2024

IETF Annual Report

A summary of Internet Engineering Task Force, Internet Architecture Board, Internet Research Task Force, and RFC Editor activities

As of 31 December 2024

IETF®

IETF by the Numbers 2024

Participants

7,831 **Participants in all IETF activities** (I-D authors, mailing list posters, meeting participants)*

4,662 **Registered participants at IETF meetings** (48% remote)

244 **Fully online interim meetings**

Documents

2,977 **Internet-Drafts (I-Ds) submitted†**

2,888 **I-D authors**

175 **RFCs published**

Messages

110,943 **Emails sent to IETF mailing lists**

Individuals

2,717 **Individuals posting to IETF mailing lists**

Working Groups

128 **Active Working Groups**

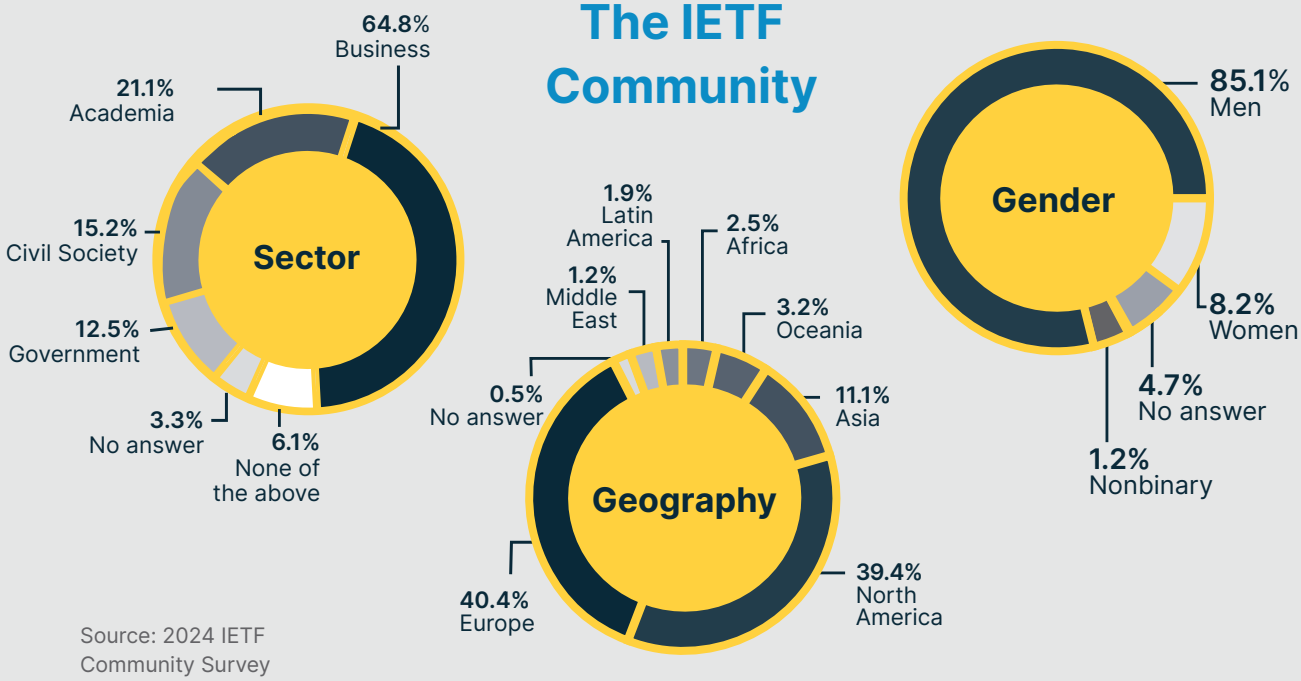
11 **New Working Groups**

13 **Working Groups concluded**

*Based on unique email address used to register for IETF events, submit I-Ds, and post to IETF mailing lists.

†Unique I-D names not counting different versions of the same I-D submitted to the IETF I-D archive.

The IETF Community



Source: 2024 IETF Community Survey

MLS Protocol Provides Better and More-Efficient Security at Internet Scale

During 2024, Messaging Layer Security (MLS) progressed from publication as an IETF standards-track RFC to being on the cusp of use by hundreds of millions of mobile devices around the world by early 2025. The core specification for MLS had already made it easy for apps to provide the highest level of end-to-end security for users, when it was published as an RFC in 2023. In early 2025, the GSMA announced that the latest Rich Communications Services (RCS) standard included end-to-end encryption (E2EE) based on the MLS protocol.

