An IETF Tutorial - All you wanted to know about the IETF

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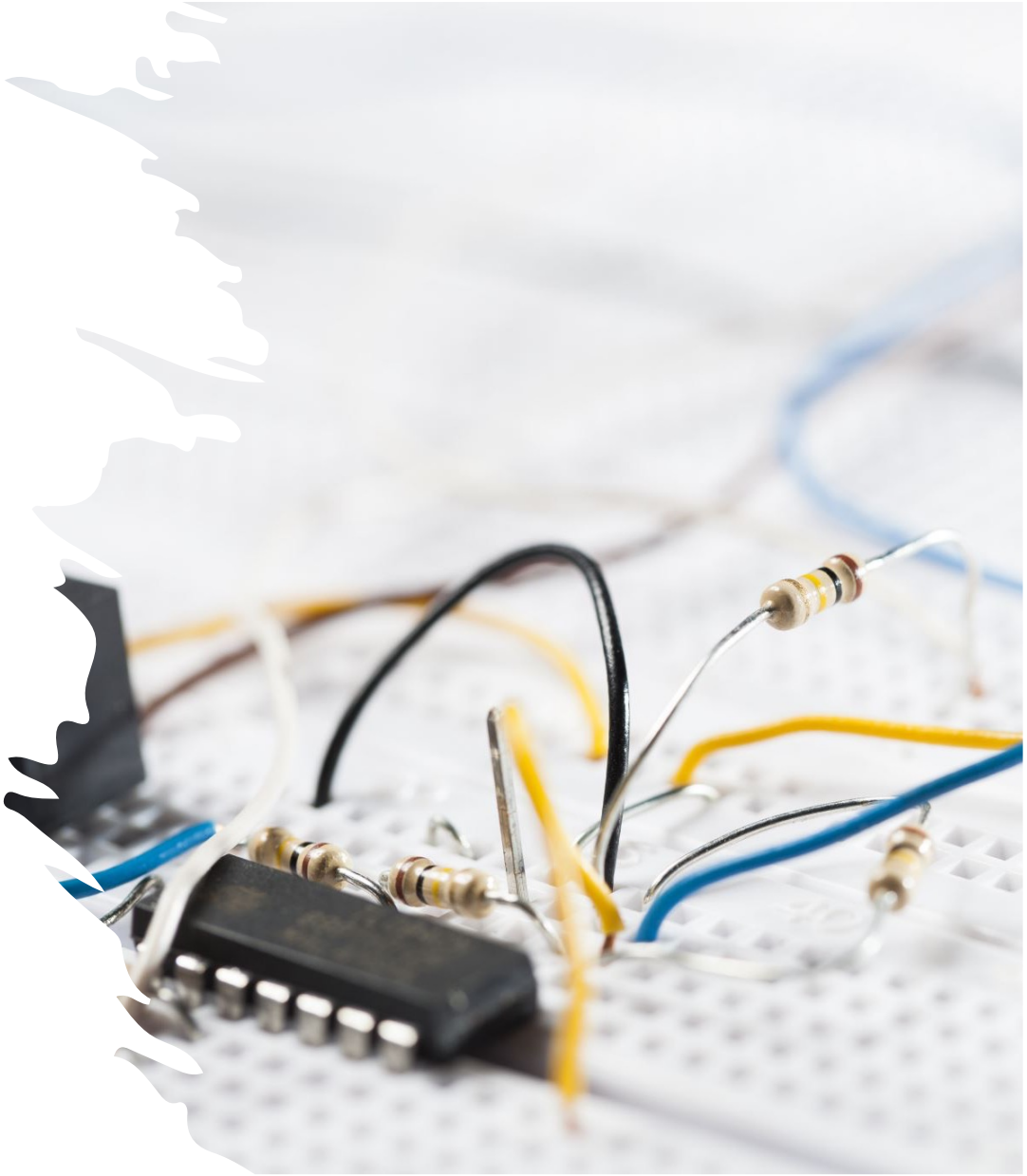
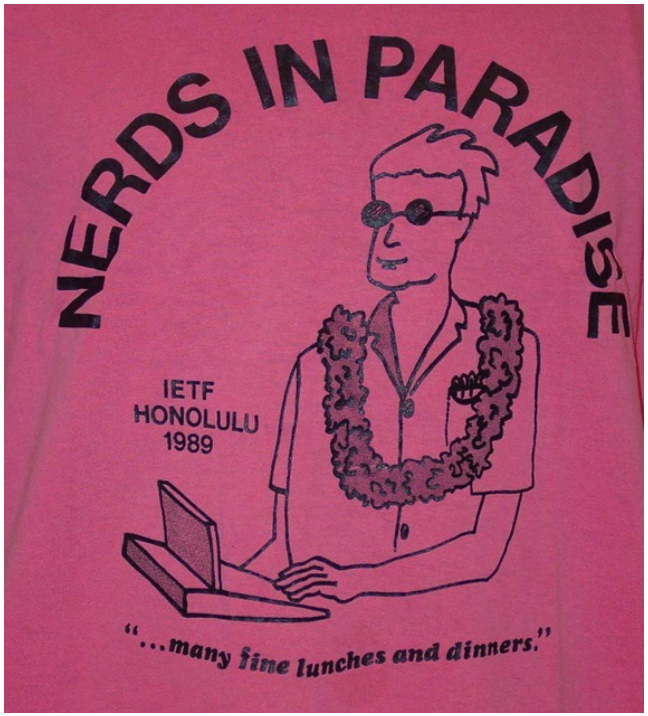


