DNSSEC for the Root Zone

DNSSEC Session at
ICANN38, Brussels, Belgium, June 2010

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Richard Lamb, ICANN

Matt Larson, VeriSign

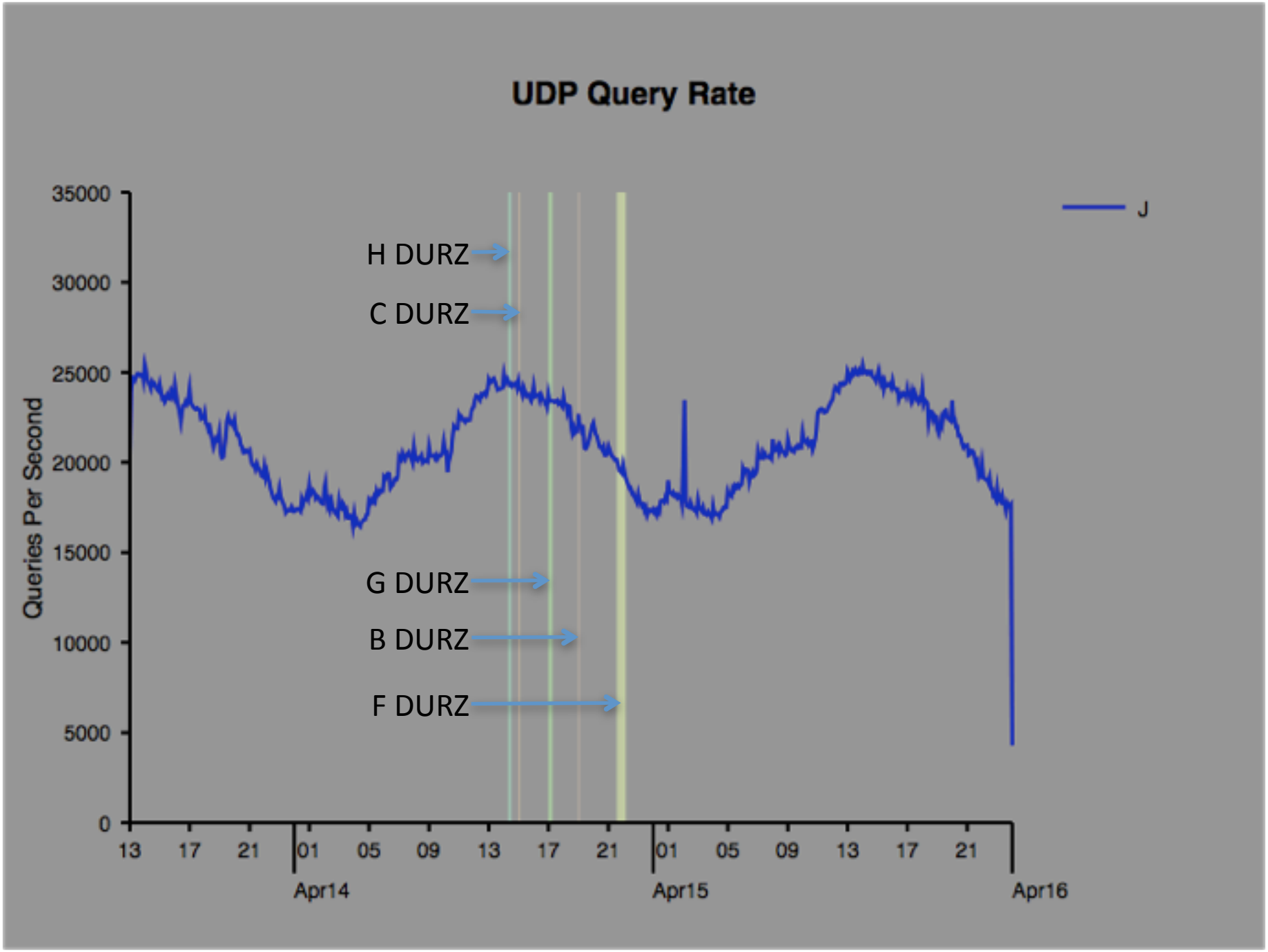
This design is the result of a cooperation between ICANN & VeriSign with support from the U.S. DoC NTIA

