DURZ Analysis

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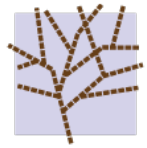
DNS-OARC
Domain Name System Operations Analysis and Research Center

DURZ Deployment Timeline

Jan 27, 2010	L-Root
Feb 10, 2010	A-Root
Mar 3, 2010	I- and M-Root
Mar 24, 2010	D-, E-, and K-Root
Apr 14, 2010	B-, C-, F-, G-, and H-Root
May 5, 2010	J-Root
Jul 15, 2010	All root servers get production signed root zone



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DURZ Data Collection

- Query data collected for all DURZ events
  - 48 hours or more per collection
  - pcap files
- Additional collection before and after DURZ rollout
- Final collection during production signed root zone deployment
- All root servers participated
  - Some more than others
- Query data only except for J-Root
- Total data: 17.5 TB (gzipped)

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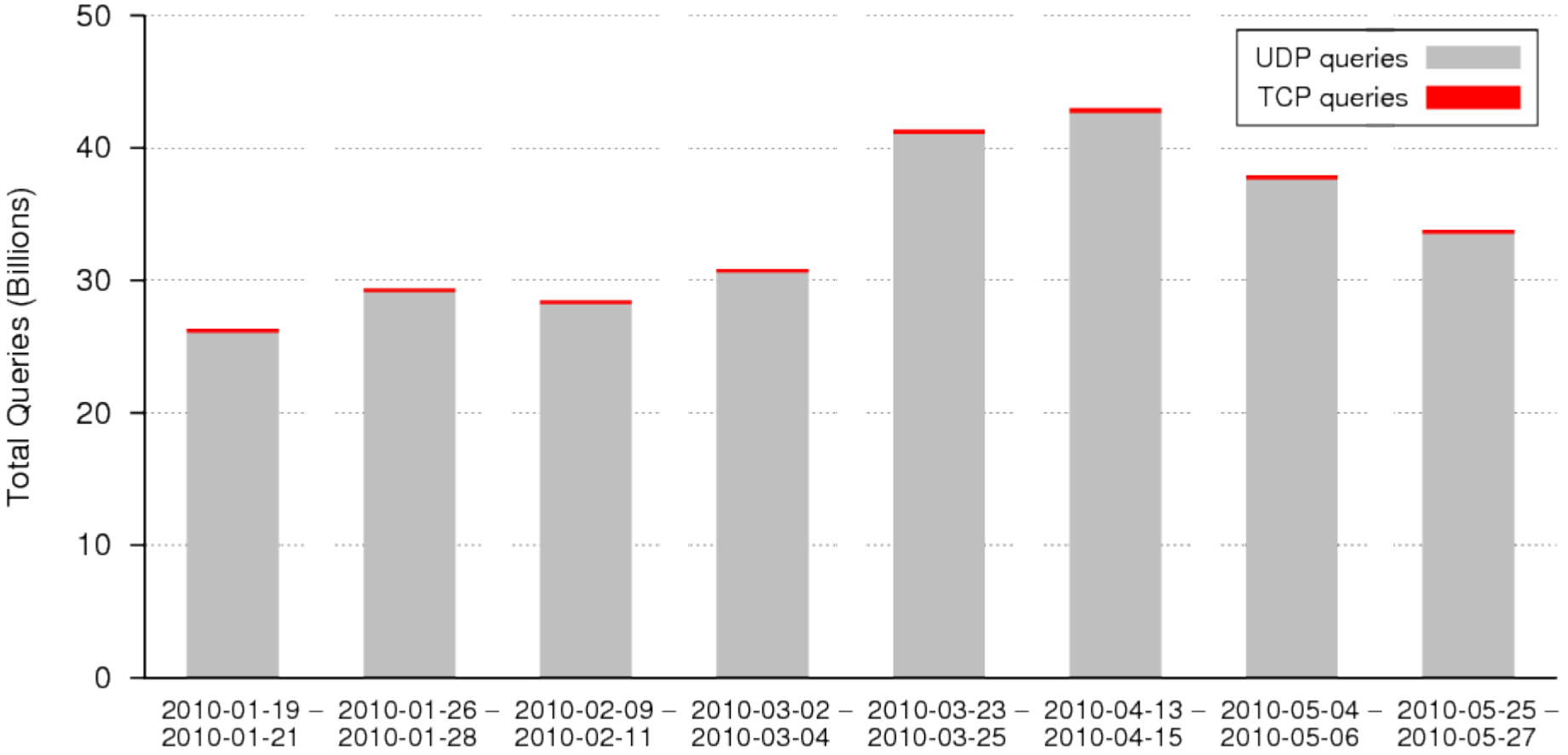
Total DNS Queries



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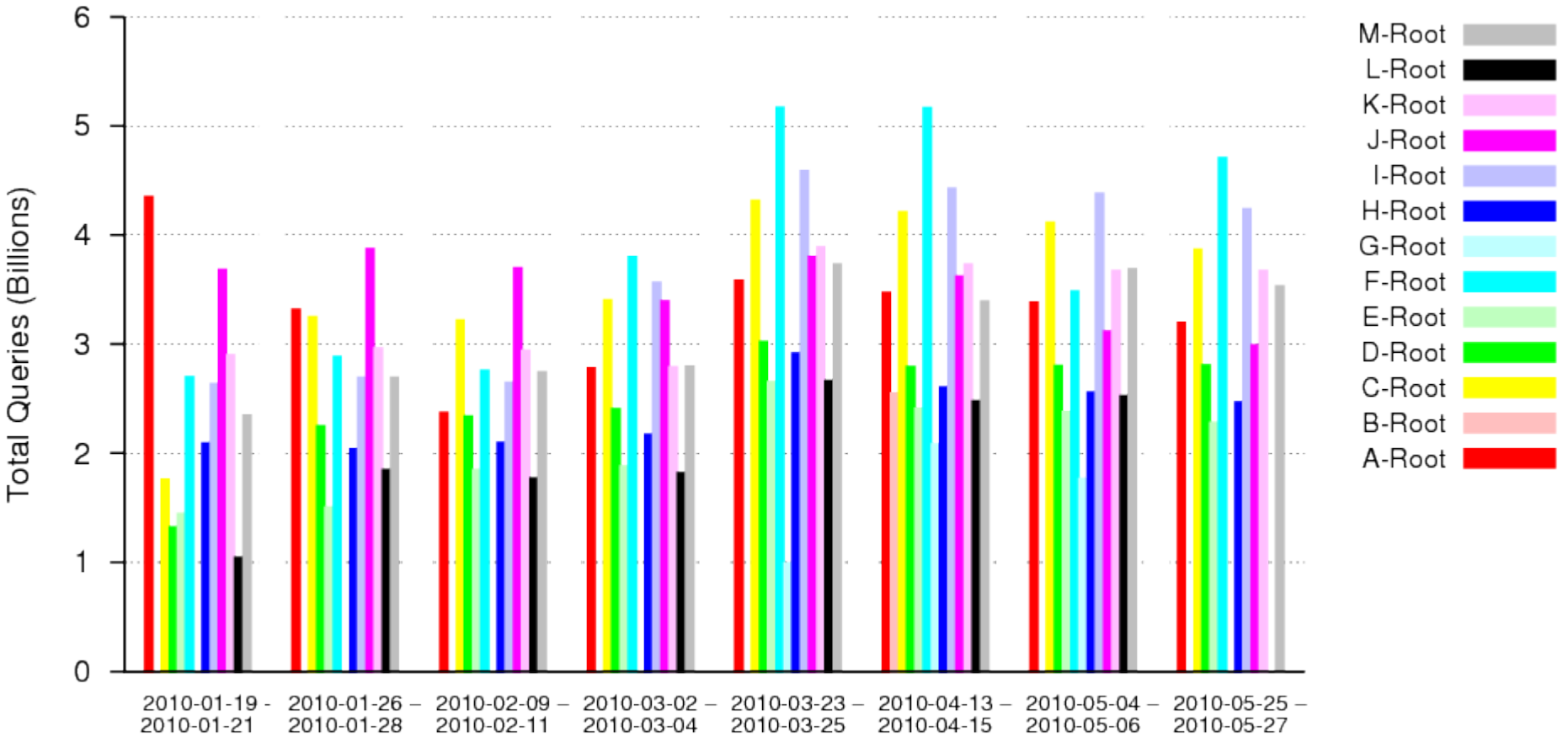
Total DNS Queries (By Server)



