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Retiring the Tao of the IETF

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Retiring the Tao of the IETF

Abstract

This document retires and obsoletes the Tao of the IETF as an IETF-maintained document. This document also obsoletes RFC 6722, which describes the publication process of the Tao. Furthermore, this document describes the rationale for the retirement of the Tao. For archival purposes, the last version of the Tao is included in the appendix. Information that new participants need to engage in the work of the IETF will continue to be provided through the IETF website in a more timely and accessible manner. This is the way.

Status of This Memo

This document is not an Internet Standards Track specification; it is published for informational purposes.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Not all documents approved by the IESG are candidates for any level of Internet Standard; see Section 2 of RFC 7841.

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at https://www.rfc-editor.org/info/rfc9592.

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1. Introduction

Since its publication as [RFC1391] in 1993, The "Tao of the IETF" ("Tao") has described the inner workings of IETF meetings and Working Groups, discussed organizations related to the IETF, and introduced the working processes to new participants. The Tao never was a formal IETF process document, but rather a community-developed and maintained informational overview. After the Tao was published as an RFC for 13 years, it was published as a webpage for over a decade following the process described in [RFC6722]. However, the Tao did not keep up with the changes in the processes of the community and the organization, and thereby ceased to be a reliable source of information. We gratefully want to acknowledge all the individuals who contributed to the Tao over the years. The changing nature of IETF participation, a better understanding of how to most effectively convey information to new participants, and experience with publishing the Tao as a webpage all suggest a new approach to collecting, updating, and communicating the information that new participants need to engage in the work of the IETF successfully. This document formally retires and obsoletes the "Tao of the IETF" as a single standalone document.

2. Reasons for Retirement

In short, the breadth of topics covered in the Tao, the unpredictable and different schedule for updates to the topics, and the high overhead for revising and reviewing the content did not match the needs or preferences of the intended audience of the Tao.

2.1. Infrequent Updates

The Tao was originally published as [RFC1391] in January 1993. In the following 17 years, four additional versions of the Tao were published as RFCs:

- [RFC1539] in October 1993,
- [RFC1718] in November 1994,
- [RFC3160] in August 2001, and
- [RFC4677] in September 2006.

In August 2012, [RFC6722] was published to document the process for publishing the Tao as a webpage so that it could "be updated more easily." However, in the subsequent 11 years, only four additional versions were published. The length of the Tao meant that review and approval of the entire document took considerable effort and time, leading to very infrequent updates.

2.2. Unwieldy Format

The large, consolidated document format of the Tao made for a heavy investment by readers, in addition to the difficulty editors faced keeping pace with the changes required to keep it current. For example, the emergence of IETF Hackathon popularity with new participants prompted an update. However, that content was effectively buried in an already long document.

2.3. Changing Participation Modes

The original Tao aimed to welcome new participants to IETF meetings as attendance grew rapidly along with the growth of the Internet in the 1990s. As other avenues for initial participation in the IETF emerged over the ensuing decades, the main focus of the Tao remained on in-person meeting participation. For example, remote participation in IETF meetings has become a much more significant aspect in the past few years.

3. Going Forward

The content of the Tao has already been integrated into the website of the IETF, which is the main channel of communication for IETF newcomers and a general audience. The content is continuously kept up to date with a variety of media to serve different audiences. The IETF seeks to ensure that the website continues to address the needs of our ever-evolving community and potential newcomers.

3.1. New Communications Opportunities

The IETF and its community continuously seek to improve its communication to newcomers and existing participants alike. Examples of possible ways of doing this:

- More focused guides, e.g., on IETF Hackathon participation, starting new work, etc.
- Alternative formats, e.g., multiple shorter documents, on-demand video, podcasts, etc.
- New channels for communications, e.g., blog posts, improved Datatracker, Slack, etc.

4. Conclusion

The coverage of a wide range of topics, the unpredictable and different schedule for updates to the topics, and the high overhead for revising and reviewing the content mean that the Tao required a lot of effort to maintain, was commonly out-of-date, and thus did not serve its intended purpose of informing the community and newcomers. Therefore, this document is the end of the road for "Tao of the IETF." The document is now retired. For archival reasons, the last version of the Tao can be found in Appendix A.

5. Security Considerations

This document has no security considerations.

6. IANA Considerations

This document has no IANA actions.

7. Informative References

[RFC1391] Malkin, G., "The Tao of the IETF: A Guide for New Attendees of the Internet Engineering Task Force", RFC 1391, DOI 10.17487/RFC1391, January 1993, <https://www.rfc-editor.org/info/rfc1391>.

[RFC1539] Malkin, G., "The Tao of IETF - A Guide for New Attendees of the Internet Engineering Task Force", RFC 1539, DOI 10.17487/RFC1539, October 1993, <https://www.rfc-editor.org/info/rfc1539>.

[RFC1718] IETF and G. Malkin, "The Tao of IETF - A Guide for New Attendees of the Internet Engineering Task Force", RFC 1718, DOI 10.17487/RFC1718, November 1994, <https://www.rfc-editor.org/info/rfc1718>.

[RFC3160] Harris, S., "The Tao of IETF - A Novice's Guide to the Internet Engineering Task Force", RFC 3160, DOI 10.17487/RFC3160, August 2001, <https://www.rfc-editor.org/info/rfc3160>.

[RFC4677] Hoffman, P. and S. Harris, "The Tao of IETF - A Novice's Guide to the Internet Engineering Task Force", RFC 4677, DOI 10.17487/RFC4677, September 2006, <https://www.rfc-editor.org/info/rfc4677>.

[RFC6722] Hoffman, P., Ed., "Publishing the "Tao of the IETF" as a Web Page", RFC 6722, DOI 10.17487/RFC6722, August 2012, <https://www.rfc-editor.org/info/rfc6722>.

Appendix A. Last Edition of the Tao

For archival purposes, the last edition of the Tao as published under the process described in [RFC6722], is included below. Note that several links to resources external to the Tao do not work at the time of publication of this RFC. Additionally, minor errors in the following text have been corrected.

Abstract

This document introduces you to the "ways of the IETF": it will convey the might and magic of networking people and packets in the Internet's most prominent standards body. In this document we describe the inner workings of IETF meetings and Working Groups, discuss organizations related to the IETF, and introduce the standards process. This is not a formal IETF process document but an informal and informational overview.

1 Introduction

The Internet Engineering Task Force (IETF) is the largest standard development organization (SDO) for the Internet. Since its early years, participation in the IETF has grown phenomenally. In-person attendance at face-to-face meetings now averages between 1000 and 1500 participants. At any given meeting, around 200 attendees are *newcomers* (defined by the IETF as someone who has attended five or fewer meetings), and many of those go on to become regular participants. When the IETF was smaller, it was relatively easy for a newcomer to adjust. Today, however, a newcomer meets many more new people -- some previously known only as the authors of documents or thought-provoking email messages.

Of course, it's true that many IETF participants don't go to the face-to-face meetings at all -- especially since the COVID-19 pandemic when meetings were completely online for a while. There are also many participants who solely focus on the mailing lists of various IETF Working Groups. Since the inner workings of Working Groups can be hard for newcomers to understand, this document provides the mundane bits of information that newcomers will need in order to become active participants. The IETF website also has a lot of newcomer information in various formats. In this document we try to cover as much as possible in one place.

The IETF is always evolving. Although the principles in this document are expected to remain consistent over time, practical details may well have changed by the time you read it; for example, a web-based tool may have replaced an email address for requesting some sort of action.

Many types of IETF documentation are mentioned here. The IETF publishes its technical documentation as RFCs, still known by their historical term *Requests for Comments*. (Sometimes people joke that it stands for *Request for Compliance*.) STDs are RFCs identified as "standards", and BCPs are RFCs that represent thoughts on Best Current Practices in the Internet. Both STDs and BCPs are also RFCs. For example, BCP 9 points to a collection of RFCs that describe the IETF's standardization processes. See RFCs and Internet-Drafts for more details.

1.1 Acronyms and Abbreviations Used in the Tao

Some of the acronyms and abbreviations from this document are listed below.

Term	Meaning
AD	Area Director
BCP	Best Current Practice (a type of RFC)
BOF	Birds of a Feather
IAB	Internet Architecture Board
IANA	Internet Assigned Numbers Authority

Term	Meaning
IASA	IETF Administrative Support Activity
ICANN	Internet Corporation for Assigned Names and Numbers
I-D	Internet-Draft
IESG	Internet Engineering Steering Group
IPR	Intellectual property rights
IRSG	Internet Research Steering Group
IRTF	Internet Research Task Force
ISOC	Internet Society
RFC	Request for Comments
STD	Standard (a type of RFC)
WG	Working Group

Table 1

2 What is the IETF?

The IETF has no members and no dues; it is a loosely self-organized group of people who contribute to the engineering and evolution of Internet technologies. It is the principal body engaged in the development of new Internet standard specifications. The IETF is unusual in that it exists as a collection of meetings (both in-person and virtual) and online activities (such as email and pull request discussions), in which individuals voluntarily participate.