ALL you wanted to know?

- Well, maybe not everything, but I'll try to share my own experience as a long standing IETF participant in this presentation

My IETF History

- 1st IETF Meeting – IETF 15 November 1989 Honolulu



My IETF History

- 1st IETF Meeting – IETF 15 November 1989 Honolulu
- I've attended at least 100 IETF meetings since then (I've lost count!)
- Member of the Internet Architecture Board: 1999 – 2005
- Chaired the TACIT, SHIM6, GROW, and SIDR Working Groups
- (Currently) Co-Chair of the the DNS Directorate

IETF Meetings

3rd IETF

July 23-24, 1986; Ann Arbor, Michigan, USA; University of Michigan.
18 Attendees
Proceedings (PDF)

2nd IETF

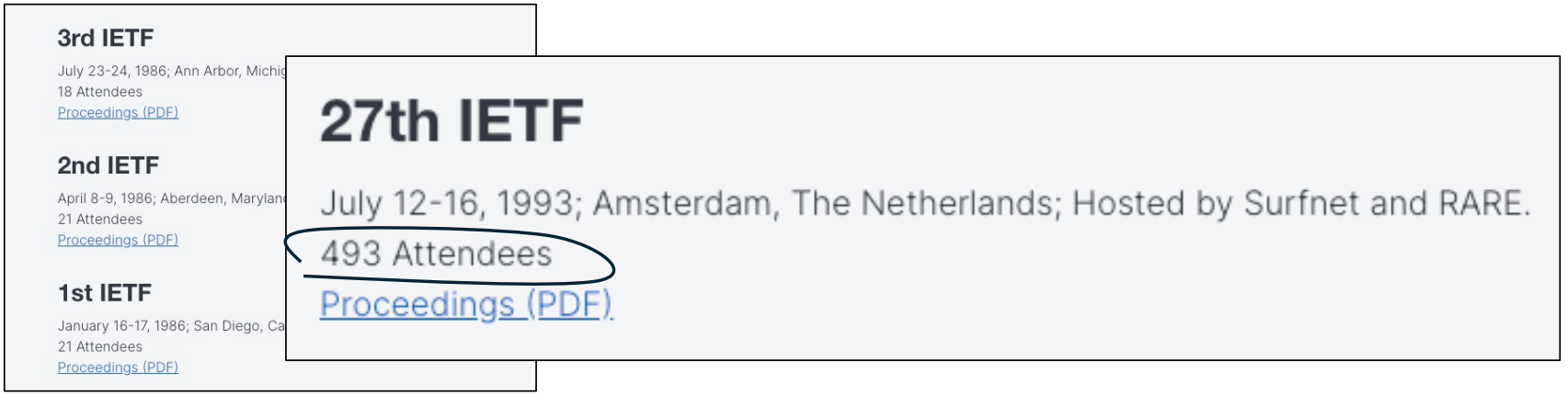
April 8-9, 1986; Aberdeen, Maryland, USA; Army Ballistics Research Lab.
21 Attendees
Proceedings (PDF)

1st IETF

January 16-17, 1986; San Diego, California, USA; Linkabit.
21 Attendees
Proceedings (PDF)

Outgrowth of the ARPA network with the advent of the NSF internet project that expanded the network to a set of US universities. Strong researcher participation, scant vendor interest!

