

Gulliver Project

- status update in 2009 -

Yuji Sekiya, Kenjiro Cho

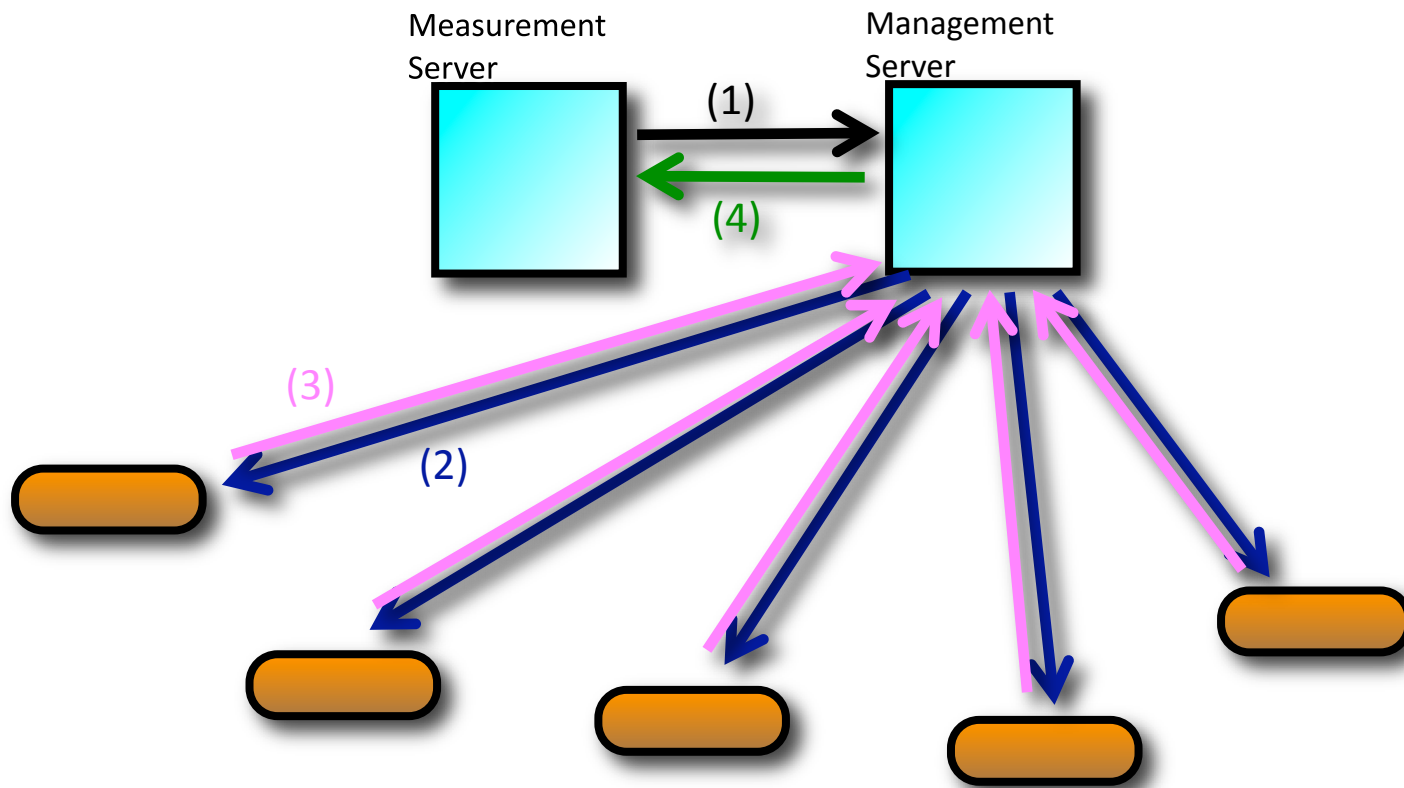
The Univ. of Tokyo / WIDE Project

sekiya@wide.ad.jp

Introduction

- Gulliver Project
 - Active Measurement Framework
 - Performing DNS Active Measurement since 2006
 - **<http://gulliver.wide.ad.jp/>**
- Probes DNS reachability from worldwide locations
 - RTT, Query Timeout
 - Node ID (hostname.bind or server.id)
- 30 Probe Locations as of Feb. 2010
 - Including South/East Asia and Africa countries
- Targets
 - Root, ccTLD, in-addr.arpa DNS servers

Overview of Our Framework



- (1) Measurement Requests
 - (2) Send commands to each node
 - (3) Upload Results
 - (4) Get Results
- Measurement Boxes

Management of measurement nodes

The screenshot displays the Management Console of SEIL, a web-based interface for managing measurement nodes. The main view shows a table of nodes with columns for ID, SEIL Name, DHCP, SMF, IP address, status, and various management options. A red arrow points from the 'WIDE KDDI, Japan' entry in the table to a detailed 'SEIL Information' panel. This panel provides specific details for the selected node, including its tag ID, alias name, operational status, IP address, and probe times. Below the information panel are buttons for 'Log', 'Reboot', 'Edit', and 'Config'. A second red arrow points from the 'Log' button to a third window showing the 'Operational Log' for the node, which contains a chronological list of system events and warnings. A third red arrow points from the 'Config' button to a fourth window showing the 'Current Config of SEIL box', which lists various configuration parameters and their values.