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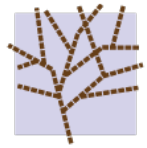
Analysis

- Undertook to investigate any significant changes
  - Expected increase in TCP
  - Anticipated possible Path MTU and middlebox issues
  - Combed data for other artifacts



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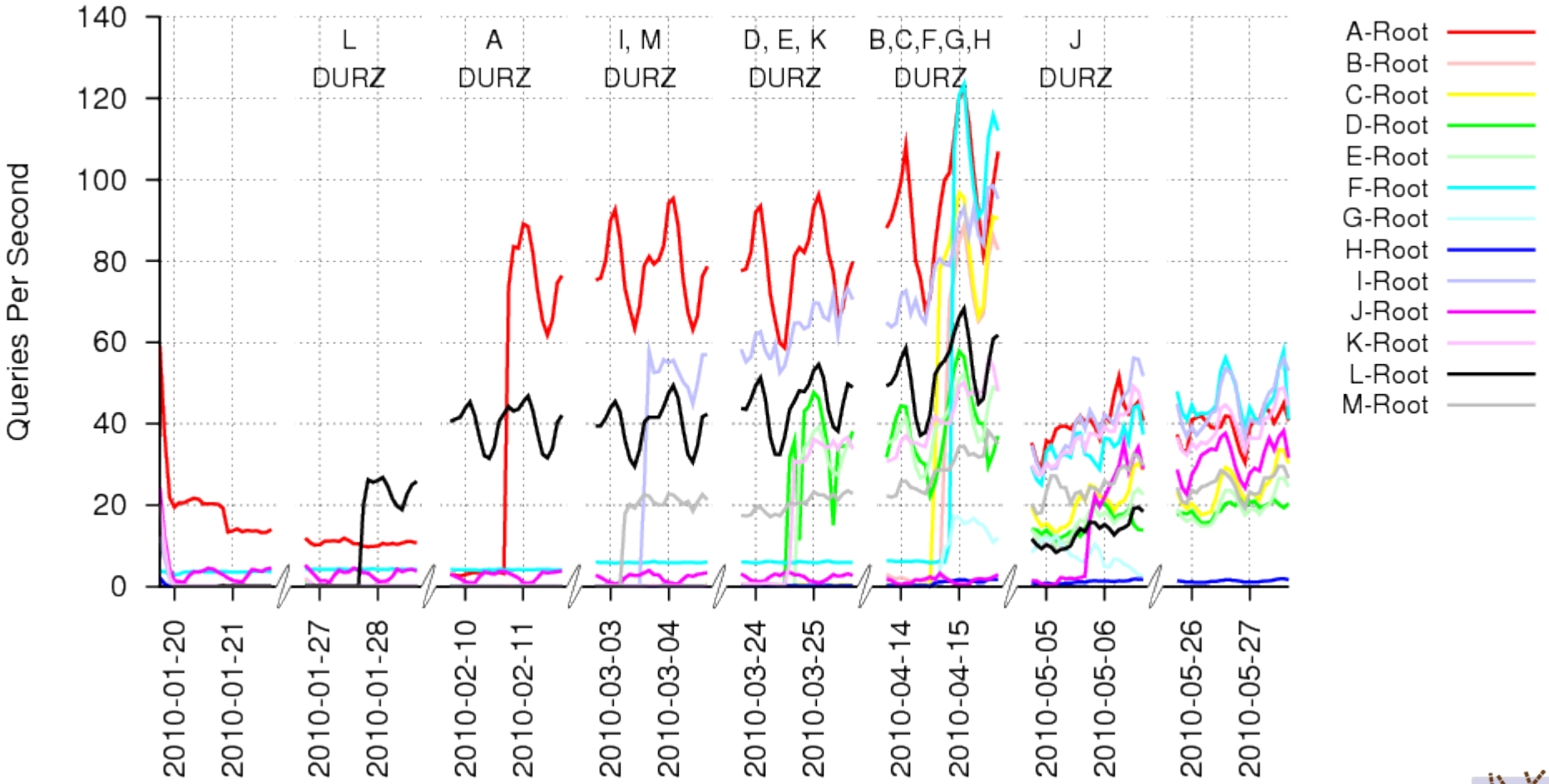
TCP-Based DNS Queries (By Server)



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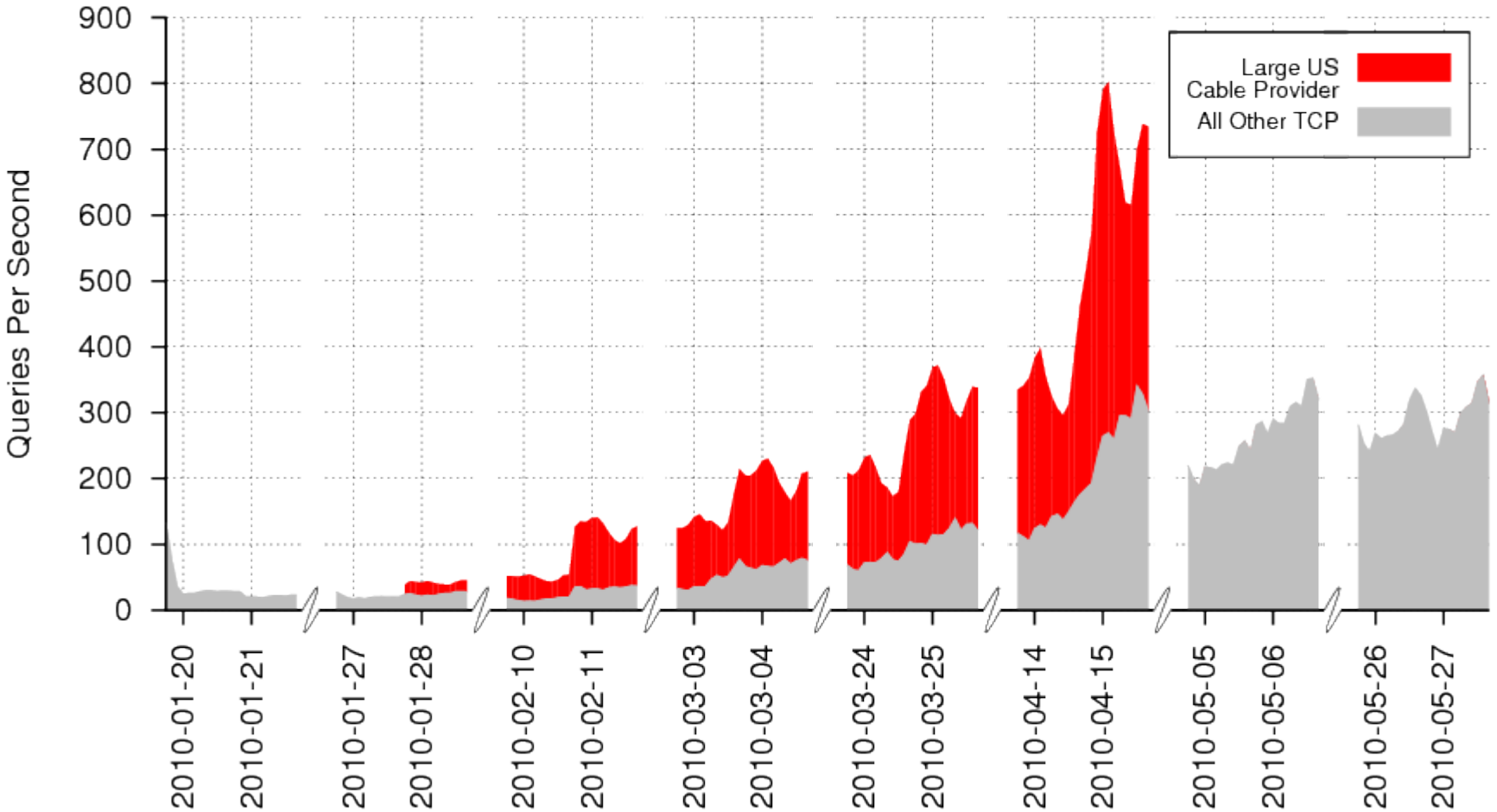
Total TCP-Based DNS Queries