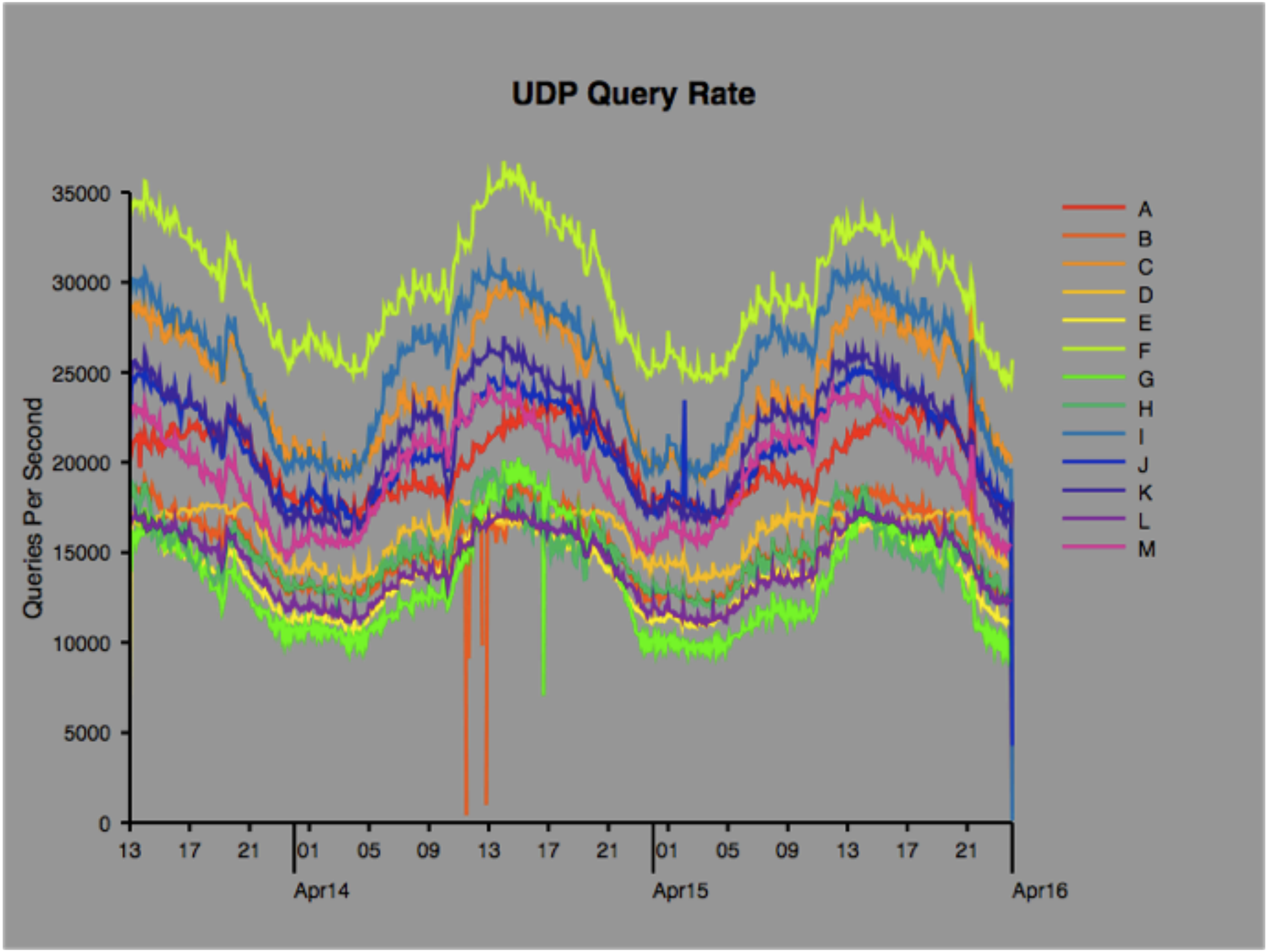
The DURZ

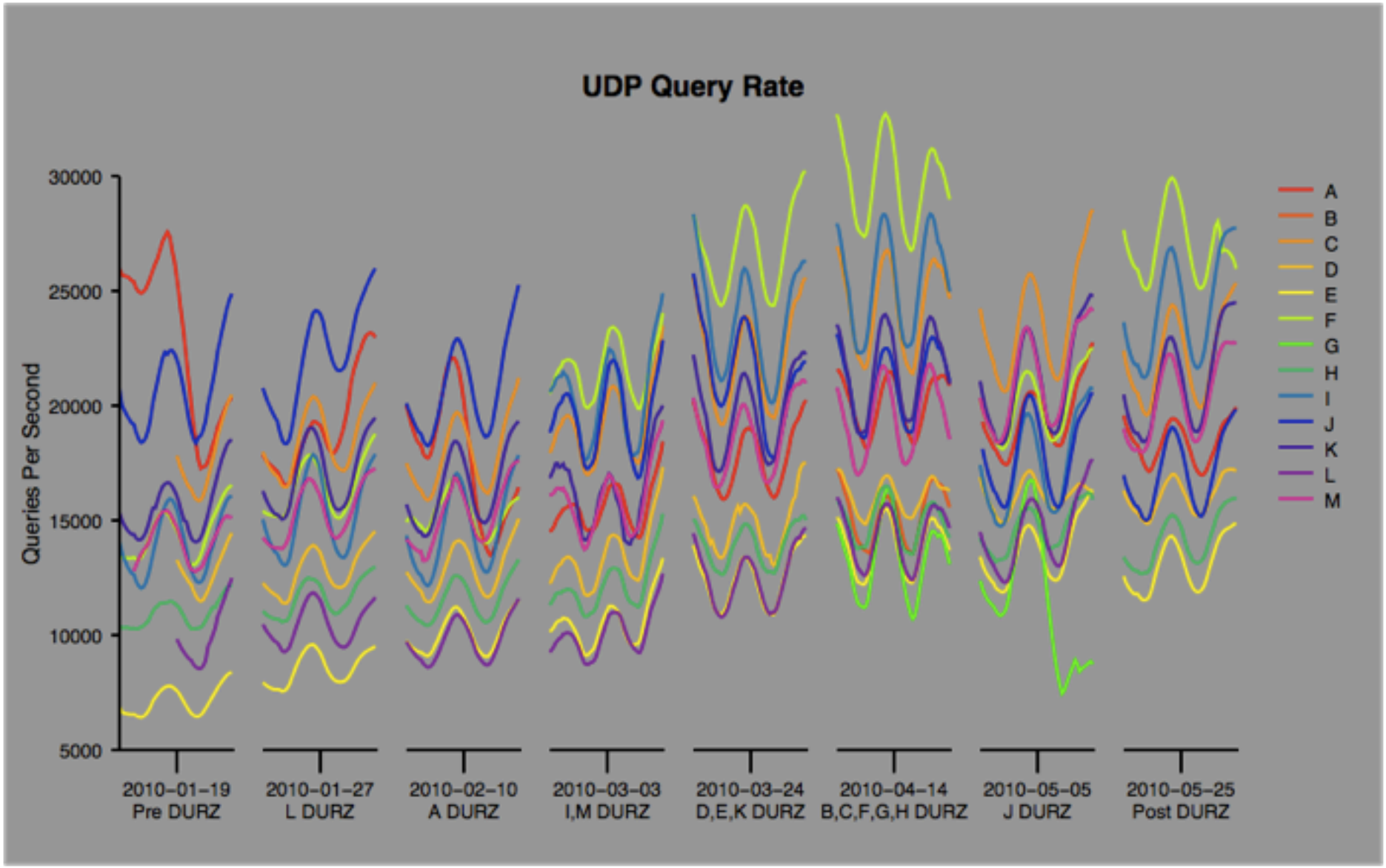
- The 13 root servers were incrementally converted to a signed, but unvalidatable, zone beginning in January and finishing in May
- Root server operators collaborated with DNS-OARC to collect DNS queries 24 hours before and after each switchover

