

ICANN 75
ANNUAL GENERAL
KUALA LUMPUR



Email Address Internationalization (EAI) Support Survey tool

ICANN 75 - TechDay

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EAI Support Survey Tool

- **Purpose:**

Survey Email Address Internationalization (EAI) support on mail exchanger (MX) servers of second level domain names across TLDs.

- **Input:**

- TLD zone file(s)
- public DNS

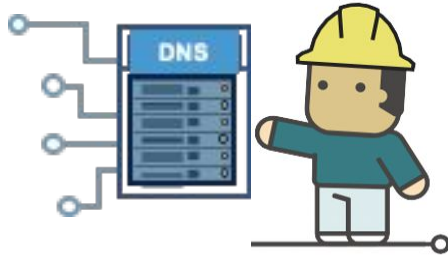
- **Output:**

Lists classified per TLD, country and EAI support verification results of:

- SLDs
- MX servers
- IP addresses

Support Survey Process

1



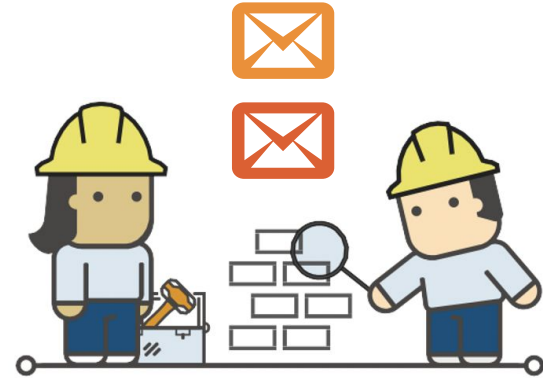
For each TLD:

- Get the list of SLDs in the zone.
- Query the DNS for existing MX records in the SLDs and their corresponding IP addresses.

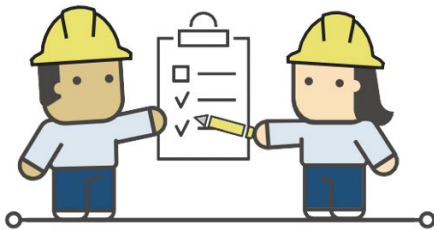
2

For each MX IP address:

- Retrieve IP geolocation details.
- Test IP address using 2 test IDN addresses:
 - **non-ASCII@a-label-domain**
 - **non-ASCII@u-label-domain**
- **EHLO** command and look for “SMTPUTF8”.
- **MAIL FROM** command and validate for a “250” response
- **QUIT**



3



Store result for MX EAI support:

- **Full:** All IPs passed.
- **Partial:** Some IPs passed.
- **None:** No IPs passed.

Test Example

Connect to email server

EHLO test

MAIL FROM test (u-label)

Terminate connection

```
C: $ telnet 35.80.244.233 25
Trying 35.80.244.233...
Connected to mx1.testo.tel.
Escape character is '^]'.
S:      220 mx1.testo.tel ESMTP Postfix
C: EHLO client.example.com.
S:      250-mx1.testo.tel
S:      250-PIPELINING
S:      250-SIZE 51200
S:      250-VRFY
S:      250-ETRN
S:      250-ENHANCEDSTATUSCODES
S:      250-8BITMIME
S:      250-DSN
S:      250-SMTPUTF8
S:      250 CHUNKING
C: MAIL FROM: <Почта@испытание.онлайн> SMTPUTF8
S:      250 2.1.0 Ok
C: quit
S:      221 2.0.0 Bye
Connection closed by foreign host.
```

Tool Implementation

- **Compiling the tool**

- Java Compiler version 8 or later.
- Apache Maven version 3.6 or later.

- **Execution**

- Java JRE version 8 or later.
- Docker CE version 20.10.7 or later.
- MariaDB client version 15.1 or later.
- SnowSQL version 1.2.16 or later.
- User must be on the docker group.
- User must be able to run sudo.

- Source code available at:

<https://github.com/icann/eai-survey-tool>

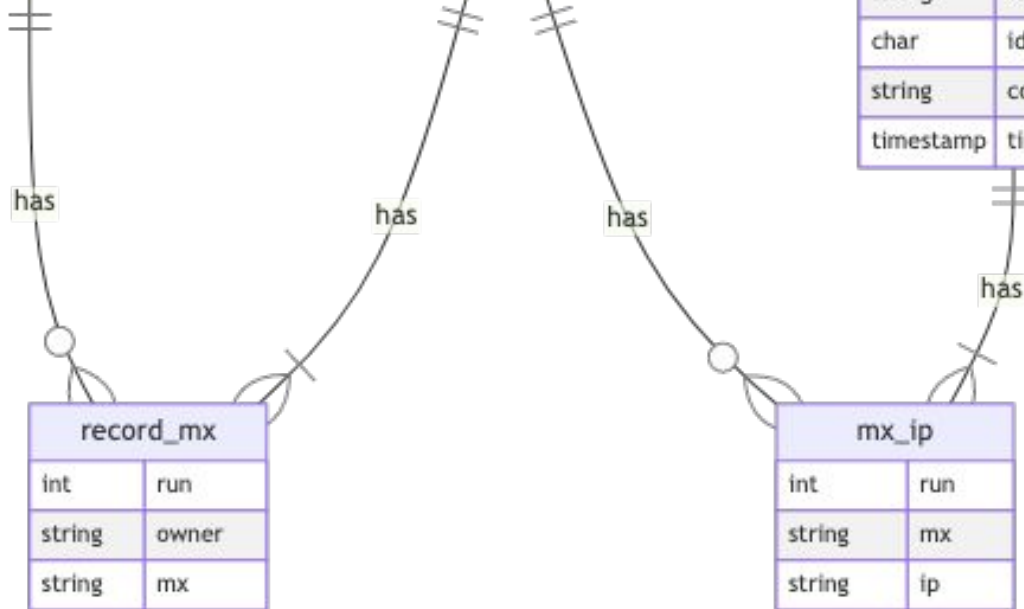
Data Model

progress	
int	run
int	id
string	name
timestamp	timestamp

record	
int	run
string	owner
string	zone
char	status

mx	
int	run
string	mx
char	status_4
char	status_6

ip	
int	run
string	ip
string	header
string	ehlo_result
char	ehlo_success
string	ascii_result
char	ascii_success
string	idn_result
char	idn_success
string	country
timestamp	timestamp



Third Party Services

- The survey tool is configured to run in an [AWS virtual environment](#) which allows to keep testing independent from ICANN's internal infrastructure.
- Google's public resolver is used when resolving SLD's MX records in the DNS.
- [Maxmind](#) service for IP geolocation data (at the country level) to identify the country associated with a mail server IP address.
- [Snowflake](#) is used to persist and process the complete survey results in their cloud data warehousing service.

False Negatives Mitigation

- The server where the survey runs has:
 - Functional SMTP server configured to receive email for the test addresses.
 - Load balancing with 2 IPv4 and 2 IPv6 addresses.
 - Switched to new set of IP addresses in the server for the last survey and saw no impact in the results
- The survey tool does NOT send any emails.
- IP addresses are tested only once.
- Implemented a maximum number of retries (1) and waiting times (30 sec) for each test performed in an IP.
- Implemented wait times between tests involving IP addresses found within the same /16 IPv4 or /48 IPv6 block.

Known Issues

- Automated DNS block lists (e.g. anti-spam "traps")
- Email servers with strict security policies that consider any contact from unknown servers as unsolicited traffic causing them to ignore or even report the source IP address as a potentially bad actor.

Survey Results - IP Address

Survey date	06-Jan-2022	07-Apr-2022	01-Jul-2022
Test email script	Cyrillic	Han	Arabic
Processed gTLD zones	1,173	1,172	1,170
Unique MX servers	35,129,853	35,521,173	35,190,999
Unique IP addresses	2,517,759	2,506,329	2,473,755
<ul style="list-style-type: none"> ● Test passed ● Test failed ● IP could not be tested 	<p style="text-align: center;">7.24 %</p> <p style="text-align: center;">2,517,759 TOTAL</p> <p style="text-align: center;">32.89 % 59.93 %</p>	<p style="text-align: center;">7.32 %</p> <p style="text-align: center;">2,506,329 TOTAL</p> <p style="text-align: center;">33.06 % 59.61 %</p>	<p style="text-align: center;">7.38 %</p> <p style="text-align: center;">2,479,755 TOTAL</p> <p style="text-align: center;">33.32 % 59.30 %</p>

Survey Results - MX Server

Survey date	06-Jan-2022	07-Apr-2022	01-Jul-2022
Test email script	Cyrillic	Han	Arabic
Processed gTLD zones	1,173	1,172	1,170
Unique MX servers	35,129,853	35,521,173	35,190,999
Unique IP addresses	2,517,759	2,506,329	2,473,755
<ul style="list-style-type: none"> ● MX Full ● MX Partial ● MX None ● Not tested ● No IPs 	<p>35,129,853 TOTAL</p>	<p>35,521,173 TOTAL</p>	<p>35,190,999 TOTAL</p>

