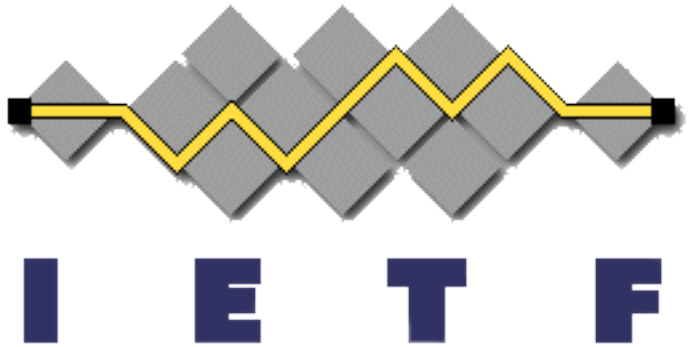
Introduction to the IETF

Fred Baker



Where the Internet started:

- J.C.R. Licklider's (MIT) "Galactic Network" concept
  - He envisioned a globally interconnected set of computers through which everyone could quickly access data and programs from any site.
  - "Wouldn't it be cool if one could walk up to a computer and find the knowledge of the universe at our fingertips?

The RFC Series in 1969:

- The RFC Series was created as a way to share notes among researchers – Steve Crocker.
  - The notes were called “Requests for Comments” in an attempt to downplay their importance.
- Later, vendors would joke that they were “Requirements for Compliance”, e.g., specifications
  - Many were in fact white papers, thoughts about what might be – and what might in the end not be - blind alleys…
  - The ruminations of a a far-flung distributed research laboratory on topics they were just working out

Kahn's Ground Rules, discussion at ICCC 1973

- The Internet was to be a collection of **independent networks** interconnected by a **common core**
- Each distinct network would have to stand on its own:
  - No internal changes could be required to any such network to connect it to the Internet.
- Communications would be on a best effort basis.
  - If a packet didn't make it to the final destination, it would shortly be retransmitted from the source.
- Black boxes (IMPs) would be used to connect the networks;
  - These would later be called gateways and routers.
  - Gateways retained no per-flow state, thereby keeping them simple and avoiding complicated adaptation and recovery from various failure modes.
- There would be no global operational control.
  - Sites were by definition autonomous. The only protocols they had to implement were IP and ICMP, and maybe TCP and UDP

And then Al Gore…

- Circa 1984, the junior senator from Tennessee started discussing his ideas for an "Information Superhighway".

- He had six NSF-sponsored supercomputer centers, and he wanted to connect universities to them

- NSF-funded IP networking experiments:
  - CSNET: an X.25 network
  - USAN: a wide area "Ethernet" network over satellite
  - 56 KBPS NSFNET
- Other networks:
  - NASA Science Internet
  - CYCLADES
  - CERN networks
  - BITNET
  - …

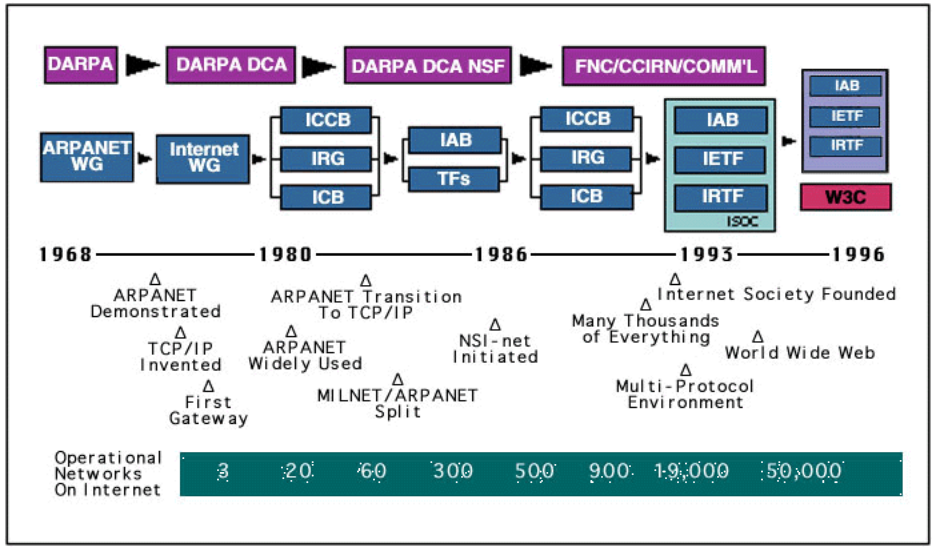
…Got Money

Decide what to build – and then build it

- We talk about “Rough Consensus and Running Code”
  - There is a myth floating around about a conflict between open standards and open source
  - They have always worked together
- Code is good
  - Useful to know what works and what doesn’t, and to deploy an idea
- Wouldn’t it be nice to know what to code, and get the best minds on it?
  - That’s the place of standards and standards processes

