La storia del DNS: nascita, sicurezza, filtri

Antonio Prado
https://www.prado.it

Cenni storici

- *Internet Governance*
- *IANA, Jon Postel*
- *ICANN stewardship transition*
- *IETF*

Ciberspazio

I tre strati di **Martin Libicki** (studioso di cibersicurezza)

Fisico: costituito dalle componenti fisiche del ciberspazio (cavi sottomarini, antenne, satelliti e fibre ottiche ecc.);

Sintattico: costituito dai protocolli, le regole e le proprietà naturali che governano il funzionamento e l'interazione tra le diverse componenti fisiche del ciberspazio;

Semantico: risultato dell'interazione dei primi due livelli è quello che dà un senso, assicurando la funzionalità e un significato ai processi dei livelli sottostanti.
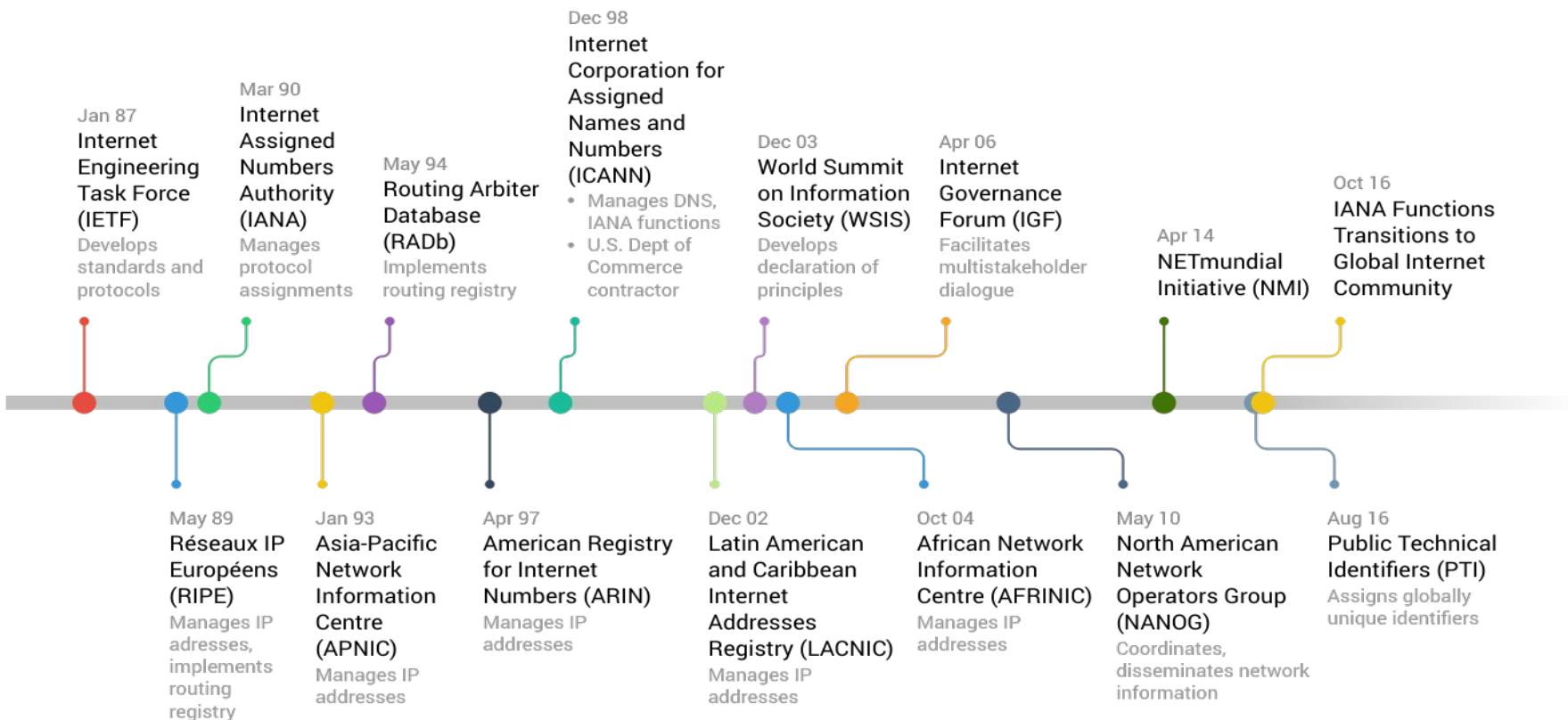
Internet Governance
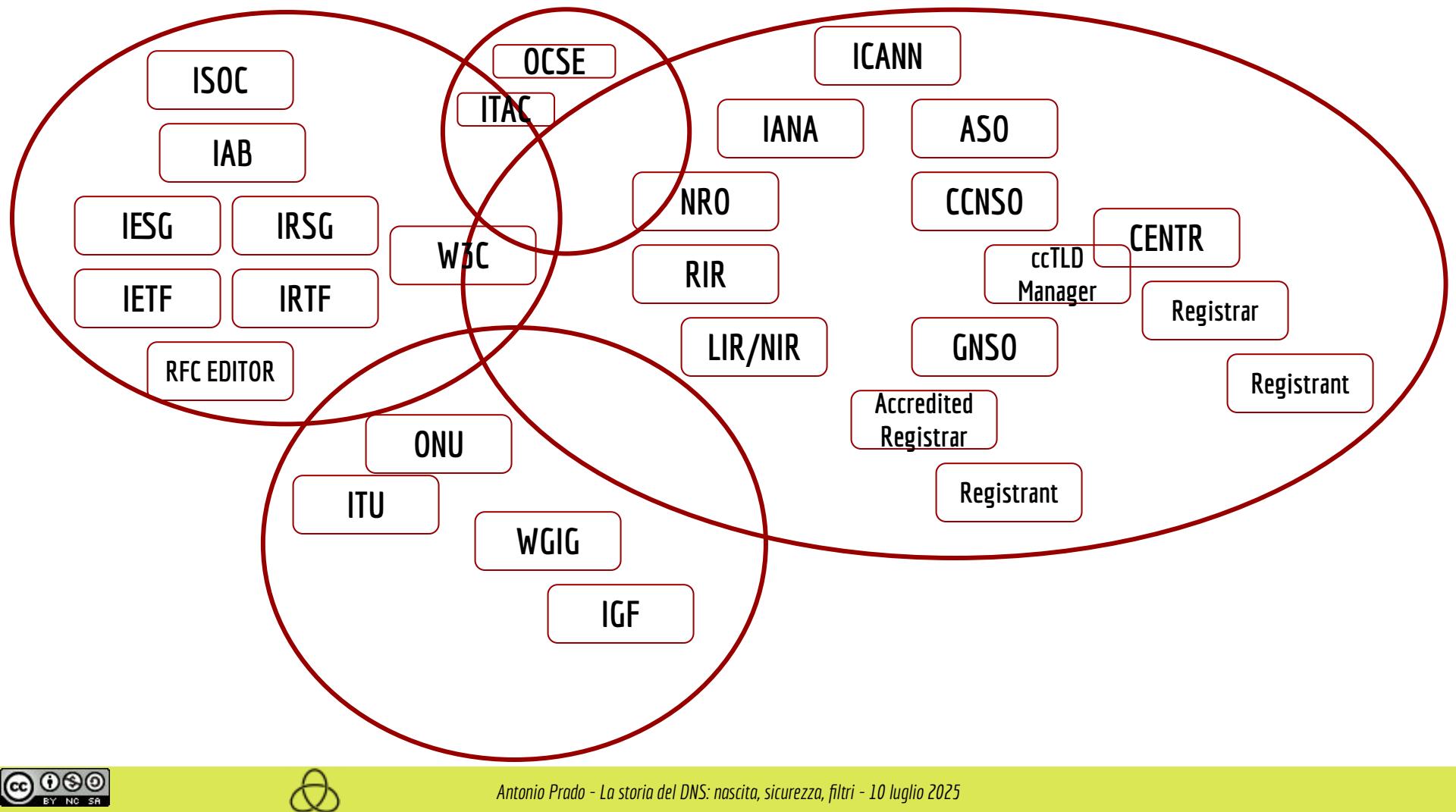
TUNIS AGENDA FOR THE INFORMATION SOCIETY
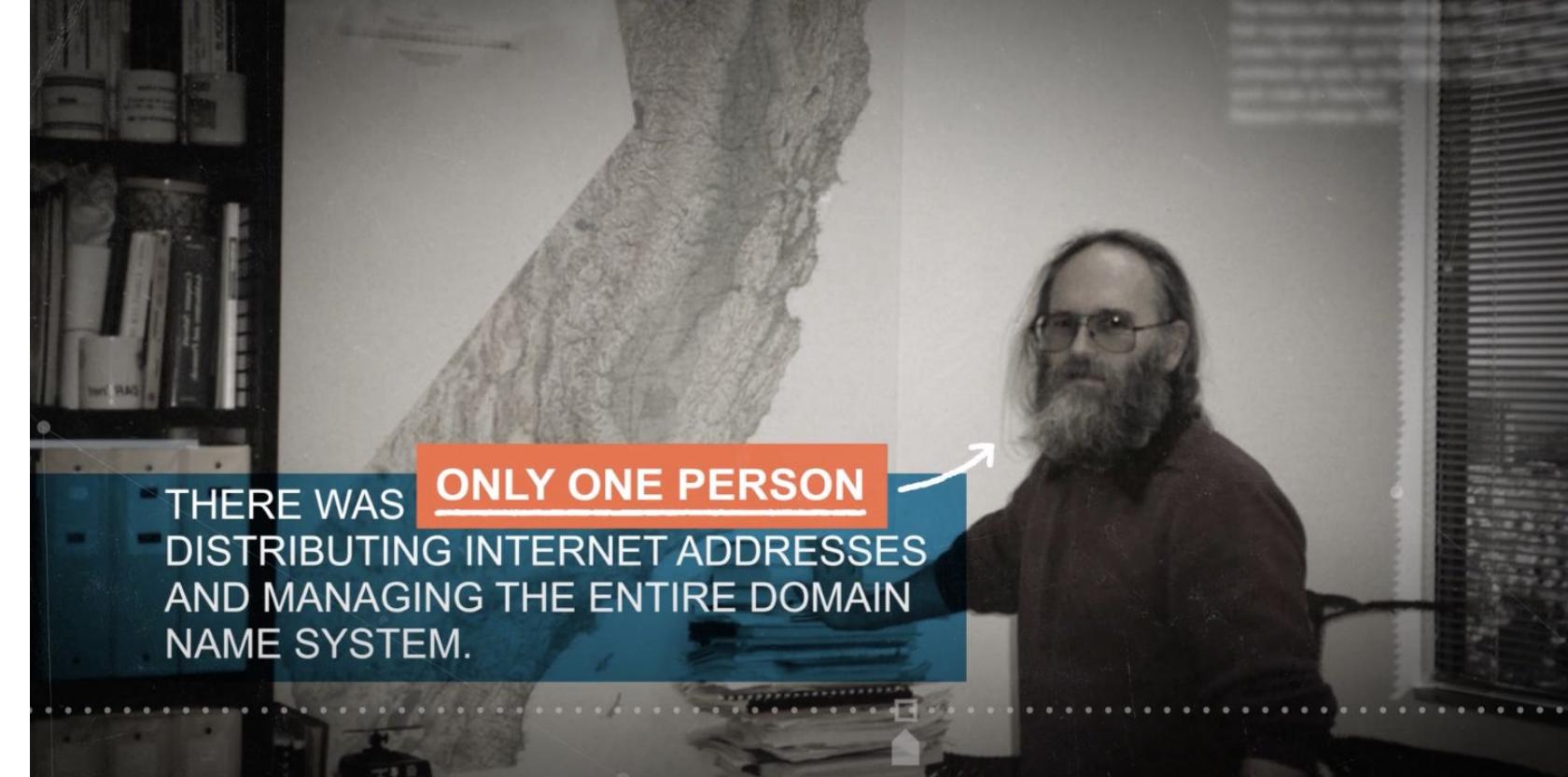
18 novembre 2005

34. Una buona definizione per Internet governance è lo sviluppo e l'applicazione da parte dei governi, del settore privato e della società civile, ciascuno nel proprio ruolo, di principi condivisi, norme, regole, procedure per assumere decisioni e programmi che plasmino l'evoluzione e l'uso di Internet. *[t.d.a]*

Internet governance timeline

Jan 87
Internet Engineering Task Force (IETF)
Develops standards and protocols

Mar 90
Internet Assigned Numbers Authority (IANA)
Manages protocol assignments

May 94
Routing Arbiter Database (RADb)
Implements routing registry

Dec 98
Internet Corporation for Assigned Names and Numbers (ICANN)
• Manages DNS, IANA functions
• U.S. Dept of Commerce contractor

Dec 03
World Summit on Information Society (WSIS)
Develops declaration of principles

Apr 06
Internet Governance Forum (IGF)
Facilitates multistakeholder dialogue

Apr 14
NETmundial Initiative (NMI)

Oct 16
IANA Functions Transitions to Global Internet Community

May 89
Réseaux IP Européens (RIPE)
Manages IP adresses, implements routing registry

Jan 93
Asia-Pacific Network Information Centre (APNIC)
Manages IP addresses

Apr 97
American Registry for Internet Numbers (ARIN)
Manages IP addresses

Dec 02
Latin American and Caribbean Internet Addresses Registry (LACNIC)
Manages IP addresses

Oct 04
African Network Information Centre (AFRINIC)
Manages IP addresses

May 10
North American Network Operators Group (NANOG)
Coordinates, disseminates network information

Aug 16
Public Technical Identifiers (PTI)
Assigns globally unique identifiers

Antonio Prado - La storia del DNS: nascita, sicurezza, filtri - 10 luglio 2025

ISOC
IAB
IESG   IRSG
IETF   IRTF
RFC EDITOR

OCSE
ITAC
W3C

ICANN
IANA   ASO
NRO   CCNSO
RIR   CENTR
             ccTLD Manager
LIR/NIR   Registrar
GNSO
Accredited Registrar   Registrant
Registrant

ONU
ITU
WGIG
IGF

ONLY ONE PERSON

THERE WAS DISTRIBUTING INTERNET ADDRESSES AND MANAGING THE ENTIRE DOMAIN NAME SYSTEM.

spam
UDP
hostnames

telnet
SMTP
IP
ICMP
TCP

Jon Postel, Internet pioneer (1943-1998)

[RFC 77, 127, 128, 139, 145, 158, 165, 204, 229, 236, 268, 295, 317, 318, 322, 324, 328, 346, 347, 348, 349, 429, 433, 489, 516, 580, 587, 604, 640, 659, 661, 678, 690, 694, 706, 717, 718, 719, 730, 750, 753, 754, 755, 759, 760, 761, 762, 764, 765, 766, 767, 768, 769, 770, 774, 776, 777, **788**, 790, 791, 792, 793, 795, 796, **821**

Jon Postel

RFC editor dal 1969
Numbering czar dal 1972

La legge di Postel (RFC 1122):

Be liberal in what you accept, and conservative in what you send

IN MEMORIAM

Dr. Jonathan B. Postel
August 3, 1943 - October 16, 1998

Executive Director and Founder, Internet Assigned Numbers Authority
Director, Computer Networks Division, Information Sciences Institute
RFC Editor; Trustee, Internet Society
Internet Networking Pioneer and Visionary

A memorial for Dr. Postel was held on November 5, 1998 at 11 a.m. in the Bovard Auditorium of the University of Southern California. The memorial service was webcast by USC.

Eulogy by Vint Cerf: I Remember IANA   RFC 2468
Eulogy by Daniel Farber: A Life Too Brief
Eulogy by Paul Vixie: Requiem for Jon Postel

Boardwatch (12-98) Jon Postel Streamlines the Afterlife
Wired (11-5-98) A Wizard Rests in Peace
Inter@ctive Week (10-26) Jon Postel: Internet Architect and Caretaker
New York Times (10-18-98) Jon Postel, Who Helped Create the Internet, is Dead at 55
Washington Post (10-18): Jon Postel, Internet Pioneer, Dies at 55 after Heart Surgery
Los Angeles Times (10-18) : Jon Postel, Influential Internet Pioneer, Dies
Wired (10-18-98) Net Mourns Passing of Giant
San Jose Mercury News (10-18) : Internet Founding Father Dies
C/Net (10-19): IANA Chief Jon Postel Dies
USC News Service (10-19): Internet Pioneer Jon Postel Dies at 55
Internet Week   TechWeb (10-19): Head of Internet Domain-Names Group Dies
Internet News (10-27): Postel Memorial Webcast Set for Nov. 5
C/Net (11-5) Postel Eulogized as Humble Genius

Photo by Peter Lothberg

Dr. Jon Postel was the Director of ISI's Computer Networks Division, based in Marina del Rey, California. He also held leadership positions in several Internet infrastructure activities. He was founder and head of the Internet Assigned Numbers Authority, RFC Editor, and chief administrator of the .US domain. He

ICANN84 Annual General Meeting

icann84.sched.com

ICANN84 | Annual General Meeting

ANNUAL GENERAL MEETING

84

ICANN

DUBLIN

Please log in to your previous account or sign-up for a new account on sched.com. Registration for ICANN84 does not automatically create a user account on sched.com. (Learn how to use Sched.com and personalize your schedule or export the entire event schedule.)