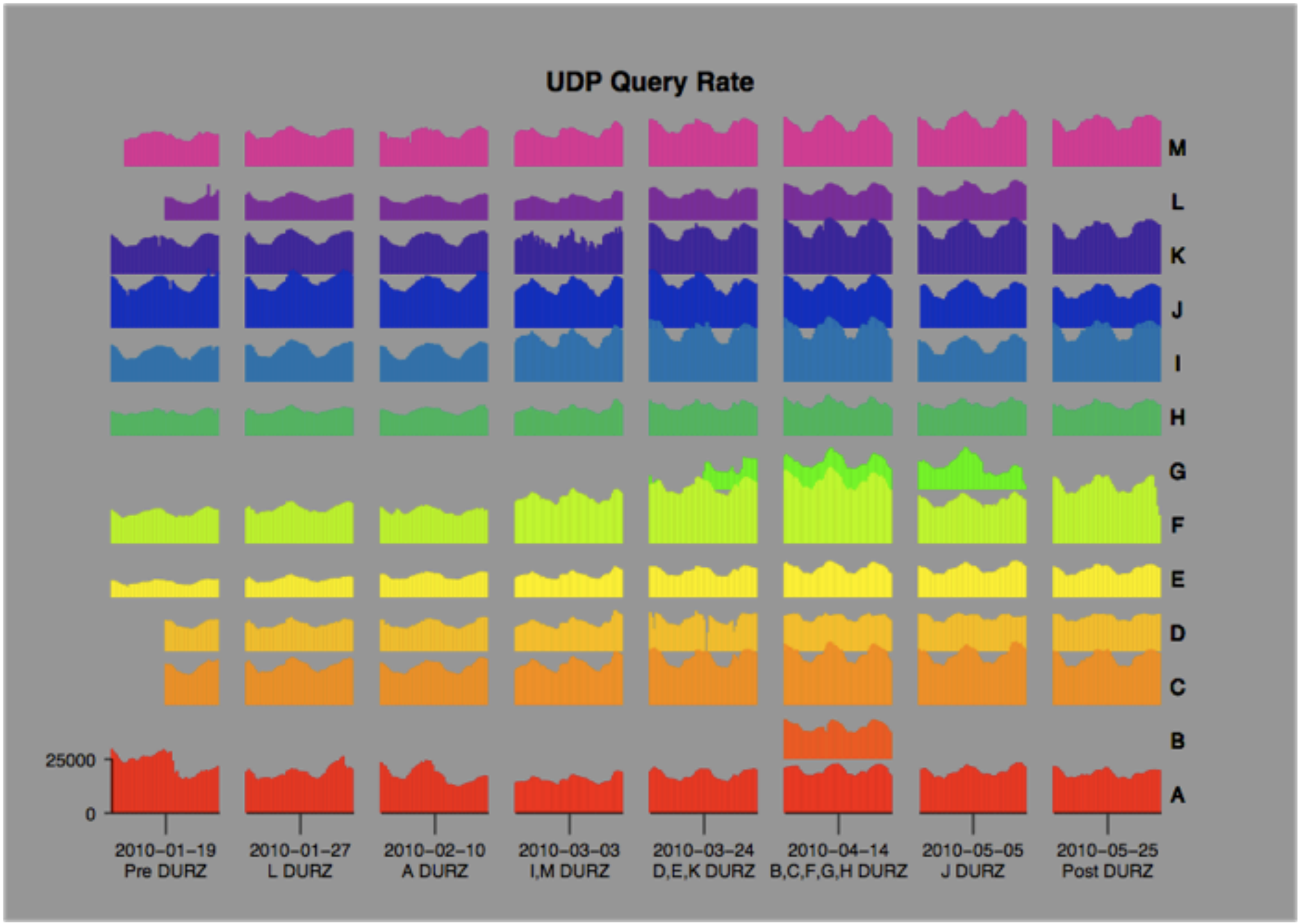
DURZ Data Analysis

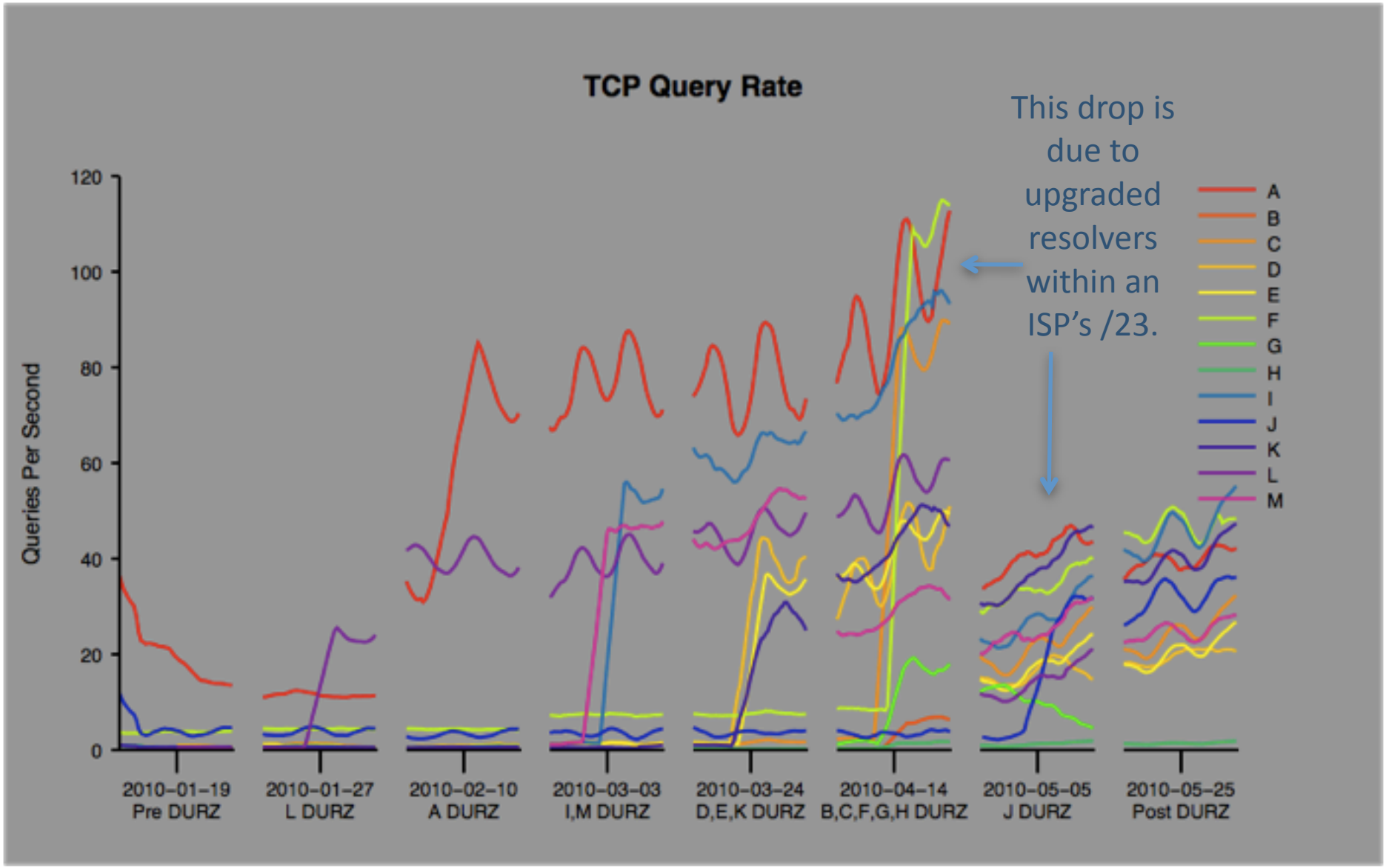
- Looking at the data for indications of problems
- Query rates
- TCP traffic
- Message sizes
- Priming queries