The organizations of the Internet

A historic context



https://arxiv.org/html/cs/9901011v1

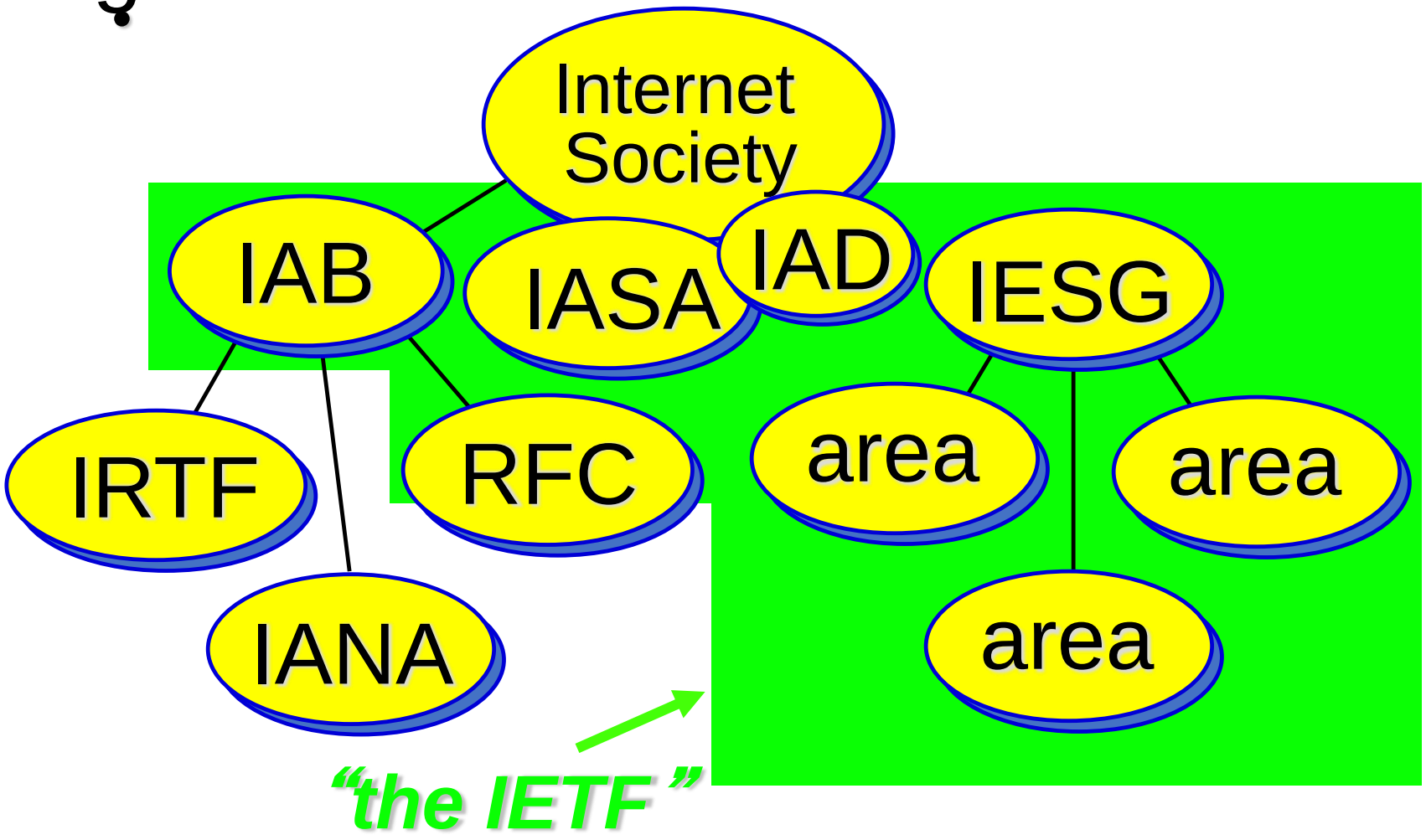
- The organizations, and funding, for the ARPANET and the Internet have changed over time.
- It would be a mistake to presume that what is now has always been

