

Measuring DNSSEC

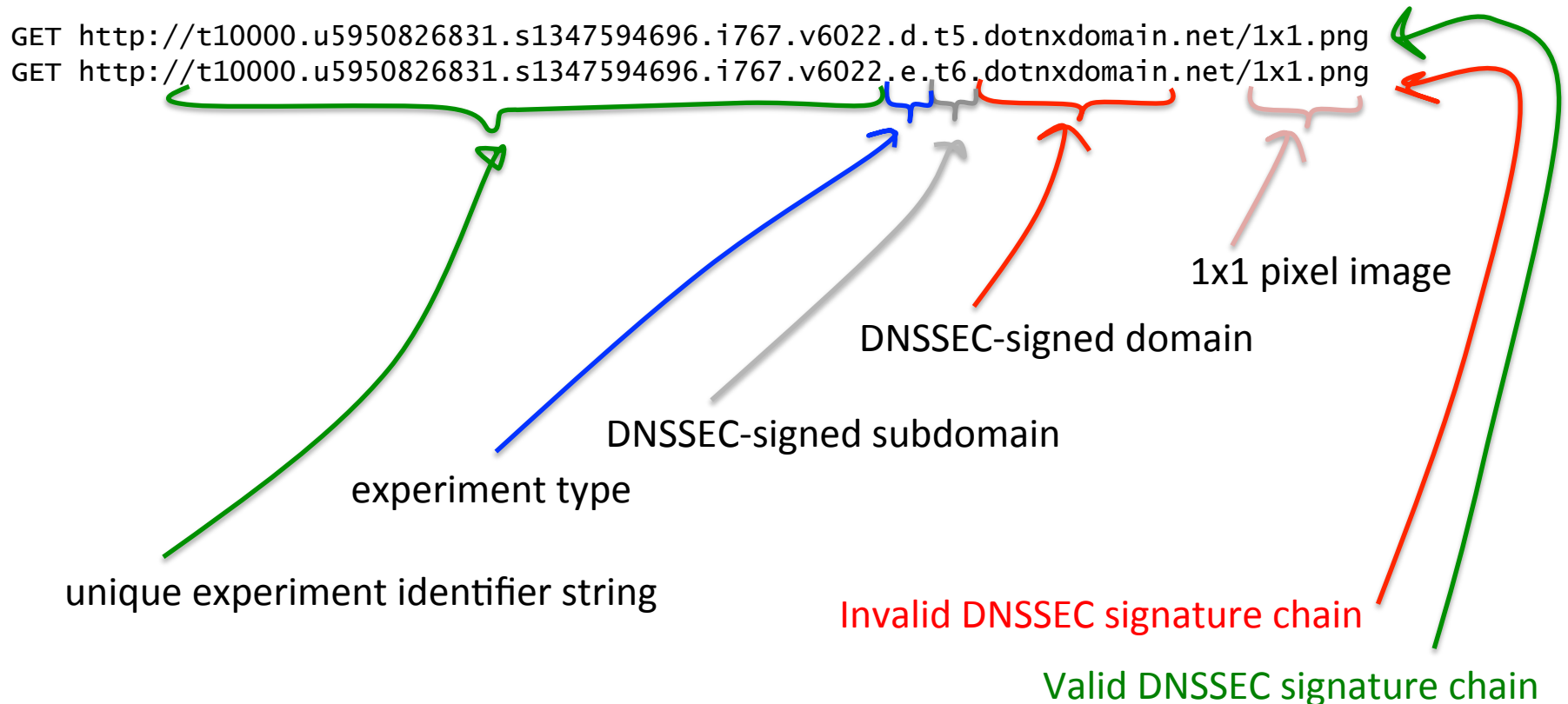
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What are the questions?

1. What proportion of DNS resolvers are DNSSEC-capable?
2. What proportion of users are using DNSSEC-validating DNS resolvers?
3. Where are these users?

