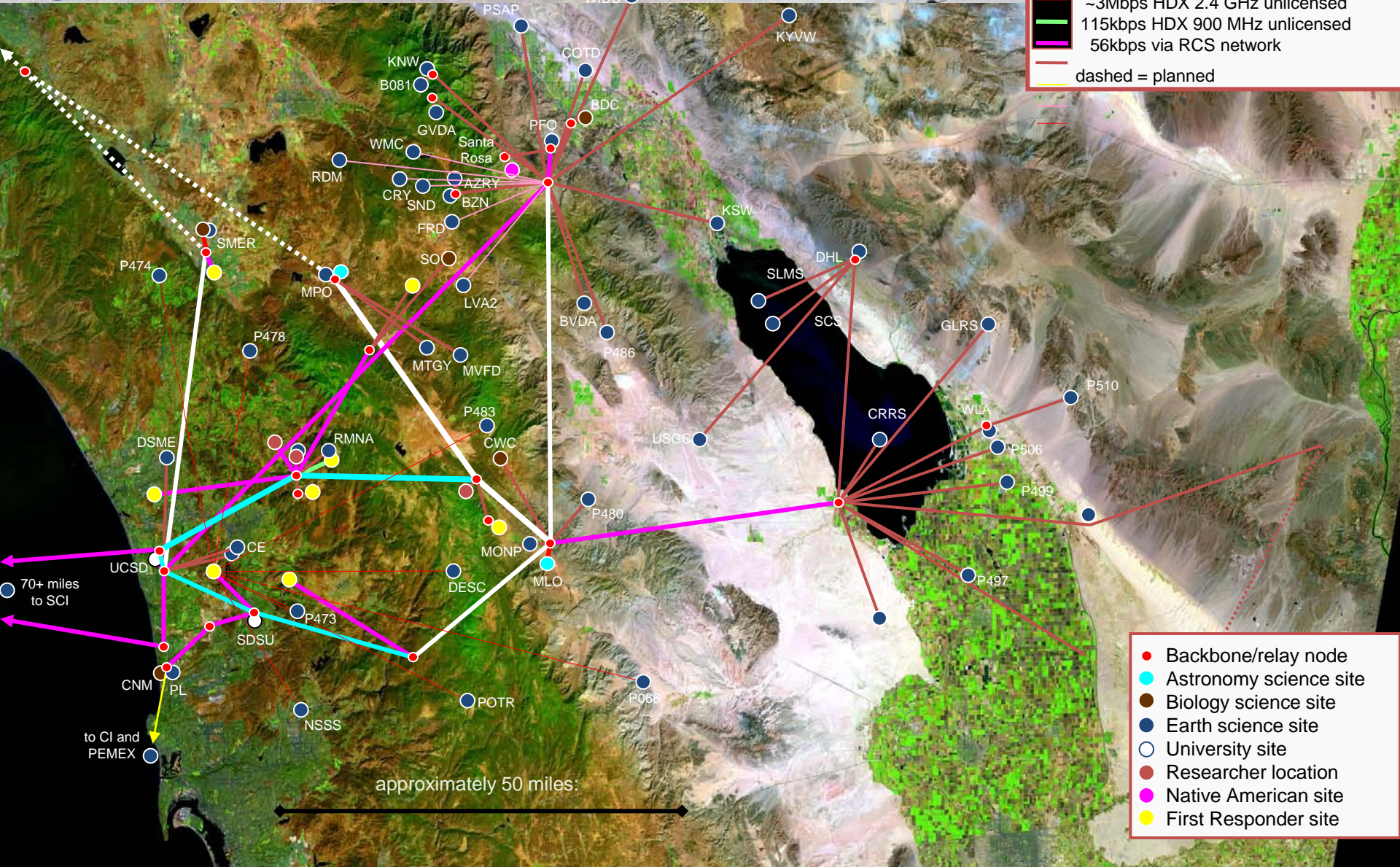




High Performance Wireless Research and Education Network

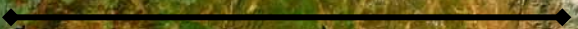


- 155Mbps FDX 6 GHz FCC licensed
- 155Mbps FDX 11 GHz FCC licensed
- 45Mbps FDX 6 GHz FCC licensed
- 45Mbps FDX 11 GHz FCC licensed
- 45Mbps FDX 5.8 GHz unlicensed
- 45Mbps-class HDX 4.9GHz
- 45Mbps-class HDX 5.8GHz unlicensed
- ~8Mbps HDX 2.4/5.8 GHz unlicensed
- ~3Mbps HDX 2.4 GHz unlicensed
- 115kbps HDX 900 MHz unlicensed
- 56kbps via RCS network
- dashed = planned