The IETF welcomes all interested individuals: IETF participants come from all over the world and from many different parts of the Internet industry. The IETF conducts its work solely in English. See Where do I fit in? for information about the ways that many people fit into the IETF.

Quoting from RFC 3935: A Mission Statement for the IETF: "the overall goal of the IETF is to make the Internet work better. Its mission is to produce high quality, relevant technical and engineering documents that influence the way people design, use, and manage the Internet in such a way as to make the Internet work better. These documents include protocol standards, best current practices, and informational documents of various kinds."

The ways to do that include the following:

- Identifying and proposing solutions to pressing operational and technical problems in the Internet.

- Specifying the development or usage of protocols and the near-term architecture to solve such technical problems for the Internet.
- Making recommendations to the Internet Engineering Steering Group (IESG) regarding the standardization of protocols and protocol usage in the Internet.
- Facilitating technology transfer from the Internet Research Task Force (IRTF) to the wider Internet community.
- Providing a forum for the exchange of information within the Internet community among vendors, users, researchers, agency contractors, operators, and network managers.

RFC 3935 further states that the Internet isn't value-neutral, and neither is the IETF. The IETF wants the Internet to be useful for communities that share our commitment to openness and fairness. The IETF embraces technical concepts such as decentralized control, edge-user empowerment and sharing of resources, because those concepts resonate with the core values of the IETF community. These concepts have little to do with the technology that's possible, and much to do with the technology that the IETF chooses to create.

In many ways, the IETF runs on the beliefs of its participants. One of the founding beliefs is embodied in an early quote about the IETF from David Clark: "We reject kings, presidents and voting. We believe in rough consensus and running code." Another early quote that has become a commonly-held belief in the IETF comes from Jon Postel: "Be conservative in what you send and liberal in what you accept."

There is no membership in the IETF. Anyone may sign up to working group mailing lists, or register for a meeting and then attend. The closest thing there is to being an IETF member is being a participant on the IETF or Working Group mailing lists. This is where the best information about current IETF activities and focus can be found.

Of course, no organization can be as successful as the IETF is without having some sort of structure. In the IETF's case, that structure is provided by other supporting organizations, as described in RFC 2028: The Organizations Involved in the IETF Standards Process. Please note that RFC 2028 is outdated and being revised.

The IETF web site is the best source for information about upcoming IETF meetings and newcomer materials. The IETF Datatracker is the best source for information about Internet-Drafts, RFCs, and Working Groups.

One more thing that is important for newcomers: the IETF in no way "runs the Internet," despite what some people mistakenly might say. The IETF makes voluntary standards that are often adopted by Internet users, network operators, and equipment vendors, and it thus helps shape the trajectory of the development of the Internet. But in no way does the IETF control, or even patrol, the Internet. If your interest in the IETF is because you want to be part of the overseers, you may be badly disappointed by the IETF. A saying you will sometimes hear is, "we are not the protocol police."

2.1 Humble Beginnings

The first IETF meeting was held in January 1986 at Linkabit in San Diego, with 21 attendees. The 4th IETF, held at SRI in Menlo Park in October 1986, was the first that equipment vendors attended. The concept of Working Groups was introduced at the 5th IETF meeting at the NASA Ames Research Center in California in February 1987. The 7th IETF, held at MITRE in McLean, Virginia, in July 1987, was the first meeting with more than 100 attendees.

After the Internet Society (ISOC) was formed in January 1992, the IAB proposed to ISOC that the IAB's activities should take place under the auspices of the Internet Society. During INET92 in Kobe, Japan, the ISOC Trustees approved a new charter for the IAB to reflect the proposed relationship.

The IETF met in Amsterdam, The Netherlands, in July 1993. This was the first IETF meeting held in Europe, and the US/non-US attendee split was nearly 50/50. The IETF first met in Oceania (in Adelaide, Australia) in 2000, the first meeting in Asia (in Yokohama, Japan) was in 2002, and the first meeting in Latin America (in Buenos Aires, Argentina) was in 2016. So far, the IETF has never met in Africa.

The IETF currently has a "1-1-1" meeting policy where the goal is to distribute the meetings equally between North America, Europe, and Asia. This policy is mainly aimed at distributing the travel effort for the existing IETF participants who physically attend meetings and for distributing the timezone difficulty for those who participate remotely. The IETF has also met in Latin America and Oceania, but these continents are currently not part of the 1-1-1 rotation schedule. More information on picking the venue and the meeting policy can be found in RFC 8718: IETF Plenary Meeting Venue Selection Process and RFC 8719: High-Level Guidance for the Meeting Policy of the IETF.

Remote participation in IETF meetings has been growing significantly in the past few years, thanks in part to the ongoing effort to improve the tools and processes used to facilitate this mode of participation.

2.2 The Hierarchy

2.2.1 The Internet Society (ISOC) and the IETF Administration LLC (IETF LLC)

The Internet Society (ISOC) is an international, non-profit, membership organization that supports and promotes the development of the Internet as a global technical infrastructure. The mission of ISOC is "to promote the open development, evolution, and use of the Internet for the benefit of all people throughout the world." One of the ways that ISOC does this is through financial support of the IETF.

The IETF Administration LLC (IETF LLC) is a "disregarded entity" of ISOC, which means it is treated as a branch or division for tax purposes. The IETF LLC has no role in the oversight or steering of the standards process, the appeal chain, the confirming bodies for existing IETF and IAB appointments, the IRTF, or ISOC's memberships in other organizations. Rather, the IETF LLC,

as overseen by its Board of Directors, is responsible for staffing and contracts with places like hotels to host IETF meetings. Most of the day-to-day activities are delegated to the IETF Executive Director.

Responsibilities of the IETF LLC include:

- Supporting the ongoing operations of the IETF, including meetings and non-meeting activities.
- Managing the IETF's finances and budget.
- Raising money on behalf of the IETF.
- Establishing and enforcing policies to ensure compliance with applicable laws, regulations, and rules.

The IETF and ISOC continue to be strongly aligned on key principles. ISOC initiatives related to the IETF continue to support participation in, and deployment of, the standards created by the IETF.

2.2.2 Internet Engineering Steering Group (IESG)

The IESG is responsible for technical management of IETF activities and the Internet standards process. However, the IESG doesn't exercise much direct leadership, such as the kind you will find in many other standards organizations. As its name suggests, its role is to set directions rather than to give orders. The IESG gets WGs started and finished, ratifies or steers the output from the IETF's Working Groups (WGs), and makes sure that non-WG I-Ds that are about to become RFCs are correct.

Check the IESG web pages to find up-to-date information about IESG statements, I-Ds processed, RFCs published, and documents in Last Call, as well as the monthly IETF status reports.

The IESG consists of the Area Directors (ADs), who are selected by the Nominations Committee (NomCom) and are appointed for two years. The process for choosing the members of the IESG is detailed in BCP 10.

The current Areas and abbreviations are shown below, and more details are on the IETF web site.

Area	Description
Applications and Real-Time Area (art)	Protocols seen by user programs, such as email and the web and delay-sensitive interpersonal communications
General (gen)	IETF process, and catch-all for WGs that don't fit in other Areas (which is very few)
Internet (int)	Different ways of moving IP packets and DNS information
Operations and Management (ops)	Network management, AAA, and various operational issues facing the Internet

Area	Description
Routing (rtg)	Getting packets to their destinations
Security (sec)	Privacy, integrity, authentication, non-repudiation, confidentiality, and access control
Transport (tsv)	Transport for large volumes of traffic at potentially high bandwidths

Table 2

Because the IESG reviews all Internet-Drafts before they become RFCs, ADs have quite a bit of influence. The ADs for a particular Area are expected to know more about the combined work of the WGs in that Area than anyone else. This is because the ADs actively follow the working groups for which they are responsible and assist working groups and chairs with charter and milestone reviews. Some people, therefore, shy away from directly engaging with Area Directors. Don't -- they can be an important resource and help you find the person or the answer that you're looking for. They are, however, often very busy during meetings, and so an email to schedule a meeting can be useful, or just ask your questions.

The entire IESG reviews each Internet-Draft (I-D or "draft") that is proposed to become an RFC and should be aware of general trends that can be gleaned from the collective work products of the IETF. For IETF produced RFCs, as part of the document reviews, ADs place ballots that may contain comments on documents. The AD enters a position that may be *YES*, *NO OBJECTION*, *DISCUSS*, *ABSTAIN*, or *RECUSE* as the result of their review. Any AD may record a *DISCUSS* ballot position against a draft if they have serious concerns and would like to discuss these concerns. It is common for documents to be approved with one or two *YES* ballots, and the majority of the remaining IESG balloting *NO OBJECTION*. An IETF blog post provides advice on how draft authors could handle the various ballot positions.

Another important job of the IESG is to watch over the output of all the WGs to help prevent IETF protocols that are at odds with each other. This is why ADs are supposed to review the I-Ds coming out of Areas other than their own, and each Area has a *directorate*, a set of experienced volunteers who review I-Ds with a focus on potential issues for their area.

