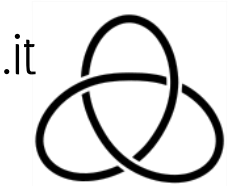
REISS ROMOLI

School of Advanced Networking by NAMEX

L'Universo del DNS

Antonio Prado
https://www.prado.it



L'Universo del DNS

16 maggio 2023	17 maggio 2023	18 maggio 2023
Cenni storici	La risoluzione diretta e la risoluzione inversa	DNSSEC
Nomi a dominio	LAB 1: esercitazioni su query e investigazioni sui nomi a dominio	LAB 2: setup di un name server autoritativo
Il protocollo	Uno o più name space?	LAB 3: setup di un name server ricorsivo
	DNS tra sicurezza e privacy	ISP tra sicurezza cibernetica e censura
		LAB 4: setup di blacklist in un name server ricorsivo

Cenni storici

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

Ciberspazio

Lo “spazio cibernetico” rappresenta un **nuovo dominio operativo** di natura artificiale, trasversale agli altri quattro domini tradizionali (dominio terrestre, dominio aereo, dominio marittimo, dominio spaziale), nel quale gli esseri umani, e nel prossimo futuro verosimilmente anche le intelligenze artificiali, possono agire e interagire a distanza.

Cfr. D.L. 105/2019 “Disposizioni urgenti in materia di perimetro di sicurezza nazionale cibernetica”

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;

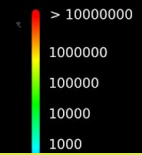
Semantico: risultato dell'interazione dei primi due livelli è quello che dà un senso, assicurando la funzionalità e un significato ai processi dei livelli sottostanti.

Internet Governance

Cos'è Internet?

Dalla *vulgata* comune, Internet viene spesso definito come un luogo di relazioni virtuali, una nuvola fuori dalla realtà, nella quale ci si incontra e scontra quotidianamente, senza necessariamente condividere lo stesso spazio fisico e talvolta nemmeno lo stesso tempo. In realtà, Internet è uno strumento molto reale, rappresenta la "*sede della dimensione immateriale del mondo che, nel XXI secolo, è la maggiore base delle relazioni sociali ed economiche delle persone e delle aziende*"

[COMMISSIONE PARLAMENTARE DI INCHIESTA SUL LIVELLO DI DIGITALIZZAZIONE E INNOVAZIONE DELLE PUBBLICHE AMMINISTRAZIONI E SUGLI INVESTIMENTI COMPLESSIVI RIGUARDANTI IL SETTORE DELLE TECNOLOGIE E DELLA COMUNICAZIONE - Relazione dal titolo "La digitalizzazione nella pubblica amministrazione italiana: analisi degli errori e valutazione delle priorità, dall'efficacia degli strumenti all'importanza del capitale umano" (Relatrice: on. Vincenza BRUNO BOSSIO) *Approvata dalla Commissione nella seduta del 26 ottobre 2017*]



Un insieme di sistemi autonomi

interconnessi tra loro

INTRODUCTION

The CAIDA AS Core visualization depicts the Internet's Autonomous Systems' (ASes) geographic locations, number of customers, and interconnections. Each AS approximately corresponds to an Internet Service Provider (ISP). The geographic location of the individual AS is inferred from the weighted centroid of its address space according to NetAcuity, a commercial geolocation service. The number of direct or indirect customers of an ASA is inferred using its *customer cone* (described below).

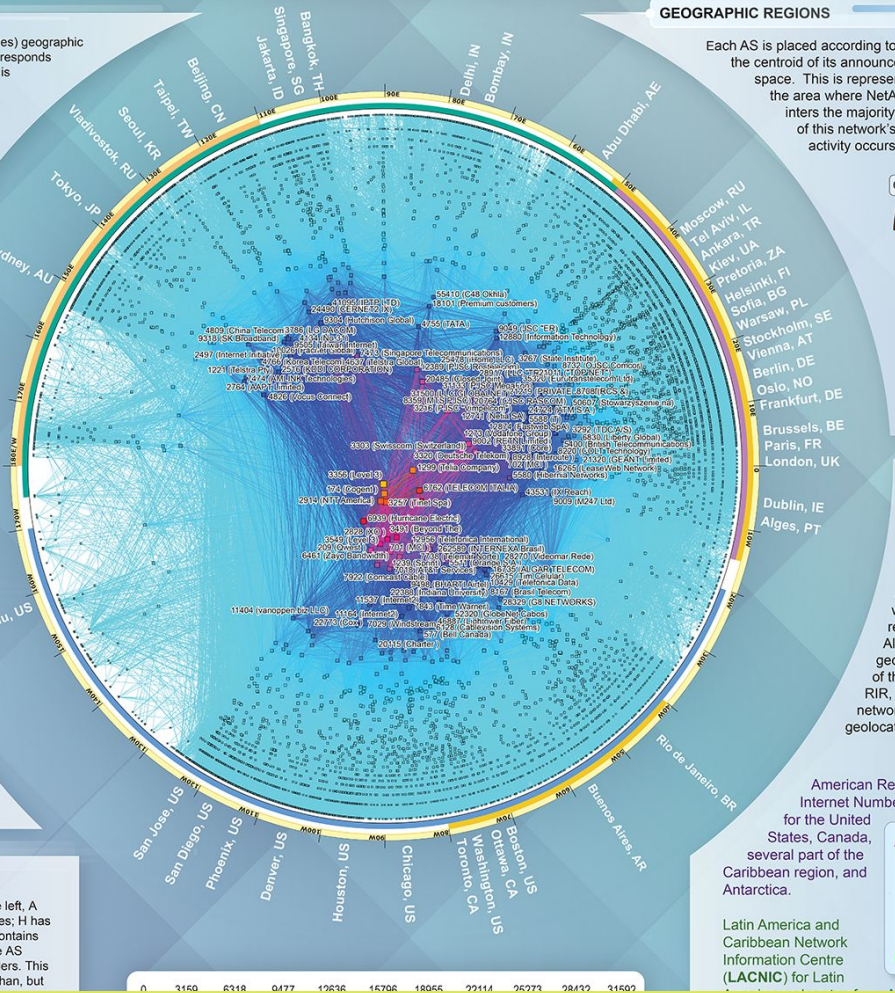
For this visualization we used the Feb 2017 Internet Topology Data Kit (ITDK). We obtained the raw IPv4 topology data for the ITDK by performing traceroutes to randomly-chosen destinations in each routed /24 BGP prefix using 121 Ark monitors located in 42 countries, on Jan 22 to Feb 7, 2017. The resulting IP topology contained almost 50 million IP addresses, 49 million inferred routers, and 36 million inferred links. We inferred the IP address to AS mappings using *bordermapit*, a tool for inferring router ownership (a collaboration between CAIDA and UPenn). The resulting AS topology contained 47,610 ASes and 148,455 links.

Each AS node is plotted in polar coordinates (radius, angle) on the circle, as formally defined in the equations below. The distance of each AS node from the center of the circle (the radial coordinate) is the inverse of each AS's customer cone size, (roughly) the number of the AS's direct or indirect customers. ASes at the outer edge of the circle have no customers and ASes at the center have the largest number of customers. The angular coordinate indicates the AS's geographic longitude.

$$\text{radius} = 1 - \log\left(\frac{\text{transit degree(AS)} + 1}{\text{maximum transit degree} + 1}\right)$$

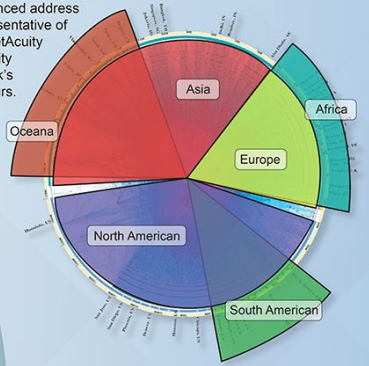
$$\text{angle} = \left(\text{longitude of the AS's BGP prefixes in Netacuity}\right)$$

The core of this topology, the set of ASes with the largest customer cones, is still dominated by U.S.-centric ASes.



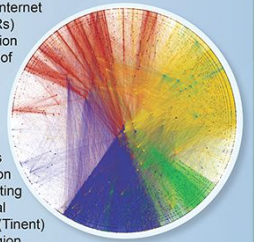
GEOGRAPHIC REGIONS

Each AS is placed according to the longitude of the centroid of its announced address space. This is representative of the area where NetAcuity inters the majority of this network's activity occurs.



REGIONAL INTERNET REGISTRIES

The Regional Internet Registries (RIRs) manage allocation and registration of Internet number resources, such as AS numbers, within a particular region of the world. Although most ASes geolocate to the region of the originally allocating RIR, some multinational networks, e.g., AS3257 (Tinent) geolocate outside their region.



American Registry for Internet Numbers (**ARIN**) for the United States, Canada, several part of the Caribbean region, and Antarctica.

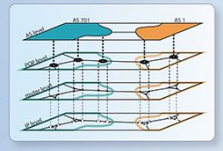
Latin America and Caribbean Network Information Centre (**LACNIC**) for Latin

Reseaux IP Europeens Network Coordination Centre (**RIPE NCC**) for Europe, Russia, the Middle East, and Central Asia

Asia-Pacific Network Information Centre (**APNIC**) for Asia, Australia,

INTERNET LAYERS

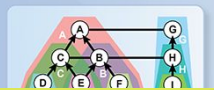
The Internet's network topology is often divided into four layers: AS, PoP, Router, and IP. The IP address uniquely identifies an attachment point (interface) of a device on the Internet. The router layer refers to the set of routers that transfer and route traffic. To support geophysically-aware topology analysis, we aggregate routers into Points of Presence (PoPs). To support interdomain (between networks) topology analysis, we aggregate routers by ownership into Autonomous Systems (ASes).



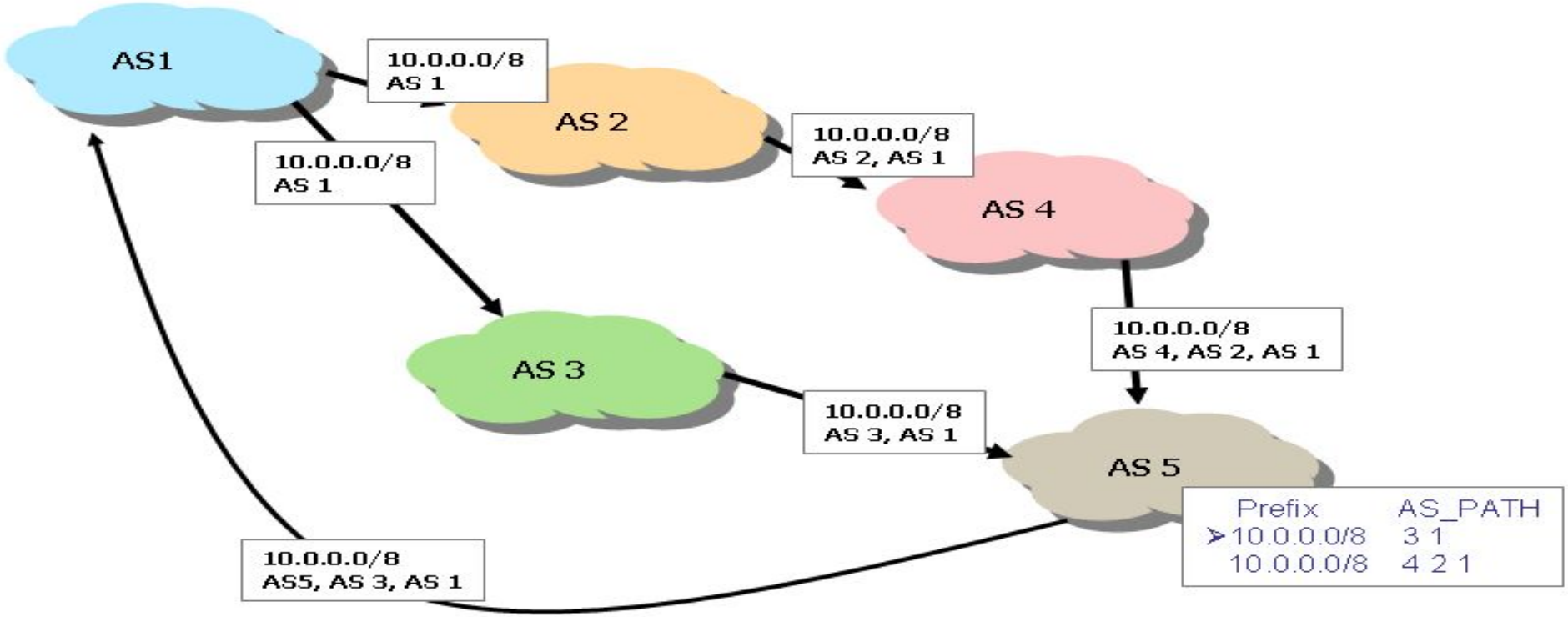
CUSTOMER CONE

The AS's customer cone is the set of ASes that directly or indirectly pay the AS to connect to the Internet. On the left, A has the largest cone with 6 ASes; H has two. An AS's customer cone contains the set of ASes we observe the AS announce to its peers or providers. This definition is more constrained than, but

AS	Size
A	6
B	3



An AS is a connected group of one or more IP prefixes run by one or more network operators which has a SINGLE and CLEARLY DEFINED routing policy. [RFC 1930]



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]*

General Assembly

Distr.: General
1 February 2016

Seventieth session
Agenda item 17

Resolution adopted by the General Assembly on 16 December 2015

[*without reference to a Main Committee (A/70/L.33)*]

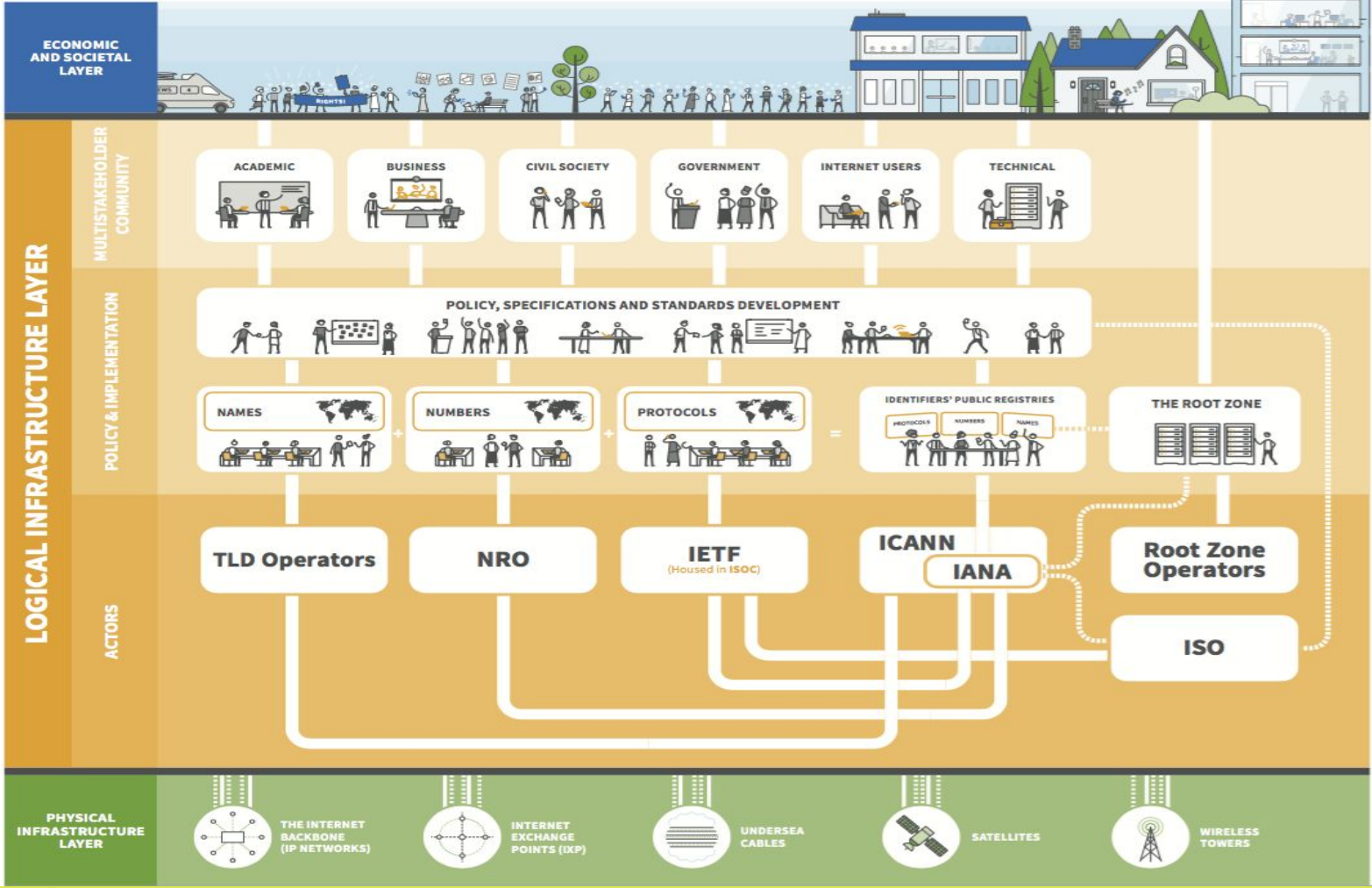
source

70/125. Outcome document of the high-level meeting of the General Assembly on the overall review of the implementation of the outcomes of the World Summit on the Information Society

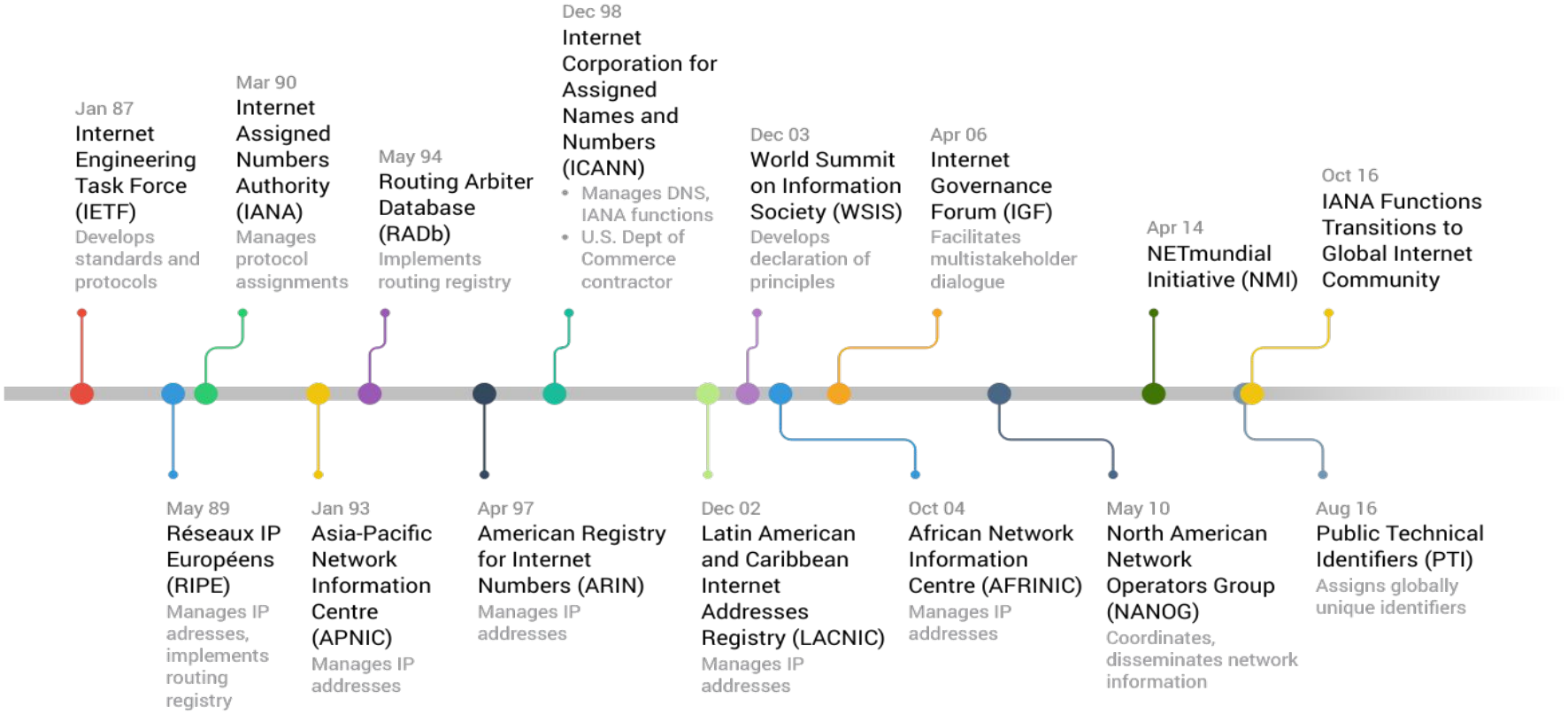
The General Assembly

Adopts the following outcome document of the high-level meeting of the General Assembly on the overall review of the implementation of the outcomes of the World Summit on the Information Society at its seventieth session:

Internet Governance



Internet governance timeline



INFRASTRUTTURE

Infrastruttura di telecomunicazioni
Internet Service Provider (ISP)
TCP/IP
DNS
Root Server
Neutralità della Rete
Standard tecnici e standard Web
Cloud Computing
Internet delle cose (IoT)
Convergenza

SICUREZZA

Cibersicurezza
Cybercrime
Infrastruttura critica
Ciberterrorismo
Guerre e conflitti cibernetici
Crittografia
SPAM
Firme digitali
Minori on-line

LEGALITÀ

Strumenti legali
Giurisdizioni
Risoluzioni alternative delle dispute
Diritti di proprietà intellettuale
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Marchi registrati
Brevetti
Diritto del lavoro
Intermediari

ECONOMIA

Commercio elettronico
Economia dei dati su Internet
Economia dell'accesso a Internet
Mercati emergenti: IoT, AI, economia collaborativa
Banche, monete elettroniche, monete virtuali
Protezione dei consumatori
Tasse

SVILUPPO

Tecnologie digitali e sviluppo digitale
Sviluppo della società
Divario digitale
Sviluppo delle abilità

SOCIETÀ E CULTURA

Criteri dei contenuti
Formazione on-line
Diversificazione culturale
Multilinguismo
Beni pubblici universali

DIRITTI UMANI

On-line e off-line
Tecnologia e diritti umani
Nuovi diritti umani nell'era di Internet
Internet e i preesistenti diritti umani
Libertà di espressione e diritto all'informazione
Riservatezza e protezione dei dati
Diritti dei bambini nel mondo digitale
Diritti dei diversamente abili
Genere e diritti umani on-line

US Department of Commerce

NTIA: National Telecommunications and Information Administration

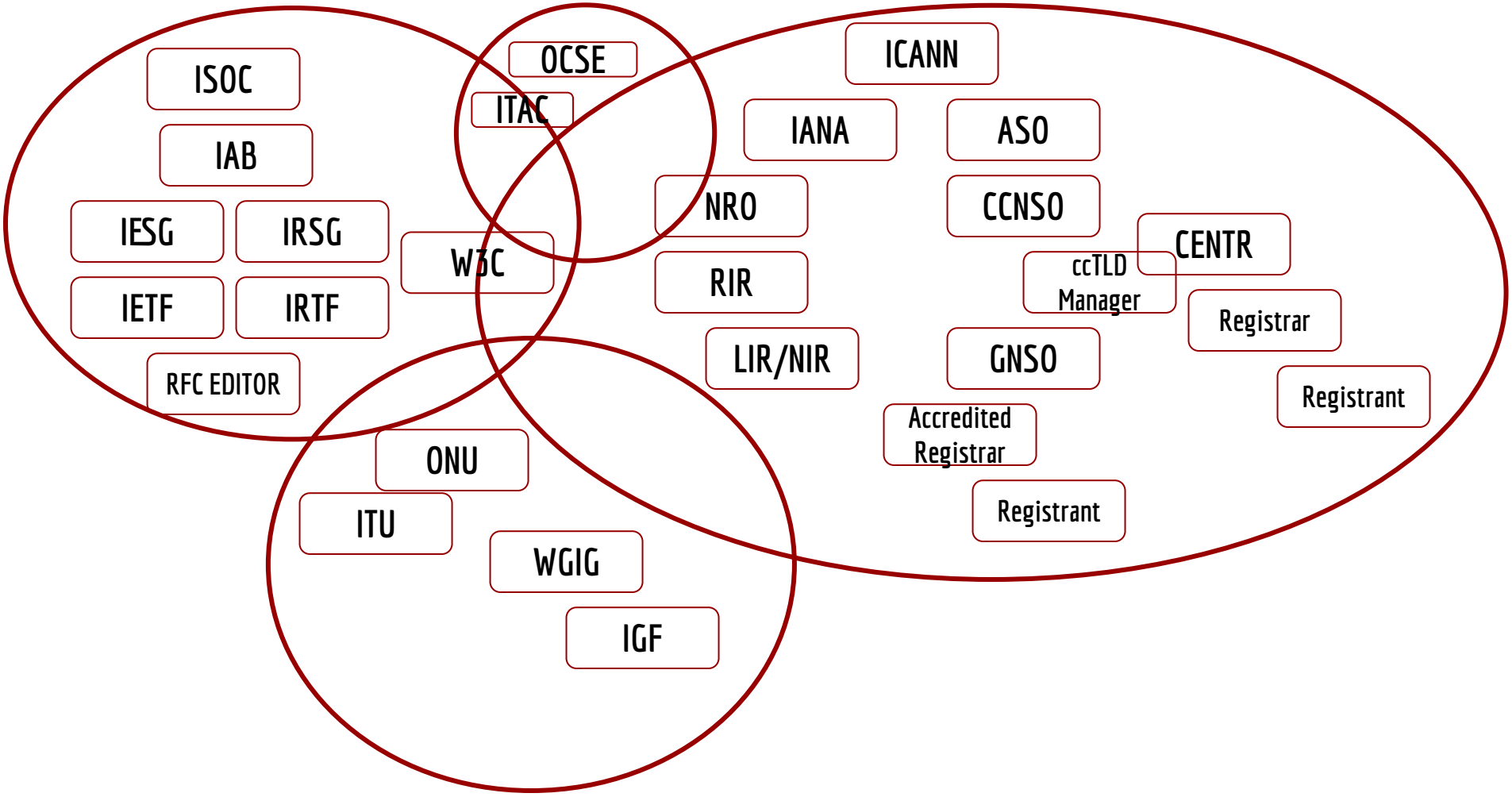
ICANN: Internet Corporation for Assigned Names and Numbers
IANA: Internet Assigned Numbers Authority