Experimental Technique

- Use code embedded in an online ad to perform two simple DNSSEC tests



The Experiment

- Embed the unique id generation and the ad control in flash code
- Get an online advertisement network to display the ad
- The underlying code and the retrieval of the image is executed as part of the ad display function
 - No click is required!
(or wanted!)

Experiment Run

10 – 17 September 2012

Resolvers:

- How many unique IP addresses queried for experiment domains in dotnxdomain.net?
- How many of these DNS resolvers also queried for the DNSKEY RR of dotnxdomain.net?

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- How many unique IP addresses queried for experiment domains in dotnxdomain.net?

57,268

- How many of these DNS resolvers also queried for the DNSKEY RR of dotnxdomain.net?

2,316

Q1: What proportion of DNS
resolvers are DNSSEC-
capable?

4.0% of visible DNS resolvers appear to be performing DNSSEC validation

"small scale" Resolvers

How many "small" resolvers were seen: **40,446**

How many perform DNSSEC validation: **1,136**

What's the DNSSEC-active proportion of these resolvers: **2.8%**

Infrastructure Resolvers:

Filter out all resolvers that are associated with just 1 or 2 end clients

How many resolvers are left: **16,822**

How many perform DNSSEC validation: **1,180**

What's the DNSSEC-active proportion of these resolvers: **7.0%**

The Biggest Resolvers

DNSSEC? Clients	AS	AS NAME	Country
yes 47973	AS15169	GOOGLE - Google Inc.	USA
no 45990	AS4766	KIXS-AS-KR Korea Telecom	Korea
no 34213	AS3462	HINET Data Communication Business Group	Taiwan
no 28452	AS3786	LGDACOM LG DACOM Corporation	Korea
no 25949	AS9318	HANARO-AS Hanaro Telecom Inc.	Korea
no 21020	AS6799	OTENET-GR (Hellenic Telecommunications)	Greece
no 16379	AS5384	Emirates Telecommunications Corporation	UAE
no 16201	AS45595	PKTELECOM-AS-PK Pakistan Telecom	Pakistan
no 16179	AS4134	CHINANET-BACKBONE No.31	China
no 15321	AS25019	SAUDINETSTC-AS SaudiNet	Saudi Arabia
no 11881	AS16880	Global IDC and Backbone of Trend Micro	Japan
no 10665	AS4788	TMNET-AS-AP TM Net	Malaysia
no 9595	AS8452	TE-AS TE-AS	Egypt
no 9536	AS3356	LEVEL3 Level 3 Communications	USA
no 9232	AS4837	CHINA169-BACKBONE CNCGROUP China169	China
no 9210	AS9829	BSNL-NIB National Internet Backbone	India

Now lets look at Clients:

- How many unique IP addresses performed web fetches for objects named in the experiment?
- How many clients used DNS resolvers that also logged queries for the DNSKEY RR of dotnxdomain.net?