IETF History



First IETF hosted outside the US

IETF History

First IETF with more than 1,000 attendees

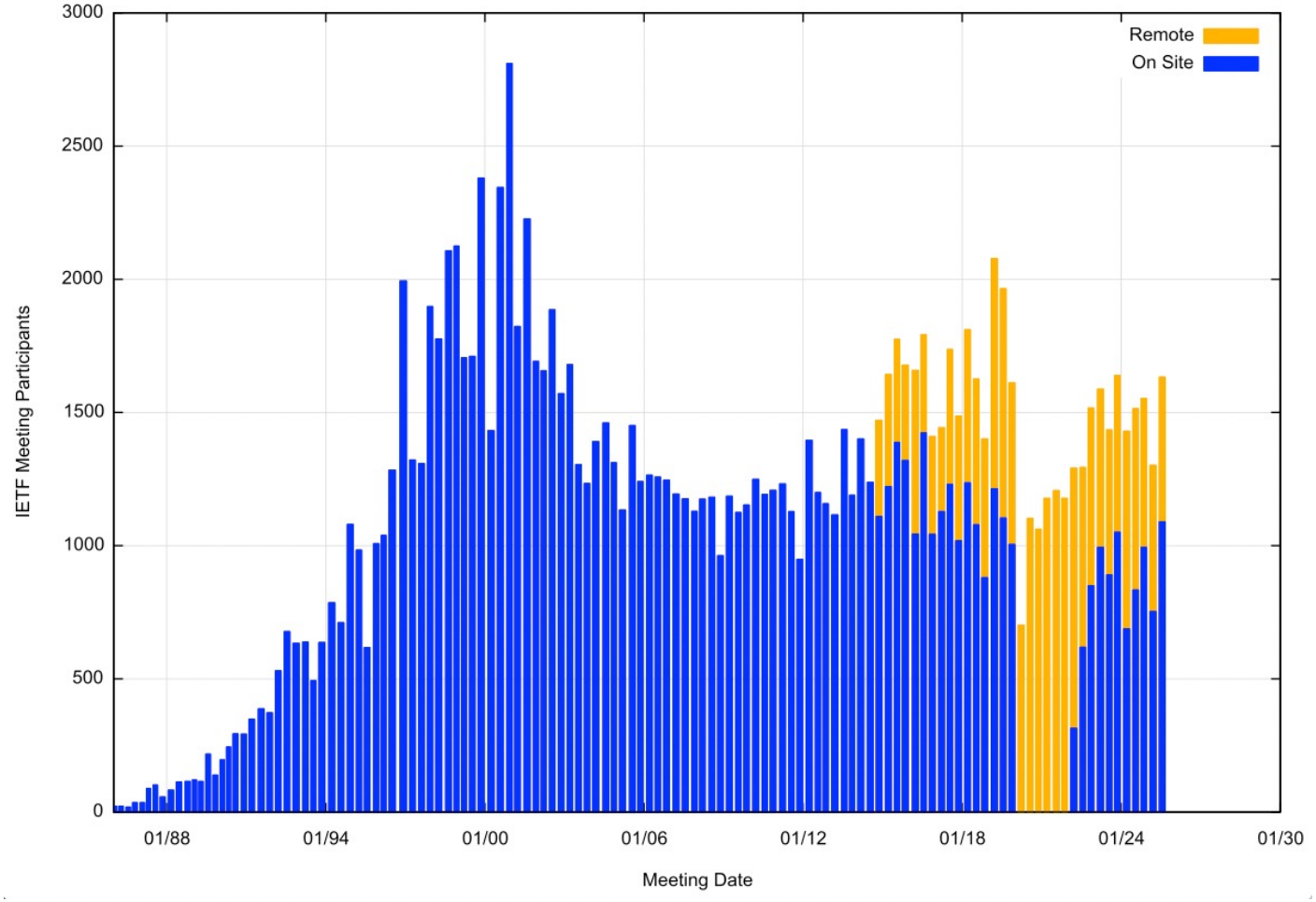
IETF History

The formation of a "standalone" IETF

IETF History

Latest IETF Meeting

IETF Meeting Attendance



IETF Meetings

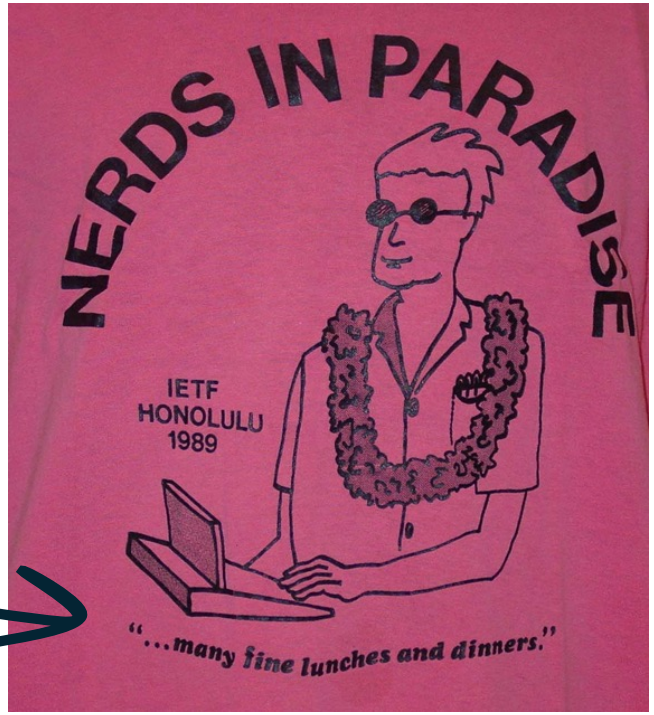
IETF meetings are a 7-day event that includes:

- Working Group Sessions
- Birds of a Feather Sessions
- Area-wide Sessions
- IRTF Research Group sessions
- Plenary sessions
- Tutorials
- Social Events
- Hackathon and Code Sprints
- And a whole raft of various side-meetings and business meetings

IETF Meetings

As well as:

- Hallway conversations
- Editing sessions
- Informal brainstorming
- Many fine lunches and dinners!



IETF Meeting Locations

- Originally the IETF met in US locations, with a couple of excursions to Canada
- The IETF first ventured off to Europe in 1993, to Amsterdam, and finally met in the Asia /Pacific region in 2000, in Adelaide
- These days the IETF rotates between Asia/Pacific, US/Canada, and Europe for its meetings each year

Asia/Pacific Meetings

- March 2025 – Bangkok
- March 2024 – Brisbane
- March 2023 – Yokohama
- November 2019 – Singapore
- November 2018 – Bangkok
- November 2017 – Singapore
- November 2017 – Seoul
- November 2015 – Yokohama
- November 2014 – Honolulu
- November 2011 – Taipei
- November 2010 – Beijing
- November 2009 – Hiroshima

March 2004 – Seoul
July 2002 – Yokohama
March 2000 - Adelaide

The IETF is a Standards Body

- The IETF's purpose is to generate Standard Specifications of technologies that can be used by product manufacturers and product buyers to specify product conformance to a set of behaviours, interoperability and performance
- The primary output of the IETF is the RFC document series ("Request for Comment")

