

# Governing the “Ungovernable”

## One Giant Leap for the RSS in 2021

Robert Carolina, General Counsel  
Internet Systems Consortium @Rob2yall  
NANOG 84, 14-16 February 2022

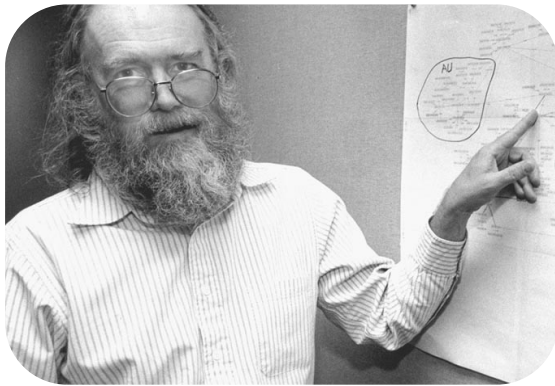


# About the presenter

- Lawyer
  - General Counsel, ISC
  - 30+ year focus on law as applied to information & communications technologies
  - 20+ years teaching legal & regulatory aspects of cyber security, Royal Holloway University of London MSc program
- Internet governance
  - Assisted in development of RSSAC058 & '059
  - RSSAC representative to Workstream 2 Cross-Community Working Group

All of my comments are personal and do not necessarily represent the opinion of ISC, any other Root Server Operator (RSO), or anyone else for that matter.

# Today's agenda



## A Brief History of the Root Server System

- As told by a lawyer

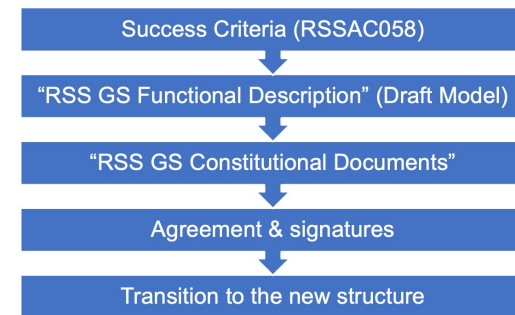
Jon Postel at work, 1994. Photo by Irene Fertik, USC News Service. Wikimedia.



## Sovereign State effort to regulate the RSS

- Draft EU NIS2 Directive

European Parliament, Strasbourg. Photo by JLogan, 2006. Public domain. Wikimedia.



## RSS governance breakthrough

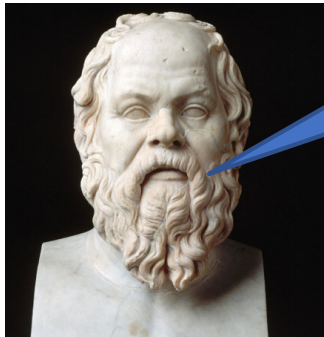
- RSSAC058 Success Criteria

Process of concluding a new governance structure. By R Carolina, NANOG84 (2022).

# A Brief History of the Root Server System (RSS)

As told by a lawyer – quickly

# What is a root server? (A Simplified Socratic Dialogue)



**Socrates**

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Where can I find the IP  
address of:  
`www.example.com`?

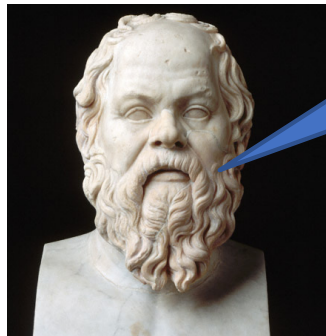
Ask the authoritative  
server for the  
domain:  
`example.com`



**Plato**

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# What is a root server? (A Simplified Socratic Dialogue)



Socrates

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Ah, but where can I find the IP  
address of the authoritative  
server for the domain:  
example.com?

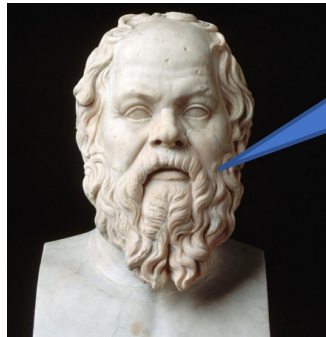
Ask the authoritative  
server for the  
dot-com TLD



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# What is a root server? (A Simplified Socratic Dialogue)



**Socrates**

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But where can I find the IP  
address of the authoritative  
server for the  
dot-com TLD?

