SEDCL/Platform Lab Retreat

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Transition

- More faculty
- More students
- Existing projects will carry over
- Broader research agenda
New platforms enable new applications

Platforms

Large Systems  Collaboration
What is a Platform?

- **General-purpose substrate**
  - Makes it easier to build applications or higher-level platforms
  - Solves significant problems
  - Usually introduces some restrictions

- **Software and/or hardware**

- **Example: Map/Reduce computational model**
  - Simplifies construction of applications that use hundreds of servers to compute on large datasets
  - Hides communication latency: data transferred in large blocks
  - Automatically handles failures & slow servers
  - Restrictions: 2 levels of computation, sequential data access
New Platforms Enable New Applications

● 1980’s:
  ▪ Platform: relational database
  ▪ Applications: enterprise applications

● 1990’s:
  ▪ Platform: HTTP + HTML + JavaScript
  ▪ Applications: online commerce

● 2000’s:
  ▪ Platform: GFS + MapReduce
  ▪ Applications: large-scale analytics

● 2010’s:
  ▪ Platform: smart phones + GPS
  ▪ Applications: Uber and many others
“Seed Platforms” for the Platform Lab

- **Software-defined networking:**
  - Separates network control and data planes
  - Makes it easier to build novel control/management applications

- **RAMCloud:**
  - High-speed key-value store for datacenters
  - All data in DRAM for low-latency access
  - Makes it easier to build applications using DRAM-based storage
Most universities can’t do large systems projects:
- Fragmented funding model
- Promotions determined by paper counts, not impact
- Result: short-term outlook

Why universities should do large systems projects:
- Companies don’t have time to evaluate, find best approach
- Universities can lead the market
- Produce better graduates

Goal for Platform Lab:
- Create environment where large systems projects flourish
Collaboration

- **Forces against collaboration:**
  - Faculty overcommitment
  - Diversity of interests
  - Physical space

- **Best way to generate collaboration:**
  - Shared research goals
  - Large projects require collaboration

- **Other ways to stimulate collaboration**
  - Events: seminars, reading groups, group lunches, etc.
  - Physical space
Collaboration, cont’d

- Can physical space help?
- Planning major renovation of Gates 3A:
  - Nothing but glass from window to window
  - Sight lines between researchers
  - Open space for casual conversation
Faculty Retreat, April 3-4

- **Attendees**
  - Platform Lab faculty (9)
  - Non-lab faculty
    - Mark Horowitz
    - Chris Re
  - Friends from industry:
    - Keith Adams (Facebook)
    - Mahesh Balakrishnan (VMware)
    - Jeff Dean (Google)

- **Goals**
  - Brainstorm possible research topics
  - Discuss lab organization: how to maximize collaboration
Fundamental Challenges

- Achieve physical limits
- Heterogeneity and specialization
  - General-purpose systems fundamentally inefficient
- Scalability and elasticity
- Raise the floor for developer productivity
Research Areas to Explore

- Programmable network fabrics
  (Katti, Levis, McKeown, Ousterhout, Parulkar)

- Low-latency datacenter
  (Dally, Katti, Kozyrakis, Levis, Ousterhout)

- Infrastructure for scalable control planes
  (Katti, Ousterhout, Parulkar)

- New memory/storage systems for the 21st Century
  (Dally, Kozyrakis, Levis)
Agenda for this Retreat

- Future-looking faculty talks
- Break-out sessions for discussing research topics
- Student talks
- Long break for outdoor activities, informal discussions
- Last session: industrial feedback
Transition Details for Affiliates

- Lab structure similar to SEDCL
- Existing SEDCL agreements carry over
- All results released open-source
- Two levels of affiliate membership
  - Base level similar to SEDCL Associate
  - New premium level for companies interested in higher level of engagement
Thanks to our Affiliate Sponsors!

- Facebook
- Google
- NEC
- Huawei
- Samsung
- NetApp
- VMware
Extra Slides
Palette
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