PlanetLab: a Petri dish for the next Internet

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What is PlanetLab?

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

What would you do if you had Akamai’s infrastructure?
Motivation

• 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)

- Thousand viewpoints on “the cloud” is what matters
  - not the thousand servers
  - not the routers, per se
  - not the pipes
• and you must have the vantage points of the crossroads
  – co-location centers, peering points, etc.
Guidelines (3)

• 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)

• 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)

- 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:

Intel Research:
  David Culler
  Timothy Roscoe
  Brent Chun
  Mic Bowman

Princeton:
  Larry Peterson
  Mike Wawrzoniak

University of Washington:
  Tom Anderson
  Steven Gribble

See website for all the rest…

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Some signed-up Planet-Lab Sites

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Implementers and Users

• 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

• 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

• Cluster-based management
• Overlay and P2P networks
• Virtual machines and sandboxing
• Service composition frameworks
• Internet measurement
• Packet processors
• Colo services \( \Rightarrow \text{The time is now.} \)
• Web services
Emerging applications

• 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

- 0: seed
- 1: get API & interfaces right
- 2: get underlying arch. and impl. right

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Development trajectory

- 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

• 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:

• 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

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

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

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What can YOU do for PlanetLab?

• 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.