

From Research to Internet Standards

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30th Brazilian Symposium on Computer Networks and Distributed Systems (SBRC)
Ouro Preto, Brazil
2012-5-3

WHO CARES?

Why should **you** care about standards?

- If you're researching Internet-related topics,
where do you learn what the real current issues are?
 - Hint: wireless ATM is not one of them
- You need to **talk** to operators, vendors, registrars, policy makers, regulators, etc.
 - Assuming you are interested in research that could have an actual impact
- Where is it **easy** to meet these folks?
 - Standards bodies, operator meetings, industry forums

But don't forget to **think**

- You will talk to many folks who aren't researchers
- Their **motivations are different** than yours
 - Often very short-term agendas
 - Few can abstract out to principles
 - Worried about the symptoms, not the causes
 - If all you have is a hammer, everything starts to look like a nail
 - Many are there to make money (or keep others from taking theirs)
- **Think hard** about the “problems” you learn about

Still... **go mingle!**

- If you're interested in learning about some of the real problems, you'll get a good understanding
- If you're interested in fixing some of them, you'll need to **participate more regularly**
- **Papers don't get deployed**
- For Internet and "future" Internet stuff that means: participate in the IETF
 - IEEE, W3C, 3GPP, ITU-T, ETSI for some topics due to SDO change control agreements

Participation takes **time**

- Standardization is very different from “fire & forget” academic publication/presentation venues
- The **time commitment** is substantial, both in terms of email discussion and meeting travel
- You will need to **convince** a diverse set of stakeholders of the value of your proposal
 - **Theoretically optimal ≠ practically optimal**
 - Business aspects & deployment incentives are **critical**
- Don't forget about research arms (e.g., the **IRTF**)

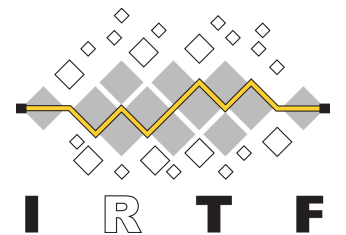
Need **additional** motivation?

- If you're on an academic career path,
standardization is unlikely to get you tenure
 - But **it doesn't often hurt** you either
- You will meet likeminded people to collaborate with
 - And some of them have substantial budgets...
- If you're going for an industry career path, getting positively noticed in these forums can be good

IETF IN A NUTSHELL

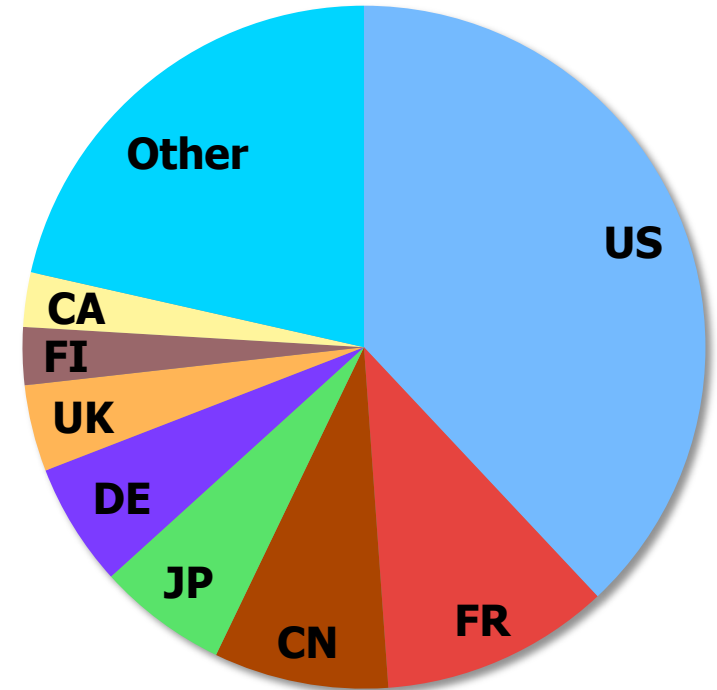
Internet standards = **IETF** standards

- The IETF is an **open, diverse** and **international** community
- Network designers, operators, vendors, researchers
- Common goal: **evolution of the Internet architecture and protocols** & smooth operation of the Internet
- **Participatory culture**; open to anyone: **people, not companies**
- Produces Internet Standards & other docs
- It has a research arm – the **IRTF**



IETF by numbers

- **1-2K people** at 3 meetings/year
 - From ca. 50 different countries
 - Many, many more on mailing lists
- Ca. **120 working groups**
- **8 areas** with 15 area directors
- More than **6600 RFCs** published
- More than **60K Internet-Draft** revisions submitted



