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# PlanetLab: a Petri dish for the next Internet

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# What is PlanetLab?

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- An open, shared testbed for
  - Developing
  - Deploying
  - Accessing
  - planetary-scale services.

What would you do if you had Akamai's infrastructure?

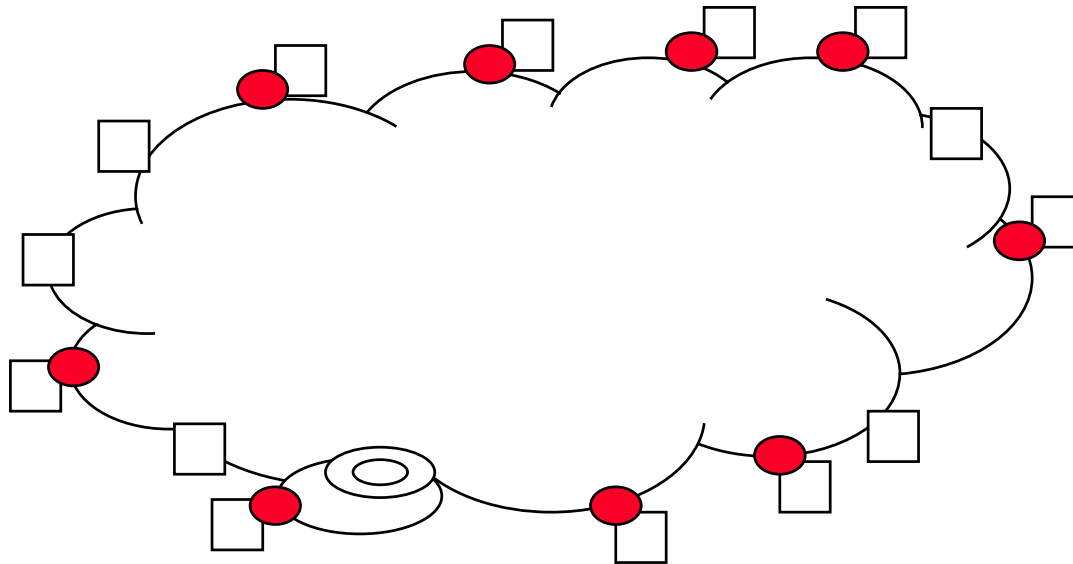
# Motivation

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- New class of applications emerging that spread over sizable fraction of the web
- Architectural components starting to emerge
- The next Internet will be created as an overlay on the current one
- It will be defined by services, not transport
- There is NO vehicle to try out the next  $n$  great ideas in this area

# Guidelines (1)

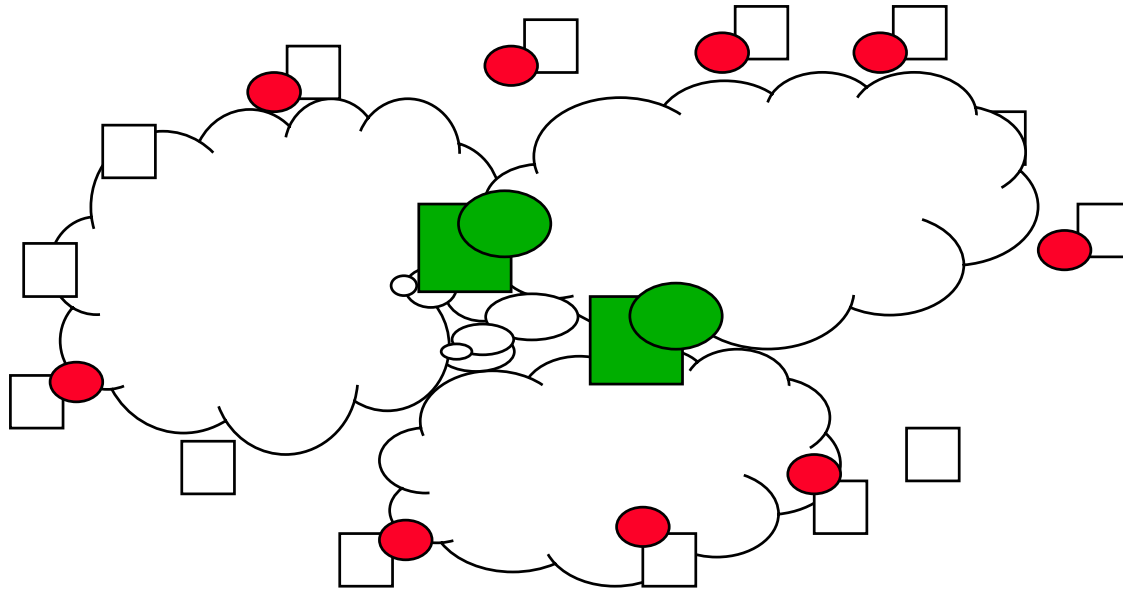
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- Thousand viewpoints on “the cloud” is what matters
  - not the thousand servers
  - not the routers, per se
  - not the pipes