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770,934

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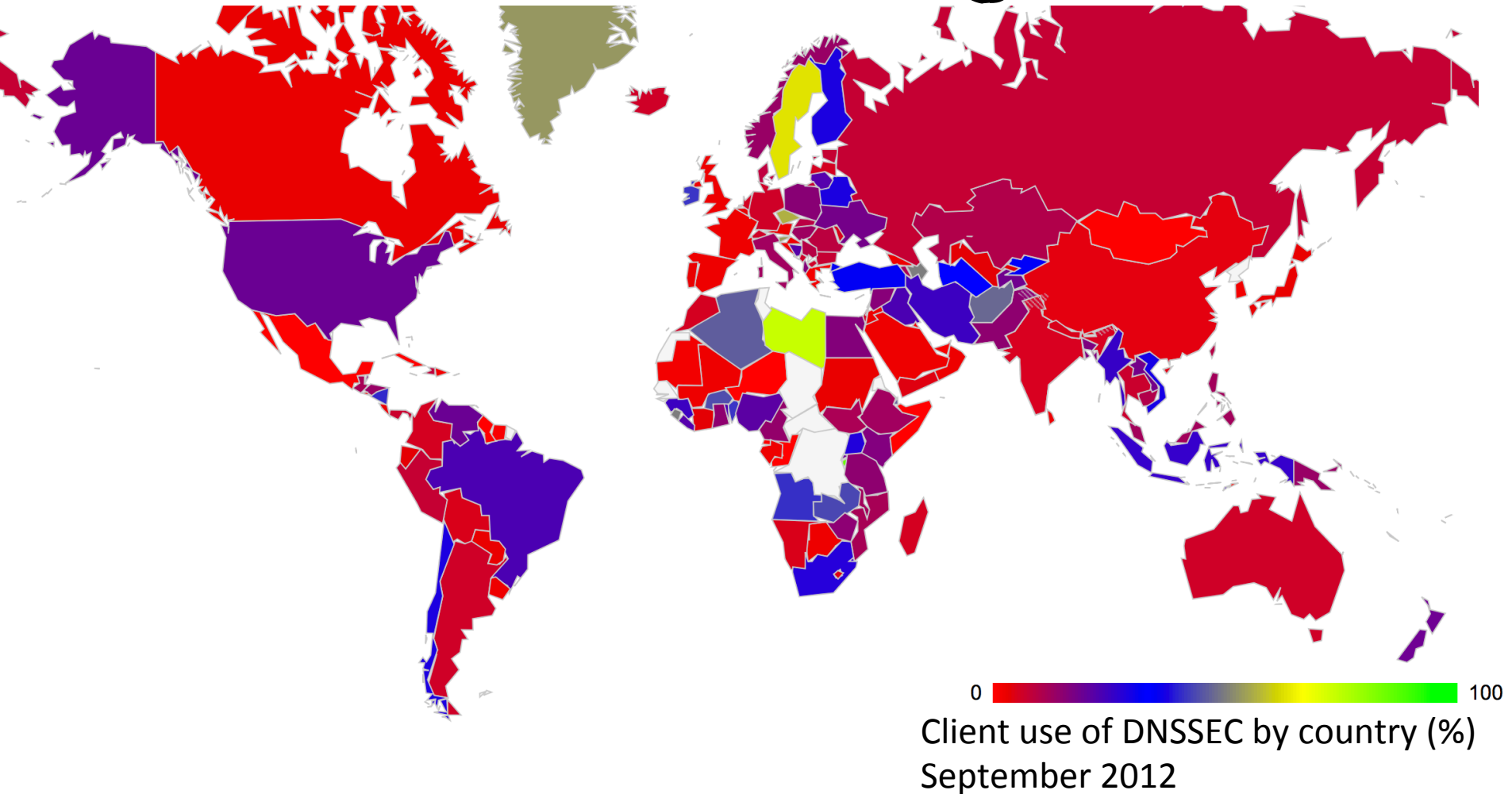
69,560

Q2: What proportion of
users are DNSSEC-
validating resolvers?

9.0% of end client systems are using DNS resolvers that appear to be performing DNSSEC validation

Q3: Where can we find
DNSSEC-validating users?

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The top of the country list

% who use DNSSEC	CC	sample client counts		
		DNSSEC	Total	
73.33%	LY	242	330	Libya
62.74%	SE	820	1307	Sweden
56.69%	CZ	1331	2348	Czech Republic
53.95%	SI	839	1555	Slovenia
53.79%	PS	568	1056	Occupied Palestinian Territory
49.93%	AZ	760	1522	Azerbaijan
46.41%	DJ	84	181	Djibouti
46.21%	DZ	1510	3268	Algeria
43.38%	ZM	154	355	Zambia
43.12%	LU	138	320	Luxembourg
42.01%	BN	92	219	Brunei Darussalam
41.22%	IE	807	1958	Ireland
40.74%	AO	66	162	Angola
40.13%	NI	61	152	Nicaragua
37.60%	FI	141	375	Finland
34.82%	TR	1793	5150	Turkey
34.31%	GU	47	137	Guam
32.33%	KG	43	133	Kyrgyzstan
29.75%	VN	1003	3371	Vietnam
29.11%	CL	845	2903	Chile
29.00%	DM	163	562	Dominica
28.97%	BY	352	1215	Belarus
28.50%	UG	181	635	Uganda
28.12%	ZA	737	2621	South Africa
26.10%	ID	3633	13921	Indonesia
25.62%	JM	154	601	Jamaica