The quality of the IETF standards comes both from the review they get in the Working Groups and the scrutiny that the WG review gets from the ADs.

2.2.3 Internet Architecture Board (IAB)

The IAB is responsible for keeping an eye on the "big picture" of the Internet, and it focuses on long-range planning and coordination among the various areas of IETF activity. The IAB stays informed about important long-term issues in the Internet, and it brings these topics to the attention of people it thinks should know about them.

IAB members pay special attention to emerging activities in the IETF. When a new IETF Working Group is proposed, the IAB reviews its charter for architectural consistency and integrity. Even before the group is chartered, the IAB members are more than willing to discuss new ideas with the people proposing them.

The IAB also sponsors and organizes the Internet Research Task Force (IRTF) and convenes invitational workshops that provide in-depth reviews of specific Internet architectural issues. Typically, the workshop reports make recommendations to the IETF community and to the IESG. The IAB keeps the community informed through blog posts and by publishing RFCs.

The IAB also:

- Approves NomCom's IESG nominations
- Acts as the appeals board for appeals against IESG actions
- Oversees the RFC series policy and procedures
- Acts as an advisory body to ISOC
- Oversees IETF liaisons with other standards bodies

Like the IESG, the IAB members are selected for two-year positions by the NomCom and are approved by the ISOC Board of Trustees.

2.2.4 Internet Assigned Numbers Authority (IANA)

The core registrar for the IETF's activities is the IANA. Many Internet protocols require that someone keep track of protocol items that were added after the protocol came out. Typical examples of the kinds of registries needed are for TCP port numbers and MIME types. IANA's work on behalf of the IETF is overseen by the IAB. There is a joint group that advises IANA. IANA is funded by ICANN.

Even though being a registry may not sound interesting, many IETF participants will testify to how important IANA has been for the Internet. Having a stable, long-term repository run by careful and conservative operators makes it much easier for people to experiment without worrying about messing things up.

2.2.5 RFC Editor and RFC Production Center (RPC)

The RPC edits, formats, and publishes RFC's. This used to be done by one person, which is why you will still see the term *RFC Editor*; IETFers are fond of their history. Also, if you are a document author, you will most commonly come in contact with people responsible for editing your draft. Another important role is to provide one definitive repository for all RFCs.

A common misconception is that all RFCs are the work of the IETF. In fact, there are four sources of RFCs: the IETF, the IAB, the IRTF, and Independent streams. It is likely that there will soon be a fifth source, which will be for documents on the RFC series itself. Only documents coming directly from the IETF through Working Groups, or sponsored by ADs, can have IETF consensus and be described as IETF specifications or standards.

Once an RFC is published, it is never revised. If the specification it describes changes, the standard will be re-published in another RFC that "obsoletes" the first. If a technical or editorial error is found in an RFC, an errata may be filed for review. If accepted, the errata will be linked to the RFC and may be held for the next document update.

At the time of this writing, the model for the RFC Editor and the RPC is being revised under an IAB Program. In this revision, there is a position hired by the IETF LLC known as the RFC Series Editor, who is advised by a couple of groups. As a newcomer, and potential author, the details shouldn't matter much to you right now.

The RPC is contracted by the IETF LLC.

2.2.6 IETF Secretariat

There are a few people who are paid to support the IETF. The IETF Secretariat provides day-to-day logistical support, which mainly means coordinating face-to-face meetings and running the IETF presence on the web, including the IETF web site, mailing lists, the repository for Internet-Drafts, and so on. The Secretariat also provides administrative assistance to the IESG and others.

The Secretariat is contracted by the IETF LLC.

2.2.7 IETF Trust

The IETF Trust was set up to hold and license the intellectual property of the IETF, such as trademarks (the IETF logo, etc.) and copyrights. The trust is a stable, legally-identifiable entity. Most participants never interact with the IETF Trust, beyond seeing it mentioned in RFC boilerplate. This is a good sign, and indicates that they are quietly doing their job.

2.3 IETF Mailing Lists

The IETF does most of its communication, and all of its official work, via email.

Anyone who plans to participate in the IETF should join the IETF announcement mailing list. This is where all of the meeting information, RFC announcements, and IESG Protocol Actions and Last Calls are posted. This list is strongly moderated, and only the Secretariat and a small number of IETF leaders can approve messages sent to the announcement list, although those messages can come from a variety of people.

There is also a general discussion list that is unmoderated. This means that everyone can express their opinions about issues affecting the Internet. As an open discussion forum, it sometimes spins out of control and it helps to be quick on the *DELETE MESSAGE* button while also being slow to take offense. The mailing list does have a charter, however, which points out that it is not a place for companies or individuals to solicit or advertise. As of this writing, the charter is being revised. It is lightly moderated by two people appointed by the IETF Chair; they used to be called the Sargent At Arms (SAA), and you might see that term sometimes. There is also a process for banning persistent offenders from the list, but fortunately this is extremely rare.

There are also subset lists. The i-d-announce list only posts when a new Internet-Draft is submitted. It is moderated. The last-call list is not moderated, and is for discussion of IETF Last Calls (the stage when the IETF community is given one last chance to comment on a draft before it is published as an RFC).

Every Working Group has its own mailing list.

Every IETF mailing list is archived. (Unfortunately, the archives for some lists from many years ago, when the IETF did not have its own servers, have been lost.)

Even though the IETF mailing lists "represent" the IETF participants at large, it is important to note that attending an IETF meeting does not mean you'll be automatically added to any list; you'll have to "opt in" directly.

3 IETF Meetings

The computer industry is rife with conferences, seminars, expositions, and all manner of other kinds of meetings. IETF face-to-face meetings are not like these. The meetings, held three times a year, are week-long gatherings with the primary goals of helping Working Groups get their tasks done, and promoting a fair amount of mixing among the WGs and the Areas. IETF meetings are of little interest to sales and marketing folks, but of high interest to engineers and developers.

For many people, IETF meetings are a breath of fresh air when compared to the standard computer industry conferences. There is no exposition hall, few tutorials, and no big-name industry pundits. Instead, there is lots of work, as well as a fair amount of time for socializing for many participants. The IETF believes that having a drink together (often beer in the hotel lobby, but drink whatever you want) is highly conducive to collaboration.

On the other hand, IETFers can sometimes be surprisingly direct, sometimes verging on rude. To build a climate in which people of many different backgrounds are treated with dignity, decency, and respect, the IETF has an anti-harassment policy, a code of conduct, and an Ombudsteam that you can reach out to.

The general flow of an IETF meeting is that it begins with an IETF Hackathon on Saturday and Sunday, tutorials and an informal gathering on Sunday, and WG and BoF meetings Monday through Friday. WG meetings last for between one and 2.5 hours each, and some WGs meet more than once, depending on how much work they anticipate doing. The WG chairs set the agenda for their meeting time(s).

There is a plenary session during the week, sometimes two. Either the first part, or a separate Technical Plenary, will have one or more technical presentations on topics of interest to many Working Groups. This is organized by the IAB. The Administrative Plenary is organized by the IETF Chair, and will have greetings from the meeting sponsor, reports on meeting attendance and IETF finances, and progress reports from most groups mentioned in the "Hierarchy" section above. This ends with an "open mic" session, with the various groups on stage. This is a good time to share administrative concerns; praise is welcome, but more often concerns and gripes are raised.

There have been more than 110 IETF meetings so far. The list of future meetings is available online, and they are also announced on the *ietf-announce* mailing list mentioned above.

Note that COVID-19 disrupted the in-person meetings. After several virtual or online meetings, the IETF tried its first hybrid meeting, in Vienna, in March 2022.

3.1 Registration

To attend an IETF meeting, either online or in person, you have to register and pay a registration fee. If you cannot afford the online registration fee, you can apply for a fee waiver during the registration process. The meeting site (if the meeting is not purely online) is generally announced at several months ahead of the meeting -- earlier if possible. An announcement goes out via email to the *ietf-announce* mailing list, and information is posted on the IETF web site, that same day. Upcoming meeting locations are also mentioned at the plenary, and the host for the next meeting often gives a welcome.

You can register online at the IETF website, or in person throughout the week. There are different fee schedules for early-bird, latecomers, single-day, and so on. The general registration fee covers all of the week's meetings, the Sunday evening *Welcome Reception*, and afternoon beverage and snack breaks.

The IETF and related organizations are committed to transparency and protecting the privacy of individuals. For information about the personal data that is collected, and how it is managed, please see the privacy statement.

You might also consider subscribing to the meeting-specific email list, which is presented as an option when you register to participate in the meeting either in-person or remotely. Discussions on the meetings list can be high volume and fairly wide-ranging about meeting-specific issues, but it is also a channel for sharing information that many find useful to understand what is going on during the meeting itself. Topics often include information about local mass transit, interesting sites to see, desire to buy or sell a social event ticket, and so on. Local experts, people who live in the area, often respond to questions and can be very helpful.

Sunday is an excellent day to join the meeting, unless you already came on Saturday for the hackathon. Sunday is the day for the newcomer's tutorial, as well the Quick Connections session where newcomers get to meet with experienced IETF participants. After these sessions there is the welcome reception, a popular event where you can get a small bite to eat and socialize with other attendees.