ID	SEIL Name	DHCP	SMF	IP address	Measurement	Probes	Firmware	Last
1	WIDE LosAngeles, USA	YES	YES	203.178.137.11	up	4516409	WIDEstat v1.03 20070817	Oct 15 2007
2	WIDE KDDI, Japan	YES	YES	203.178.137.11	up	2991580	WIDEstat v1.03 20070817	Oct 15 2007
3	Registro.br, Brazil	NO	YES	200.160.7.167	up	3705925	WIDEstat v1.03 20070817	Oct 15 2007
4	WIDE NTT, Japan	YES	YES	203.178.137.230	up	4776387	WIDEstat v1.03 20070817	Oct 15 2007
5	WIDE DOJIMA-1, Japan	YES	YES	203.178.138.203	up	2713910	WIDEstat v1.03 20070817	Oct 15 2007
6	WIDE DOJIMA-3, Japan	YES	YES	203.178.138.204	up	3272057	WIDEstat v1.03 20070817	Oct 15 2007
7	WIDE Paris, France	NO	NO	192.134.1.110	up	4588361	WIDEstat v1.03 20070817	Oct 15 2007
8	APNIC, Australia	NO	YES	202.12.29.90	up	4601767	WIDEstat v1.03 20070817	Oct 15 2007 13:00:03 (JST)
9	NECTEC, Thailand	NO	YES	203.185.129.51	up	4308900	WIDEstat v1.03 20070817	Oct 15 2007 13:01:50 (JST)
10	AIT, Thailand	NO	YES	203.159.31.13	up	4451286	WIDEstat v1.03 20070817	Oct 15 2007 13:01:50 (JST)
11	JGN2, Japan	NO	YES	202.180.34.40	up	4901477	WIDEstat v1.03 20070817	Oct 15 2007 13:01:50 (JST)
12	The Univ. of Tokyo, Japan	YES	YES	130.69.250.226	up	4930252	WIDEstat v1.03 20070817	Oct 15 2007 13:01:50 (JST)
13	IITLAB, Japan	YES	YES	202.214.86.167	up	4609193	WIDEstat v1.03 20070817	Oct 15 2007 13:01:50 (JST)
14	KT, Korea	NO	NO	61.252.48.19	up	3862929	WIDEstat v1.03 20070817	Oct 15 2007 13:01:50 (JST)
15	MIMOS, Malaysia	NO	YES	202.187.22.141	up	2141124	WIDEstat v1.03 20070817	Oct 15 2007 13:01:50 (JST)
16	CAIDA, USA	NO	NO	192.172.226.242	down		WIDEstat v1.03 20070817	Oct 15 2007 13:01:50 (JST)
17	Spain	YES	YES	130.69.250.227	down		WIDEstat v1.03 20070817	Oct 15 2007 13:01:50 (JST)
18	UCSC, Sri Lanka	NO	YES	192.248.16.124	up	756036	WIDEstat v1.03 20070817	Oct 15 2007 13:01:50 (JST)
19	University of Napoli Federico II, Italy	YES	YES	143.225.229.188	up	362215	WIDEstat v1.03 20070817	Oct 15 2007 13:01:50 (JST)
20	The Univ. of Auckland, New Zealand	YES	YES	130.216.76.3	up	124304	WIDEstat v1.03 20070817	Oct 15 2007 13:01:50 (JST)