Developed by the IETF Messaging Layer Security (mls) Working Group, MLS provides unsurpassed security and privacy for users of group communications applications. Participants who use MLS always know which members of a group will receive their messages, and the validity of new participants joining a group is verified by all the other participants. During its development in the IETF, MLS underwent formal security analysis and industry review. It currently supports multiple ciphersuites and enables the straightforward addition of quantum attack resistant ciphersuites in the future.

The open processes and running code that are hallmarks of the IETF mean that MLS is proven at Internet scale, working efficiently with groups with thousands of participants. Today, MLS is available from, implemented in, and deployed by a wide range of companies and organizations, including real-time platforms Webex, Wire, and Discord, and in devices, such as drones.

In addition, MLS is extensible, meaning it can be easily updated in a variety of ways. Work continues across the MLS Working Group in a number of areas, and the IETF More Instant Messaging Interoperability (mimi) Working Group aims to build on MLS as they work towards specifying the minimal set of mechanisms required for Internet messaging service interoperability.

> "MLS fills a critical protocol gap for secure messaging. With seven years of development, it is mature and rigorously validated, making it the ideal choice to provide the security foundations of interoperable messaging."
>
> GILES HOGBEN, DIRECTOR OF PRIVACY ENGINEERING, ANDROID

> "Cisco is committed to providing collaboration solutions that ensure the privacy and security of users and their content. We've supported the MLS effort since its inception and are delighted to welcome the publication of the MLS protocol standard."
>
> RICHARD BARNES, DISTINGUISHED ENGINEER, SECURITY AND COLLABORATION, CISCO

Internet Engineering Task Force Activities

The Internet Engineering Task Force (IETF) is the premier Internet standards organization, providing a neutral venue for developing open standards through open processes. The IETF brings together a large international community of network designers, operators, vendors, and researchers to work on the evolution of the Internet architecture and the smooth operation of the Internet. The IETF pursues its mission by adhering to the cardinal principles of open processes, technical competence, volunteer participation and leadership, rough consensus and running code, and by taking responsibility for all aspects of its protocols.

IETF Working Groups

Working Groups (WGs) are the primary mechanisms for developing IETF specifications and guidelines, many of which are intended to be standards or recommendations. Working Groups submit these specifications and guidelines for publication as RFCs.

IETF Working Groups are created with defined objectives and deliverables. Once they have completed, these groups are usually closed, though they may also be rechartered to take on subsequent related work. In 2024, 11 new Working Groups were chartered and 13 were concluded, resulting in 128 active working groups at the end of the year.

New IETF Working Groups

The following new Working Groups were chartered during 2024:

Detecting Unwanted Location Trackers (dult)

The DULT working group is working to standardize an application protocol for information exchange between location-tracking accessories and nearby devices, along with the actions that these accessories and devices should take once unwanted tracking is detected. This protocol is intended to protect people against being unknowingly tracked.

DNS Delegation (deleg)

The DELEG working group aims to address challenges presented by the current DNS protocol's limited abilities by documenting the requirements for adding a new DNS signaling mechanism that allows parents to return additional DNS delegation information about their children, defining semantics of a new DNS signaling mechanism, and specifying extensions to the DNS.

Getting Ready for Energy-Efficient Networking (green)

The GREEN working group is chartered to explore use cases, derive requirements, and provide solutions for identifying and characterizing energy efficiency metrics, methods related to the energy consumption of network devices, and the optimization of energy efficiency across a network.

Mail Maintenance (mailmaint)

The MAILMAINT working group provides a standing venue for email-related work or projects that don't garner sufficient critical mass for a standalone working group, but for which it would still be useful to publish as a standard.

Moderation Procedures (modpod)

The MODPOD working group will revise existing and define new moderation procedures suitable for all IETF communication channels.

Network Management Operations (nmop)

The NMOP working group aims to solicit input from network operators to identify existing and anticipated operational issues arising from the near-term deployment of network management technologies, and to consider solutions/workarounds for them.

Secure Patterns for Internet CrEdentials (spice)

The SPICE working group analyzes existing and emerging IETF technologies and addresses any remaining gaps to facilitate their applications in digital credentials and presentations. The working group is developing digital credential profiles that support various use cases.