ICANN84 Annual General Meeting will be held in Dublin, Ireland at The Convention Centre Dublin from 23-30 October 2025.

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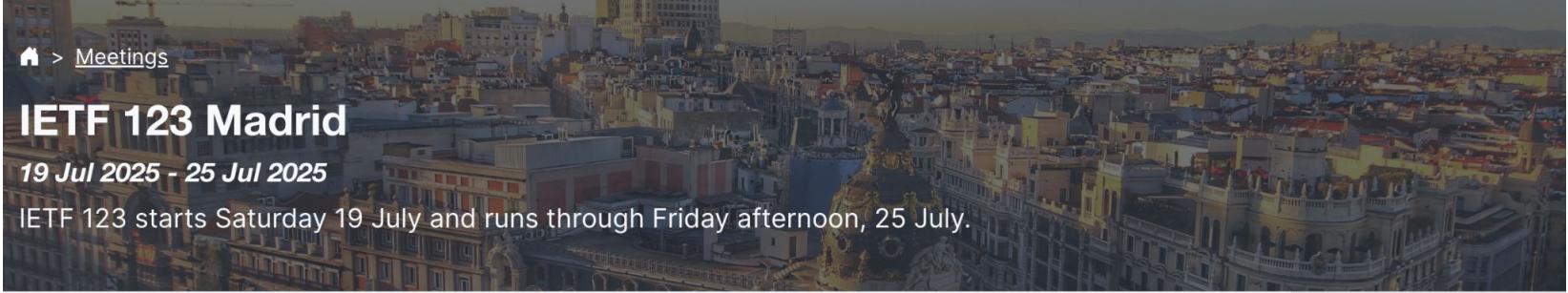
ICANN84 | Annual General Meeting

Mark your calendars for the October 25, 2025. Keep checking back for event registration, speaker announcements, and more details. Need answers ASAP? Reach out to our event planning team at kimberly.carlson@icann.org for info and more.

🏠 > [Meetings](#)

IETF 123 Madrid

19 Jul 2025 - 25 Jul 2025

IETF 123 starts Saturday 19 July and runs through Friday afternoon, 25 July.

The [IETF Hackathon](#) and [IETF Codesprint](#) take place on the weekend. Events to help [new participants](#) get the most out of IETF meetings begin on Sunday afternoon. Participants should plan their travel accordingly. An [introduction to IETF meetings](#) provides an overview of how to prepare for and get the most out of sessions all week.

Key details

Meeting Registration ▾

[Register](#)   [Registration Fee Waivers](#)

[Terms and conditions](#)   [Participant List](#)

[Visa and LOI information](#)

Participation Information ▾

Venue Information ▾

[Venue and Hotels](#)   [Preferred Air Carrier](#)   [Childcare](#)

[Floor plans](#)   [Participant wiki (local information)](#)

[Meeting network and technology](#)

Additional Events ▾

Meetings

[IETF 123 Madrid](#)

[IETF 124 Montreal](#)

[IETF 125 Shenzhen](#)

[Upcoming meetings](#)

[Past meetings](#)

[Interim meetings](#)

[IETF Hackathons](#)
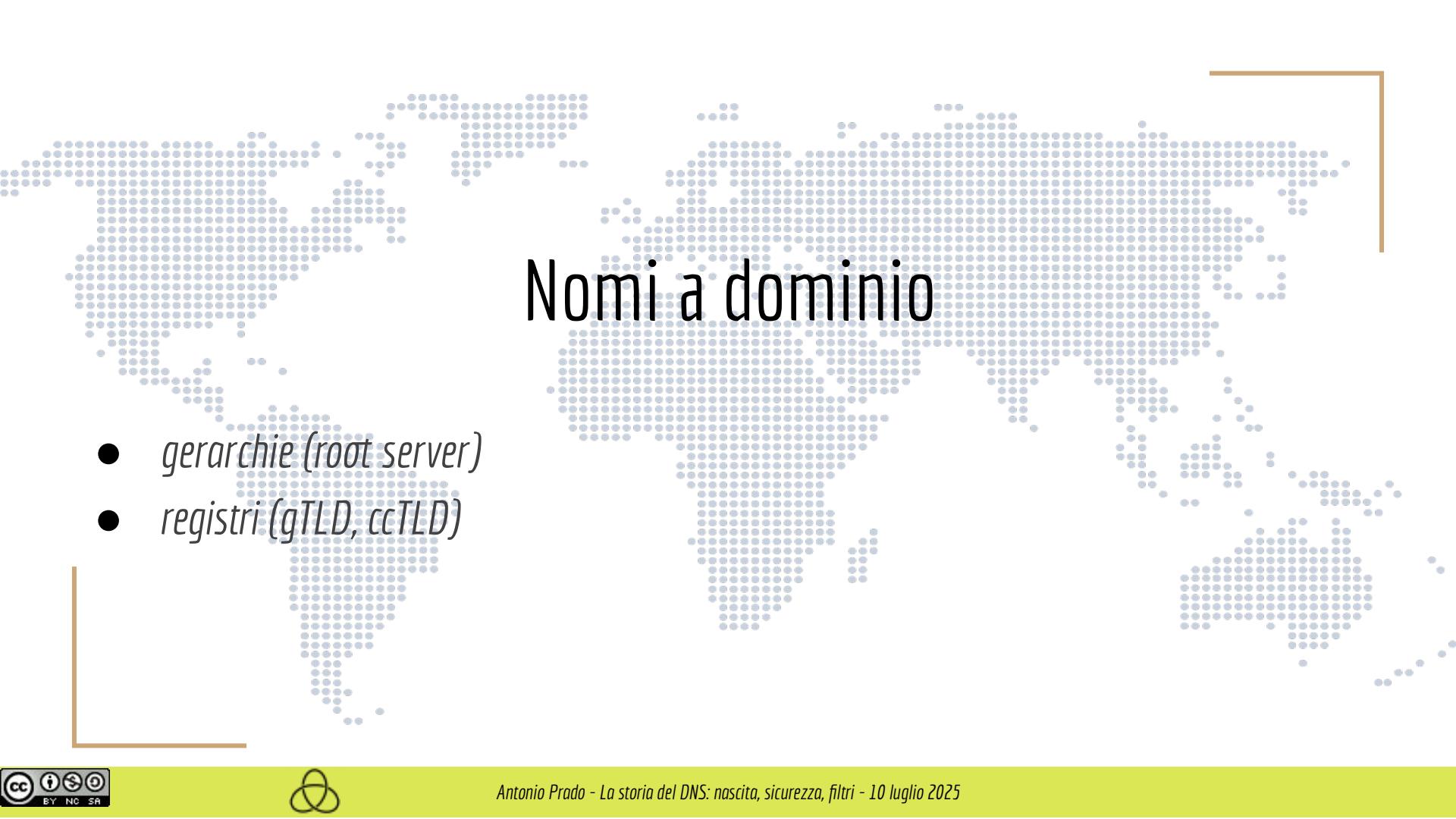
[Code Sprint](#)

ROUGH CONSENSUS (RFC 2418)

Processo del consenso approssimativo: non è necessario che tutti i partecipanti siano d'accordo (sebbene sia preferibile), ma dovrebbe prevalere il punto di vista dominante espresso in seno al gruppo di lavoro di IETF.

Va ricercato un accordo in senso generale che, solitamente, emerge dopo una selezione naturale delle argomentazioni espresse dai membri del gruppo di lavoro.

Comunque è il presidente del gruppo di lavoro a determinare il raggiungimento del consenso imperfetto.

Nomi a dominio

- *gerarchie (root server)*
- *registri (gTLD, ccTLD)*

ARPA, ccTLD, gTLD, grTLD, sTLD, tTLD

gTLD

.com

.net

.org

.info

...

ccTLD

.it

.eu

.de

.ch

.tv

...

ARPA - Address and Routing Parameter Area

Infrastructure domain: ARPA

Infrastructure sub-domain:

as112.arpa, e164.arpa, home.arpa, in-addr.arpa, ip6.arpa, in-addr-servers.arpa, ip6-servers.arpa, ipv4only.arpa, iris.arpa, uri.arpa, urn.arpa

grTLD

Generic Restricted TLD

.biz, .name, .pro

sTLD
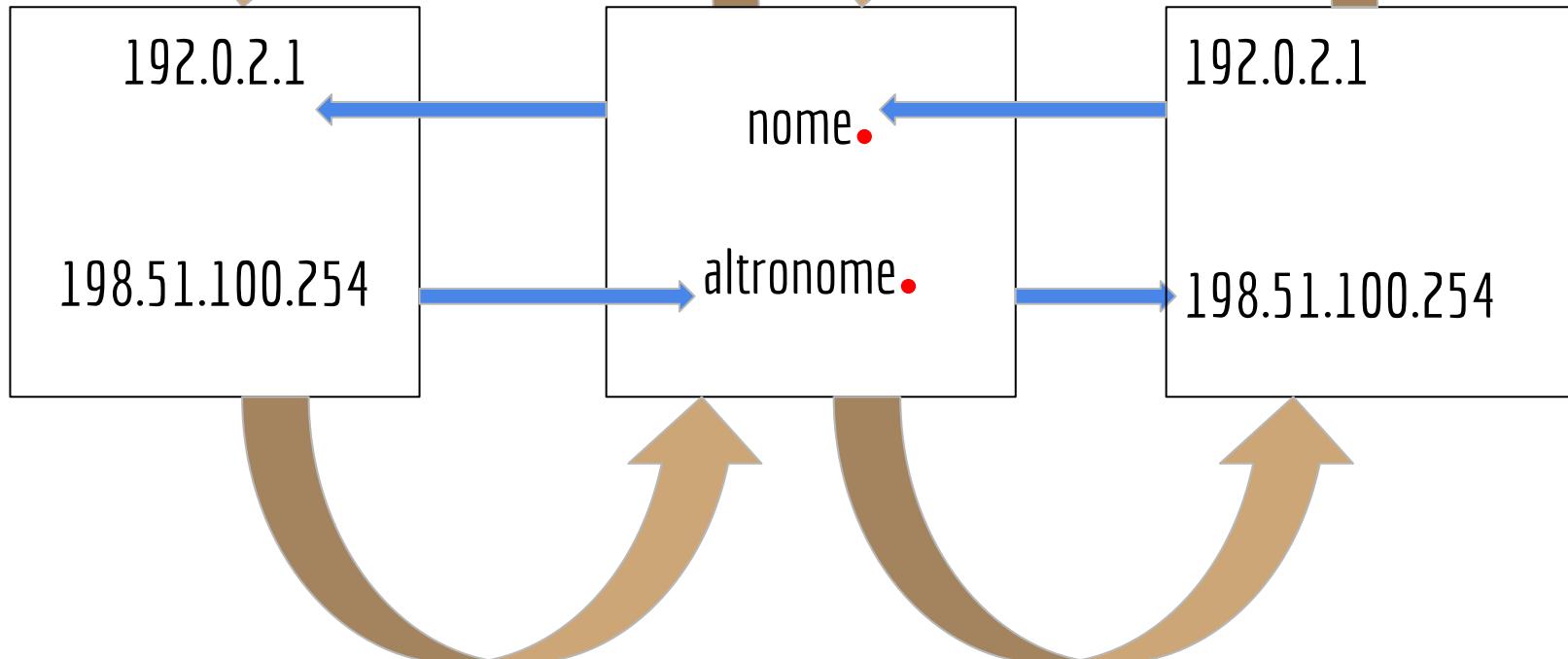
Sponsored TLD

.aero, .asia, .cat, .coop, .edu, .gov, .int, .jobs, .mil, .mobi, .museum, .tel, .travel
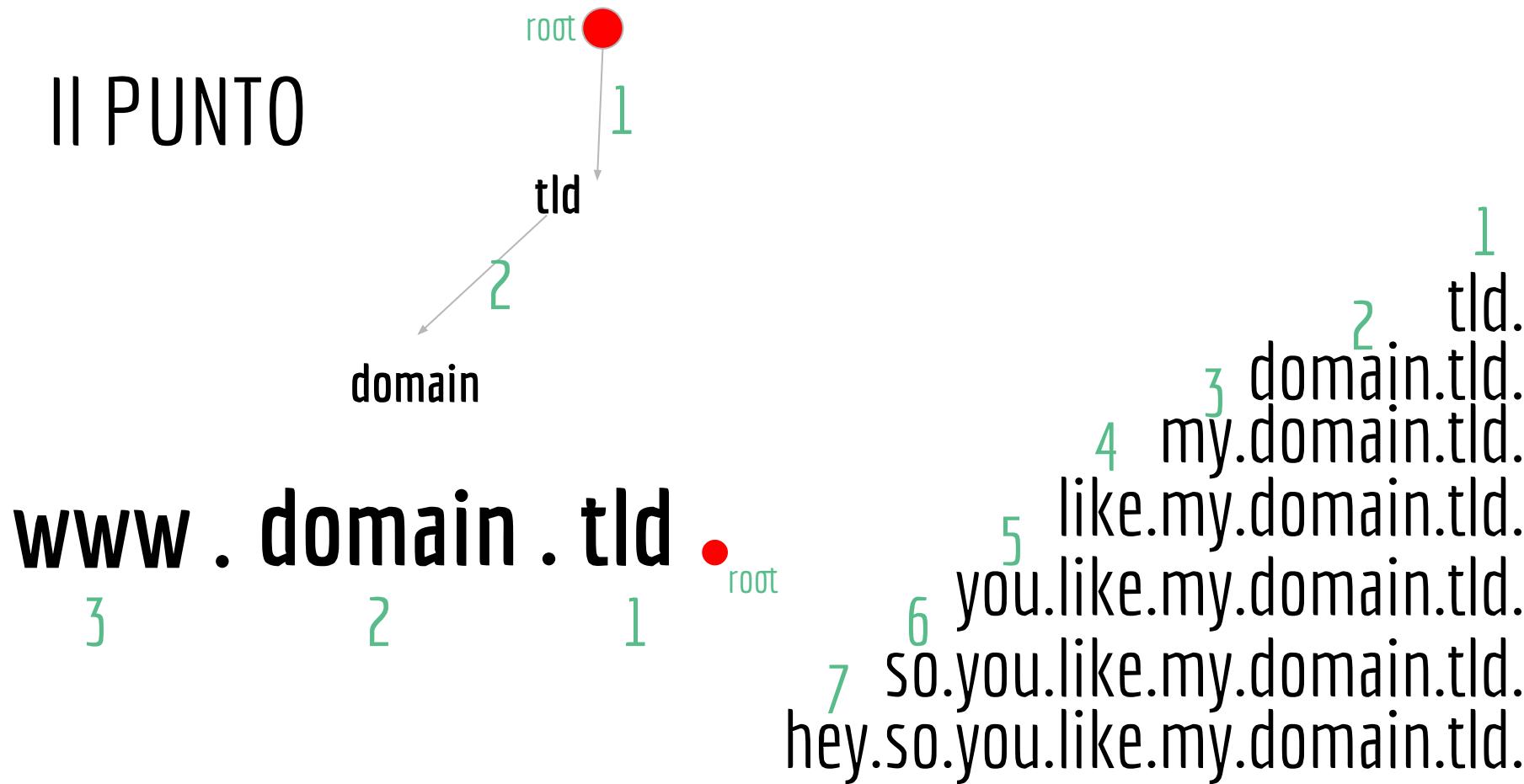
tTLD

test TLD

.example, .invalid, .localhost, .test

Numeri e Nomi

| 192.0.2.1 | nome. | 192.0.2.1 |
| 198.51.100.254 | altronome. | 198.51.100.254 |

Il PUNTO

root ●

1

tld

2

domain

www . domain . tld .root

3   2   1

1
tld.

2
domain.tld.

3
my.domain.tld.

4
like.my.domain.tld.

5
you.like.my.domain.tld.