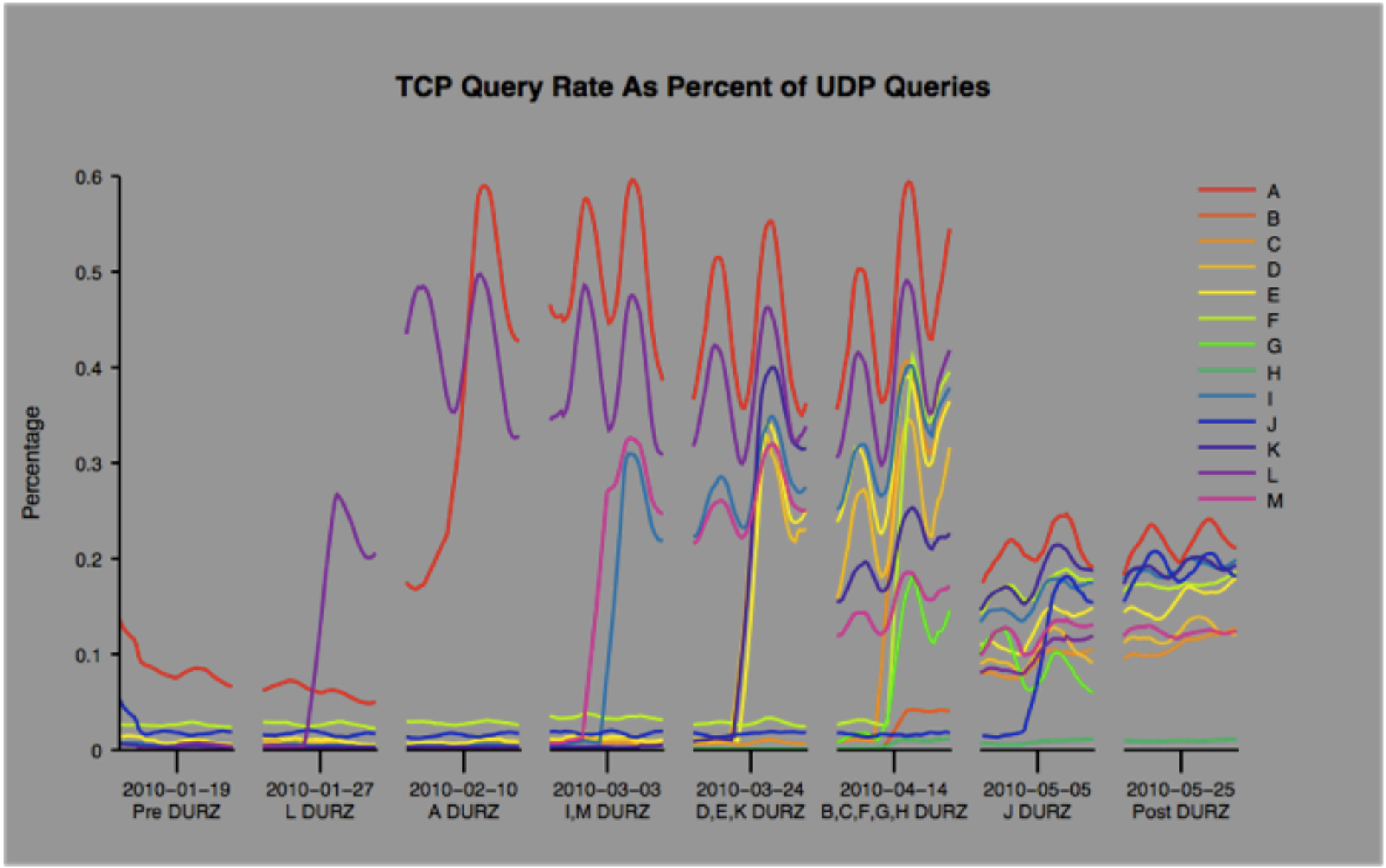

UDP Query Rate
Queries Per Second
35000
30000
25000
20000
15000
10000
5000
0
J
H DURZ
C DURZ
G DURZ
B DURZ
F DURZ
13
17
21
01
05
09
13
17
21
01
05
09
13
17
21
Apr14
Apr15
Apr16