Participants at IETF-83
Paris, France, April 2012

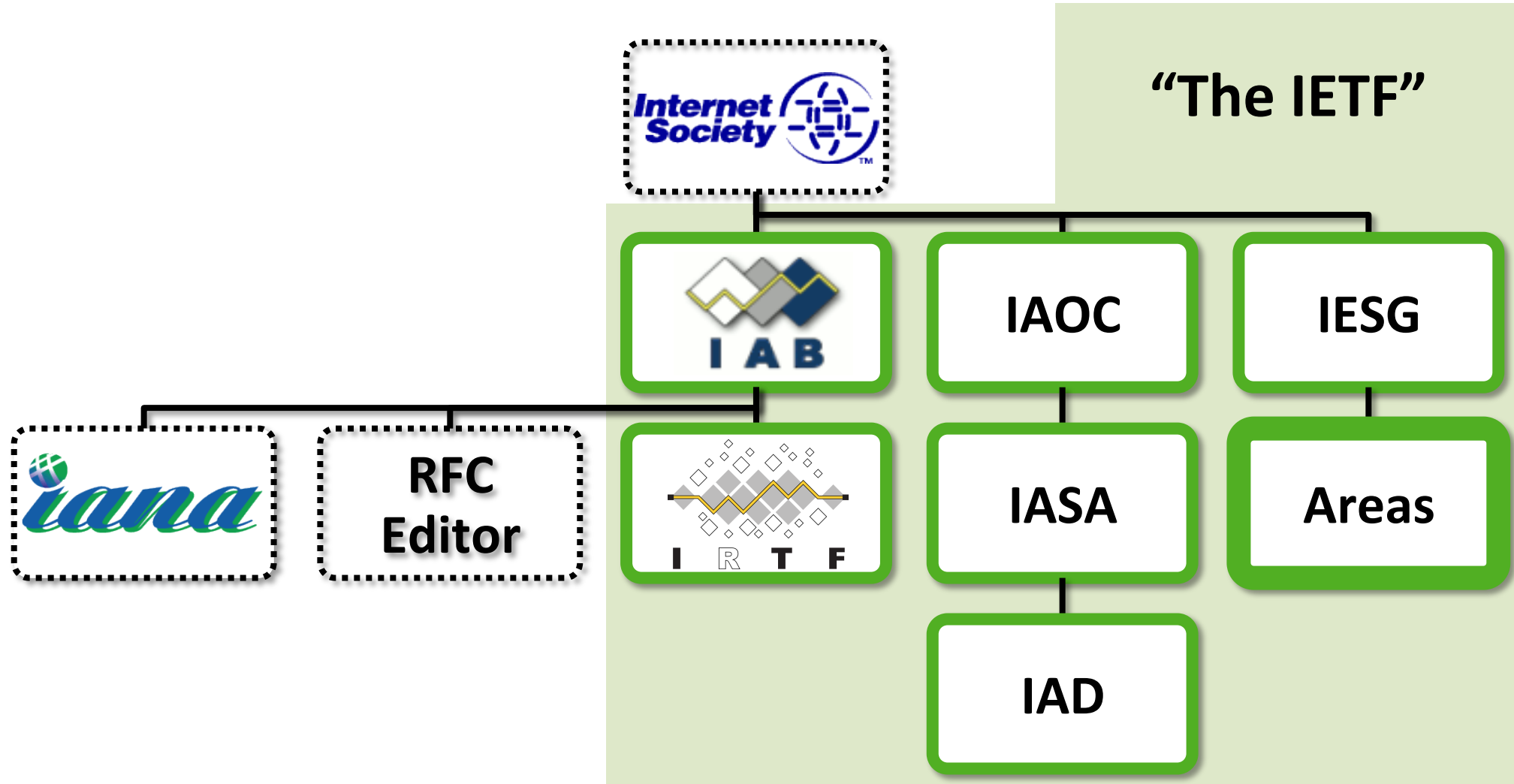
1318 total
230 newcomers
56 countries

IETF standardization

- **Open process** to produce open Internet standards
- **Global standards** for a global Internet
- Alignment with Internet **architectural principles**
- Maximum **interoperability**
- Maximum **scalability**
- Improved Internet **security & privacy**