6
so.you.like.my.domain.tld.

7
hey.so.you.like.my.domain.tld.

As of 2024-11-17T20:55:07Z, the root server system consists of 1916 instances operated by the 12 independent root server operators.

Root servers locations

TCP/UDP 53

[Paul_Mockapetris]

Paul Mockapetris, Internet pioneer
[RFC 822, 883, 973, **1034, 1035**, 1101, 1183]

Le definizioni

Number	Files	Title	Authors	Date	More Info	Status
RFC 1034 part of STD 13	ASCII, PDF, HTML, HTML with inline errata	Domain names - concepts and facilities	P.V. Mockapetris	November 1987	**Errata**, Obsoletes RFC 973, RFC 882, RFC 883, Updated by RFC 1101, RFC 1183, RFC 1348, RFC 1876, RFC 1982, RFC 2065, RFC 2181, RFC 2308, RFC 2535, RFC 4033, RFC 4034, RFC 4035, RFC 4343, RFC 4035, RFC 4592, RFC 5936, RFC 8020, RFC 8482, RFC 8767	Internet Standard
RFC 1035 part of STD 13	ASCII, PDF	Domain names - implementation and specification	P.V. Mockapetris	November 1987	Obsoletes RFC 973, RFC 882, RFC 883, Updated by RFC 1101, RFC 1183, RFC 1348, RFC 1876, RFC 1982, RFC 1995, RFC 1996, RFC 2065, RFC 2136, RFC 2181, RFC 2137, RFC 2308, RFC 2535, RFC 2673, RFC 2845, RFC 3425, RFC 3658, RFC 4033, RFC 4034, RFC 4035, RFC 4343, RFC 5936, RFC 5966, RFC 6604, RFC 7766, Errata	Internet Standard
RFC 1101	ASCII, PDF	DNS encoding of network names and other types	P.V. Mockapetris	April 1989	Updates RFC 1034, RFC 1035	Unknown
RFC 1183	ASCII, PDF	New DNS RR Definitions	C.F. Everhart, L.A. Mamakos, R. Ullmann, P.V. Mockapetris	October 1990	Updates RFC 1034, RFC 1035, Updated by RFC 5395, RFC 5864, RFC 6195, RFC 6895, Errata	Experimental
RFC 1348	ASCII, PDF	DNS NSAP RRs	B. Manning	July 1992	Obsoleted by RFC 1637, Updates RFC 1034, RFC 1035	Experimental
RFC 1383	ASCII, PDF	An Experiment in DNS Based IP Routing	C. Huitema	December 1992		Experimental
RFC 1386	ASCII, PDF	The US Domain	A. Cooper, J. Postel	December 1992	Obsoleted by RFC 1480	Informational
RFC 1394	ASCII, PDF	Relationship of Telex Answerback Codes to Internet Domains	P. Robinson	January 1993		Informational

1987

1993

Le definizioni

1993

RFC 1401	ASCII, PDF	Correspondence between the IAB and DISA on the use of DNS	Internet Architecture Board	January 1993		Informational
RFC 1464	ASCII, PDF	Using the Domain Name System To Store Arbitrary String Attributes	R. Rosenbaum	May 1993	Errata	Experimental
RFC 1480	ASCII, PDF	The US Domain	A. Cooper, J. Postel	June 1993	Obsoletes RFC 1386	Informational
RFC 1535	ASCII, PDF	A Security Problem and Proposed Correction With Widely Deployed DNS Software	E. Gavron	October 1993	Errata	Informational
RFC 1536	ASCII, PDF	Common DNS Implementation Errors and Suggested Fixes	A. Kumar, J. Postel, C. Neuman, P. Danzig, S. Miller	October 1993		Informational
RFC 1537	ASCII, PDF	Common DNS Data File Configuration Errors	P. Beertema	October 1993	Obsoleted by RFC 1912	Informational
RFC 1591	ASCII, PDF	Domain Name System Structure and Delegation	J. Postel	March 1994		Informational
RFC 1611	ASCII, PDF	DNS Server MIB Extensions	R. Austein, J. Saperia	May 1994		Historic (changed from Proposed Standard October 2001)

1994

Le definizioni

1994

RFC 1612	ASCII, PDF	**DNS Resolver MIB Extensions**	R. Austein, J. Saperia	May 1994		Historic (changed from Proposed Standard October 2001)
RFC 1637	ASCII, PDF	**DNS NSAP Resource Records**	B. Manning, R. Colella	June 1994	Obsoletes RFC 1348, Obsoleted by RFC 1706	Experimental
RFC 1664	ASCII, PDF	**Using the Internet DNS to Distribute RFC1327 Mail Address Mapping Tables**	C. Allocchio, A. Bonito, B. Cole, S. Giordano, R. Hagens	August 1994	Obsoleted by RFC 2163	Experimental
RFC 1706	ASCII, PDF	**DNS NSAP Resource Records**	B. Manning, R. Colella	October 1994	Obsoletes RFC 1637	Informational
RFC 1712	ASCII, PDF	**DNS Encoding of Geographical Location**	C. Farrell, M. Schulze, S. Pleitner, D. Baldoni	November 1994	Errata	Experimental
RFC 1713 a.k.a. FYI 27	ASCII, PDF	**Tools for DNS debugging**	A. Romao	November 1994		Informational
RFC 1788	ASCII, PDF	**ICMP Domain Name Messages**	W. Simpson	April 1995	Obsoleted by RFC 6918	Historic (changed from Experimental February 2013)
RFC 1794	ASCII, PDF	**DNS Support for Load Balancing**	T. Brisco	April 1995		Informational

1995

Le definizioni

RFC*Editor*

1996

RFC 1876	ASCII, PDF	A Means for Expressing Location Information in the Domain Name System	C. Davis, P. Vixie, T. Goodwin, I. Dickinson	January 1996	Updates RFC 1034, RFC 1035	Experimental
RFC 1886	ASCII, PDF	DNS Extensions to support IP version 6	S. Thomson, C. Huitema	December 1995	Obsoleted by RFC 3596, Updated by RFC 2874, RFC 3152	Proposed Standard
RFC 1912	ASCII, PDF	Common DNS Operational and Configuration Errors	D. Barr	February 1996	Obsoletes RFC 1537	Informational
RFC 1982	ASCII, PDF	Serial Number Arithmetic	R. Elz, R. Bush	August 1996	Updates RFC 1034, RFC 1035	Proposed Standard
RFC 1995	ASCII, PDF	Incremental Zone Transfer in DNS	M. Ohta	August 1996	Updates RFC 1035, Errata	Proposed Standard
RFC 1996	ASCII, PDF	A Mechanism for Prompt Notification of Zone Changes (DNS NOTIFY)	P. Vixie	August 1996	Updates RFC 1035	Proposed Standard
RFC 2052	ASCII, PDF	A DNS RR for specifying the location of services (DNS SRV)	A. Gulbrandsen, P. Vixie	October 1996	Obsoleted by RFC 2782	Experimental
RFC 2065	ASCII, PDF	Domain Name System Security Extensions	D. Eastlake 3rd, C. Kaufman	January 1997	Obsoleted by RFC 2535, Updates RFC 1034, RFC 1035	Proposed Standard
RFC 2136	ASCII, PDF	Dynamic Updates in the Domain Name System (DNS UPDATE)	P. Vixie, Ed., S. Thomson, Y. Rekhter, J. Bound	April 1997	Updates RFC 1035, Updated by RFC 3007, RFC 4035, RFC 4033, RFC 4034, Errata	Proposed Standard
RFC 2137	ASCII, PDF	Secure Domain Name System Dynamic Update	D. Eastlake 3rd	April 1997	Obsoleted by RFC 3007, Updates RFC 1035	Proposed Standard
RFC 2163	ASCII, PDF	Using the Internet DNS to Distribute MIXER Conformant Global Address Mapping (MCGAM)	C. Allocchio	January 1998	Obsoletes RFC 1664, Updated by RFC 3597	Proposed Standard

1998

Le definizioni

RFC 2181	ASCII, PDF	Clarifications to the DNS Specification	R. Elz, R. Bush	July 1997	Updates RFC 1034, RFC 1035, RFC 1123, Updated by RFC 4035, RFC 2535, RFC 4343, RFC 4033, RFC 4034, RFC 5452	Proposed Standard
RFC 2182 a.k.a. BCP 16	ASCII, PDF	Selection and Operation of Secondary DNS Servers	R. Elz, R. Bush, S. Bradner, M. Patton	July 1997	Errata	Best Current Practice
RFC 2219 a.k.a. BCP 17	ASCII, PDF	Use of DNS Aliases for Network Services	M. Hamilton, R. Wright	October 1997		Best Current Practice
RFC 2230	ASCII, PDF	Key Exchange Delegation Record for the DNS	R. Atkinson	November 1997		Informational
RFC 2240	ASCII, PDF	A Legal Basis for Domain Name Allocation	O. Vaughan	November 1997	Obsoleted by RFC 2352	Informational
RFC 2247	ASCII, PDF	Using Domains in LDAP/X.500 Distinguished Names	S. Kille, M. Wahl, A. Grimstad, R. Huber, S. Sataluri	January 1998	Updated by RFC 4519, RFC 4524	Proposed Standard
RFC 2308	ASCII, PDF	Negative Caching of DNS Queries (DNS NCACHE)	M. Andrews	March 1998	Updates RFC 1034, RFC 1035, Updated by RFC 4035, RFC 4033, RFC 4034, RFC 6604, RFC 8020, Errata	Proposed Standard
RFC 2345	ASCII, PDF	Domain Names and Company Name Retrieval	J. Klensin, T. Wolf, G. Oglesby	May 1998		Experimental
RFC 2352	ASCII, PDF	A Convention For Using Legal Names as Domain Names	O. Vaughan	May 1998	Obsoletes RFC 2240	Informational
RFC 2517	ASCII, PDF	Building Directories from DNS: Experiences from WWWSeeker	R. Moats, R. Huber	February 1999		Informational

1997

1999

Le definizioni

1999

RFC 2535	ASCII, PDF	**Domain Name System Security Extensions**	D. Eastlake 3rd	March 1999	Obsoletes RFC 2065, Obsoleted by RFC 4033, RFC 4034, RFC 4035, Updates RFC 2181, RFC 1035, RFC 1034, Updated by RFC 2931, RFC 3007, RFC 3008, RFC 3090, RFC 3226, RFC 3445, RFC 3597, RFC 3655, RFC 3658, RFC 3755, RFC 3757, RFC 3845	Proposed Standard
RFC 2536	ASCII, PDF	**DSA KEYs and SIGs in the Domain Name System (DNS)**	D. Eastlake 3rd	March 1999	Updated by RFC 6944	Proposed Standard
RFC 2537	ASCII, PDF	**RSA/MD5 KEYs and SIGs in the Domain Name System (DNS)**	D. Eastlake 3rd	March 1999	Obsoleted by RFC 3110	Proposed Standard
RFC 2538	ASCII, PDF	**Storing Certificates in the Domain Name System (DNS)**	D. Eastlake 3rd, O. Gudmundsson	March 1999	Obsoleted by RFC 4398	Proposed Standard
RFC 2539	ASCII, PDF	**Storage of Diffie-Hellman Keys in the Domain Name System (DNS)**	D. Eastlake 3rd	March 1999	Updated by RFC 6944	Proposed Standard
RFC 2540	ASCII, PDF	**Detached Domain Name System (DNS) Information**	D. Eastlake 3rd	March 1999		Experimental
RFC 2541	ASCII, PDF	**DNS Security Operational Considerations**	D. Eastlake 3rd	March 1999	Obsoleted by RFC 4641	Informational
RFC 2606 a.k.a. BCP 32	ASCII, PDF	**Reserved Top Level DNS Names**	D. Eastlake 3rd, A. Panitz	June 1999	Updated by RFC 6761	Best Current Practice
RFC 2671	ASCII, PDF	**Extension Mechanisms for DNS (EDNS0)**	P. Vixie	August 1999	Obsoleted by RFC 6891	Proposed Standard
RFC 2672	ASCII, PDF	**Non-Terminal DNS Name Redirection**	M. Crawford	August 1999	Obsoleted by RFC 6672, Updated by RFC 4592, RFC 6604	Proposed Standard

1999

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RFC 2673	ASCII, PDF	**Binary Labels in the Domain Name System**	M. Crawford	August 1999	Obsoleted by RFC 6891, Updates RFC 1035, Updated by RFC 3363, RFC 3364, Errata	Historic (changed from Proposed Standard August 1999)
RFC 2694	ASCII, PDF	**DNS extensions to Network Address Translators (DNS_ALG)**	P. Srisuresh, G. Tsirtsis, P. Akkiraju, A. Heffernan	September 1999		Informational
RFC 2782	ASCII, PDF	**A DNS RR for specifying the location of services (DNS SRV)**	A. Gulbrandsen, P. Vixie, L. Esibov	February 2000	Obsoletes RFC 2052, Updated by RFC 6335, Errata	Proposed Standard
RFC 2826	ASCII, PDF	**IAB Technical Comment on the Unique DNS Root**	Internet Architecture Board	May 2000	Errata	Informational
RFC 2845	ASCII, PDF	**Secret Key Transaction Authentication for DNS (TSIG)**	P. Vixie, O. Gudmundsson, D. Eastlake 3rd, B. Wellington	May 2000	Updates RFC 1035, Updated by RFC 3645, RFC 4635, RFC 6895	Proposed Standard
RFC 2874	ASCII, PDF	**DNS Extensions to Support IPv6 Address Aggregation and Renumbering**	M. Crawford, C. Huitema	July 2000	Updates RFC 1886, Updated by RFC 3152, RFC 3226, RFC 3363, RFC 3364	Historic (changed from Proposed Standard January 2012)
RFC 2915	ASCII, PDF	**The Naming Authority Pointer (NAPTR) DNS Resource Record**	M. Mealling, R. Daniel	September 2000	Obsoleted by RFC 3401, RFC 3402, RFC 3403, RFC 3404, Updates RFC 2168	Proposed Standard
RFC 2916	ASCII, PDF	**E.164 number and DNS**	P. Faltstrom	September 2000	Obsoleted by RFC 3761, Errata	Proposed Standard
RFC 2929	ASCII, PDF	**Domain Name System (DNS) IANA Considerations**	D. Eastlake 3rd, E. Brunner-Williams, B. Manning	September 2000	Obsoleted by RFC 5395	Best Current Practice

1999

2000

Le definizioni

2000

RFC 2930	ASCII, PDF	Secret Key Establishment for DNS (TKEY RR)	D. Eastlake 3rd	September 2000	Updated by RFC 6895	Proposed Standard
RFC 2931	ASCII, PDF	DNS Request and Transaction Signatures (SIG(0)s)	D. Eastlake 3rd	September 2000	Updates RFC 2535	Proposed Standard
RFC 3007	ASCII, PDF	Secure Domain Name System (DNS) Dynamic Update	B. Wellington	November 2000	Obsoletes RFC 2137, Updates RFC 2535, RFC 2136	Proposed Standard
RFC 3008	ASCII, PDF	Domain Name System Security (DNSSEC) Signing Authority	B. Wellington	November 2000	Obsoleted by RFC 4035, RFC 4033, RFC 4034, Updates RFC 2535, Updated by RFC 3658	Proposed Standard
RFC 3026	ASCII, PDF	Liaison to IETF/ISOC on ENUM	R. Blane	January 2001		Informational
RFC 3071	ASCII, PDF	Reflections on the DNS, RFC 1591, and Categories of Domains	J. Klensin	February 2001		Informational
RFC 3088	ASCII, PDF	OpenLDAP Root Service An experimental LDAP referral service	K. Zeilenga	April 2001		Experimental
RFC 3090	ASCII, PDF	DNS Security Extension Clarification on Zone Status	E. Lewis	March 2001	Obsoleted by RFC 4033, RFC 4034, RFC 4035, Updates RFC 2535, Updated by RFC 3658	Proposed Standard
RFC 3110	ASCII, PDF	RSA/SHA-1 SIGs and RSA KEYs in the Domain Name System (DNS)	D. Eastlake 3rd	May 2001	Obsoletes RFC 2537, Updated by RFC 6944, Errata	Proposed Standard
RFC 3123	ASCII, PDF	A DNS RR Type for Lists of Address Prefixes (APL RR)	P. Koch	June 2001		Experimental
RFC 3130	ASCII, PDF	Notes from the State-Of-The-Technology: DNSSEC	E. Lewis	June 2001		Informational