Internet Architecture Board (IAB)

- 1979 ICCB
- 1984 IAB (Internet Advisory Board)
- 1986 IAB (Internet Activities Board)
- 1992 IAB (Internet Architecture Board)

- …decided it needed to create several task forces.
  - Internet Engineering Task Force (IETF)
  - Internet Research Task Force (IRTF)
- Purpose:
  - Facilitate continued research in the now-rapidly-growing network
  - 1987: vendors allowed to attend
- The IAB at that time retained control of RFC publication
  - But delegated control of the IETF to the Internet Engineering Steering Group (IESG)
  - RFC Editor and IANA offices contracted with NSF

Top Level View of IETF Organization



Internet Engineering Task Force (IETF)

- Intended to address protocol requirements of Internet operators, including
  - Routing
  - Network Management
  - Operational Procedures
  - Security
  - New interface types
  - End to end transports including TCP, UDP, RTP, others
  - Infrastructure Applications (DNS, SIP, etc.)
- Contributors include vendors, operators, researchers, and academics

Multi-disciplinary Organization

Multi-stakeholder Organization

Internet Research Task Force (IRTF)

- Intended as a loose organization of Internet **research groups**
  - End to End – transports, especially TCP
  - Cryptography
  - Delay Tolerant Networking
  - Internet Congestion Control
  - Information-Centric Networking
  - Network Management
  - Network Coding
  - Software-Defined Networking
  - Internet of Things
- Contributors include vendors, operators, researchers, and academics, but tends to be primarily researchers

Multi-disciplinary Organization

Multi-stakeholder Organization

IETF: What is it trying to achieve?

- “The mission of the IETF is to ***make the Internet work better*** by producing high quality, relevant technical documents that influence the way people design, use, and manage the Internet.”
- Principles:
  - Open Process
  - Technical Competence
  - Volunteer core
  - Rough Consensus and Running Code
  - Protocol ownership

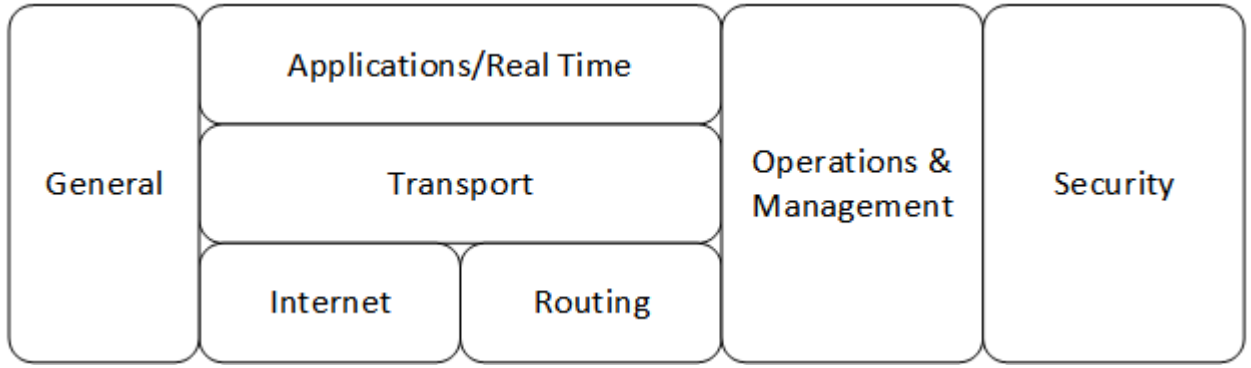
https://www.ietf.org/about/mission.html

How does the IETF work?