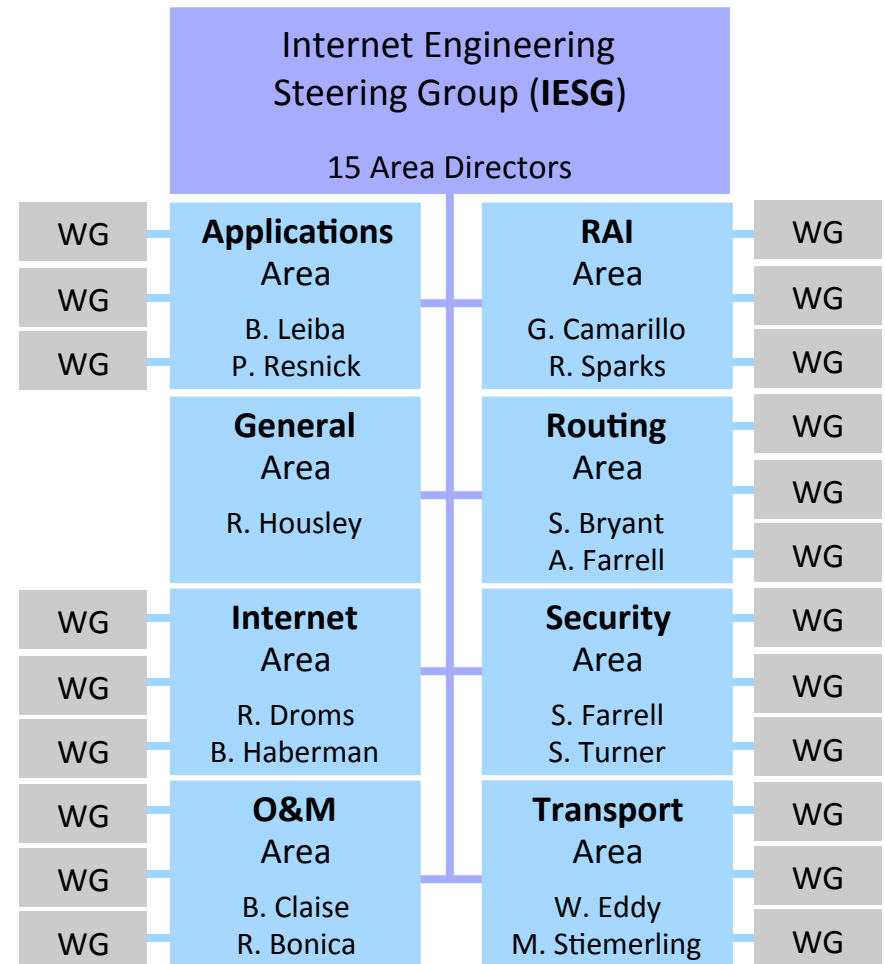
IETF ORGANIZATIONAL STRUCTURE

Top-level organizational view



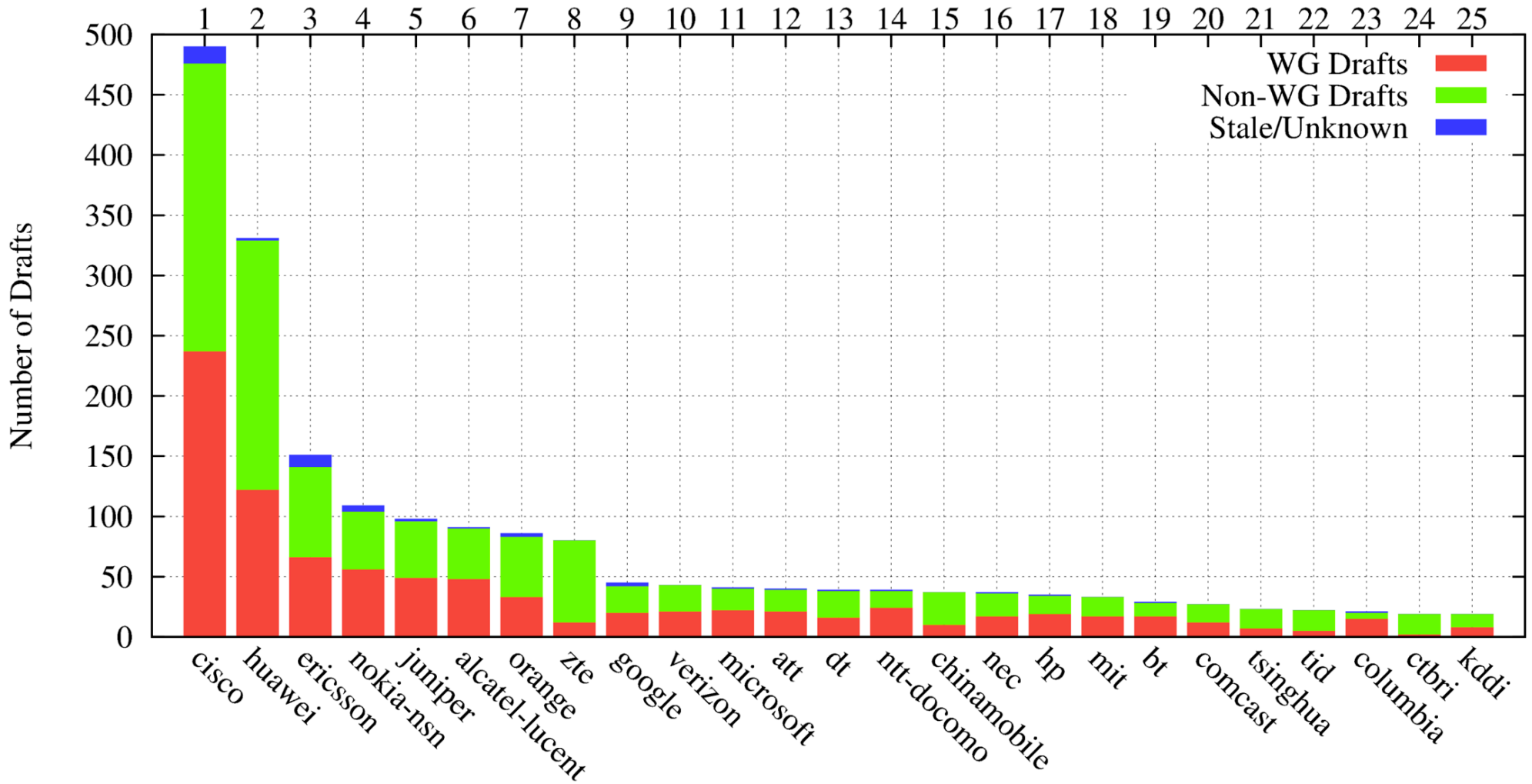
Top-level IETF & area structure

- IETF is structured into **8 areas**
 - Each with area directors (**ADs**)
- Areas are structured into **working groups (WGs)**
 - Each with WG chairs
- Internet Engineering Steering Group (**IESG**) = all ADs
 - Approves all Internet Standards
 - Manages technical work
 - Starts/ends WGs
 - Assigns WG Chairs



Most active IETF organizations

("at least one author with affiliation X")