2001

Le definizioni

2001

RFC 3152 a.k.a. BCP 49	ASCII, PDF	Delegation of IP6.ARPA	R. Bush	August 2001	Obsoleted by RFC 3596, Updates RFC 2874, RFC 2772, RFC 2766, RFC 2553, RFC 1886	Best Current Practice
RFC 3172 a.k.a. BCP 52	ASCII, PDF	Management Guidelines & Operational Requirements for the Address and Routing Parameter Area Domain ("arpa")	G. Huston, Ed.	September 2001		Best Current Practice
RFC 3197	ASCII, PDF	Applicability Statement for DNS MIB Extensions	R. Austein	November 2001		Informational
RFC 3225	ASCII, PDF	Indicating Resolver Support of DNSSEC	D. Conrad	December 2001	Updated by RFC 4033, RFC 4034, RFC 4035	Proposed Standard
RFC 3226	ASCII, PDF	DNSSEC and IPv6 A6 aware server/resolver message size requirements	O. Gudmundsson	December 2001	Updates RFC 2535, RFC 2874, Updated by RFC 4033, RFC 4034, RFC 4035, Errata	Proposed Standard
RFC 3258	ASCII, PDF	Distributing Authoritative Name Servers via Shared Unicast Addresses	T. Hardie	April 2002		Informational
RFC 3363	ASCII, PDF	Representing Internet Protocol version 6 (IPv6) Addresses in the Domain Name System (DNS)	R. Bush, A. Durand, B. Fink, O. Gudmundsson, T. Hain	August 2002	Updates RFC 2673, RFC 2874, Updated by RFC 6672, Errata	Informational
RFC 3364	ASCII, PDF	Tradeoffs in Domain Name System (DNS) Support for Internet Protocol version 6 (IPv6)	R. Austein	August 2002	Updates RFC 2673, RFC 2874, Errata	Informational
RFC 3397	ASCII, PDF	Dynamic Host Configuration Protocol (DHCP) Domain Search Option	B. Aboba, S. Cheshire	November 2002		Proposed Standard

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RFC 3403	ASCII, PDF	**Dynamic Delegation Discovery System (DDDS) Part Three: The Domain Name System (DNS) Database**	M. Mealling	October 2002	Obsoletes RFC 2915, RFC 2168, Errata	Proposed Standard
RFC 3425	ASCII, PDF	**Obsoleting IQUERY**	D. Lawrence	November 2002	Updates RFC 1035	Proposed Standard
RFC 3445	ASCII, PDF	Limiting the Scope of the KEY Resource Record (RR)	D. Massey, S. Rose	December 2002	Obsoleted by RFC 4033, RFC 4034, RFC 4035, Updates RFC 2535, Errata	Proposed Standard
RFC 3467	ASCII, PDF	**Role of the Domain Name System (DNS)**	J. Klensin	February 2003		Informational
RFC 3596 a.k.a. STD 88	ASCII, PDF	**DNS Extensions to Support IP Version 6**	S. Thomson, C. Huitema, V. Ksinant, M. Souissi	October 2003	Obsoletes RFC 3152, RFC 1886	Internet Standard (changed from Draft Standard May 2017)
RFC 3597	ASCII, PDF	**Handling of Unknown DNS Resource Record (RR) Types**	A. Gustafsson	September 2003	Updates RFC 2163, RFC 2535, Updated by RFC 4033, RFC 4034, RFC 4035, RFC 5395, RFC 6195, RFC 6895, Errata	Proposed Standard
RFC 3645	ASCII, PDF	**Generic Security Service Algorithm for Secret Key Transaction Authentication for DNS (GSS-TSIG)**	S. Kwan, P. Garg, J. Gilroy, L. Esibov, J. Westhead, R. Hall	October 2003	Updates RFC 2845	Proposed Standard
RFC 3646	ASCII, PDF	**DNS Configuration options for Dynamic Host Configuration Protocol for IPv6 (DHCPv6)**	R. Droms, Ed.	December 2003		Proposed Standard
RFC 3655	ASCII, PDF	Redefinition of DNS Authenticated Data (AD) bit	B. Wellington, O. Gudmundsson	November 2003	Obsoleted by RFC 4033, RFC 4034, RFC 4035, Updates RFC 2535	Proposed Standard

2002

2003

RFC 3658	ASCII, PDF	**Delegation Signer (DS) Resource Record (RR)**	O. Gudmundsson	December 2003	Obsoleted by RFC 4033, RFC 4034, RFC 4035, Updates RFC 3090, RFC 3008, RFC 2535, RFC 1035, Updated by RFC 3755	Proposed Standard
RFC 3681 a.k.a. BCP 80	ASCII, PDF	**Delegation of E.F.F.3.IP6.ARPA**	R. Bush, R. Fink	January 2004		Best Current Practice
RFC 3755	ASCII, PDF	**Legacy Resolver Compatibility for Delegation Signer (DS)**	S. Weiler	May 2004	Obsoleted by RFC 4033, RFC 4034, RFC 4035, Updates RFC 3658, RFC 2535, Updated by RFC 3757, RFC 3845	Proposed Standard
RFC 3757	ASCII, PDF	**Domain Name System KEY (DNSKEY) Resource Record (RR) Secure Entry Point (SEP) Flag**	O. Kolkman, J. Schlyter, E. Lewis	April 2004	Obsoleted by RFC 4033, RFC 4034, RFC 4035, Updates RFC 3755, RFC 2535, Errata	Proposed Standard
RFC 3832	ASCII, PDF	**Remote Service Discovery in the Service Location Protocol (SLP) via DNS SRV**	W. Zhao, H. Schulzrinne, E. Guttman, C. Bisdikian, W. Jerome	July 2004		Experimental
RFC 3833	ASCII, PDF	**Threat Analysis of the Domain Name System (DNS)**	D. Atkins, R. Austein	August 2004		Informational
RFC 3845	ASCII, PDF	**DNS Security (DNSSEC) NextSECure (NSEC) RDATA Format**	J. Schlyter, Ed.	August 2004	Obsoleted by RFC 4033, RFC 4034, RFC 4035, Updates RFC 3755, RFC 2535	Proposed Standard
RFC 3901 a.k.a. BCP 91	ASCII, PDF	**DNS IPv6 Transport Operational Guidelines**	A. Durand, J. Ihren	September 2004		Best Current Practice
RFC 3915	ASCII, PDF	**Domain Registry Grace Period Mapping for the Extensible Provisioning Protocol (EPP)**	S. Hollenbeck	September 2004		Proposed Standard

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RFC	Format	Title	Author	Date	Also/Updates	Status
RFC 4025	ASCII, PDF	**A Method for Storing IPsec Keying Material in DNS**	M. Richardson	March 2005		Proposed Standard
RFC 4027	ASCII, PDF	**Domain Name System Media Types**	S. Josefsson	April 2005		Informational
RFC 4033	ASCII, PDF	**DNS Security Introduction and Requirements**	R. Arends, R. Austein, M. Larson, D. Massey, S. Rose	March 2005	Obsoletes RFC 2535, RFC 3008, RFC 3090, RFC 3445, RFC 3655, RFC 3658, RFC 3755, RFC 3757, RFC 3845, Updates RFC 1034, RFC 1035, RFC 2136, RFC 2181, RFC 2308, RFC 3225, RFC 3597, RFC 3226, Updated by RFC 6014, RFC 6840, Errata	Proposed Standard
RFC 4034	ASCII, PDF	**Resource Records for the DNS Security Extensions**	R. Arends, R. Austein, M. Larson, D. Massey, S. Rose	March 2005	Obsoletes RFC 2535, RFC 3008, RFC 3090, RFC 3445, RFC 3655, RFC 3658, RFC 3755, RFC 3757, RFC 3845, Updates RFC 1034, RFC 1035, RFC 2136, RFC 2181, RFC 2308, RFC 3225, RFC 3597, RFC 3226, Updated by RFC 4470, RFC 6014, RFC 6840, RFC 6944, Errata	Proposed Standard
RFC 4035	ASCII, PDF	**Protocol Modifications for the DNS Security Extensions**	R. Arends, R. Austein, M. Larson, D. Massey, S. Rose	March 2005	Obsoletes RFC 2535, RFC 3008, RFC 3090, RFC 3445, RFC 3655, RFC 3658, RFC 3755, RFC 3757, RFC 3845, Updates RFC 1034, RFC 1035, RFC 2136, RFC 2181, RFC 2308, RFC 3225, RFC 3597, RFC 3226, Updated by RFC 4470, RFC 6014, RFC 6840, RFC 8198, Errata	Proposed Standard
RFC 4074	ASCII, PDF	**Common Misbehavior Against DNS Queries for IPv6 Addresses**	Y. Morishita, T. Jinmei	May 2005		Informational
RFC 4143	ASCII, PDF	**Facsimile Using Internet Mail (IFAX) Service of ENUM**	K. Toyoda, D. Crocker	November 2005	Updated by RFC 6118, Errata	Proposed Standard
RFC 4159 a.k.a. BCP 109	ASCII, PDF	**Deprecation of "ip6.int"**	G. Huston	August 2005		Best Current Practice

2003

2004

RFC 4183	ASCII, PDF	A Suggested Scheme for DNS Resolution of Networks and Gateways	E. Warnicke	September 2005		Informational
RFC 4185	ASCII, PDF	National and Local Characters for DNS Top Level Domain (TLD) Names	J. Klensin	October 2005		Informational
RFC 4255	ASCII, PDF	Using DNS to Securely Publish Secure Shell (SSH) Key Fingerprints	J. Schlyter, W. Griffin	January 2006	Errata	Proposed Standard
RFC 4310	ASCII, PDF	Domain Name System (DNS) Security Extensions Mapping for the Extensible Provisioning Protocol (EPP)	S. Hollenbeck	December 2005	Obsoleted by RFC 5910	Proposed Standard
RFC 4322	ASCII, PDF	Opportunistic Encryption using the Internet Key Exchange (IKE)	M. Richardson, D.H. Redelmeier	December 2005	Errata	Informational
RFC 4339	ASCII, PDF	IPv6 Host Configuration of DNS Server Information Approaches	J. Jeong, Ed.	February 2006	Errata	Informational
RFC 4343	ASCII, PDF	Domain Name System (DNS) Case Insensitivity Clarification	D. Eastlake 3rd	January 2006	Updates RFC 1034, RFC 1035, RFC 2181, Errata	Proposed Standard
RFC 4367	ASCII, PDF	What's in a Name: False Assumptions about DNS Names	J. Rosenberg, Ed., IAB	February 2006	Errata	Informational
RFC 4386	ASCII, PDF	Internet X.509 Public Key Infrastructure Repository Locator Service	S. Boeyen, P. Hallam-Baker	February 2006		Experimental

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2005

2006

RFC 4398	ASCII, PDF	**Storing Certificates in the Domain Name System (DNS)**	S. Josefsson	March 2006	Obsoletes RFC 2538, Updated by RFC 6944, Errata	Proposed Standard
RFC 4431	ASCII, PDF	**The DNSSEC Lookaside Validation (DLV) DNS Resource Record**	M. Andrews, S. Weiler	February 2006		Informational
RFC 4470	ASCII, PDF	**Minimally Covering NSEC Records and DNSSEC On-line Signing**	S. Weiler, J. Ihren	April 2006	Updates RFC 4035, RFC 4034, Errata	Proposed Standard
RFC 4471	ASCII, PDF	**Derivation of DNS Name Predecessor and Successor**	G. Sisson, B. Laurie	September 2006		Experimental
RFC 4472	ASCII, PDF	**Operational Considerations and Issues with IPv6 DNS**	A. Durand, J. Ihren, P. Savola	April 2006		Informational
RFC 4501	ASCII, PDF	**Domain Name System Uniform Resource Identifiers**	S. Josefsson	May 2006	Errata	Proposed Standard
RFC 4509	ASCII, PDF	**Use of SHA-256 in DNSSEC Delegation Signer (DS) Resource Records (RRs)**	W. Hardaker	May 2006	Errata	Proposed Standard
RFC 4635	ASCII, PDF	**HMAC SHA (Hashed Message Authentication Code, Secure Hash Algorithm) TSIG Algorithm Identifiers**	D. Eastlake 3rd	August 2006	Updates RFC 2845, Errata	Proposed Standard
RFC 4641	ASCII, PDF	**DNSSEC Operational Practices**	O. Kolkman, R. Gieben	September 2006	Obsoletes RFC 2541, Obsoleted by RFC 6781, Errata	Informational
RFC 4690	ASCII, PDF	**Review and Recommendations for Internationalized Domain Names (IDNs)**	J. Klensin, P. Faltstrom, C. Karp, IAB	September 2006	Errata	Informational

2006

2006

RFC 4697 a.k.a. BCP 123	ASCII, PDF	Observed DNS Resolution Misbehavior	M. Larson, P. Barber	October 2006		Best Current Practice
RFC 4701	ASCII, PDF	A DNS Resource Record (RR) for Encoding Dynamic Host Configuration Protocol (DHCP) Information (DHCID RR)	M. Stapp, T. Lemon, A. Gustafsson	October 2006	Updated by RFC 5494, Errata	Proposed Standard
RFC 4702	ASCII, PDF	The Dynamic Host Configuration Protocol (DHCP) Client Fully Qualified Domain Name (FQDN) Option	M. Stapp, B. Volz, Y. Rekhter	October 2006		Proposed Standard
RFC 4703	ASCII, PDF	Resolution of Fully Qualified Domain Name (FQDN) Conflicts among Dynamic Host Configuration Protocol (DHCP) Clients	M. Stapp, B. Volz	October 2006		Proposed Standard
RFC 4704	ASCII, PDF	The Dynamic Host Configuration Protocol for IPv6 (DHCPv6) Client Fully Qualified Domain Name (FQDN) Option	B. Volz	October 2006		Proposed Standard
RFC 4759	ASCII, PDF	The ENUM Dip Indicator Parameter for the "tel" URI	R. Stastny, R. Shockey, L. Conroy	December 2006		Proposed Standard
RFC 4870	ASCII, PDF	Domain-Based Email Authentication Using Public Keys Advertised in the DNS (DomainKeys)	M. Delany	May 2007	Obsoleted by RFC 4871	Historic
RFC 4892	ASCII, PDF	Requirements for a Mechanism Identifying a Name Server Instance	S. Woolf, D. Conrad	June 2007		Informational

2006

RFC 4955	ASCII, PDF	**DNS Security (DNSSEC) Experiments**	D. Blacka	July 2007		Proposed Standard
RFC 4956	ASCII, PDF	**DNS Security (DNSSEC) Opt-In**	R. Arends, M. Kosters, D. Blacka	July 2007	Errata	Experimental
RFC 4986	ASCII, PDF	**Requirements Related to DNS Security (DNSSEC) Trust Anchor Rollover**	H. Eland, R. Mundy, S. Crocker, S. Krishnaswamy	August 2007		Informational
RFC 5001	ASCII, PDF	**DNS Name Server Identifier (NSID) Option**	R. Austein	August 2007		Proposed Standard
RFC 5006	ASCII, PDF	**IPv6 Router Advertisement Option for DNS Configuration**	J. Jeong, Ed., S. Park, L. Beloeil, S. Madanapalli	September 2007	Obsoleted by RFC 6106	Experimental
RFC 5011 a.k.a. STD 74	ASCII, PDF	**Automated Updates of DNS Security (DNSSEC) Trust Anchors**	M. StJohns	September 2007		Internet Standard (changed from Proposed Standard January 2013)
RFC 5074	ASCII, PDF	**DNSSEC Lookaside Validation (DLV)**	S. Weiler	November 2007		Informational
RFC 5155	ASCII, PDF	**DNS Security (DNSSEC) Hashed Authenticated Denial of Existence**	B. Laurie, G. Sisson, R. Arends, D. Blacka	March 2008	Updated by RFC 6840, RFC 6944, Errata	Proposed Standard
RFC 5158	ASCII, PDF	**6to4 Reverse DNS Delegation Specification**	G. Huston	March 2008	Errata	Informational
RFC 5205	ASCII, PDF	**Host Identity Protocol (HIP) Domain Name System (DNS) Extensions**	P. Nikander, J. Laganier	April 2008	Obsoleted by RFC 8005	Experimental