- Backbone/relay node
- Astronomy science site
- Biology science site
- Earth science site
- University site
- Researcher location
- Native American site
- First Responder site

approximately 50 miles:



70+ miles to SCI

to CI and PEMEX

Sensor Nodes in the HPWREN



Motion-detect cameras



Earthquake sensors

SIO; ~5kbps

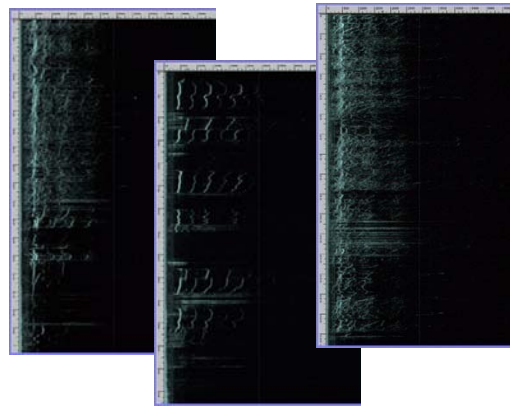


High-resolution
still camera
SMER

Wildfire tracking cams *Cal Fire Dept.*



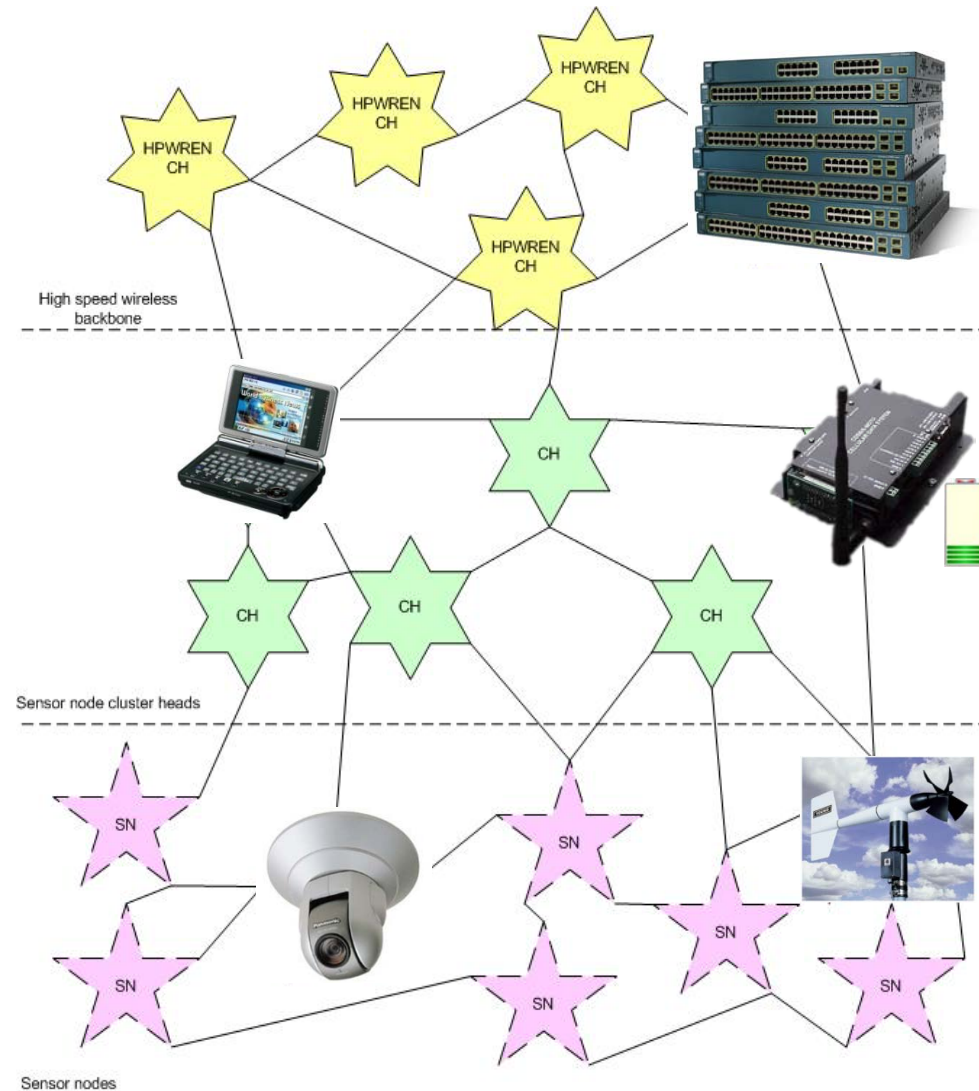
Acoustic sensors *- Wolf howls at the California Wolf Center*



