Presentation at the ISMA 2009 AIMS Workshop on Active Internet Measurements
CAIDA, UC San Diego, 12 February 2009

The TopHat Measurement Infrastructure

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TopHat Overview

TopHat is a measurement service

- in support of applications,
- in a future-internet testbed,
- that draws on federated measurement services

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A service for applications

- Many applications, e.g., overlays, require measurements in real time

- Why applications should draw on a measurement service:
  - Developers focus on their core competencies
  - They gain access to best-of-breed tools
  - They are network-friendly, avoiding inefficient duplication

Inspirations

- Spring, Wetherall, Anderson [USITS 2003]
  "Scriptroute: A Public Internet Measurement Facility"
  - Describes a user-queryable measurement service
  - An ongoing running service

- Nakao, Peterson, Bavier [SIGCOMM 2003]
  "A Routing Underlay for Overlay Networks"
  - Makes the case for a shared measurement service
  - Proposes primitives the service should supply
  - Describes an implementation

Other inspirations

- RIPE TTM
- DIMES
- N-TAP
- skitter and its successors
- ETOMIC
- others

What we bring

This combination:

- A service for applications
  - In the spirit of the routing underlay
- Running on a continuous basis
  - As in skitter, DIMES, scriptroute, RIPE-TTM, ETOMIC

Primitives we will offer

- Same as routing underlay
  - Network graph
  - Route from A to B
  - Path characteristics (latency, etc.)
- A callback service
  - Alert the application if anything has changed.
- Others to be developed
  - Work in collaboration with application developers.

Challenge: be useful

Systems that are useful today:

- Provide historic measurements for study, and/or
- Provide a platform for experimental measurements

They mostly serve measurement researchers

To serve application researchers:

- Work with real application developers
- Build around their needs

Not just ‘build it and they will come’ (though certainly that’s part of it too)

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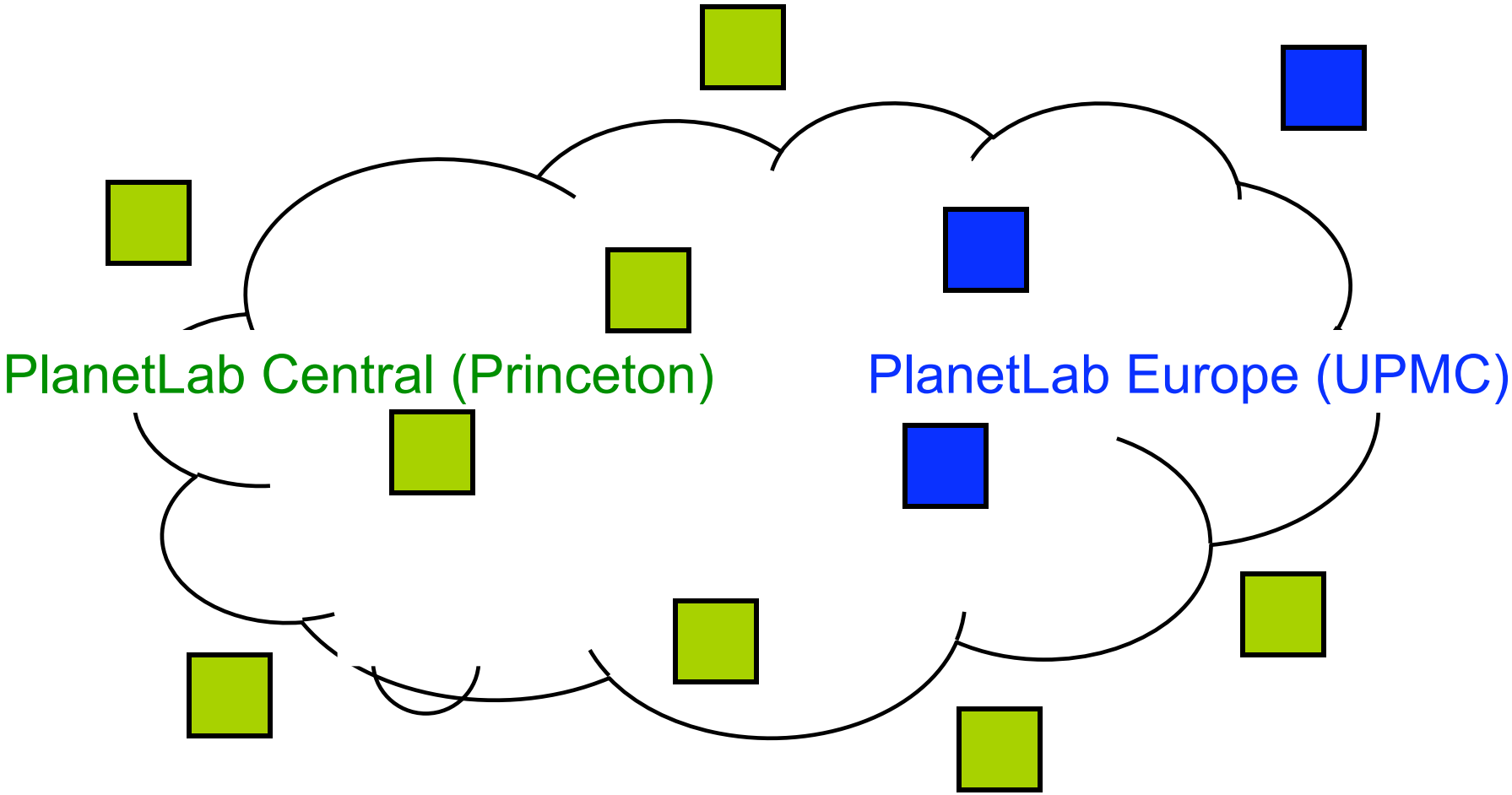
An EU future internet project