Secure Shell Maintenance (sshm)

The main goal of the SSH working group is to maintain the SSH protocol. SSH provides support for secure remote login, file transfer, and the forwarding of UNIX-domain sockets, TCP/IP, and X11. It can automatically encrypt, authenticate, and compress transmitted data.

SRv6 Operations (srv6ops)

The SRv6OPS working group is dedicated to the operational aspects of deploying and managing Segment Routing over IPv6 (SRv6) networks.

Standard Communication with Network Elements (scone)

The SCONE working group aims to specify and develop a proposed standard protocol to communicate an upper bound on achievable bitrate—termed *throughput advice*—from network elements to an endpoint.

Workload Identity in Multi System Environments (wimse)

The WIMSE working group aims to address the challenges of implementing fine-grained access control across platforms in the public and private clouds, which are increasingly important to how complex software functions are built and deployed.

Concluded IETF Working Groups

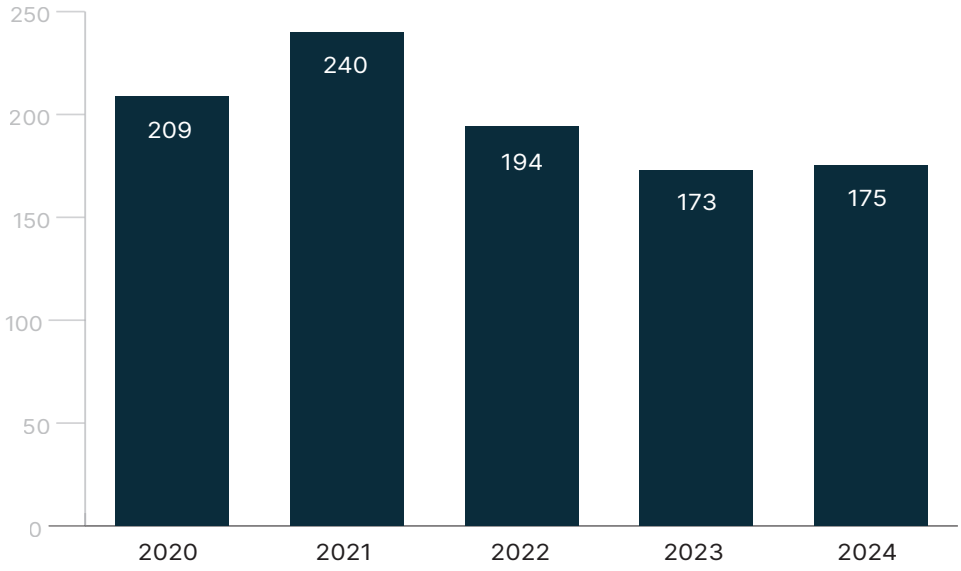
The following Working Groups were concluded during 2024:

- Application-Layer Traffic Optimization (alto)
- Diameter Maintenance and Extensions (dime)
- Domain Keys Identified Mail (dkim)
- Grant Negotiation and Authorization Protocol (gnap)
- JSON Path (jsonpath)
- Light-Weight Implementation Guidance (lwig)
- Multiparty Multimedia Session Control (mmusic)
- Operational Security Capabilities for IP Network Infrastructure (opsec)
- Real-Time Communication in WEB-browsers (rtcweb)
- Revise Universally Unique Identifier Definitions (uuidrev)
- Secure Media Frames (sframe)
- Serialising Extended Data About Times and Events (sedate)
- Transfer dIGital cREdentialS Securely (tigress)

RFCs

The RFC document series contains technical and organizational notes about the Internet. The final form of the work undertaken in the IETF is captured in RFCs. RFCs are also published by the Internet Architecture Board (IAB), the Internet Research Task Force (IRTF), and an Individual Submissions editor. Editorial Stream RFCs specify and update policies, procedures, guidelines, rules, and related information regarding the RFC Series as a whole. In 2024, 175 RFCs composed of 6,404 pages were published.

RFCs Published, 2020–2024



Internet-Drafts

Internet-Drafts are working documents of the IETF, its Areas, and its Working Groups, as well as groups, such as IRTF Research Groups. While only some I-Ds become RFCs, I-Ds are the focal points for much of the day-to-day work and discussion of the IETF.

During 2024, I-Ds posted to the IETF I-D repository included:

- 2,977 I-Ds of all types*
- 2,888 Different I-D authors†

*This is a count of unique *-00* versions of I-D submitted to the IETF I-D repository during 2024, not counting different versions of the same I-D.