Palomar
Observatory
~ 150 MBps



HPWREN - three tier network



Wireless MESH

- QoS routing
- Fast wireless connectivity

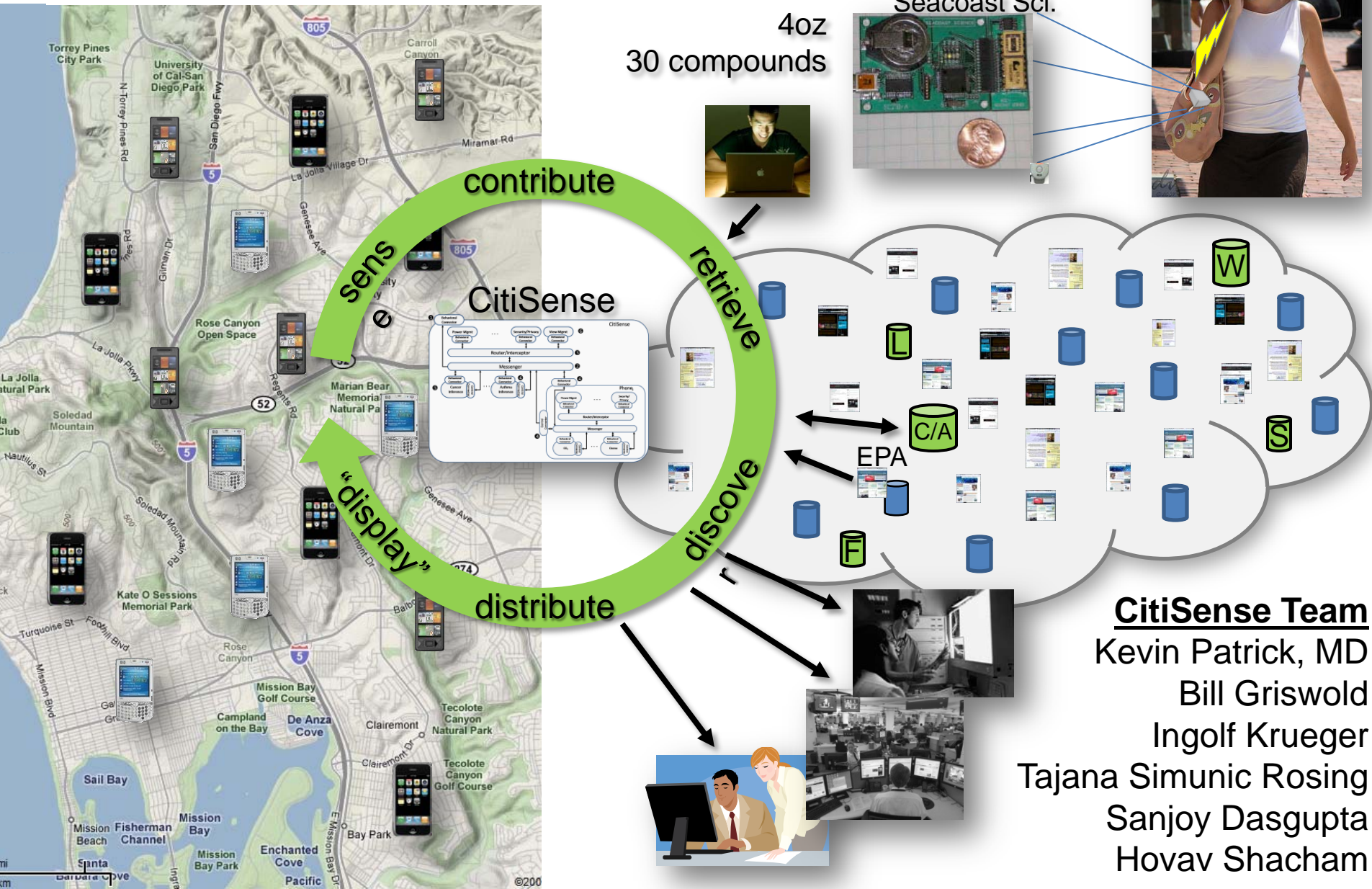
Sensor Node Cluster Heads

- Key issue:
 - Delivering good QoS
 - With long battery lifetime
- Our routing and scheduling algorithms consume 60% less power with 10% higher throughput