During registration, you will be asked to confirm that you agree to follow the *Note Well*. You can also read it, anytime, online. This points out the rules for IETF intellectual property rights (IPR), anti-harassment, and other important guiding policies for the IETF. These slides will also be shown before every WG session; as it gets later in the week, the slide transitions tend to get faster and faster.

If you need to leave messages for other attendees, you can do so at the cork boards that are usually near the IETF registration desk. These cork boards will also have last-minute meeting changes and room changes. The agenda is available online, and changes can happen up to the last minute, such as cancelling a WG meeting.

You can also turn in lost-and-found items to the registration desk. At the end of the meeting, anything left over from the lost-and-found will usually be turned over to the hotel or brought back to the Secretariat's office. Incidentally, the IETF registration desk is often a convenient place to arrange to meet people. If someone says "meet me at registration," you should clarify if they mean the IETF registration desk, or the hotel registration desk: This has been a common cause of missed connections.

3.2 Take the Plunge and Stay All Week!

IETF WG meetings are scheduled from Monday morning through Friday afternoon. Associated non-WG meetings often take place on the preceding or following weekends, and unofficial "side meetings" can also be scheduled during the week. It is best to plan to be present the whole week, to benefit from cross-fertilization between WGs and from hallway discussions (both offline as well as in online environments such as the *gather.town* website). As noted below, the agenda is fluid, and there have been instances of participants missing important sessions due to last-minute scheduling changes after their travel plans were fixed. Being present the whole week is the only way to avoid this annoyance.

If you cannot find meetings all week to interest you, you can still make the most of the IETF meeting by working between sessions. Almost every attendee has a laptop, and it is common to see many of them in the terminal room or in the lobbies and hallways working during meeting sessions. The IETF sets up a high-speed network throughout the hotel for the duration of the meeting, and there's no charge to use the "IETF wifi." This usually covers many places of the meeting venue (restaurants, coffee shops, and so on), so catching up on email when not in meetings is a fairly common task for IETFers.

Note that many people use their laptops actively during meeting sessions for practical purposes such as consulting drafts. Power strips in all meeting rooms and hotel rooms will provide only the sockets permitted by local regulations, so ensure in advance that you have an appropriate travel adapter.

3.3 Newcomer Training

Newcomers should attend the Newcomer's Tutorial on Sunday, which is especially designed for them. The tutorial is organized and conducted by the IETF Education, Mentoring, and Outreach Directorate (*EMODIR*) team and is intended to provide useful introductory information. The session covers the structure of the IETF, how to get the most out of the meeting, and many other essential and enlightening topics for new IETFers. The IETF has a YouTube channel which has the previous tutorials. This has recently been broken down into four 15-minute segments which might be easier to view.

Quick Connections is a session limited to newcomers and experienced IETF participants. It is a great chance to meet people, and establish contacts that can be useful during the rest of the week. Registration is required as space is limited. It is held right before the welcome reception.

3.4 Dress Code

At meetings people generally dress informally, and newcomers could feel out of place if they show up Monday morning in suits. The general rule is "dress for casual comfort." Note that the hotel air conditioning might mean bringing a sweater or other covering as well.

3.5 Working Group Meetings

The heart of an IETF meeting is the WG meetings themselves. Different WGs chairs have very different styles, so it is impossible to generalize how a WG meeting will feel. All WGs have agendas, however, and most will follow the following approach.

At the beginning of the meeting, the chair will pass around the *blue sheets*, which are paper forms on which everyone writes their name and their affiliation. These are archived and used for planning capacity needs for the next time the WG meets. In very rare cases, they have been used to indicate exactly who showed up. When you are handed the sheet, sign your name and pass it along in the same direction. If you arrive after the start, at the end of the meeting you can go up front and sign it then. For virtual attendance using the *MeetEcho* video conference system, attendance is handled by accessing the application.

After the blue sheets, there are calls for volunteers to take minutes. More than one person can do so, and they are often done on a Web page using a collaborative editing app. Taking minutes can be a good way to ensure you follow the discussions without distraction! The link to the web page will be part of the WG entry that is part of the online meeting agenda. There is also a chance to make any last-minute updates to the agenda. This is known as "agenda bashing." Finally, there will be a review of the Note Well. The order in which these things happen can vary, but they are all done before the meeting really "starts."

To speak during a meeting, go to the microphone(s) located near the middle of the room. For controversial topics, there will be a line at the mic, but do not hesitate to be the first person at the line if you have a question or a contribution to the discussion. The WG chair or presenter will indicate when you can speak. Although it would be easier to just raise your hand from where you are sitting, the mics perform a very useful task: they let the people listening remotely and in the room hear your question or comment. When you first speak, say your name and affiliation for identification purposes. If you miss this, folks will often say "name!" to remind you. Don't be embarrassed if this happens, it's not uncommon.

3.6 Seeing Spots Before Your Eyes

Some attendees will have a little colored dot on their name tag, and a few people have more than one. These dots identify people who have volunteered to do extra work, such as being a WG chair, an IESG member, and so on. The colors have the meanings shown here.

Color	Meaning
Blue	Working Group/BOF Chair
Green	Meeting Host/Sponsor
Red	IAB member
Yellow	IESG member
Pink	IRSG member
Orange	Nominating Committee member
Black	IETF LLC Board

Table 3

Members of the press wear orange-tinted badges with the word "press" on them.

As newcomer, don't be afraid to strike up conversations with people who wear these dots. If the IAB and IESG members and Working Group and BOF chairs didn't want to talk to anybody, they wouldn't be wearing the dots in the first place! Note, however, that IETF meetings are usually intense times for Area Directors. Talking to an AD during an IETF meeting will often result in them asking you to send email after the meeting ends. Also, when you start a hallway conversation with an Area Director (or even a WG chair, for that matter), it is often good to give them about 30 seconds of context for the discussion.

Near the registration area there are usually ribbons and markers so that people can label their specific interests, history, and so on. Many people use them to make (inside) jokes, which are sometimes amusing.

3.7 Terminal Room

The IETF wifi is provided by volunteers who run the Network Operations Center (NOC). The terminal room is where you can get wired connectivity and limited access to a printer. The people and companies that donate their equipment, services, and time are to be heartily congratulated and thanked.

You must be wearing your badge in order to get into the terminal room. The terminal room provides power strips, Ethernet ports, and wifi (for the people who don't need Ethernet but want power). What it doesn't provide are terminals; the name is historical. The help desk in the terminal room is also a good place to ask questions about network failures, although they might point you off to different networking staff.

3.8 Meals and Snacks

Although it is true that some people eat very well at the IETF, they find the food on their own since lunches and dinners are not included in the registration fee. In addition to socializing, dinner meetings can be a good way to get additional work done.

If sponsorship for it is secured, the welcome reception provides drinks and appetizers but is not meant to be a full replacement for dinner. Sometimes a continental breakfast can be included with the hotel registration. There IETF meeting also includes a morning coffee and snack break, and a similar one in the afternoon.

If you prefer to get out of the hotel for meals, the local host usually provides a list of places to eat within easy reach of the meeting site, and the meeting-specific email list is also a useful source.

3.9 Social Event

Another of the most important things organized and managed by the host is the IETF social event. The social event is sometimes high-tech-related event, or it might be in an art museum or a reception hall. Note, however, that not all IETF meetings have social events.

Newcomers to the IETF are encouraged to attend the social event. Wear your name tag and leave your laptop behind. The social event is designed to give people a chance to meet on a social, rather than technical, level. The social ticket costs extra, is reserved at registration time, and has limited capacity. People looking to buy or sell a social ticket often post to the email list, or on the corkboards mentioned above.

3.10 Agenda

The agenda for the IETF meetings is a very fluid thing. It is available on the web and through the IETF mobile apps starting a few weeks before the meeting. Of course, "final" in the IETF doesn't mean the same thing as it does elsewhere in the world. The final agenda is simply the last version posted before the meeting. The Secretariat will post agenda changes on the bulletin board near the IETF registration desk (reminder, not the hotel registration desk!). These late changes are not capricious: they are made "just in time" as session chairs and speakers become aware of unanticipated conflicts. The IETF is too dynamic for agendas to be tied down weeks in advance.

A map showing the hotel layout and, specifically the meeting rooms, is also available with the agenda. Room assignments can change as the agenda changes. Some Working Groups meet multiple times during a meeting, and every attempt is made to have a Working Group meet in the same room for each session.

3.11 EMODIR to the Rescue

If, after you finish reading this document, certain aspects of the IETF still mystify you, you'll want to drop in on the on-site training offered by the Education, Mentoring, and Outreach (EMODIR) team. In addition to the Newcomer training mentioned above, EMODIR also hosts informal newcomer gatherings during the coffee break sessions. Details vary for each meeting, so watch the agenda and the newcomer-specific email list.

EMODIR also organized in-depth technical tutorials, useful for newcomers and experienced IETFers alike. These are also announced as part of the program, and are usually on Sundays.

