

# 2016 Winter Review: Lab Overview and Update

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**Faculty Director**



PLATFORMLAB

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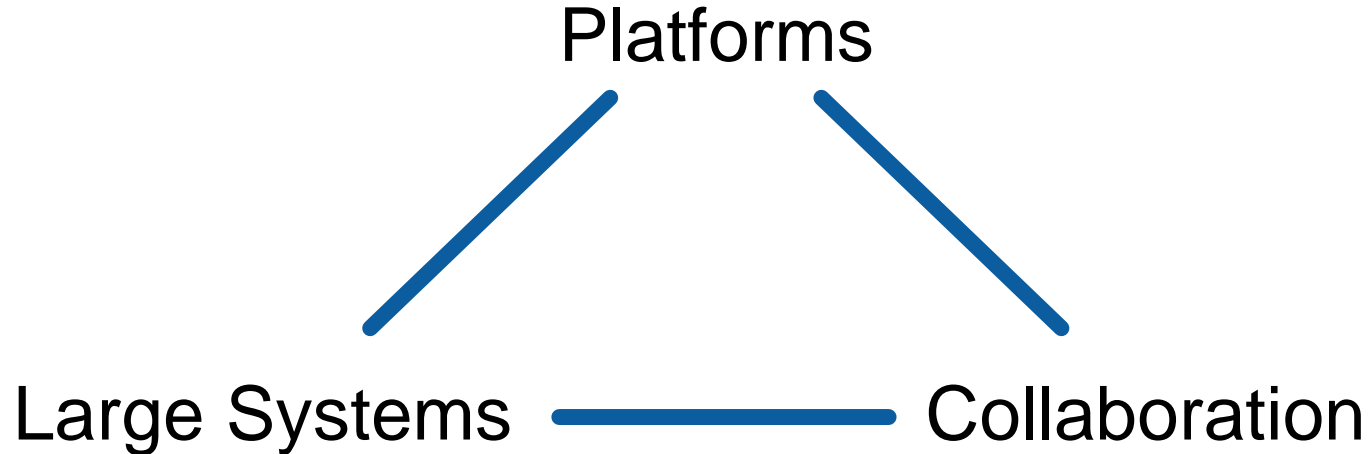
# Platform Lab Motivation

## New platforms enable new applications

- **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
- **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
  - Masks failures & slow servers
  - Restrictions: 2 levels of computation, sequential data access

# Platform Lab Mission

Create the next generation of platforms  
to stimulate new classes of applications



# Platform Lab Faculty



Bill Dally



Sachin Katti



Christos Kozyrakis



Phil Levis



Nick McKeown



John Ousterhout  
Faculty Director



Guru Parulkar  
Executive Director



Mendel Rosenblum



Keith Winstein

# Drivers For New Platforms

## Goals:



## Techniques:

### Scalability and elasticity

- Build large systems out of many small, cheap components
- Vary scale by adding/removing components
- Challenges:
  - Fault tolerance
  - Scale-independent architectures

### Specialization and heterogeneity

- Special-purpose components much more efficient than general-purpose
- Build future systems out of heterogeneous collections?
- Challenges:
  - High design cost of components
  - Integration

# Lab Progress

- **Identify an over-arching goal:**  
**Swarm Control Infrastructure**
- **Initiate a few flagship projects:**
  - Scalable control planes
  - ??
  - ??
- **Create a more collaborative environment**
  - Weekly Platform Lab Seminar
  - Connect with application experts



# Opportunity: New Datacenter Clusters

Increasing Core Density

Specialized Components



Low Latency Interconnects

Large Nonvolatile Memories

# Opportunity: Swarms of Devices



Cell Phones



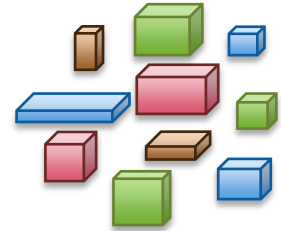
Switches/Routers  
(SDN)