SEIL Tag ID	UT508-7210203						
Alias Name	WIDE KDDI, Japan						
Operational Status	UP						
IP address	203.178.137.11						
DHCP	YES						
Managed by SMF	YES						
Firmware Version	WIDEstat v1.03 20070817						
Total Probe Times	2991580 Probes						
Probe Status	<table border="1"> <tr> <td>ROOT</td> <td>CCTLD</td> <td>ARPA</td> </tr> <tr> <td>STOP</td> <td>RUNNING</td> <td>RUNNING</td> </tr> </table>	ROOT	CCTLD	ARPA	STOP	RUNNING	RUNNING
ROOT	CCTLD	ARPA					
STOP	RUNNING	RUNNING					
This Object was created	Mon Apr 09 16:50:01 JST 2007						
Last Update	Mon Oct 15 13:08:17 JST 2007						

```

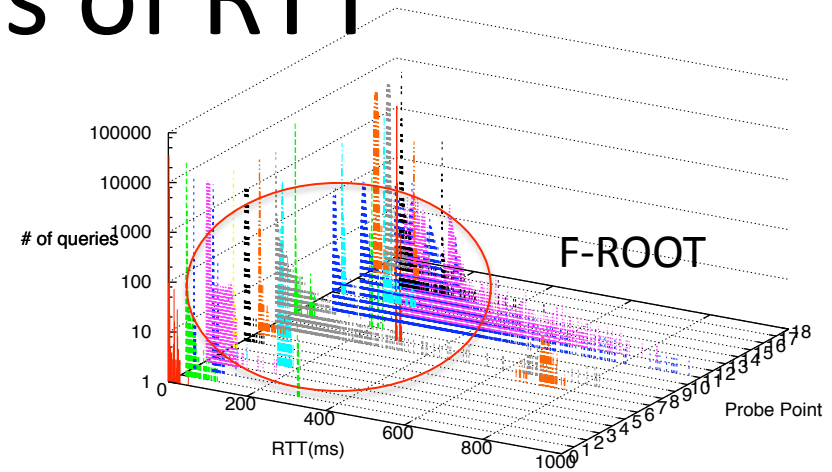
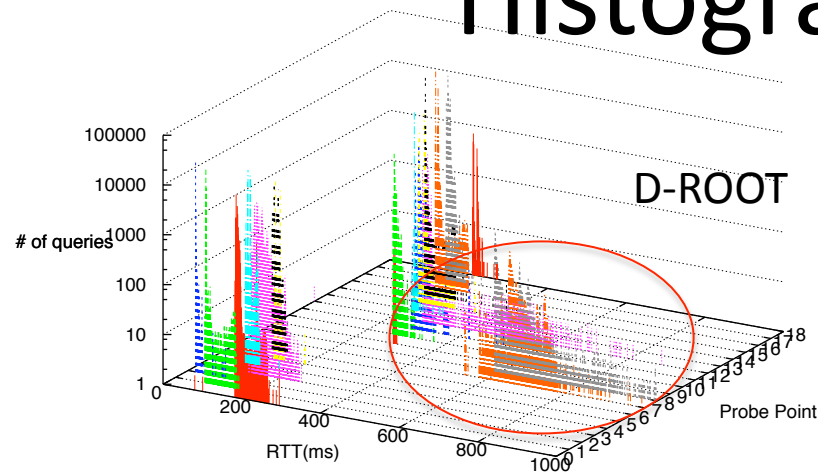
1 Jan 1 00:00:00 notice system ipfw: IPv4/IPv6 Packet Filter Initialized
2 Jan 1 00:00:04 warn system selconfig: error: no such command: httdp
3 Jan 1 00:00:04 notice system selfreinitiaze: Sending HUP signal to syslogd
4 Jan 1 09:00:04 crit ether lan1: link up (100baseTX-FDX)
5 Jan 1 09:00:06 info queue selfreinitiaze: initialized cbq
6 Jan 1 09:00:06 info queue selfreinitiaze: disabled cbq on lan1
7 Jan 1 09:00:06 notice system selfreinitiaze: Sending HUP signal to wantraced
8 Jan 1 09:00:06 info trace wantraced: restart
9 Jan 1 09:00:07 info system selfreinitiaze: Remote-Console(SERIAL 1) disable
10 Jan 1 09:00:07 warn system selconfig: error: no such command: httdp
11 Jan 1 09:00:07 notice system selfreinitiaze: Sending HUP signal to syslogd
12 Jan 1 09:00:09 info route zebra[352]: Terminating on signal
13 Jan 1 09:00:10 info queue selfreinitiaze: initialized cbq
14 Jan 1 09:00:10 info queue selfreinitiaze: disabled cbq on lan1
15 Jan 1 09:00:10 notice system selfreinitiaze: Sending HUP signal to wantraced
16 Jan 1 09:00:10 info trace wantraced: restart
17 Jan 1 09:00:10 notice system selfreinitiaze: Sending TERM signal to sshd
18 Jan 1 09:00:13 info system selfreinitiaze: Remote-Console(SERIAL 1) disable
19 Jan 1 09:00:26 warn system selconfig: error: no such keyword
20 Jan 1 09:00:26 warn system selconfig: error: no such keyword
21 Jan 1 09:00:26 warn system selconfig: error: no such command: httdp
22 Jan 1 09:00:26 warn system selconfig: error: no such keyword
23 Jan 1 09:00:26 warn system selconfig: error: no such keyword
24 Jan 1 09:00:27 warn system selconfig: error: no such command: httdp
25 Jan 1 09:00:34 warn smf sup-get 3: error! in uconfig
26 Jan 1 09:00:34 warn system selconfig: error: no such keyword
27 Jan 1 09:00:34 warn system selconfig: error: no such keyword
28 Jan 1 09:00:34 warn system selconfig: error: no such command: httdp
29 Jan 1 09:00:34 notice system selfreinitiaze: Sending HUP signal to syslogd
30 Jan 1 09:00:36 notice system dhcpd-script: starting bind
31 Jan 1 09:00:36 notice system dhcpd-script: using version 1.4-beta
  
```

Config/Version: 2.03
 Config/Label:
 hostname NICT-SEIL-KOTE
 timezone Japan
 encrypted-password user KaTV3pDOL6RE
 encrypted-password admin KaTV3pDOL6RE
 environment login-user 300
 environment pager on
 environment terminal auto-rotate off
 option ip monitor-linkstate off
 option ip monitor-linkstate off
 option ipfw monitor-linkstate off
 option ipfw restricts on
 option ipfw update-connected-route off
 interface lan0 md auto
 interface lan0 media auto
 interface lan1 media auto
 interface lan1 md auto
 interface lan1 media normal
 interface lan1 md auto
 interface lan1 md auto
 interface lan1 md auto
 interface lan1 md auto
 bridge ip-bringing on
 bridge ip-bringing on
 bridge vman-apid none
 route static default-rip disable
 route dynamic rip default-route-originate disable
 route dynamic rip default-route-originate disable
 route dynamic ospf disable
 route dynamic ospf disable
 route dynamic redistribute rip-to-ospf disable
 route dynamic redistribute connected-to-rip enable
 route dynamic redistribute ospf-to-rip disable
 route dynamic redistribute static-to-ospf disable
 route dynamic redistribute static-to-rip disable
 route dynamic redistribute connected-to-ospf enable
 route dynamic pim-sparse disable

Analysis of DNS Measurements

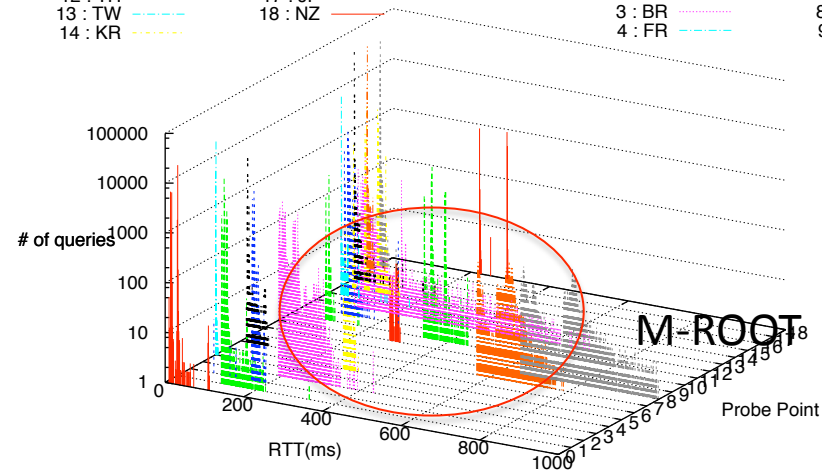
- Span
 - From Jan. 2009 to Dec. 2009
- Targets
 - Root DNS Servers
- RTT distribution
 - We found there are 3 types of RTT distribution on Root DNS Servers