Finally, EMODIR runs the *IETF Guides* program, pairing newcomers with an experienced IETF person to help you become acclimated and effective quickly. This has not worked out very well during the all-virtual meetings, frankly. If you are interested, watch for the announcement.

Ideally you have a call with your mentor before the meeting, a meeting during the beginning of the meeting, and check in some time during the meeting, so they can help you with any questions you might have.

Details on EMODIR membership and charter are available online.

3.12 Where Do I Fit In?

The IETF is different things to different people. There are many people who have been very active in the IETF who have never attended an IETF meeting, and you should not feel obligated to come to an IETF meeting just to get a feel for the IETF. If, however, you decide to come, this document and RFC 4144: How to Gain Prominence and Influence in Standards Organizations provides some pointers on how to make your meeting a success. The following guidelines (based on stereotypes of people in various industries) might help you decide whether you actually want to come and, if so, what might be the best use of your time at your first meeting.

3.12.1 IT Managers

As discussed throughout this document, an IETF meeting is nothing like any trade show you have attended. IETF meetings are singularly bad places to go if your intention is to find out what will be hot in the Internet industry next year. You can safely assume that going to Working Group meetings will confuse you more than it will help you understand what is happening, or will be happening, in the industry.

This is not to say that no one from the industry should go to IETF meetings. As an IT manager, you might want to consider sending specific people who are responsible for technologies that are under development in the IETF. As these people read the current Internet-Drafts and email traffic on the relevant Working Group lists, they will get a sense of whether or not their presence would be worthwhile for your company or for the Working Groups.

3.12.2 Network Operators and ISPs

Knowledge of how networks are run is indispensable for the development of new (versions of) protocols. Especially if you work for the type of network that is always using the very latest hardware and software, and you are already following the relevant Working Groups, you could certainly find participating in the IETF valuable. Note that the IETF has several WGs focused on operations, that might be particularly relevant.

Finally, note that the IETF is increasingly focused on encrypting network traffic, and that this has implications for operators. A fair amount of IETF work also covers many other parts of operations of ISPs and large enterprises, and the input of operators from each of these types of organizations is quite valuable to keep this work vibrant and relevant. Many of the best operations documents from the IETF come from real-world operators, not vendors and academics.

3.12.3 Networking Hardware and Software Vendors

The image of the IETF being mostly network researchers may have been true in the distant past, but the jobs of today's attendees are typically in industry. In most areas of the IETF, employees of vendors are the ones writing the protocols and leading the Working Groups, so it's completely appropriate for vendors to attend. If you create Internet hardware or software, or run a service available on the Internet, and no one from your company has ever attended an IETF meeting, it behooves you to come to a meeting if for no other reason than to tell the others how relevant the meeting was or was not to your business.

This is not to say that companies should close up shop during IETF meeting weeks so everyone can go to the meeting. Marketing folks, even technical marketing folks or pre-sales, are safe in staying away from the IETF as long as some of the technical people from the company are at the meeting. Similarly, it isn't required, or likely useful, for everyone from a technical department to go, especially if they are not all reading the Internet-Drafts and following the Working Group mailing lists. Many companies have just a few designated meeting attendees who are chosen for their ability to do complete and useful trip reports. In addition, many companies have internal coordination efforts and a standards strategy. If a company depends on the Internet for some or all of its business, the strategy should probably cover the IETF, but note that IETF participation is as an *individual* not a formal representative of their employer.

3.12.4 Academics

IETF meetings are often excellent places for all kinds of researchers to find out what is happening in the way of soon-to-be-deployed protocols, and networking architecture and infrastructure. Professors and grad students (and sometimes overachieving undergrads) who are doing research in networking or communications can get a wealth of information by following Working Groups in their specific fields of interest. Wandering into different Working Group meetings can have the same effect as going to symposia and seminars in your department. Researchers are also, of course, likely to be interested in IRTF activities.

In addition, the IRTF and ACM co-host the annual Applied Networking Research Workshop, normally scheduled during the July IETF meeting Registration is required, IETF attendees can attend for free. The IRTF also hosts the Applied Networking Research Prize, which includes a cash prize, a travel grant to attend, and a chance to present. See the web page for requirements.

3.12.5 Computer Trade Press

If you're a member of the press and are considering attending IETF, please see the special section below.

3.13 Proceedings

IETF proceedings are compiled in the weeks and months after each meeting and are available online. Be sure to look through a copy at least once; the proceedings are filled with information about IETF that you're not likely to find anywhere else. For example, you'll copies of every session's slides, links to the video recording, copies of the blue sheets (attendance), and so on.

3.14 Other General Things

IETFers in general are very approachable. Never be afraid to approach someone and introduce yourself. Also, don't be afraid to ask questions, especially when it comes to jargon and acronyms. If someone is presenting an update to their draft, feel free to step up to the mic and ask a clarifying question. Before you do, however, make sure to have read the draft first. Working Group meetings are not a time for general tutorials.

Hallway conversations are very important. A lot of very good work gets done by people who talk together between meetings and over lunches and dinners. Every minute of the IETF can be considered work time (much to some people's dismay).

A side meeting (historically but often inaccurately called a "bar BOF") is an unofficial get-together between WG meetings or in the late evening, during which a lot of work gets done. These side meetings spring up in many different places around an IETF meeting, such as restaurants, coffee shops, unused hall spaces and the like. You can read more about Birds-of-a Feather sessions (BOFs) in section 5.

The IETF meetings, and the plenary session in particular, are not places for vendors to try to sell their wares. People can certainly answer questions about their company and its products, but bear in mind that the IETF is not a trade show.

There is always a "materials distribution table" near the registration desk. This desk is used to make appropriate information available to the attendees (e.g., copies of something discussed in a Working Group session, descriptions of online IETF-related information). Please check with the Secretariat before placing materials on the desk; the Secretariat has the right to remove material that they feel is not appropriate.

3.15 Remote Participation

People have joined IETF meetings remotely for a long time, but the tools for this have changed a lot over the years. Currently the IETF uses a browser- based tool known as *MeetEcho*. There is also a text-based discussion forum called *Jabber*. This is integrated into MeetEcho, but there are also stand-alone clients available. Planned for 2022, the *Zulip* text will be available. Each WG will have its own stream.

The links for the Meetecho rooms, the Jabber chats, and meeting materials, can always be found in the right-hand side of the agenda, under the different icons. All sessions are recorded and can be viewed after the meeting, along with chat logs and meeting minutes. This can be useful to refresh your memory while writing a trip report, or for catching up on what happened when you wanted to be in two WG meetings at once. It happens; scheduling conflicts are unavoidable.

4 Working Groups

The vast majority of the IETF's work is done in its many Working Groups; at the time of this writing, there are well over one hundred different WGs. BCP 25, "IETF Working Group Guidelines and Procedures," is an excellent resource for anyone participating in WG discussions. The full list of working groups can be found on the datatracker.

A WG is really just a mailing list with a bit of supervision and facilitation. You "join" the WG by subscribing to the mailing list; all mailing lists are open to anyone. Anyone can post to a WG mailing list, although non-subscribers have to have their postings approved first.

More importantly, each WG has a charter that the WG is supposed to follow. The charter states the scope of discussion for the Working Group and its goals. The WG's mailing list and face-to-face meetings are supposed to focus on only what is in the charter and not to wander off on other "interesting" topics. Of course, looking a bit outside the scope of the WG is occasionally useful, but the large majority of the discussion should be on the topics listed in the charter. In fact, some WG charters actually specify what the WG will not do, particularly if there were some attractive but nebulous topics brought up during the drafting of the charter. The list of all WG charters makes interesting reading for folks who want to know what the different Working Groups are supposed to be doing. Each WG has its own page on the datatracker.

4.1 Working Group Chairs

Each Working Group has one or two (or, rarely, three) chairs. The role of the WG chairs is described in both BCP 11 and BCP 25.

Chairs have responsibility for the technical and non-technical quality of WG output. The chair must keep the WG productive, and making progress on its drafts. Sometimes there is a WG Secretary to help. Document editors, too, are usually incentivized to make progress on their drafts. The chair must manage WG discussion, both on the list and by scheduling meetings when appropriate. Sometimes discussions get stuck on contentious points and the chair may need to steer people toward productive interaction and then declare when rough consensus has been met and the discussion is over. Sometimes chairs also manage interactions with non-WG participants or the IESG, especially when a WG document approaches publication. As you can imagine given the mix of secretarial, interpersonal, and technical demands, some Working Group chairs are much better at their jobs than others.

4.2 Getting Things Done in a Working Group

One fact that confuses many newcomers is that the face-to-face WG meetings are much less important in the IETF than they are in most other organizations. Any decision made at a face-to-face meeting must also gain consensus on the WG mailing list. This is sometimes phrased as "at the last WG meeting, we decided XXX; if you disagree please speak up by the end of the week" and you'll therefore often hear the phrase "to be confirmed on the list." There are numerous examples of important decisions made in WG meetings that are later overturned on the mailing list, often because someone who couldn't attend the meeting pointed out a serious flaw in the logic used to come to the decision. Finally, WG meetings aren't "drafting sessions" as they are in some other standards bodies: in the IETF, drafting is done elsewhere.