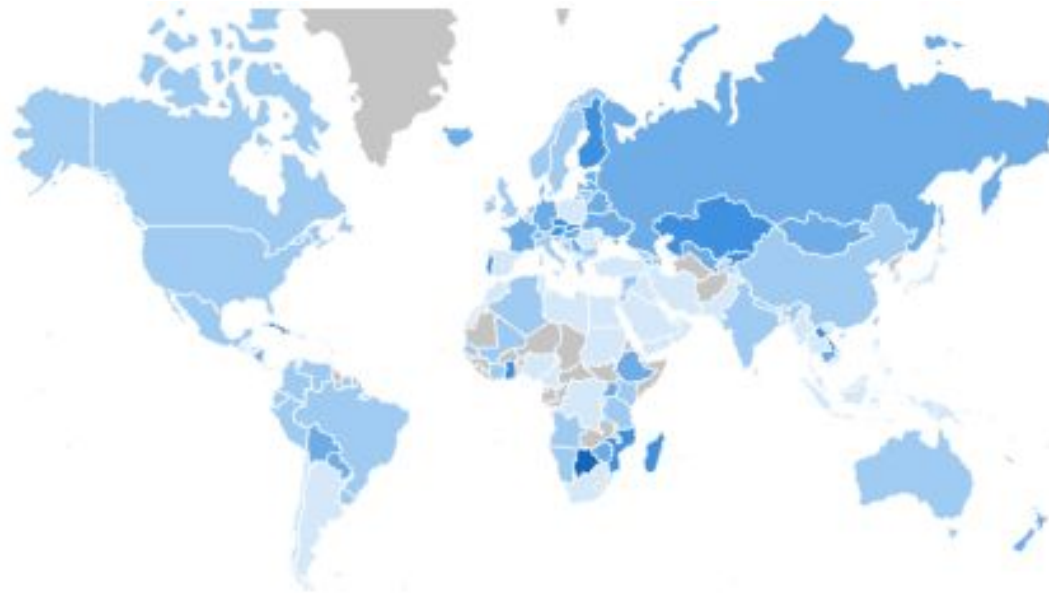
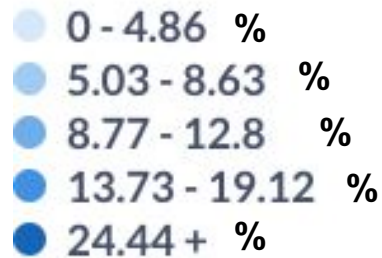
Survey Results - Per TLD

- Highest rates per gTLD (with 150,000+ MX servers surveyed)

TLD	Total SLDs	Total MX found	MX EAI full support %	MX with full EAI support	MX with partial EAI support	MX with no EAI support
page.	60,442	152,341	91%	138,922	7	13,412
studio.	97,323	168,613	49%	82,962	24	85,627
dev.	305,286	457,775	41%	188,116	189	269,470
org.	10,578,079	12,552,501	36%	4,479,749	23,465	8,049,287
com.	159,282,619	155,531,192	35%	54,933,602	523,403	100,074,187
design.	118,100	180,052	35%	63,283	136	116,633
app.	606,008	481,932	32%	153,886	83	327,963
email.	111,358	164,749	30%	48,952	211	115,586
tech.	384,920	400,714	27%	109,216	233	291,265
net.	13,036,676	12,977,486	27%	3,477,178	36,431	9,463,877
life.	254,964	195,415	27%	52,271	194	142,950
one.	168,311	266,771	26%	69,609	75	197,087
digital.	123,708	202,295	24%	47,554	60	154,681
work.	264,754	180,189	23%	41,700	1,933	136,556
biz.	1,408,065	1,330,598	22%	292,591	6,296	1,031,711
pro.	282,603	296,945	22%	64,399	1,608	230,938

EAI Support Rate per Country

- Results from 01 Jul 2022 show the following support rates of surveyed addresses per country associated to the IP address



Next Steps (1/2)

- Integration with the “Identifier Technology Health Indicators” (ITHI) metrics <https://ithi.research.icann.org/>
- Identifying the mail server software based on the test results.
- Persist if the 8BITMIME header is present or not (new check of EHLO response)
- Dockerize application
- Configuration to disable geolocation feature
- Send internal notification when execution ends or is interrupted

Next Steps (2/2)

- Log the type of connection error when there is no server response
- Configure DKIM in testo.tel server
- Configure DMARC in testo.tel server
- Support SMTP over TLS (port 465) (RFC 7672)
- Support for STARTTLS (RFC 3207)
- Support for “Null MX” (RFC 7505)
- Add logic to retry connections that fail due to transient errors (e.g. ratelimit, concurrent connections, etc.)

ccTLDs Are Invited to Participate!

- Measure the EAI support rate in the email servers configured for domain names in your ccTLD.
- ccTLDs may be included in ICANN's survey by granting access to the ccTLD zone file.
- Opportunity to also participate in other ICANN projects:
 - [Domain Abuse Activity Reporting \(DAAR\)](#)
 - [Monitoring System API](#)

Please contact:

GlobalSupport@icann.org



Thank You and Questions