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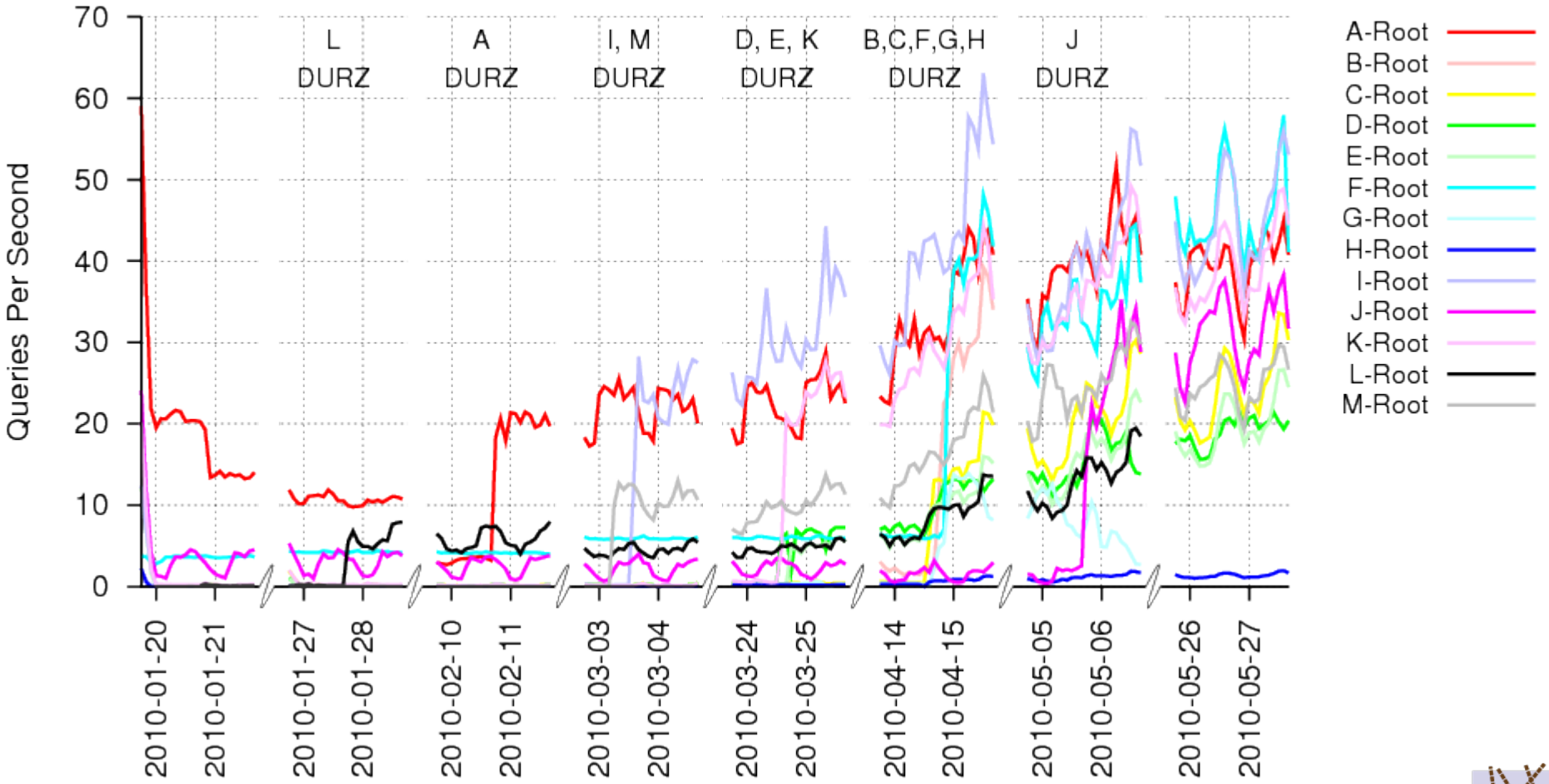
TCP-Based DNS Queries (By Server)

(with anomalous traffic removed)



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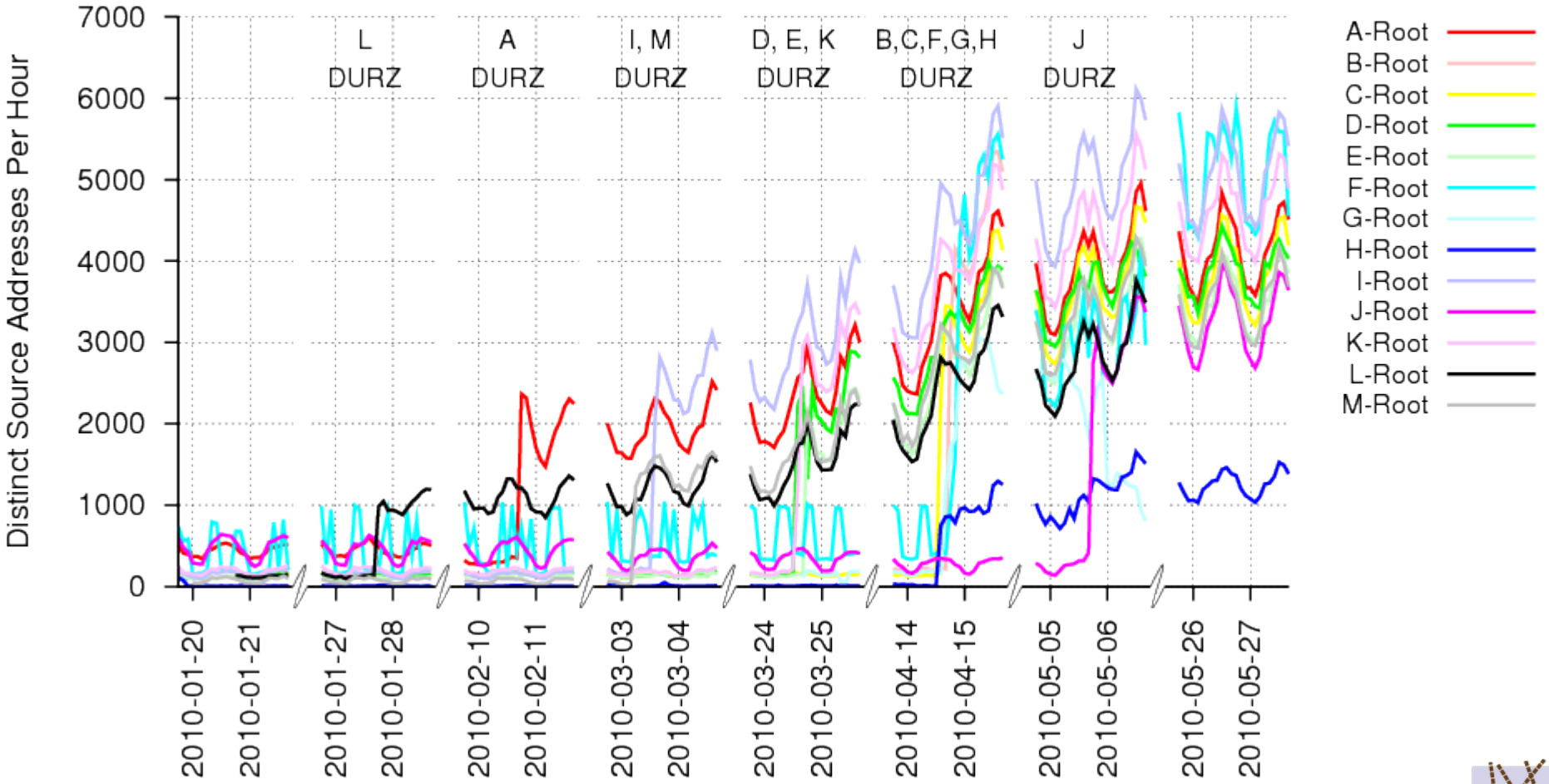
Distinct TCP Sources By Server