	Dates	Partners (academic & industrial)	Funding from EU's FIRE unit
OneLab1	Sept. 2006 - Aug. 2008	10	1.9 M€
OneLab2	Sept. 2008 - Dec. 2010	26	6.3 M€

OneLab based on PlanetLab



OneLab federation plans

Extend PlanetLab federation

- New regional authorities
  - PL Japan, Korea, and China, as they emerge

- New subsidiary authorities
  - National PlanetLabs within Europe
    - G-Lab in Germany
  - Private PlanetLabs (projects, corporations)

Federate with advanced networking test beds

OneLab wireless test beds

- A 50-node Wi-Fi test bed (CERTH, Greece)
  - wireless mesh capabilities
- A mobile WiMAX test bed (Alcatel-Lucent, France)
- A multi-link test bed (Ericsson, Hungary)
  - HSDPA, WLAN, Bluetooth, ZigBee, 3GPP-LTE-like links
  - both real and emulated links
- Using OMF (NICTA, Australia)

OneLab CDN test bed

Content distribution network (CDN)

- Publish/subscribe (pub/sub) architecture (BT, UK)
- Routing in a slice for CDN (Ericsson, Germany)
- Virtualisation at the service of CDN (U. Paderborn, Germany)

OneLab SAC test beds

Situated and autonomic communications (SAC)

- A SAC gateway (ETH Zurich, Switzerland)
  - connect SAC test beds to PlanetLab Europe
  - from the ANA project
- An ad-hoc opportunistic (pocket-switched) test bed (Thomson, France)
  - from the HAGGLE project
- A disruption- or delay-tolerant network (DTN) test bed (Thales, France)

OneLab monitoring

- Test bed monitoring
  Provides experimenters with abilities to
  - track their packets through the network (Fraunhofer, Germany)
  - know the network topology (UPMC, France)

- Develop benchmarking methodologies (INRIA, France)
  - The real-world environment is not reproducible
  - How to validate results nonetheless?

