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Exploring YouTube's Content Distribution Network Through Distributed Application-Layer Measurements: A First View

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Outline

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- Objective of experiment
- Measurement techniques
- Results
- Outlook

Objective Of Experiment

- Get an end user's view on YouTube's CDN
  - Network performance
  - Temporal variations
- Large (different?) scale
  - End user >= PlanetLab
  - Long-term
- Active probing → public data
  - No NDAs, no traces in campus networks, PoPs, GGSNs
- Simplicity
  - No specialized hardware

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Measurement Techniques

- Application-layer measurements
  - Socket library level (TCP, DNS)
  - Similar to a browser's (plugin's) point of view
  - Detail vs penetration trade-off

- Experiment *platform*, not application
  - Flexible experiments
  - Updateable
  - Using the *Seattle* Internet Testbed, see next slide!

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The Seattle Internet Testbed

- Aim
  - Rapid prototyping for teaching and research in distributed and networked applications

- Approach
  - Python-based programming language virtualization
  - Resource restrictions aid sharing, end user, and network security
  - Donated by arbitrary users → worldwide distribution
  - Free to use by researchers
  - Incentive: Donate more VMs, access more VMs!

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Steps In Building The Experiment

- Gather data locally
- Parse URLs, HTML, packet traces, `digs`

- While you come up with new ideas
  - Prototype measurement script
  - Deploy to nodes (!)
  - Evaluate results

- Finally, let it run!
  - 40 nodes
  - 26 days

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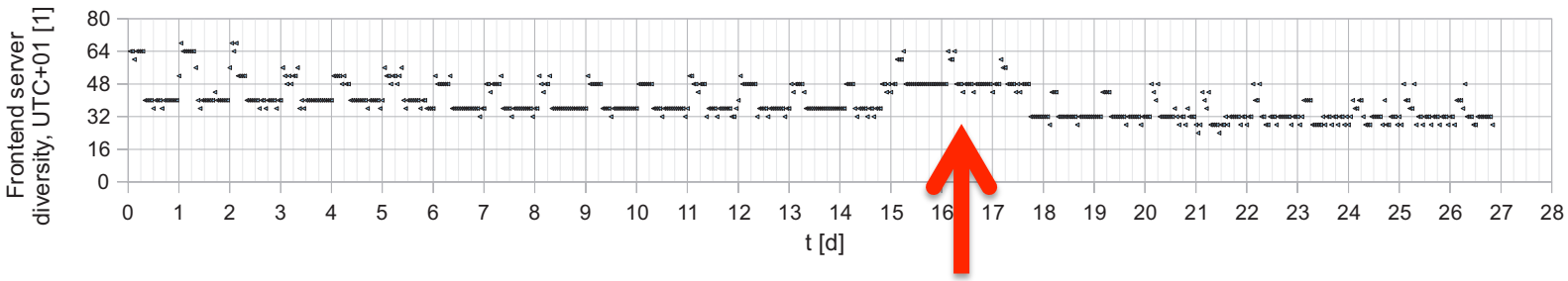
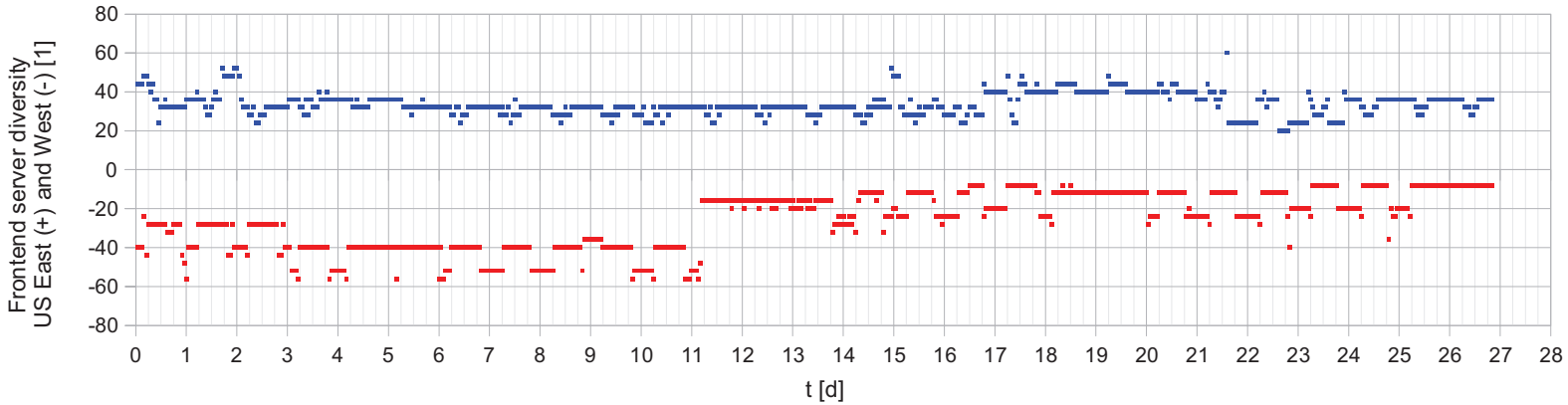
Results (1)

- Number of advertised frontend servers (www.youtube.com) per hour and time zone
  - Europe (UTC+01)



  - US (UTC-05 to UTC-08)



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Conlusion And Outlook

- Distributed, long-term user's view on YouTube's CDN
- Identify temporal behavior of CDN management
  - Load balancing, optimization
- Seattle Internet Testbed as platform
  - Flexible; heterogeneous nodes; automated

- Next steps
  - Improve scale (number of nodes, access technologies)
  - Further experiments (bandwidth estimation, your idea here)
  - Other interesting CDN targets?

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Thanks for participating!

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Feel free to

ask questions!