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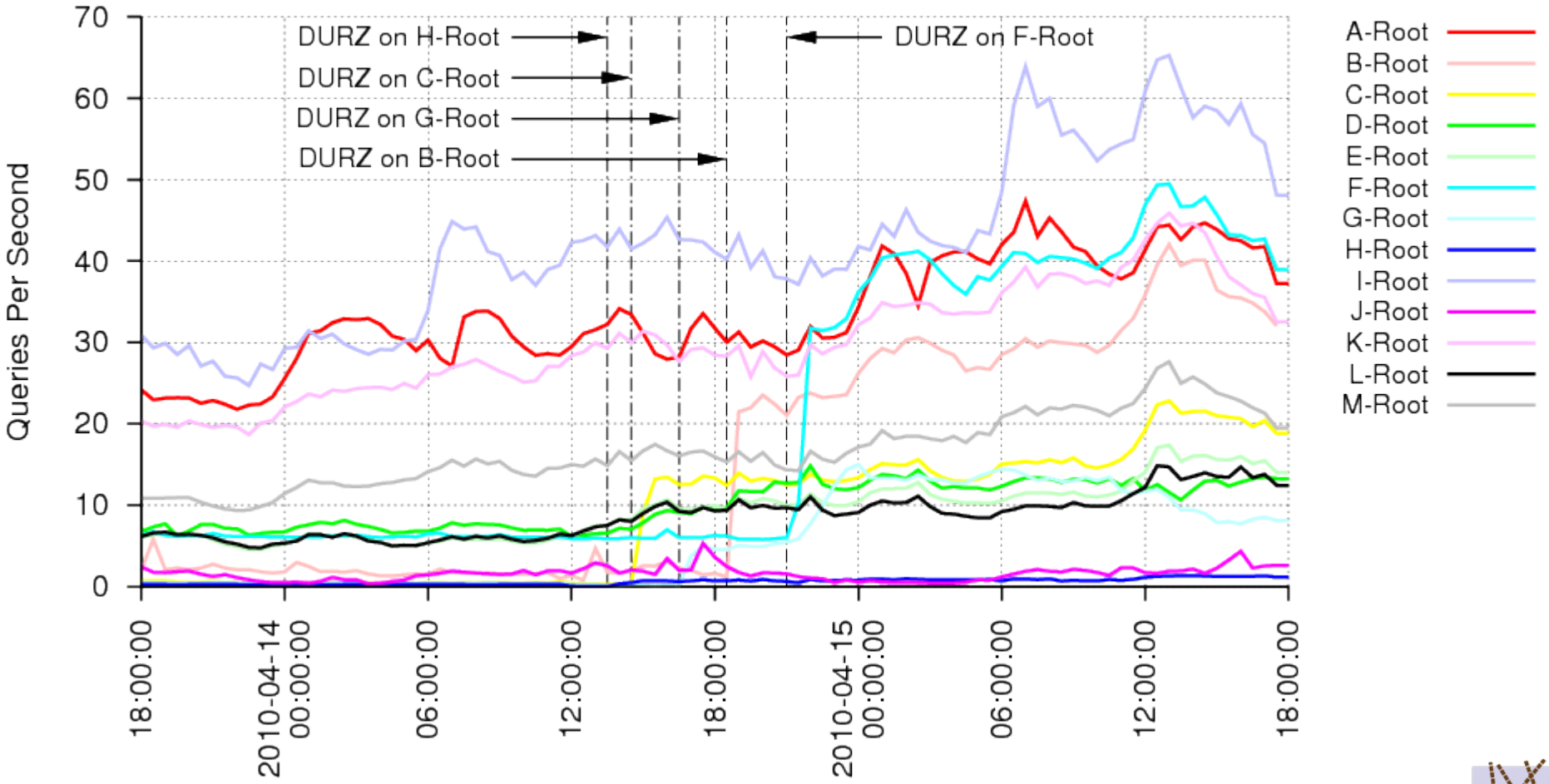
TCP-Based DNS Queries During April DURZ Rollout



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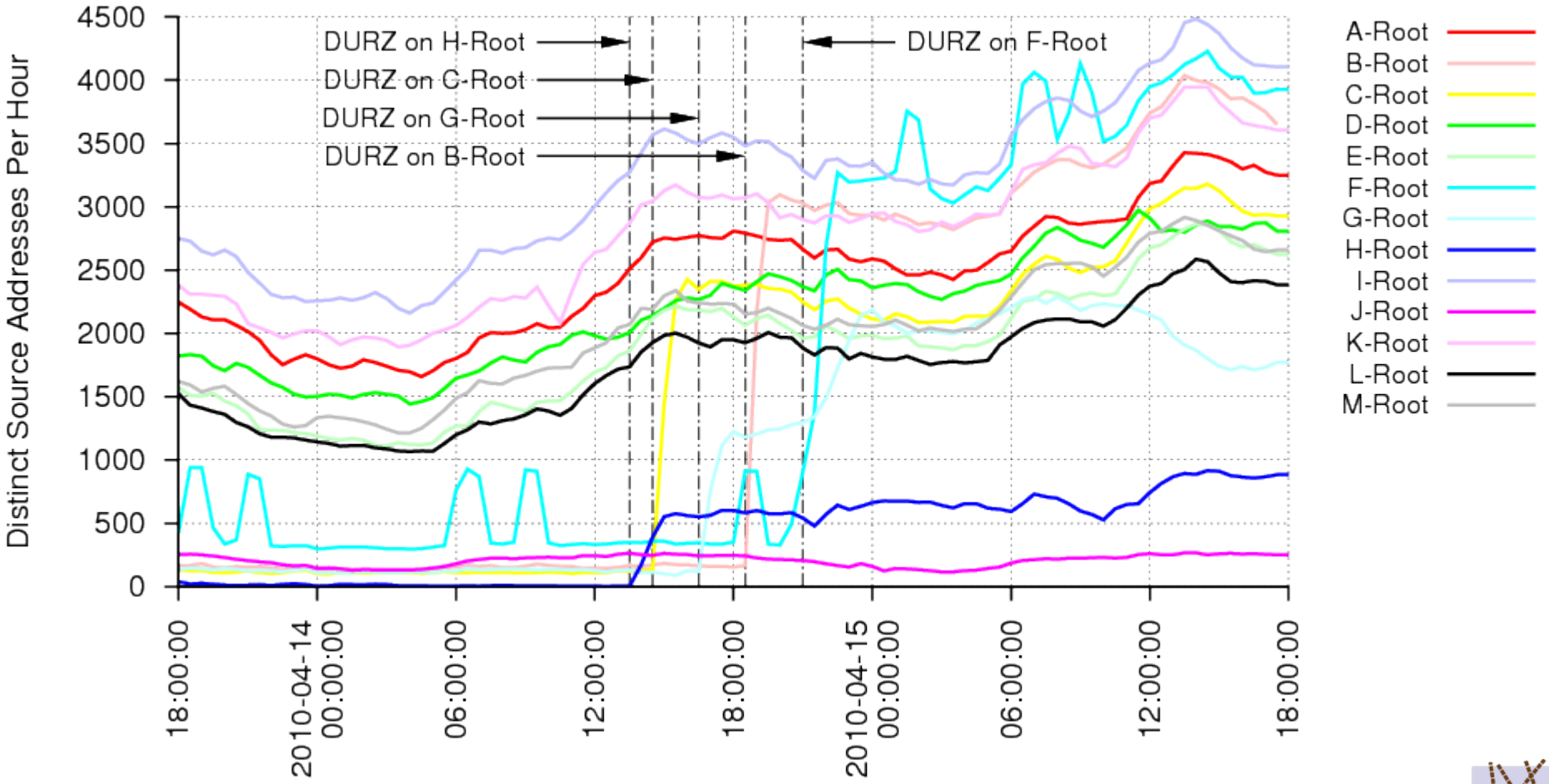
Distinct TCP Sources During April DURZ Rollout