†The total number of individuals listed on any version of an I-D submitted to the IETF I-D repository during 2024.

IETF Meetings

While the work of the IETF is largely conducted over mailing lists, the IETF community holds online and in-person meetings to encourage connection and face-to-face progress. IETF meetings continued with a hybrid approach in 2024, with remote registrations leveraging ongoing investments in improving online participation capabilities.

IETF 119 Brisbane

16–22 March 2024

Cohosted by Google, auDA, Console Connect, and IAA

687 onsite participants

742 online participants

IETF 120 Vancouver

20–26 July 2024

Hosted by Huawei

833 onsite participants

681 online participants

IETF 121 Dublin

2–8 November 2024

Hosted by Cisco

993 onsite participants

559 online participants

Interim meetings

As a complement to the three IETF-wide meetings held each year, interim meetings enable groups to dedicate time toward making progress and supplementing the ongoing work that occurs on their mailing lists. In 2024, IETF groups held more than 200 fully virtual interim meetings.

Thanks to a multiyear investment in a meeting platform that enables extremely effective collaboration within the open standards-setting process used by the IETF, nearly all IETF working group meetings are entirely online. This means anyone, anywhere in the world can participate. More details, including agendas, minutes, and other materials for every interim meeting, can be found on the past meetings page of the IETF Datatracker.

IETF Global Hosts and Supporters

Work in the IETF is supported by contributions from dozens of sponsors each year. Significant ongoing support is provided by IETF Global Hosts and Global Supporters, who have made sustained commitments to ensure that the standards that power the Internet remain open for permissionless innovation. See the IETF website for more information about how sponsors support the IETF.

Sustainability Sponsors

As a forward-looking community focused on the Internet's continued growth and evolution, the IETF recognizes the importance of sustainability in both Internet technologies and our global environment. Support from Sustainability sponsors enables the IETF to become a more sustainable organization by sourcing and using eco-friendly materials in all of its meeting materials.

Gold sponsor

Bronze sponsor

Diversity and Inclusivity Sponsors

The work of the IETF benefits from a broad range of technical perspectives. Diversity and Inclusion sponsors help more individuals participate in the work of the IETF.

Gold sponsors

Silver sponsor

Bronze sponsors

Running Code Sponsors

We believe in rough consensus and running code is the unofficial mantra of the IETF and underscores the value the community puts on work that makes a difference in the real world. Running Code sponsors support some of the IETF's most-attended events, such as IETF Hackathons, while also supporting the technical tools used every day by IETF participants.

Gold sponsor

Silver sponsor

Bronze sponsors

Open Internet Sponsors

By anticipating future needs today, Open Internet sponsors ensure the high-functioning, diverse, and robust IETF community of tomorrow.