ISOC: Internet Society

IAB: Internet Architecture Board

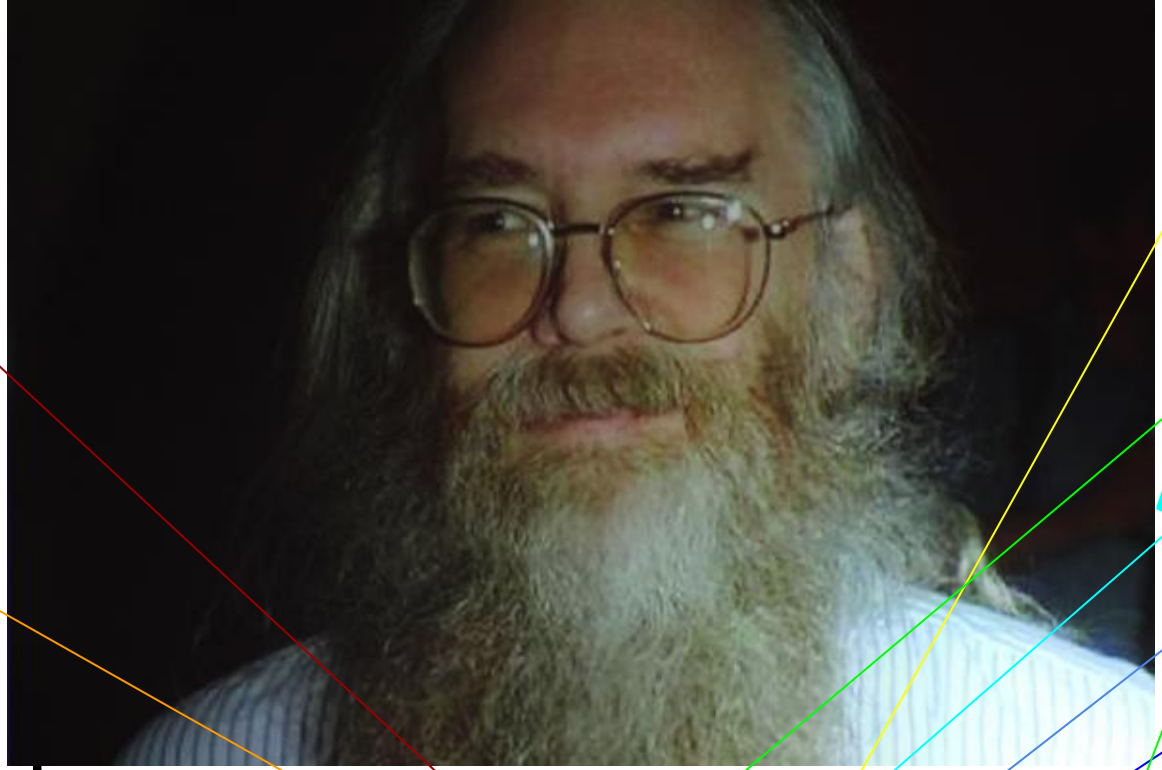
IESG: Internet Engineering Steering Group
IETF: Internet Engineering Task Force (meeting 114)

IRSG: Internet Research Steering Group
IRTF: Internet Research Task Force


ISOC
IAB
IESG
IRSG
IETF
IRTF
RFC EDITOR
W3C
OCSE
ITAC
ONU
ITU
WGIG
IGF
ICANN
IANA
ASO
NRO
CCNSO
RIR
LIR/NIR
GNSO
CENTR
ccTLD Manager
Registrar
Registrant
Accredited Registrar
Registrant

Jon Postel


THERE WAS ONLY ONE PERSON
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

Jon Postel

Network Working Group
Request for Comments: 2468
Category: Informational

V. Cerf
MCI
October 1998

I REMEMBER IANA

October 17, 1998

Status of this Memo

This memo provides information for the Internet community. It does not specify an Internet standard of any kind. Distribution of this memo is unlimited.

Copyright Notice

Remembrance

A long time ago, in a network, far far away, a great adventure took place!

Out of the chaos of new ideas for communication, the experiments, the tentative designs, and crucible of testing, there emerged a cornucopia of networks. Beginning with the ARPANET, an endless stream of networks evolved, and ultimately were interlinked to become the Internet. Someone had to keep track of all the protocols, the identifiers, networks and addresses and ultimately the names of all the things in the networked universe. And someone had to keep track of all the information that erupted with volcanic force from the intensity of the debates and discussions and endless invention that has continued unabated for 30 years. That someone was Jonathan B. Postel, our Internet Assigned Numbers Authority, friend, engineer, confidant, leader, icon, and now, first of the giants to depart from our midst.

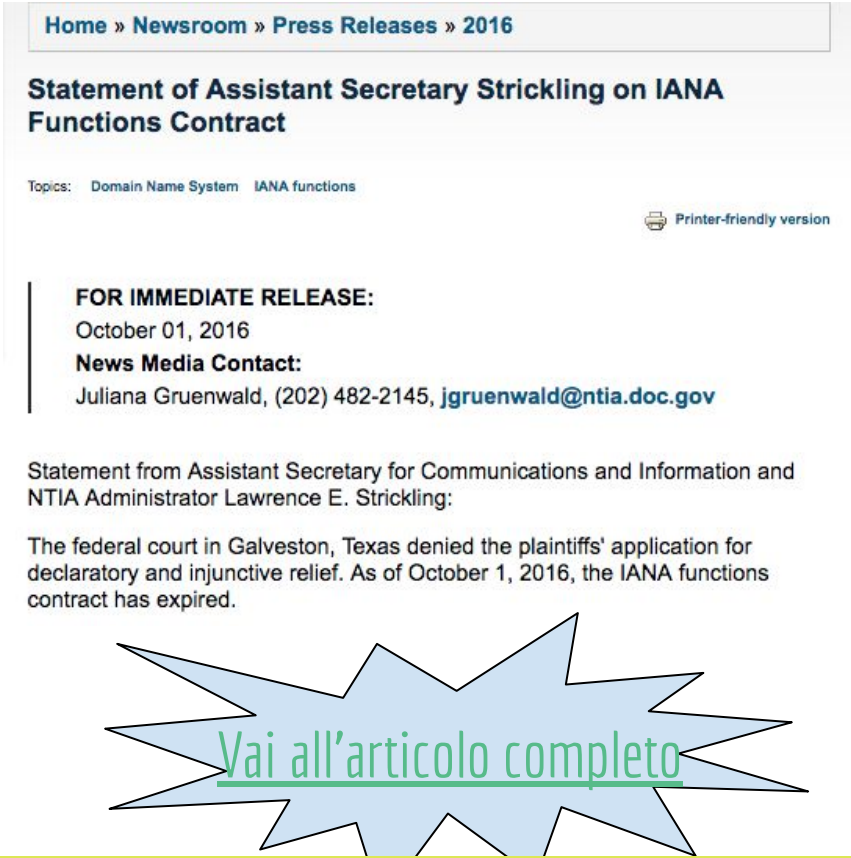
Jon, our beloved IANA, is gone. Even as I write these words I cannot quite grasp this stark fact. We had almost lost him once before in 1991. Surely we knew he was at risk as are we all. But he had been our rock, the foundation on which our every web search and email was

Perché dal 2016 Internet è più libera di prima

Dopo una consultazione pubblica, l'agenzia **NTIA** (*National Telecommunications and Information Administration*) in seno al Dipartimento del commercio (**DoC**, *Department of Commerce*) del Governo degli Stati Uniti d'America, formalizzò un contratto, nel **1998**, con un nuovo organismo appositamente creato, **ICANN** (*Internet Corporation for Assigned Names and Numbers*).

Il **14 marzo 2014** NTIA espresse la volontà di cessare il contratto con ICANN e trasferire le proprie prerogative sull'infrastruttura dei numeri di Internet (cioè IANA) a ICANN stessa a patto che il suo ruolo venisse sostituito da una organizzazione cosiddetta multi-stakeholder, cioè estesa a tutti i portatori di interesse.

Quel processo di formazione di una comunità senza colore, né bandiera è durato oltre un anno e dal **primo ottobre 2016** ICANN garantisce che le funzioni di IANA siano supervisionate da questa comunità globale di portatori di interesse.



Home » Newsroom » Press Releases » 2016

Statement of Assistant Secretary Strickling on IANA Functions Contract

Topics: Domain Name System IANA functions

Printer-friendly version

FOR IMMEDIATE RELEASE:
October 01, 2016
News Media Contact:
Juliana Gruenwald, (202) 482-2145, jgruenwald@ntia.doc.gov

Statement from Assistant Secretary for Communications and Information and NTIA Administrator Lawrence E. Strickling:

The federal court in Galveston, Texas denied the plaintiffs' application for declaratory and injunctive relief. As of October 1, 2016, the IANA functions contract has expired.

ICANN77 Policy Forum
12 - 15 giugno 2023

Lars Eggert- Presidente

Internet Area (int)

int Area Directors (ADs)

Erik Kline
Éric Vyncke

int Area-specific web pages

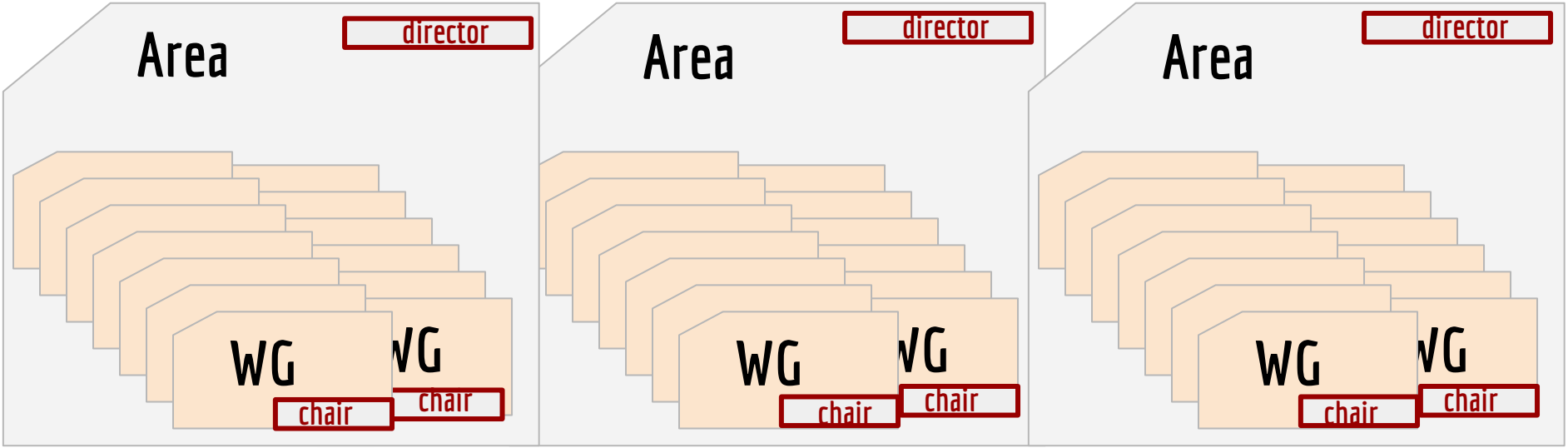
Issuer Tracker
Wiki

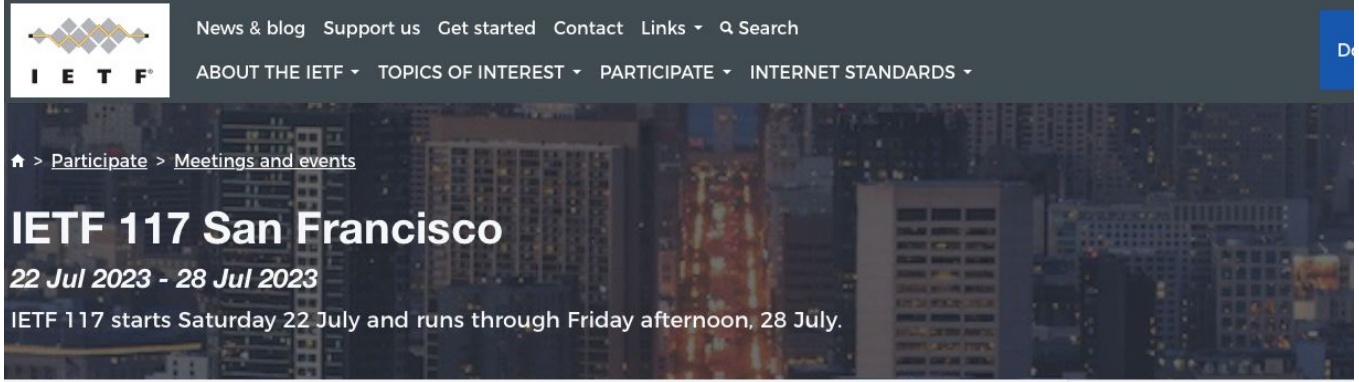
int active WGs (17)

Search

Group	Responsible AD	Name	Chairs
6lo	Erik Kline	IPv6 over Networks of Resource-constrained Nodes	Shwetha Bhandari, Carles Gomez
6man	Erik Kline	IPv6 Maintenance	Bob Hinden, Jen Linkova, Ole Trøan
6tisch	Erik Kline	IPv6 over the TSCH mode of IEEE 802.15.4e	Pascal Thubert, Thomas Watteyne
add	Éric Vyncke	Adaptive DNS Discovery	Glenn Deen, David C Lawrence
dhc	Éric Vyncke	Dynamic Host Configuration	Bernie Volz, Timothy Winters
dmm	Erik Kline	Distributed Mobility Management	Sri Gundavelli, Dapeng Liu, Satoru Matsushima
dnssd	Éric Vyncke	Extensions for Scalable DNS Service Discovery	Chris Box, David Schinazi
dprive	Éric Vyncke	DNS PRIVate Exchange	Brian Haberman, Tim Wicinski
drip	Éric Vyncke	Drone Remote ID Protocol	Mohamed Boucadair, Daniel Migault
homenet	Éric Vyncke	Home Networking	Stephen Farrell, Kiran Makhijani
intarea	Éric Vyncke	Internet Area Working Group	Wassim Haddad, Juan-Carlos Zúñiga
ipwave	Erik Kline	IP Wireless Access in Vehicular Environments	Carlos J. Bernardos, Russ Housley
lpwan	Éric Vyncke	IPv6 over Low Power Wide-Area Networks	Alexander Pelov, Pascal Thubert
lwig	Erik Kline	Light-Weight Implementation Guidance	Zhen Cao, Mohit Sethi
madinas	Éric Vyncke	MAC Address Device Identification for Network and Application Services	Carlos J. Bernardos, Juan-Carlos Zúñiga
ntp	Erik Kline	Network Time Protocols	Karen O'Donoghue, Dieter Sibold
tictoc	Erik Kline	Timing over IP Connection and Transfer of Clock	Karen O'Donoghue, Yaakov (J) Stein

IETF è una grande comunità di esperti di rete, operatori, costruttori, utenti e ricercatori interessati a Internet e alla sua tecnologia. Le attività vengono condotte all'interno dei gruppi di lavoro (IETF Working Group), ciascuno dei quali ha degli obiettivi specifici e una durata nel tempo legata al loro raggiungimento. Ognuno di questi gruppi ha un presidente (Chair). I gruppi di lavoro omogenei sono riuniti in aree, ciascuna delle quali è gestita da un direttore.
I direttori di area (AD) formano, assieme al presidente di IETF, l'Internet Engineering Steering Group (IESG), organo che ha il compito di approvare gli standard e di pubblicare gli altri documenti di IETF.





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. The schedule may be updated very close to the start to the meeting.

Key details

Meeting registration
Register | Registration Fee Waivers | Participant list

Participation information
Agenda | Birds of a Feather Submissions
Android App | iOS App | Preparing for the meeting
Important dates and deadlines
Information for new participants | Covid measures

Meeting Communication
Reporting Problems | Network Information
Meeting Mailing Lists | Reporting Potential Harassment

Venue Information
Venue and Hotels | Onsite childcare
Meeting room floor plans
Local Information (community driven wiki)

Additional Events
Code Sprint | Hackathon | Social Event
Public Side Meetings

Meetings and events

IETF 117 San Francisco
IETF 118 Prague
Upcoming Meetings
Past Meetings
Interim Meetings
Preparing for an IETF Meeting
Meeting Planning
Meeting Technology
New Participants
Onsite Childcare

Network Working Group
Request for Comments: 1

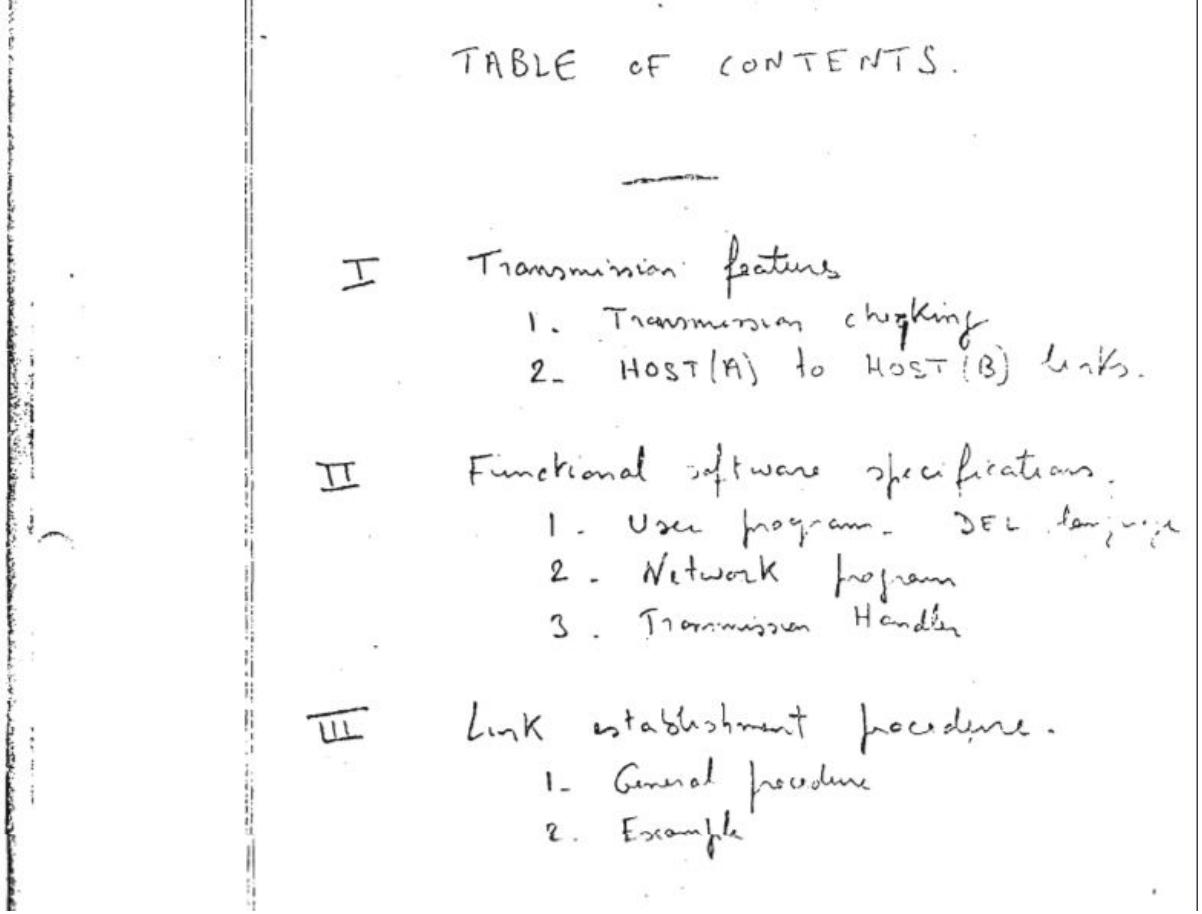
Steve Crocker
UCLA
7 April 1969

Title: Host Software
Author: Steve Crocker
Installation: UCLA
Date: 7 April 1969
Network Working Group Request for Comment: 1

CONTENTS

RFC 1, 7 aprile 1969

Request for comments



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I Transmission features
1. Transmission checking
2. HOST(A) to HOST(B) links.

II Functional software specifications.
1. User program - DEL language
2. Network program
3. Transmission Handler

III Link establishment procedure.
1. General procedure
2. Example

RFC 8, 5 maggio 1969

Request for comments

NWG
RFC # 174
NIC # 6799
Categories: D.6,I.1
References: 134
Obsoletes: none

J. Postel, V. Cerf
UCLA-NMC
Computer Science
8 June 71

UCLA-Computer Science Graphics Overview

I. Hardware

A. Imlac PDS-1

We have 2 PDS-1 graphics consoles each with 8K 16 bit words of memory.

The display screens are mounted with the long axis vertical.

B. DEC 340

We have a DEC 340 Display Station with a light pen. Associated with the station are a Rand Tablet and a Lincoln Wand. There is a display processor which drives the DEC 340 which reads its instruction from the XDS Sigma 7 memory via dedicated memory port.

II. Software

A. Imlacs

We have not as yet developed any software for the PDS-1. We have used the Imlac provided text and graphics support software to utilize the PDS-1's as alphameric and limited graphics consoles (at 1200 baud).

These are used only with the SEX timesharing system.

B. DEC 340

We have over several years developed a package of Library routines* which interface to FORTRAN programs for use with the DEC 340 and its associated devices. This station is used only with a stand alone system (RAD 75).

Several programs have been implemented using these facilities

RFC 174, 8 giugno 1971
Jon Postel, Vinton Cerf

Request for comments

Network Working Group
Request for Comments: 3271
Category: Informational

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Internet Society
April 2002

The Internet is for Everyone

Status of this Memo

This memo provides information for the Internet community. It does not specify an Internet standard of any kind. Distribution of this memo is unlimited.

RFC 3271, aprile 2002
Vinton Cerf

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Abstract

This document expresses the Internet Society's ideology that the Internet really is for everyone. However, it will only be such if we make it so.

1. The Internet is for everyone

How easy to say - how hard to achieve!

Request for comments

Running code

An unofficial motto of the IETF is, "We believe in rough consensus and running code." Implementation experience provides critical feedback to the standardization process.

IETF participants are encouraged to develop implementations of standards and pre-standard specifications before, during, and after the IETF standardization process. While many participants write code relevant to IETF standards on their own time for work or pleasure, the IETF also plays host to a number of activities to encourage participants develop, contribute, and promote code directly related to the IETF and IETF standards.

ROUGH CONSENSUS (RFC 2418)

Processo del consenso imperfetto: 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.

ROUGH CONSENSUS (RFC 2418)

In parole povere:

le obiezioni fortemente sostenute devono essere discusse fino a quando la maggior parte delle persone non sarà convinta che queste obiezioni siano sbagliate.

IETF: un po' di storia

Il primo *meeting* è del 1986, ma è nel 1987 che viene introdotto il concetto di gruppi di lavoro.
Il *meeting* numero 14, nel 1989, segnò un riposizionamento di IAB (oggi *Internet Architecture Board*) che, anziché supervisionare molte *task force*, cominciò a concentrarsi solo su IETF e IRTF (*Internet Research Task Force*). Quest'ultima vocata alla ricerca di lungo periodo sui problemi di Internet.
Nel 1992, costituita ISOC, IAB propose di poter operare sotto la supervisione di ISOC stessa che, nello stesso anno, accettò.

Dunque, per grandi linee, la gerarchia è: ISOC → IAB → IETF

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How easy to say - how hard to achieve!