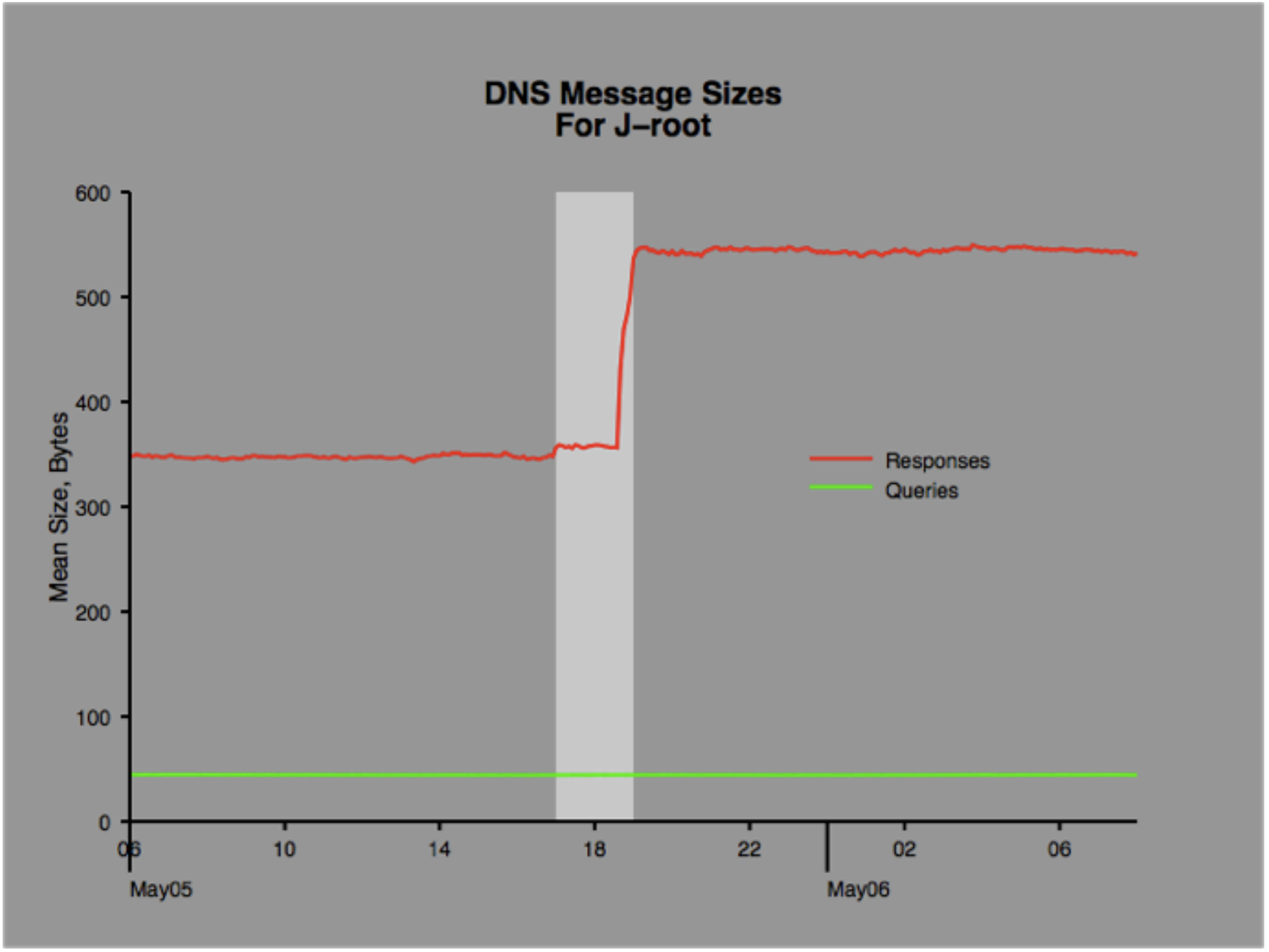

UDP Query Rate
Queries Per Second
35000
30000
25000
20000
15000
10000
5000
0
13
17
21
01
05
09
13
17
21
01
05
09
13
17
21
Apr14
Apr15
Apr16
A
B
C
D
E
F
G
H
I
J
K
L
M