# Guidelines (2)

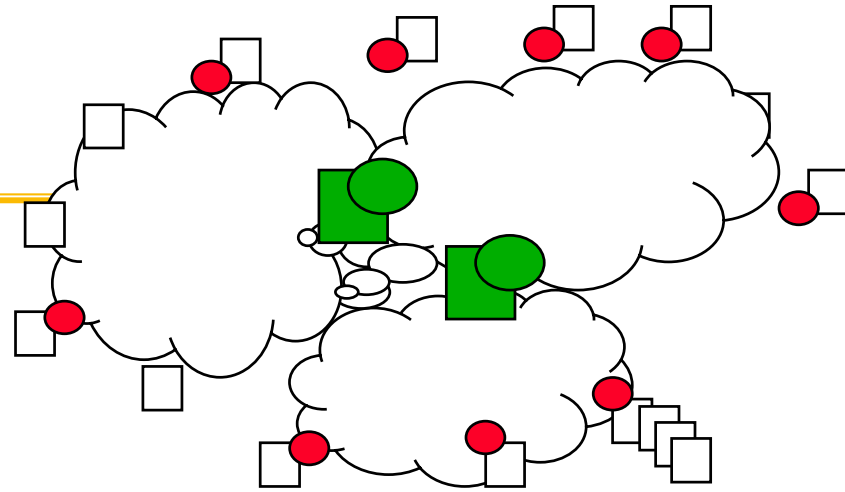
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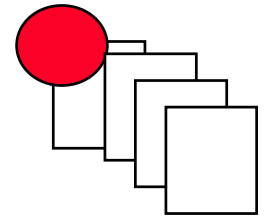
- and you must have the vantage points of the crossroads
  - co-location centers, peering points, etc.

# Guidelines (3)

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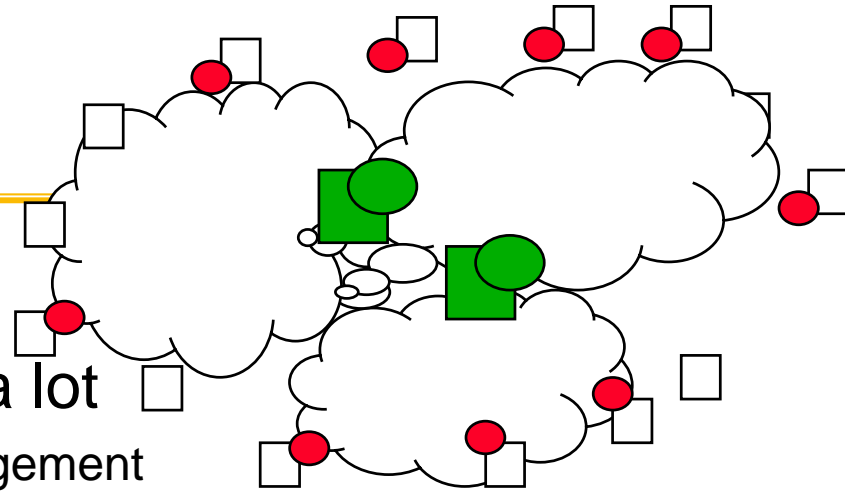


- Each service needs an overlay covering many points
  - logically isolated
- Many concurrent services and applications
  - must be able to slice nodes => VM per service
  - service has a slice across large subset
- Must be able to run each service / app over long period to build meaningful workload
  - traffic capture/generator must be part of facility
- Consensus on “a node” more important than “which node”



# Guidelines (4)

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- Test-lab as a whole must be up a lot
  - global remote administration and management
  - redundancy within
- Each service will require own management capability
- Testlab nodes cannot “bring down” their site
  - not on forwarding path
- Relationship to firewalls and proxies is key

# Guidelines (5)

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- Storage has to be a part of it
  - edge nodes have significant capacity
- Needs a basic well-managed capability
  - Initial ‘core’ of ~100 stable, supported sites.
  - May grow to less managed contributors in time



# Initial core team:

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## Intel Research:

David Culler

Timothy Roscoe

Brent Chun

Mic Bowman

See website for all  
the rest...

## Princeton:

Larry Peterson

Mike Wawrzoniak

## University of Washington:

Tom Anderson

Steven Gribble

# Some signed-up Planet-Lab Sites



June 18, 2003

PlanetLab

# Implementers and Users

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- PlanetLab community seems to divide into two groups at this stage:
  - Folks who want to build this
  - Folks who want to use this
- Both have diverse and promising research agendas

# Implementation Research Issues

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- Sliceability: distributed virtualization
- Isolation and resource control
- Security and integrity: exposed machines
- Management of a very large, widely dispersed system
- Instrumentation and measurement
- Building blocks and primitives

# Confluence of Technologies

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- Cluster-based management
  - Overlay and P2P networks
  - Virtual machines and sandboxing
  - Service composition frameworks
  - Internet measurement
  - Packet processors
  - Colo services
  - Web services
- ⇒ ***The time is now.***