Ranking only those countries with more than 100 sample points in this experiment run (136 countries)

And the bottom of the list

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% who use DNSSEC	CC	sample client counts DNSSEC	sample client counts Total	
2.63%	LK	115	4372	Sri Lanka
2.52%	CR	6	238	Costa Rica
2.49%	UY	27	1084	Uruguay
2.45%	GE	36	1472	Georgia
2.42%	BW	9	372	Botswana
2.36%	JO	50	2118	Jordan
2.33%	SA	376	16169	Saudi Arabia
2.30%	HR	117	5077	Croatia
2.30%	FR	336	14625	France
2.18%	AT	177	8113	Austria
2.15%	ES	176	8168	Spain
2.11%	AN	3	142	Netherlands Antilles
2.08%	OM	36	1732	Oman
2.03%	CY	165	8137	Cyprus
1.89%	KR	1469	77571	Republic of Korea
1.86%	MU	16	859	Mauritius
1.72%	GR	562	32649	Greece
1.70%	KW	40	2359	Kuwait
1.56%	MO	11	706	Macao Special Administrative Region of China
1.56%	SV	7	450	El Salvador
1.56%	TT	7	450	Trinidad and Tobago
1.46%	DO	20	1369	Dominican Republic
0.79%	AE	114	14374	United Arab Emirates
0.69%	MX	43	6274	Mexico
0.51%	QA	37	7263	Qatar
0.47%	MN	1	212	Mongolia

Ranking only those countries with more than 100 sample points in this experiment run (136 countries)

DNSSEC-Validating Clients by AS - the top AS's

% who use DNSSEC	ASN	sample client counts		
		DNSSEC	Total	
100.00%	44143	67	67	RS VIPMOBILE-AS Vip mobile d.o.o., Serbia
99.18%	31343	121	122	UA INTERTELECOM Intertelecom Ltd, Ukraine
98.65%	198471	73	74	IT , Italy
98.37%	44034	121	123	SE HI3G Hi3G Access AB, Sweden
97.53%	12849	79	81	IL HOTNET-IL Hot-Net internet services Ltd., Israel
96.96%	7657	575	593	NZ VODAFONE-NZ-NGN-AS Vodafone NZ Ltd., New Zealand
96.88%	12912	186	192	PL ERA Polska Telefonía Cyfrowa S.A., Poland
96.54%	48161	335	347	RO NG-AS SC NextGen Communications SRL, Romania
96.15%	22047	800	832	CL VTR BANDA ANCHA S.A., Chile
95.74%	34779	292	305	SI T-2-AS AS set propagated by T-2, d.o.o., Slovenia
95.00%	8473	57	60	SE BAHNHOF Bahnhof Internet AB, Sweden
95.00%	29562	228	240	DE KABELBW-ASN Kabel BW GmbH, Germany
94.37%	20776	67	71	FR OUTREMER-AS Outremer Telecom, France
93.84%	5713	533	568	ZA SAIX-NET, South Africa
93.54%	5603	478	511	SI SIOL-NET Telekom Slovenije d.d., Slovenia
93.01%	38511	133	143	ID TACHYON-AS-ID PT Remala Abadi, Indonesia
92.98%	8767	53	57	DE MNET-AS M-net AS, Germany
91.93%	34170	205	223	AZ AZTELEKOM Azerbaijan Telecommunication ISP, Azerbaijan
91.61%	5610	732	799	CZ TO2-CZECH-REPUBLIC Telefonía Czech Republic, a.s., Czech Republic
91.60%	1759	229	250	EU TSF-IP-CORE TeliaSonera Finland IP Network, European Union
91.30%	4704	63	69	JP SANNET SANYO Information Technology Solutions Co., Ltd., Japan
91.24%	5466	781	856	IE EIRCOM Eircom Limited, Ireland
90.32%	39725	56	62	KZ DTVKZ-AS Digital TV, LLP, Kazakhstan
90.08%	7922	4578	5082	US COMCAST-7922 - Comcast Cable Communications, Inc., United States of America
90.00%	29518	63	70	SE BREDBAND2 Bredband2 AB, Sweden
89.33%	3301	268	300	SE TELIANET-SWEDEN TeliaSonera AB, Sweden