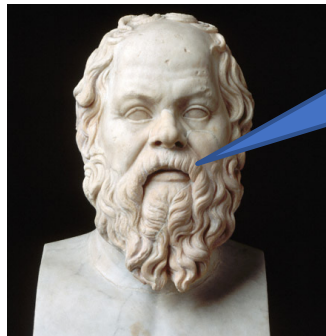
Ask any one of the  
Root Servers in the  
Root Server System (RSS)!



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# What is a root server? (A Simplified Socratic Dialogue)



**Socrates**

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Because a Root Server  
does what?

A Root Server publishes to the world  
the contents of the Root Zone:  
a list of IP address of the  
authoritative server for each and  
every TLD registry

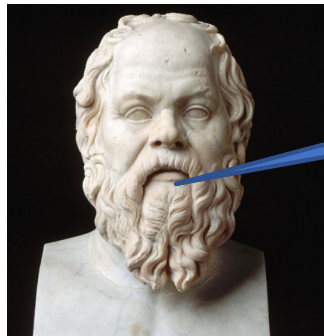


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# What is a root server? (A Simplified Socratic Dialogue)



**Socrates**

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And who operates the  
Root Servers?

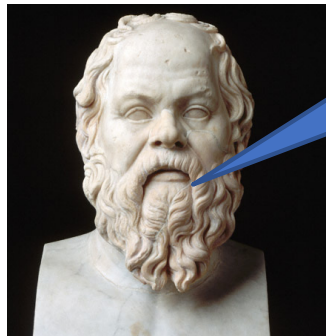
The Root Server Operators!



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# What is a root server? (A Simplified Socratic Dialogue)



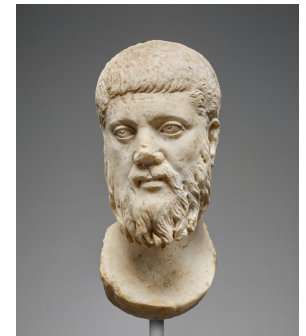
Socrates

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Very good.  
You get a cookie.

```
Set-Cookie: SID=31d4d96e407aad42; Path=/; Secure; HttpOnly  
Set-Cookie: lang=en-US; Path=/; Domain=example.com
```

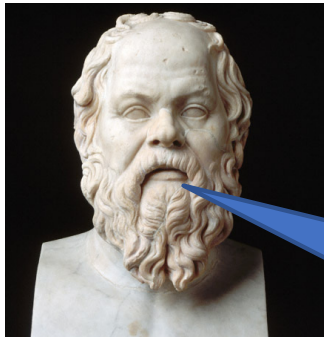
Thank you, RFC 6265.



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# What is a root server? (A Simplified Socratic Dialogue)



**Socrates**

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Hang on. WHO are the  
Root Server Operators?

Let us consult  
The Great Scroll of History\*

\* RSSAC023



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# Who are the Root Server Operators?

Name	IP Address	Software	Organization
SRI-NIC	10.0.0.51 26.0.0.73	JEEVES	SRI International
ISIB <sup>12</sup>	10.3.0.52	JEEVES	Information Sciences Institute, USC
ISIC	10.0.0.52	JEEVES	Information Sciences Institute, USC
BRL-AOS	192.5.25.82 128.20.1.2	BIND	Ballistic Research Laboratory, U.S. Army

- 1984:
  - Jon Postel & Paul Mockapetris set up first ARPANET DNS Root Server at USC (California) on a PDP-10
- 1985:
  - Added SRI
  - US Army BRL starts to host one on a UNIX machine (MILNET)
  - 4 Root Servers & 3 RSOs

# Who are the Root Server Operators?

- In October 1991
  - 6 Root Servers
  - 6 RSOs

Name	IP Address	Organization
NS.NIC.DDN.MIL	192.112.36.4	Network Solutions, Inc.
KAVA.NISC.SRI.COM	192.33.33.24	SRI International
C.NYSER.NET	192.33.4.12	NYSERnet
TERP.UMD.EDU	128.8.10.90	University of Maryland
NS.NASA.GOV	128.102.16.10 192.52.195.10	NASA Ames Research Center
NIC.NORDU.NET	192.36.148.17	NORDUnet
AOS.BRL.MIL	192.5.25.82	Ballistic Research Laboratory, U.S. Army