Another aspect of Working Groups that confounds many people is the fact that there is no formal voting. The general rule on disputed topics is that the Working Group has to come to "rough consensus," meaning that a very large majority of those who care must agree, and that those in the minority have had a chance to explain why. Generally consensus is determined by *humming*: if you agree with a proposal, you hum when prompted by the chair. Most hum questions come in three parts: you hum to the first part if you agree with the proposal, to the second part if you

disagree, or to the third part if you do not have enough information to make up your mind. Newcomers find it quite peculiar, but it works. It is up to the chair to decide when the Working Group has reached rough consensus; sometimes the responsible AD will also do so.

The lack of formal voting has caused some very long delays for some proposals, but most IETF participants who have witnessed rough consensus after acrimonious debates feel that the delays often result in better protocols. (And, if you think about it, how could you have "voting" in a group that invites all interested individuals to participate, and when it's impossible to count the participants?) A common definition and practice of humming can be found in RFC 7282: On Consensus and Humming in the IETF.

A related problem is that some people think that their topic should be discussed in the WG even when the WG chair believes it is outside the scope of the charter. If the WG agrees, they can work to *re-charter* so that the topic is in scope. The individual can also bring their concerns to the responsible AD.

When a WG has fulfilled its charter, it is supposed to cease operations. (Most WG mailing lists continue on after a WG is closed, still discussing the same topics as the Working Group did.) In the IETF, it is a mark of success that the WG closes up because it fulfilled its charter. This is one of the aspects of the IETF that newcomers who have experience with other standards bodies have a hard time understanding.

4.3 Working Group Documents

There is an official distinction between WG I-Ds and individual I-Ds. A WG will have to review an individual draft before deciding if it should be adopted by the WG. The WG chairs appoint who will be the authors or editors of the I-Ds; often those who wrote the initial draft continue work on behalf of the WG. Procedures for Internet-Drafts are covered in much more detail later in this document.

For Working Group documents, the document editor serves at the pleasure of the WG Chair. There is often more than one editor for Working Group documents, particularly for complex documents. The document editor is responsible for ensuring that the contents of the document accurately reflects Working Group decisions; when a document editor does not follow the WG consensus, the WG Chairs will either be more forceful about getting changes that match the consensus or replace the document editor with someone more responsive to the WG. As a Working Group document is progressing, participants suggest changes on the Working Group's mail list (or online if the document is maintained somewhere accessible); the editors are expected to follow the discussion and make changes when there is consensus.

Sometimes a Working Group will consider several alternatives before selecting a particular Internet-Draft as a Working Group document. A Working Group will often take ideas from several of the alternatives to create a single Working Group document; in such a case, the chair determines who will be listed as authors on the title page and who will be acknowledged as contributors in the body of the document.

When a WG document is ready to progress beyond the WG, the WG Chairs will assign a "shepherd" to take over the final process. The role of the document shepherd is described in RFC 4858: Document Shepherding from Working Group Last Call to Publication. The chair, who knows the history of the draft within the WG, often does the shepherd write-up.

4.4 Preparing for Working Group Meetings

The most important thing that **everyone** should do before coming to a face-to-face meeting is to read the Internet-Drafts and RFCs ahead of time. WG meetings are explicitly not for education: they are for developing the group's documents and often the document is presented as a set of slides saying "here's what changed since last meeting." Even if you do not plan to say anything in the meeting, you should read, or at least skim, the group's documents before attending so you can understand what is being said.

It's up to the WG chairs to set the meeting agenda, usually a few weeks in advance. If you want something discussed at the meeting, be sure to let the chair know about it. The agendas for all the WG meetings are available in advance on the datatracker, and links to will be found on every full meeting agenda. Unfortunately, some WG chairs are lax (if not totally negligent) about turning them in.

The Secretariat only makes the full IETF meeting schedule a few weeks in advance, and the schedule often changes as little as a week before the first day. If you are only coming for one WG meeting, you may have a hard time booking your flight with such little notice, particularly if the Working Group's meeting changes schedule. Be sure to keep track of the current agenda so you can schedule flights and hotels. But, when it comes down to it, you probably shouldn't be coming for just one WG meeting. It's likely that your knowledge could be valuable in a few WGs, assuming that you've read the I-Ds and RFCs for those groups. Work in the IETF is often reciprocal, contribute positively to others work and you are more likely to receive comments and feedback on your work.

If you are on the agenda at a face-to-face meeting, you should prepare a few slides and mail them to the chair before the meeting. Don't come with a tutorial; people are supposed to read the I-Ds in advance. Projectors for laptop-based presentations are available in all the meeting rooms.

And here's a tip for your slides: don't put your company's logo on every one, even though that is a common practice outside the IETF. The IETF frowns on this kind of corporate advertising (except for the meeting sponsor in the plenary presentation), and most presenters don't even put their logo on their opening slide. The IETF is about technical content, not company boosterism. Slides are often plain black and white for legibility, with color used only when it really adds clarity. Again, the content is the most important part of the slides, not how it's presented.

One thing you might find helpful, and possibly even entertaining, during Working Group sessions is to follow the running commentary on the Jabber room associated with that Working Group. Jabber is a free, streaming XML technology mainly used for instant messaging. You can find pointers to Jabber clients for many platforms at (https://xmpp.org/xmpp-software/clients). The Jabber chatrooms have the name of the Working Group followed by "@jabber.ietf.org". Those rooms are, in fact, available year-round, not just during IETF meetings, and some are used by active Working Group participants during protocol development.

4.5 Working Group Mailing Lists

As we mentioned earlier, the IETF announcement and discussion mailing lists are the central mailing lists for IETF activities. However, there are many other mailing lists related to IETF work. For example, every Working Group has its own discussion list. In addition, there are some long-term technical debates that have been moved off of the IETF list onto lists created specifically for those topics. It is highly recommended that you follow the discussions on the mailing lists of the Working Groups that you wish to attend. The more work that is done on the mailing lists, the less work that will need to be done at the meeting, leaving time for cross pollination (i.e., attending Working Groups outside one's primary areas of interest in order to broaden one's perspective).

The mailing lists also provide a forum for those who wish to follow, or contribute to, the Working Groups' efforts, but can't attend the IETF meetings. That's why IETF procedures require all decisions to be confirmed "on the list" and you will often hear a WG chair say, "Let's take it to the list" to close a discussion.

Every WG has a dedicated page on the datatracker site, and the "About" tab will point to mailing list subscription and archives.

4.6 Interim Working Group Meetings

Working Groups sometimes hold interim meetings between IETFs. Interim meetings aren't a substitute for IETF meetings, however -- a group can't decide to skip a meeting in a location they're not fond of and meet in Cancun (or even someplace mundane) three weeks later, for example. Interim meetings need to be announced at least one month in advance. Location and timing need to allow fair access for all participants. Like regular IETF meetings, someone needs to take notes and the group needs to take attendance. Decisions tentatively made during an interim WG meeting must still be confirmed on the mailing list. Interim meetings are subject to the IETF Note Well. Most interim meetings are virtual these days and have the same reporting requirements as face-to-face virtual meetings.

The IESG has rules for advance notice on time and place of interim Working Group meetings, as well as reporting the results of the meetings. The purpose of these rules is to make interim meetings accessible to as many Working Group members as possible and to maintain the transparency of the Working Group process.

5 BOFs and Dispatching

In order to form a Working Group, you need a charter and someone who is able to be chair. In order to get those things, you need to get people interested so that they can help focus the charter and convince an Area Director that the project is worthwhile. A face-to-face meeting is useful for this. In fact, very few WGs get started without an initial meeting.

A *Birds of a Feather* (BOF) meeting has to be approved by the Area Director in the relevant area, in consultation with the IESG and the IAB, before it can be scheduled. If you think you need a new WG, approach an AD with your proposal and see what they think. You will have to write some informative background text, and they will work with you to get it scheduled. Of course, you can also gather interested people and work on a draft charter in the meantime.

BOF meetings have a very different tone than do WG meetings. The purpose of a BOF is to make sure that a good charter with good milestones can be created, that there are enough people willing to do the work needed in order to create standards, and that any standards would get adoption. Often a self-selected group of key people will get together after the BOF to refine the draft charter.

Generally, there are only two BOF meetings allowed for the same topic. Sometimes it is obvious after one meeting that a WG should be created, and sometimes it is obvious a WG would not be successful.

If you have a draft already written, you can submit it to the relevant "dispatch" WG. Each area has one of these. Their job is to review submitted documents, and come to a decision about the next steps: possibilities include create a new WG, send to an existing WG, hold a BOF, and so on.

An advantage of using the dispatch WG compared to a BOF is that the discussion is more limited and focused. On the other hand, a draft might tend to limit what the other folks in the BOF want to do in the charter. Remember that most BOFs are held in order to get support for an eventual Working Group, not to get support for a particular document.