How have we progressed towards this noble goal?
The Internet is in its 14th year of annual doubling since 1988. There are over 150 million hosts on the Internet and an estimated 513 million users, world wide. By 2006, the global Internet is likely to exceed the size of the global telephone network, if it has not already become the telephone network by virtue of IP telephony. Moreover, as many as 1.5 billion Internet-enabled appliances will have joined traditional servers, desktops and laptops as part of the Internet family. Pagers, cell phones and personal digital assistants may well have merged to become the new telecommunications tools of the next decade. But even at the scale of the telephone system, it is sobering to realize that only half of the Earth's population has ever made a telephone call. It is estimated that commerce on the network will reach somewhere between $1.8T and $3.2T by 2003. That is only two years from now (but a long career in Internet years).

The number of Internet users will likely reach over 1000 million by the end of the year 2005, but that is only about 16% of the world's population. By 2047 the world's population may reach about 11 billion. If only 25% of the then world's population is on the Internet, that will be nearly 3 billion users.

As high bandwidth access becomes the norm through digital subscriber loops, cable modems and digital terrestrial and satellite radio links, the convergence of media available on the Internet will become obvious. Television, radio, telephony and the traditional print media will find counterparts on the Internet - and will be changed in profound ways by the presence of software that transforms the one-way media into interactive resources, shareable by many.

The Internet is proving to be one of the most powerful amplifiers of speech ever invented. It offers a global megaphone for voices that might otherwise be heard only feebly, if at all. It invites and facilitates multiple points of view and dialog in ways unimplementable by the traditional, one-way, mass media.

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The Internet can facilitate democratic practices in unexpected ways. Did you know that proxy voting for stock shareholders is now commonly supported on the Internet? Perhaps we can find additional ways in which to simplify and expand the voting franchise in other domains, including the political, as access to Internet increases.

The Internet is becoming the repository of all we have accomplished as a society. It has become a kind of disorganized "Boswell" of the human spirit. **Be thoughtful in what you commit to email, news groups, and other Internet communication channels** - it may well turn up in a web search some day. Thanks to online access to common repositories, shared databases on the Internet are acting to accelerate the pace of research progress.

The Internet is moving off the planet! Already, interplanetary Internet is part of the NASA Mars mission program now underway at the Jet Propulsion Laboratory. By 2008 we should have a well-functioning Earth-Mars network that serves as a nascent backbone of an inter-planetary system of Internets - InterPlaNet is a network of Internets! Ultimately, we will have interplanetary Internet relays in polar solar orbit so that they can see most of the planets and their associated interplanetary gateways for most, if not all of the time.

The Internet Society is launching a new campaign to facilitate access to and use of Internet everywhere. The campaign slogan is "Internet is for everyone," but there is much work needed to accomplish this objective.

Internet is for everyone - but it won't be if it isn't affordable by all that wish to partake of its services, so we must dedicate ourselves to making the Internet as affordable as other infrastructures so critical to our well-being. While we follow Moore's Law to reduce the cost of Internet-enabling equipment, let us also seek to stimulate regulatory policies that take advantage of the power of competition to reduce costs.

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Internet is for everyone - but it won't be if Governments restrict access to it, so **we must dedicate ourselves to keeping the network unrestricted, unfettered and unregulated. We must have the freedom to speak and the freedom to hear.**

Internet is for everyone - but it won't be if it cannot keep up with the explosive demand for its services, so we must dedicate ourselves to continuing its technological evolution and development of the technical standards that lie at the heart of the Internet revolution. Let us dedicate ourselves to the support of the Internet Architecture Board, the Internet Engineering Steering Group, the Internet Research Task Force, the Internet Engineering Task Force and other organizations dedicated to developing Internet technology as they drive us forward into an unbounded future. Let us also commit ourselves to support the work of the Internet Corporation for Assigned Names and Numbers - a key function for the Internet's operation.

Internet is for everyone - but it won't be until in every home, in every business, in every school, in every library, in every hospital in every town and in every country on the Globe, the Internet can be accessed without limitation, at any time and in every language.

Internet is for everyone - but it won't be if it is too complex to be used easily by everyone. **Let us dedicate ourselves to the task of simplifying the Internet's interfaces and to educating all that are interested in its use**.

Internet is for everyone - but it won't be if legislation around the world creates a thicket of incompatible laws that hinder the growth of electronic commerce, stymie the protection of intellectual property, and stifle freedom of expression and the development of market economies. **Let us dedicate ourselves to the creation of a global legal framework in which laws work across national boundaries** to reinforce the upward spiral of value that the Internet is capable of creating.

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Internet is for everyone - but it won't be if its users cannot protect their privacy and the confidentiality of transactions conducted on the network. Let us dedicate ourselves to the proposition that **cryptographic technology sufficient to protect privacy from unauthorized disclosure should be freely available, applicable and exportable**. Moreover, as authenticity lies at the heart of trust in networked environments, let us dedicate ourselves to work towards the development of authentication methods and systems capable of supporting electronic commerce through the Internet.

Internet is for everyone - but it won't be if parents and teachers cannot voluntarily create protected spaces for our young people for whom the full range of Internet content still may be inappropriate. Let us dedicate ourselves to the development of **technologies and practices that offer this protective flexibility to those who accept responsibility for providing it**.

Internet is for everyone - but it won't be if we are not responsible in its use and mindful of the rights of others who share its wealth. Let us dedicate ourselves to the responsible use of this new medium and to the proposition that with the freedoms the Internet enables comes a commensurate responsibility to use these powerful enablers with care and consideration. For those who choose to abuse these privileges, **let us dedicate ourselves to developing the necessary tools to combat the abuse and punish the abuser**.

Internet is for everyone - even Martians!

I hope Internauts everywhere will join with the Internet Society and like-minded organizations to achieve this, easily stated but hard to attain goal. As we pass the milestone of the beginning of the third millennium, what better theme could we possibly ask for than making the Internet the medium of this new millennium? Internet IS for everyone - but it won't be unless WE make it so.

Nomi a dominio

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

ARPA, ccTLD, gTLD, grTLD, sTLD, tTLD

ICANN

gTLD

.com
.net
.org
.biz
.info
...

neustar

VERISIGN

ccTLD

.it
.eu
.de
.ch
.tv
...

Registro.it

.eu
Your European Identity

ARPA

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

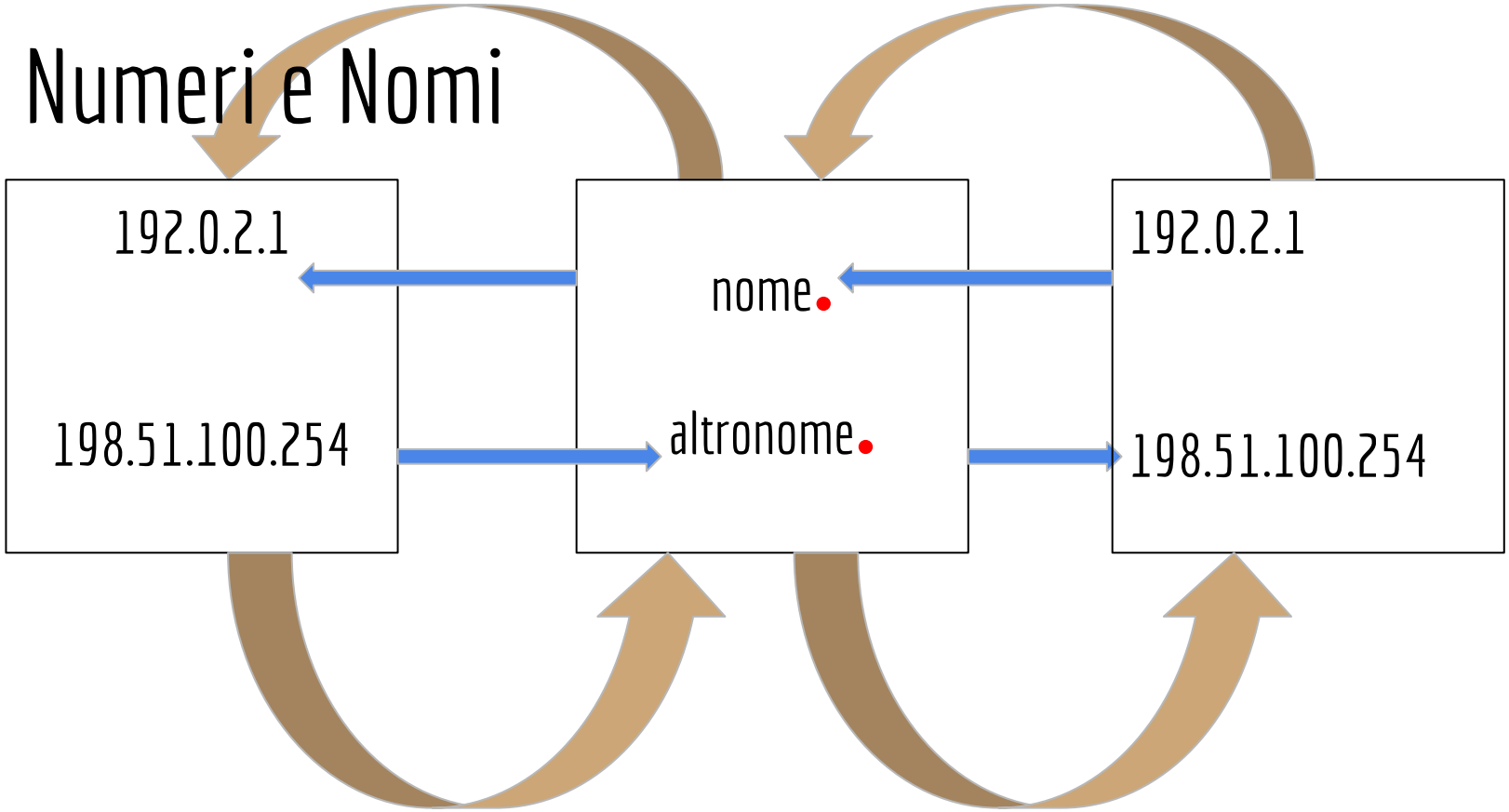
.aero, .asia, .cat, .coop, .edu, .gov, .int, .jobs, .mil, .mobi, .museum, .tel, .travel

tTLD

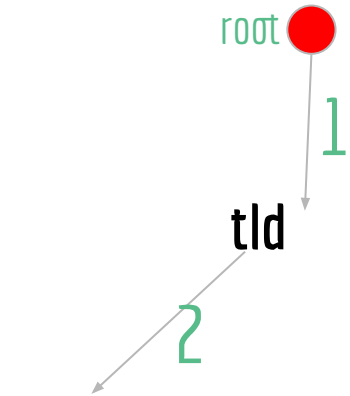
test TLD

.example, .invalid, .localhost, .test

Numeri e Nomi



Il PUNTO



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.

whois garr.it

```
Domain:                 garr.it
Status:                 ok
Signed:                 no
Created:                1996-01-29 00:00:00
Last Update:            2020-02-14 00:52:09
Expire Date:            2021-01-29

Registrant
  Organization:         Consortium GARR
  Address:              Via dei Tizii, 6
                        Roma
                        00185
                        RM
                        IT
  Created:              2007-03-01 10:33:25
  Last Update:          2011-03-24 11:01:07

Admin Contact
  Name:                 Federico Ruggieri
  Organization:         Consortium GARR
  Address:              Via dei Tizii, 6
                        Roma
                        00185
                        RM
                        IT
  Created:              2015-08-18 11:28:43
  Last Update:          2016-03-18 14:55:34

Technical Contacts
  Name:                 GARR-NIC
  Organization:         Consortium GARR
  Address:              Via dei Tizii, 6
                        Roma
                        00185
                        RM
                        IT
  Created:              2017-03-21 12:28:11
  Last Update:          2017-03-21 13:27:29

Registrar
  Organization:         Consortium GARR
  Name:                 GARR-REG
  Web:                  http://www.garr.it
  DNSSEC:               no


Nameservers
  ns1.garr.net
  ns2.garr.net
```

Regional Internet Registries (RIR)

AFRINIC: African Network Information Centre

APNIC: Asia-Pacific Network Information Centre

ARIN: American Registry for Internet Numbers

LACNIC: Latin America and Caribbean Network Information Centre

RIPE NCC: Réseaux IP Européens Network Coordination Centre

NRO: Number Resource Organization

LIR: Local Internet Registry

RIPE NCC

RIPE NETWORK COORDINATION CENTRE

```
thinker@PRDMBP ~ $ whois -h whois.ripe.net AS137
as-block:       AS137 - AS137
descr:          RIPE NCC ASN block
remarks:        These AS Numbers are assigned to network operators in the RIPE NCC service region.
mnt-by:         RIPE-NCC-HM-MNT
created:        2018-11-22T15:27:05Z
last-modified:  2018-11-22T15:27:05Z
source:         RIPE

% Information related to 'AS137'

% Abuse contact for 'AS137' is 'cert@garr.it'

aut-num:        AS137
as-name:        ASGARR
descr:          Consortium GARR
org:            ORG-GIRa1-RIPE
import:         from AS20965 action pref=300; accept ANY
import:         from AS1299 action pref=100; accept ANY
mp-import:      afi ipv4.multicast from AS20965 action pref=100; accept ANY
mp-import:      afi ipv6.unicast from AS20965 action pref=100; accept ANY
mp-import:      afi ipv6.multicast from AS20965 action pref=100; accept ANY
export:         to AS20965 announce AS-GARRTOGEANT
export:         to AS1299 announce AS-GARR
mp-export:      afi ipv4.multicast to AS20965 announce AS-GARRTOGEANT;
mp-export:      afi ipv6.unicast to AS20965 announce AS-GARRTOGEANT;
mp-export:      afi ipv6.multicast to AS20965 announce AS-GARRTOGEANT;
admin-c:        FR7236-RIPE
tech-c:         GL965-RIPE
tech-c:         GN450-RIPE
status:         LEGACY
mnt-by:         RIPE-NCC-LEGACY-MNT
mnt-by:         GARR-LIR
created:        2002-08-21T13:03:42Z
last-modified:  2018-06-25T06:43:36Z
source:         RIPE
```

whois -h whois.ripe.net AS137

Test

Qual è il mio indirizzo IPv4?

```
curl -s http://whatismyip.akamai.com
```

Qual è il sistema autonomo responsabile per il mio indirizzo IPv4?

```
curl -s http://whatismyip.akamai.com|xargs whois
```

Qual è il mio indirizzo IPv6?

```
curl -s http://ipv6.whatismyip.akamai.com
```

Qual è il sistema autonomo responsabile per il mio indirizzo IPv6?

```
curl -s http://ipv6.whatismyip.akamai.com|xargs whois -h whois.ripe.net
```

Qual è il server DNS ricorsivo che sto usando?

```
dig whoami.akamai.net +short
```

Qual è il sistema autonomo responsabile del server DNS ricorsivo che sto usando?

```
dig whoami.akamai.net +short|xargs whois
```

Root servers locations

As of 2023-05-11T13:41:30Z, the root server system consists of 1699 instances operated by the 12 independent root server operators.

ARPA, ccTLD, gTLD, grTLD, sTLD, tTLD

ICANN

gTLD

.com
.net
.org
.biz
.info
...

neustar

VERISIGN

ccTLD

.it
.eu
.de
.ch
.tv
...

Registro.it

.eu
Your European Identity

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

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1987

1993

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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)

RFC Editor

1993

1994

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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

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1994

1995

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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

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1996

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

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1997

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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

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1999

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

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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

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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

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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 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

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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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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
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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

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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

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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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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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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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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

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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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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

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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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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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RFC 7671	ASCII, PDF	**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 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

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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

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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

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Domain Name System Operations (dnsop)

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Document	Date	Status
Active Internet-Drafts (13 hits)		
draft-ietf-dnsop-alt-tld-14 **The ALT Special Use Top Level Domain**	11 pages 2021-12-15	I-D Exists Held by WG : Proposed Standard
draft-ietf-dnsop-avoid-fragmentation-06 **Fragmentation Avoidance in DNS**	12 pages 2021-12-23	I-D Exists WG Document
draft-ietf-dnsop-dns-catalog-zones-05 **DNS Catalog Zones**	17 pages 2022-03-07	I-D Exists WG Document
draft-ietf-dnsop-dns-error-reporting-01 **DNS Error Reporting**	10 pages 2021-11-09	I-D Exists WG Document
draft-ietf-dnsop-dnssec-bcp-01 **DNS Security Extensions (DNSSEC)**	10 pages 2022-04-14 New	I-D Exists WG Document
draft-ietf-dnsop-dnssec-bootstrapping-00 **Automatic DNSSEC Bootstrapping using Authenticated Signals from the Zone's Operator**	14 pages 2022-04-21 New	I-D Exists WG Document
draft-ietf-dnsop-glue-is-not-optional-05 **DNS Glue Requirements in Referral Responses**	12 pages 2022-04-22 New	I-D Exists WG Document
draft-ietf-dnsop-ns-revalidation-02 **Delegation Revalidation by DNS Resolvers**	7 pages 2022-03-07	I-D Exists WG Document
draft-ietf-dnsop-nsec3-guidance-08 **Guidance for NSEC3 parameter settings**	11 pages 2022-04-16 New	In Last Call (ends 2022-05-02) for 8 days Submitted to IESG for Publication : Best Current Practice Reviews: genart, opsdir Action Holder: Warren "Ace" Kumari
draft-ietf-dnsop-rfc5933-bis-07 **Use of GOST 2012 Signature Algorithms in DNSKEY and RRSIG Resource Records for DNSSEC**	9 pages 2021-11-12	I-D Exists In WG Last Call : Informational
draft-ietf-dnsop-svcb-https-08 **Service binding and parameter specification via the DNS (DNS SVCB and HTTPS RRs)**	60 pages 2021-10-12	IESG Evaluation::Revised I-D Needed for 54 days Submitted to IESG for Publication : Proposed Standard Reviews: artart, genart, intdir, opsdir, secdir, tsvart Action Holders: Warren "Ace" Kumari for 194 days, Mike Bishop for 54 days,
draft-ietf-dnsop-zoneversion-00 **The "ZONEVERSION" EDNS option for the version token of a RR's zone**	9 pages 2022-04-21 New	I-D Exists WG Document
draft-wisser-dnssec-automation-03 **DNSSEC automation**	12 pages 2022-03-06	I-D Exists Adopted by a WG
RFCs (62 hits)		

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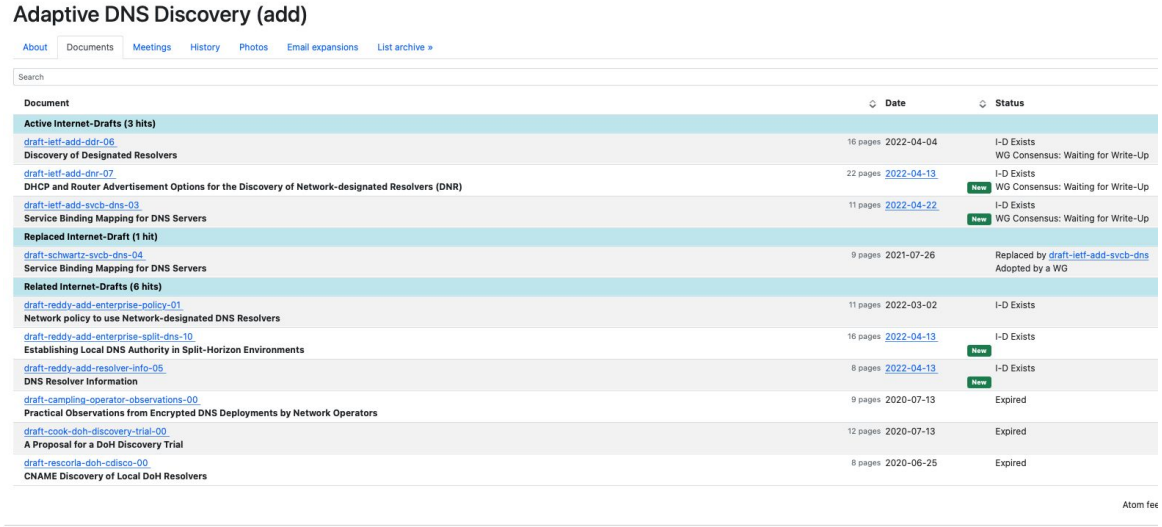

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Document	Date	Status
Active Internet-Drafts (3 hits)		
draft-ietf-add-ddr-06 **Discovery of Designated Resolvers**	16 pages 2022-04-04	I-D Exists WG Consensus: Waiting for Write-Up
draft-ietf-add-dnr-07 **DHCP and Router Advertisement Options for the Discovery of Network-designated Resolvers (DNR)**	22 pages 2022-04-13 New	I-D Exists WG Consensus: Waiting for Write-Up
draft-ietf-add-svcb-dns-03 **Service Binding Mapping for DNS Servers**	11 pages 2022-04-22 New	I-D Exists WG Consensus: Waiting for Write-Up
Replaced Internet-Draft (1 hit)		
draft-schwartz-svcb-dns-04 **Service Binding Mapping for DNS Servers**	9 pages 2021-07-26	Replaced by draft-ietf-add-svcb-dns Adopted by a WG
Related Internet-Drafts (6 hits)		
draft-reddy-add-enterprise-policy-01 **Network policy to use Network-designated DNS Resolvers**	11 pages 2022-03-02	I-D Exists
draft-reddy-add-enterprise-split-dns-10 **Establishing Local DNS Authority in Split-Horizon Environments**	16 pages 2022-04-13 New	I-D Exists
draft-reddy-add-resolver-info-05 **DNS Resolver Information**	8 pages 2022-04-13 New	I-D Exists
draft-campling-operator-observations-00 **Practical Observations from Encrypted DNS Deployments by Network Operators**	9 pages 2020-07-13	Expired
draft-cook-doh-discovery-trial-00 **A Proposal for a DoH Discovery Trial**	12 pages 2020-07-13	Expired
draft-rescorla-doh-cdisco-00 **CNAME Discovery of Local DoH Resolvers**	8 pages 2020-06-25	Expired

Atom fee

The Adaptive DNS Discovery (ADD) working group will work on the following deliverables:

- Define a mechanism that allows clients to discover DNS resolvers that support encryption and that are available to the client either on the public Internet or on private or local networks.

- Define a mechanism that allows communication of DNS resolver information to clients for use in selection decisions. This could be part of the mechanism used for discovery, above.

- Develop an informational document that describes mechanisms for clients to detect specific network environments (such as captive portal and split horizon) and to use that information to inform their DNS configuration.

This working group will coordinate with dnsop, doh, and dprive for any changes required in DNS protocols and will make sure that those groups are included in major document reviews at appropriate times. It will also work with capport to ensure that solutions are applicable to captive networks.