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2007

2008

RFC 5346	ASCII, PDF	**Operational Requirements for ENUM-Based Softswitch Use**	J. Lim, W. Kim, C. Park, L. Conroy	October 2008	Errata	Informational
RFC 5395	ASCII, PDF	**Domain Name System (DNS) IANA Considerations**	D. Eastlake 3rd	November 2008	Obsoletes RFC 2929, Obsoleted by RFC 6195, Updates RFC 1183, RFC 3597, Errata	Best Current Practice
RFC 5452	ASCII, PDF	**Measures for Making DNS More Resilient against Forged Answers**	A. Hubert, R. van Mook	January 2009	Updates RFC 2181	Proposed Standard
RFC 5483	ASCII, PDF	**ENUM Implementation Issues and Experiences**	L. Conroy, K. Fujiwara	March 2009		Informational
RFC 5507	ASCII, PDF	**Design Choices When Expanding the DNS**	IAB, P. Faltstrom, Ed., R. Austein, Ed., P. Koch, Ed.	April 2009		Informational
RFC 5509	ASCII, PDF	**Internet Assigned Numbers Authority (IANA) Registration of Instant Messaging and Presence DNS SRV RRs for the Session Initiation Protocol (SIP)**	S. Loreto	April 2009		Proposed Standard
RFC 5625 a.k.a. BCP 152	ASCII, PDF	**DNS Proxy Implementation Guidelines**	R. Bellis	August 2009		Best Current Practice
RFC 5679	ASCII, PDF	**Locating IEEE 802.21 Mobility Services Using DNS**	G. Bajko	December 2009		Proposed Standard
RFC 5702	ASCII, PDF	**Use of SHA-2 Algorithms with RSA in DNSKEY and RRSIG Resource Records for DNSSEC**	J. Jansen	October 2009	Updated by RFC 6944	Proposed Standard

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2009

RFC 5782	ASCII, PDF	**DNS Blacklists and Whitelists**	J. Levine	February 2010	Errata	Informational
RFC 5864	ASCII, PDF	**DNS SRV Resource Records for AFS**	R. Allbery	April 2010	Updates RFC 1183, Errata	Proposed Standard
RFC 5892	ASCII, PDF	**The Unicode Code Points and Internationalized Domain Names for Applications (IDNA)**	P. Faltstrom, Ed.	August 2010	Errata	Proposed Standard
RFC 5910	ASCII, PDF	**Domain Name System (DNS) Security Extensions Mapping for the Extensible Provisioning Protocol (EPP)**	J. Gould, S. Hollenbeck	May 2010	Obsoletes RFC 4310, Errata	Proposed Standard
RFC 5933	ASCII, PDF	**Use of GOST Signature Algorithms in DNSKEY and RRSIG Resource Records for DNSSEC**	V. Dolmatov, Ed., A. Chuprina, I. Ustinov	July 2010	Updated by RFC 6944	Proposed Standard
RFC 5936	ASCII, PDF	**DNS Zone Transfer Protocol (AXFR)**	E. Lewis, A. Hoenes, Ed.	June 2010	Updates RFC 1034, RFC 1035	Proposed Standard
RFC 5966	ASCII, PDF	**DNS Transport over TCP - Implementation Requirements**	R. Bellis	August 2010	Obsoleted by RFC 7766, Updates RFC 1035, RFC 1123	Proposed Standard
RFC 6014	ASCII, PDF	**Cryptographic Algorithm Identifier Allocation for DNSSEC**	P. Hoffman	November 2010	Updates RFC 4033, RFC 4034, RFC 4035	Proposed Standard
RFC 6097	ASCII, PDF	**Local Mobility Anchor (LMA) Discovery for Proxy Mobile IPv6**	J. Korhonen, V. Devarapalli	February 2011		Informational
RFC 6106	ASCII, PDF	**IPv6 Router Advertisement Options for DNS Configuration**	J. Jeong, S. Park, L. Beloeil, S. Madanapalli	November 2010	Obsoletes RFC 5006, Obsoleted by RFC 8106, Errata	Proposed Standard

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Antonio Prado - La storia del DNS: nascita, sicurezza, filtri - 10 luglio 2025

RFC 6116	ASCII, PDF	**The E.164 to Uniform Resource Identifiers (URI) Dynamic Delegation Discovery System (DDDS) Application (ENUM)**	S. Bradner, L. Conroy, K. Fujiwara	March 2011	Obsoletes RFC 3761	Proposed Standard
RFC 6147	ASCII, PDF	**DNS64: DNS Extensions for Network Address Translation from IPv6 Clients to IPv4 Servers**	M. Bagnulo, A. Sullivan, P. Matthews, I. van Beijnum	April 2011	Errata	Proposed Standard
RFC 6168	ASCII, PDF	**Requirements for Management of Name Servers for the DNS**	W. Hardaker	May 2011		Informational
RFC 6186	ASCII, PDF	**Use of SRV Records for Locating Email Submission/Access Services**	C. Daboo	March 2011	Updates RFC 1939, RFC 3501	Proposed Standard
RFC 6195	ASCII, PDF	**Domain Name System (DNS) IANA Considerations**	D. Eastlake 3rd	March 2011	Obsoletes RFC 5395, Obsoleted by RFC 6895, Updates RFC 1183, RFC 3597	Best Current Practice
RFC 6303 part of BCP 163	ASCII, PDF	**Locally Served DNS Zones**	M. Andrews	July 2011		Best Current Practice
RFC 6304	ASCII, PDF	**AS112 Nameserver Operations**	J. Abley, W. Maton	July 2011	Obsoleted by RFC 7534	Informational
RFC 6382 a.k.a. BCP 169	ASCII, PDF	**Unique Origin Autonomous System Numbers (ASNs) per Node for Globally Anycasted Services**	D. McPherson, R. Donnelly, F. Scalzo	October 2011		Best Current Practice
RFC 6394	ASCII, PDF	**Use Cases and Requirements for DNS-Based Authentication of Named Entities (DANE)**	R. Barnes	October 2011		Informational
RFC 6418	ASCII, PDF	**Multiple Interfaces and Provisioning Domains Problem**	M. Blanchet, P. Seite	November 2011	Errata	Informational

2011

2011

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RFC 6452	ASCII, PDF	Points and Internationalized Domain Names for Applications (IDNA) - Unicode 6.0	P. Faltstrom, Ed., P. Hoffman, Ed.	November 2011	Proposed Standard
RFC 6471	ASCII, PDF	Overview of Best Email DNS-Based List (DNSBL) Operational Practices	C. Lewis, M. Sergeant	January 2012	Informational
RFC 6535	ASCII, PDF	Dual-Stack Hosts Using "Bump-in-the-Host" (BIH)	B. Huang, H. Deng, T. Savolainen	February 2012	Obsoletes RFC 2767, RFC 3338, Errata	Proposed Standard
RFC 6594	ASCII, PDF	Use of the SHA-256 Algorithm with RSA, Digital Signature Algorithm (DSA), and Elliptic Curve DSA (ECDSA) in SSHFP Resource Records	O. Sury	April 2012		Proposed Standard
RFC 6604	ASCII, PDF	xNAME RCODE and Status Bits Clarification	D. Eastlake 3rd	April 2012	Updates RFC 1035, RFC 2308, RFC 2672	Proposed Standard
RFC 6605	ASCII, PDF	Elliptic Curve Digital Signature Algorithm (DSA) for DNSSEC	P. Hoffman, W.C.A. Wijngaards	April 2012		Proposed Standard
RFC 6641	ASCII, PDF	Using DNS SRV to Specify a Global File Namespace with NFS Version 4	C. Everhart, W. Adamson, J. Zhang	June 2012		Proposed Standard
RFC 6672	ASCII, PDF	DNAME Redirection in the DNS	S. Rose, W. Wijngaards	June 2012	Obsoletes RFC 2672, Updates RFC 3363	Proposed Standard
RFC 6698	ASCII, PDF	The DNS-Based Authentication of Named Entities (DANE) Transport Layer Security (TLS) Protocol: TLSA	P. Hoffman, J. Schlyter	August 2012	Updated by RFC 7218, RFC 7671, Errata	Proposed Standard

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RFC 6725	ASCII, PDF	DNS Security (DNSSEC) DNSKEY Algorithm IANA Registry Updates	S. Rose	August 2012		Proposed Standard
RFC 6731	ASCII, PDF	Improved Recursive DNS Server Selection for Multi-Interfaced Nodes	T. Savolainen, J. Kato, T. Lemon	December 2012		Proposed Standard
RFC 6742	ASCII, PDF	DNS Resource Records for the Identifier-Locator Network Protocol (ILNP)	RJ Atkinson, SN Bhatti, S. Rose	November 2012	Errata	Experimental
RFC 6762	ASCII, PDF	Multicast DNS	S. Cheshire, M. Krochmal	February 2013	Errata	Proposed Standard
RFC 6763	ASCII, PDF	DNS-Based Service Discovery	S. Cheshire, M. Krochmal	February 2013		Proposed Standard
RFC 6781	ASCII, PDF	DNSSEC Operational Practices, Version 2	O. Kolkman, W. Mekking, R. Gieben	December 2012	Obsoletes RFC 4641, Errata	Informational
RFC 6804	ASCII, PDF	DISCOVER: Supporting Multicast DNS Queries	B. Manning	November 2012		Historic
RFC 6840	ASCII, PDF	Clarifications and Implementation Notes for DNS Security (DNSSEC)	S. Weiler, Ed., D. Blacka, Ed.	February 2013	Updates RFC 4033, RFC 4034, RFC 4035, RFC 5155, Errata	Proposed Standard
RFC 6841	ASCII, PDF	A Framework for DNSSEC Policies and DNSSEC Practice Statements	F. Ljunggren, AM. Eklund Lowinder, T. Okubo	January 2013		Informational
RFC 6844	ASCII, PDF	DNS Certification Authority Authorization (CAA) Resource Record	P. Hallam-Baker, R. Stradling	January 2013	Errata	Proposed Standard
RFC 6889	ASCII, PDF	Analysis of Stateful 64 Translation	R. Penno, T. Saxena, M. Boucadair, S. Sivakumar	April 2013		Informational

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2013

RFC 6891 a.k.a. STD 75	ASCII, PDF	**Extension Mechanisms for DNS (EDNS(0))**	J. Damas, M. Graff, P. Vixie	April 2013	Obsoletes RFC 2671, RFC 2673, Errata	Internet Standard
RFC 6895 a.k.a. BCP 42	ASCII, PDF	**Domain Name System (DNS) IANA Considerations**	D. Eastlake 3rd	April 2013	Obsoletes RFC 6195, Updates RFC 1183, RFC 2845, RFC 2930, RFC 3597	Best Current Practice
RFC 6912	ASCII, PDF	**Principles for Unicode Code Point Inclusion in Labels in the DNS**	A. Sullivan, D. Thaler, J. Klensin, O. Kolkman	April 2013		Informational
RFC 6927	ASCII, PDF	**Variants in Second-Level Names Registered in Top-Level Domains**	J. Levine, P. Hoffman	May 2013		Informational
RFC 6944	ASCII, PDF	**Applicability Statement: DNS Security (DNSSEC) DNSKEY Algorithm Implementation Status**	S. Rose	April 2013	Updates RFC 2536, RFC 2539, RFC 3110, RFC 4034, RFC 4398, RFC 5155, RFC 5702, RFC 5933, Errata	Proposed Standard
RFC 6950	ASCII, PDF	**Architectural Considerations on Application Features in the DNS**	J. Peterson, O. Kolkman, H. Tschofenig, B. Aboba	October 2013		Informational
RFC 6975	ASCII, PDF	**Signaling Cryptographic Algorithm Understanding in DNS Security Extensions (DNSSEC)**	S. Crocker, S. Rose	July 2013		Proposed Standard
RFC 7043	ASCII, PDF	**Resource Records for EUI-48 and EUI-64 Addresses in the DNS**	J. Abley	October 2013		Informational
RFC 7050	ASCII, PDF	**Discovery of the IPv6 Prefix Used for IPv6 Address Synthesis**	T. Savolainen, J. Korhonen, D. Wing	November 2013	Errata	Proposed Standard

2013

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RFC 7051	ASCII, PDF	Analysis of Solution Proposals for Hosts to Learn NAT64 Prefix	J. Korhonen, Ed., T. Savolainen, Ed.	November 2013		Informational
RFC 7085	ASCII, PDF	Top-Level Domains That Are Already Dotless	J. Levine, P. Hoffman	December 2013		Informational
RFC 7129	ASCII, PDF	Authenticated Denial of Existence in the DNS	R. Gieben, W. Mekking	February 2014		Informational
RFC 7216	ASCII, PDF	Location Information Server (LIS) Discovery Using IP Addresses and Reverse DNS	M. Thomson, R. Bellis	April 2014		Proposed Standard
RFC 7218	ASCII, PDF	Adding Acronyms to Simplify Conversations about DNS-Based Authentication of Named Entities (DANE)	O. Gudmundsson	April 2014	Updates RFC 6698	Proposed Standard
RFC 7250	ASCII, PDF	Using Raw Public Keys in Transport Layer Security (TLS) and Datagram Transport Layer Security (DTLS)	P. Wouters, Ed., H. Tschofenig, Ed., J. Gilmore, S. Weiler, T. Kivinen	June 2014	Errata	Proposed Standard
RFC 7314	ASCII, PDF	Extension Mechanisms for DNS (EDNS) EXPIRE Option	M. Andrews	July 2014		Experimental
RFC 7344	ASCII, PDF	Automating DNSSEC Delegation Trust Maintenance	W. Kumari, O. Gudmundsson, G. Barwood	September 2014	Updated by RFC 8078	Proposed Standard (changed from Informational March 2017)
RFC 7393	ASCII, PDF	Using the Port Control Protocol (PCP) to Update Dynamic DNS	X. Deng, M. Boucadair, Q. Zhao, J. Huang, C.	November 2014		Informational

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2013

RFC 7477	ASCII, PDF	Child-to-Parent Synchronization in DNS	W. Hardaker	March 2015	Errata	Proposed Standard
RFC 7505	ASCII, PDF	A "Null MX" No Service Resource Record for Domains That Accept No Mail	J. Levine, M. Delany	June 2015		Proposed Standard
RFC 7534	ASCII, PDF	AS112 Nameserver Operations	J. Abley, W. Sotomayor	May 2015	Obsoletes RFC 6304	Informational
RFC 7535	ASCII, PDF	AS112 Redirection Using DNAME	J. Abley, B. Dickson, W. Kumari, G. Michaelson	May 2015		Informational
RFC 7553	ASCII, PDF	The Uniform Resource Identifier (URI) DNS Resource Record	P. Faltstrom, O. Kolkman	June 2015		Informational
RFC 7558	ASCII, PDF	Requirements for Scalable DNS-Based Service Discovery (DNS-SD) / Multicast DNS (mDNS) Extensions	K. Lynn, S. Cheshire, M. Blanchet, D. Migault	July 2015		Informational
RFC 7583	ASCII, PDF	DNSSEC Key Rollover Timing Considerations	S. Morris, J. Ihren, J. Dickinson, W. Mekking	October 2015		Informational
RFC 7585	ASCII, PDF	Dynamic Peer Discovery for RADIUS/TLS and RADIUS/DTLS Based on the Network Access Identifier (NAI)	S. Winter, M. McCauley	October 2015	Errata	Experimental
RFC 7626	ASCII, PDF	DNS Privacy Considerations	S. Bortzmeyer	August 2015		Informational
RFC 7646	ASCII, PDF	Definition and Use of DNSSEC Negative Trust Anchors	P. Ebersman, W. Kumari, C. Griffiths, J. Livingood, R. Weber	September 2015		Informational

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		The DNS-Based Authentication of Named Entities (DANE) Protocol: Updates and Operational Guidance	V. Dukhovni, W. Hardaker	October 2015	Updates RFC 6698	Proposed Standard
RFC 7671	ASCII, PDF					
RFC 7672	ASCII, PDF	SMTP Security via Opportunistic DNS-Based Authentication of Named Entities (DANE) Transport Layer Security (TLS)	V. Dukhovni, W. Hardaker	October 2015		Proposed Standard
RFC 7673	ASCII, PDF	Using DNS-Based Authentication of Named Entities (DANE) TLSA Records with SRV Records	T. Finch, M. Miller, P. Saint-Andre	October 2015		Proposed Standard
RFC 7719	ASCII, PDF	DNS Terminology	P. Hoffman, A. Sullivan, K. Fujiwara	December 2015	Errata	Informational
RFC 7720 a.k.a. BCP 40	ASCII, PDF	DNS Root Name Service Protocol and Deployment Requirements	M. Blanchet, L-J. Liman	December 2015	Obsoletes RFC 2870	Best Current Practice
RFC 7745	ASCII, PDF	XML Schemas for Reverse DNS Management	T. Manderson	January 2016		Informational
RFC 7766	ASCII, PDF	DNS Transport over TCP - Implementation Requirements	J. Dickinson, S. Dickinson, R. Bellis, A. Mankin, D. Wessels	March 2016	Obsoletes RFC 5966, Updates RFC 1035, RFC 1123	Proposed Standard
RFC 7793 part of BCP 163	ASCII, PDF	Adding 100.64.0.0/10 Prefixes to the IPv4 Locally-Served DNS Zones Registry	M. Andrews	May 2016		Best Current Practice
RFC 7816	ASCII, PDF	DNS Query Name Minimisation to Improve Privacy	S. Bortzmeyer	March 2016	Errata	Experimental