Histograms of RTT



- | | | | |
|--------|--------|---------|---------|
| 0 : US | 5 : IT | 10 : MY | 15 : JP |
| 1 : US | 6 : NL | 11 : TH | 16 : JP |
| 2 : US | 7 : KE | 12 : TH | 17 : JP |
| 3 : BR | 8 : KE | 13 : TW | 18 : NZ |
| 4 : FR | 9 : LK | 14 : KR | |

- | | | | |
|--------|--------|---------|---------|
| 0 : US | 5 : IT | 10 : MY | 16 : JP |
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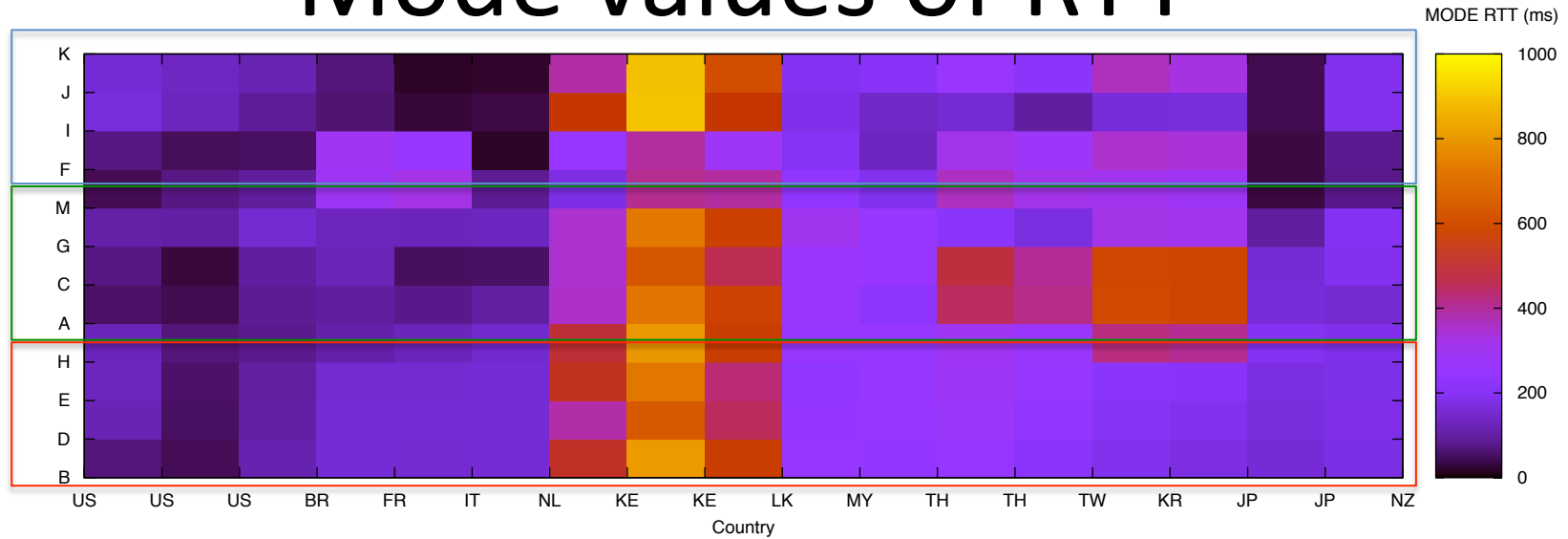
- | | | | |
|--------|--------|---------|---------|
| 0 : US | 5 : IT | 10 : MY | 15 : JP |
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| 2 : US | 7 : KE | 12 : TH | 17 : JP |
| 3 : BR | 8 : KE | 13 : TW | 18 : NZ |
| 4 : FR | 9 : LK | 14 : KR | |

Categorize Root DNS Servers by Anycasting deployment

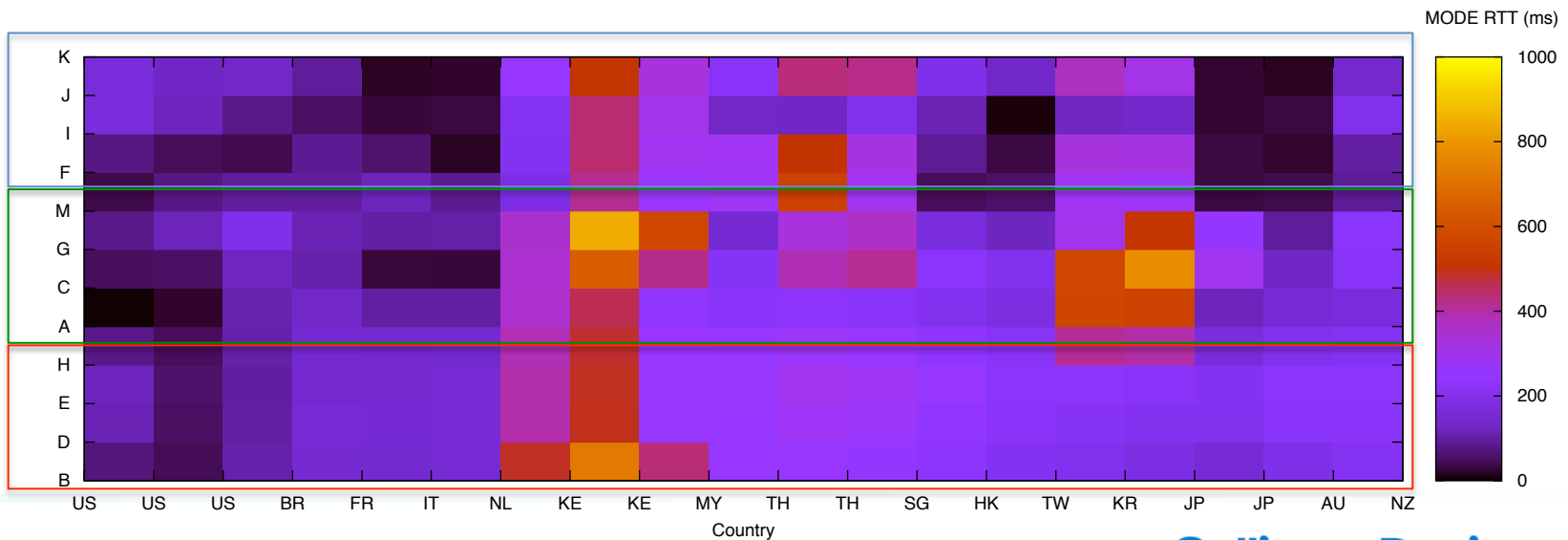
- Root DNS Servers are categorized by its operation policy
 - Type-1 : Non Anycasting
 - B(1) , D(1) , E(1) , H(1)
 - Type-2 : Anycasting
 - A(6) , C(6) , G(6) , L(3) , M(6)
 - Type-3 : Heavily Anycasting
 - F(49) , I(34) , J(70) , K(18)
- Any relation ???
 - Anycast Changes, RTT, and Query Timeout

