

Platform Lab Overview and Update

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PLATFORMLAB

Thank You, Sponsors!



Special Thanks To...

vmware[®]

Platform Lab Faculty



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Phil Levis



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Mendel Rosenblum



Keith Winstein

Platform Lab Overview

- **Platform: general-purpose substrate**
 - Software and/or hardware
 - Makes it easier to build applications or higher-level platforms
 - Solves significant problems
 - Usually introduces some restrictions
- **Recent examples**
 - HTTP + HTML + Javascript
 - GFS + MapReduce
 - Smart phones + GPS
 - OpenFlow

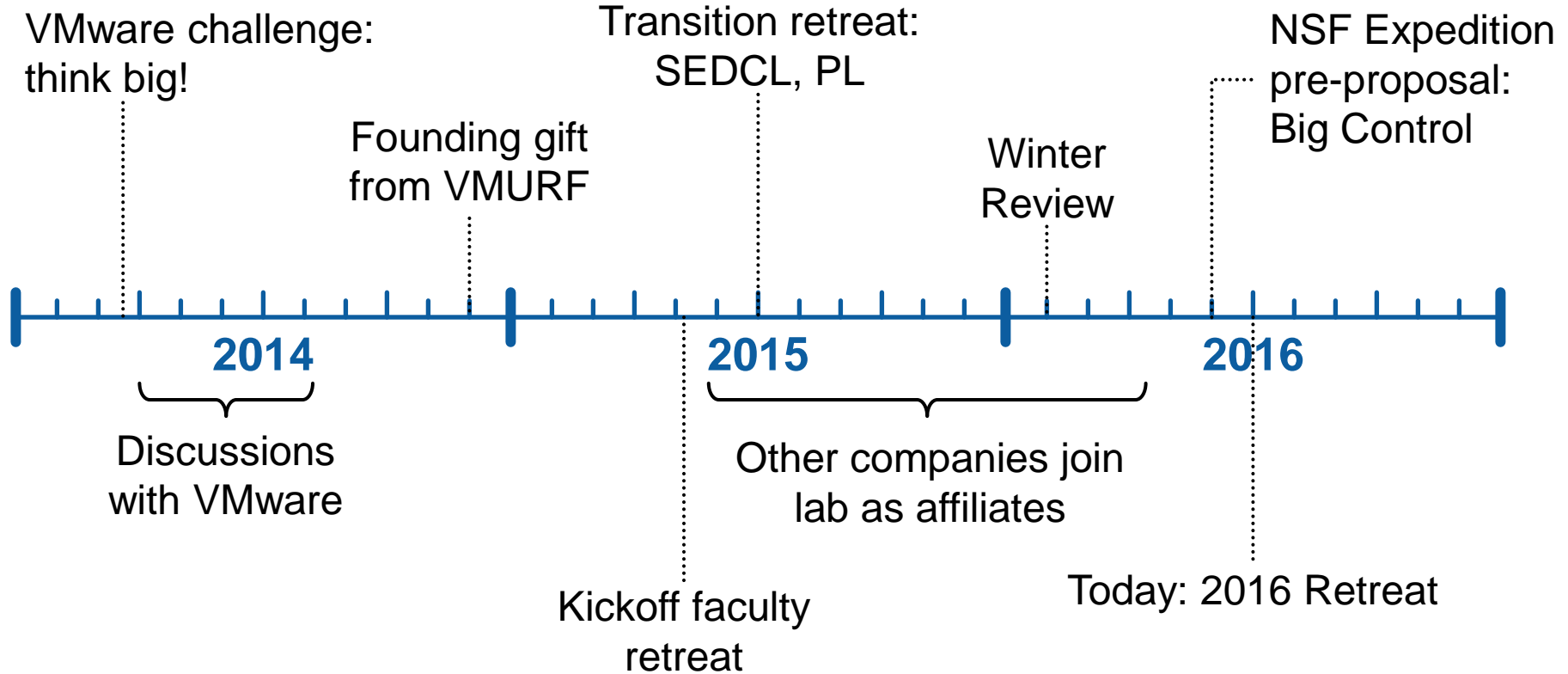
New platforms enable new applications

Platform Lab Mission

Create the next generation of platforms
Stimulate new classes of applications

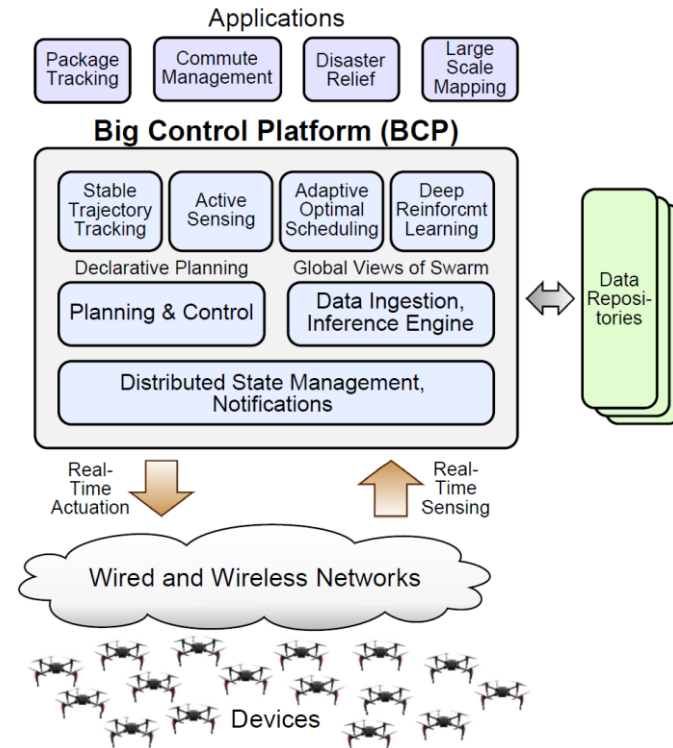
- **Variety of projects**
- **Mostly focused on computing at scale:**
 - Datacenters
 - Networks
- **One or two flagship projects**
 - Magnets for collaboration
- **Current flagship: Big Control**