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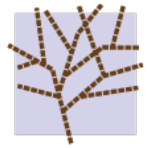
Response Sizes

- Responses collected for J-Root only
- Average response message size increased from 405 to 569 octets
- Average response packet size increased from 433 to 597 octets
  - ~38% increase



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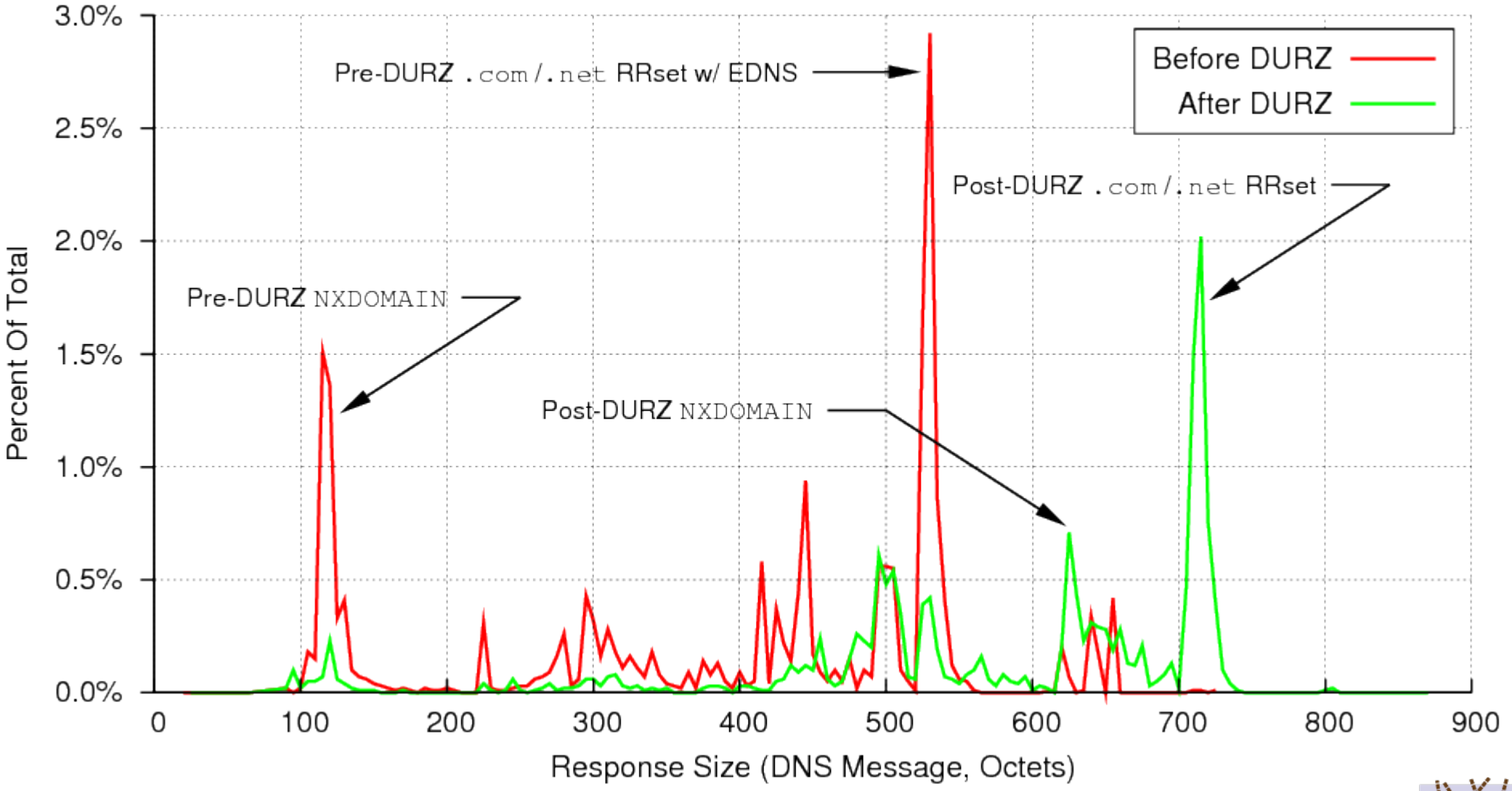
Response Sizes