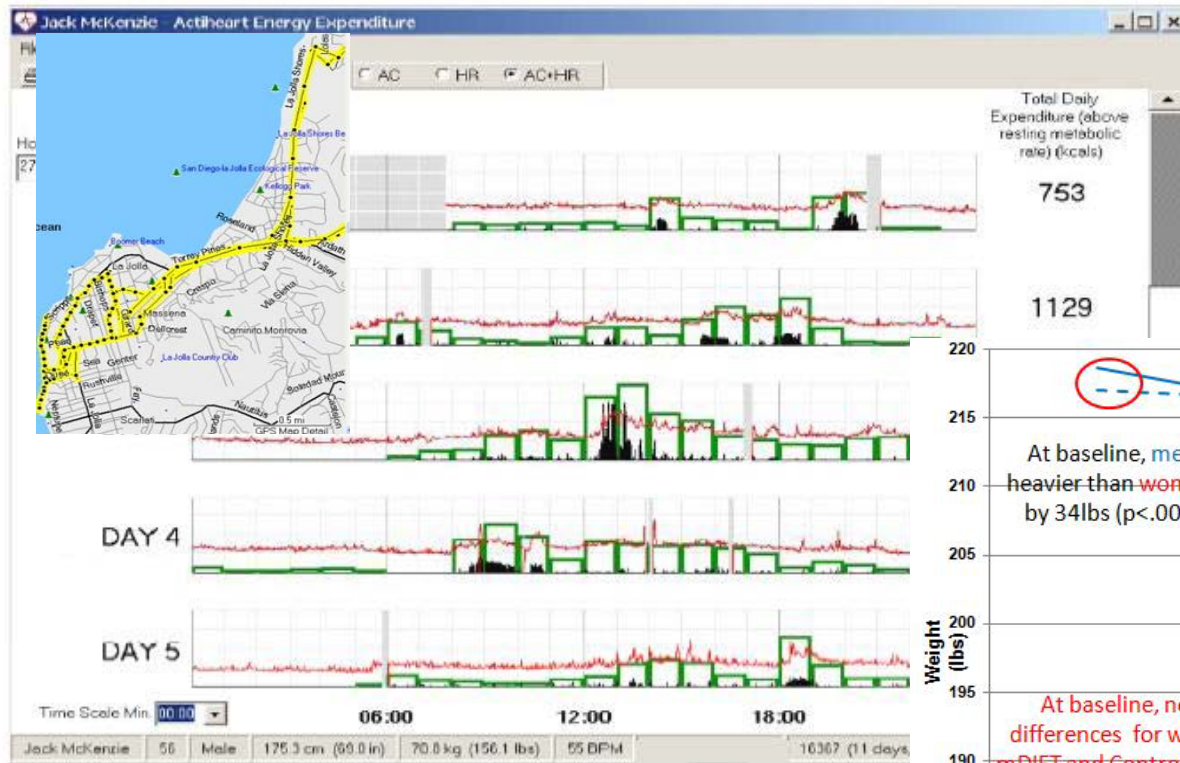
Sensor Network

- QoS: not considered in traditional sensor net research
- Battery lifetime

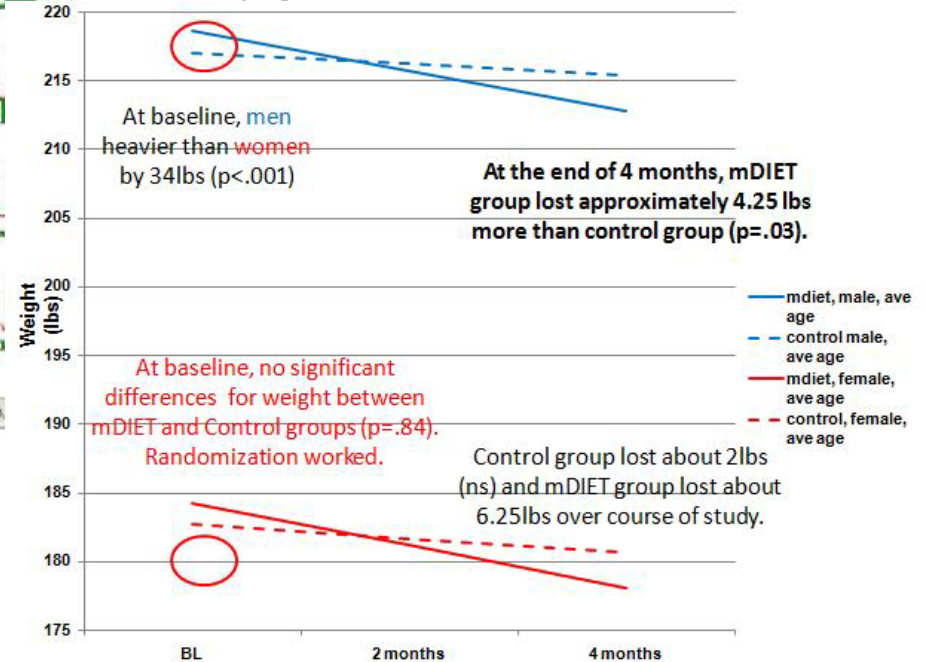
CitiSense - Radical Transparency



Clinical trial results



Real-time Energy
Expenditure Data [e/Balance]



Subject Study [mDiet]
Sample Size = 63



SANTECH

UCSD