Authors with the most impact

Highest h-index

- 24 for Keith McCloghrie
- 20 for Steve Deering
- 18 for Jonathan Rosenberg
- 18 for Henning Schulzrinne
- 16 for Yakov Rekhter
- 16 for Marshall Rose
- 15 for Russ Housley
- 14 for Steve Kille
- 14 for Sally Floyd
- 14 for Ned Freed
- 14 for Mark Handley
- 14 for John Klensin
- 14 for Bert Wijnen
- 13 for Tony Li
- 13 for Randy Presuhn
- 13 for Paul Hoffman
- 13 for Bernard Aboba

Most citations

- 3489 for Scott Bradner (42 RFCs)
- 2918 for Keith McCloghrie (91 RFCs)
- 1556 for Henning Schulzrinne (79 RFCs)
- 1358 for Steve Deering (35 RFCs)
- 1267 for Marshall Rose (63 RFCs)
- 1240 for Jonathan Rosenberg (68 RFCs)
- 1117 for Leslie Daigle (28 RFCs)
- 1071 for Harald Alvestrand (44 RFCs)
- 1054 for Mark Handley (37 RFCs)
- 1049 for Yakov Rekhter (72 RFCs)
- 1024 for Ned Freed (42 RFCs)
- 980 for Thomas Narten (20 RFCs)
- 941 for Juergen Schoenwaelder (30 RFCs)
- 906 for Stephen Kent (19 RFCs)
- 896 for Olaf Kolkman (5 RFCs)
- 847 for Bob Braden (30 RFCs)
- 816 for Larry Masinter (23 RFCs)

IETF STANDARDS & DOCUMENTS

IETF documents – two types

Internet-Draft (I-D)

- Active **working documents**
- Not finalized! Not stable!
- **Anyone can submit**
 - draft-*yourname*-...
- **Only some I-Ds are WG documents!**
 - draft-**ietf**-*wgname*-...

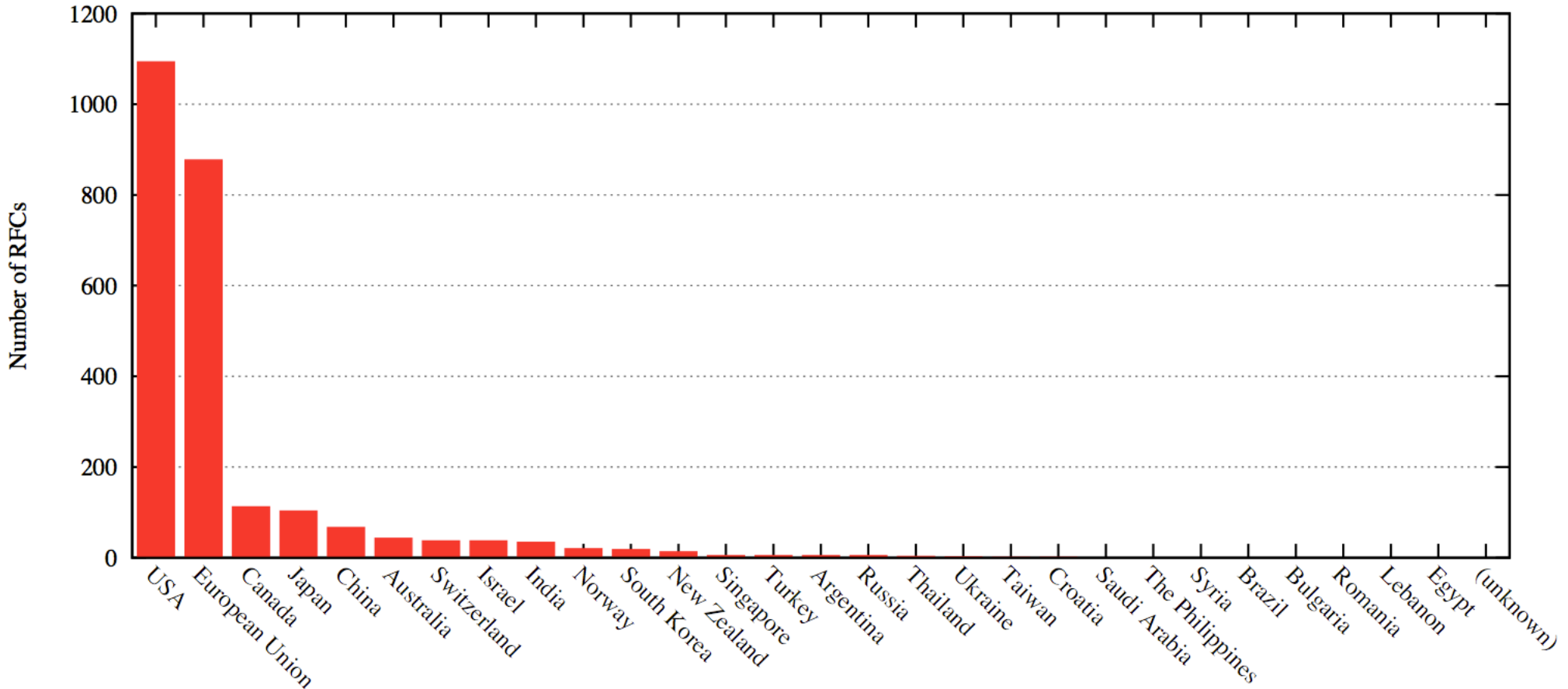
Request For Comment (RFC)