6 RFCs and Internet-Drafts

This section discusses Internet-Drafts and RFCs in the IETF stream, that is, it describes how documents are produced and advanced within the IETF. For a brief note on other RFC streams, see above.

If you're a new IETF participant and are looking for a particular RFC or Internet-Draft, you can use the IETF *Datatracker*. This website, https://datatracker.ietf.org/, has a text search capability (including content, keywords, author, and so on), and the search results point to the document status, page count, and other useful information. A little-known hint is that *dt.ietf.org* is an abbreviation (a DNS CNAME entry) for the longer "datatracker.ietf.org" hostname.

Most RFCs in the IETF stream follow the same process, and the sections below discuss the process and some of the issues. Note that there are other ways to get an RFC published, particularly if it is not intended for the standards track. For the sake of brevity, we will not mention those here. After all, this document is about "the Way of the IETF" and the main Way is "developing standards."

If you are interested in learning more about how to author an Internet-Draft yourself, the I-D Authors website has a lot of information and resources, including pointers to online tools that can help.

6.1 The Overall Process

The very first step is to have a draft document. Internet-Drafts should follow a specific format, and are required to have particular sections. This will be discussed more below.

RFCs are generally written by a Working Group. If an appropriate WG doesn't seem to exist, then the BOF or Dispatch process mentioned above can be used to learn which one is appropriate, or start the process to create one.

Once a potential WG exists, the document must be *adopted*. To do this, you submit your individual draft to the datatracker. It should start with `draft-YOURNAME-brief-subject` where *YOURNAME* is your name. Send a note to the WG mailing list, with an introduction to the draft, and why you think it is appropriate. After any discussion, the WG Chair will issue a *call for adoption*. If consensus is to adopt the draft, you will be asked to submit it with the name `draft-ietf-WGNAME-brief-subject`; you can probably guess what *WGNAME* should be.

Note that as part of submitting an Internet Draft according to the rules, you grant the IETF certain rights. These rights give the IETF the ability to reliably build upon the work you have brought forward. These rights are held by the IETF Trust. BCP 78 explains the certain rights the IETF Trust takes on for submissions.

Once a WG adopt a document, the WG as a whole has the right of "change control." This means the WG, can make any changes to the document, the one you initially wrote, that they want. If you are not comfortable with this, then the IETF is not the place for your document. There are a few more details on this below.

The WG now "works on" the document. This will be a combination of mailing list discussion, perhaps agenda time at a meeting, and publishing updated drafts. (Every draft ends with *-NN* where the digits indicate the draft number.)

At some point, the document will seem finished. The WG Chair will put the document in *WG Last Call* (WGLC) which gives the members of the WG a chance for last-minute changes. It can be frustrating to get a bunch of changes after you think you're done, but don't take it personally. Like many things, people are often deadline-driven.

After WGLC, the responsible AD (the one who oversees the WG) does a review. They will probably have comments that must be resolved by you and the WG; it's quite likely you'll have to publish a new draft. Then the IESG and the overall IETF reviews the draft, as mentioned above. The purpose of IETF Last Call is to get community-wide discussion on documents before the IESG considers them. Note the word *discussion* here. It is generally considered bad form to send IETF Last Call comments on documents that you have not read, or to send comments but not be prepared to discuss your views. The IETF Last Call is not a vote. Having said that, IETF Last Call comments that come from people who have just read the document for the first time can expose issues that IETF and WG regulars may have completely missed, which is why the discussion is open to everyone.

Finally, the draft is given to the RFC Production Center (RPC), and prepared for publication. There might be other changes required, including reviews by IANA for registrations and the like. The most common item you'll hear about this is *AUTH48* state, which means the document is in the final stages of copy-editing by the RPC and you. The publication process can take weeks, but be patient, and you'll eventually see an email announcement saying that your brand-new RFC has been published. Congratulations!

A much more complete explanation of these steps is contained in BCP 9. This set of documents goes into great detail on a topic that is very often misunderstood, even by seasoned IETF participants: different types of RFCs go through different processes and have different rankings.

6.2 Common Issues

There are two major issues that often come up while preparing I-Ds: copyright and patents.

We discussed copyright above, but expand on it here. When the IETF adopts an Internet-Draft, it is required that the *boilerplate*, the common text that appears in every draft, has a notice that says the IETF, *and the document authors* own the copyright. This means that while the IETF can do what it wants with the document, within limitations so can you. You cannot, for example, claim this is an IETF standard, nor use the IETF trademarks.

Incidentally, the change control on Internet standards doesn't end when the RFC is published. Things can be changed later for a number of reasons, such as to solve a newly-discovered problem or address new use-cases. These later changes are also under the control of the IETF, not the editors of the standards document.

The second issue is patents. The goal of the IETF is to have its standards widely used and validated by the marketplace. If creating a product that uses a standard requires getting a license for a patent, people are less likely to implement the standard. Not surprisingly, then, the general rule has been "use good non-patented technology where possible."

Of course, this isn't always possible. Sometimes patents appear after a standard has been established and there is little the IETF can do about that. Sometimes there's a patent on something that is so valuable that there isn't a non-patented equivalent, and generally the IETF tries to avoid it.

Sometimes the patent holder is generous and promises to give all implementors of a standard a royalty-free license to the patent, thereby making it almost as easy to implement as it would have been if no patent existed. Ideally, and this is the common case when a patent-holder is active in a document, the patent holder will grant free use of the patent to implement the specification.

The official rules for all intellectual property rights (IPR) in IETF documents, not just patents but also code samples and the like, are covered in BCP 78 and BCP 79.

If you are writing an Internet-Draft and you know of a patent that applies to the technology you're writing about, don't list the patent in the document. Instead, consult the IPR disclosures page. If you still have issues, consult with the WG Chair or the responsible AD. Intellectual property rights aren't mentioned in RFCs because RFCs never change after they are published,

while knowledge of IPR can change at any time. Therefore, an IPR list in an RFC could be incomplete and mislead the reader. BCP 79 provides specific text that should be added to RFCs where the author knows of IPR issues.

6.3 Writing an Internet-Draft

Every RFC starts its life as an I-D. Internet-Drafts have the same format as an RFC, and are required to have all the content that should appear in the RFC. This includes a couple of sections detailed below. A draft may also have more information, such as an incremental list of changes from previous versions of the draft, or pointers to online locations for raising issues and suggesting changes.

For the past several years, the official canonical source of RFCs as RFC 7991: The "xml2rfc" Version 3 Vocabulary. Some people enjoy writing in XML, and some don't. An alternative for the second group is to use a specific dialect of markdown, which is then converted to XML as needed (and especially during the publication process). A recent trend is the increasing use of markdown, and hosting I-Ds on GitHub to attract a wider audience of Internet-savvy users. Some information on this can be found at RFC 8874: Working Group GitHub Usage Guidance.

The IETF is setting up a new site, https://authors.ietf.org, to contain guides and online tools to help both new and experienced authors. As of this writing, it's still a draft but it does contain a great deal of useful content. You should feel free to use the site, and offer feedback.

Outside of the formatting decision, the most important document you can read is Guidelines to Authors of Internet-Drafts. That document explains the naming conventions, formatting requirements, required content, and details of how to submit (also called *post*) your draft.

6.3.1 Internet-Draft Language

It is common for Internet-Drafts that revise existing RFCs to have draft names with "bis" in them, meaning "again" or "twice." For example, a draft might be called "draft-ietf-uta-rfc6125bis" meaning that this is intended to be a revision of, and eventual replacement for, RFC6125.

Writing clear specifications can be a bit of an art, particularly for people who don't have English as their native language. You can keep the specification very short, with just a list of requirements, but that tends to cause implementors to take too much leeway. If you instead make the specification very wordy with lots of suggestions, implementors tend to miss the requirements (and often disagree with your suggestions anyway). An optimal specification is somewhere in between.

One way to make it more likely that developers will create interoperable implementations of standards is to be clear about what's being mandated in a specification. Over time, the IETF has realized that defining a few words with specific meanings helps a great deal. BCP 14 defines about a dozen keywords that can be used to clarify what are requirements, as compared to what is purely informative. It defines the meaning of words like *MUST* and points out that it has to appear in all uppercase to its special meaning.

It is not uncommon for feedback on standards-track I-Ds to question the particular uses of what is called "2119 language." For example, "The document says MAY but doesn't explain why not; should it be a MUST?"

6.3.2 About References

One aspect of writing IETF standards that trips up many newcomers is the rule about how to make *normative references* to non-IETF documents or to other RFCs in a standard. A normative reference is a reference to a document that must be followed in order to implement the standard. A non-normative reference (sometimes called an *informative reference*) is one that is helpful to an implementor but not strictly needed to implement it.

An IETF standard may make a normative reference to any other standards-track RFC that is at the same standards level or higher, or to any "open standard" that has been developed outside the IETF. The "same level or higher" rule means that before a standard can move from Proposed to Internet Standard, all of the RFCs that appear as a normative reference must also be an Internet Standard. This rule gives implementors assurance that everything in an Internet standard is quite stable, even the things referenced outside the standard. This rule, and its exceptions, is described in BCP 97.