Ranking only those ASs with more than 50 sample points in this experiment run (1014 AS's)

DNSSEC use in the RIPE Region...

Country Code

DNSSEC use

Clients who used DNSSEC Resolvers

Client count

SE	62.74%	820	1307	Sweden	LB	14.67%	71	484	Lebanon	MD	4.77%	101	2119	Moldova
CZ	56.69%	1331	2348	Czech Rep.	NO	13.57%	267	1968	Norway	YE	4.50%	42	934	Yemen
SI	53.95%	839	1555	Slovenia	HU	12.68%	593	4675	Hungary	GI	3.70%	1	27	Gibraltar
PS	53.79%	568	1056	Palestine	IT	12.45%	1217	9778	Italy	UZ	3.68%	5	136	Uzbekistan
GL	53.33%	8	15	Greenland	AM	11.14%	183	1642	Armenia	BE	3.11%	118	3794	Belgium
AZ	49.93%	760	1522	Azerbaijan	BH	10.34%	130	1257	Bahrain	PT	2.71%	90	3323	Portugal
LU	43.12%	138	320	Luxembourg	KZ	10.18%	185	1818	Kazakhstan	GB	2.66%	758	28453	UK
IE	41.22%	807	1958	Ireland	SK	9.09%	117	1287	Slovakia	GE	2.45%	36	1472	Georgia
FI	37.60%	141	375	Finland	RO	8.68%	925	10658	Romania	JO	2.36%	50	2118	Jordan
TR	34.82%	1793	5150	Turkey	DK	8.55%	118	1380	Denmark	SA	2.33%	376	16169	Saudi Arabia
TM	33.33%	1	3	Turkmenistan	EE	7.75%	41	529	Estonia	HR	2.30%	117	5077	Croatia
KG	32.33%	43	133	Kyrgyzstan	RU	7.59%	694	9149	Russia	FR	2.30%	336	14625	France
BY	28.97%	352	1215	Belarus	BG	7.47%	716	9588	Bulgaria	AT	2.18%	177	8113	Austria
IR	25.00%	1	4	Iran	AD	6.90%	2	29	Andorra	ES	2.15%	176	8168	Spain
IQ	23.43%	279	1191	Iraq	MC	6.67%	3	45	Monaco	OM	2.08%	36	1732	Oman
MT	22.59%	401	1775	Malta	MK	6.17%	43	697	Macedonia	CY	2.03%	165	8137	Cyprus
LT	22.23%	623	2803	Lithuania	IL	6.07%	176	2901	Israel	GR	1.72%	562	32649	Greece
BA	21.78%	888	4077	Bosnia	DE	6.00%	502	8371	Germany	KW	1.70%	40	2359	Kuwait
TJ	18.75%	3	16	Tajikistan	IS	5.97%	12	201	Iceland	AE	0.79%	114	14374	UAES
UA	17.78%	1228	6906	Ukraine	CH	5.95%	105	1765	Switzerland	QA	0.51%	37	7263	Qatar
AL	15.95%	107	671	Albania	LI	5.88%	1	17	Liechtenstein	SM	0.00%	0	6	San Marino
SY	15.70%	27	172	Syria	LV	5.52%	47	852	Latvia	FO	0.00%	0	18	Faroe Islands
PL	15.55%	1573	10115	Poland	NL	5.36%	328	6119	Netherlands					

Thank you!

More details at: blabs.apnic.net