- **Archival** publications
 - Never change once published
- **Not all RFCs are standards!**
 - Standards track =
Proposed/Draft/Full Standard
 - Other types =
Informational, Experimental,
Best-Current-Practice (BCP)

Origins of authors of recent RFCs

("at least one author from country X")

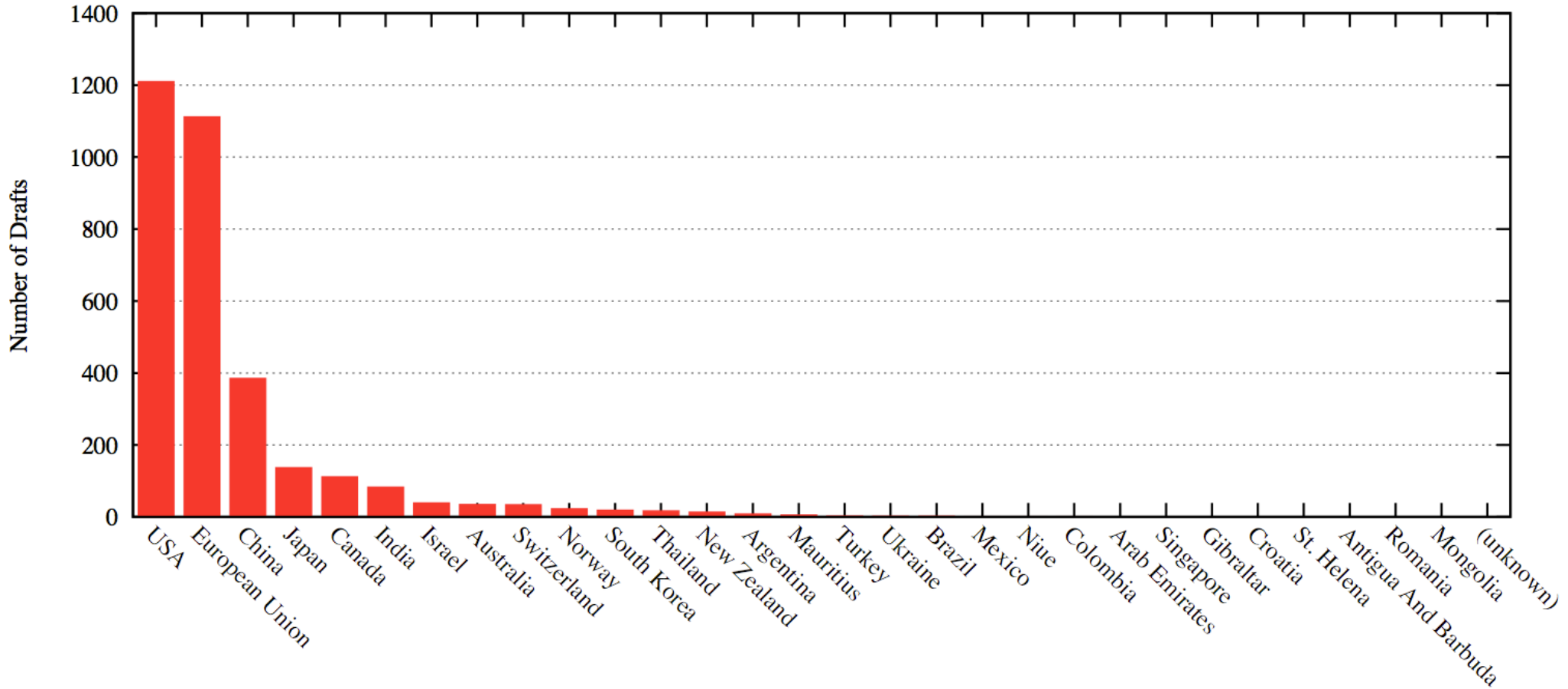
Number of RFCs with Authors from a Country



Origins of authors of recent I-Ds

("at least one author from country X")

Number of Drafts with Authors from a Country



IETF document format

- **English** if the official language
- **ASCII** is the mailing list and document format
- Frequent discussion of alternate formats
 - IETF seen as “behind the times”
 - (Almost) no drawings
 - But no consensus on alternative
- The current format is still **readable after 40+ years...**

```
Network Working Group                                Steve Crocker
Request for Comments: 1                             UCLA
                                                    7 April 1969

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