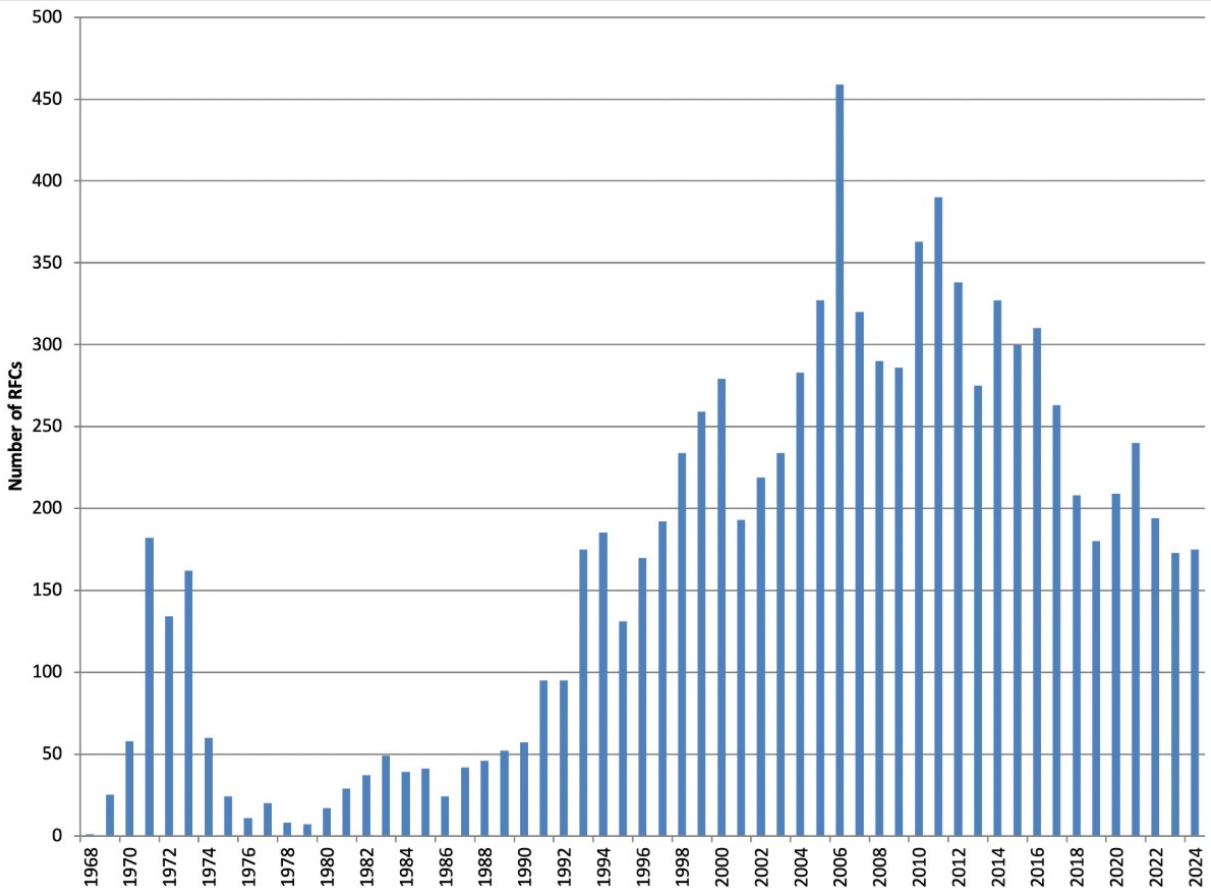
IETF RFC Publication

The RFC document series originated in 1969 to hold the working notes for the ARPAnet research program

The RFC collection now has some 9,879 documents, organized into Standard Track, Experiments, Best Current Practice, Informational, Updated and Historic

Landmark RFCs:

- RFC 791, Internet Protocol, Sep 1981
- RFC 793, TCP, Sep 1981
- RFC 1883, IPv6, Dec 1985
- RFC 1034, Domain Names, Nov 1987
- RFC 1771, BGP-4, Mar 1995



https://www.rfc-editor.org/rfcs-per-year/

Overview

- Peak IETF meeting attendance occurred back in 2000
- In-person attendance has been slowly declining since then, although the rise in online attendance has offset that decline to some extent
- Peak RFC publication occurred in 2011 (400 RFCs p.a.)
- The current RFC publication rate is now below 200 RFCs p.a.

The Culture of the IETF

It's not "conventional" international technology standards body:

- It is **not** a meeting of government representatives nor a peak body of a set of national standards bodies (as compared to the ISO or the IEC)
- Its **not** based in an international treaty (as compared to the ITU)
- It has **no formal membership** structure – There are no qualifications of preconditions to participating in IETF activities
- It does **not** adopt standards by voting, or ballots or any other formal means of counting expressions of support or opposition
- It's process is fixed, but flexible at the same time!
- It's outcomes (RFCs) are openly available without charge or constraint – RFCs are copyrighted by the IETF, but are made freely available
- RFCs are **not** mandatory to adopt

