Thank You, Sponsors!
Platform Lab Faculty

Bill Dally
Architecture

Sachin Katti
Networking

Christos Kozyrakis
Architecture, System Software

Phil Levis
Embedded Systems

Nick McKeown
Networking

John Ousterhout
Granular Computing (Fac. Director)

Guru Parulkar
Networking (Exec. Director)

Balaji Prabhakar
Networking

Mendel Rosenblum
Distributed Systems, Networking

Keith Winston
Networking, Granular Apps

Matei Zaharia
Big Data, Cloud Computing
Lab mission:

define new hardware/software platforms

that enable exciting new classes of applications
State of the Lab

- 14 affiliate companies
- 11 faculty in EE and CS
- Dozens of research projects
Theme #1: Self-Programming Networks

- Rethinking networking to raise the level of programming
- Desired network behavior described in high-level, declarative fashion
- Low-level control actions determined automatically using
  - Desired behaviors
  - Measurements of current usage
- Example Platform Lab projects:
  - Applying machine learning to network control
  - Rethinking the management and usage of clocks
  - Using smart NICs
Theme #2: Granular Computing

- Building large-scale datacenter applications out of large numbers of very short-lived tasks

- Why?
  - Analyze large datasets in real time
  - Manage robot swarms operating at millisecond timescale

- Example Platform Lab projects
  - Infrastructure and applications for today’s serverless computing platforms (e.g. AWS Lambda: 100 ms granularity tasks)
  - Low-latency communication and dispatching
  - Millisort: sorting at scale in 1 ms
Theme #3: Machine Learning

- Using machine learning to build better systems:
  - Self-programming networks
  - Improved video streaming
  - Machine learning for robotic control

- Systems to enable better machine learning:
  - New hardware and software approaches to accelerate machine learning
  - Distributed inference
How We Work

- All work is open, freely accessible
- Goal: results not just interesting, but actually useful
- We love industrial collaboration
  - Interested in your ideas and feedback
  - Looking for opportunities to transfer technology
News

- Fintech symposia (Prabhakar, Rosenblum)
- O-RAN Alliance (www.o-ran.org): global consortium creating software defined architecture for mobile radio networks (Katti)
- New projects:
  - Inference as a service (Kozyrakis)
  - Machine learning for the Internet (Levis, Winstein)
Awards

- Inaugural ACM Thacker Award: Rosenblum
- Sloan Fellowship: Winstein
- SIGCOMM “Test of Time” Award: Katti et al. (XORs in the air)
- Caltech Distinguished Alumni Award: Dally
- SIGCOMM SOSR Software Systems Award: McKeown et al. (NetFPGA)

Best Paper Awards:

- Pantheon: Yan, Levis, Winstein (USENIX ATC)
- Darwin: Turakhia, Dally, Bejerano (ASPLOS)
<table>
<thead>
<tr>
<th>Name</th>
<th>Affiliation</th>
<th>Project/Research Area</th>
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<tbody>
<tr>
<td>Grant Ayers (CK)</td>
<td>CK</td>
<td>Optimizing Processor Architectures for Warehouse-Scale Computers</td>
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<td>Assaf Eisenman (SK)</td>
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<td>Reducing DRAM Footprint to Scale Data Store Systems</td>
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<td>Lavanya Jose (NM)</td>
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<td>Proactive Congestion Control</td>
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<td>Ana Klimovic (CK)</td>
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<td>Fast, Elastic Storage for the Cloud</td>
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<td>Manikanta Kotaru (SK)</td>
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<td>Harnessing Nature to Make Wireless Positioning</td>
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<td>Behnam Montazeri (JO)</td>
<td>JO</td>
<td>Designing Datacenter Transports for Low Latency and High Throughput</td>
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<td>Henry Qin (JO)</td>
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<td>Arachne: Improving Latency and Utilization through Core Aware Thread Management</td>
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<td>Hang Qu (PL)</td>
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<td>High Performance Cloud Computing</td>
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<td>Chinmayee Shah (PL)</td>
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<td>Automatically Distributing and Load Balancing Graphical Fluid Simulations</td>
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<td>Yatish Turakhia (WD)</td>
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<td>Hardware Acceleration of Genomic Sequence Alignment and Applications</td>
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<td>Feiran Wang (BP)</td>
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<td>Building High-Performance Distributed Systems with Synchronized Clocks</td>
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<td>Lisa Yan (NM)</td>
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<td>Tools to Help Teach Large Classes</td>
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# Thursday Agenda

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Presenter(s)</th>
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<tr>
<td>1:00</td>
<td>Welcome, Introductions, Platform Lab Overview</td>
<td>John Ousterhout</td>
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<tr>
<td>1:30</td>
<td>Distributed Inference and Learning</td>
<td>Sandeep Chinchali</td>
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<td>2:00</td>
<td>INFaaS: Managed and Model-Less Inference Serving</td>
<td>Franky Romero, Qian Li, Neeraja Yadwadkar</td>
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<td>2:30</td>
<td>Smart Harvesting of Spare CPU Cores in Cloud Servers</td>
<td>Yawen Wang</td>
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<td>3:00</td>
<td>Break</td>
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<td>3:30</td>
<td>OREO: Serverless Computing with Perf. Guarantees</td>
<td>Neeraja Yadwadkar</td>
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<td>4:00</td>
<td>Continual Learning Improves Video Streaming</td>
<td>Keith Winstein</td>
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<td>4:30</td>
<td>Millisort: An Experiment in Flash Bursts</td>
<td>Yilong Li</td>
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<td>5:00</td>
<td>Lightning talks for posters</td>
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<td>5:30</td>
<td>Reception/posters</td>
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<td>7:00</td>
<td>Dinner</td>
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<td>8:30</td>
<td>Evening activities</td>
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Friday Agenda

9:00  The World Needs a New NIC (and it needs to run Homa)  John Ousterhout
9:30  Enabling Affordable Precision Agriculture by Sensing Soil Moisture Wirelessly  Colleen Josephson
10:00 Power Clocks: Dynamic Multi-Clock Management for Embedded Systems  Holly Chiang
10:40 Recreation and Informal Conversations
12:00 Lunch
12:00 SDN and Programmable Forwarding  Nick McKeown
1:30  Self-Programming Networks: from Sensing to Control  Balaji Prabhakar
2:00  Using NICs and ECC to Improve Packet Transport  Shiyu Liu
2:30  CRaft: Using Accurate Clocks to Build Multi-Leader Version of Raft  Feiran Wang
3:00  Break
4:00  Industrial Feedback
Questions/Discussion