```
Internet Engineering Task Force (IETF)              K. Kinnear
Request for Comments: 6607                          R. Johnson
Updates: 3046                                       M. Stapp
Category: Standards Track                          Cisco Systems
ISSN: 2070-1721                                    April 2012
```

Virtual Subnet Selection Options for DHCPv4 and DHCPv6

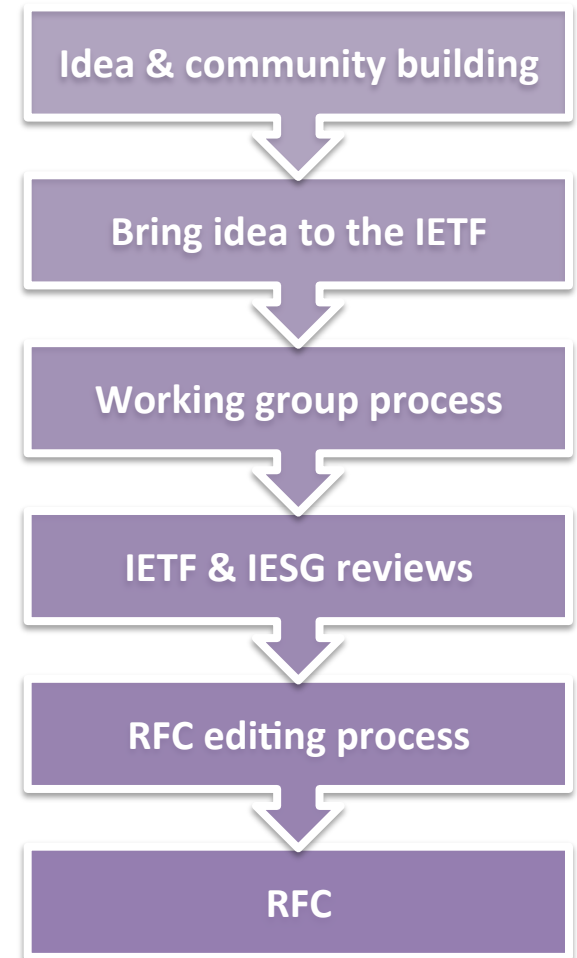
Abstract

This memo defines a DHCPv4 Virtual Subnet Selection (VSS) option, a DHCPv6 VSS option, and the DHCPv4 VSS and VSS-Control sub-options carried in the DHCPv4 Relay Agent Information option. These are intended for use by DHCP clients, relay agents, and proxy clients in situations where VSS information needs to be passed to the DHCP server for proper address or prefix allocation to take place.

BRINGING NEW WORK TO THE IETF

The IETF takes on work, when...

- There is a **problem that needs solving**
- The **problem fits** one of the IETF areas
- **Aligned with architectural principles** of the Internet
- **Scope is well defined** and understood
 - **Research is complete**
 - Engineering work is needed
- Agreement on specific **deliverables**
- Probability of **timely completion**
- **Willing people** to do the work

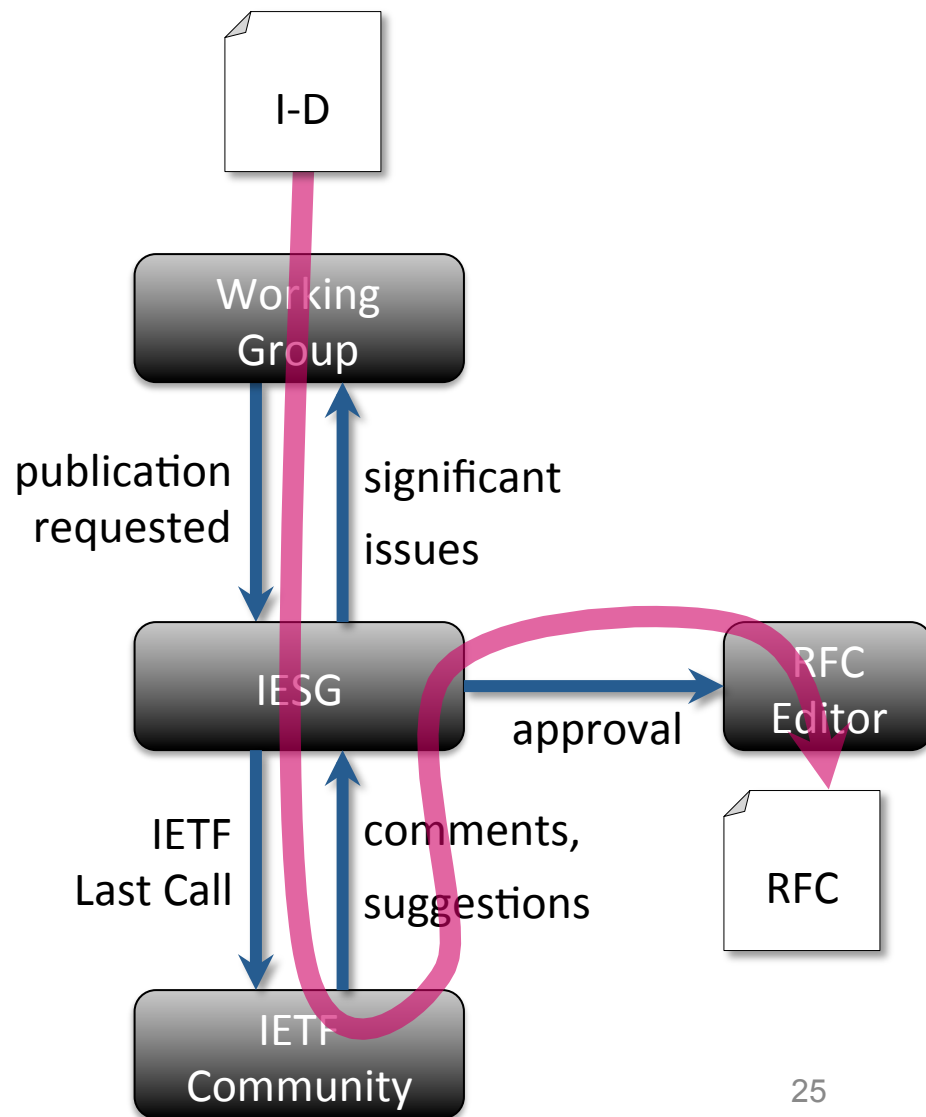


Initiating New IETF Work – **Existing WG**