School of Medicine



Energy Harvested Wireless Sensing Systems

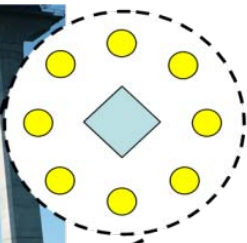
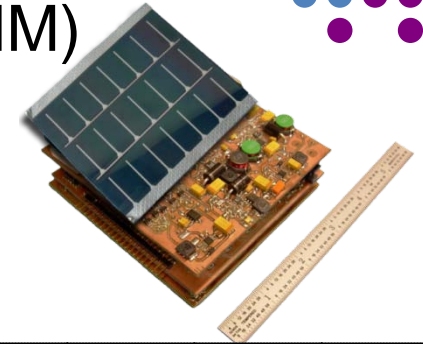


Active Sensing for Structural Health Monitoring

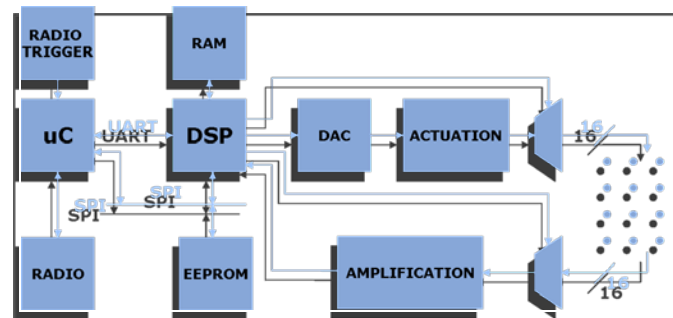
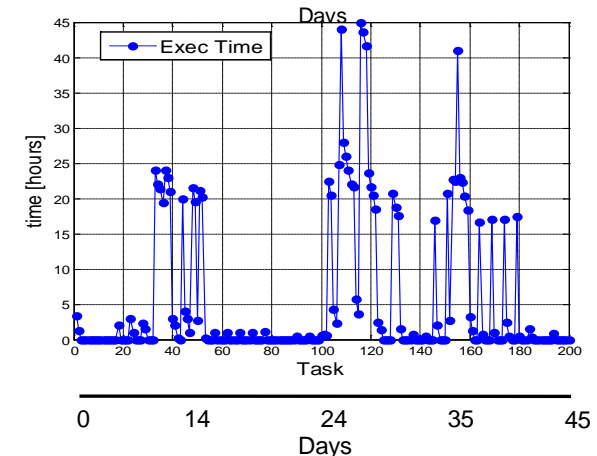
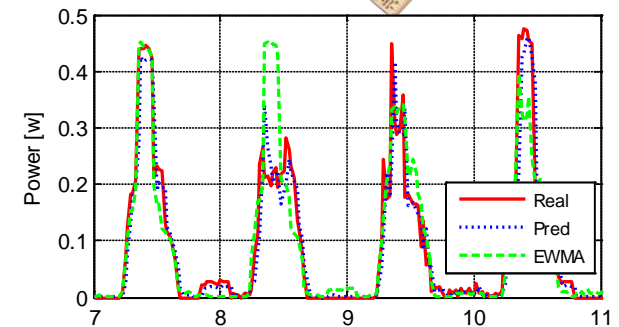
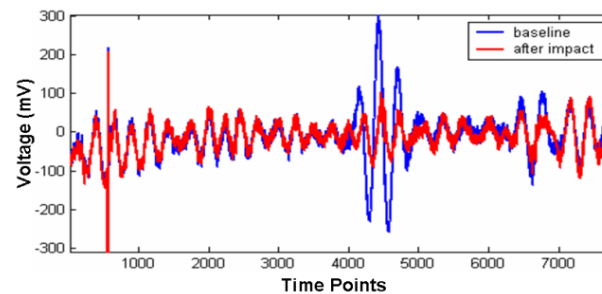