# Who are the Root Server Operators?

- 1994: NS . ISC . ORG

- 1995:

- 9 Root Servers
- 9 RSOs
- Renamed:

x . ROOT - SERVERS . NET

$x \in \{A, B, C, D, E, F, G, H, I\}$

Original Name	New Name	Organization
NS.INTERNIC.NET	A.ROOT-SERVERS.NET	InterNIC (operated by NSI)
NS1.ISI.EDU	B.ROOT-SERVERS.NET	Information Sciences Institute, USC
C.PSI.NET	C.ROOT-SERVERS.NET	PSINet
TERP.UMD.EDU	D.ROOT-SERVERS.NET	University of Maryland
NS.NASA.GOV	E.ROOT-SERVERS.NET	NASA Ames Research Center
NS.ISC.ORG	F.ROOT-SERVERS.NET	Internet Software Consortium
NS.NIC.DDN.MIL	G.ROOT-SERVERS.NET	GSI (operated by NSI)
AOS.ARL.ARMY.MIL	H.ROOT-SERVERS.NET	U.S. Army Research Lab
NIC.NORDU.NET	I.ROOT-SERVERS.NET	NORDUnet

# A few Letter changes (1997-2002)...

- 1997: added {J, K, L, M}
  - J & K to NSI
  - L & M to USC
- K-Root moved to RIPE (EU)
- M-Root moved to WIDE (Japan)
- 1998:
  - ICANN founded
  - L-Root moved to ICANN
- 2000:
  - Verisign acquires NSI (A-Root & J-Root)
  - I-Root moved to Netnod
- 2002:
  - Cogent acquires PSINet operations (C-Root)

# Changes to the surrounding environment...

- 2002:
  - F-Root first root server to be anycasted internationally
- 2014-16:
  - IANA function transitions from US Gov't to ICANN



# Root Server Operators (January 2022)

Hostname	IP Addresses	Operator
A.ROOT-SERVERS.NET	198.41.0.4 2001:503:ba3e::2:30	Verisign, Inc.
B.ROOT-SERVERS.NET	199.9.14.201 2001:500:200::b	University of Southern California, Information Sciences Institute
C.ROOT-SERVERS.NET	192.33.4.12 2001:500:2::c	Cogent Communications
D.ROOT-SERVERS.NET	199.7.91.13 2001:500:2d::d	University of Maryland
E.ROOT-SERVERS.NET	192.203.230.10 2001:500:a8::e	NASA Ames Research Center
F.ROOT-SERVERS.NET	192.5.5.241 2001:500:2f::f	Internet Systems Consortium, Inc.
G.ROOT-SERVERS.NET	192.112.36.4 2001:500:12::d0d	Defense Information Systems Agency
H.ROOT-SERVERS.NET	198.97.190.53 2001:500:1::53	U.S. Army Research Lab
I.ROOT-SERVERS.NET	192.36.148.17 2001:7fe::53	Netnod
J.ROOT-SERVERS.NET	192.58.128.30 2001:503:c27::2:30	Verisign, Inc.
K.ROOT-SERVERS.NET	193.0.14.129 2001:7fd::1	RIPE NCC
L.ROOT-SERVERS.NET	199.7.83.42 2001:500:9f:42	ICANN
M.ROOT-SERVERS.NET	202.12.27.33 2001:dc3::35	WIDE Project and JPRS

# RSS today (in numbers)

- 12 operators (RSOs)
- Using 13 root letter addresses  
`{A, B, C, ..., M} .ROOT-SERVERS .NET`
- Resolving to 1,450+ root server instances  
(including Anycast instances)
- Located in 100+ sovereign states
- Operate 24x365 without interruption  
... to publish the Root Zone to the world at no charge

# NIS 2: The [Accidental?] RSS Killer?

Or maybe not

# NIS2 – what is it?

- The (first) NIS Directive (NIS 1)
  - “DIRECTIVE (EU) 2016/1148 ... of 6 July 2016 concerning measures for a high common level of security of network and information systems across the Union”
  - Scope: cyber defence of critical national infrastructure
    - Did not apply to DNS services, as such
- NIS2 (European Commission draft, late 2020)
  - Includes DNS services (and many other things)
    - Specifically includes root servers as a subject of regulation
    - Small business exception does not apply to RSOs