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RFC 7828	ASCII, PDF	The edns-tcp-keepalive EDNS0 Option	P. Wouters, J. Abley, S. Dickinson, R. Bellis	April 2016		Proposed Standard
RFC 7830	ASCII, PDF	The EDNS(0) Padding Option	A. Mayrhofer	May 2016		Proposed Standard
RFC 7858	ASCII, PDF	Specification for DNS over Transport Layer Security (TLS)	Z. Hu, L. Zhu, J. Heidemann, A. Mankin, D. Wessels, P. Hoffman	May 2016		Proposed Standard
RFC 7871	ASCII, PDF	Client Subnet in DNS Queries	C. Contavalli, W. van der Gaast, D. Lawrence, W. Kumari	May 2016	Errata	Informational
RFC 7873	ASCII, PDF	Domain Name System (DNS) Cookies	D. Eastlake 3rd, M. Andrews	May 2016		Proposed Standard
RFC 7901	ASCII, PDF	CHAIN Query Requests in DNS	P. Wouters	June 2016		Experimental
RFC 7929	ASCII, PDF	DNS-Based Authentication of Named Entities (DANE) Bindings for OpenPGP	P. Wouters	August 2016	Errata	Experimental
RFC 7958	ASCII, PDF	DNSSEC Trust Anchor Publication for the Root Zone	J. Abley, J. Schlyter, G. Bailey, P. Hoffman	August 2016		Informational
RFC 7975	ASCII, PDF	Request Routing Redirection Interface for Content Delivery Network (CDN) Interconnection	B. Niven-Jenkins, Ed., R. van Brandenburg, Ed.	October 2016		Proposed Standard
RFC 7984	ASCII, PDF	Locating Session Initiation Protocol (SIP) Servers in a	O. Johansson, G. Salgueiro, V. Gurbani, D.	September 2016	Updates RFC 3263	Proposed Standard

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RFC 8005	ASCII, PDF	**Host Identity Protocol (HIP) Domain Name System (DNS) Extension**	J. Laganier	October 2016	Obsoletes RFC 5205	Proposed Standard
RFC 8006	ASCII, PDF	**Content Delivery Network Interconnection (CDNI) Metadata**	B. Niven-Jenkins, R. Murray, M. Caulfield, K. Ma	December 2016	Errata	Proposed Standard
RFC 8027 a.k.a. BCP 207	ASCII, PDF	**DNSSEC Roadblock Avoidance**	W. Hardaker, O. Gudmundsson, S. Krishnaswamy	November 2016	Errata	Best Current Practice
RFC 8078	ASCII, PDF	**Managing DS Records from the Parent via CDS/CDNSKEY**	O. Gudmundsson, P. Wouters	March 2017	Updates RFC 7344, Errata	Proposed Standard
RFC 8080	ASCII, PDF	**Edwards-Curve Digital Security Algorithm (EdDSA) for DNSSEC**	O. Sury, R. Edmonds	February 2017	Errata	Proposed Standard
RFC 8094	ASCII, PDF	**DNS over Datagram Transport Layer Security (DTLS)**	T. Reddy, D. Wing, P. Patil	February 2017		Experimental
RFC 8106	ASCII, PDF	**IPv6 Router Advertisement Options for DNS Configuration**	J. Jeong, S. Park, L. Beloeil, S. Madanapalli	March 2017	Obsoletes RFC 6106	Proposed Standard
RFC 8109 a.k.a. BCP 209	ASCII, PDF	**Initializing a DNS Resolver with Priming Queries**	P. Koch, M. Larson, P. Hoffman	March 2017		Best Current Practice
RFC 8145	ASCII, PDF	**Signaling Trust Anchor Knowledge in DNS Security Extensions (DNSSEC)**	D. Wessels, W. Kumari, P. Hoffman	April 2017		Proposed Standard
RFC 8162	ASCII, PDF	**Using Secure DNS to Associate Certificates with Domain Names for S/MIME**	P. Hoffman, J. Schlyter	May 2017		Experimental

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RFC 8198	ASCII, PDF, HTML	**Aggressive Use of DNSSEC-Validated Cache**	K. Fujiwara, A. Kato, W. Kumari	July 2017	Updates RFC 4035	Proposed Standard
RFC 8219	ASCII, PDF, HTML	**Benchmarking Methodology for IPv6 Transition Technologies**	M. Georgescu, L. Pislaru, G. Lencse	August 2017		Informational
RFC 8222	ASCII, PDF, HTML	**Selecting Labels for Use with Conventional DNS and Other Resolution Systems in DNS-Based Service Discovery**	A. Sullivan	September 2017		Informational
RFC 8305	ASCII, PDF, HTML	**Happy Eyeballs Version 2: Better Connectivity Using Concurrency**	D. Schinazi, T. Pauly	December 2017	Obsoletes RFC 6555	Proposed Standard
RFC 8310	ASCII, PDF, HTML	**Usage Profiles for DNS over TLS and DNS over DTLS**	S. Dickinson, D. Gillmor, T. Reddy	March 2018	Updates RFC 7858	Proposed Standard
RFC 8324	ASCII, PDF, HTML, HTML with inline errata	**DNS Privacy, Authorization, Special Uses, Encoding, Characters, Matching, and Root Structure: Time for Another Look?**	J. Klensin	February 2018	**Errata**	Informational
RFC 8427	ASCII, PDF, HTML, HTML with inline errata	**Representing DNS Messages in JSON**	P. Hoffman	July 2018	**Errata**	Informational
RFC 8467	ASCII, PDF, HTML	**Padding Policies for Extension Mechanisms for DNS (EDNS(0))**	A. Mayrhofer	October 2018		Experimental
RFC 8482	ASCII, PDF, HTML	**Providing Minimal-Sized Responses to DNS Queries That Have QTYPE=ANY**	J. Abley, O. Gudmundsson, M. Majkowski, E. Hunt	January 2019	Updates RFC 1034, RFC 1035	Proposed Standard
RFC 8483	ASCII, PDF, HTML	**Yeti DNS Testbed**	L. Song, Ed., D. Liu, P. Vixie, A. Kato, S. Kerr	October 2018		Informational
RFC 8484	ASCII, PDF, HTML	**DNS Queries over HTTPS (DoH)**	P. Hoffman, P. McManus	October 2018	**Errata**	Proposed Standard
RFC 8490	ASCII, PDF, HTML	**DNS Stateful Operations**	R. Bellis, S. Cheshire, J. Dickinson, S. Dickinson, T. Lemon, T.	March 2019	Updates RFC 1035, RFC 7766	Proposed Standard

RFC 8499 a.k.a. BCP 219	ASCII, PDF, HTML	DNS Terminology	P. Hoffman, A. Sullivan, K. Fujiwara	January 2019	Obsoletes RFC 7719, Updates RFC 2308	Best Current Practice
RFC 8501	ASCII, PDF, HTML	Reverse DNS in IPv6 for Internet Service Providers	L. Howard	November 2018		Informational
RFC 8509	ASCII, PDF, HTML	A Root Key Trust Anchor Sentinel for DNSSEC	G. Huston, J. Damas, W. Kumari	December 2018		Proposed Standard
RFC 8552 part of BCP 222	ASCII, PDF, HTML	Scoped Interpretation of DNS Resource Records through "Underscored" Naming of Attribute Leaves	D. Crocker	March 2019	Errata	Best Current Practice
RFC 8553 part of BCP 222	ASCII, PDF, HTML	DNS Attrleaf Changes: Fixing Specifications That Use Underscored Node Names	D. Crocker	March 2019	Updates RFC 2782, RFC 3263, RFC 3529, RFC 3620, RFC 3832, RFC 3887, RFC 3958, RFC 4120, RFC 4227, RFC 4386, RFC 4387, RFC 4976, RFC 5026, RFC 5328, RFC 5389, RFC 5415, RFC 5518, RFC 5555, RFC 5617, RFC 5679, RFC 5766, RFC 5780, RFC 5804, RFC 5864, RFC 5928, RFC 6120, RFC 6186, RFC 6376, RFC 6733, RFC 6763, RFC 7208, RFC 7489, RFC 8145	Best Current Practice
RFC 8567	ASCII, PDF, HTML	Customer Management DNS Resource Records	E. Rye, R. Beverly	1 April 2019		Informational
RFC 8586	ASCII, PDF, HTML	Loop Detection in Content Delivery Networks (CDNs)	S. Ludin, M. Nottingham, N. Sullivan	April 2019	Errata	Proposed Standard
RFC 8598	ASCII, PDF, HTML	Split DNS Configuration for the Internet Key Exchange Protocol Version 2 (IKEv2)	T. Pauly, P. Wouters	May 2019		Proposed Standard
RFC 8618	ASCII, PDF, HTML	Compacted-DNS (C-DNS): A Format for DNS Packet Capture	J. Dickinson, J. Hague, S. Dickinson, T. Manderson, J. Bond	September 2019		Proposed Standard
RFC 8624	ASCII, PDF, HTML	Algorithm Implementation Requirements and Usage Guidance for DNSSEC	P. Wouters, O. Sury	June 2019	Errata, Obsoletes RFC 6944	Proposed Standard
RFC 8659	HTML, TEXT, PDF, XML	DNS Certification Authority Authorization (CAA) Resource Record	P. Hallam-Baker, R. Stradling, J. Hoffman-Andrews	November 2019	Errata, Obsoletes RFC 6844	Proposed Standard
RFC 8683	HTML, TEXT, PDF, XML	Additional Deployment Guidelines for NAT64/464XLAT in Operator and Enterprise Networks	J. Palet Martinez	November 2019		Informational
RFC 8749	HTML, TEXT, PDF, XML	Moving DNSSEC Lookaside Validation (DLV) to Historic Status	W. Mekking, D. Mahoney	March 2020	Updates RFC 6698, RFC 6840	Proposed Standard

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RFC 8764	HTML, TEXT, PDF, XML	Apple's DNS Long-Lived Queries Protocol	S. Cheshire, M. Krochmal	June 2020		Informational
RFC 8765	HTML, TEXT, PDF, XML	DNS Push Notifications	T. Pusateri, S. Cheshire	June 2020		Proposed Standard
RFC 8766	HTML, TEXT, PDF, XML	Discovery Proxy for Multicast DNS-Based Service Discovery	S. Cheshire	June 2020		Proposed Standard
RFC 8767	HTML, TEXT, PDF, XML	Serving Stale Data to Improve DNS Resiliency	D. Lawrence, W. Kumari, P. Sood	March 2020	Updates RFC 1034, RFC 1035, RFC 2181	Proposed Standard
RFC 8777	HTML, TEXT, PDF, XML, HTML with inline errata	DNS Reverse IP Automatic Multicast Tunneling (AMT) Discovery	J. Holland	April 2020	Errata, Updates RFC 7450	Proposed Standard
RFC 8806	HTML, TEXT, PDF, XML	Running a Root Server Local to a Resolver	W. Kumari, P. Hoffman	June 2020	Obsoletes RFC 7706	Informational
RFC 8880	HTML, TEXT, PDF, XML	Special Use Domain Name 'ipv4only.arpa'	S. Cheshire, D. Schinazi	August 2020	Updates RFC 7050	Proposed Standard
RFC 8882	HTML, TEXT, PDF, XML	DNS-Based Service Discovery (DNS-SD) Privacy and Security Requirements	C. Huitema, D. Kaiser	September 2020		Informational
RFC 8901	HTML, TEXT, PDF, XML	Multi-Signer DNSSEC Models	S. Huque, P. Aras, J. Dickinson, J. Vcelak, D. Blacka	September 2020		Informational
RFC 8904	HTML, TEXT, PDF, XML	DNS Whitelist (DNSWL) Email Authentication Method Extension	A. Vesely	September 2020		Informational
RFC 8906 a.k.a. BCP 231	HTML, TEXT, PDF, XML	A Common Operational Problem in DNS Servers: Failure to Communicate	M. Andrews, R. Bellis	September 2020		Best Current Practice
RFC 8914	HTML, TEXT, PDF, XML	Extended DNS Errors	W. Kumari, E. Hunt, R. Arends, W. Hardaker, D. Lawrence	October 2020		Proposed Standard

RFC 8932 a.k.a. BCP 232	HTML, TEXT, PDF, XML	Recommendations for DNS Privacy Service Operators	S. Dickinson, B. Overeinder, R. van Rijswijk-Deij, A. Mankin	October 2020	Errata	Best Current Practice
RFC 8945 a.k.a. STD 93	HTML, TEXT, PDF, XML	Secret Key Transaction Authentication for DNS (TSIG)	F. Dupont, S. Morris, P. Vixie, D. Eastlake 3rd, O. Gudmundsson, B. Wellington	November 2020	Obsoletes RFC 2845, RFC 4635	Internet Standard
RFC 8976	HTML, TEXT, PDF, XML	Message Digest for DNS Zones	D. Wessels, P. Barber, M. Weinberg, W. Kumari, W. Hardaker	February 2021	Errata	Proposed Standard
RFC 9018	HTML, TEXT, PDF, XML	Interoperable Domain Name System (DNS) Server Cookies	O. Sury, W. Toorop, D. Eastlake 3rd, M. Andrews	April 2021	Updates RFC 7873	Proposed Standard
RFC 9076	HTML, TEXT, PDF, XML	DNS Privacy Considerations	T. Wicinski, Ed.	July 2021	Obsoletes RFC 7626	Informational
RFC 9077	HTML, TEXT, PDF, XML	NSEC and NSEC3: TTLs and Aggressive Use	P. van Dijk	July 2021	Updates RFC 4034, RFC 4035, RFC 5155, RFC 8198	Proposed Standard
RFC 9102	HTML, TEXT, PDF, XML, HTML with inline errata	TLS DNSSEC Chain Extension	V. Dukhovni, S. Huque, W. Toorop, P. Wouters, M. Shore	August 2021	Errata	Experimental
RFC 9103	HTML, TEXT, PDF, XML	DNS Zone Transfer over TLS	W. Toorop, S. Dickinson, S. Sahib, P. Aras, A. Mankin	August 2021	Updates RFC 1995, RFC 5936, RFC 7766	Proposed Standard
RFC 9108	HTML, TEXT, PDF, XML	YANG Types for DNS Classes and Resource Record Types	L. Lhotka, P. Špaček	September 2021		Proposed Standard
RFC 9120	HTML, TEXT, PDF, XML	Nameservers for the Address and Routing Parameter Area ("arpa") Domain	K. Davies, J. Arkko	October 2021	Updates RFC 3172	Informational
RFC 9156	HTML, TEXT, PDF, XML	DNS Query Name Minimisation to Improve Privacy	S. Bortzmeyer, R. Dolmans, P. Hoffman	November 2021	Obsoletes RFC 7816	Proposed Standard
RFC 9157	HTML, TEXT, PDF, XML	Revised IANA Considerations for DNSSEC	P. Hoffman	December 2021	Updates RFC 5155, RFC 6014, RFC 8624	Proposed Standard
RFC 9199	HTML, TEXT, PDF, XML	Considerations for Large Authoritative DNS Server Operators	G. Moura, W. Hardaker, J. Heidemann, M. Davids	March 2022		Informational
RFC 9210 a.k.a. BCP 235	HTML, TEXT, PDF, XML	DNS Transport over TCP - Operational Requirements	J. Kristoff, D. Wessels	March 2022	Updates RFC 1123, RFC 1536	Best Current Practice
RFC 9224 part of STD 95	HTML, TEXT, PDF, XML	Finding the Authoritative Registration Data Access Protocol (RDAP) Service	M. Blanchet	March 2022	Obsoletes RFC 7484	Internet Standard