Internet Engineering Steering Group (IESG)

- Area Directors + IETF Chair (~15 members)
- Multi-disciplinary technical review group
- Provides cross-area pre-publication technical review of IETF RFCs
- Approves publication of IETF documents
  - Reviews and comments on non-IETF RFC submissions
- Manages IETF process
- Approves WG creation (with IAB advice)
- Part of appeal chain

IETF Areas


General
Applications/Real Time
Transport
Internet
Routing
Operations &
Management
Security

Area Directors

- Areas have 1-3 ADs
  - except General Area, which has one
- Responsible for setting direction in Area
- Responsible for managing process in Area
  - Approve BOFs & propose working groups
  - Ensure working groups follow proper process
  - Have authority to change working group management
    - Generally with IESG consultation
- Review working group documents prior to IESG review

Working Group vs. BOF

Working Group

- Where the main work of the IETF takes place
- Face to face meetings ideally focused on key issues
  - A lot of discussion on mailing lists
- Has an agreed work plan and schedule
- Lives on between IETF Meetings
- Often preceded by (usually one) Birds of a Feather session

Birds of a Feather (BOF)

- Often precedes formation of a WG
- Sometimes a one-shot to discuss or present information on timely topic
- Group of people interested in topic convince an AD that an idea is worth exploring
- BOFs generally meet only once

IETF: Documents: RFCs and Internet Drafts

Internet Draft

- A discussion document
- *If you want to contribute to the IETF, the IETF works with Internet Drafts.*
- Two important sources:
  - https://tools.ietf.org
  - https://datatracker.ietf.org

RFC

- An archival document
- Important for implementing the protocol or feature
- *Not usually a discussion document,* unless we are about to write an internet draft about changing it
- Four RFC streams:
  - IETF, IRTF, IAB, and Independent

Standards Track RFCs:

- Best Current Practices (**BCP**)
  - Policies or procedures (best way we know)
  - Nominally SDO procedures, but often Internet operational procedures.
- 2-stage standards track (changed 2011 - RFC 6410)
  - Proposed Standard (**PS**)
    - Good idea, no known problems
  - Internet Standard (**STD**)
    - PS + stable + “benefit to Internet community”
    - Multiple interoperable implementations to prove document clarity
    - Note: interoperability, not conformance

Other RFC Types

- Informational
- Experimental
- Historical
- ***always check the current status of an RFC before relying on it. A new RFC may have obsoleted or updated the one you are looking at***
- *you can find out by looking at the RFC index*
- *remember that RFCs are not changed after publication - so no status change notice put in RFC*

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Names of Internet Drafts

- Internet Drafts have three general formats of names
  - **Draft discussing a topic**, not necessarily in a working group
    - draft-author-topic-NN.txt
    - Example: **draft-white**-openfabric-00.txt
  - **Individual submission to a working group**
    - draft-author-workinggroup-topic-NN.txt
    - Example: **draft-wkumari-dnsop**-multiple-responses-00.txt
  - **Working Group document**
    - draft-ietf-workinggroup-topic-NN.txt
    - Example: **draft-ietf-v6ops**-conditional-ras-00.txt
- IETF tools parse the format to determine what to do with a draft
  - As a working group chair, I look for drafts containing my working group name, and include other drafts when asked.

Several ways to be involved in the discussion

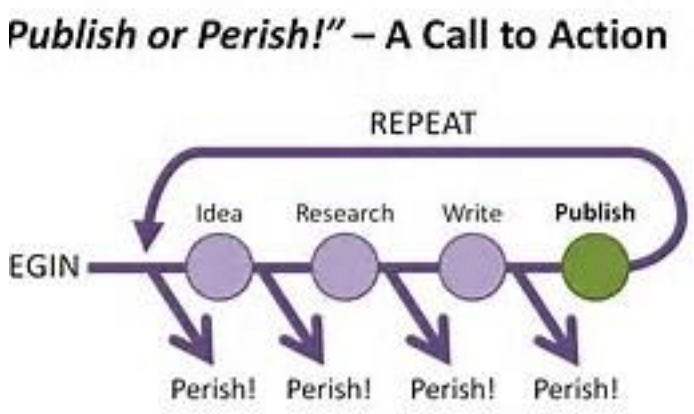
- The mailing lists https://www.ietf.org/list/
  - IETF List – general IETF discussion
  - Announcement lists
  - Working Group and Research Group lists (details in charter)
  - Non-working group lists https://www.ietf.org/list/nonwg.html
- In interim and plenary meetings
  - Open; yes, you may come. https://www.ietf.org/meeting/100/index.html
  - Jabber: you may participate by IM (usually listen on MeetEcho and comment in Jabber)