# NIS2 – why {was,is} it a problem?

- Geographic scope of regulation
- Commission 2020 draft would mandate
  - Regulation of everyone who provides
  - root server services
  - to people in the EU

# NIS2 – why {was,is} it a problem?

- BUT the RSS is a globally unified “system”
  - Massively distributed highly resilient database service
    - All RSOs manage (some) equipment in the EU
  - People in the EU
    - consult root servers geo-located inside and outside of the EU
    - consult root servers operated by all 12 of the RSOs
  - Regulating people who operate root servers delivering service to people in the EU means regulating ALL 12 of them

# NIS2 – why {was,is} it a problem?

- The slippery slope of national regulation
  - If EU Member States  $S_1, S_2, \dots, S_{27}$  can each regulate the RSS...
  - ... THEN why not Sovereign States  $S_{28}, S_{29}, S_{30}, \dots, S_{191}, S_{192}$ ?
- Risk of conflicting standards, reporting requirements, etc
  - Regulatory interventions from multiple Sovereign States...
    - ... would create pressure to fracture operations along border lines
    - ... which would in turn threaten unity and resilience of the RSS

Isn't this the type of issue that the multi-stakeholder model is designed to resolve?

# NIS2 – was this intentional?

There is (some) evidence

... that (some) people in the European Commission

... did not intend to regulate all 12 global RSOs

- Commission foundational reports repeatedly reference the two RSOs whose place of business is in the EU (RIPE and Netnod)



# NIS2 – European Parliament view

“Root name servers should be out of scope; regulating them is contrary to the EU’s vision of a ‘single, open, neutral, free, secure and un-fragmented network’ and could encourage and empower states advocating for a top-down, state-controlled Internet governance approach, instead of the multi-stakeholder approach.”

– Report of the Parliamentary Rapporteur (May 2021) (emphasis added)

- Committee on Industry, Research and Energy (ITRE) agrees and adopts the report (October 2021) (vote: 70-3-1)
- Parliamentary redraft of NIS2 (November 2021): Removes root servers from coverage

# NIS2 – what's next?

- 2022: trilogue discussions
  - European Parliament and
  - European Council

try to reach agreement on content of the Directive

- with assistance from European Commission

# Breakthrough in RSS Governance

# The RSS governance challenge

There is no governance  
structure for the RSS

Or IS there?\*

\* Foreshadowing

# One Small Step...

- The RSOs (2015-18):
  - Recognize “We should do something about governance”
  - Carry out as series of governance workshops that lead to...
  - RSSAC037 “A Proposed Governance Model for the DNS Root Server System” (2018, 50 pages)
    - Plus RSAC038 (3 recommendations for dealing with ‘037)

RSSAC? The Root Server System Advisory Committee

- Provides advice to ICANN Board; issues publications
- 12 voting seats (1/RSO) plus ICANN liaisons/observers/staff

# One Small Step...

- Responding to RSSAC recommendations, the ICANN Board
  - Charters the Root Server System Governance Working Group (RSS GWG)
  - Gives RSS GWG the task of proposing a model RSS governance structure that takes account of RSSAC037, etc.
- RSS GWG
  - Commences work in January 2020
  - Produces a draft model in early 2021

# One Small Step...

- The RSOs read the GWG draft model...

And now things get really interesting

really fast....

# Feedback to the GWG draft model

- RSS GWG draft model diverges (far) from '037
  - Unrest among many RSOs
- How to structure a productive conversation with GWG?
  - Option 1: Everyone shout at each other
  - Option 2: Look at some other structures in use for inspiration
    - “Is this GS better/worse? What about this? Or this one?”
  - Option 3: Create a framework to analyze proposals
    - Draw up a list of what the RSOs believe a good model should include
    - Use this to develop a structured dialogue



# One Giant Leap...

- Option 3 chosen. Result? 2 new RSSAC publications
  - RSSAC058 “Success Criteria for the RSS Governance Structure” (17 November 2021, 21 pages)
  - RSSAC059 (17 November 2021, 4 recommendations)
- FROM: first informal RSO discussions  
TO: unanimous (12-0) approval of RSSAC058 & ‘059
  - 22+ hours of meeting/workshop over 15+ online sessions
  - attended by 15-40 RSO leaders, staff, liaisons, observers, etc,
  - finished in 7 calendar months.