There is no hard-and-fast rule about what is an "open standard", but generally this means a stable standard that was made by a generally-recognized SDO, and that anyone can get a copy of, although not necessarily for free. If the external standard changes, you have to reference the particular instantiation of that standard in your specification, as with a designation of the date of the standard. Some external standards bodies don't make old standards available, which is a problem for IETF standards that need to be used in the future. When in doubt, ask the WG chair or AD if a particular external standard can be used in an IETF standard.

6.3.3 About Required Content

Every draft is required to have some content. Some of this is boilerplate text about copyright, "2119 keyword," and so on. The document formatting tools will generate this for you automatically if you use the right keyword. In addition, there are special sections that might be required for your draft, and you (and the WG) will have to write them.

Many IETF standards have extension points, such as unassigned fields in a message header, or for something like email or HTTP, an actual message header. As mentioned above, IANA maintains online registries for these. Because of the large and diverse kinds of registries that standards require, IANA needs to have specific information about how to register parameters, what not to register, who (if anyone) approves any registration requests, and so on.

Anyone writing a draft that needs one or more registries, or adds values to existing registries must have an "IANA Considerations" section. Authors should read BCP 26, "Guidelines for Writing an IANA Considerations Section in RFCs," which describes how to properly ask for IANA to make the changes requested in their draft. If there are no considerations, it is a good idea to have the section and explicitly say "This document has no IANA requests."

Every draft must have a "Security Considerations" section. This describes possible threats or attacks, known vulnerabilities, information that could be exposed, and so on. It should also describe any strategies or mechanisms to mitigate them. When the security directorate (SECDIR) reviews your draft, this section will be one of their major focuses. Don't gloss over the section, or say things like "use TLS to get security" without explaining how the protocol uses TLS and what it provides. See BCP 72, "Guidelines for Writing RFC Text on Security Considerations", for more information on writing good security considerations sections.

Also, a draft might have a "Privacy Considerations" section. An Informational RFC, RFC 6973: Privacy Considerations for Internet Protocols, written by the IAB, is intended to raise the general awareness of privacy on the Internet. It also provides advice for when a draft should have an explicit privacy section.

Some drafts benefit from having an "Implementation Status" section, as explained by BCP 205: Improving Awareness of Running Code: The Implementation Status Section.

More detail on the required content can be found online.

6.4 Standards-Track RFCs

If the IESG approves the draft to become a standards-track RFC, they ask the RPC to publish it as a *Proposed Standard*.

Don't be surprised if a particular standard doesn't progress from Proposed Standard to Internet Standard. To become an Internet Standard, an RFC must have multiple interoperable implementations and the unused features in the Proposed Standard must be removed; there are additional requirements listed in BCP 9. Most of the protocols in common use are Proposed standards and never move forward. This may be because no one took the time to try to get them to Internet Standard, or some of the normative references in the standard are still at Proposed standard, or it may be that everyone found more important things to do.

6.5 RFCs Other than Standards-Track

As mentioned earlier, not all RFCs are standards. In fact, many important RFCs are not on the standards track at all. At the time of writing, there are also categories for Informational, Experimental, Best Current Practice, and Historical for standards that are no longer recommended for use. The role of Informational RFCs can be confusing, and people sometimes refer to them as "standards," when they are not.

Experimental RFCs are for specifications that are interesting, but for which it is unclear if there will be widespread deployment, or if they will scale to work after such deployment. That is, a specification might solve a problem, but there might not be IETF consensus that the problem is worth solving or that the specification is complete enough to address the problem. Experimental RFCs are also used to get people to experiment with a technology that looks like it might be standards-track material, but for which there are still unanswered questions.

The IESG has created guidelines that can help choose between Informational and Experimental classification. This is a short informal read, and if are not sure where your document fits, it is worth reading.

Finally, there are two sub-series of RFCs: Best Current Practice (BCP) and Internet Standards (STD). BCP describes the application of various technologies in the Internet, and are also commonly used to document the many parts of the IETF process. The STD sub-series was created to identify RFCs that do in fact specify Internet standards.

These are an example of the aphorism that everything in computer science can be solved by a layer of indirection. For example, a single BCP can refer to one or more RFCs, and the specific RFCs can change such as when a new version of a protocol is published. Likewise, some STDs are actually sets of more than one RFC, and the "standard" designation applies to the whole set of documents.

7 How to Contribute to the IETF

7.1 What You Can Do

Read: Review the Internet-Drafts in your area of expertise and comment on them in the Working Groups. Participate in the discussion in a friendly, helpful fashion, with the goal being the best Internet standards possible. Listen much more than you speak. If you disagree, debate the technical issues: never attack the people.

Implement: Write programs that use the current Internet standards. The standards aren't worth much unless they are available to Internet users. Implement even the "minor" standards, since they will become less minor if they appear in more software. Report any problems you find with the standards to the appropriate Working Group so that the standard can be clarified in later revisions. Remember the tenet, "rough consensus and running code," so you can help support the standards you want to become more widespread by creating more running code. You can help the development of protocols before they become standards by implementing I-Ds (but not doing wide-spread deployment) to ensure that the authors have done a good job. If you find errors or omissions, offer improvements based on your implementation experience. A great way to get involved in this is by participating in the Hackathons.

Write: Edit or co-author Internet-Drafts in your area of expertise. Do this for the benefit of the Internet community, not to get your name (or, even worse, your company's name) on a document. Draft authors receive kinds of technical (and, sadly, sometimes personal) criticism. Take the technical comments with equanimity and use it to improve your draft in order to produce the best and most interoperable standard, and ignore the personal ones.

7.2 What Your Company Can Do

Share: Avoid proprietary standards. If you are an implementor, exhibit a strong preference for IETF standards. If the IETF standards aren't as good as the proprietary standards, work to make the IETF standards better. If you're a purchaser, avoid products that use proprietary standards that compete with the open standards of the IETF and tell the vendors that you are doing so.

Open Up: If your company owns a patent that is used in an IETF standard, convince the company to make the patent available at no cost to anyone who is implementing the standard. Patents have previously caused many serious problems for Internet standards because they prevent some companies from being able to freely implement them. Fortunately, many companies have

generously offered unlimited licenses for particular patents in order to help the IETF standards flourish. These companies are usually rewarded with positive publicity for the fact that they are not as greedy or short-sighted as other patent-holders.

Support: The IETF has sponsorship opportunities and an endowment which can also take individual-sized donations. Become a member of ISOC. Urge any company that has benefited from the Internet to contribute, since this has the greatest financial benefit for the group. It will, of course, also benefit the Internet as a whole.

8 IETF and the Outside World

While some IETF participants would like to think otherwise, the IETF does not exist in a standards vacuum. This section discusses two important groups.

8.1 IETF and Other SDOs

There are many other standards organizations whose decisions affect the Internet. Some of them ignored the Internet for a long time and now want to get a piece of the action. In general, the IETF tries to have cordial relationships with other SDOs. This isn't always easy, since they usually have different structures and processes than the IETF does, and the IETF is mostly run by volunteers who would probably prefer to write standards rather than meet with representatives from other bodies. Even so, many SDOs make a great effort to interact well with the IETF despite the obvious cultural differences.

As stated in BCP 39, the IAB Charter: "Liaisons are kept as informal as possible and must be of demonstrable value in improving the quality of IETF specifications." In practice, the IETF prefers liaisons to take place directly at the WG level, with formal relationships and liaison documents in a backup role. The best place to check to see whether the IETF has any formal liaison at all is the list of IETF liaisons.

At the time of this writing, the IETF has around two dozen liaisons. Some of these liaison tasks fall to the IESG, whereas others fall to the IAB. Full details about the processes for dealing with other SDOs can be found in BCP 102 and BCP 103.

8.2 Press Coverage of the IETF

Given that the IETF is one of the best-known bodies that is helping move the Internet forward, it's natural for the media to cover its actions. But it can be hard to cover the IETF; a common mistake is reporting an individual's Internet-Draft as something the IETF is working on, or that the IETF has approved a new standard when it was an Informational or Individual RFC. Often, the press is not really to blame for the problem, as they might have been alerted to the story by a company trying to get publicity for a protocol, or they see the latest "controversy" on social media.

Reporters who want to find out about "what the IETF is doing" on a particular topic would be well-advised to talk to more than one person who is active on that topic in the IETF, and should probably try to talk to the WG chair in any case. It's impossible to determine what will happen

with a draft by looking at the draft or talking to the draft's author. Fortunately, all WGs have archives that a reporter can look through for recent indications about what the progress of a draft is; unfortunately, few reporters have the time or inclination to do this kind of research.

Reporters looking for information about the IETF, or pointers to IETF participants working on a particular topic relevant to the IETF, should send a message to media@ietf.org, and a full page of contacts for a variety of needs is available online. Replies are usually sent within a day. Even if a direct answer to a particular query is not available, pointers to resources or people who can provide more information about a topic are often provided.

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