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Extensions for Scalable DNS Service Discovery (dnssd)

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Document	Date	Status
Active Internet-Drafts (3 hits)		
draft-ietf-dnssd-advertising-proxy-00 **Advertising Proxy for DNS-SD Service Registration Protocol**	10 pages 2022-01-12	I-D Exists WG Document
draft-ietf-dnssd-srp-13 **Service Registration Protocol for DNS-Based Service Discovery**	30 pages 2022-04-24	I-D Exists New Waiting for WG Chair Go-Ahead : Proposed Standard
draft-ietf-dnssd-update-lease-01 **An EDNS0 option to negotiate Leases on DNS Updates**	7 pages 2022-04-24	I-D Exists New WG Document
RFCs (5 hits)		
RFC 7558 *(was draft-ietf-dnssd-requirements)* **Requirements for Scalable DNS-Based Service Discovery (DNS-SD) / Multicast DNS (mDNS) Extensions**	14 pages 2015-07	Informational RFC
RFC 8222 *(was draft-ietf-dnssd-mdns-dns-interop)* **Selecting Labels for Use with Conventional DNS and Other Resolution Systems in DNS-Based Service Discovery**	11 pages 2017-09	Informational RFC
RFC 8765 *(was draft-ietf-dnssd-push)* **DNS Push Notifications**	32 pages 2020-06	Proposed Standard RFC
RFC 8766 *(was draft-ietf-dnssd-hybrid)* **Discovery Proxy for Multicast DNS-Based Service Discovery**	33 pages 2020-06	Proposed Standard RFC
RFC 8882 *(was draft-ietf-dnssd-prireq)* **DNS-Based Service Discovery (DNS-SD) Privacy and Security Requirements**	17 pages 2020-09	Informational RFC
Related Internet-Drafts (3 hits)		
draft-eckert-anima-grasp-dnssd-03 **DNS-SD Compatible Service Discovery in GeneRic Autonomic Signaling Protocol (GRASP)**	16 pages 2022-03-04	I-D Exists
draft-lemon-srp-replication-01 **Automatic Replication of DNS-SD Service Registration Protocol Zones**	26 pages 2021-11-07	I-D Exists
draft-tllq-tsr-01 **A 'Time Since Registration' Resource Record for Multicast DNS**	7 pages 2022-04-24	I-D Exists New

IETF Working Groups related to DNS

DNS PRIVate Exchange (dprive)

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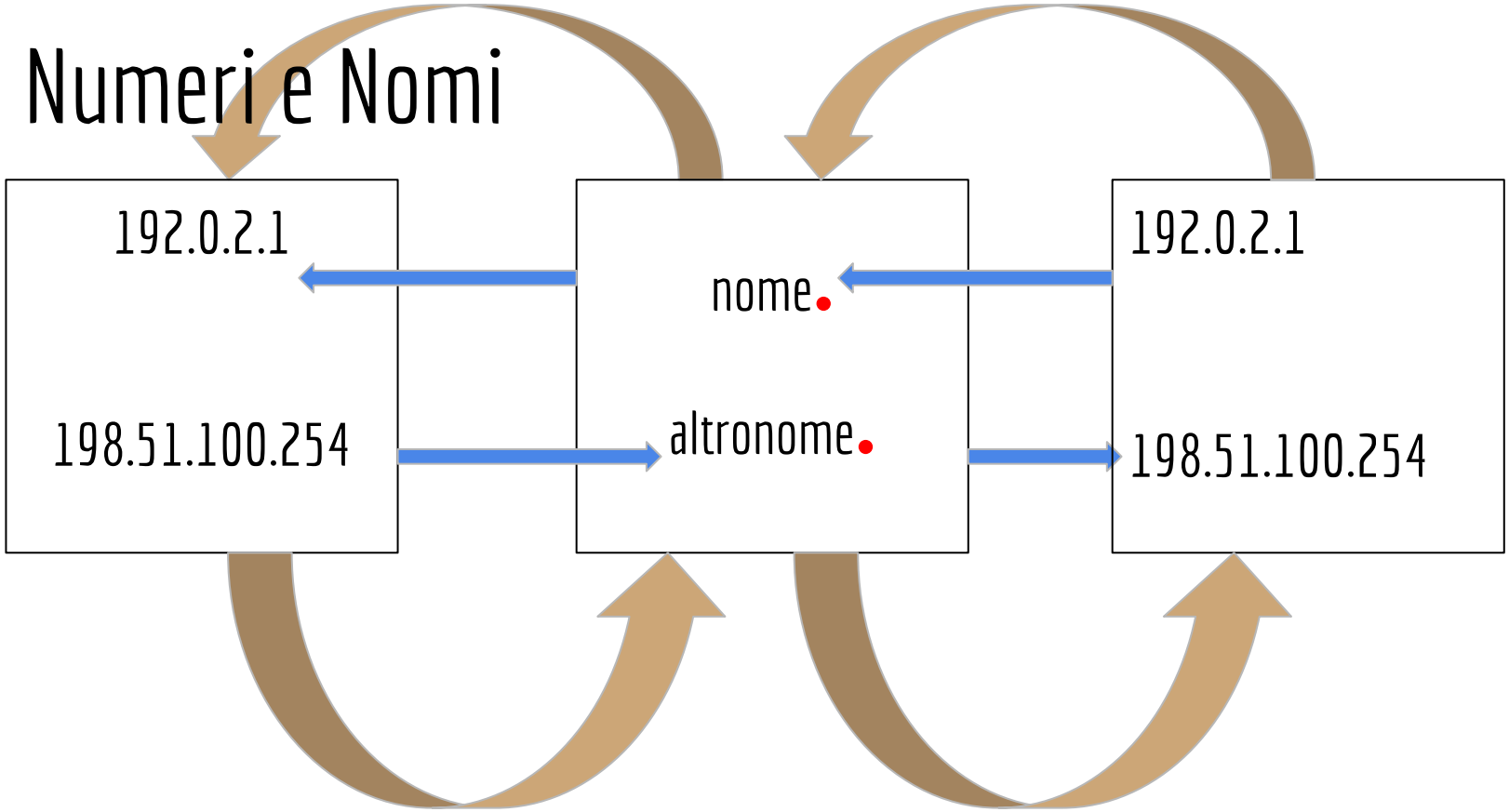
Search

Document	Date	Status
Active Internet-Drafts (2 hits)		
draft-ietf-dprive-dnsoquic-12 **DNS over Dedicated QUIC Connections**	34 pages 2022-04-20	RFC Ed Queue : EDIT for 35 days New Submitted to IESG for Publication : Proposed Standard Reviews: genart, opsdir, secdir, tsvart
draft-ietf-dprive-unilateral-probing-00 **Unilateral Opportunistic Deployment of Encrypted Recursive-to-Authoritative DNS**	23 pages 2022-03-07	I-D Exists WG Document
RFCs (9 hits)		
RFC 7626 *(was draft-ietf-dprive-problem-statement)* **DNS Privacy Considerations**	17 pages 2015-08	Informational RFC Obsoleted by RFC 9076
RFC 7830 *(was draft-ietf-dprive-edns0-padding)* **The EDNS(0) Padding Option**	5 pages 2016-05	Proposed Standard RFC
RFC 7858 *(was draft-ietf-dprive-dns-over-tls)* **Specification for DNS over Transport Layer Security (TLS)**	19 pages 2016-05 Errata	Proposed Standard RFC Updated by RFC 8310
RFC 8094 *(was draft-ietf-dprive-dnsodtls)* **DNS over Datagram Transport Layer Security (DTLS)**	13 pages 2017-02	Experimental RFC
RFC 8310 *(was draft-ietf-dprive-dtls-and-tls-profiles)* **Usage Profiles for DNS over TLS and DNS over DTLS**	27 pages 2018-03	Proposed Standard RFC
RFC 8467 *(was draft-ietf-dprive-padding-policy)* **Padding Policies for Extension Mechanisms for DNS (EDNS(0))**	9 pages 2018-10	Experimental RFC
RFC 8932 *(was draft-ietf-dprive-bcp-op)* **Recommendations for DNS Privacy Service Operators**	34 pages 2020-10 Errata	Best Current Practice RFC
RFC 9076 *(was draft-ietf-dprive-rfc7626-bis)* **DNS Privacy Considerations**	22 pages 2021-07	Informational RFC
RFC 9103 *(was draft-ietf-dprive-xfr-over-tls)* **DNS Zone Transfer over TLS**	32 pages 2021-08	Proposed Standard RFC
Related Internet-Drafts (4 hits)		
draft-dickson-dprive-adot-auth-06 **Authenticated DNS over TLS to Authoritative Servers**	17 pages 2021-11-09	I-D Exists
draft-dickson-dprive-dnst-00 **Resource Record for Signaling Transport for DNS to Authority Servers**	5 pages 2021-10-24 Expires soon	I-D Exists
draft-pauly-dprive-oblivious-doh-11 **Oblivious DNS Over HTTPS**	21 pages 2022-02-17	I-D Exists : AUTH48-DONE Sent to the RFC Editor : Experimental
draft-schwartz-ds-glue-02	12 pages 2021-08-19	Expired

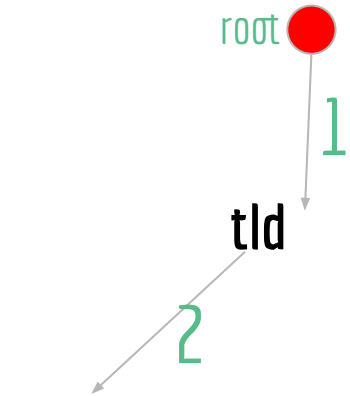
Il protocollo

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

Numeri e Nomi



Il PUNTO



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.

I tre componenti del DNS

Domain name space e Resource Records

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

Name Servers

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

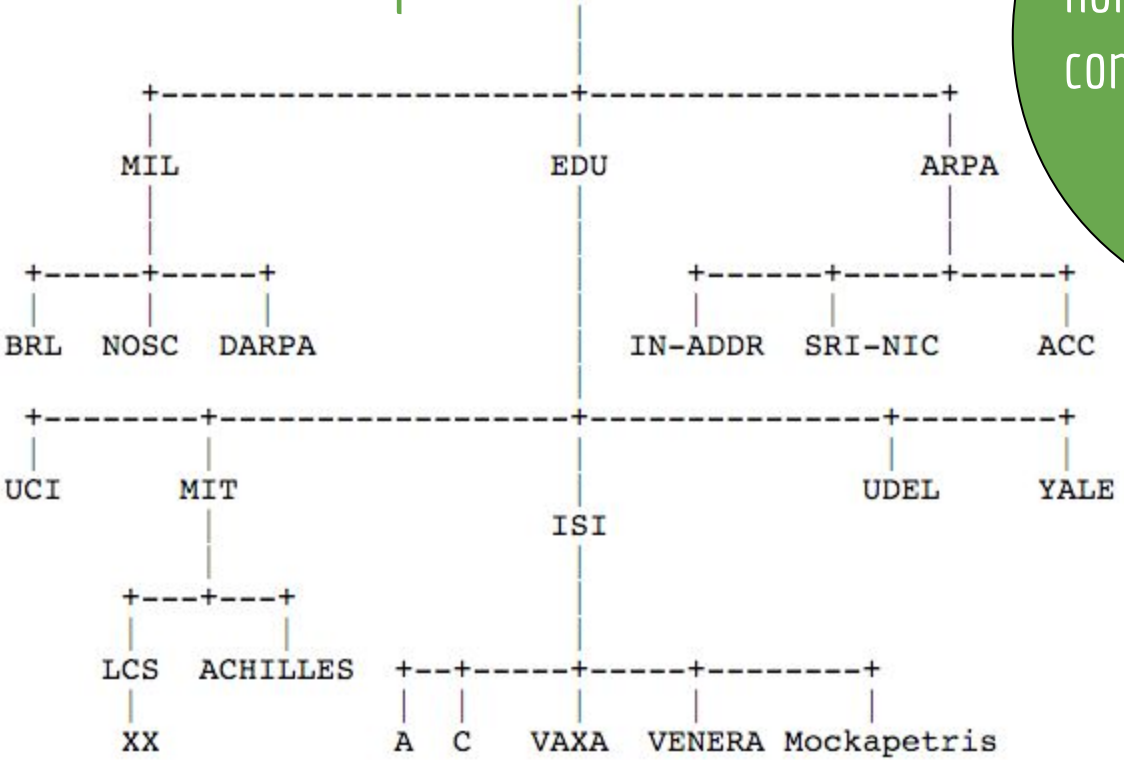
Resolvers

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

RFC 1034
Novembre 1987

I tre componenti del DNS

Domain name space e Resource Records

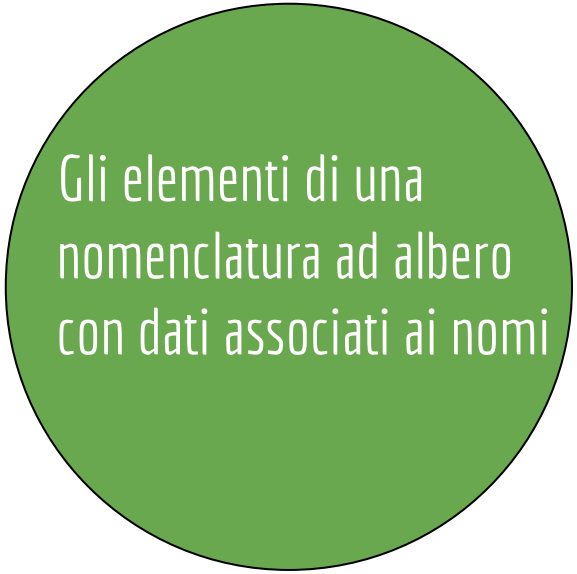


Gli elementi di una nomenclatura ad albero con dati associati ai nomi

RFC 1034
Novembre 1987

I tre componenti del DNS

Domain name space e Resource Records



CLASS	IN - internet
	CH - chaos
	(HS - hesiod) ← RFC2929
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
```

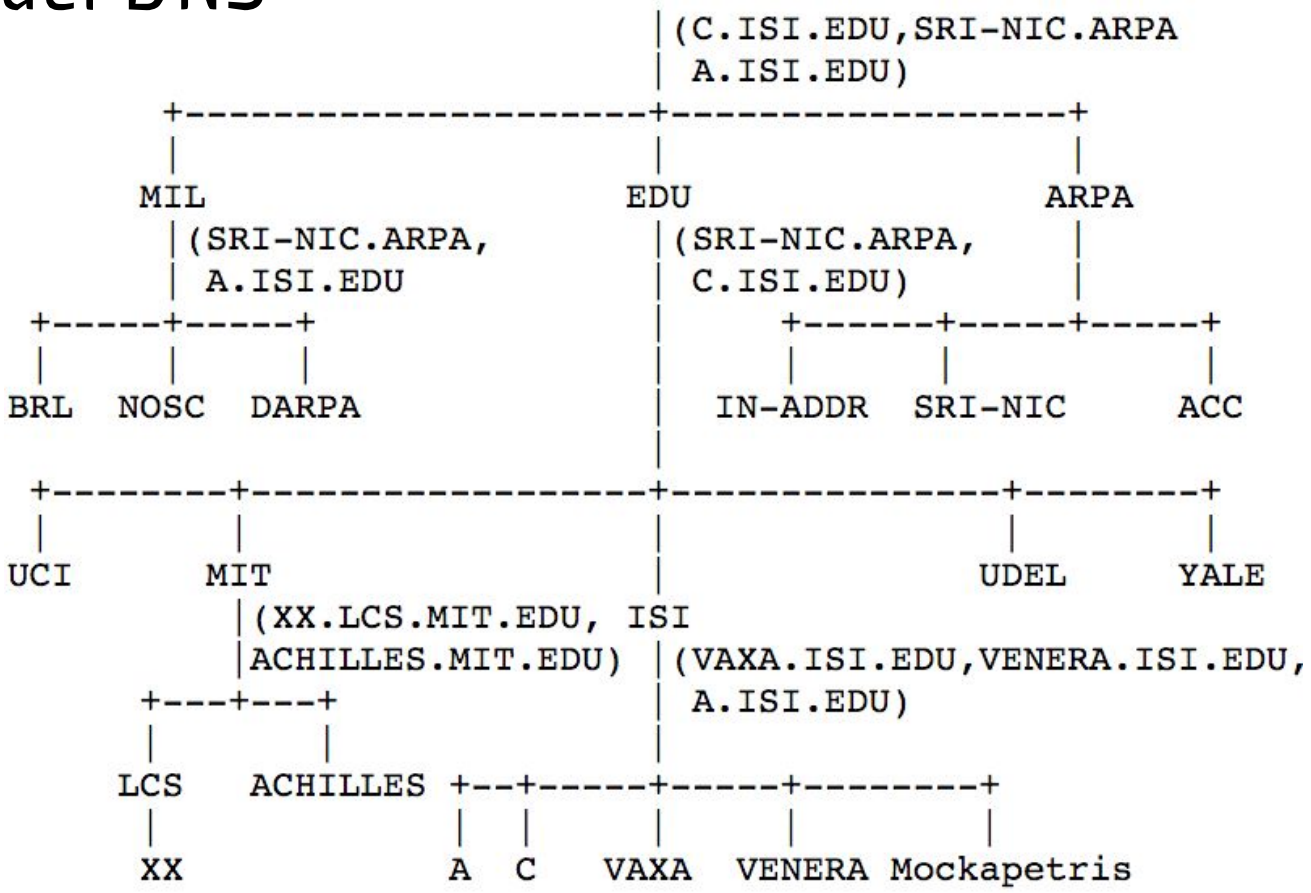
RFC 1034
Novembre 1987

I tre componenti del DNS

RFC 1034
Novembre 1987

Name Servers

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



I tre componenti del DNS

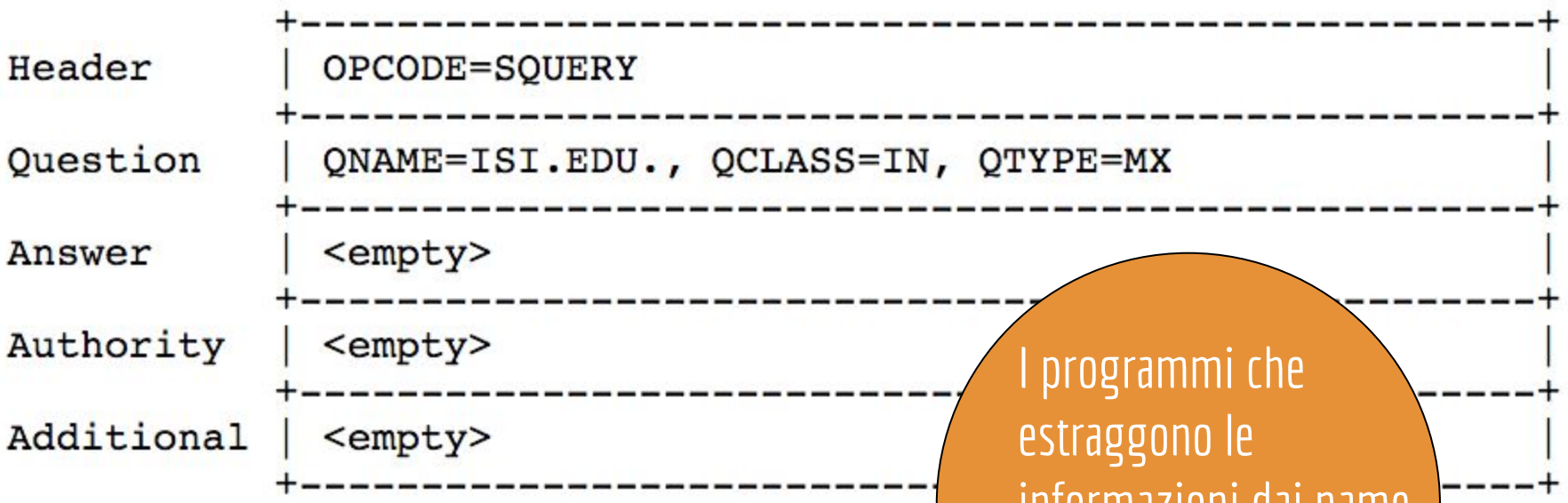
RFC 1034
Novembre 1987

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

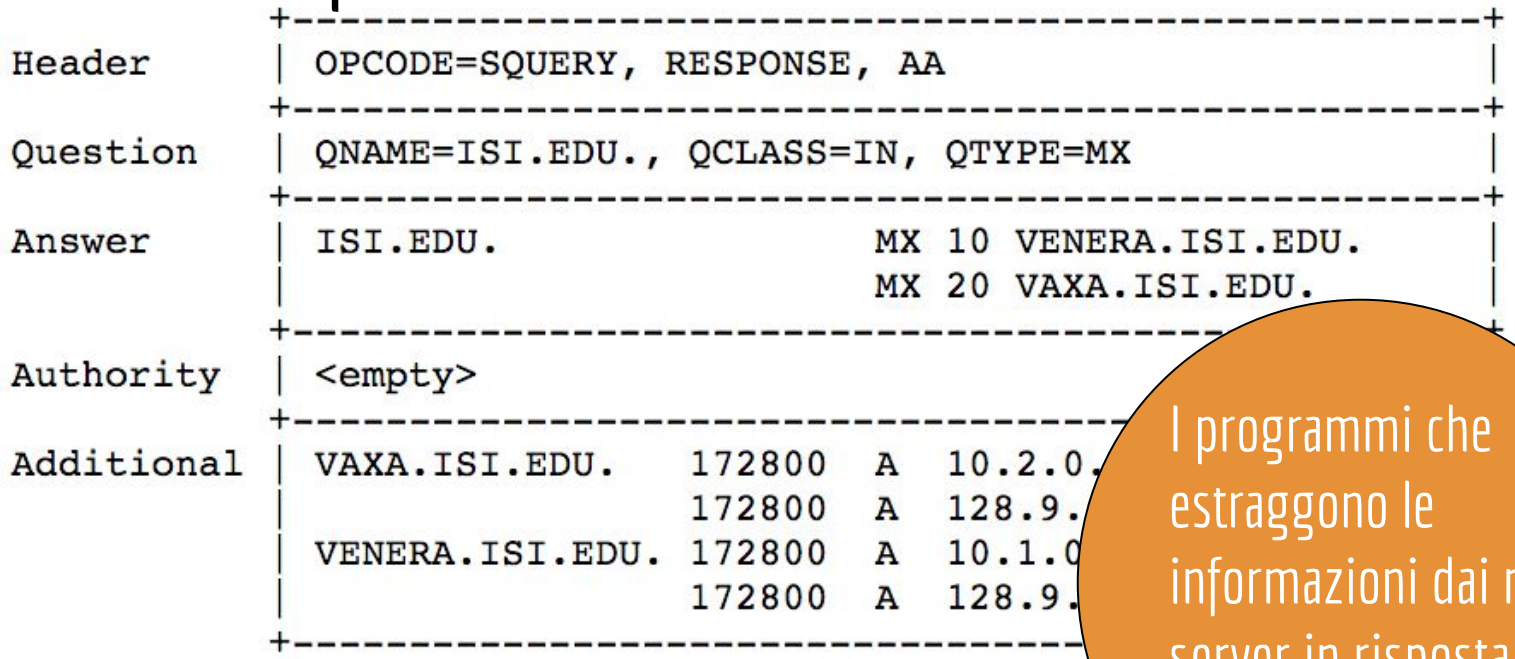


I programmi che estraggono le informazioni dai name server in risposta alle richieste dei client

Resolvers

RFC 1034
Novembre 1987

I tre componenti del DNS



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)

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

4 3 2 1

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

2.5.0.0.0.0.0.2.0.0.0.0.1.0.0.0.0.0.0.0.0.0.0.0.8.b.d.0.1.0.0.2.IP6.ARPA.

IN-ADDR.ARPA e IP6.ARPA

Chi gestisce questi speciali nomi a dominio?

I 5 RIR i quali consentono di delegare i prefissi direttamente a nameserver indicati dai LIR

```
domain:         200.5.185.in-addr.arpa
org:            ORG-CdSB1-RIPE
descr:          SBTAP - REV
admin-c:        SBT21-RIPE
tech-c:         SBT20-RIPE
zone-c:         AP7729-RIPE
ds-rdata:       42429 14 2 a7c8d54fd53f
nserver:        ns1.as59715.net
nserver:        ns2.as59715.net
nserver:        ns3.as59715.net
mnt-by:         SBTAP-MNT
created:        2012-10-06T12:59:06Z
last-modified:  2019-11-16T13:46:45Z
source:         RIPE# Filtered
```

/24

Si possono delegare solo /16 e /24

IN-ADDR.ARPA e IP6.ARPA

Chi gestisce questi speciali nomi a dominio?

I 5 RIR i quali consentono di delegare i prefissi direttamente a nameserver indicati dai LIR