● Shimmer for Structural Health Monitoring (SHM)

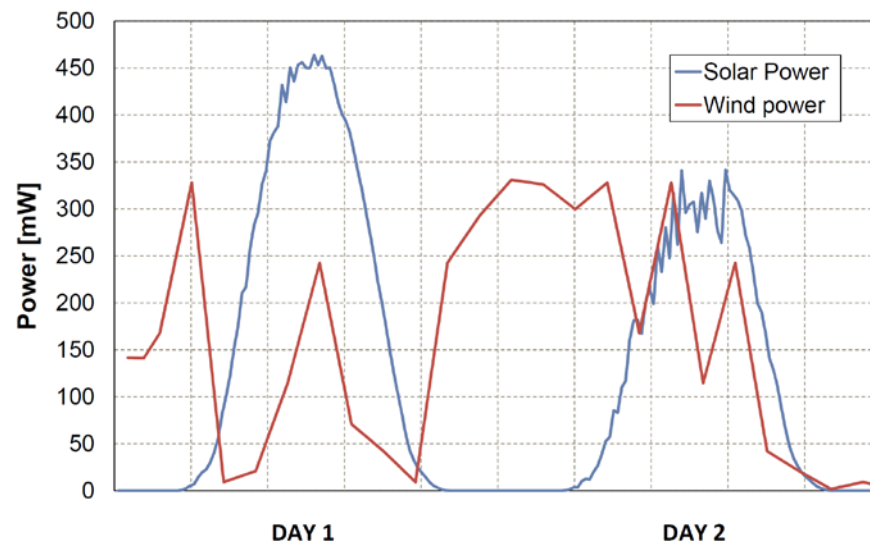
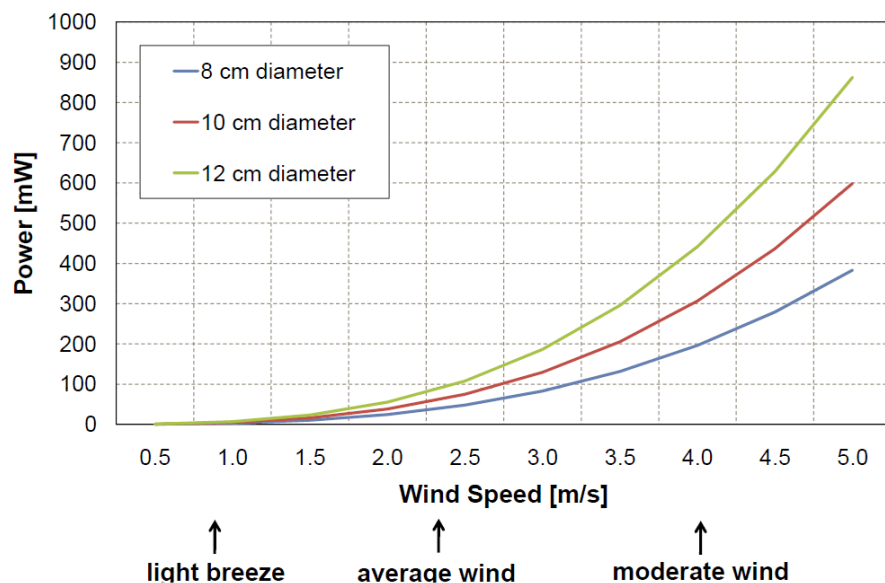
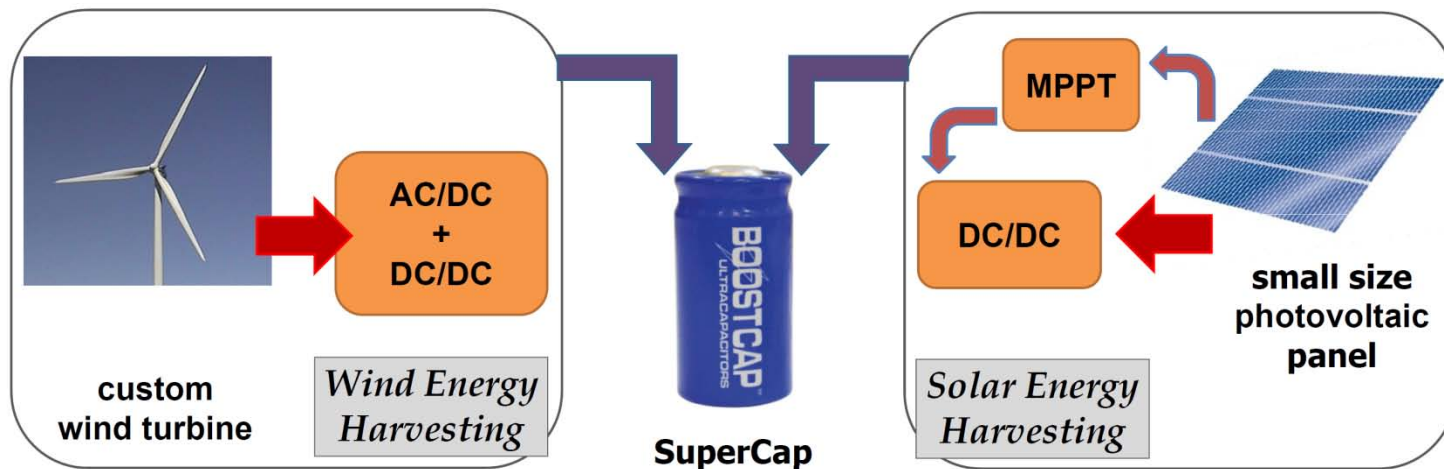
- Detection and localization of damage in structures
- Active sensing: 10ms at 10MSPS for 10k samples
- 600 MIPS computation; 3 sec to analyze one path