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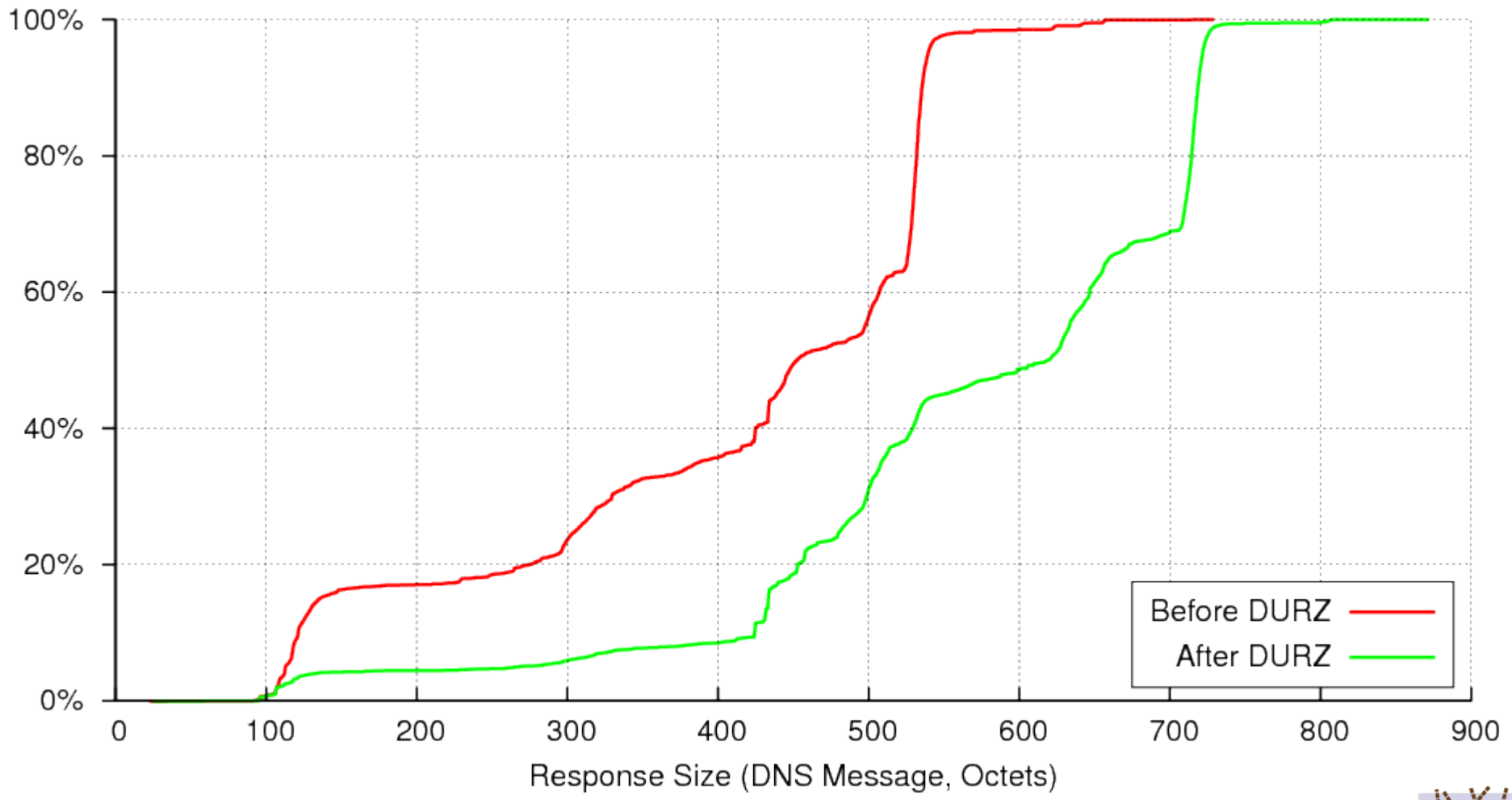
Response Sizes (CDF)



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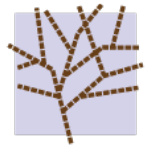
UDP Retries

- Expected some Path MTU and middlebox issues with larger response sizes
- Examined retries to search for patterns suggesting reachability problems
  - Looked for queries with the same source address, QNAME, QTYPE, and QCLASS received within 60 seconds of each other at distinct root servers
  - Looked only at queries with EDNS0, DO=1, and EDNS payload > 512



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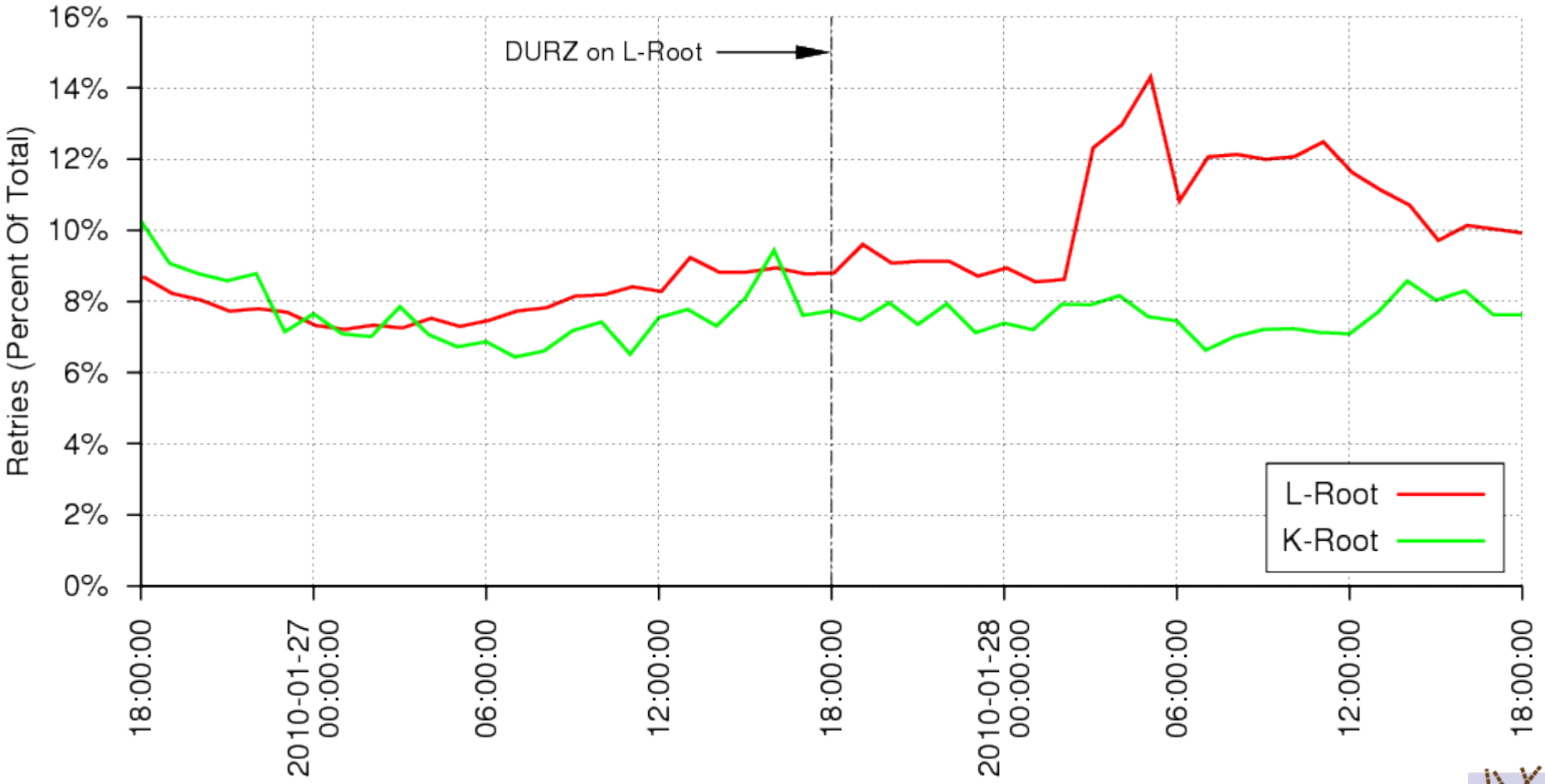
L-Root: Retries As a Percentage Of All Queries With DO=1