Self-Driving  
Cars



Drones

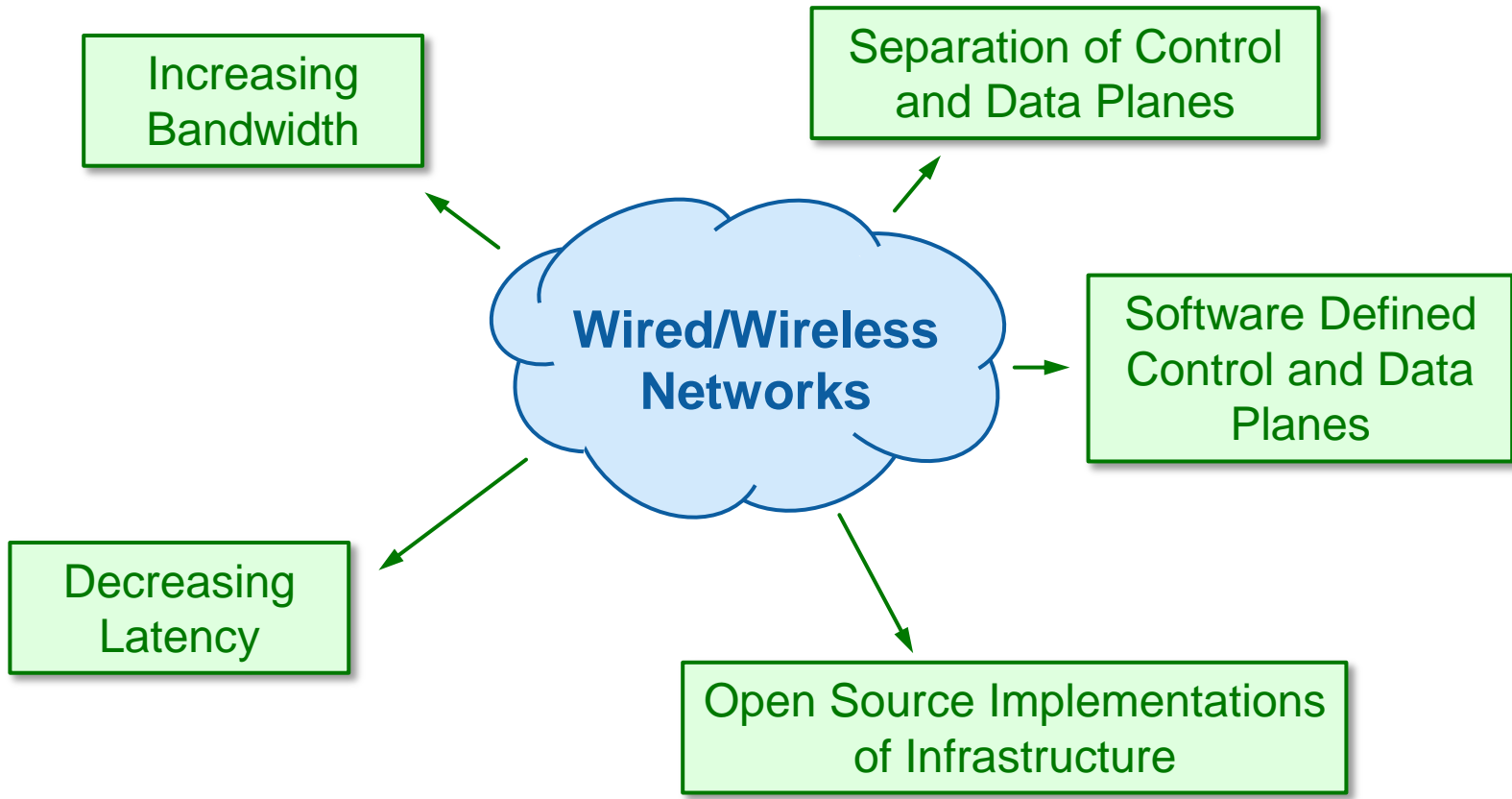


Internet  
of Things

## Game Changers:

- More and larger swarms
- Increasing collaboration (more centralized management)

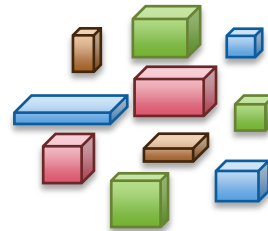
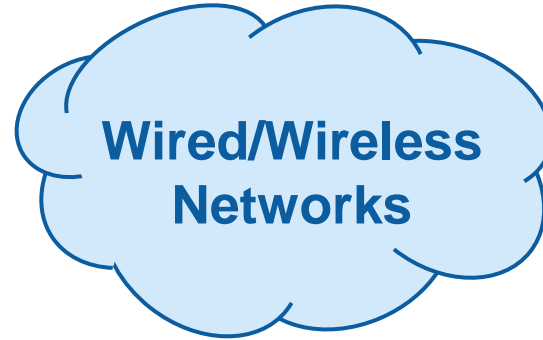
# Opportunity: Changing Interconnects