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RFC 9230	HTML, TEXT, PDF, XML	**Oblivious DNS over HTTPS**	E. Kinnear, P. McManus, T. Pauly, T. Verma, C.A. Wood	June 2022	**Errata**	Experimental
RFC 9250	HTML, TEXT, PDF, XML	**DNS over Dedicated QUIC Connections**	C. Huitema, S. Dickinson, A. Mankin	May 2022		Proposed Standard
RFC 9267	HTML, TEXT, PDF, XML	**Common Implementation Anti-Patterns Related to Domain Name System (DNS) Resource Record (RR) Processing**	S. Dashevskyi, D. dos Santos, J. Wetzels, A. Amri	July 2022		Informational
RFC 9276 a.k.a. BCP 236	HTML, TEXT, PDF, XML, HTML with inline errata	**Guidance for NSEC3 Parameter Settings**	W. Hardaker, V. Dukhovni	August 2022	**Errata**, Updates RFC 5155	Best Current Practice
RFC 9313	HTML, TEXT, PDF, XML	**Pros and Cons of IPv6 Transition Technologies for IPv4-as-a-Service (IPv4aaS)**	G. Lencse, J. Palet Martinez, L. Howard, R. Patterson, I. Farrer	October 2022		Informational
RFC 9364 a.k.a. BCP 237	HTML, TEXT, PDF, XML	**DNS Security Extensions (DNSSEC)**	P. Hoffman	February 2023		Best Current Practice
RFC 9432	HTML, TEXT, PDF, XML	**DNS Catalog Zones**	P. van Dijk, L. Peltan, O. Surý, W. Toorop, C.R. Monshouwer, P. Thomassen, A. Sargsyan	July 2023		Proposed Standard
RFC 9445	HTML, TEXT, PDF, XML	**RADIUS Extensions for DHCP-Configured Services**	M. Boucadair, T. Reddy.K, A. DeKok	August 2023	Updates RFC 4014	Proposed Standard
RFC 9460	HTML, TEXT, PDF, XML	**Service Binding and Parameter Specification via the DNS (SVCB and HTTPS Resource Records)**	B. Schwartz, M. Bishop, E. Nygren	November 2023		Proposed Standard

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2023

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RFC 9461	HTML, TEXT, PDF, XML	**Service Binding Mapping for DNS Servers**	B. Schwartz	November 2023		Proposed Standard
RFC 9462	HTML, TEXT, PDF, XML	**Discovery of Designated Resolvers**	T. Pauly, E. Kinnear, C. A. Wood, P. McManus, T. Jensen	November 2023		Proposed Standard
RFC 9463	HTML, TEXT, PDF, XML, HTML with inline errata	**DHCP and Router Advertisement Options for the Discovery of Network-designated Resolvers (DNR)**	M. Boucadair, Ed., T. Reddy.K, Ed., D. Wing, N. Cook, T. Jensen	November 2023	Errata	Proposed Standard
RFC 9464	HTML, TEXT, PDF, XML	**Internet Key Exchange Protocol Version 2 (IKEv2) Configuration for Encrypted DNS**	M. Boucadair, T. Reddy.K, D. Wing, V. Smyslov	November 2023		Proposed Standard
RFC 9471	HTML, TEXT, PDF, XML	**DNS Glue Requirements in Referral Responses**	M. Andrews, S. Huque, P. Wouters, D. Wessels	September 2023	Updates RFC 1034	Proposed Standard
RFC 9520	HTML, TEXT, PDF, XML	**Negative Caching of DNS Resolution Failures**	D. Wessels, W. Carroll, M. Thomas	December 2023	Updates RFC 2308, RFC 4035, RFC 4697	Proposed Standard
RFC 9526	HTML, TEXT, PDF, XML, HTML with inline errata	**Simple Provisioning of Public Names for Residential Networks**	D. Migault, R. Weber, M. Richardson, R. Hunter	January 2024	Errata	Experimental
RFC 9527	HTML, TEXT, PDF, XML	**DHCPv6 Options for the Homenet Naming Authority**	D. Migault, R. Weber, T. Mrugalski	January 2024		Proposed Standard
RFC 9539	HTML, TEXT, PDF, XML, HTML with inline errata	**Unilateral Opportunistic Deployment of Encrypted Recursive-to-Authoritative DNS**	D. K. Gillmor, Ed., J. Salazar, Ed., P. Hoffman, Ed.	February 2024	Errata	Experimental
RFC 9540	HTML, TEXT, PDF, XML	**Discovery of Oblivious Services via Service Binding Records**	T. Pauly, T. Reddy.K	February 2024		Proposed Standard

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RFC 9558	HTML, TEXT, PDF, XML	Use of GOST 2012 Signature Algorithms in DNSKEY and RRSIG Resource Records for DNSSEC	B. Makarenko, V. Dolmatov, Ed.	April 2024		Informational
RFC 9563	HTML, TEXT, PDF, XML	SM2 Digital Signature Algorithm for DNSSEC	C. Zhang, Y. Liu, F. Leng, Q. Zhao, Z. He	December 2024		Informational
RFC 9567	HTML, TEXT, PDF, XML	DNS Error Reporting	R. Arends, M. Larson	April 2024		Proposed Standard
RFC 9606	HTML, TEXT, PDF, XML	DNS Resolver Information	T. Reddy.K, M. Boucadair	June 2024	**Errata**	Proposed Standard
RFC 9615	HTML, TEXT, PDF, XML, HTML with inline errata	Automatic DNSSEC Bootstrapping Using Authenticated Signals from the Zone's Operator	P. Thomassen, N. Wisiol	July 2024	**Errata**, Updates RFC 7344, RFC 8078	Proposed Standard
RFC 9619	HTML, TEXT, PDF, XML	In the DNS, QDCOUNT Is (Usually) One	R. Bellis, J. Abley	July 2024	Updates RFC 1035	Proposed Standard
RFC 9660	HTML, TEXT, PDF, XML	The DNS Zone Version (ZONEVERSION) Option	H. Salgado, M. Vergara, D. Wessels	October 2024		Proposed Standard
RFC 9704	HTML, TEXT, PDF, XML	Establishing Local DNS Authority in Validated Split-Horizon Environments	T. Reddy.K, D. Wing, K. Smith, B. Schwartz	January 2025		Proposed Standard
RFC 9715	HTML, TEXT, PDF, XML	IP Fragmentation Avoidance in DNS over UDP	K. Fujiwara, P. Vixie	January 2025		Informational
RFC 9718	HTML, TEXT, PDF, XML	DNSSEC Trust Anchor Publication for the Root Zone	J. Abley, J. Schlyter, G. Bailey, P. Hoffman	January 2025	Obsoletes RFC 7958	Informational

Il protocollo

- *Domain name space e Resource Records*
- *Name servers*
- *Resolvers*

I tre componenti del DNS

Domain name space e Resource Records

Name Servers

Gli elementi di una nomenclatura ad albero con dati associati ai nomi

I programmi server che detengono le informazioni sulla struttura ad albero e il relativo insieme di dati

I programmi che estraggono le informazioni dai name server in risposta alle richieste dei client

Resolvers

RFC 1034
Novembre 1987

I tre componenti del DNS

Domain name space e Resource Records

```
                                   |
        +----------------------+----------------------+
        |                      |                      |
       MIL                    EDU                    ARPA
        |                      |                      |
   +----+----+            +----+----+----+       +----+----+----+----+
   |    |    |            |    |    |            |    |         |
  BRL  NOSC DARPA       IN-ADDR SRI-NIC ACC
                                   |
   +---------+----------+----------+----------+---------+
   |         |                     |          |         |
  UCI       MIT                   ISI        UDEL      YALE
            |                      |
         +---+---+                 |
         |       |                 |
        LCS   ACHILLES      +--+----+----+--------+
         |                  |  |    |    |        |
        XX                  A  C  VAXA VENERA Mockapetris
```

RFC 1034
Novembre 1987

I tre componenti del DNS

Domain name space e Resource Records

CLASS
IN – internet
CH – chaos
(HS – hesiod) ← RFC2929

Gli elementi di una nomenclatura ad albero con dati associati ai nomi

TYPE
A – indirizzo di un host
CNAME – alias di un host
HINFO – informazioni su un host
MX – server di posta per il dominio
NS – name server autoritativo per il dominio
PTR – puntatore a un'altra sezione del dominio
SOA – origine dell'autorità per una zona
TXT – stringa di testo

TTL   Time To Live, durata di un Resource Record

RFC 1034
Novembre 1987

I tre componenti del DNS

Domain name space e Resource Records (RR)

A	indirizzo IPv4 di un host
AAAA	indirizzo IPv6 di un host
CAA	certification authorities autorizzate (RFC8659)
CERT	certificati nel DNS (RFC4398)
CNAME	mappa un dominio su un altro
DNAME	mappa più domini su un dominio
DNSKEY	chiave pubblica DNSSEC (RFC4034)
DS	delegation signer DNSSEC (RFC4034)
HINFO	storicamente info su host. Oggi invece RFC8482
LOC	posizione di un host (RFC1876)
MX	nome del server di posta (con priorità)
NS	server dei nomi

NSEC	negazione di esistenza DNSSEC (RFC4034)
PTR	puntatore verso un CNAME (zona inversa)
RRSIG	firma del resource record (RFC4034)
SMIMEA	dominio→certificato per autenticazione mittente
SOA	origine dell'autorità
SPF	sender policy framework (obsoleto, ora si usa TXT)
SRV	più server per un dominio con peso e priorità
SSHFP	chiave pubblica ssh nel DNS (RFC4225)
TLSA	per standard DANE (RFC6698)
TXT	vari testi, anche multi riga, per uomini e macchine
URI	mappa host su domini (RFC7553)

I tre componenti del DNS

Domain name space e Resource Records

Gli elementi di una nomenclatura ad albero con dati associati ai nomi

```
XX.LCS.MIT.EDU.    IN        A        10.0.0.44
                   CH        A        MIT.EDU. 2420

ISI.EDU.           MX        10 VENERA.ISI.EDU.
                   MX        10 VAXA.ISI.EDU.
VENERA.ISI.EDU.    A         128.9.0.32
                   A         10.1.0.52
VAXA.ISI.EDU.      A         10.2.0.27
                   A         128.9.0.33
```

RFC 1034
Novembre 1987
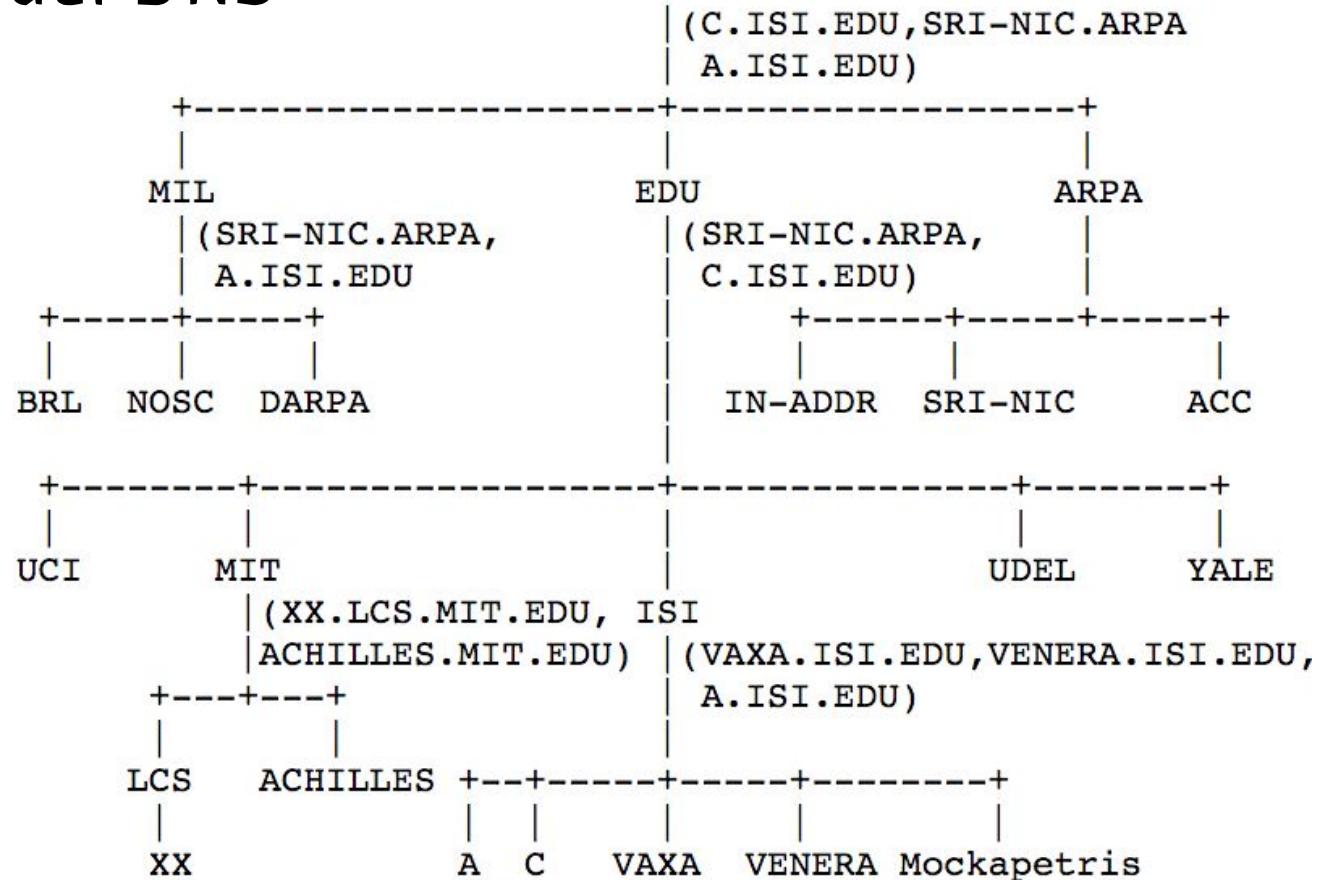
I tre componenti del DNS

Name Servers

I programmi server che detengono le informazioni sulla struttura ad albero e il relativo insieme di dati

```
                                    |(C.ISI.EDU,SRI-NIC.ARPA
                                    | A.ISI.EDU)
            +-----------------------+------------------+
            |                       |                  |
           MIL                     EDU                ARPA
            |(SRI-NIC.ARPA,          |(SRI-NIC.ARPA,     |
            | A.ISI.EDU              | C.ISI.EDU)        |
     +------+-----+                  |           +------+-----+-----+
     |      |     |                  |           |      |     |
    BRL   NOSC  DARPA                |        IN-ADDR SRI-NIC  ACC
                                     |
     +---------+------------+--------------+-----------+--------+
     |         |            |              |           |        |
    UCI       MIT           |             UDEL       YALE
              |(XX.LCS.MIT.EDU, ISI
              |ACHILLES.MIT.EDU) |(VAXA.ISI.EDU,VENERA.ISI.EDU,
     +---+---+                    | A.ISI.EDU)
     |       |                    |
    LCS   ACHILLES  +--+-----+-----+--------+
     |              |  |     |     |        |
    XX             A  C   VAXA  VENERA  Mockapetris
```

I tre componenti del DNS

Name Servers
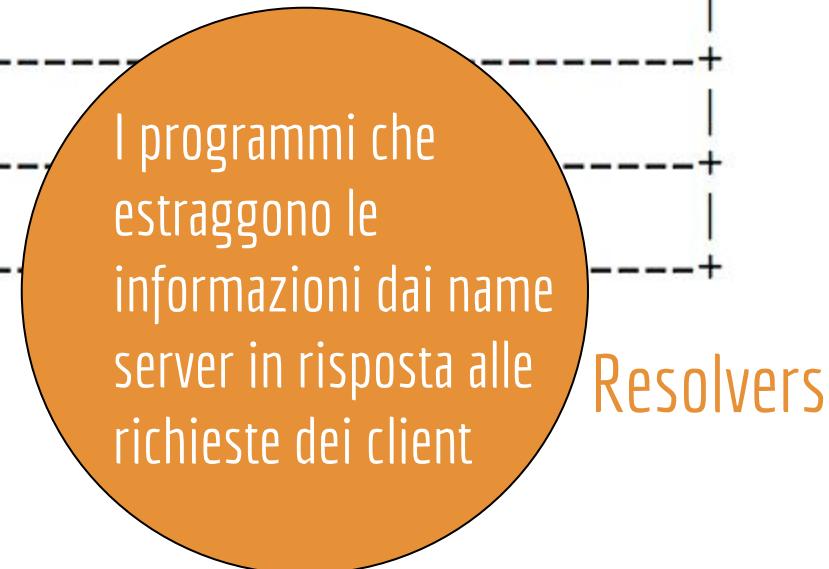
I programmi server che detengono le informazioni sulla struttura ad albero e il relativo insieme di dati

```
.            IN      SOA     SRI-NIC.ARPA. HOSTMASTER.SRI-NIC.ARPA. (
                             870611          ;serial
                             1800            ;refresh every 30 min
                             300             ;retry every 5 min
                             604800          ;expire after a week
                             86400)          ;minimum of a day
                     NS      A.ISI.EDU.
                     NS      C.ISI.EDU.
                     NS      SRI-NIC.ARPA.

MIL.        86400    NS      SRI-NIC.ARPA.
            86400    NS      A.ISI.EDU.

EDU.        86400    NS      SRI-NIC.ARPA.
            86400    NS      C.ISI.EDU.

SRI-NIC.ARPA.        A       26.0.0.73
                     A       10.0.0.51
                     MX      0 SRI-NIC.ARPA.
                     HINFO   DEC-2060 TOPS20

ACC.ARPA.            A       26.6.0.65
                     HINFO   PDP-11/70 UNIX
                     MX      10 ACC.ARPA.

USC-ISIC.ARPA.       CNAME   C.ISI.EDU.
```