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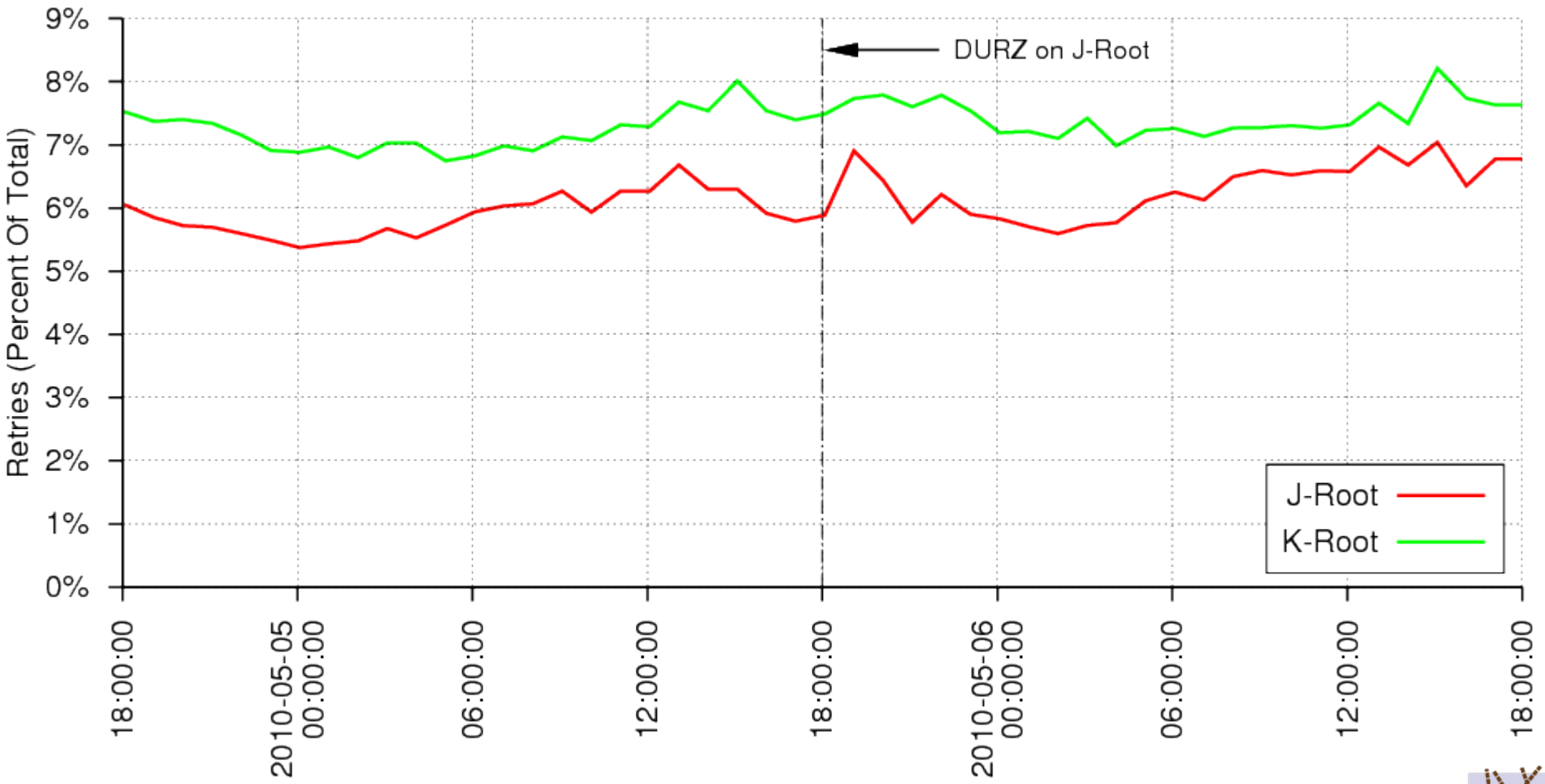

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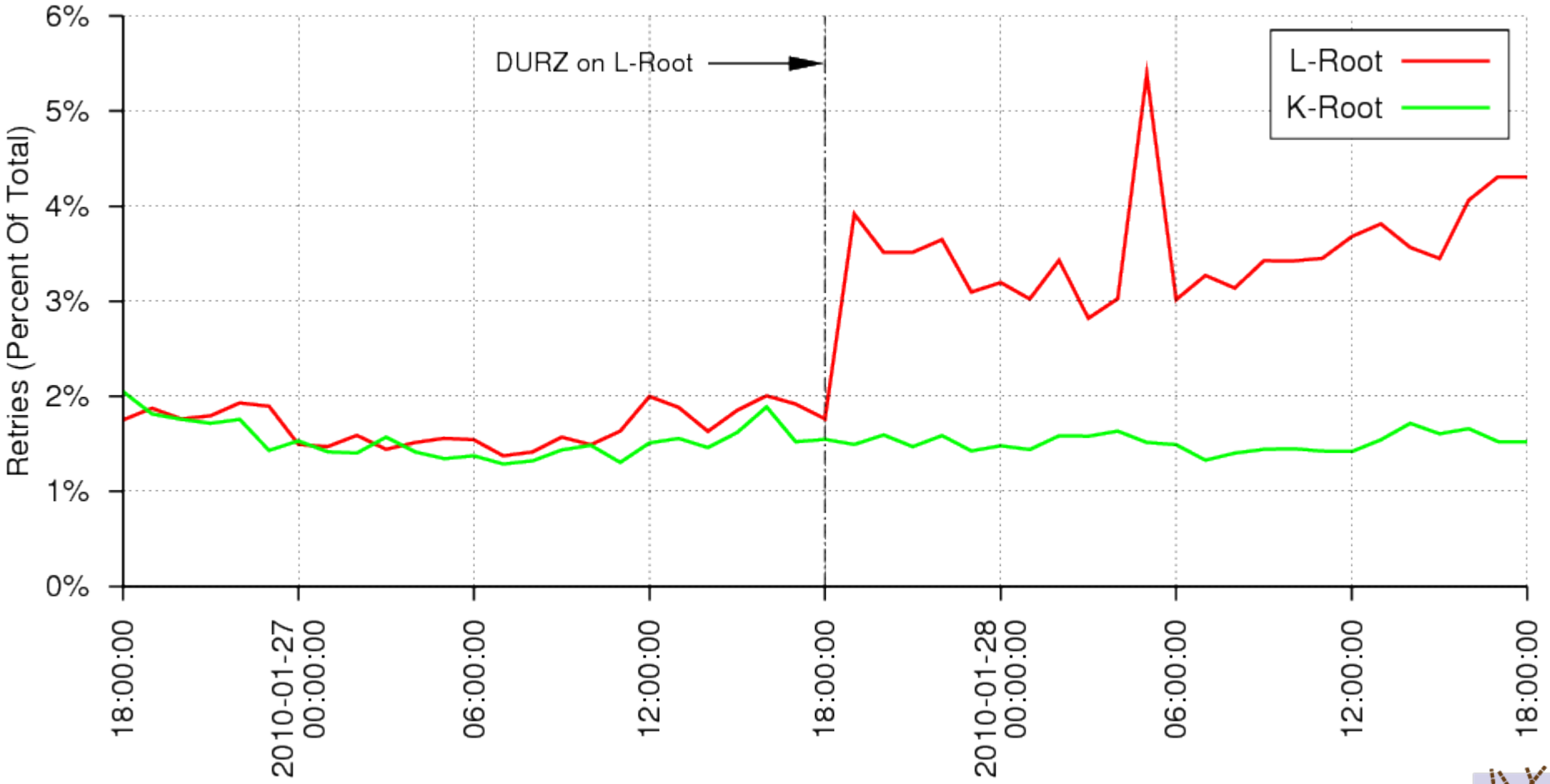
L-Root: Retries As a Percentage Of All Queries With DO=1 *and* Resulting In NXDOMAIN