# Uber-Goal: Swarm Control Infrastructure

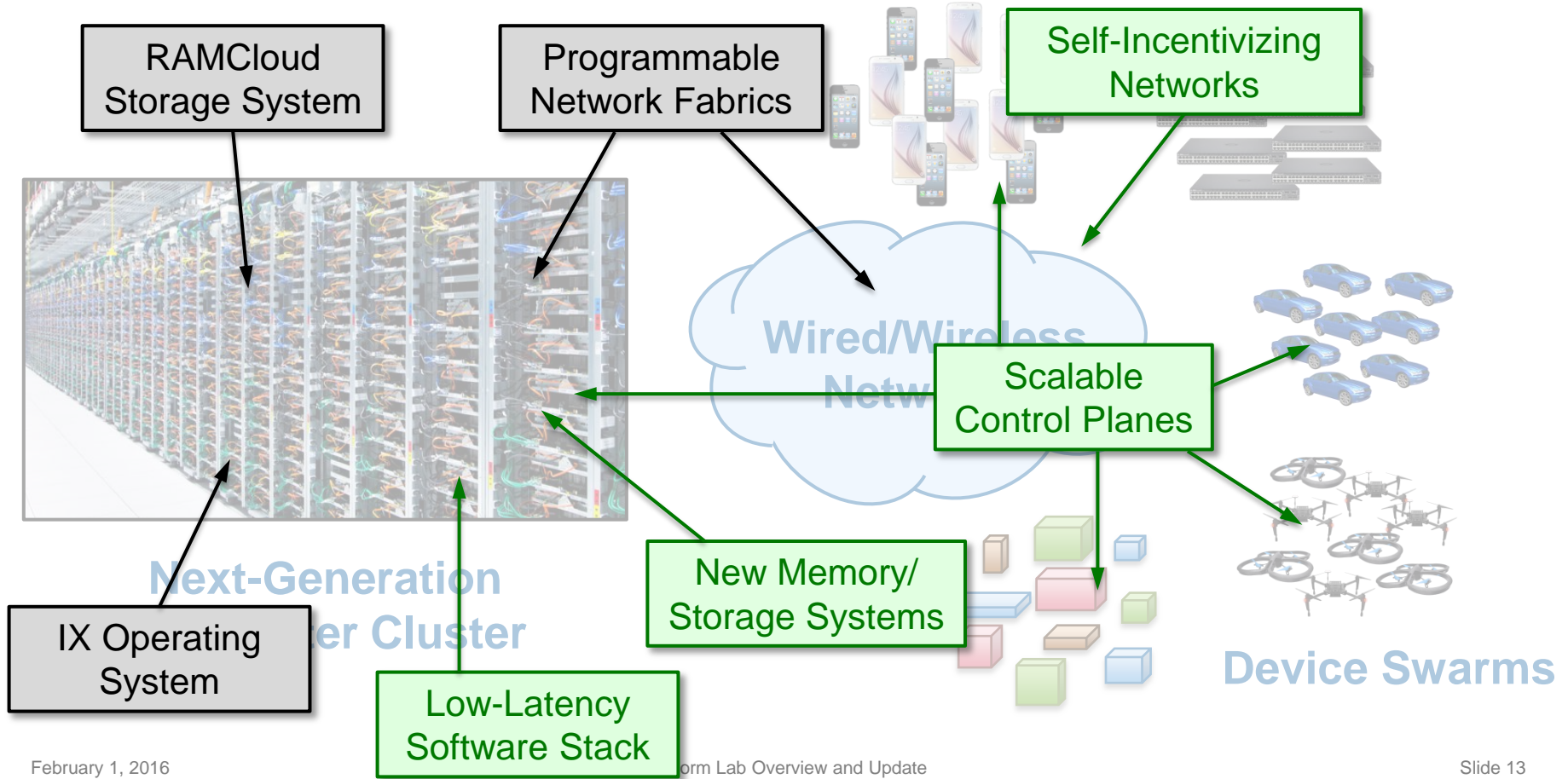


**Next-Generation  
Datacenter Cluster**



**Device Swarms**

# Research Projects



# Lab Progress

- **Identify an over-arching goal:**  
**Swarm Control Infrastructure**
- **Initiate a few flagship projects:**
  - Scalable control planes
  - ??
  - ??
- **Create a more collaborative environment**
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# Other News

- **PhD students interviewing this year:**
  - Adam Belay: IX operating system
  - Ankita Kejriwal: secondary indexes in RAMCloud
  - Yiannis Yiakoumis
- **We even have a logo!**



# Conclusion

- **Momentum is building:**
  - People
  - Ideas
  - Projects
  - Collaborations
- **Next steps:**
  - Define additional flagship project(s)
  - Learn more about applications
  - Continue to develop collaborations



# Questions / Discussion