The Culture of the IETF

The IETF is perhaps best described as a fluid collection of interested subject matter experts

- There IETF has no concept of a “standing” membership
- Individual experts contribute to the work of a working party on the basis of their interest and expertise in the subject matter
- These contributions are open, not qualified by any forms of non-disclosure provisions, and permit the IETF process to develop these contributions during the standards process

The Culture of the IETF

- From time to time the IETF has achieved consensus on positions of opinion:
  - RFC 7258 ”Pervasive Monitoring is an Attack” which states the position that “Pervasive monitoring is a technical attack that should be mitigated in the design of IETF protocols, where possible.”
  - RFC 2804 “IETF Policy in Wiretapping” which states that “the IETF has decided not to consider requirements for wiretapping as part of the process for creating and maintaining IETF standards.”

but these actions are uncommon, as the IETF strives **not** to be an active participant in any national or international political space

The Culture of the IETF

- It's informal and techno-nerd aligned
  - No dress code, no visible hierarchy
  - These are smart and often (highly) opinionated individuals, who do not necessarily have a high level of people skills
  - What other might see as "rude" even "arrogant" is seen as simply being blunt and direct – if a suggested approach make no sense, then that's the exact feedback you will likely see at the IETF!

The measurement of "success"

- Is not the number of meetings or meeting attendees
- Is not the number of RFCs
- Success is based on market adoption of standardized technologies

The Purpose of the IETF

- To develop and maintain standards for technologies used to provide Internet service and services over the Internet
    - There is **NO** clear delineation of what is “in scope” for the IETF and what is not. In general, the IETF is not used to standardize media (local area networks, radio, optical, etc). The IETF is also very selective at the application layer as to what applications sit within the IETF’s scope, but there is no consistency in this selectivity. IP is within the IETF’s scope, as is end-to-end transport. The ways to secure these functions is in the IETF’S scope, but the cryptographic algorithms used as the foundation of such security is not.
  - In general, the IETF will work on an issue if there is interest to do from IETF participants, and the work is not already being undertaken any other standards body

The Purpose of the IETF

- To develop and maintain standards for technologies used to provide Internet service and services over the Internet
- Ensure that the technology itself is secure and can be operated securely
  - That's perhaps an overly ambitious objective. "think about security" is a better objective, as necessarily there are complex trade-offs between usability and technology paranoia and the IETF tends towards the pragmatic compromise over the rigid forms of absolutism

The Purpose of the IETF

- To develop and maintain standards for technologies used to provide Internet service and services over the Internet
- Ensure that the technology itself is secure and can be operated securely
- Ensure that the technology can support scale of deployment and use
  - If there is one common theme of the internet so far, its unrelenting growth. This means that the technologies standardised by the IETF need to be capable of sustaining large scale growth

The Purpose of the IETF

- To develop and maintain standards for technologies used to provide Internet service and services over the Internet
- Ensure that the technology itself is secure and can be operated securely
- Ensure that the technology can support scale of deployment and use
- Open and fiercely independent
  - And opinionated!
  - Capture of the IETF is simply not an option !

IETF Mantras

“We reject kings, presidents, and voting. We believe in rough consensus and running code”

- The IETF does not impose authority in a hierarchical manner. No individual or office is in control of the activities undertaken in the IETF context
- There is no use of voting in the IETF to determine an outcome. There is not even a concept of “membership” of the IETF that would assist in defining who has the ability to exercise a vote in any case
- The IETF seeks to establish a common consensus across individuals who have familiarity with the topic. That’s not unanimity, nor complete inclusion. It’s an expression of the core of common agreement among individuals
- The specifications should be sufficient to allow for the independent development of code that conforms to the specification where the code performs the functions described in the specification. The specification should be such that the implementations interoperate with each other

IETF Mantras

We are all here as individuals, not as corporate or government representatives

- The IETF processes place no additional weight to a contribution if it is made by a government or by an industry entity
- All RFCs credit individual authors - there are no anonymous work party authors. RFC may also acknowledge the contributions of other individuals.
- By convention, updated RFCs still credit the individual authors of the original documents

- Which is a fine thing to say, but the reality is that corporates and at times government bodies fund individual to attend IETF meetings and participate in IETF activities

IETF Mantras

Come Prepared!