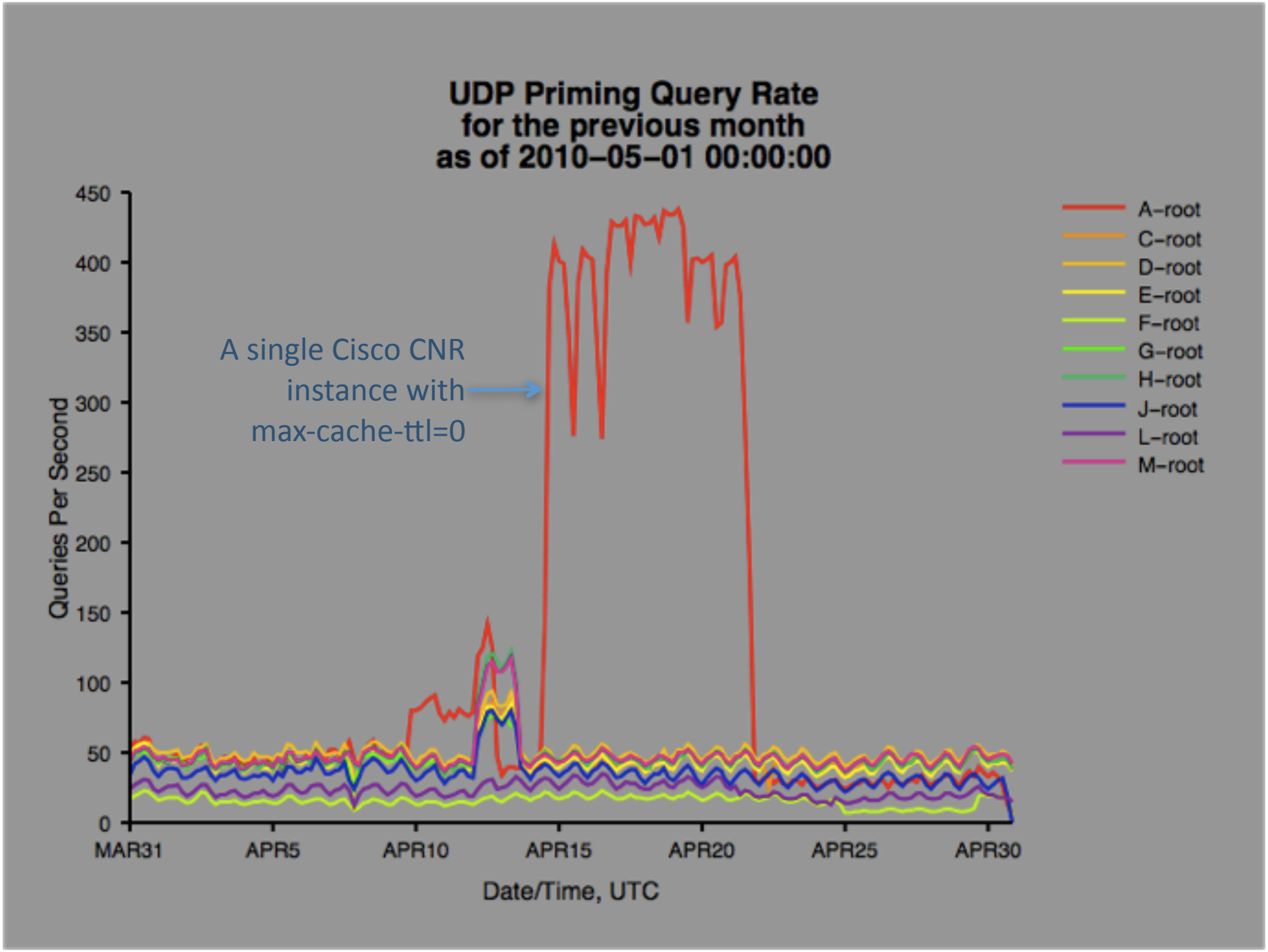

UDP Query Rate
Queries Per Second
30000
25000
20000
15000
10000
5000
A
B
C
D
E
F
G
H
I
J
K
L
M
2010-01-19
Pre DURZ
2010-01-27
L DURZ
2010-02-10
A DURZ
2010-03-03
I,M DURZ
2010-03-24
D,E,K DURZ
2010-04-14
B,C,F,G,H DURZ
2010-05-05
J DURZ
2010-05-25
Post DURZ


UDP Query Rate
M
L
K
J
I
H
G
F
E
D
C
B
A
25000
0
2010-01-19
Pre DURZ
2010-01-27
L DURZ
2010-02-10
A DURZ
2010-03-03
I,M DURZ
2010-03-24
D,E,K DURZ
2010-04-14
B,C,F,G,H DURZ
2010-05-05
J DURZ
2010-05-25
Post DURZ


TCP Query Rate
This drop is due to upgraded resolvers within an ISP's /23.
Queries Per Second
120
100
80
60
40
20
0
A
B
C
D
E
F
G
H
I
J
K
L
M
2010-01-19 Pre DURZ
2010-01-27 L DURZ
2010-02-10 A DURZ
2010-03-03 I,M DURZ
2010-03-24 D,E,K DURZ
2010-04-14 B,C,F,G,H DURZ
2010-05-05 J DURZ
2010-05-25 Post DURZ