I tre componenti del DNS

```
+--------------------------------------------------------------------+
Header      | OPCODE=SQUERY                                           |
+--------------------------------------------------------------------+
Question    | QNAME=ISI.EDU., QCLASS=IN, QTYPE=MX                     |
+--------------------------------------------------------------------+
Answer      | <empty>                                                 |
+--------------------------------------------------------------------+
Authority   | <empty>                                                 |
+--------------------------------------------------------------------+
Additional  | <empty>                                                 |
+--------------------------------------------------------------------+
```

I programmi che estraggono le informazioni dai name server in risposta alle richieste dei client

Resolvers

RFC 1034
Novembre 1987

I tre componenti del DNS

```
                +-----------------------------------------------+
Header          | OPCODE=SQUERY, RESPONSE, AA                   |
                +-----------------------------------------------+
Question        | QNAME=ISI.EDU., QCLASS=IN, QTYPE=MX           |
                +-----------------------------------------------+
Answer          | ISI.EDU.                MX 10 VENERA.ISI.EDU. |
                |                         MX 20 VAXA.ISI.EDU.   |
                +-----------------------------------------------+
Authority       | <empty>                                       |
                +-----------------------------------------------+
Additional      | VAXA.ISI.EDU.   172800  A   10.2.0.          |
                |                 172800  A   128.9.            |
                | VENERA.ISI.EDU. 172800  A   10.1.0           |
                |                 172800  A   128.9.            |
                +-----------------------------------------------+
```

I programmi che estraggono le informazioni dai name server in risposta alle richieste dei client

Resolvers

RFC 1034
Novembre 1987

IN-ADDR.ARPA e IP6.ARPA (Address and Routing Parameter Area)

Speciali nomi a dominio (infrastructure TLD) per mappare gli IP (v4 e v6) agli host (NUMERO ⇒ NOME)

4   3   2 1

I dati dell'indirizzo 10. 2. 0. 52 possono essere rintracciati nel nome a dominio

1   2   3   4

52.0.2.10.IN-ADDR.ARPA.

I dati dell'indirizzo 2001:db8::10:2:0:52 possono essere rintracciati nel nome a dominio

2.5.0.0.0.0.0.0.2.0.0.0.0.1.0.0.0.0.0.0.0.0.0.0.8.b.d.0.1.0.0.2.IP6.ARPA.

RFC 2826 IAB Technical Comment on the Unique DNS Root, maggio 2000
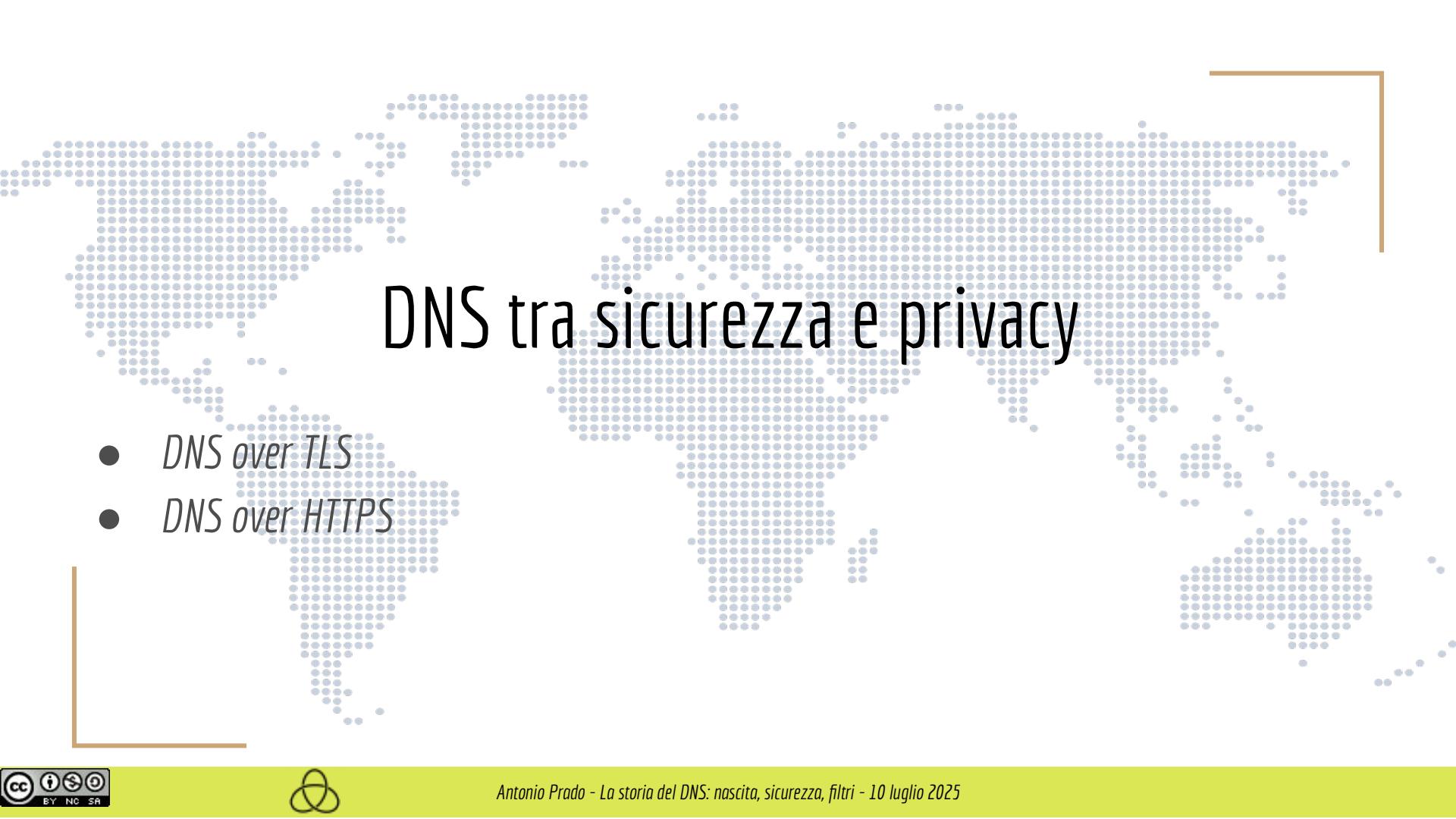
To remain a global network, the Internet requires the existence of a ==globally unique public name space==. The DNS name space is a hierarchical name space derived from a single, globally unique root. This is a technical constraint inherent in the design of the DNS. Therefore it is not technically feasible for there to be more than one root in the public DNS. That one root must be supported by a set of coordinated ==root servers administered by a unique naming authority==.

The requirement for uniqueness within a domain further implies that there be some mechanism to prevent name conflicts within a domain. In DNS this is accomplished by assigning a single owner or maintainer to every domain, including the root domain, who is responsible for ensuring that each sub-domain of that domain has the proper records associated with it. This is a technical requirement, not a policy choice.

DNS tra sicurezza e privacy

- *DNS over TLS*
- *DNS over HTTPS*

https://dnsprivacy.org

DNS Privacy Project

🔍 Search... ✖

🏠 Home

1. The Problem
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4. IETF DNS Privacy Tutorial
5. Public Resolvers
6. Test Servers
7. DNS Privacy Clients
8. DNS Privacy Daemon - Stubby
9. Implementation Status
10. Running a DNS Privacy server
11. Encrypted Zone Transfer
12. DNS Privacy Reference Material

WELCOME TO THE DNS PRIVACY PROJECT

Quick Start Links

› DNS Privacy	› For Users	› For Operators	› DNS Privacy Workshop

This site is the home of a collaborative open project to promote, implement and deploy DNS Privacy. The goals of this project include:

(1) Raising awareness of the issue of DNS Privacy
(2) Empowering users to take advantage of DNS Privacy tools and resources (client applications, DNS Privacy resolvers)
(3) Evolving the DNS to support DNS Privacy and in particular developing new DNS Protocol standards
(4) Working towards full support for DNS Privacy in a range of Open Source DNS implementations including: getdns, Unbound, NSD, BIND, PowerDNS and Knot (Auth and Resolver)
(5) Co-ordinating deployment of DNS Privacy services and documenting operational practices

Among the many contributors to this project are Sinodun IT, NLnet Labs, SalesForce, Surftnet, NLnet Foundation, OTF, Stephane Bortzmeyer and No Mountain Software.

PRIVACY

- QNAME e IP sorgente (e probabile porta sorgente)
- Cache dei name server ricorsivi
- Spionaggio sul cavo, sugli autoritativi, sui ricorsivi

PRIVACY

<mark>Strict Privacy</mark>

Cioè la Privacy è richiesta a pena di mancato funzionamento, e necessita di connessione autenticata e criptata.

PRIVACY

Opportunistic privacy

Cioè la Privacy non è richiesta a pena di mancato funzionamento, ma è desiderata quando disponibile.

DoT, DNS over TLS

RFC 7858
Contro lo spionaggio delle query, cioè a favore della privacy

TCP 853

TCP → Handshake TLS

Nel canale cifrato il client invia la query e il server risponde. Entrambi dovrebbero riusare la stessa sessione TCP per far transitare ulteriori messaggi così da ottimizzare "il costo" di instaurare nuove sessioni TCP.

DTLS, DNS over Datagram TLS

RFC 8094 (stato sperimentale)
Contro lo spionaggio delle query, cioè a favore della privacy

UDP 853

UDP → Handshake TLS

Completata con successo la negoziazione DTLS, la connessione viene criptata e protetta da spionaggio. La crittografia fornisce in un certo senso anche garanzia sull'integrità del dato, tuttavia, per ottenere maggiore protezione da malintenzionati che volessero introdurre un falso server, è necessario che il server stesso sia autenticato.

DTLS, DNS over Datagram TLS

L'ordine di preferenza per lo scambio di traffico DNS dovrebbe essere:

1. Messaggi criptati su server autenticato

2. Messaggi criptati su server non autenticato

3. Messaggi non criptati

DoH, DNS over HTTPS

RFC 8484

Query e risposte attraverso URI HTTP su TLS (cioè HTTPS)

Trasporto che segue le regole del protocollo HTTP: il client confeziona una query secondo un modello e lo invia al server secondo il metodo GET o il il metodo POST

TCP 443

DoH, DNS over HTTPS

RFC 8484

Il server deve supportare almeno HTTP/2

La privacy che si ottiene è quella di un messaggio criptato su server autenticato

La sicurezza è quella del sottostante protocollo TLS

DNSSEC

Problema:

Le risposte del DNS potrebbero giungere a noi corrotte o provenienti da una fonte avvelenata

Soluzione:

Firma digitale sui dati

CRITTOGRAFIA

Crittografia a chiave pubblica, cioè per ogni nome a dominio (zona) esiste una coppia di chiavi: una pubblica e una privata. Da un lato, il responsabile della zona userà la sua chiave privata (segreta e custodita gelosamente) per firmare i dati relativi al nome a dominio e anche per creare delle firme digitali. Dall'altro, la chiave pubblica verrà pubblicata proprio nella zona, così che chiunque possa consultarla e usarla liberamente per stabilire la genuinità dei dati DNS.

CRITTOGRAFIA

".". → coppia di chiavi: *root-pubblica* e *root-privata.*

"**it.**" → coppia di chiavi: it.-pubblica (firmata da root-privata) e

it.-privata

"**governo.it.**" → coppia di chiavi: governo.it.-pubblica (firmata da

it.-privata) e governo.it.-privata

"**mail.governo.it.**" firmata da "**governo.it.-privata**".

IL RISOLUTORE

Il *resolver* consulta la chiave pubblica che trova nella zona e la usa per capire se i dati del *DNS* siano coerenti con quelli, sempre presenti nella zona, precedentemente firmati dal responsabile con la sua chiave privata. Il *resolver* può restituire due tipi di risposta all'utente: *positiva*, nel caso in cui la verifica dei dati firmati vada a buon fine con la chiave pubblica; o, in caso contrario, *negativa* (con un fondato sospetto che possa essere in corso una qualche specie di attacco).

ISP
tra sicurezza cibernetica e censura

La situazione (oggi) in Italia

"Limitazione della libertà civile di espressione del pensiero, disposta per la tutela di un interesse pubblico e attuata mediante l'esame, da parte di un'autorità, di scritti o giornali da stamparsi, di manifesti o avvisi da affiggere in pubblico, di opere teatrali o pellicole da rappresentare, di siti Internet, con lo scopo di permetterne o vietarne la pubblicazione, l'affissione, la rappresentazione ecc."

TRECCANI

Censura: due sono gli ambiti di applicazione

Pubblicazione di contenuti

Evitare che il contenuto sia diffuso on-line (o oscurarlo nel caso in cui sia già stato pubblicato)

Fruizione di contenuti

Applicare una inibizione agli utenti di Internet che impedisca loro l'accesso al contenuto censurato

Censura: perché?

Interessi della collettività

a esempio il contrasto della pornografia infantile

Interessi dei singoli

a esempio la difesa del diritto d'autore

Censura: le fonti

Centro nazionale per il contrasto alla pedo-pornografia on-line (CNCPO): Legge 38 del 6 febbraio 2006

Agenzia delle dogane e dei monopòli (ADM): Decreto direttoriale 2 gennaio 2007

Autorità per le garanzie nelle comunicazioni (AGCOM): Delibera 680/13/CONS del 12/12/2013 e Legge 14/07/2023

Piracy Shield: legge 14 luglio 2023, n. 93 e Delibera n. 189/23/CONS

CONSOB: legge n. 58 del 28 giugno 2019 e LEGGE 28 febbraio 2020, n. 8

IVASS: Regolamento del Parlamento Europeo e del Consiglio n. 2017/2394 e Codice del Consumo

Provvedimenti dell'Autorità Giudiziaria

Solo per Pubblica Amministrazione

Ministero Pubblica Amministrazione, Dipartimento Funzione Pubblica: Direttiva 2 del 26 maggio 2009

Censura: VIOLAZIONI

CNCPO: La violazione di questo obbligo comporta una sanzione amministrativa che va da 50mila a 250mila euro

ADM: Le violazioni dell'obbligo di inibizione sono punite con una sanzione amministrativa da 30mila a 180mila euro

AGCOM: I soggetti che non ottemperano agli ordini e alle diffide dell'Autorità ... sono puniti con la sanzione amministrativa pecuniaria da lire venti milioni a lire cinquecento milioni

Censura: VIOLAZIONI

Piracy Shield: [...] si applica a ciascun soggetto interessato una sanzione amministrativa pecuniaria da euro diecimila fino al 2 per cento del fatturato realizzato nell'ultimo esercizio chiuso anteriormente alla notifica della contestazione...

Censura: metodi

DNS

Con l'indicazione di una specifica landing-page esplicativa

ROUTING

Blackhole per liste di IP

Censura: le liste

CNCPO: procedura di accreditamento, rilascio certificato client, liste ~~segrete~~ non pubbliche

ADM: https://www1.adm.gov.it/files_siti_inibiti/elenco_siti_inibiti.txt e
https://www1.adm.gov.it/files_siti_inibiti_tabacchi/elenco_siti_inibiti.txt

AGCOM: fino al 2018 liste inviate solo via PEC, poi file con txt:
https://www.agcom.it/documents/10179/18199222/Allegato+3-4-2020+1585911871765/b5d0867a-0647-4bd8-bc09-54ff86e96aba?version=1.0

Piattaforma Piracy Shield

Provvedimenti dell'Autorità Giudiziaria: inviati via PEC

Solo per Pubblica Amministrazione

Funzione Pubblica: discrezionale censura su tutte le risorse Internet eccetto quelle necessarie all'attività lavorativa

Questions?

FlashStart
Internet **Protection**