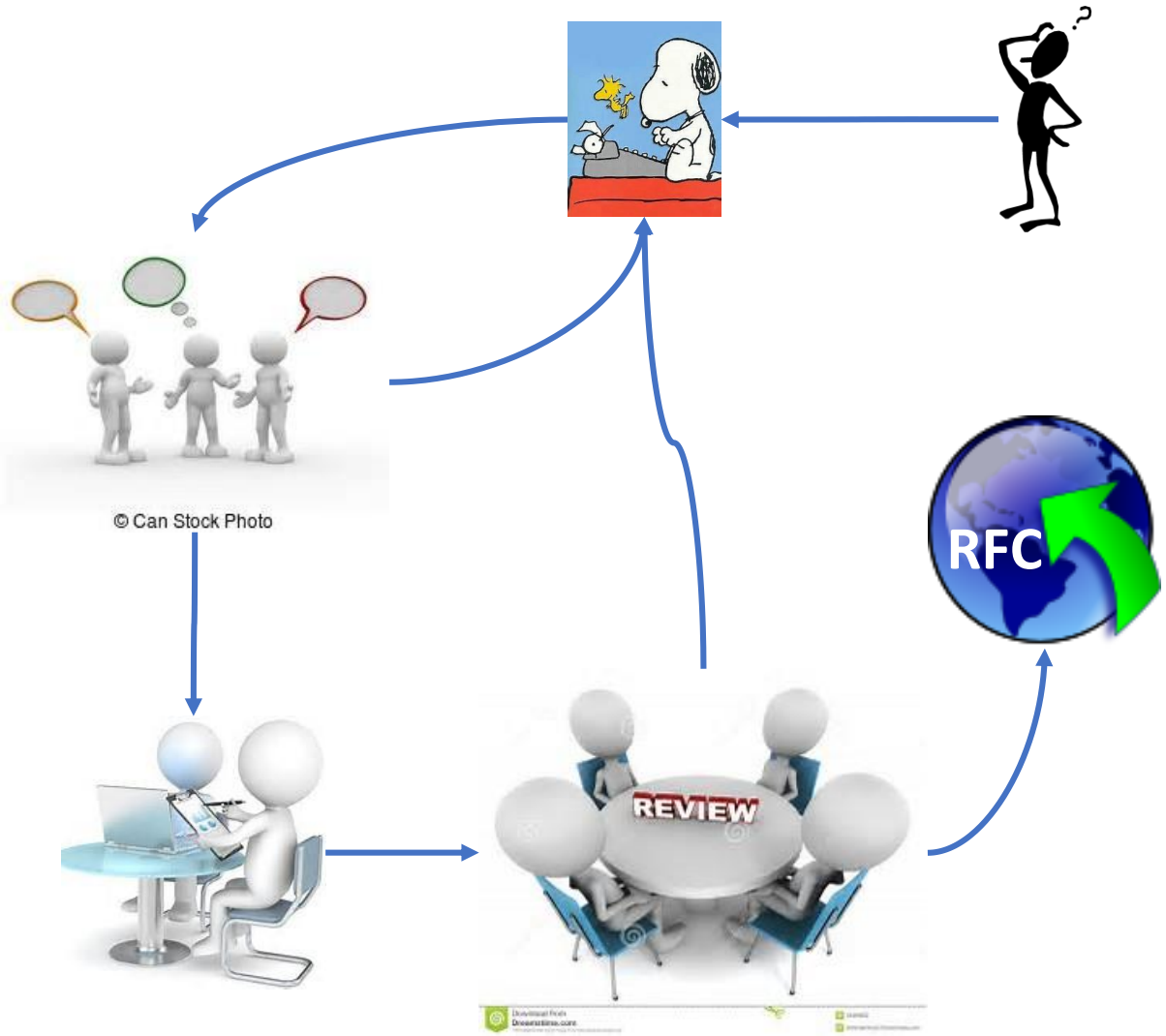
Meetings:

- I find meetings useful because it's a community. I get to meet my friends/collaborators, have hallway discussions, eat together.
  - And, oh yes, discuss documents and technology
- Possible to attend remotely
  - Jabber, Audio Feed, Video feed (Meetecho)
- Typical meetings:
  - Five days in which ~120 working groups meet for 1-2 hours at a time to work through hard issues and "get on the same page"
    - Working groups with a lot of work may meet multiple times. They usually don't.
  - *Most of the discussion has already happened on the mailing list*
  - *We presume people have read the documents and need no tutorial*

IETF: How does anything get accomplished?

- Document process:
  1. Have an idea or question
  2. Write it down (email or I-D)
  3. Discuss on mailing list and/or in person
  4. Change the document
  5. Cross-Area Review
  6. RFC Publication





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Questions?