TCP Query Rate As Percent of UDP Queries
Percentage
0.6
0.5
0.4
0.3
0.2
0.1
0
A
B
C
D
E
F
G
H
I
J
K
L
M
2010-01-19
Pre DURZ
2010-01-27
L DURZ
2010-02-10
A DURZ
2010-03-03
I,M DURZ
2010-03-24
D,E,K DURZ
2010-04-14
B,C,F,G,H DURZ
2010-05-05
J DURZ
2010-05-25
Post DURZ


DNS Message Sizes
For J-root
Mean Size, Bytes
600
500
400
300
200
100
0
06
10
14
18
22
02
06
May05
May06
Responses
Queries


UDP Priming Query Rate
for the previous month
as of 2010–05–01 00:00:00
A single Cisco CNR
instance with
max-cache-ttl=0
Queries Per Second
450
400
350
300
250
200
150
100
50
0
MAR31
APR5
APR10
APR15
APR20
APR25
APR30
Date/Time, UTC
A–root
C–root
D–root
E–root
F–root
G–root
H–root
J–root
L–root
M–root

Generating a Root Key

Done.

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DNSSEC Root Zone KSK Ceremony 1

Where: 16 June 2010 in Culpeper, Virginia (outside the nuclear blast zone of Washington, DC)

When: Started at 17:25 UTC, ended at 00:25 UTC (1:25-8:25 PM)

Who: 30 people in a small room for 7 hours (without laptops!):

- 16 Trusted Community Representatives (TCRs) acting as Crypto Officers, Recovery Key Share Holders and backups
- 11 ICANN staff and contractors
- 1 external auditor
- 1 VeriSign representative to verify the KSR/ZSK (Matt!!)
- 1 external camera man

What: ***19036*** (DNSSEC Key Tag for KSK)

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DNSSEC Root Zone KSK Ceremony 1 TCRs

- Sacrificed time and money to improve the confidence in and acceptance of DNSSEC in the root
- 14 Crypto Officers (CO) – 7 for US East and 7 for US West key management facilities
- 7 Recovery Key Share Holders (RKSH)
- Not from an organization affiliated with the root zone management process (ICANN, VeriSign, or the U.S. Department of Commerce)

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TCRs

- Crypto Officers (COs)
  - Have physical keys to safe deposit boxes holding smartcards that activate the HSM
  - ICANN cannot generate new key or sign ZSK without 3-of-7 COs
  - Able to travel up to 4 times a year to US. Don't lose key.

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TCRs

- Recovery Key Share Holders (RKSHs)
  - Have smartcards holding pieces (M-of-N) of the key used to encrypt the KSK inside the HSM
  - If both key management facilities fall into the ocean, 5-of-7 RKSH smartcards and an encrypted KSK smartcard can reconstitute KSK in a new HSM
    - Backup KSK encrypted on smartcard held by ICANN
  - Able to travel on relatively short notice to US. Hopefully never. Annual inventory.

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CO

Alain Aina, BJ
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Frederico Neves, BR
Gaurab Upadhaya, NP
Olaf Kolkman, NL
Robert Seastrom, US
Vinton Cerf, US

Andy Linton, NZ
Carlos Martinez, UY
Dmitry Burkov, RU
Edward Lewis, US
João Luis Silva Damas, PT
Masato Minda, JP
Subramanian Moonesamy, MU

CO Backup

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Fabian Arbogast, TZ
John Curran, US
Nicolas Antoniello, UY
Rudolph Daniel, UK
Sarmad Hussain, PK
Ólafur Guðmundsson, IS

RKSH

Bevil Wooding, TT
Dan Kaminsky, US
Jiankang Yao, CN
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Paul Kane, UK

BCK

David Lawrence, US
Dileepa Lathsara, LK
Jorge Etges, BR
Kristian Ørmen, DK
Ralf Weber, DE
Warren Kumari, US

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Quick Recap

- 2048-bit RSA KSK, 1024-bit RSA ZSK
- Signatures with RSA/SHA-256
- Split ZSK/KSK operations
- KSK and ZSK policies and other documents published on http://www.root-dnssec.org

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DS Change Requests

- Accepting DS records NOW

- DS records handling document at http://www.root-dnssec.org/documentation/

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Next….

- Key Ceremony on 12 July 2010 in Los Angeles, California, completes the process
- Key material then replicated and stored in the West coast facility
- At L.A. ceremony, KSR for Q4 will also be signed
- See http://dns.icann.org/ksk

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15 July 2010
Finally…the DVRZ

- A fully validatable production root zone is currently planned to be published
- Another data collection (five days)
- Root zone trust anchor to be published by ICANN (the IANA Functions Operator)

Key Ceremony
Participants and Attendees

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Acknowledgements

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David Conrad
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Jakob Schlyter
Duane Wessels

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VeriSign Staff:

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