- **Check WG charters** & ask chairs for their opinion
- **Submit an I-D** to the WG
 - *draft-yourname-wgname-topic-00*
- **Ask for feedback** on I-D on WG mail list
- **Ask for presentation time** during an IETF meeting
- Constructively **incorporate feedback**
 (“revise quickly, revise often”)
- Eventually, **ask to adopt as WG item**
- **Continue work** in WG (you now become editor)

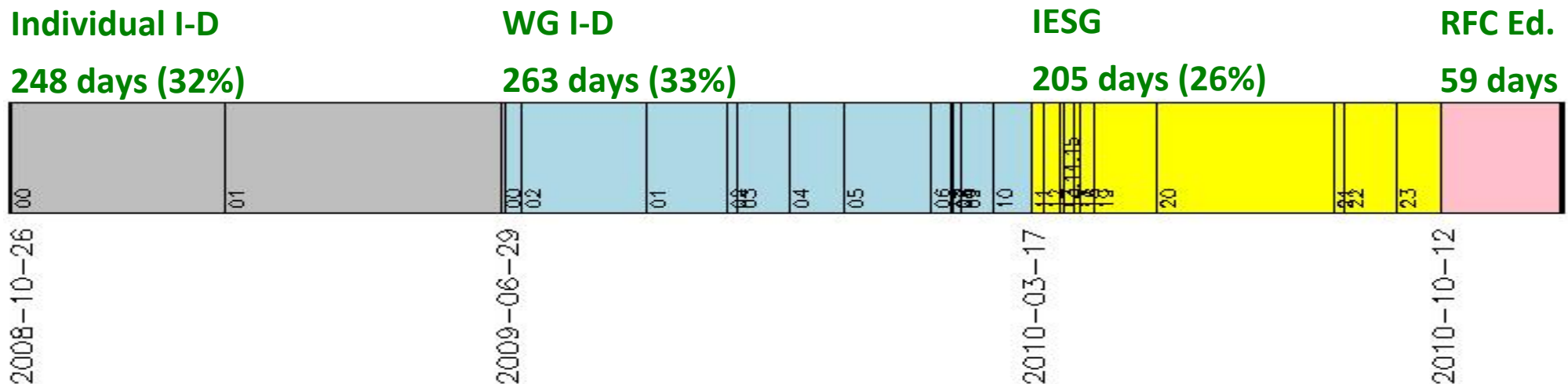
WG, IETF and IESG Process

- Chair establishes **WG consensus**
- **Requests publication** of I-D
- **AD review** by responsible AD
- IETF-wide “**Last Call**”
- **IESG review**
 - LC comments & own technical review
- **IESG approval**
- RFC editor process & **publication as RFC**

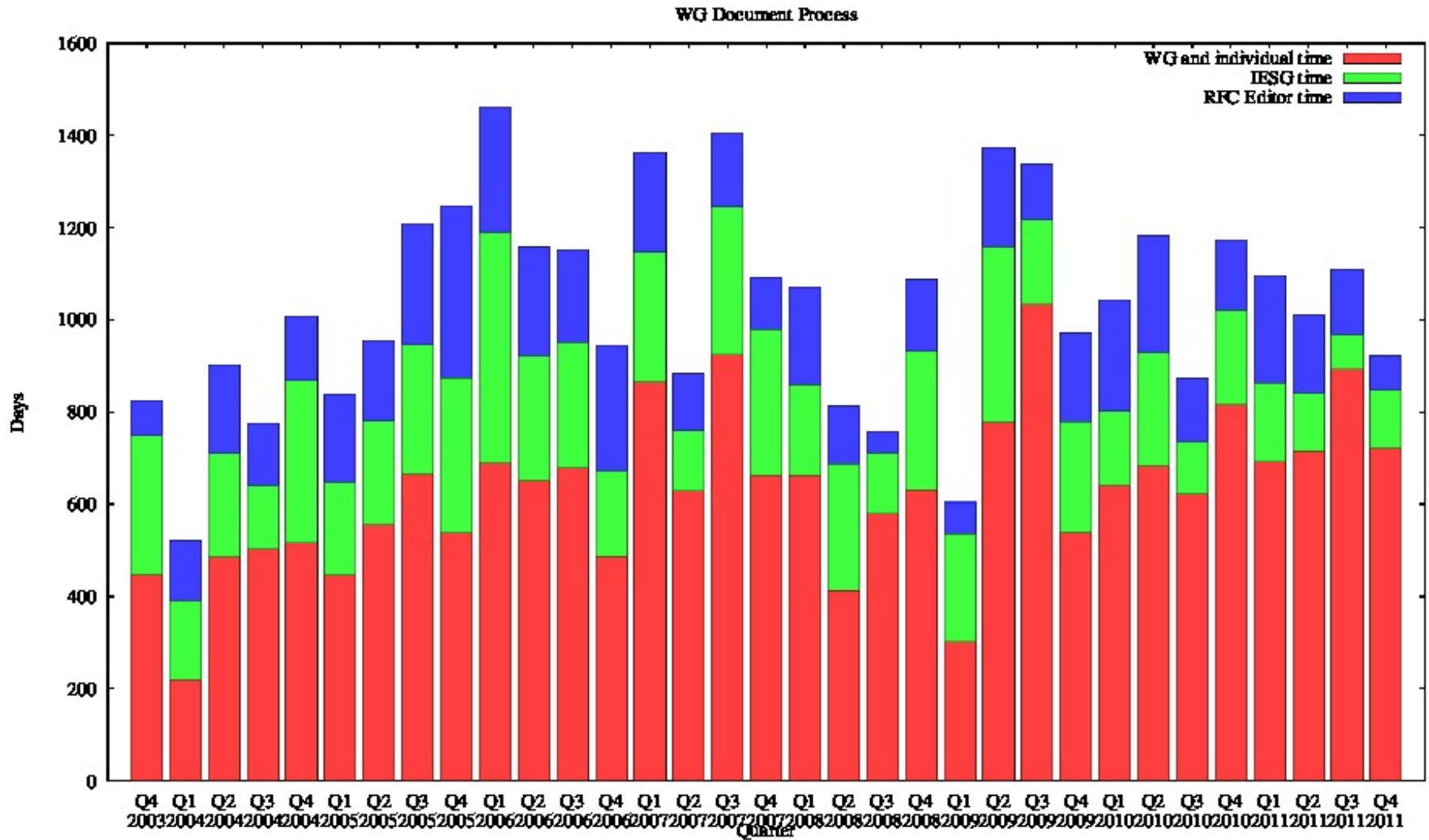


Example: Tools for IPv6/IPv4 co-existence

- In 2008, service providers worried about the ability to deploy IPv6 fast enough (before IPv4 depletion)
- A series of bar, hallway and interim meetings led to a decision to develop some new technology for better co-existence in two WGs
- Results now complete; process took about **2 years**

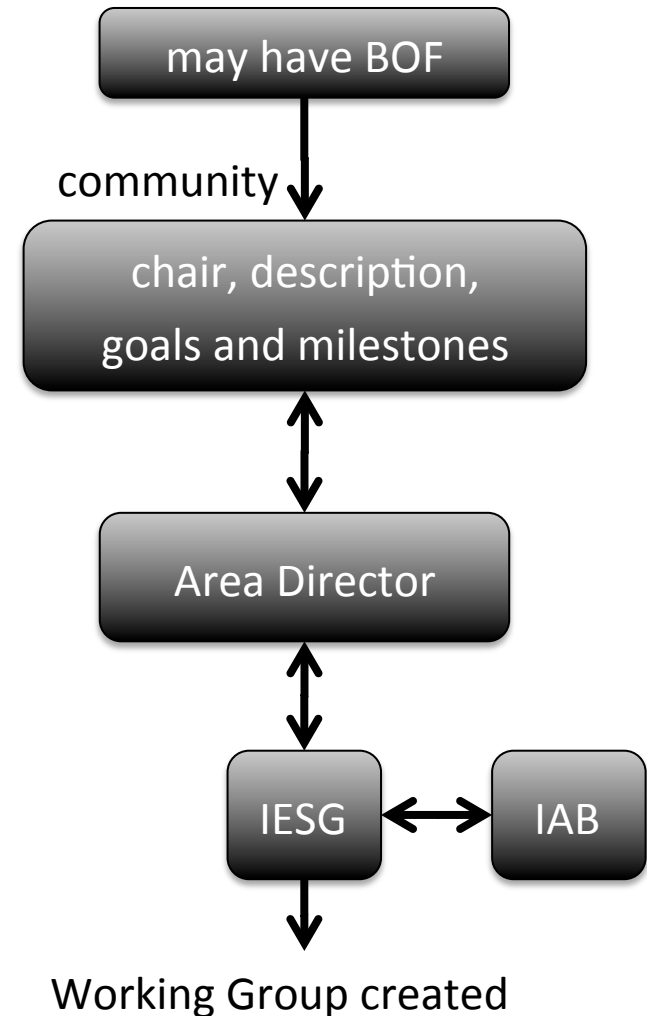


Average time from Internet-Draft to RFC



Initiating New IETF Work – **New WG**

- Make sure **no existing WG fits!**
- If “small”, can ask AD for I-D sponsorship