Lab History



Flagship Project: Big Control

- Infrastructure for collaborative device swarms
- Many related research challenges:
 - Networking (wide area, datacenter)
 - Low-latency datacenter technologies
 - State management, notifications
 - Data ingestion, inference
 - Declarative planning
 - Security
 - Applications
- Submitted NSF Expedition proposal
 - Includes other faculty in CS, EE, Aero/Astro
- Next talk will discuss in detail



Major Research Thrusts

- **Programmable fabrics (Cisco, Google, Facebook, VMware)**
 - Pisces: P4 front-end for OVS scheduling (Choi)
 - PIFO: new abstraction for packet scheduling
- **Low-latency datacenter (Facebook)**
 - Homa network protocol for RPCs (Montazeri)
 - Core-aware thread scheduling (Qin)
 - IX operating system (Belay)
 - Indexes and transactions in RAMCloud (Kejriwal, Lee, Park, Yang)
 - Cliffhanger: better memcached memory allocation (Cidon, Eisenman)
- **Scalable control planes (VMware)**
 - Discussion group (Stanford, VMware, ONLab)

Major Research Thrusts, cont'd

- **Resource-efficient datacenters**
 - ML and dynamic control in cluster management (Delimitrou)
 - Starling HPC scheduler (Qu, Mashayekhi, Terei)
 - IX operating system (Belay)
 - Flash disaggregation (Klimovic, Litz)
 - XFabric: bandwidth allocation in datacenters (Nagaraj, Bharadia)
- **Hardware support for deep neural networks**
 - Pruning, compression, acceleration (Han, Liu)
- **In-memory graph processing systems**
 - Grazelle (Grossman)
 - TorcDb (Ellithorpe)

Major Research Thrusts, cont'd

- **Application-transport codesign for better networking performance (Facebook):**
 - DrCloud: cluster job planner (Terei, Mashtizadeh, Qu)
 - ExCamera: massively distributed video encoder (Fouladi, Wahby)
 - Koho: utility-maximizing transport for the developing world (Hill, Yan)

Recent/Soon-To-Be Graduates

Adam Belay	OSes for low latency and high throughput	MIT
Dinesh Bharadia	Full-duplex radios	Postdoc
Christina Delimitrou	Resource-efficient datacenter management	Cornell
Subhasis Das	Cache (re)placement policies	Zoox
Kiran Joshi	Sensing using wireless signals	startup
Ankita Kejriwal	Secondary indexes for RAMCloud	
Rakesh Misra	Low latency control for wireless networks	startup
Milad Mohadammi	Energy-efficient out-of-order execution	Apple
Nic McDonald	Service-oriented NIC architectures	
Yiannis Yiakoumis	User-defined networks	

Retreat Agenda Highlights

- **Numerous technical talks**
- **Breakout discussions:**
 - Applications for Big Control (today)
 - Technologies for Big Control (tomorrow)
- **Lightning talks and poster session (today)**
- **Long break for recreation/discussion (tomorrow)**
- **Industrial feedback (tomorrow)**

Conclusion

- **Momentum continues to build**
- **Expect new projects to start over the next year**
 - More aligned with Big Control
 - Initial projects likely to be exploratory, possibly throw-away
- **Looking for opportunities to collaborate on Big Control**

Questions / Discussion



Groups for Breakout #1

Group #1

Stephen Choi
E. Cidon
B. Dally
C. Delimitrou
S. Park
G. Parulkar
H. Qu
S. Rao
I. Tarazi
B. Welch

Group #2

W-P. Chen
Sean Choi
R. Clewett
S. Katti
H. Litz
M. Rosenblum
J. Speiser
Y. Turakhia
K. Voruganti
Y. Wang

Group #3

M. Aguilera
J. Ellithorpe
S. Grossman
S. Han
T. Ikeuchi
P. Levis
S. Matsushita
H. Qin
A. Takacs
K. Winstein

Group #4

P. Bailis
M. Bansal
A. Kejriwal
J. Kempf
N. McKeown
M. Morimoto
P. Palacharla
C. Ramming
S. Yang

Group #5

T. Herbert
K. Malladi
C. Lee
J. Ousterhout
O. Mashayekhi
B. Prabhakar
A. Schulman
R. Sriram
P. Subrahmanyam

Groups for Breakout #2

Group #1

M. Aguilera
P. Bailis
W-P. Chen
Stephen Choi
P. Levis
K. Malladi
M. Morimoto
G. Parulkar
A. Schulman
J. Speiser

Group #2

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P. Palacharla
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