● PZTs
◆ Shimmer



Hybrid energy harvesting: wind and solar



Lots of interesting & collaborative work!



- **Ultra low power sensing systems**
 - Balance the need for energy harvesting with accuracy
 - Structural health monitoring, intelligent pipelines
- **Heterogeneous wireless networks**
 - Monitoring environment on a large scale
 - CitiSense: links environment with human health
- **Information infrastructure**
 - Online adaptation and control gives energy savings of up to 50%, and decrease in thermal hot spots of 60%
 - Energy efficient virtualization provides additional 15% savings even during high utilization processing



System Energy Efficiency Lab

seelab.ucsd.edu



CAP Business:
Anne O'Donnell
Director
Corporate Affiliates Program (CAP)



Triton Engineering Student Council

Dinner with the Deans

Wednesday, February 24, 2010 5:00pm – 6:30pm

New Location! Price Center West Ballroom

Agenda:

- Welcome
- Organization Presentations
- Table Discussions
- TESC report



Jacobs Graduate Student Council *Evening at Jacobs*

Information Technology focus

February 10th, 2010, 5:30-7pm

Computer Science Building, Room 1202

Agenda:

- Graduate Student Presentations
- Table Discussions
- Council report

Custom Applications at the Speed of Business

Kian Win Ong, Computer Science & Engineering
Advisors: Alin Deutsch, Yannis Papakonstantinou

Saliency for Video Processing Application

Natan Jacobson, Electrical & Computer Engineering
Advisor: Truong Q. Nguyen

Distributive UAV Deployment with Uncertain Information

Cameron Nowzari, Mechanical & Aerospace Engineering
Advisor: Jorge Cortes

Team Internship Program (TIP) Fest

January 28, 2010

- 120+ students filled the room
- Panel of past TIP interns sharing their experiences
- Energy and enthusiasm spread
- Students are ready to work for you!



Let's get started!

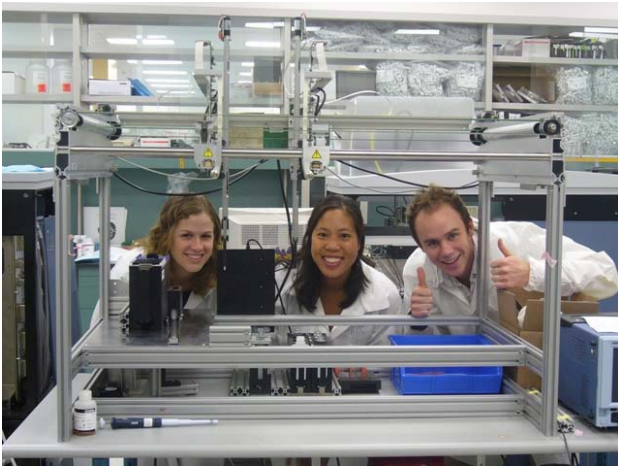
OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Budget; Devise project											
			Submit project description								
				Review resumes							
					Interview; Hire						
								Internship			

Summer 2010 TIP sponsors so far...