# Emerging applications

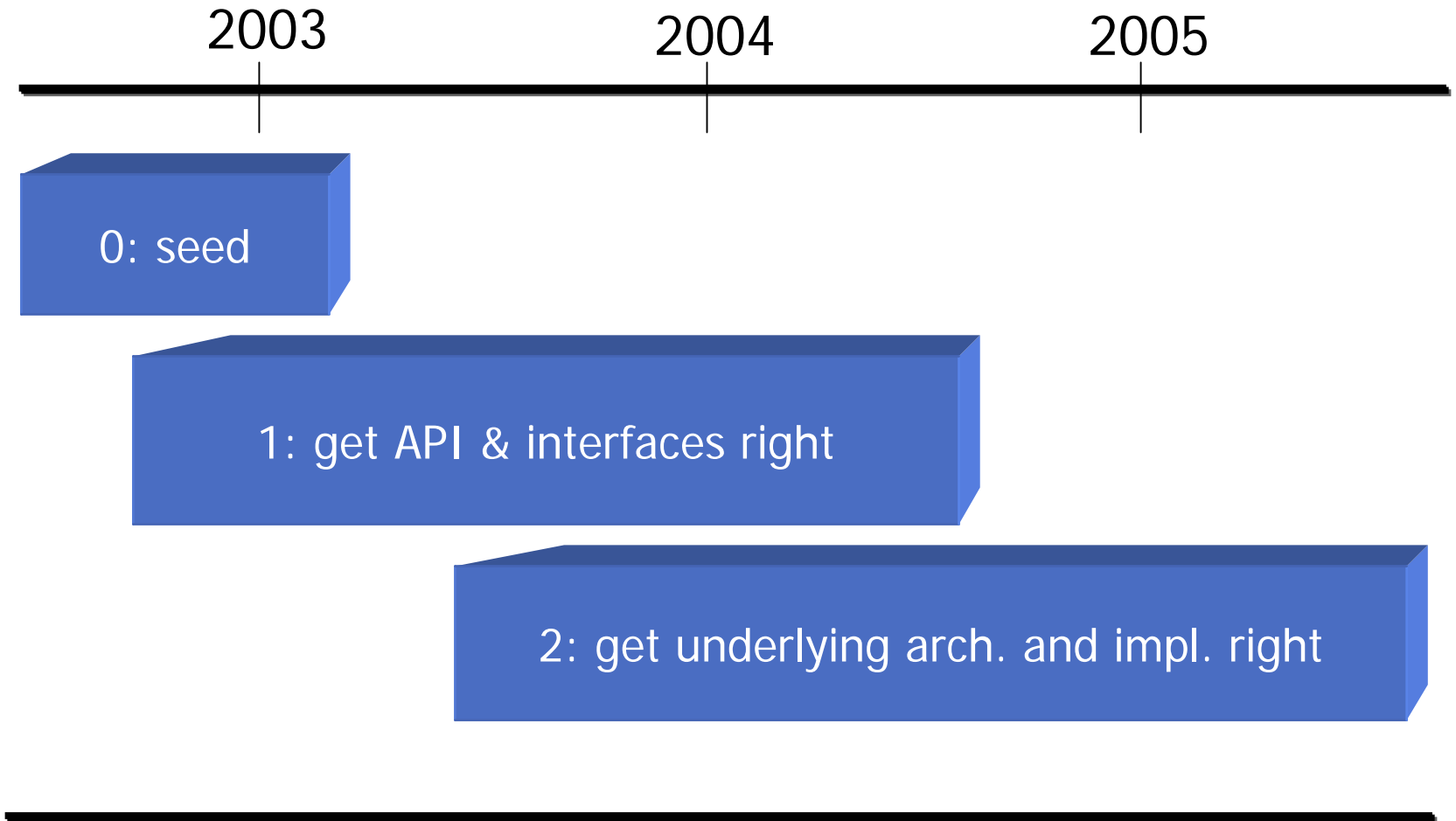
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- Content distribution
- Peer-to-Peer networks
- Global storage
- Mobility services
- Etc. etc.

*Vibrant research community  
embarking on new direction and  
none can try out their ideas.*

# Overlapping Phases of Development

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# Development trajectory

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- Node operating system
  - Start with Linux
  - Add isolation and resource management
  - Controlled access to raw sockets
  - Create new “thin” VMM API
  - Eventually, invert the APIs
- Distributed components
  - Will run in slices on the platform
  - Community will be enlisted to contribute



# The Plan

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- Intel Research is seeding the effort
- Success: adoption and growth of the research community and creation of novel network services
- Bring in NSF, Darpa, industry partners
- Create a non-profit or consortium to manage PlanetLab by late 2004
  - PlanetLab takes on a life of its own
  - Services define the next Internet
  - Organization manages the central core

# What PlanetLab will enable:

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- Open infrastructure for next generation of wide-area (“planetary-scale”) services
- Foundation on which the next Internet can emerge
  - Think beyond TCP/IP/BGP/DNS/etc.
- Different kind of network testbed
- Focus and mobilize the Network / Systems research communities to define the emerging Internet.

# Current status

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- Sites coming up each week
- Second “underground” meeting in August (SIGCOMM)
- Website and lists online

`http://www.planet-lab.org/`

# What can YOU do for PlanetLab?

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- Be a part of the design process
- As *designers*, look at the platform architecture
- As *users*, participate in defining the requirements
- We are looking for all the input we can get.