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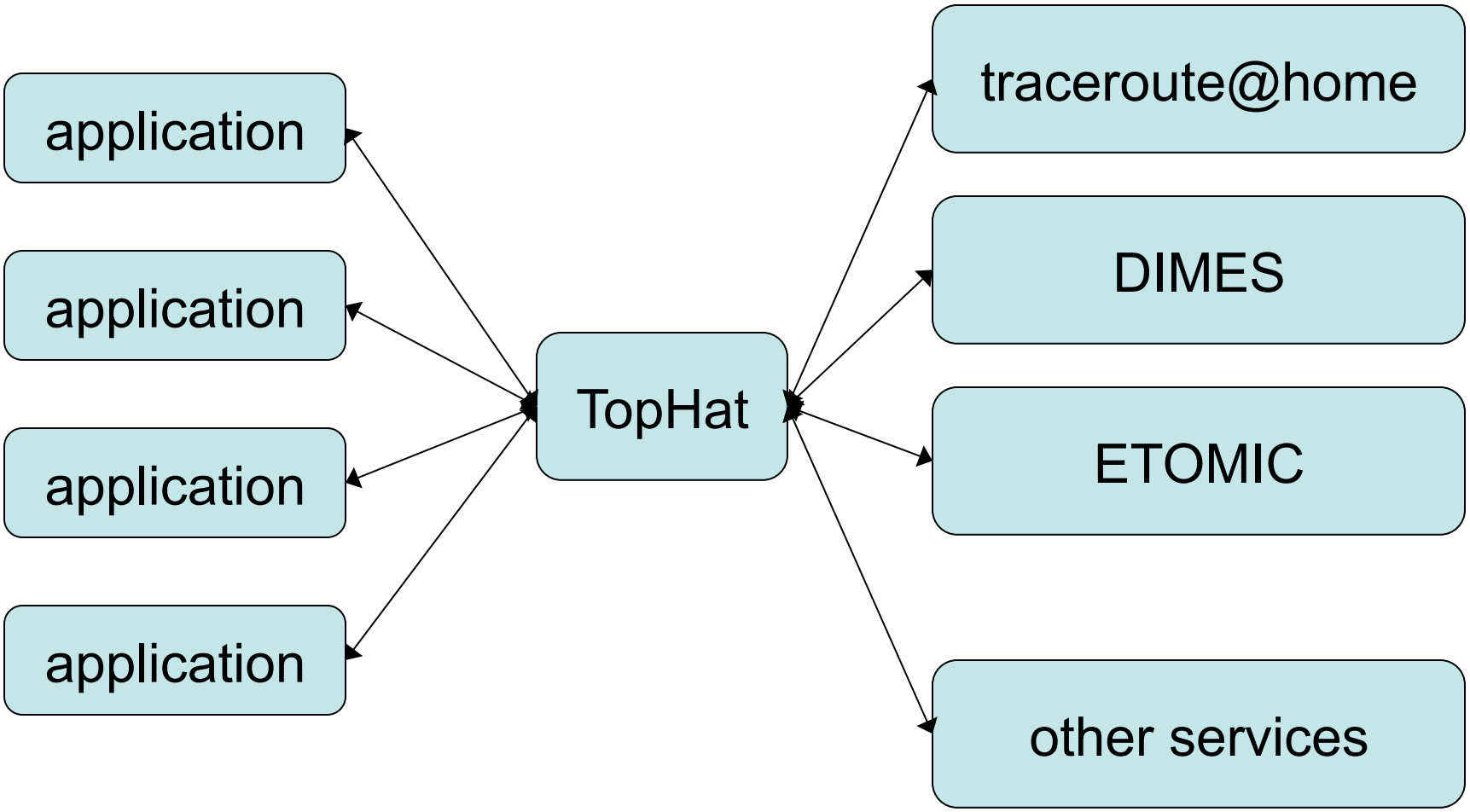
General schema



traceroute@home

- A skitter-like service
  - Probing permanently
  - Runs on PlanetLab nodes
- Provides the basic topology information
  - Augmented by the other services

DIMES

- A large scale internet measurement platform
  - Capabilities: ping, traceroute, packettrain
  - Some statistics since September 2004
    - Total users 8104
    - Total agents 18890
    - Countries with users 114
    - ASes 29404
    - AS Links 204204
- DIMES provides TopHat with scale
  - Applications running on PlanetLab interact with the entire internet

ETOMIC

- High temporal resolution (~10 nano second), globally synchronized, active measurements between measurement boxes
- ETOMIC provides TopHat with precision
  - A few high resolution measurement boxes can augment measurements taken from a large number of lower-resolution boxes

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