Mode values of RTT

2008

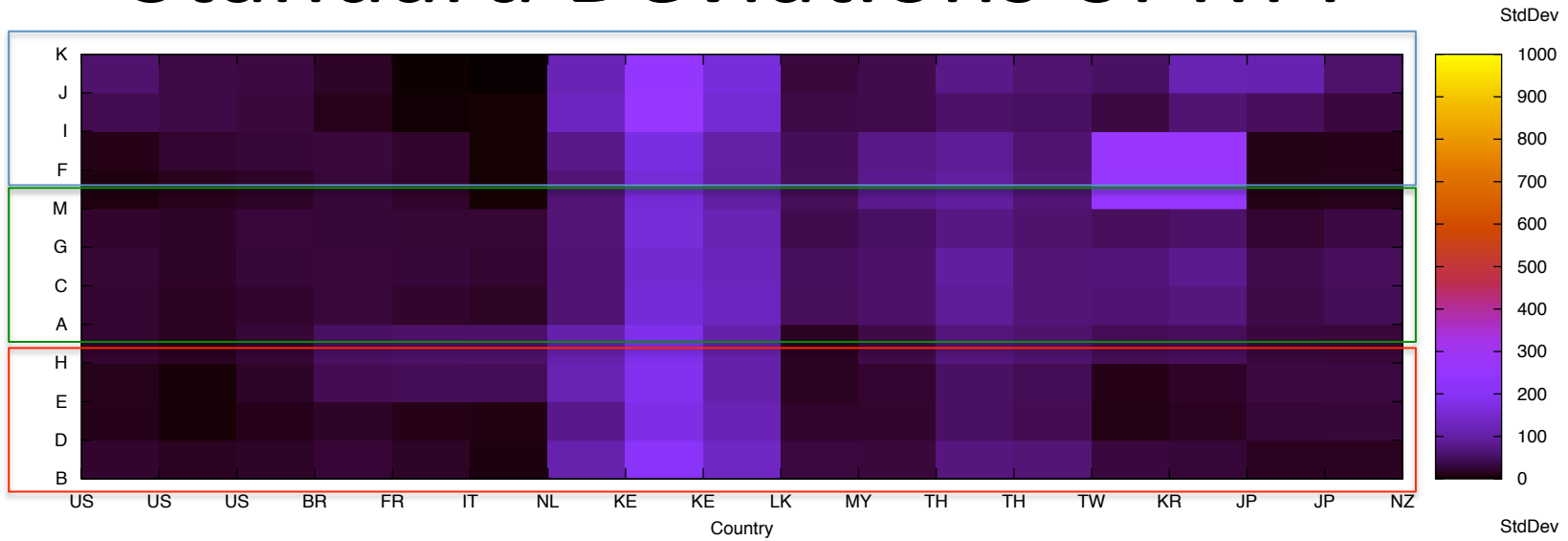


2009

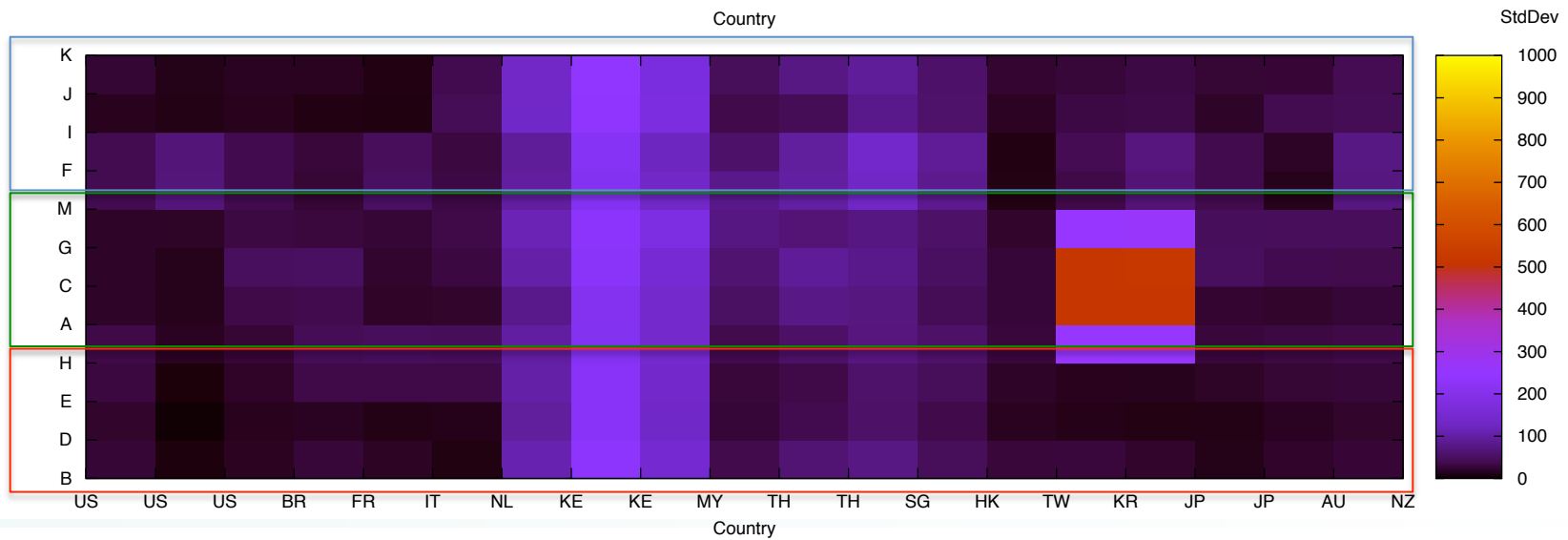


Standard Deviations of RTT

2008

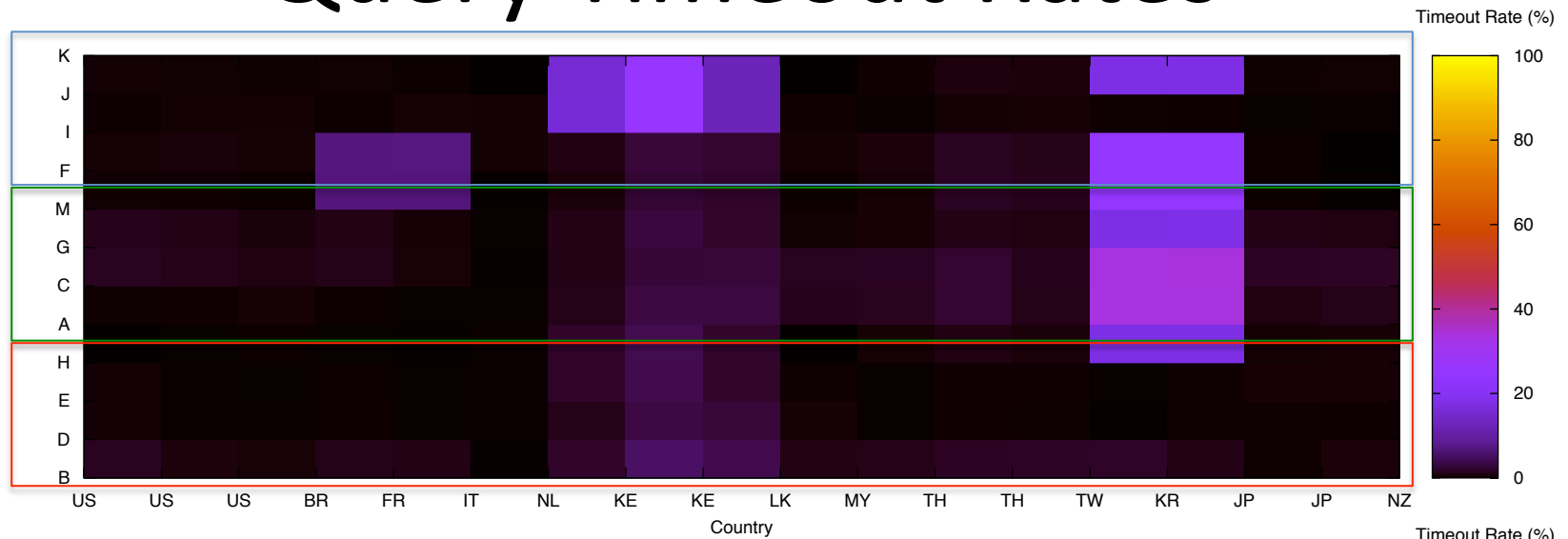


2009

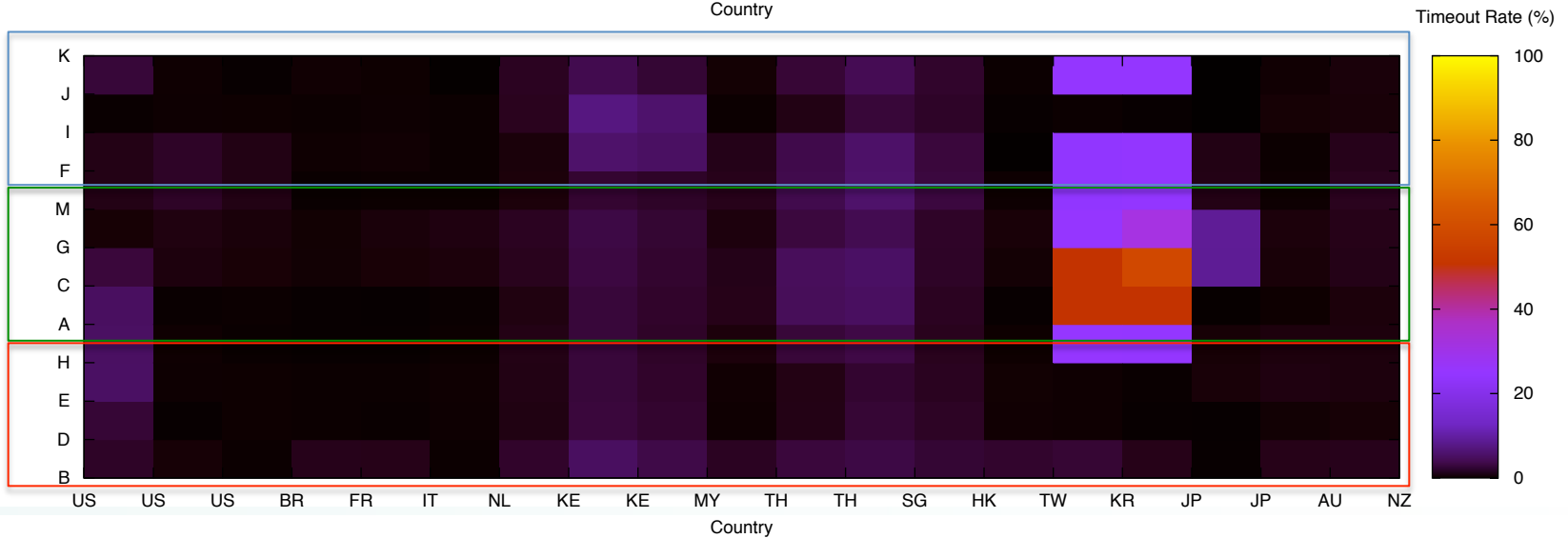


Query Timeout Rates

2008

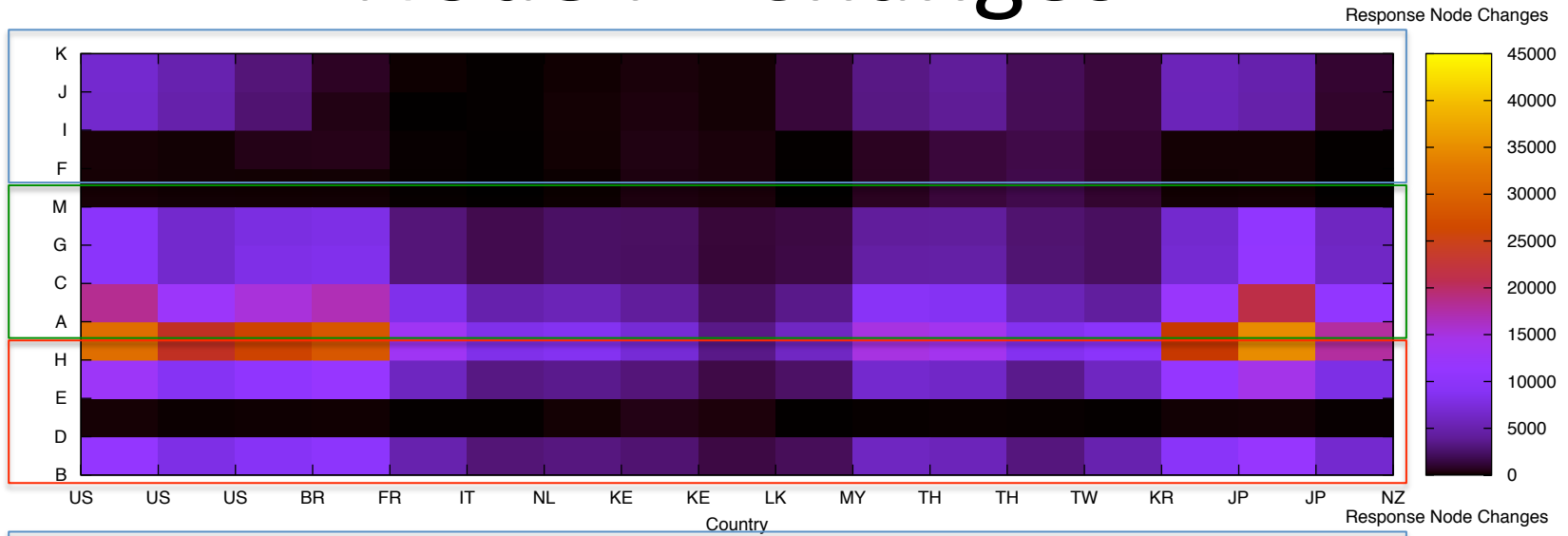


2009