- IETF Working Group sessions and the associated mailing list activity is **not** there to educate folk about the technology being studied
- Working Group sessions assume that participants have read the drafts and are ready to contribute to the discussion

The IETF Document Management Process

- It all starts with an Internet Draft
  - Internet drafts are individual contributions
  - They are held in the drafts repository for a period of 6 months, then deleted!
  - Thay are intended to be work-in-progress notes, and should not be cited
  - They are used as the working space for RFCs, where drafts get progressively refined
- Working Group Adoption
  - The next step is “adoption” of a draft by a Working Group
  - Adoption is a call to the Working Group to see if there is interest in developing the draft

The IETF Document Management Process

- Working Group Documents
  - The drafts' authors assume an editor role and respond to items raised in Working Group sessions and on the mailing list
  - An area directorate may be asked to also review the draft
  - It's up to the Working Group Chair to make the call to the working gropup to see if the document is ready for the next step – this is the Working Group Last Call (WGLC)
- IESG Review
  - The document is passed to the Area Director who submits it to the IESG for an IESG ballot
    - (yes, I know I said "no votes", but the ballot is a consensus gathering process among IESG members to see if there is general agreement that the document is ready)
  - It's possible that the document is passed back to the Working Group, but normally it would head to the RFC Editor Queue

The IETF Document Management Process

- RFC Editor
  - The document is processed by the RFC Editor for a final pass, consistency of style and references
  - The authors are given a last call to approve and then…
- RFC
  - The document is assigned an RFC Number and published as an RFC