```
domain:          0.c.d.c.2.0.a.2.ip6.arpa
org:             ORG-CdSB1-RIPE
descr:           SBTAP - REV
admin-c:         SBT21-RIPE
tech-c:          SBT20-RIPE
zone-c:          AP7729-RIPE
ds-rdata:        59801 14 2 b002167a90125d
nserver:         ns1.as59715.net
nserver:         ns2.as59715.net
nserver:         ns3.as59715.net
mnt-by:          SBTAP-MNT
created:         2012-10-06T13:37:52Z
last-modified:   2019-11-12T17:53:13Z
source:          RIPE# Filtered
```

/32

Si può delegare all'altezza del *nibble* (4 bit): /28, /32, /36, /40, /44, /48 ecc.

REISS ROMOLI

School of Advanced Networking by NAMEX

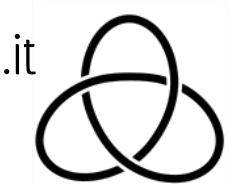
Domande?

REISS ROMOLI

School of Advanced Networking by NAMEX

L'Universo del DNS

Antonio Prado
https://www.prado.it

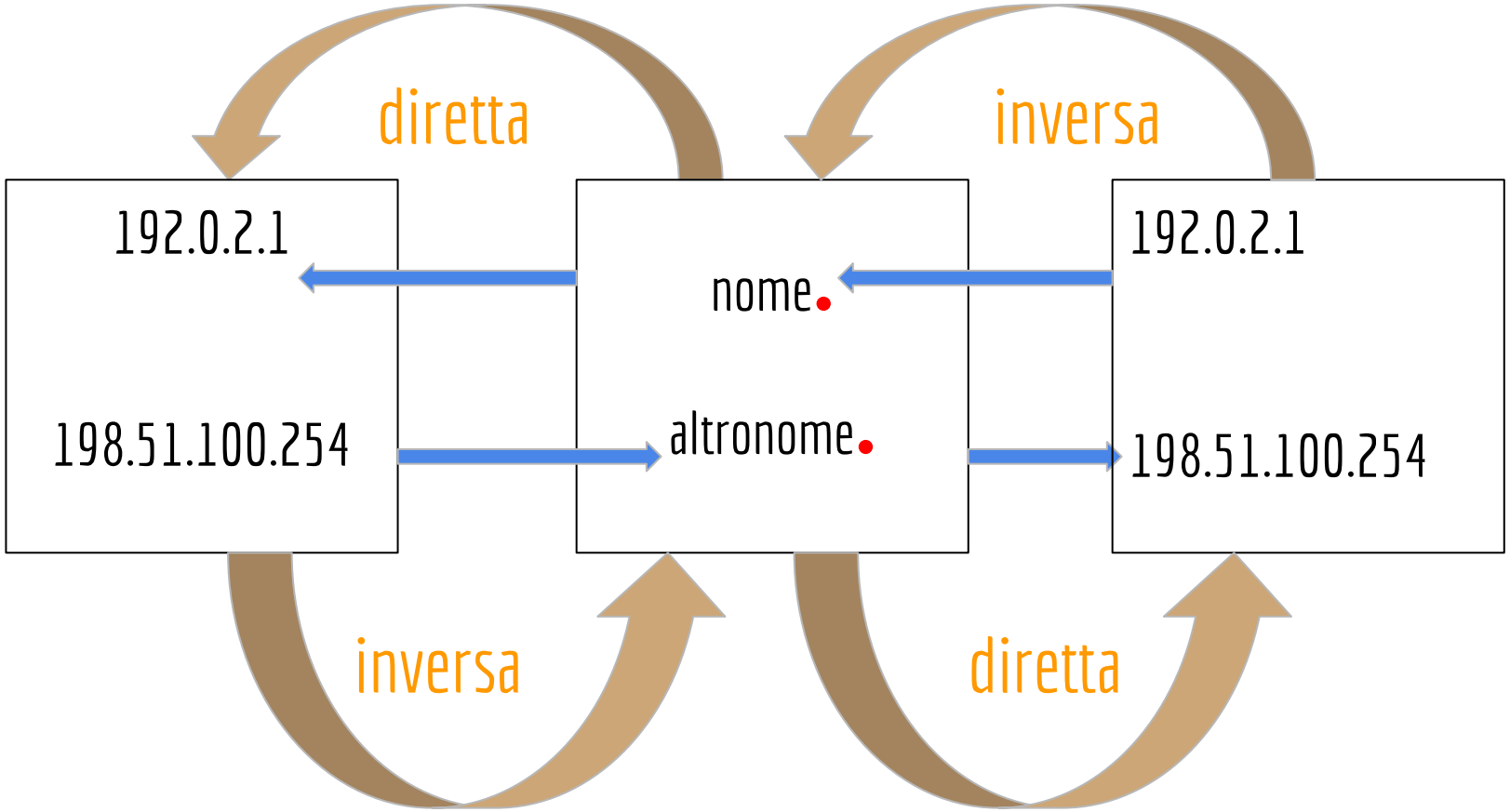


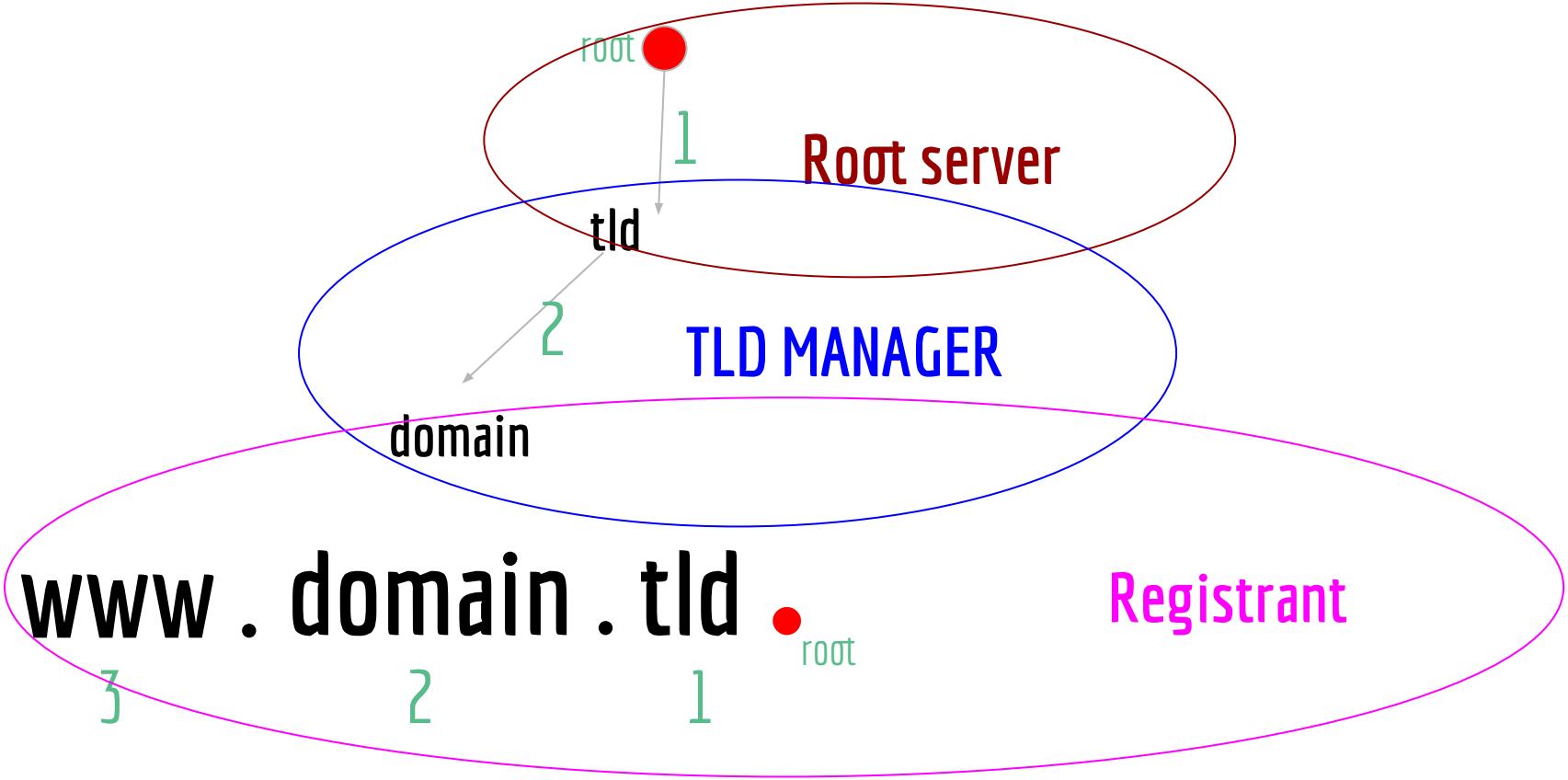
L'Universo del DNS

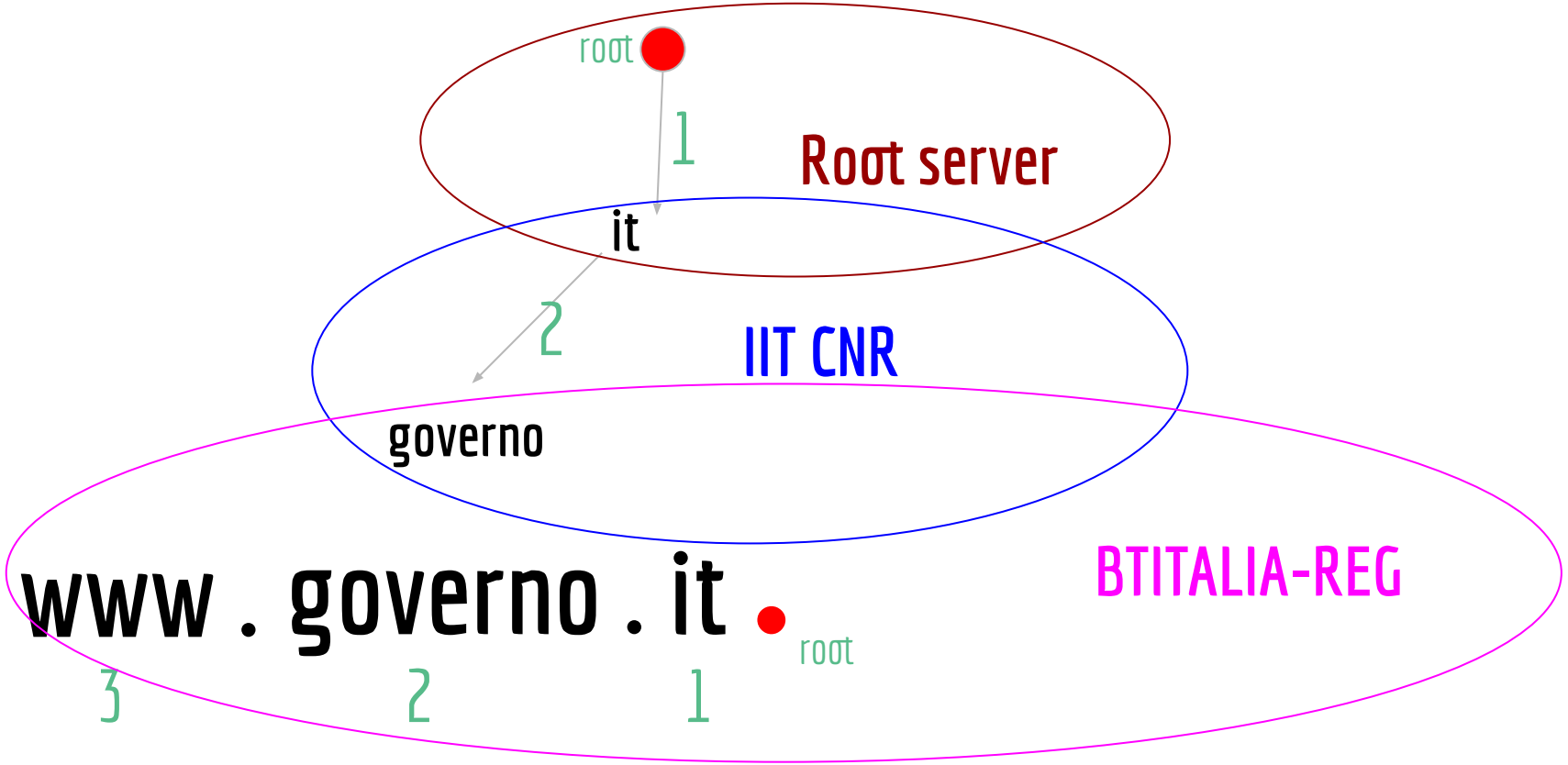
16 maggio 2023	17 maggio 2023	18 maggio 2023
Cenni storici	La risoluzione diretta e la risoluzione inversa	DNSSEC
Nomi a dominio	LAB 1: esercitazioni su query e investigazioni sui nomi a dominio	LAB 2: setup di un name server autoritativo
Il protocollo	Uno o più name space?	LAB 3: setup di un name server ricorsivo
	DNS tra sicurezza e privacy	ISP tra sicurezza cibernetica e censura
		LAB 4: setup di blacklist in un name server ricorsivo

Diretta e inversa

- *dig*
- *drill*
- *esempi*


diretta
inversa
192.0.2.1
198.51.100.254
nome.
altronome.
192.0.2.1
198.51.100.254
inversa
diretta


root
1
Root server
tld
2
TLD MANAGER
domain
www . domain . tld . root
3 2 1
Registrant


root
1
Root server
it
2
IIT CNR
governo
www . governo . it . root
3
2
1
BTITALIA-REG

dig ⟶ strumento per interrogare i nameserver
autore: Internet Systems Consortium, Inc.

utilità appartenente al software ISC Bind 9 e disponibile per i più diffusi sistemi operativi: *nix, Apple IOS, Microsoft Windows 64-bit

drill ⟶ strumento per interrogare i nameserver (con particolare accento sul DNSSEC)

autore: NLnet Labs

utilità sviluppata in seno alla libreria *ldns* reperibile principalmente nei sistemi operativi *BSD, ma installabile anche su distribuzioni basate su kernel GNU/Linux

dig

```
dig @1.1.1.1 -c IN -t NS .
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 3523
;; flags: qr rd ra ad; QUERY: 1, ANSWER: 13, AUTHORITY: 0, ADDITIONAL: 1
;; QUESTION SECTION:
;.                              IN      NS
;; ANSWER SECTION:
.                       511980  IN      NS      a.root-servers.net.
.                       511980  IN      NS      b.root-servers.net.
.                       511980  IN      NS      c.root-servers.net.
.                       511980  IN      NS      d.root-servers.net.
.                       511980  IN      NS      e.root-servers.net.
.                       511980  IN      NS      f.root-servers.net.
.                       511980  IN      NS      g.root-servers.net.
.                       511980  IN      NS      h.root-servers.net.
.                       511980  IN      NS      i.root-servers.net.
.                       511980  IN      NS      j.root-servers.net.
.                       511980  IN      NS      k.root-servers.net.
.                       511980  IN      NS      l.root-servers.net.
.                       511980  IN      NS      m.root-servers.net.
;; Query time: 98 msec
;; SERVER: 1.1.1.1#53(1.1.1.1)
;; WHEN: Mon Mar 08 19:08:58 CET 2021
```

drill

```
drill . @1.1.1.1 NS IN
;; ->>HEADER<<- opcode: QUERY, rcode: NOERROR, id: 7807
;; flags: qr rd ra ; QUERY: 1, ANSWER: 13, AUTHORITY: 0, ADDITIONAL: 0
;; QUESTION SECTION:
;; .            IN      NS
;; ANSWER SECTION:
.       511678  IN      NS      a.root-servers.net.
.       511678  IN      NS      b.root-servers.net.
.       511678  IN      NS      c.root-servers.net.
.       511678  IN      NS      d.root-servers.net.
.       511678  IN      NS      e.root-servers.net.
.       511678  IN      NS      f.root-servers.net.
.       511678  IN      NS      g.root-servers.net.
.       511678  IN      NS      h.root-servers.net.
.       511678  IN      NS      i.root-servers.net.
.       511678  IN      NS      j.root-servers.net.
.       511678  IN      NS      k.root-servers.net.
.       511678  IN      NS      l.root-servers.net.
.       511678  IN      NS      m.root-servers.net.
;; Query time: 25 msec
;; SERVER: 1.1.1.1
;; WHEN: Mon Mar  8 19:05:02 2021
```

dig

```
dig @1.1.1.1 -c IN -t NS it.
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 9693
;; flags: qr rd ra ad; QUERY: 1, ANSWER: 6, AUTHORITY: 0, ADDITIONAL: 1
;; QUESTION SECTION:
;it.                            IN      NS
;; ANSWER SECTION:
it.                     9194    IN      NS      a.dns.it.
it.                     9194    IN      NS      m.dns.it.
it.                     9194    IN      NS      r.dns.it.
it.                     9194    IN      NS      s.dns.it.
it.                     9194    IN      NS      dns.nic.it.
it.                     9194    IN      NS      nameserver.cnr.it.
;; Query time: 71 msec
;; SERVER: 1.1.1.1#53(1.1.1.1)
;; WHEN: Mon Mar 08 19:16:29 CET 2021
;; MSG SIZE  rcvd: 150
```

drill

```
drill it. @1.1.1.1 NS IN
;; ->>HEADER<<- opcode: QUERY, rcode: NOERROR, id: 50128
;; flags: qr rd ra ; QUERY: 1, ANSWER: 6, AUTHORITY: 0, ADDITIONAL: 0
;; QUESTION SECTION:
;; it.      IN      NS
;; ANSWER SECTION:
it.     6084    IN      NS      a.dns.it.
it.     6084    IN      NS      m.dns.it.
it.     6084    IN      NS      r.dns.it.
it.     6084    IN      NS      s.dns.it.
it.     6084    IN      NS      dns.nic.it.
it.     6084    IN      NS      nameserver.cnr.it.
;; Query time: 21 msec
;; SERVER: 1.1.1.1
;; WHEN: Mon Mar  8 19:18:17 2021
;; MSG SIZE  rcvd: 139
```

dig

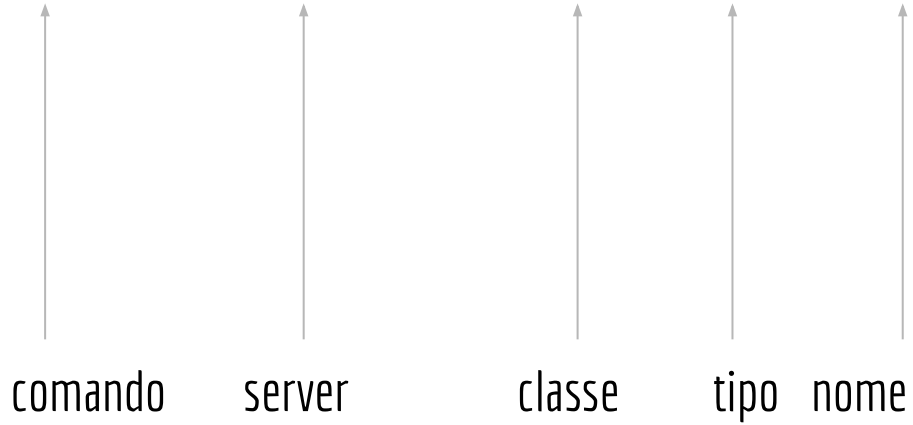
```
dig @1.1.1.1 -c IN -t NS governo.it.
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 13942
;; flags: qr rd ra; QUERY: 1, ANSWER: 4, AUTHORITY: 0, ADDITIONAL: 1
;; QUESTION SECTION:
;governo.it.                    IN      NS
;; ANSWER SECTION:
governo.it.             85036   IN      NS      ns2.palazzochigi.it.
governo.it.             85036   IN      NS      ns.palazzochigi.it.
governo.it.             85036   IN      NS      ns2a.btitalia.it.
governo.it.             85036   IN      NS      ns1a.btitalia.it.
;; Query time: 44 msec
;; SERVER: 1.1.1.1#53(1.1.1.1)
;; WHEN: Mon Mar 08 19:19:39 CET 2021
;; MSG SIZE  rcvd: 134
```

drill

```
drill governo.it. @1.1.1.1 NS IN
;; ->>HEADER<<- opcode: QUERY, rcode: NOERROR, id: 41251
;; flags: qr rd ra ; QUERY: 1, ANSWER: 4, AUTHORITY: 0, ADDITIONAL: 0
;; QUESTION SECTION:
;; governo.it.    IN      NS
;; ANSWER SECTION:
governo.it.     81680   IN      NS      ns2.palazzochigi.it.
governo.it.     81680   IN      NS      ns1a.btitalia.it.
governo.it.     81680   IN      NS      ns2a.btitalia.it.
governo.it.     81680   IN      NS      ns.palazzochigi.it.
;; Query time: 25 msec
;; SERVER: 1.1.1.1
;; WHEN: Mon Mar  8 19:19:48 2021
;; MSG SIZE  rcvd: 123
```

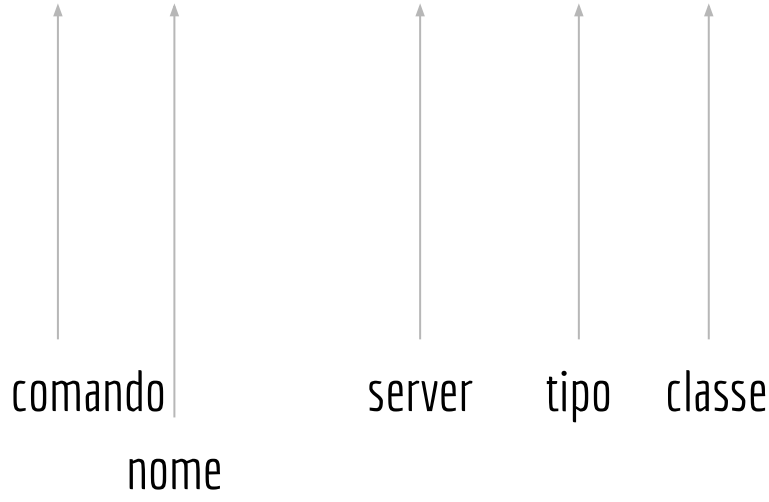
dig

```
dig @1.1.1.1 -c IN -t NS .
```



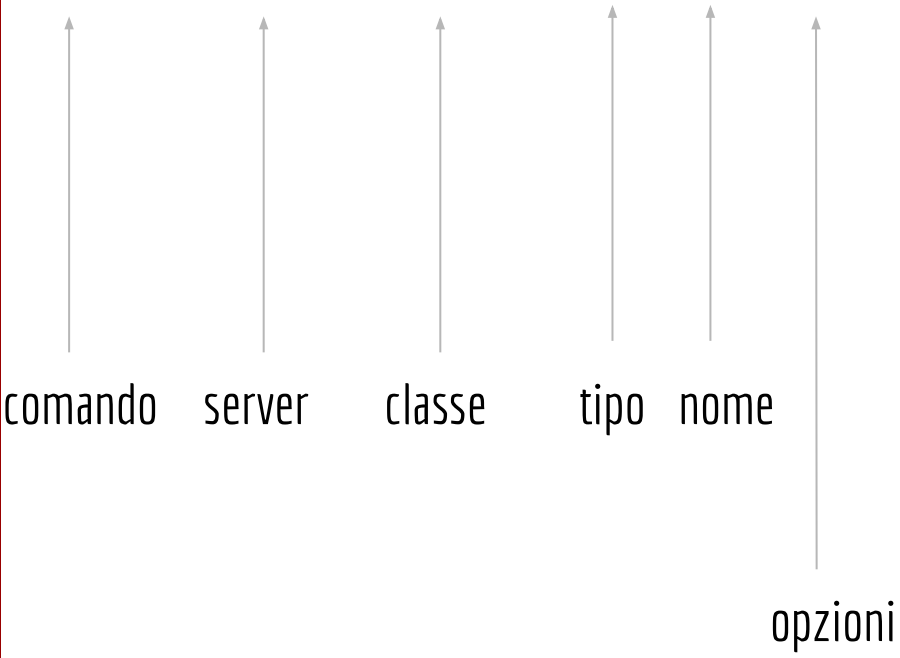
drill

```
drill . @1.1.1.1 NS IN
```



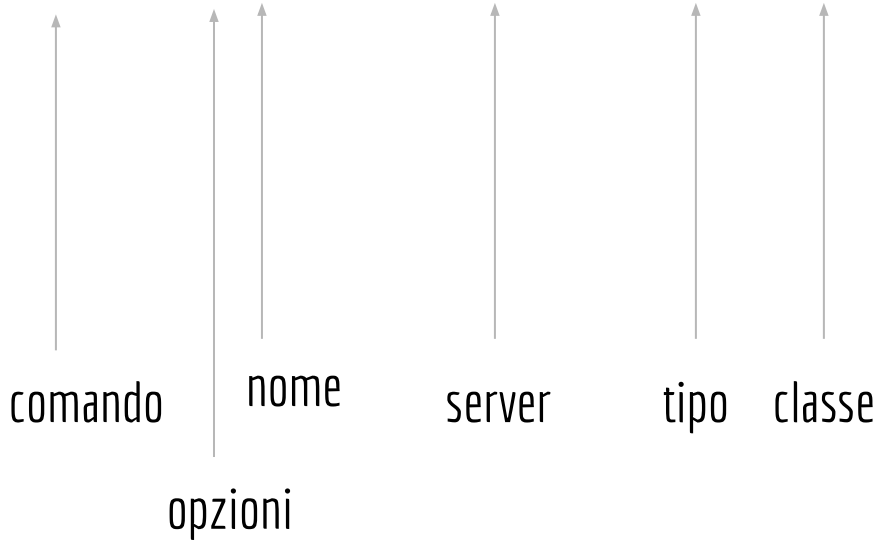
dig

```
dig @1.1.1.1 -c IN -t NS . +tcp
```



drill

```
drill -t . @1.1.1.1 NS IN
```



LAB 1

- *Esercitazioni su query*
- *Investigazioni su nomi e numeri*

Esercizi sulla consultazione dei registri

Esercizi 1

Si consideri il seguente nome a dominio della gerarchia ccTLD .it: ***governo.it***.

1. Qual è il *registrar* di riferimento?
2. Dove si evince se il nome a dominio ha le estensioni DNSSEC attive?
3. Dove si evince se il *registrar* di quel nome a dominio sia abilitato alla gestione del DNSSEC?
4. Quali sono i *name server* autoritativi?
5. Chi è il tecnico responsabile per il nome a dominio?
6. Chi è il titolare del nome a dominio?

Soluzioni 1 (whois in FreeBSD 12.3)

Si consideri il seguente nome a dominio della gerarchia ccTLD .it: *governo.it*.

1. Qual è il *registrar* di riferimento?

```
whois governo.it|grep -iA3 registrar
```

2. Dove si evince se il nome a dominio ha le estensioni DNSSEC attive?

```
whois governo.it|grep -i signed
```

3. Dove si evince se il *registrar* di quel nome a dominio sia abilitato alla gestione del DNSSEC?

```
whois governo.it|grep -i dnssec
```

4. Quali sono i *name server* autoritativi?

```
whois governo.it|grep -iA5 nameservers
```

5. Chi è il tecnico responsabile per il nome a dominio?

```
whois governo.it|sed -n '/^Technical/,/^Registrar/{//!p;}'
```

6. Chi è il titolare del nome a dominio?

```
whois governo.it|sed -n '/^Registrant/,/^Admin/{//!p;}'
```

Esercizi 2

Si consideri il seguente indirizzo IPv4: **80.64.127.105**

1. Qual è la rete di appartenenza?
2. Qual è il nome della rete di appartenenza?
3. Chi è il contatto amministrativo della rete?
4. Chi è il contatto tecnico della rete?
5. A quale oggetto di instradamento afferisce l'indirizzo?

Soluzioni 2 (whois in FreeBSD 12.3)

Si consideri il seguente indirizzo IPv4: **80.64.127.105**

1. Qual è la rete di appartenenza?

whois -h whois.ripe.net 80.64.127.105|grep inetnum

2. Qual è il nome della rete di appartenenza?

whois -h whois.ripe.net 80.64.127.105|grep netname

3. Chi è il contatto amministrativo della rete?

whois -h whois.ripe.net 80.64.127.105|grep admin-c|cut -d':' -f2|xargs whois -h whois.ripe.net

4. Chi è il contatto tecnico della rete?

whois -h whois.ripe.net 80.64.127.105|grep tech-c|cut -d':' -f2|xargs whois -h whois.ripe.net

5. A quale oggetto di instradamento afferisce l'indirizzo?

whois -h whois.ripe.net 80.64.127.105|grep route

Esercizi 3

Si consideri il seguente indirizzo IPv6: **2a00:1620:c0:60:146:48:98:40**

1. Qual è la rete di appartenenza?
2. Qual è il nome della rete di appartenenza?
3. Chi è il contatto amministrativo della rete?
4. Chi è il contatto tecnico della rete?
5. A quale oggetto di instradamento afferisce l'indirizzo?

Soluzioni 3 (whois in FreeBSD 12.3)

Si consideri il seguente indirizzo IPv6: **2a00:1620:c0:60:146:48:98:40**

1. Qual è la rete di appartenenza?