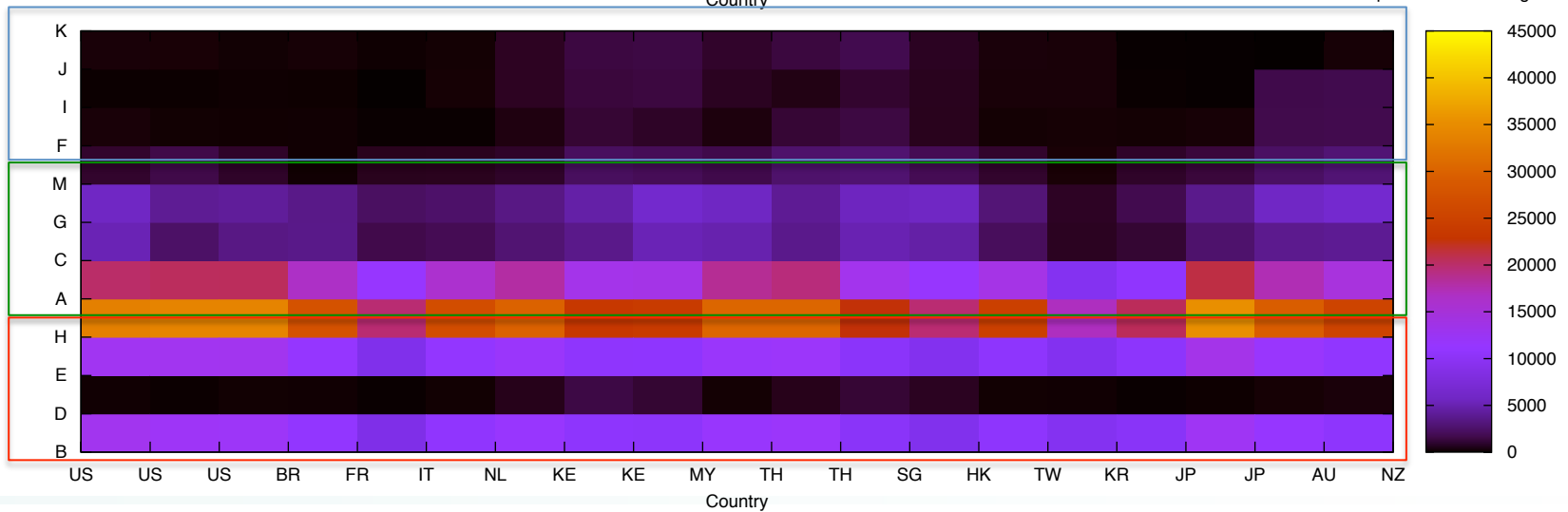


Node ID Changes

2008

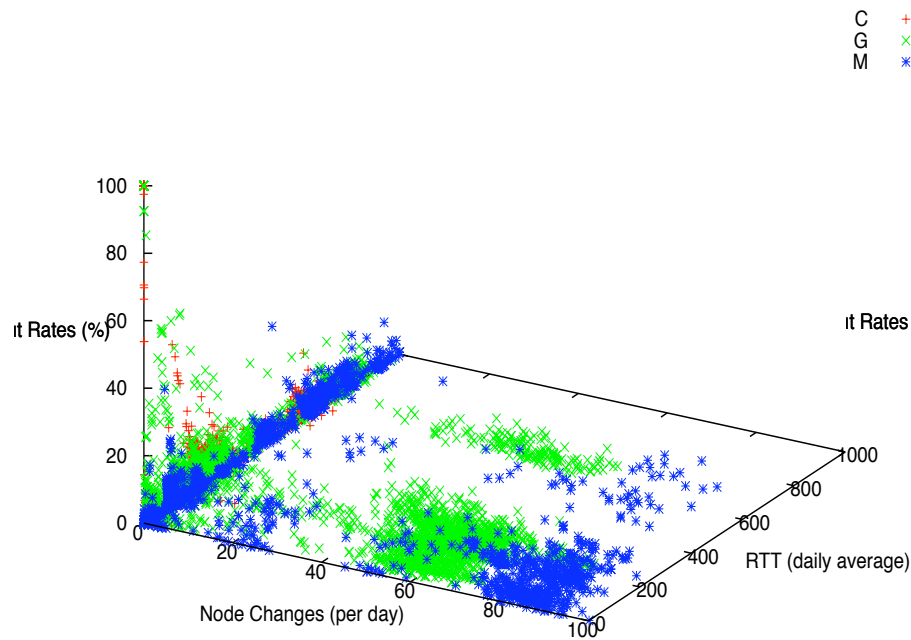


2009

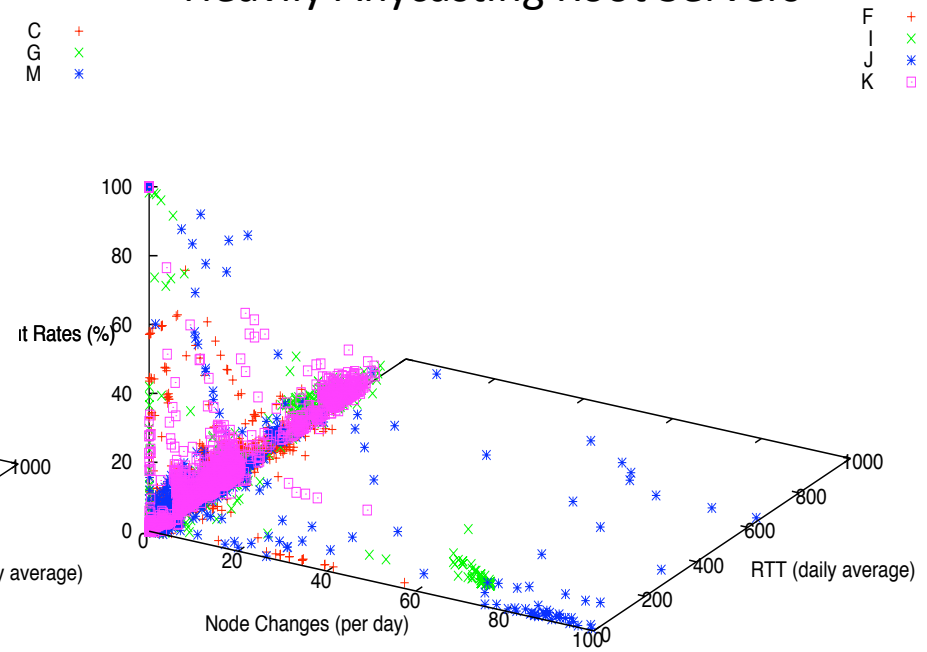


Relation with RTT, Node Changes, and Timeout Rates

Anycasting Root Servers



Heavily Anycasting Root Servers



Further works

- IPv6 measurements
 - Only a few probe locations support IPv6
- DNS packet size measurements
 - EDNS0
 - TCP query

Problems of management

- Have been continued the measurements about 3 years...
- Measurement nodes in developing countries often lost connectivity
- Can not control measurement nodes
 - Affects results of long-term measurement
- Our measurement node does nothing under uncontrollable situation
 - For safety of measurement traffic
 - But lack of measurement data

Future Plan

- It is too costly to deploy and manage measurement framework.
- Collaboration with Other Measurement Frameworks
 - Data exchange
 - Interconnection of Measurement Mechanism
 - Planning to interconnect with TopHat