NOW ACCEPTING PROJECTS FOR SUMMER 2010!!

Michelle Vavra, TIP Manager
mvavra@ucsd.edu



Engineering Leadership Forum

Featuring Keynote Speaker: Rear Admiral Burroughs

Chief Engineer at SPAWAR &
Former Navy Submarine Commander

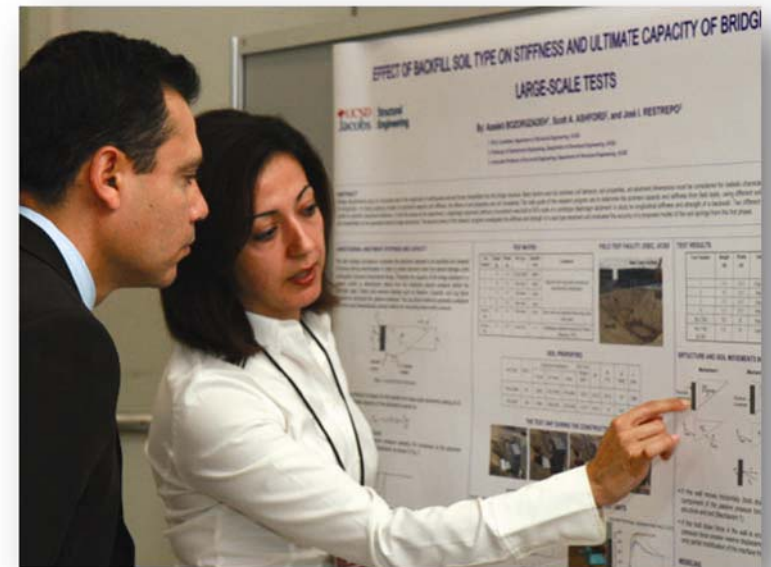
Wednesday April 7, 2010
4:00-6:00pm



www.gordoncenter.ucsd.edu

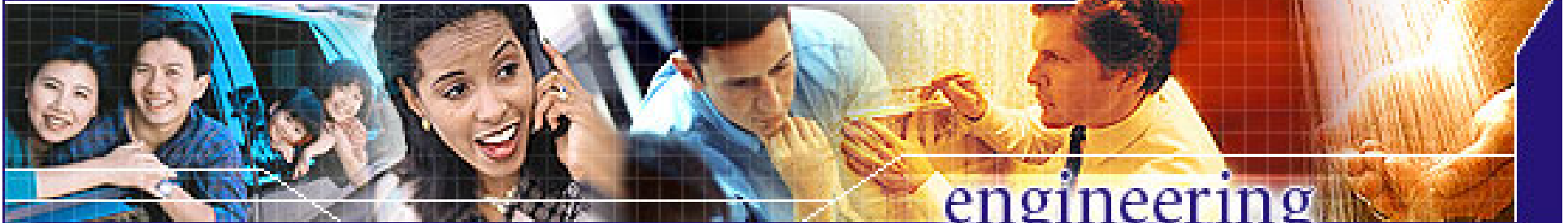
"best access to research underway at the Jacobs School"

- **240+ Graduate Level Research posters**
- **Engineering faculty presentations**
- **Keynote Speaker Dr. Larry Papay, NAE**
- **Connect with students, faculty and industry!**





NATIONAL ACADEMY OF ENGINEERING
OF THE NATIONAL ACADEMIES



engineering

AND THE QUALITY OF LIFE

*You're
Invited*

Interested CAP members are welcome to one seat

Regional National Academy of Engineering Dinner

Thursday, April 15, 2010

7:15pm – 8:30pm

Jacobs Hall



**Corporate
Affiliates Program**

connecting you to talent and technology...

CAP Business:

Dates to Remember in 2010:



Feb 10	Jacobs Graduate Student Council Evening with Jacobs <i>Focus on Information Technology</i>
Feb 16-19	E-Week
Feb 19	Disciplines in Engineering Career Fair (DECaF)
Feb 24	TESC Dinner with the Deans
Apr 7	Gordon Engineering Leadership Center <i>Engineering Leadership Forum</i>
Apr 15	Research Expo Regional National Academy of Engineering dinner
Jun 3	CAP Executive Board Meeting <i>in NEW Jacobs Hall</i>
Oct 7	CAP Executive Board Meeting