```
whois -h whois.ripe.net 2a00:1620:c0:60:146:48:98:40|grep inet6num
```

2. Qual è il nome della rete di appartenenza?

```
whois -h whois.ripe.net 2a00:1620:c0:60:146:48:98:40|grep netname
```

3. Chi è il contatto amministrativo della rete?

```
whois -h whois.ripe.net 2a00:1620:c0:60:146:48:98:40|grep admin-c|cut -d':' -f2|xargs whois -h whois.ripe.net
```

4. Chi è il contatto tecnico della rete?

```
whois -h whois.ripe.net 2a00:1620:c0:60:146:48:98:40|grep tech-c|cut -d':' -f2|xargs whois -h whois.ripe.net
```

5. A quale oggetto di instradamento afferisce l'indirizzo?

```
whois -h whois.ripe.net 2a00:1620:c0:60:146:48:98:40|grep route6
```

Esercizi 4

Si consideri il seguente indirizzo IPv6: **2a00:1620:c0:60:146:48:98:40**

1. Qual è il RR di tipo PTR in classe Internet?
2. Qual è il RR di tipo SOA in classe Internet della /64?
3. Qual è il nome a dominio della zona padre?
4. Quali sono i RR di tipo NS in classe Internet della zona padre gestita dal LIR?
5. Quali sono i RR di tipo NS in classe Internet della zona padre gestita dal RIR?

Soluzioni 4 (dig 9.16.12)

Si consideri il seguente indirizzo IPv6: **2a00:1620:c0:60:146:48:98:40**

1. Qual è il RR di tipo PTR in classe Internet?

```
dig -x 2a00:1620:c0:60:146:48:98:40
```

2. Qual è il RR di tipo SOA in classe Internet della /64?

```
dig 0.6.0.0.0.c.0.0.0.2.6.1.0.0.a.2.ip6.arpa. SOA IN +short
```

3. Qual è il nome a dominio della zona padre?

```
dig -x 2a00:1620:c0:60:146:48:98:40 SOA IN|grep -A1 "AUTHORITY SECTION"|grep 'ip6.arpa'|cut -d' ' -f1
```

4. Quali sono i RR di tipo NS in classe Internet della zona padre gestita dal LIR?

```
dig 0.6.0.0.0.c.0.0.0.2.6.1.0.0.a.2.ip6.arpa. NS IN +short
```

5. Quali sono i RR di tipo NS in classe Internet della zona padre gestita dal RIR?

```
dig 0.a.2.ip6.arpa. NS IN +short
```

Esercizi 5

Si considerino i seguenti risolutori pubblici: 1.1.1.1, 8.8.8.8, 2620:fe::fe, 2620:119:35::35

1. Chiedere a ciascuno il RR di tipo A in classe Internet per *google.it* confrontando le risposte

2. Chiedere a ciascuno il RR di tipo A in classe Internet per *www.microsoft.com* confrontando le risposte

3. Chiedere a ciascuno il RR di tipo A in classe Internet per *www.apple.com* confrontando le risposte

4. Chiedere a ciascuno il RR di tipo TXT in classe Chaos per *version.bind* confrontando le risposte

Soluzioni 5 (in C shell con dig 9.16.12)

```
foreach x ( 1.1.1.1 8.8.8.8 2620:fe::fe 2620:119:35::35 )
foreach y ( google.it www.microsoft.com www.apple.com )
dig @$x $y A IN +short
echo "===="
end
end
```

```
foreach x ( 1.1.1.1 8.8.8.8 2620:fe::fe 2620:119:35::35 )
dig @$x version.bind TXT CH +short
echo "===="
end
```

Bonus 1

N.	QUESTION
1.	qual e' il RR IN MX per il nome a dominio gnu.org.?
2.	qual e' il RR IN AAAA di $1?
3.	qual e' il RR IN PTR di $2?
4.	qual e' un RR IN NS di com.?
5.	qual e' il RR IN A di $4?
6.	qual e' il RR IN PTR di $5?
7.	qual e' il RR IN PTR di 114.19.0.193.in-addr.arpa.?
8.	qual e' il dominio in-addr.arpa. per 127.0.0.1?
9.	qual e' il dominio ip6.arpa. per fe80::e6ce:8ff:2:1?
10.	qual e' il RR IN A di mail.comune.osimo.an.it?
11.	qual e' il RR IN PTR di $10?
12.	qual e' il RR IN A di $11?
13.	qual e' il RR IN TXT di comune.osimo.an.it?
14.	qual e' il RR IN RRSIG di RR IN AAAA di as112.net.?

15. infine: se volessi inviare una e-mail al responsabile della zona org, a quale indirizzo dovrei inviarla?

Bonus 2

1. Qual è il RR IN MX del nome a dominio sviluppoeconomico.gov.it?
2. Qual è il RR IN A di $1?
3. Qual è il RR IN PTR di $2?
4. Qual è il RR IN MX del nome a dominio interno.it?
5. Qual è il RR IN A di $4?
6. Qual è il RR IN PTR di $5?

Uno o più name space

- *AlterNIC*
- *Realnames*
- *New.net*
- *Yeti DNS project e 6ORS*

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.

RFC 2826 IAB Technical Comment on the Unique DNS Root, maggio 2000

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.

AlterNIC

1997

ALTERNIC.NET

alternic.nic

HOWTO DO 'ALTERNATE' DNS

....a HOWTO in progress... Please send comments to ekashp@alternic.net

There are a couple of ways we've come up with to implement some alternative to the current ROOT-SERVERS...they involve making changes to the named configuration file - /etc/named.boot.

- **Use an alternate name server...**

  For dial up users, or others who need end-user name service: Use one of the following DNS servers, instead of the one you're currently using for primary DNS :

  ```
  TORONTO.ALTERNIC.NET    207.107.232.106 (Toronto, ON, Canada)
  NYC.ALTERNIC.NET        207.51.48.15    (New York, NY, USA)
  KITTEN.MCS.COM          192.160.127.90  (Chicago, IL, USA)
  MX.ALTERNIC.NET         204.94.42.1     (Bremerton, WA, USA)
  ROOT-NS.MCS.NET         192.160.127.86  (Chicago, IL, USA)
  ```

  You should try to get your provider to implement one of the below methods for name server configurations, use these servers as a last resort...

- **Replace your current named cache file...**

  There's almost always one first statement in a named.boot file, which refers to a file containing a list of the ROOT name servers...

  ```
  cache           .                       root.cache
  ```

  We have installed a backbone network of alternative domain name servers, and prepared an alternative cache file for your use. This cache file may be downloaded via the WWWeb as db.cache.bin, and is also available via anonymous ftp from FTP.ALTERNIC.NET, get the file 'db.cache'.

- **Replace your cache with a root zone file...**

  We advocate replacing your cache file with a similar one, which includes the addresses of all of the TLD servers, about 200 of them, for not only the InterNIC domains, but the two digit country TLD servers and new TLDs, like the .BIZ .DOT .EARTH .INC .LTD and .NIC zones.

  This root zone file is about 67**K**, and available by anonymous ftp from **FTP.ALTERNIC.NET**, and get the file 'db.root'

  The 'cache' line in your named.boot file should then be replaced with:

  ```
  primary         .                       db.root
  ```

  We will continue to make this file available for public download. db.root may be WWWeb downloaded, as db.root.bin

  There is also a PERL script to regularly ftp the file... the system administrator should be shure to check db.root regularly, to insure the most accurate top level name sever information.

- **Windows NT...**

  Can get one of the BIND versions for Windows NT found on the Microsoft Tools Page. *Thanks to Jack Grey for the NT work!*

- **Secondary TLD Servers...**

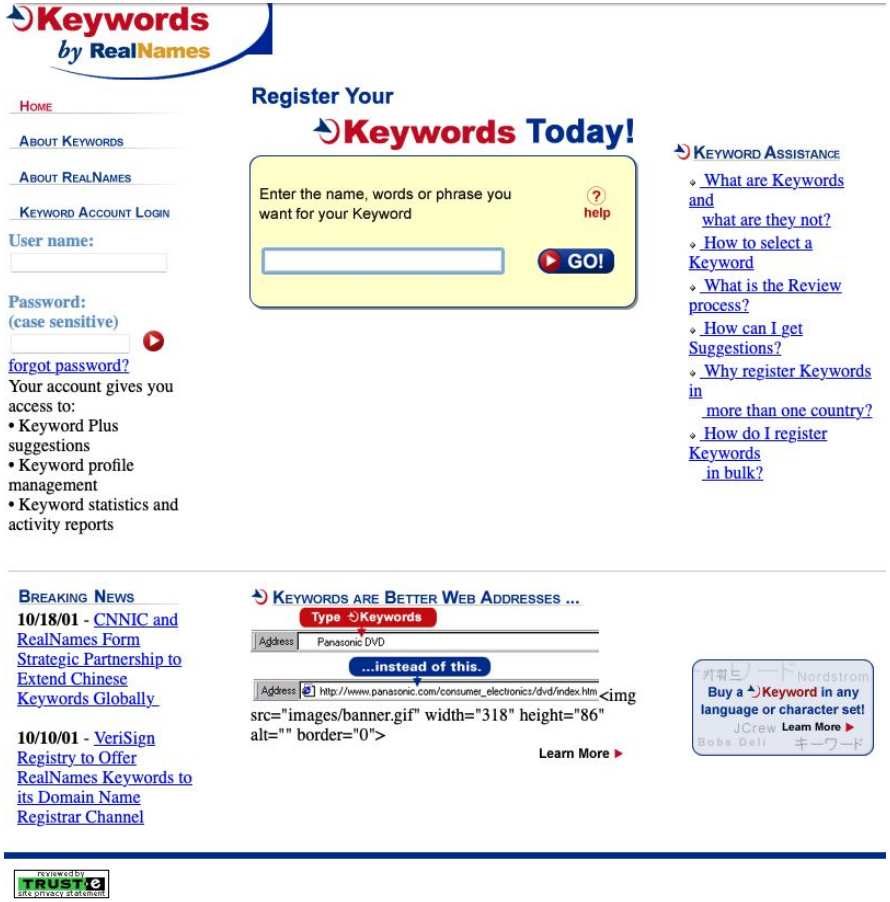
  To implement a specific TLD you may add a 'secondary' statement to your named.boot file to slave service for that TLD:

  ```
  secondary       nic     204.94.42.1             db.nic

  secondary       biz     192.160.127.125         db.biz
  secondary       dot     206.71.77.2             db.dot
  secondary       ent     205.206.189.3           db.ent
  secondary       eur     194.106.36.1            db.eur
  secondary       inc     204.94.42.1             db.inc
  secondary       sea     199.181.164.1           db.sea
  secondary       usa     198.170.216.19          db.usa
  ```

- ALTERNIC.NET Test Links to enhance DNS sites...

RealNames

2001



New.net

2004


new.net Domain Names
Enable Your Browser to see New.net domains
Enhanced with Quick! Search
Search the web directly from your browser's address bar
ENGLISH | ESPANOL | FRANCAIS | PORTUGUES | DEUTSCH | ITALIANO
Home | Help | About Us
Get a meaningful Web address in your own language!
Manage My Account | Renew Your Domain | Shopping Cart | Instructions
Domain Names
• Register Domain Names
• Manage My Account
• Renew Domain
• My Shopping Cart
• Instructions
Services
• Web Site Solutions
• Web Hosting
• Free URL Forwarding
Domain Support
• FAQ/Support
• About New.net Software
• ISP Information
Sell Domains
• Registrar Program
• Affiliate Program
Domain News
Sign Up for our Newsletter
join
Sample Newsletter
Privacy Policy
1 Enter Domain Name
www. Domain Name
2 Select Extension(s)
.shop .xxx .club .ltd
.inc .travel .tech .sport
.family .law .med .mp3
3 Click "Check It"
Check It
See all English Extensions
as low as $25.50 per year
Get the domain name you've always wanted!
Partner Promotion
registerfly easyspace BulkRegister dollardomainname.com
Visit our reseller partners for great value on New.net domain names
New.net Search Spotlight
Stargate.com
New.net Adds Registrar Stargate to Growing Reseller Network.
Click here to learn more.
New.net Exclusive
InterSurge
Free Web Hosting
Receive 3 months free web hosting when you host your New.net domain with InterSurge.
Click here to learn more.
New.net News
Attention New.net Domain Name Registrants and Software Users!
New.net has updated its Registration Agreement, Software Use Agreement and Software Use Privacy Policy. We recommend that you review the new agreements.
Forum | Info For ISPs | Affiliates | Registrars | Services | Policies | Press Room
Please note the recent changes to our Software Use Agreement and Software Use Privacy Policy.
Partners
tiscali EarthLink
© 2003 - 2004 New.net, Inc. All rights reserved. Privacy Policy
INDEPENDENT AUDITORS' REPORT
ENABLED USERS
PRICEWATERHOUSECOOPERS
174,661,619 New.net enabled Internet users worldwide*
* New.net domain names are accessible by persons that use one of our partner ISPs to access the Internet or who activate their browsers. This number is limited now, but growing daily. For source information click here.

Yeti DNS Project Phase-2

--A Live IPv6-only Root DNS Server System Testbed

Introduction

"One World, One Internet, One Namespace" is the essence for the success of today's Internet. The top level of the unique identifier system, the DNS root system, has been operational for 25+ years. It is pivot to make the current Internet useful. So it is considered somewhat ossified for stability reasons. It is hard to test and implement new ideas evolving to a more advanced level to counter challenges. To benefit the Internet development as a whole, Yeti Project is founded to build a parallel experimental live IPv6 DNS root system to discover the limits of DNS root name service and deliver useful technical output. Note that Yeti is not providing alternative name space… More

Yeti Phase-2

The Yeti Phase-2 project is based on a P2P network and designs a new decentralized distributed DM system.

The system design has the following characteristics:

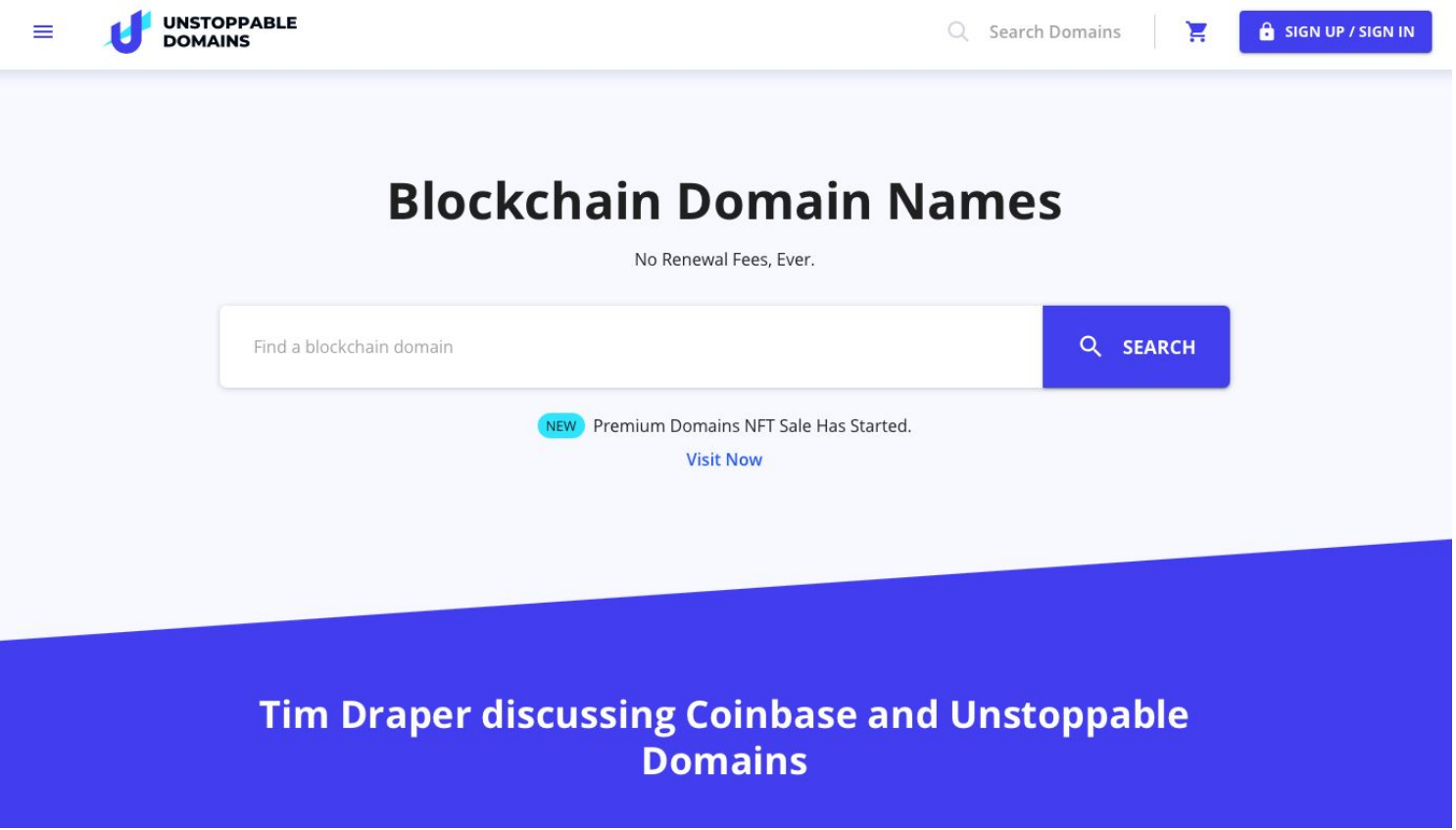
- Decentralized, no central node, each node needs to reach a consensus when performing operations, the Primary node is the executor, and have no special authority
- Scalable, Increase system redundancy
- Using threshold signature (TS) technology to reduce the number of DNSKEY
- Introduced DM Management Committee (DMMC), responsible for transaction management

News & blogs

- [News] 2020/04/03, A Summary of 2020 Yeti DNS Workshop meeting
- [News] 2019/08/05, A Summary of 2019 Yeti Phase-2 kick-off meeting
- [News] 2019/04/24, Algorithm Rollover Lab Testing page is published
- [News] 2019/04/02, Call for participation of Second Algorithm rollover test

2015

RFC8483


UNSTOPPABLE DOMAINS
Search Domains
SIGN UP / SIGN IN
Blockchain Domain Names
No Renewal Fees, Ever.
Find a blockchain domain
SEARCH
NEW
Premium Domains NFT Sale Has Started.
Visit Now
Tim Draper discussing Coinbase and Unstoppable Domains

2021

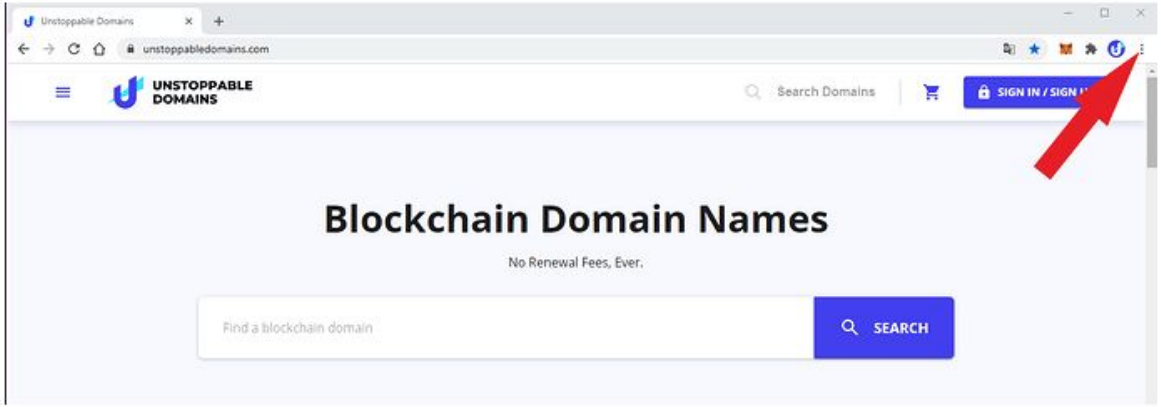
Once you have configured your browser as per this guide you will be able to access .crypto Unstoppable domains in 2 different ways:

1. `http://domainname.crypto` note **http** not https
2. **domainname.crypto/** the **forward slash** is to override your browser's search engine searching for the domain.

If you have the Unstoppable extension in your browser you will need to disable it to switch to DNS over https (which retains the domain name in the browser).

Chrome browser

1. Select browser settings from the menu in the top right of Chrome.



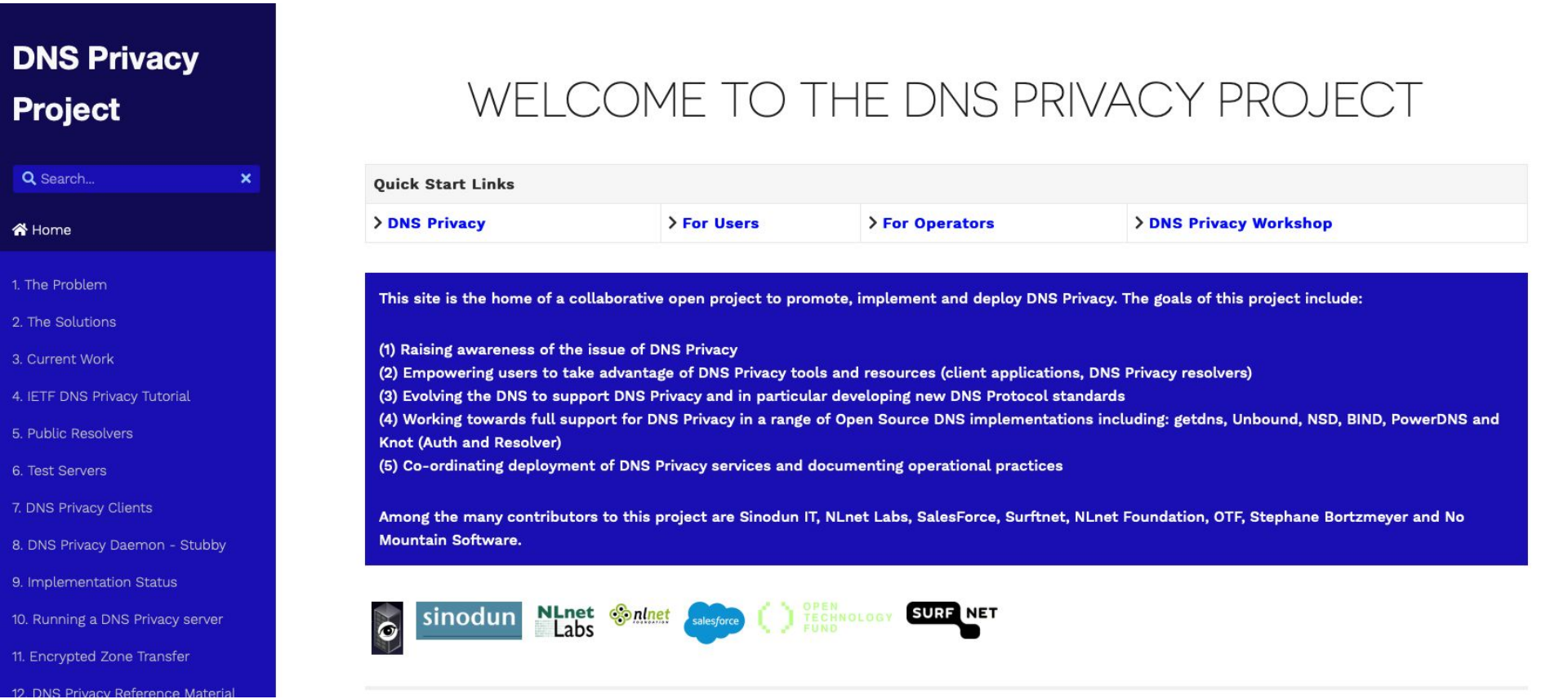
2. From the Settings menu select Privacy and security > Security > Advanced section and set Custom URL as https://resolver.unstoppable.io/dns-query 614

DoH

DNS tra sicurezza e privacy

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

https://dnsprivacy.org



PRIVACY

RFC 7626

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

PRIVACY

Strict Privacy

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.

PRIVACY

Usage Profile	Connection	Passive Attacker	Active Attacker
Strict	A, E	P	P
Opportunistic	A, E	P	P
Opportunistic	E	P	N, D
Opportunistic		N, D	N, D

P == Protection; N == No protection; D == Detection is possible;
A == Authenticated connection; E == Encrypted connection

DoT, DNS over TLS

RFC 7858

Contro lo spionaggio delle query, cioè a favore della privacy

TCP 853

DoT, DNS over TLS

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

DTLS, DNS over Datagram TLS

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

REISS ROMOLI

School of Advanced Networking by NAMEX

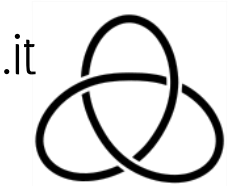
Domande?

REISS ROMOLI

School of Advanced Networking by NAMEX

L'Universo del DNS

Antonio Prado
https://www.prado.it



L'Universo del DNS

16 maggio 2023	17 maggio 2023	18 maggio 2023
Cenni storici	La risoluzione diretta e la risoluzione inversa	DNSSEC
Nomi a dominio	LAB 1: esercitazioni su query e investigazioni sui nomi a dominio	LAB 2: setup di un name server autoritativo
Il protocollo	Uno o più name space?	LAB 3: setup di un name server ricorsivo
	DNS tra sicurezza e privacy	ISP tra sicurezza cibernetica e censura
		LAB 4: setup di blacklist in un name server ricorsivo

DNSSEC

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).

Passaggi bottom-up

L'autorità DNS (noi), attraverso una chiave privata, firma i RR di una zona

La firma viene pubblicata in un apposito record chiamato RRSIG

La chiave pubblica viene pubblicata in un apposito *record* chiamato DNSKEY

Viene generato un altro *record* chiamato Delegation Signer (DS) che poi l'autorità sovraordinata andrà a firmare e pubblicare.

Requisiti

Il TLD manager deve avere implementato DNSSEC

I root-server devono aver firmato il RR DS del TLD Manager

Il TLD manager deve consentire ai REGISTRAR di gestire i RR DS

Il REGISTRAR deve consentire al REGISTRANT di abilitare DNSSEC

Verifica su autoritativi e su ricorsivi

https://dnsviz.net

https://dnssec-analyzer.verisignlabs.com

https://dnssec-name-and-shame.com

https://dnssec.vs.uni-due.de

Risolutori ricorsivi

Il risolutore deve essere abilitato per la validazione DNSSEC

Se i dati sono firmati con DNSSEC e la validazione ha successo, il risolutore restituisce il RR richiesto certificando la sua autenticità

Se i dati non sono firmati, il risolutore restituisce il RR senza certificazione di autenticità

Se i dati sono firmati ma la validazione non va a buon fine, il risolutore non restituisce il RR

Controlli e validazione

Prendiamo il nome a dominio prado.it e controlliamo se il REGISTRAR è capace di trattare DNSSEC:

- # whois -h whois.nic.it prado.it|grep -iA5 registrar

Registrar

Organization: Domeneshop AS

Name: DOMENESHOP-REG

Web: http://www.domainnameshop.com/

DNSSEC: yes

Controlli e validazione

Ora scopriamo quali name server autoritativi sono stati dichiarati al REGISTRAR:

```
whois -h whois.nic.it prado.it|grep -iA5 nameserver
Nameservers
  lily.ns.cloudflare.com
  theo.ns.cloudflare.com
```

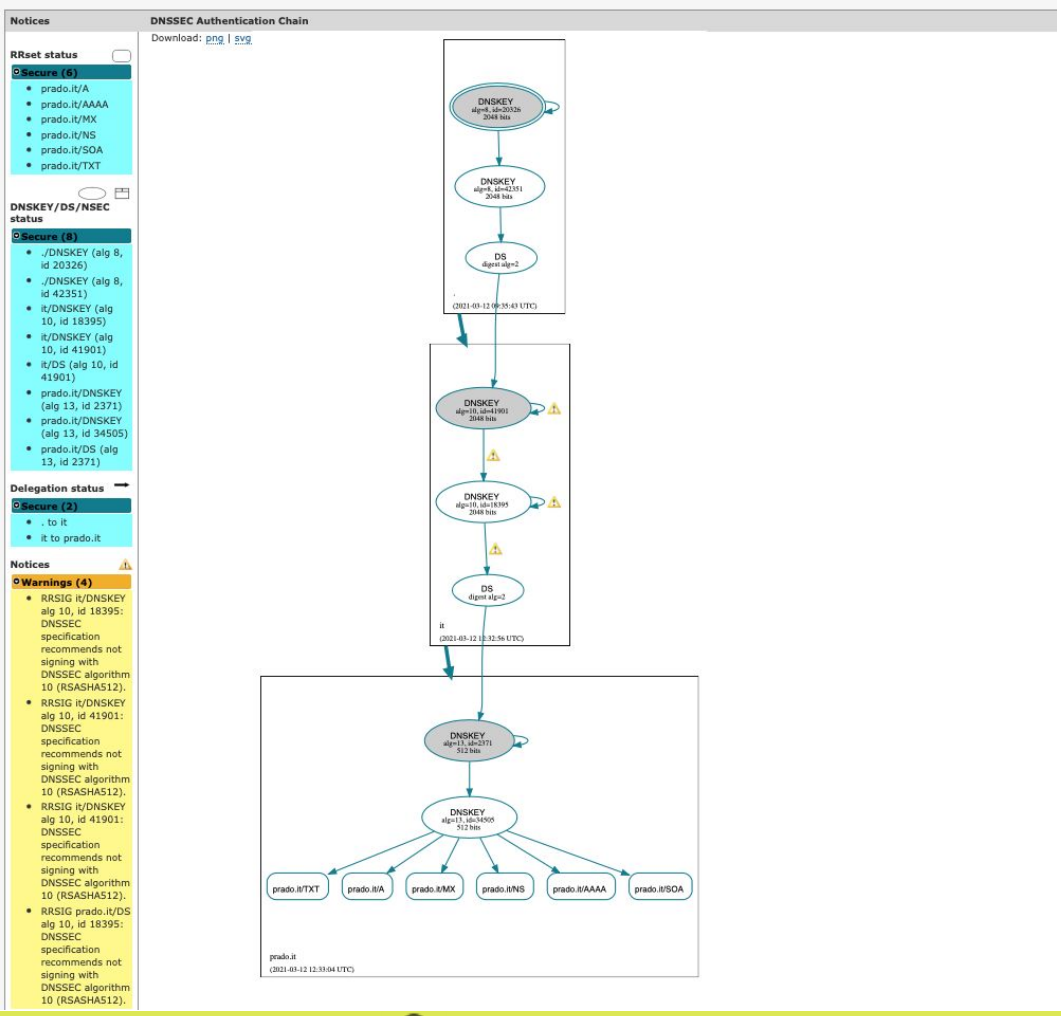
Controlli e validazione

Controlliamo ora se il REGISTRANT ha configurato il DNSSEC sul nome a dominio:

```
- # drill -D prado.it @lily.ns.cloudflare.com SOA IN
;; ->>HEADER<<- opcode: QUERY, rcode: NOERROR, id: 25754
;; flags: qr aa rd ; QUERY: 1, ANSWER: 2, AUTHORITY: 0, ADDITIONAL: 0
;; QUESTION SECTION:
;; prado.it. IN SOA

;; ANSWER SECTION:
prado.it. 3600 IN SOA lily.ns.cloudflare.com. dns.cloudflare.com. 2035120822 10000 2400 604800 3600
prado.it. 3600 IN RRSIG SOA 13 2 3600 20200916151628 20200914131628 34505 prado.it.
ADM+YOcXnqu+EVNyuJk5TIRiq9uN9D0ApLeixkp4ipeLkY3H5EP1QDfCO4Saf0sfji2E3oXRScLVIS7++PzTBg==
;; Query time: 41 msec
;; EDNS: version 0; flags: do ; udp: 1232
;; SERVER: 108.162.192.130
;; WHEN: Tue Sep 15 18:00:22 2020
;; MSG SIZE rcvd: 203
```

-D abilita DNSEC nella query

Controlli e validazione su https://dnsviz.net



Controlli e validazione

https://dnssec-analyzer.verisignlabs.com/

VERISIGN // LABS

Domain Name: prado.it

Detail: more(+) / less(-)

Analyzing DNSSEC problems for prado.it

.	Found 2 DNSKEY records for . DS=20326/SHA-256 verifies DNSKEY=20326/SEP Found 1 RRSIGs over DNSKEY RRset RRSIG=20326 and DNSKEY=20326/SEP verifies the DNSKEY RRset
it	Found 1 DS records for it in the . zone DS=41901/SHA-256 has algorithm RSASHA512 Found 1 RRSIGs over DS RRset RRSIG=42351 and DNSKEY=42351 verifies the DS RRset Found 2 DNSKEY records for it DS=41901/SHA-256 verifies DNSKEY=41901/SEP Found 2 RRSIGs over DNSKEY RRset RRSIG=18395 and DNSKEY=18395 verifies the DNSKEY RRset
prado.it	Found 1 DS records for prado.it in the it zone DS=2371/SHA-256 has algorithm ECDSAP256SHA256 Found 1 RRSIGs over DS RRset RRSIG=18395 and DNSKEY=18395 verifies the DS RRset Found 2 DNSKEY records for prado.it DS=2371/SHA-256 verifies DNSKEY=2371/SEP Found 1 RRSIGs over DNSKEY RRset RRSIG=2371 and DNSKEY=2371/SEP verifies the DNSKEY RRset prado.it A RR has value 104.21.5.174 Found 1 RRSIGs over A RRset RRSIG=34505 and DNSKEY=34505 verifies the A RRset

Move your mouse over any ⊗ or ⚠ symbols for remediation hints.

Want a second opinion? Test prado.it at dnsviz.net.

LAB2

Setup di un name server autoritativo

NSD su FreeBSD

Name Server Daemon è un *software* (usato a esempio anche dal Root Server K) scritto da NLnet Labs per funzionare come servizio di risoluzione dei nomi e gestisce come autorità le zone, cioè non ha funzioni di *cache* o di risoluzione ricorsiva.

```
root@thinkbsd:~ # pkg install nsd
Updating FreeBSD repository catalogue...
FreeBSD repository is up to date.
All repositories are up to date.
The following 2 package(s) will be affected (of 0 checked):

New packages to be INSTALLED:
        libevent: 2.1.12
        nsd: 4.3.6_1

Number of packages to be installed: 2

The process will require 4 MiB more space.
718 KiB to be downloaded.

Proceed with this action? [y/N]: y
[1/2] Fetching nsd-4.3.6_1.txz: 100%  398 KiB 408.0kB/s    00:01
[2/2] Fetching libevent-2.1.12.txz: 100%  320 KiB 327.3kB/s    00:01
Checking integrity... done (0 conflicting)
[1/2] Installing libevent-2.1.12...
[1/2] Extracting libevent-2.1.12: 100%
[2/2] Installing nsd-4.3.6_1...
===> Creating groups.
Creating group 'nsd' with gid '216'.
===> Creating users
Creating user 'nsd' with uid '216'.
[2/2] Extracting nsd-4.3.6_1: 100%
=====
Message from nsd-4.3.6_1:

--
To run nsd from startup, add nsd_enable="YES" to your etc/rc.conf

   Starting with nsd version 4 the old nsdc control program has been
   replaced by nsd-control. This requires some manual setup with
   nsd-control-setup and editing of the config files.

   nsd-control is incompatible with nsdc so when that is used in scripts,
   these should be adapted
```

```
root@FreeBSD:~ # sysrc nsd_enable=yes
nsd_enable:  -> yes
root@FreeBSD:~ #
```

```
root@thinkbsd:~ # cd /usr/local/etc/nsd/
root@thinkbsd:/usr/local/etc/nsd # ls
nsd.conf.sample
root@thinkbsd:/usr/local/etc/nsd # cp nsd.conf.sample nsd.conf
root@thinkbsd:/usr/local/etc/nsd # vi nsd.conf
```

```
# round robin rotation of records in the answer.
round-robin: yes

# minimal-responses only emits extra data for referrals.
minimal-responses: yes

# Do not return additional information if the apex zone of the
# additional information is configured but does not match the apex zone
# of the initial query.
# confine-to-zone: no

# refuse queries of type ANY.  For stopping floods.
refuse-any: yes
```

```
# Service clients over TLS (on the TCP sockets), with plain DNS inside
# the TLS stream. Give the certificate to use and private key.
# Default is "" (disabled). Requires restart to take effect.
# tls-service-key: "path/to/privatekeyfile.key"
# tls-service-pem: "path/to/publiccertfile.pem"
# tls-service-ocsp: "path/to/ocsp.pem"
# tls-port: 853
```

```
root@thinkbsd:~ # tail /usr/local/etc/nsd/nsd.conf
        # rrl-whitelist: wildcard
        # rrl-whitelist: nodata
        # rrl-whitelist: dnskey
        # rrl-whitelist: positive
        # rrl-whitelist: all
        # RRLend

    zone:
        name: mia.demo
        zonefile: "mia.demo.zone"
```

```
root@thinkbsd:/usr/local/etc/nsd # cat mia.demo.zome
$ORIGIN mia.demo.
@       3600 SOA ns1.mia.demo. (
             admin.mia.demo. ; address of responsible party
             2020061301 ; serial number
             3600 ; refresh period
             600 ; retry period
             604800 ; expire time
             1800    ) ; minimum ttl
@       86400 NS ns1.mia.demo.
@       86400 NS ns2.mia.demo.
@       3600 MX 10 mail.mia.demo.
@           60 A 192.0.2.10
@           60 AAAA 2001:db8:a:b:c::a
ns1 3600 A 192.0.2.1
ns1 3600 AAAA 2001:db8:c:d:e::1
ns2 3600 A 198.51.100.2
ns2 3600 AAAA 2001:db8:f:1:2::12
mail 14400 A 203.0.113.20
mail 14400 AAAA 2001:db8:c:1:2::14
www 43200 CNAME @
```

https://pastebin.com/5UNrTDcw

```
root@thinkbsd:~ # /usr/local/etc/rc.d/nsd stop
Stopping nsd.
root@thinkbsd:~ # /usr/local/etc/rc.d/nsd start
Starting nsd.
[2021-03-12 23:44:22.761] nsd[54620]: notice: nsd starting (NSD 4.3.5)
root@thinkbsd:~ # drill @localhost -c IN -t NS mia.demo
;; ->>HEADER<<- opcode: QUERY, rcode: NOERROR, id: 30422
;; flags: qr aa rd ; QUERY: 1, ANSWER: 2, AUTHORITY: 0, ADDITIONAL: 4
;; QUESTION SECTION:
;; mia.demo.    IN      NS

;; ANSWER SECTION:
mia.demo.       86400   IN      NS      ns1.mia.demo.
mia.demo.       86400   IN      NS      ns2.mia.demo.

;; AUTHORITY SECTION:

;; ADDITIONAL SECTION:
ns1.mia.demo.   3600    IN      A       192.0.2.1
ns2.mia.demo.   3600    IN      A       198.51.100.2
ns1.mia.demo.   3600    IN      AAAA    2001:db8:c:d:e::1
ns2.mia.demo.   3600    IN      AAAA    2001:db8:f:1:2::12

;; Query time: 0 msec
;; SERVER: 127.0.0.1
;; WHEN: Fri Mar 12 23:45:15 2021
;; MSG SIZE  rcvd: 150
root@thinkbsd:~ #
```

LAB3

Setup di un name server ricorsivo

Unbound su FreeBSD

Unbound è un software di NLnet Labs con funzioni di *cache* e di risoluzione ricorsiva con possibilità di validazione DNSSEC e RPZ, response policy zone (meccanismo di filtraggio)

```
root@thinkbsd:~ # pkg install unbound
Updating FreeBSD repository catalogue...
FreeBSD repository is up to date.
All repositories are up to date.
The following 3 package(s) will be affected (of 0 checked):

New packages to be INSTALLED:
        expat: 2.4.1
        libnghttp2: 1.43.0
        unbound: 1.13.2

Number of packages to be installed: 3

The process will require 9 MiB more space.
2 MiB to be downloaded.

Proceed with this action? [y/N]: y
[1/3] Fetching unbound-1.13.2.txz: 100%    2 MiB   1.2MB/s    00:02
[2/3] Fetching libnghttp2-1.43.0.txz: 100%  123 KiB 126.0kB/s    00:01
[3/3] Fetching expat-2.4.1.txz: 100%  103 KiB 105.1kB/s    00:01
Checking integrity... done (0 conflicting)
[1/3] Installing libnghttp2-1.43.0...
[1/3] Extracting libnghttp2-1.43.0: 100%
[2/3] Installing expat-2.4.1...
[2/3] Extracting expat-2.4.1: 100%
[3/3] Installing unbound-1.13.2...
===> Creating groups.
Using existing group 'unbound'.
===> Creating users
Using existing user 'unbound'.
[3/3] Extracting unbound-1.13.2: 100%
```

```
root@FreeBSD:~ # sysrc unbound_enable=yes
unbound_enable:  -> yes
root@FreeBSD:~ #
```

```
root@thinkbsd:~ # cd /usr/local/etc/unbound/
root@thinkbsd:/usr/local/etc/unbound # ls
unbound.conf.sample
root@thinkbsd:/usr/local/etc/unbound # cp unbound.conf.sample unbound.conf
root@thinkbsd:/usr/local/etc/unbound # vi unbound.conf
```

```
# File with trusted keys, kept uptodate using RFC5011 probes,
# initial file like trust-anchor-file, then it stores metadata.
# Use several entries, one per domain name, to track multiple zones.
#
# If you want to perform DNSSEC validation, run unbound-anchor before
# you start unbound (i.e. in the system boot scripts).  And enable:
# Please note usage of unbound-anchor root anchor is at your own risk
# and under the terms of our LICENSE (see that file in the source).
auto-trust-anchor-file: "/usr/local/etc/unbound/root.key"
```

```
# service clients over TLS (on the TCP sockets) with plain DNS inside
# the TLS stream, and over HTTPS using HTTP/2 as specified in RFC8484.
# Give the certificate to use and private key.
# default is "" (disabled).  requires restart to take effect.
# tls-service-key: "path/to/privatekeyfile.key"
# tls-service-pem: "path/to/publiccertfile.pem"
# tls-port: 853
# https-port: 443

# cipher setting for TLSv1.2
# tls-ciphers: "DHE-RSA-AES256-GCM-SHA384:DHE-RSA-AES128-GCM-SHA256:ECDHE-RSA-AES256-GCM-SHA384:ECDHE
S128-GCM-SHA256:DHE-RSA-AES256-SHA256:DHE-RSA-AES128-SHA256:ECDHE-RSA-AES256-SHA384:ECDHE-RSA-AES128-S

# cipher setting for TLSv1.3
# tls-ciphersuites: "TLS_AES_128_GCM_SHA256:TLS_AES_128_CCM_8_SHA256:TLS_AES_128_CCM_SHA256:TLS_AES_2
SHA384:TLS_CHACHA20_POLY1305_SHA256"

# Use the SNI extension for TLS connections.  Default is yes.
# Changing the value requires a reload.
# tls-use-sni: yes

# Add the secret file for TLS Session Ticket.
# Secret file must be 80 bytes of random data.
# First key use to encrypt and decrypt TLS session tickets.
# Other keys use to decrypt only.
# requires restart to take effect.
# tls-session-ticket-keys: "path/to/secret_file1"
# tls-session-ticket-keys: "path/to/secret_file2"

# request upstream over TLS (with plain DNS inside the TLS stream).
# Default is no.  Can be turned on and off with unbound-control.
# tls-upstream: no

# Certificates used to authenticate connections made upstream.
# tls-cert-bundle: ""

# Add system certs to the cert bundle, from the Windows Cert Store
# tls-win-cert: no

# Also serve tls on these port numbers (eg. 443, ...), by listing
# tls-additional-port: portno for each of the port numbers.
```

```
# Also serve tls on these port numbers (eg. 443, ...), by listing
# tls-additional-port: portno for each of the port numbers.

# HTTP endpoint to provide DNS-over-HTTPS service on.
# http-endpoint: "/dns-query"

# HTTP/2 SETTINGS_MAX_CONCURRENT_STREAMS value to use.
# http-max-streams: 100

# Maximum number of bytes used for all HTTP/2 query buffers.
# http-query-buffer-size: 4m

# Maximum number of bytes used for all HTTP/2 response buffers.
# http-response-buffer-size: 4m

# Set TCP_NODELAY socket option on sockets used for DNS-over-HTTPS
# service.
# http-nodelay: yes

# Disable TLS for DNS-over-HTTP downstream service.
# http-notls-downstream: no
```

```
root@thinkbsd:/usr/local/etc/unbound # /usr/local/etc/rc.d/unbound start
Obtaining a trust anchor...
Starting unbound.
root@thinkbsd:/usr/local/etc/unbound # ls
root.key        unbound.conf        unbound.conf.sample    unbound.pid
```

```
root@thinkbsd:/usr/local/etc/unbound # netstat -anfinet
Active Internet connections (including servers)
Proto Recv-Q Send-Q Local Address          Foreign Address        (state)
tcp4       0      0 127.0.0.1.53          *.*                    LISTEN
tcp4       0      0 127.0.0.1.25          *.*                    LISTEN
tcp4       0      0 10.0.2.15.22          10.0.2.2.59630         ESTABLISHED
tcp4       0      0 *.22                  *.*                    LISTEN
udp4       0      0 127.0.0.1.53          *.*
udp4       0      0 *.514                 *.*
root@thinkbsd:/usr/local/etc/unbound #
```

```
root@thinkbsd:/usr/local/etc/unbound # drill -D @localhost -c IN -t NS prado.it
;; ->>HEADER<<- opcode: QUERY, rcode: NOERROR, id: 42879
;; flags: qr rd ra ad ; QUERY: 1, ANSWER: 3, AUTHORITY: 0, ADDITIONAL: 0
;; QUESTION SECTION:
;; prado.it.    IN      NS

;; ANSWER SECTION:
prado.it.       86228   IN      NS      theo.ns.cloudflare.com.
prado.it.       86228   IN      NS      lily.ns.cloudflare.com.
prado.it.       86228   IN      RRSIG   NS 13 2 86400 20210314105354 20210312085354 34505 prado.it. sqRzNP3YicNXHbM2rkn2JgKYpV51rcuTSS+wT0GtGQQ
jjmcaHZb8BfLp9s/Jgk3toIKuqV2UA4q0GtPwo+1xhQ==

;; AUTHORITY SECTION:

;; ADDITIONAL SECTION:

;; Query time: 0 msec
;; EDNS: version 0; flags: do ; udp: 1232
;; SERVER: 127.0.0.1
;; WHEN: Sat Mar 13 00:55:04 2021
;; MSG SIZE  rcvd: 196
root@thinkbsd:/usr/local/etc/unbound #
```

```
root@thinkbsd:/usr/local/etc/unbound # drill -D  @localhost -c IN -t NS dnssec-failed.org
;; ->>HEADER<<- opcode: QUERY, rcode: SERVFAIL, id: 563
;; flags: qr rd ra ; QUERY: 1, ANSWER: 0, AUTHORITY: 0, ADDITIONAL: 0
;; QUESTION SECTION:
;; dnssec-failed.org.   IN      NS

;; ANSWER SECTION:

;; AUTHORITY SECTION:

;; ADDITIONAL SECTION:

;; Query time: 912 msec
;; EDNS: version 0; flags: do ; udp: 1232
;; SERVER: 127.0.0.1
;; WHEN: Sat Mar 13 01:03:58 2021
;; MSG SIZE  rcvd: 46
```

```
root@thinkbsd:/usr/local/etc/unbound # drill -D -o CD @localhost -c IN -t NS dnssec-failed.org
;; ->>HEADER<<- opcode: QUERY, rcode: NOERROR, id: 25868
;; flags: qr rd cd ra ; QUERY: 1, ANSWER: 6, AUTHORITY: 0, ADDITIONAL: 0
;; QUESTION SECTION:
;; dnssec-failed.org.   IN      NS

;; ANSWER SECTION:
dnssec-failed.org.      6999    IN      NS      dns103.comcast.net.
dnssec-failed.org.      6999    IN      NS      dns104.comcast.net.
dnssec-failed.org.      6999    IN      NS      dns105.comcast.net.
dnssec-failed.org.      6999    IN      NS      dns101.comcast.net.
dnssec-failed.org.      6999    IN      NS      dns102.comcast.net.
dnssec-failed.org.      6999    IN      RRSIG   NS 5 2 7200 20210321145103 20210304144603 44973 dnssec-failed.org. 4N97EYsVjqn/XFx+I07fTQgfRJ9B
JHvcgNM+tkcq5sFe4PZ6kmNky+fgVtqAMCDEUnjsCCJ1jigMD69DLXXAqdjgp6uh2B3hkEvTql98lq/p4ohIWhaDMZMPXBuRxVHw5uC4WXilZdgjLNuNLv1To9SDWJsUI9f0As1j1ri2Z8E
=

;; AUTHORITY SECTION:

;; ADDITIONAL SECTION:

;; Query time: 0 msec
;; EDNS: version 0; flags: do ; udp: 1232
;; SERVER: 127.0.0.1
;; WHEN: Sat Mar 13 01:07:19 2021
;; MSG SIZE  rcvd: 339
```

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 dicembre 2013 e ss.mm.ii.

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: metodi

DNS

Con l'indicazione di una specifica landing-page esplicativa

ROUTING

Blackhole per liste di IP

Censura: DNS

Ministero dell'Interno
Dipartimento della Pubblica Sicurezza
Servizio Polizia Postale e delle Comunicazioni

STOP

PAGINA INTERDETTA DAL CENTRO NAZIONALE PER IL CONTRASTO ALLA PEDOPORNOGRAFIA SULLA RETE INTERNET

Il tuo browser sta tentando di raggiungere un sito Internet contenente immagini e filmati pedopornografici.
La detenzione, la distribuzione, la produzione, la commercializzazione di tale materiale prevedono l'applicazione di gravi sanzioni in base alla legge penale italiana e sono perseguibili anche ad opera di forze di polizia estere.

Nessun dato relativo al tuo ip address od altra traccia utile ad identificarti verrà registrato.

L'inibizione dell'accesso a questo sito è prevista dalla legge n. 38/2006 ed è stata operata al fine di impedire la commissione e la documentazione di violenze sessuali a minori degli anni diciotto. Questo servizio di protezione della navigazione sulla rete Internet è predisposto grazie alla collaborazione tra il "Centro Nazionale per il Contrasto alla Pedopornografia sulla rete Internet" e gli Internet Service Provider italiani.

Censura: DNS

AVVISO

L'accesso al presente sito è stato disabilitato in esecuzione di un provvedimento adottato dall'Autorità per le garanzie nelle comunicazioni, ai sensi del regolamento in materia di tutela del diritto d'autore online approvato con delibera n. 680/13/CONS.

Per maggiori informazioni visiti il sito www.agcom.it

AGCOM

Censura: DNS

AVVERTENZA - SITO NON RAGGIUNGIBILE

In linea con quanto previsto dall'*articolo 1, commi 50 e 50-bis, della Legge 27 dicembre 2006, n. 296*, a cui è stata data attuazione con decreti direttoriali dell'Agenzia delle dogane e dei monopoli del 15 novembre 2017 e del 2 gennaio 2007, disciplinante la rimozione dei casi di offerta in assenza di autorizzazione, attraverso rete telematica, di giochi, lotterie, scommesse o concorsi pronostici con vincite in denaro, ***il sito richiesto non è raggiungibile perché sprovvisto delle autorizzazioni necessarie per operare la raccolta di giochi in Italia.***

L'elenco degli operatori autorizzati al gioco telematico è disponibile sul sito istituzionale https://www.adm.gov.it.

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

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

Censura: DNS

Data documento	16 ottobre 2018
Abstract	Ordine ai prestatori di servizi di mere conduit operanti sul territorio italiano, individuati ai sensi dell'art. 14 del decreto legislativo 9 aprile 2003, n. 70, di provvedere alla disabilitazione dell'accesso al sito serietvsubita.net, mediante blocco del DNS.
Data pubblicazione	Disponibile sul sito www.agcom.it da martedì 23 ottobre 2018
Aree tematiche	Media
Argomenti	• Diritto d'autore

Censura: DNS

https://www.agcom.it/documentazione/documento?p_p_auth=fLw7zRht&p_p_id=101_INSTANCE_FnOw5lVOIXoE&p_p_lifecycle=0&p_p_col_id=column-1&p_p_col_count=1&_101_INSTANCE_FnOw5lVOIXoE_struts_action=%2Fasset_publisher%2Fview_content&_101_INSTANCE_FnOw5lVOIXoE_assetEntryId=18231894&_101_INSTANCE_FnOw5lVOIXoE_type=document

Determina n. 99/20/DDA

Provvedimento ai sensi dell' articolo 8-bis, comma 3, del regolamento in materia di tutela del diritto d'autore sulle reti di comunicazione elettronica Dda/2670 – http://ilgeniodellostreaming.blog

Scarica il file (PDF Document 298Kb)

Data documento	01 aprile 2020
Abstract	DISPONE l'aggiornamento dell'elenco di cui all'art. 8, comma 4, del Regolamento con l'inserimento del nome a dominio http://ilgeniodellostreaming.blog di cui all'allegato B al presente provvedimento, con contestuale reindirizzamento automatico verso una pagina internet redatta secondo l'allegato A al presente provvedimento.
Data pubblicazione	Disponibile sul sito www.agcom.it da venerdì 03 aprile 2020
Aree tematiche	Media
Argomenti	• Diritto d'autore

Allegati

Allegato A: Landing page

Allegato B: Elenco URL

Le liste: 13 anni di caccia al tesoro

Formato non omogeneo

Versioning inesistente

Expiry questo sconosciuto

Evviva i doppioni

Autorità giudiziaria via PEC

Il controllo parentale

Decreto-legge 30 aprile 2020, n. 28, coordinato con la legge di conversione 25 giugno 2020, n. 70

Il controllo parentale

L'art. 7-*bis*, ***Sistemi di protezione dei minori dai rischi del cyberspazio***: *I contratti di fornitura nei servizi di comunicazione elettronica devono prevedere tra i servizi* ***preattivati*** *sistemi di* ***controllo parentale*** *ovvero di filtro di contenuti inappropriati per i minori e di blocco di contenuti riservati ad un pubblico di età superiore agli anni diciotto.*

Il controllo parentale

Tali servizi preattivati sono gratuiti e disattivabili solo su richiesta del consumatore, titolare del contratto.

Il controllo parentale

In caso di violazione degli obblighi, l'AGCOM ordina all'operatore la cessazione della condotta e la restituzione delle eventuali somme ingiustificatamente addebitate agli utenti.

Il controllo parentale

AGCOM ha richiesto ai principali operatori ed associazioni di categoria (vedi slide seguente) di fornire alcune informazioni di dettaglio in relazione alle misure adottate al fine di proteggere i minori dai rischi connessi al *cyberspazio*. (*delibera 16/22/CONS*)

Il controllo parentale

AIIP, ASSTEL, EOLO S.p.A., Fastweb S.p.A., Iliad Italia S.p.A., IRIDEOS S.p.A., Linkem S.p.A., SKY Italia S.r.l., TIM S.p.A., Tiscali Italia S.p.A. Vodafone Italia S.p.A., Wind Tre S.p.A

Il controllo parentale

Classificazione degli operatori

Operatori di fascia A: operatori con almeno 100.000 linee dati attive.

Operatori di fascia B: operatori con almeno 10.000 e fino a 100.000 linee dati attive.

Operatori di fascia C: tutti gli altri operatori.

Il controllo parentale 1

“I fornitori di servizi di accesso ad Internet (ISP), qualsiasi sia la tecnologia utilizzata per l’erogazione del servizio, mettono a disposizione degli utenti sistemi di parental control ovvero di filtro di contenuti inappropriati per i minori e di blocco di contenuti riservati ad un pubblico di età superiore agli anni diciotto.”

Il controllo parentale 1

"Per parental control system (SCP) o sistema di controllo genitoriale si intende, ai fini delle presenti Linee Guida, un sistema che permette di limitare o bloccare l'accesso a determinate attività da parte di un minore, ad esempio impedendo l'accesso, tramite qualunque applicazione, a contenuti inappropriati per la sua età, di impostare il tempo di utilizzo dei dispositivi in uso al minore e di monitorarne l'attività svolta"

Il controllo parentale 1

"Le modalità di classificazione, in categorie, dei contenuti in oggetto e la definizione di filtri per fasce d'età sono oggetto di separato procedimento."

Il controllo parentale 2

"I SCP sono preattivati sulle nuove linee e possono essere disattivati e configurati esclusivamente dal titolare del contratto, se maggiorenne. Sulle linee esistenti i SCP devono essere resi disponibili come attivabili da parte del titolare del contratto, se maggiorenne. Se il titolare del contratto è minorenne, i SCP devono essere attivati automaticamente anche sulle linee preesistenti ed i soggetti che possono eseguire le operazioni di disattivazione, riattivazione e configurazione sono coloro che esercitano la potestà genitoriale sul minore. In caso di disattivazione, i SCP sono sempre riattivabili su richiesta del titolare del contratto."

Il controllo parentale 3

“Gli ISP offrono gratuitamente i SCP agli utenti e non impongono costi correlati all’attivazione, alla disattivazione, alla configurazione o al funzionamento degli stessi.”

Il controllo parentale 4

“Gli ISP pubblicano sui propri siti web guide chiare ed esaustive per l’utilizzo dei SCP ed offrono assistenza gratuita, anche attraverso call center con operatore umano, per l’attivazione, la disattivazione e la configurazione dei SCP.”

Il controllo parentale 5

“I SCP prevedono, come funzionalità minima, almeno il blocco, mediante DNS, dei siti ospitanti contenuti oggetto di filtro”

Il controllo parentale 6

Gli operatori di fascia A complementano le funzionalità di cui alla slide precedente, mediante a) l'implementazione di filtri, basati sugli indirizzi IP, dei siti ospitanti contenuti non consentiti o di DNS non sicuri, b) l'implementazione del blocco di quelle funzionalità del terminale che consentono all'utente di utilizzare servizi DNS di altri soggetti, o servizi DNS di tipo DoT (DNS-over-TLS) e DoH (DNS-over-HTTPS), c) la fornitura di applicativi installabili dall'utente sui propri dispositivi per consentire il filtraggio dei singoli contenuti.

Il controllo parentale 7

“Gli operatori di fascia A completano le funzionalità dei SCP mediante l’implementazione della configurabilità degli stessi per fasce orarie e di memorizzazione dei siti visitati.”

Il controllo parentale 9

“Le operazioni di attivazione, disattivazione e configurazione dei SCP devono essere realizzabili in modo semplice e intuitivo.”

Il controllo parentale 10

“I contenuti oggetto di filtro dei SCP sono personalizzabili dal titolare del contratto, con la possibilità di aggiungere o personalizzare i contenuti oggetto di filtro.”

Il controllo parentale 11

"Gli operatori di telefonia, di reti televisive e di comunicazioni elettroniche assicurano adeguate forme di pubblicità dei SCP preattivati, in modo da assicurare che i consumatori possano compiere scelte informate. In particolare, i SCP dovranno essere pubblicizzati sui siti web degli ISP, nelle carte dei servizi e con campagne di comunicazione mirate."

La situazione (futura) in Europa

DNS4EU

Il nuovo che "avanza": DNS4EU

Cos'è: Infrastruttura per un servizio europeo di DNS con funzione di risolutore

Fruitori: settore privato, settore pubblico, utenti finali residenti in EU

Caratteristiche: affidabilità molto alta, protezione contro minacce globali alla cibersicurezza e contro minacce specifiche per l'Europa

DNS4EU: gli optional

In opzione: **controllo parentale gratuito**, servizi a pagamento per prestazioni avanzate o per sicurezza destinati a utenti aziendali

DNS4EU: i requisiti

Utenti dell'Unione Europea

DNS4EU: i requisiti

Ampia copertura in EU con alta affidabilità, disponibilità, capillarità e ridondanza

DNS4EU: i requisiti

Accessibilità dai più diffusi dispositivi, semplicità di configurazione, guide e supporto, informazioni sulla privacy

DNS4EU: i requisiti

Rilevabilità da parte dei browser più diffusi, sistemi operativi e dispositivi utente.

DNS4EU: i requisiti

Servizi a pagamento (filtri ad hoc, monitoraggio, supporto 24x7) e all'ingrosso (per ISP, cloud provider)

DNS4EU: i requisiti

Servizi per utenti finali: filtri e **controllo parentale** su richiesta (opt-in) e trasparenti

DNS4EU: i requisiti

Sicurezza: protezione aggiornata dalle minacce alla cibersicurezza così da bloccare malware, phishing ecc.

DNS4EU: i requisiti

Trattamento dei dati conforme alle regole europee

DNS4EU: i requisiti

Rispetto degli standard in ambito privacy e sicurezza: HTTPS, DNSSEC, DoT, DoH, IPv6(!?)

DNS4EU: i requisiti

Design in linea con le migliori pratiche dell'industria di Internet

DNS4EU: i requisiti

Filtri di legge: URL di risorse ritenute illegali da norme europee o nazionali (a esempio su ordine di autorità giudiziaria)

LAB4

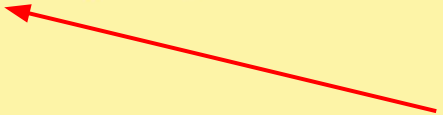
Setup di blacklist in un name server ricorsivo

Software di gestione open source:

Mauro Angiolillo: https://github.com/mphilosopher/censura

```
root@thinkbsd:~ # pkg install git
Updating FreeBSD repository catalogue...
Fetching packagesite.txz: 100%    6 MiB   2.2MB/s    00:03
Processing entries: 100%
FreeBSD repository update completed. 30177 packages processed.
All repositories are up to date.
Checking integrity... done (0 conflicting)
The following 1 package(s) will be affected (of 0 checked):

New packages to be INSTALLED:
        git: 2.30.1

Number of packages to be installed: 1

The process will require 28 MiB more space.

Proceed with this action? [y/N]: y
[1/1] Installing git-2.30.1...
===> Creating groups.
Using existing group 'git_daemon'.
===> Creating users
Using existing user 'git_daemon'.
[1/1] Extracting git-2.30.1: 100%
=====
Message from git-2.30.1:

--
If you installed the GITWEB option please follow these instructions:

In the directory /usr/local/share/examples/git/gitweb you can find all files to
make gitweb work as a public repository on the web.

All you have to do to make gitweb work is:
1) Please be sure you're able to execute CGI scripts in
   /usr/local/share/examples/git/gitweb.
2) Set the GITWEB_CONFIG variable in your webserver's config to
   /usr/local/etc/git/gitweb.conf. This variable is passed to gitweb.cgi.
3) Restart server.
```

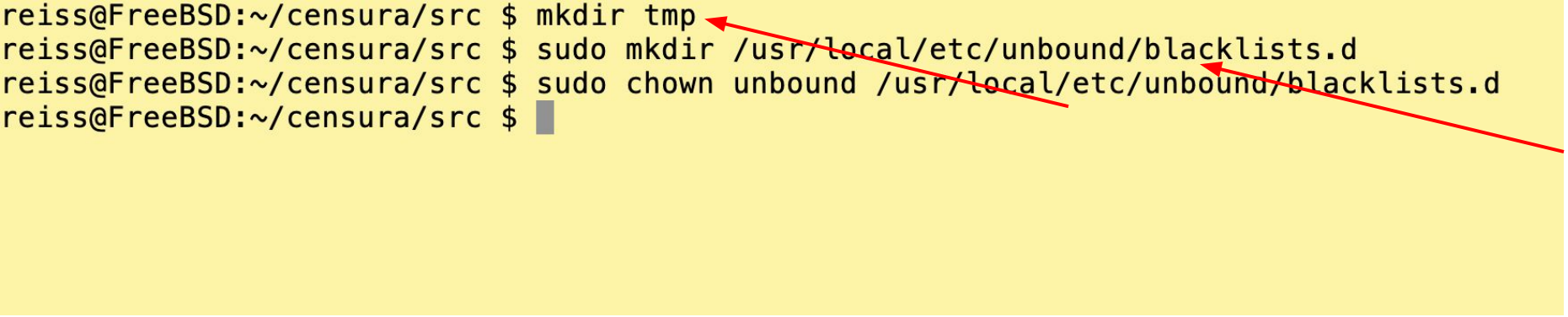
```
root@thinkbsd:~ # git clone https://github.com/mphilosopher/censura
Cloning into 'censura'...
remote: Enumerating objects: 36, done.
remote: Counting objects: 100% (36/36), done.
remote: Compressing objects: 100% (30/30), done.
remote: Total 36 (delta 13), reused 16 (delta 6), pack-reused 0
Receiving objects: 100% (36/36), 8.93 KiB | 2.23 MiB/s, done.
Resolving deltas: 100% (13/13), done.
root@thinkbsd:~ #
```



```
reiss@FreeBSD:~ $ cd censura
reiss@FreeBSD:~/censura $ ls
LICENSE                 README.md               requirements.txt        src
reiss@FreeBSD:~/censura $ cd src
reiss@FreeBSD:~/censura/src $ ls
censor_parser.py                named_dns_block.zone.template   update_agcom.sh                 update_manual.sh
censorship_params.sh            update_aams.sh                  update_blacklists.sh
download_agcom.py               update_admt.sh                  update_cncpo.sh
reiss@FreeBSD:~/censura/src $
```

```
root@thinkbsd:~/censura/src # vi censorship_params.sh

#!/bin/sh -e

ROOT_DIR="/root/censura"
TMP_DL_DIR="${ROOT_DIR}/tmp"
PARSER_BIN="${ROOT_DIR}/censor_parser.py"
WGET_BIN=$(which wget)

BLACKHOLE="127.0.0.1" #Replace with the chosen IP address
OUTPUT_FORMAT="unbound"  # Replace to "bind" or to "unbound"

# Unbound params
UNBOUND_CONF_DIR="/usr/local/etc/unbound/blacklists.d"

# Bind params
BIND_CONF_DIR="/etc/bind/zones/blacklist.d"
```

```
reiss@FreeBSD:~/censura/src $ mkdir tmp
reiss@FreeBSD:~/censura/src $ sudo mkdir /usr/local/etc/unbound/blacklists.d
reiss@FreeBSD:~/censura/src $ sudo chown unbound /usr/local/etc/unbound/blacklists.d
reiss@FreeBSD:~/censura/src $
```



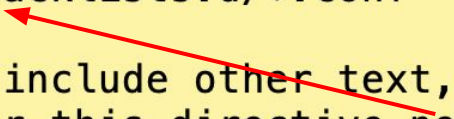
```
root@thinkbsd:~/censura # pkg install wget
Updating FreeBSD repository catalogue...
FreeBSD repository is up to date.
All repositories are up to date.
The following 3 package(s) will be affected (of 0 checked):

New packages to be INSTALLED:
        libidn2: 2.3.1
        libunistring: 0.9.10_1
        wget: 1.21

Number of packages to be installed: 3

The process will require 7 MiB more space.
1 MiB to be downloaded.

Proceed with this action? [y/N]: y
[1/3] Fetching wget-1.21.txz: 100%  674 KiB 689.8kB/s    00:01
[2/3] Fetching libidn2-2.3.1.txz: 100%  111 KiB 113.5kB/s    00:01
[3/3] Fetching libunistring-0.9.10_1.txz: 100%  519 KiB 531.6kB/s    00:01
Checking integrity... done (0 conflicting)
[1/3] Installing libunistring-0.9.10_1...
[1/3] Extracting libunistring-0.9.10_1: 100%
[2/3] Installing libidn2-2.3.1...
[2/3] Extracting libidn2-2.3.1: 100%
[3/3] Installing wget-1.21...
[3/3] Extracting wget-1.21: 100%
```

```
reiss@FreeBSD:~/censura/src $ ls
censor_parser.py               named_dns_block.zone.template   update_admt.sh                 update_cncpo.sh
censorship_params.sh           tmp                             update_agcom.sh                update_manual.sh
download_agcom.py              update_aams.sh                  update_blacklists.sh
reiss@FreeBSD:~/censura/src $ cat update_aams.sh
#!/bin/sh -e

. $(dirname "${0}")/censorship_params.sh

LIST_URL="https://www1.adm.gov.it/files_siti_inibiti/elenco_siti_inibiti.txt"
LIST_FILE="${TMP_DL_DIR}/blacklist_aams.txt"
LIST_OUT="${UNBOUND_CONF_DIR}/db.blacklist_aams.conf"
LIST_TYPE="aams"
BLACKHOLE="217.175.53.72"

WGET_CERTS=""
WGET_OPTS="${WGET_CERTS} --no-check-certificate"

if [ ! -d "${TMP_DL_DIR}" ]
then
   echo "Missing temp download dir ${TMP_DL_DIR}"
   mkdir "${TMP_DL_DIR}"
fi

PARSER_OPTS="-i ${LIST_FILE} -o ${LIST_OUT} -f ${OUTPUT_FORMAT} -d ${LIST_TYPE} -b ${BLACKHOLE}"

###############################################################################
# be verbose when stdout is a tty
if [ ! -t 0 ]; then
  WGET_OPTS="$WGET_OPTS -q"
fi

## downloading ################################################################
${WGET_BIN} ${WGET_OPTS} ${LIST_URL} -O ${LIST_FILE}

## parsing ####################################################################
${PARSER_BIN} ${PARSER_OPTS}
reiss@FreeBSD:~/censura/src $
```

```
reiss@FreeBSD:~/censura/src $ sudo pkg install py39-validators-0.20.0
Password:
Updating FreeBSD repository catalogue...
FreeBSD repository is up to date.
All repositories are up to date.
The following 3 package(s) will be affected (of 0 checked):

New packages to be INSTALLED:
        py39-decorator: 5.1.1
        py39-setuptools: 63.1.0
        py39-validators: 0.20.0

Number of packages to be installed: 3

The process will require 9 MiB more space.
1 MiB to be downloaded.

Proceed with this action? [y/N]: y
[1/3] Fetching py39-setuptools-63.1.0.pkg: 100%    1 MiB   1.1MB/s    00:01
[2/3] Fetching py39-decorator-5.1.1.pkg: 100%   14 KiB  14.0kB/s    00:01
[3/3] Fetching py39-validators-0.20.0.pkg: 100%   22 KiB  22.8kB/s    00:01
Checking integrity... done (0 conflicting)
[1/3] Installing py39-setuptools-63.1.0...
[1/3] Extracting py39-setuptools-63.1.0: 100%
[2/3] Installing py39-decorator-5.1.1...
[2/3] Extracting py39-decorator-5.1.1: 100%
[3/3] Installing py39-validators-0.20.0...
[3/3] Extracting py39-validators-0.20.0: 100%
```

```
freeBSD:~/censura/src $ cat censor_parser.py
/bin/env python3.9

optparse
csv
yping import List
validators

s = None
t_blackhole = '127.0.0.1'
t_bind_block_zonefile = '/etc/bind/zones/dns_block_zone.zone'
rmat_list = ['unbound', 'bind','powerdns']
mat_list = ['cncpo', 'aams', 'admt', 'agcom', 'manuale']

ite_unbound_list(outfile, blacklist, blackhole):
= open(outfile, 'w')
write("server:\n")
r c in blacklist:
  fp.write("local-zone: \"{}\" redirect \n".format(c))
  fp.write("local-data: \"{} A {}\"\n".format(c, blackhole))
close()
turn
```

```
root@thinkbsd:~/censura/src # vi /usr/local/etc/unbound/unbound.conf

#
# Example configuration file.
#
# See unbound.conf(5) man page, version 1.13.0.
#
# this is a comment.

# Use this anywhere in the file to include other text into this file.
#include: "otherfile.conf"
include: "/usr/local/etc/unbound/blacklists.d/*.conf"

# Use this anywhere in the file to include other text, that explicitly starts a
# clause, into this file. Text after this directive needs to start a clause.
#include-toplevel: "otherfile.conf"
```



```
[root@thinkbsd ~]# /usr/local/etc/rc.d/unbound restart
Stopping unbound.
.
Starting unbound.
```

```
[root@thinkbsd ~/censura/src]# ls /usr/local/etc/unbound/blacklists.d
db.blacklist_aams.conf
[root@thinkbsd ~/censura/src]#
```

```
root@thinkbsd:~/censura/src # tail /usr/local/etc/unbound/blacklists.d/db.blacklist_aams.conf
local-zone: "www.planetwin2014.net" redirect
local-data: "www.planetwin2014.net A 217.175.53.72"
local-zone: "www.dansk777.dk" redirect
local-data: "www.dansk777.dk A 217.175.53.72"
local-zone: "www.swapbets.com" redirect
local-data: "www.swapbets.com A 217.175.53.72"
local-zone: "b2875.org" redirect
local-data: "b2875.org A 217.175.53.72"
local-zone: "www.1betasia.com" redirect
local-data: "www.1betasia.com A 217.175.53.72"
```

```
root@thinkbsd:~/censura/src # drill @9.9.9.9 -c IN -t A www.1betasia.com
;; ->>HEADER<<- opcode: QUERY, rcode: NOERROR, id: 5378
;; flags: qr rd ra ; QUERY: 1, ANSWER: 2, AUTHORITY: 0, ADDITIONAL: 0
;; QUESTION SECTION:
;; www.1betasia.com.    IN      A

;; ANSWER SECTION:
www.1betasia.com.       300     IN      A       172.67.136.47
www.1betasia.com.       300     IN      A       104.21.62.136

;; AUTHORITY SECTION:

;; ADDITIONAL SECTION:

;; Query time: 126 msec
;; SERVER: 9.9.9.9
;; WHEN: Sun Sep  5 14:29:43 2021
;; MSG SIZE  rcvd: 66
```

```
root@thinkbsd:~/censura/src # drill @localhost -c IN -t A www.1betasia.com
;; ->>HEADER<<- opcode: QUERY, rcode: NOERROR, id: 55000
;; flags: qr aa rd ra ; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 0
;; QUESTION SECTION:
;; www.1betasia.com.    IN      A

;; ANSWER SECTION:
www.1betasia.com.       3600    IN      A       217.175.53.72

;; AUTHORITY SECTION:

;; ADDITIONAL SECTION:

;; Query time: 0 msec
;; SERVER: 127.0.0.1
;; WHEN: Sun Sep  5 14:30:26 2021
;; MSG SIZE  rcvd: 50
```

REISS ROMOLI

School of Advanced Networking by NAMEX

Domande?