# One Giant Leap...

- ICANN Board (November 2021)
  - Accepted RSSAC058 & '059 within days of publication
  - Transmitted these to RSS GWG with a positive endorsement and a guidance note

# What does it say?

# Acknowledges a current reality

Is there an RSS governance structure today?

# Acknowledges a current reality

To find the answer, contrast:

A technical standard:

- Describes: what technical systems do
- Goal: influence design of systems

A governance structure:

- Describes: what people\* are supposed to do
- Goal: influence the behaviour of people\*

\* In this context, “people” includes organizations like companies, government departments, etc.

# Acknowledges a current reality

Is there an RSS governance structure today?

**Yes!**

It's governance, Jim, but not as we know it.

# History of governance success

“Over the course of decades, the Root Server Operators (RSOs):

- while acting collectively with one another;
- while acting collaboratively with the other RSS Stakeholders;
- while remaining individually independent,
- have defined the core principles that govern how the DNS root service should operate;
- have delivered the DNS root service in accordance with those same governing principles; and
- have served (as a group) to maintain trust in the integrity of that service.”

– RSSAC058 (2021) §1.2 (emphasis added)

# History of governance success

“From the very early days of the DNS, before the establishment of ICANN, the RSOs have undertaken both an operational and a collective governance role in delivering the DNS root service. In addition to technical expertise, they have worked to assure a stable single Internet by defending the principles that make the RSS successful against all who threaten those principles, and maintaining global trust in the service....”

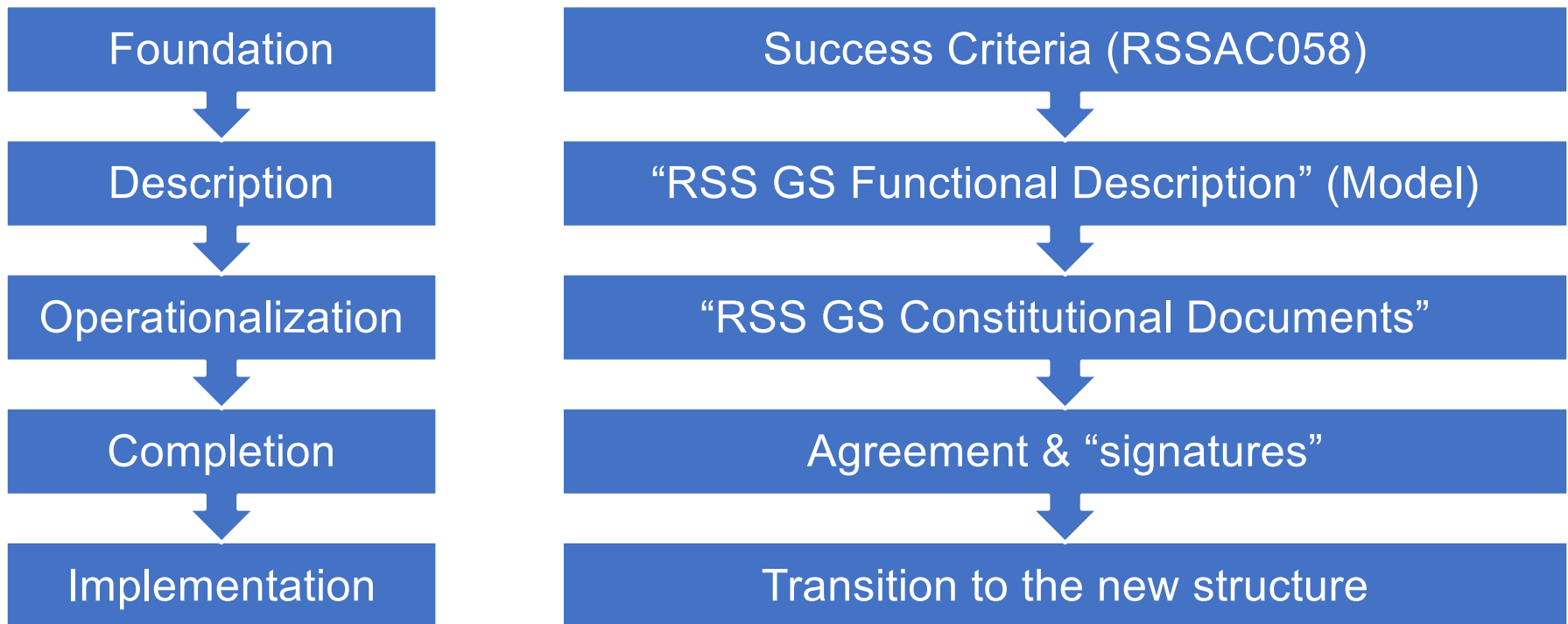
– RSSAC058 (2021) §1.2 (emphasis added)