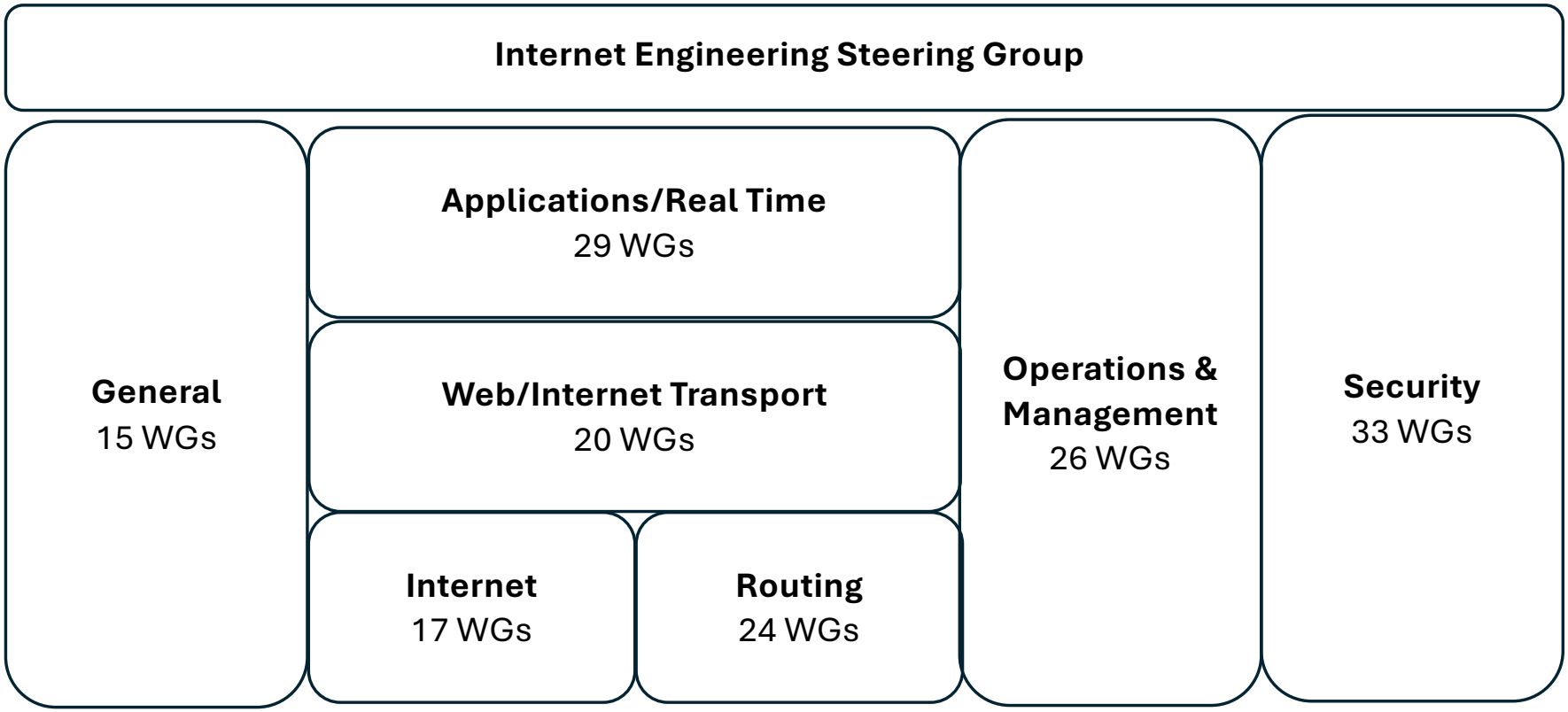
Intellectual Property Rights

- In general, the IETF Working Groups prefer to standardize technologies with no known IPR claims. There are always exceptions to this, and royalty-free licensing is preferred over other forms of IPR, all other things being equal
- When contributions are made to the IETF the contributor grants to the IETF the right to copy, publish, display and distribute the work, and to modify or prepare derivative works
  - You can’t ask the IETF to adopt your favourite technology and prevent the IETF from making changes!

The Organisation of the IETF

- The work of the IETF is roughly divided into:
  - The engineering of the Internet and IP technologies (the “Internet Engineering Task Force”, or **IETF**)
  - Facilitating researchers to delve into related topics that do not have an immediate impact on engineering and operations (the “Internet Research Task Force”, or **IRTF**)
  - A **secretariat** to perform organizational functions and support the work of the other IETF entities

IETF Organisation



IRTF Organisation

IRTF Chair

CFRG Crypto Forum	DINRG Decentralisation of the Internet	GAIA Global Access to the Internet for all	HRPC Human Rights Protocol Considerations
ICCRG Internet Congestion Control	ICNRG Information-Centric Networking	MAPRG Measurement and Analysis for Protocols	NMRG Network Management
PANRG Path Aware Networking	PEARG Privacy Enhancements and Assessments	QIRG Quantum Internet	RASPRG Research and Analysis of Standards Processes
SPACERG Systems and Protocols for Space Networking	SUSTAIN Sustainability and the Internet	T2TRG Thing-to-Thing	UFMRG Usable Formal Methods

Internet Architecture Board

- Architectural Commentary
- Standards Process Appeals and Oversight
- External Liaisons
- Oversight of IETF Protocol and Parameter Registries function - IANA

Others

- IETF Trust
- RFC Editor
- Independent Submissions Editor
- Nominating Committee

Funding

2025 Budget:

- The IETF has expenses of some $12M per year
- Revenue from 3 x IETF meetings per year raise $4.5M
- The Internet Society contributes $8M
- The IETF Endowment contributes $300K

    - The current objective is to build the Endowment Fund to $US50M, and as a longer-term objective to lift this to $150M

Does the IETF develop technologies any more?

- In the early days the IETF was the place where technologies were developed and debugger, and where deployment was coordinated
- At that time IETF attracted researchers and academics, developers, network operators and vendors
- The IETF does not do much in the way of development any more
  - “design by committee” is excruciatingly painful and often fails!
  - IPv6 is a good example of the flaws in this process
- These days the IETF tends to take in contributions by others and passes the technology through a working group review for sanity and consistency
- These days the IETF attracts researchers, vendor developers, and social scientists!

Working Code?

- These days many vendors are not interested in implementing every internet draft that it on its way to become an RFC
  - Its just too expensive to constantly tweak a deployed product to implement every idea that is under discussion in an IETF Working Group
- These days many vendors wait for a Proposed Standard RFC to be published before considering whether to implement it (or not)
  - Which implies that the characterization of ”running code” is more aspirational than real!

Futures

- The IETF relies on continued participation to keep going
- As long as there are interested folk to attend meetings, contribute to Working Groups, write Internet drafts and volunteer for leadership roles, there is likely to be an IETF!
- But without that level of support, it will be unable to continue!
- So, the IETF's future is largely up to you!

Thanks!