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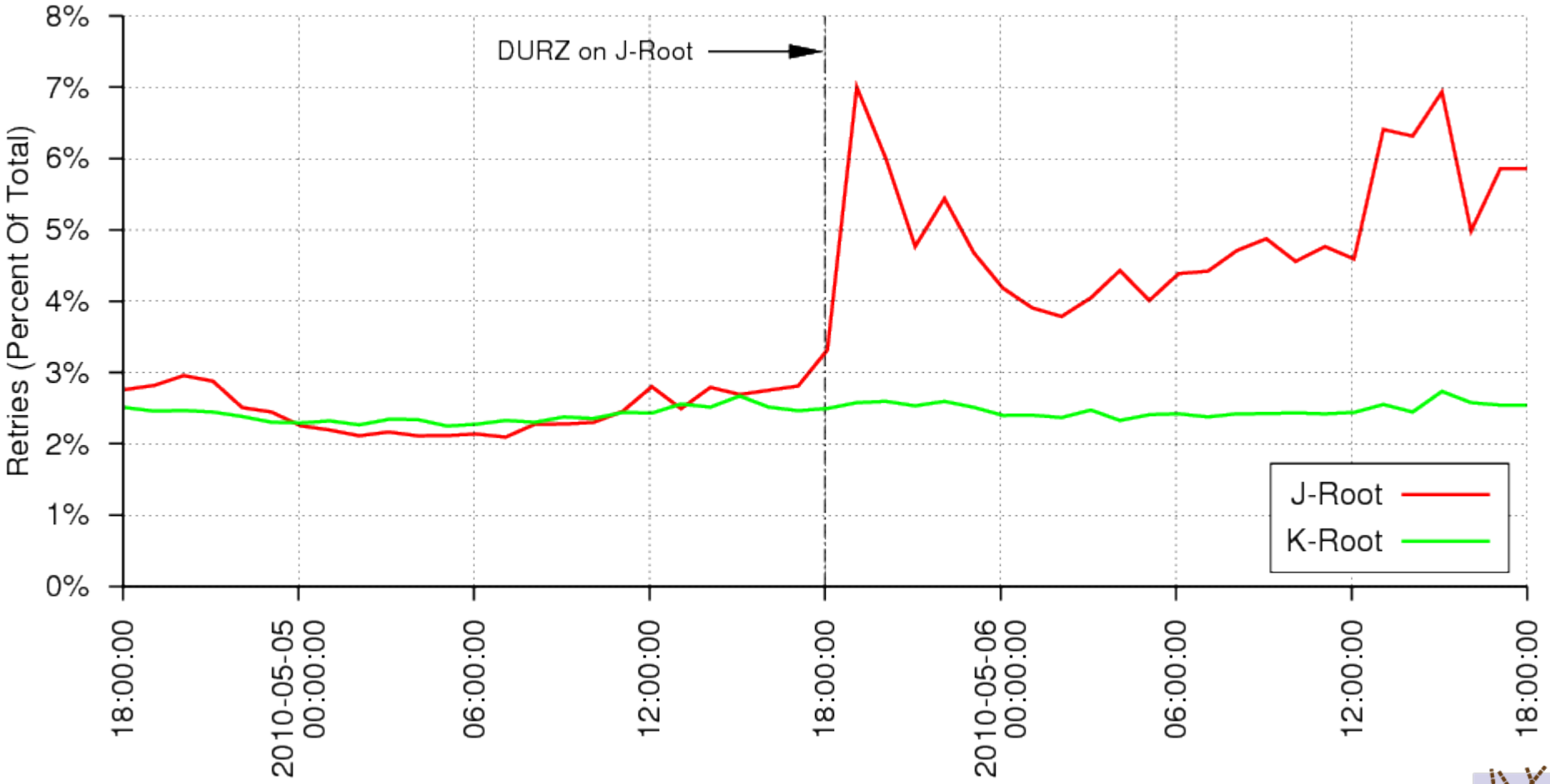

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Final Data Collection

- A final data collection was held during the rollout of the production signed root zone on July 15th.
- Nothing dramatic expected
  - A “just in case” collection

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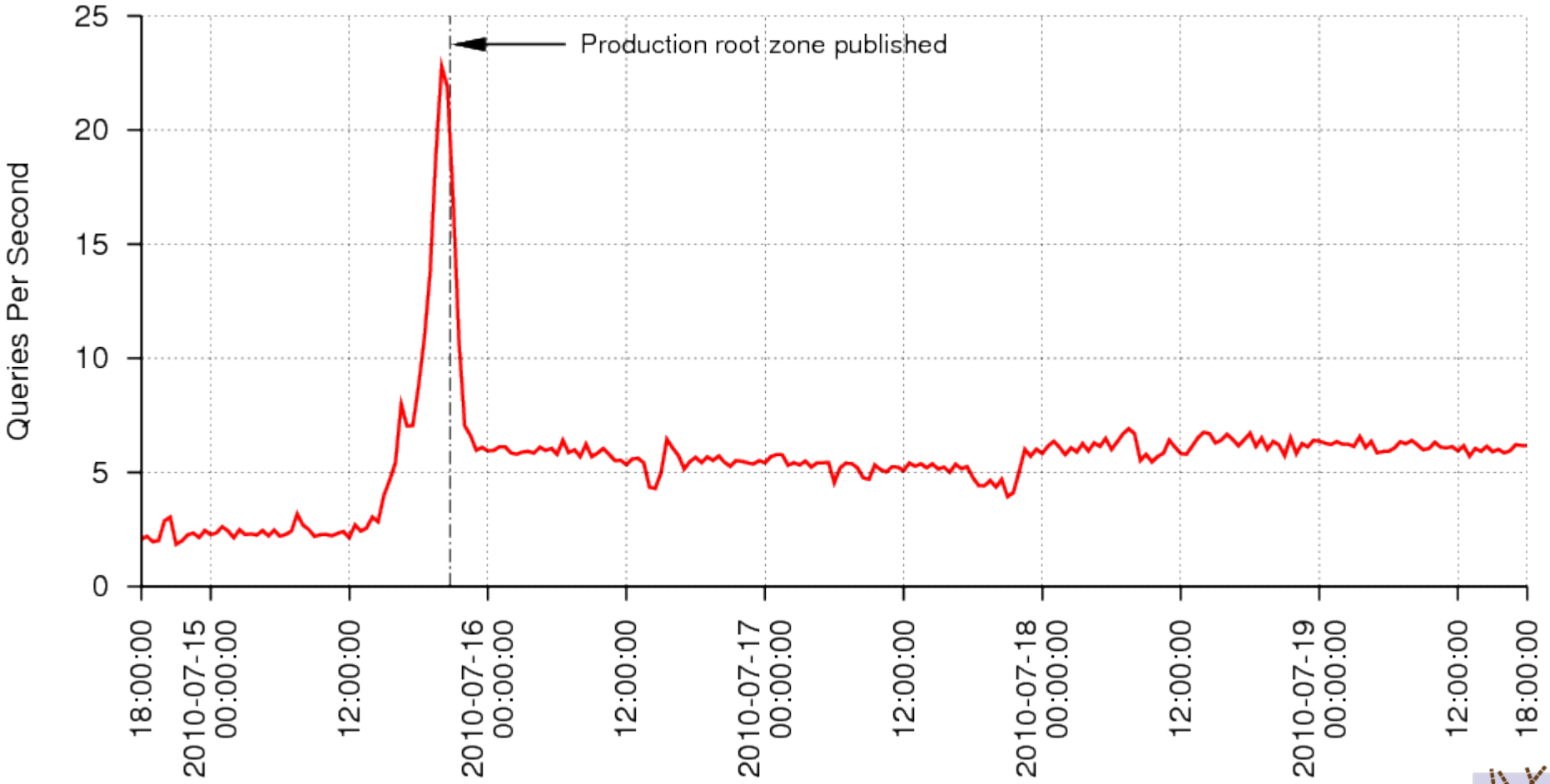
Queries For QTYPE=DNSKEY



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Key Findings

- TCP queries increased from ~30 qps to ~400 qps
  - Average of 1-2 qps per node
- Distinct TCP sources per hour increased from ~1,600 to ~30,000
- No concrete evidence of significant reachability issues
  - No known reports of significant outages
    - Has anyone heard otherwise?
- Internet survived
  - \o/

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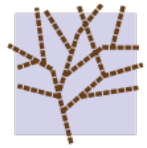
Questions?



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