- Else, likely need to **organize a BOF** (“Birds of a Feather”) session at IETF meeting
- Must **form a community** of interested people around your proposal (!)
- Read RFC5434 & **prepare BOF proposal**
 - Problem statement I-D, open mailing list, draft BOF agenda, etc.
- **Ask an AD** for BOF sponsorship
- BOF determines if a WG may form



Example: Pre-Congestion Notification

Idea presented in TSVWG

ca. 2005

Bar meeting at IETF-66 in Dallas, TX

Mar 2006

PCN mailing list created

Aug 2006

draft-chan-pcn-problem-statement-00 posted

Sep 2006

First draft charter posted

Sep 2006

BOF requested

Sep 2006

BOF held at IETF-67 in San Diego, CA, USA

Nov 2006

Charter went for External Review

Feb 2007

WG chartered

Mar 2007

WG is ca. 75% done

Apr 2012

CONCLUSION

Win-Win

Researcher

- Learn about the **real problems**
- Work on meaningful open issues
– help build the Internet
- Understand what promotes and hinders deployment
- **Meet potential collaborators**
and funding sources
- Have a realistic understanding of the time commitments

IETF

- Gains highly skilled, less-biased experts
- Use academic results to create **better standards**
- Enable researchers to directly **improve the Internet**
- **Insight into trends** that will impact standards down the road
- Accompany relevant topics in the IRTF research arm