

Measuring DNSSEC Use

We want to measure the extent to which DNSSEC is actually being used in today's Internet by DNS resolvers, and the extent to which end host systems have their DNS queries validated with DNSSEC

- We used the Online Advertisement systems to enlist users all over the Internet to test the DNSSEC validation capabilities of their DNS resolvers
- The code embedded in the ad fetches a unique (non-cacheable) object from a DNSSEC enabled domain name
- We match the DNS resolution records with the web fetch records to see if DNSSEC validation took place as part of DNS name resolution

These results reported here are generated from running the ad for 7 days in September 2012

- The DNSSEC test was executed by 770,934 host systems from 11,862 AS's and 207 countries.
- These hosts use 57,268 distinct DNS resolvers from 10,050 AS's and 207 country codes



DNSSEC Use in Resolvers and Clients

- Of the 57,268 DNS resolvers some 2,316 query DNSSEC RRs
 - **4.0%** of resolvers perform DNSSEC validation
- To see if there was a difference between edge and infrastructure DNS resolvers we filtered out all resolvers with 2 or less clients. We are left with 16,822 resolvers, of which 1,180 perform DNSSEC validation
 - **7.0%** of infrastructure resolvers perform DNSSEC validation
- Of those 770,934 end hosts who executed the ad's test, 69,560 use DNSSEC-capable resolvers
 - **9.0%** of end hosts use DNSSEC-validating DNS resolvers
 - These DNSSEC users are not uniformly distributed across the Internet...

Where are these DNSSEC users?

Countries

% 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

Countries > 100 sample points

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., Isra
96.96%	7657	575	593	NZ VODAFONE-NZ-NGN-AS Vodafone NZ Ltd., New Zeala
96.88%	12912	186	192	PL ERA Polska Telefonja 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, 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 Tele, Azerbaijan
91.61%	5610	732	799	CZ TO2-CZECH-REPUBLIC Telefonica, Czech Republic
91.60%	1759	229	250	EU TSF-IP-CORE TeliaSonera, Finland
91.30%	4704	63	69	JP SANNET SANYO IT, 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, USA
90.00%	29518	63	70	SE BREDBAND2 Bredband2 AB, Sweden
89.33%	3301	268	300	SE TELIANET-SWEDEN TeliaSonera AB, Sweden

AS's > 50 sample points

Where aren't these DNSSEC users?

Countries

% who use DNSSEC	CC	sample client counts		
		DNSSEC	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
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

Countries > 100 sample points

AS's

% who use DNSSEC	ASN	sample client counts		
		DNSSEC	Total	
0.02%	8151	1	4325	MX Uninet S.A. de C.V., Mexico
0.09%	55740	1	1133	IN TATAINDICOM-IN TATA TELESERVICES LTD - TATA INDICOM - CDMA DIVISION, India
0.12%	20001	1	818	US ROADRUNNER-WEST - Road Runner HoldCo LLC, USA
0.15%	12271	1	658	US SCRR-12271 - Road Runner HoldCo LLC, United States of America
0.21%	29247	1	467	GR COSMOTE-GR Cosmote Mobile, Greece
0.00%	13999	0	447	MX Mega Cable, S.A. de C.V., Mexico
0.23%	13046	1	442	HR ISKON INTERNET d.d. telekomunikacije, Croatia
0.00%	35736	0	441	GB WUK-AS ORANGE HOME UK PLC, UK
0.23%	17839	1	436	KR DREAMPLUS-AS-KR DreamcityMedia, Republic of Korea
0.00%	12357	0	411	ES COMUNITEL VODAFONE ESPANA, S.A.U., Spain
0.00%	23693	0	361	ID Telekomunikasi Selular, Indonesia
0.29%	5645	1	345	CA TekSavvy Solutions Inc. Toronto, Canada
0.00%	37069	0	336	EG MOBINIL, Egypt
0.00%	16586	0	334	US CLEARWIRE - Clearwire US LLC, USA
0.00%	11427	0	330	US SCRR-11427 - Road Runner HoldCo LLC, USA
0.31%	55441	1	321	IN TATA-DOCOMO-AS-AP D 26/2, India
0.00%	39603	0	312	PL P4NET P4 Sp. z o.o., Poland
0.00%	11351	0	303	US RR-NYSREGION-ASN-01 - Road Runner, USA
0.34%	9617	1	293	JP ZAQ KANSAI MULTIMEDIA SERVICE COMPANY, Japan
0.00%	47377	0	283	BE MES MOBISTAR ENTERPRISE SERVICES SA, Belgium
0.36%	17849	1	276	KR hanvit ginam broadcasting comm., Republic of Korea
0.00%	132165	0	275	PK , Pakistan
0.37%	55831	1	273	IN AIRCEL-IN Aircel Ltd., India
0.00%	9845	0	269	KR CJCKN-AS-KR CJ-CABLENET, Republic of Korea
0.00%	28548	0	269	MX Cablevisi?n, S.A. de C.V., Mexico
0.00%	9689	0	265	KR FCABLE-AS Qrix, Inc., Republic of Korea

+ 232 more!

AS's > 50 sample points

Nordunet Countries

Countries

% who use DNSSEC	CC	sample client counts		
		DNSSEC	Total	
62.74%	SE	820	1307	Sweden
37.60%	FI	141	375	Finland
13.57%	NO	267	1968	Norway
8.55%	DK	118	1380	Denmark
5.97%	IS	12	201	Iceland

AS's

% who use DNSSEC	ASN	sample client counts		
		DNSSEC	Total	
98.37%	44034	121	123	SE HI3G Hi3G Access AB, Sweden
95.00%	8473	57	60	SE BAHNHOF Bahnhof Internet AB, Sweden
90.00%	29518	63	70	SE BREDBAND2 Bredband2 AB, Sweden
89.33%	3301	268	300	SE TELIANET-SWEDEN TeliaSonera AB, Sweden
63.99%	39651	247	386	SE COMHEM-SWEDEN Com Hem Sweden, Sweden
54.77%	16086	109	199	FI DNA DNA Oy, Finland
23.92%	2119	237	991	NO TELENOR-NEXTEL Telenor Norge AS, Norway
10.14%	12969	7	69	IS VODAFONE_ICELAND Fjarskipti ehf, Iceland
6.95%	3292	47	676	DK TDC TDC Data Networks, Denmark
4.10%	29695	5	122	NO LYSE-AS Altibox AS, Norway
3.45%	197288	3	87	DK , Denmark
2.73%	39554	3	110	DK FULLRATE Fullrate A/S, Denmark
2.56%	2116	4	156	NO ASN-CATCHCOM Ventelo AS, Norway
1.64%	3308	1	61	SE TELIANET-DENMARK TeliaNet Denmark, Sweden
1.61%	9158	2	124	DK TELENOR_DANMARK_AS Telenor A/S, Denmark
1.03%	15659	2	194	NO NEXTGENTEL NEXTGENTEL Autonomous System, Norway
1.01%	6677	1	99	IS ICENET-AS1 Siminn hf, Iceland
0.50%	41164	1	202	NO GET-NO GET Norway, Norway

AS's > 50 sample points