# Looking to a governance future

“... The continuing status of RSOs as autonomous and independent entities, with a significant voice in governance, remains an important principle for the success of the RSS Governance Structure (RSS GS).”  
– RSSAC058 (2021) §1.2 (emphasis added)

# Process of moving to a new RSS GS



# Success criteria – classification

- Three categories
  - A: Substantive Criteria
    - 9 major categories & 46 sub-categories
    - Rights & responsibilities; checks & balances
  - B: Transition Process Criteria
    - 3 major categories & 2 sub-categories
    - Maintain stability; define when transition starts
  - C: Clear Statement Criteria
    - 4 major categories & 4 sub-categories
    - Make the RSS GS Functional Description sufficiently detailed to move everyone forward; avoid “we’ll figure that out later”

# Success criteria – finding balance

- Some criteria (especially Part A substantive criteria) are in tension with one another
  - Example:  
A.1: Accountability & Transparency  
VS  
A.2: RSO autonomy and independence
- An RSS GS Functional Description will not achieve super-strong embodiment of ALL of the Part A criteria
- Finding an appropriate balance requires negotiation

# Success criteria – a few highlights

- A.1 (Accountability and Transparency) includes:
  - A.1.1.1: “The [governance structure] must include provision for cyber incident oversight and disclosure obligations, and codify security threat and vulnerability information sharing amongst RSOs and the [governance body to be created].”

(emphasis added)

# Success criteria – a few highlights

- A.3 (Financial Function) includes:
  - A.3.4.3: “Methods of raising funds to support the RSS should, to the extent practicable, preserve the status of the RSS as a public good: made available for no charge at point of use.”
  - A.3.5: “To align properly with the goals of Internet governance generally the [governance body to be created] must operate on a not-for-profit basis.”

(emphasis added)

# Success criteria – a few highlights

- A.3 (Financial Function) includes:
  - A.3.7: “While the [governance system] must provide opportunities to finance RSOs, there must be no obligation imposed upon RSOs to accept all or any such sources of funding. ...”

# Success criteria – a few highlights

- B.1 (Transition to new RSS GS is conditional upon prior settlement of all RSS GS Constitutional Documents):
  - “Parties who will be governed by a new (or revised) RSS GS must have appropriate and enforceable assurance that the governance structure is fully implemented in RSS GS Constitutional Documents prior to transition from existing governance structure to the new form. Checks & balances need to be clear before the new structure moves into force.”

(emphasis added)



# Success criteria – a few highlights

- B.2 (Operational stability during transition to RSS GS):
  - “Any RSS GS Functional Description must contain a clear statement that the process of transitioning from any current RSS governance to any new RSS GS must take extraordinary care not to disrupt the proper functioning of the RSS.”

# Next steps – the RSS GWG:

- 2 December 2021
  - Accepted RSSAC058 & '059 into work plan; requested RSO input on possible changes to RSS GWG working structure
- 17 January 2022
  - Transmitted a letter to the ICANN Board asking the Board to amend the RSS GWG Charter to:
    - (1) Invite all 12 RSOs to join RSS GWG; and
    - (2) Amend RSS GWG decision-making procedures
      - From: Decide by consensus (if possible); or (if no consensus) decide by majority vote
      - To: Decide by consensus only



# Thank you!

**Robert Carolina**  
**General Counsel, ISC**  
**@Rob2yall**



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