Bronze sponsor

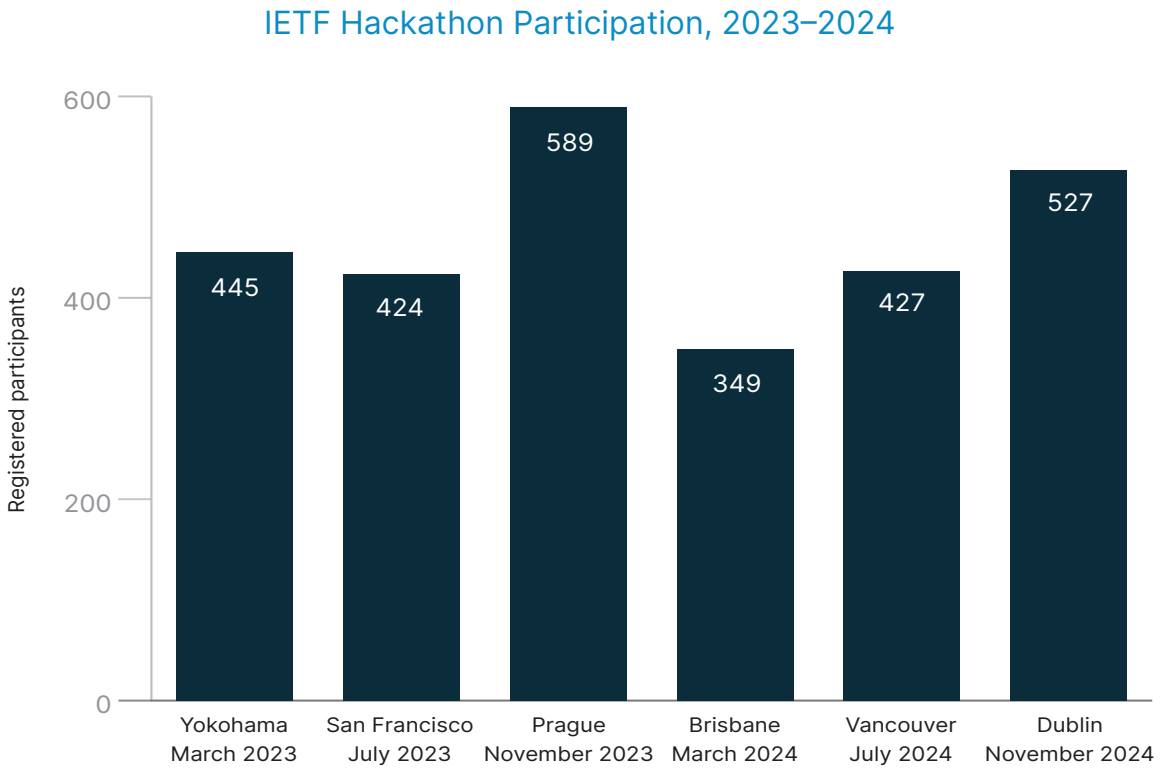
Equipment and Services Sponsors

Equipment and Services sponsors provide in-kind support for IETF meetings and other activities that bring the community together across the year, fostering vital communication and collaboration.

IETF Hackathons

IETF Hackathons encourage developers to collaborate and develop utilities, ideas, sample codes and solutions that show practical implementations of IETF standards. They are collaborative events, not competitions. Past IETF Hackathons have covered a range of topics, including: DNS, HTTP 2.0, NETVC, OpenDaylight, ONOS, VPP/FD.io, RiOT, SFC, TLS 1.3, WebRTC, YANG/NETCONF/RESTCONF.

Since the first event in 2015 with approximately 50 participants, IETF Hackathon participation has grown dramatically. During 2024, three IETF Hackathons averaged more than 434 in-person and remote participants, with a peak of 527 registered participants at the event in Dublin. Support for IETF Hackathons is provided by Cisco DevNet.



IETF Endowment

The IETF Endowment, a designated investment fund created in support of the IETF and its activities, gathered more than $7.7 million by the end of 2024. Established in 2012, the IETF Endowment was created to ensure the long-term financial sustainability of the work of the IETF. Building on a significant financial commitment made by the Internet Society in 2020, a renewed effort to grow the IETF Endowment was launched in 2021. Contributions to the IETF Endowment are bolstered by the Internet Society's 1:1 matching program. Those donations, combined with their matching funds and yearly gains on the fund's existing monies, contributed more than $2.3 million to the IETF Endowment in 2024.

IETF Endowment donors

ARIN American Registry for Internet Numbers

Internet Society

lacnic

RIPE NCC RIPE NETWORK COORDINATION CENTRE

craigslist CHARITABLE FUND

Google

HUAWEI

intel

PCH Packet Clearing House

IETF Administration LLC Updates

The IETF Administration LLC (IETF LLC) was established in 2018 following an extensive community process to update the administrative arrangements that support the work of the IETF. In 2024, it completed its sixth year of operation.

As the corporate legal home for the IETF, the IAB and the IRTF, the IETF LLC supports their ongoing operations, manages their finances and budgets, raises money, and establishes and enforces policies that ensure their compliance with applicable laws, regulations, and rules. IETF LLC board meetings are guided by the principles of trust, responsiveness, and transparency. To that end, board meetings are open to observers, with meeting agendas published prior to each meeting and minutes published afterward. Limited exceptions include legally restrictive items, such as legal actions, contracts, and personnel matters.

The following noteworthy accomplishments and developments occurred in 2024:

Second IASA 2.0 retrospective

The IETF Administration LLC (IETF LLC) completed its second IETF Administrative Support Activity (IASA 2.0) retrospective. The administration published a report detailing changes that have occurred since the first retrospective, as well as points of action to be taken in the future. The 2021 IASA 2.0 retrospective was a requirement specified by BCP 101, which also recommends that a retrospective of the IETF Administrative Support Activity version 2.0 be conducted every three years. Future retrospectives should be published in 2027, 2030, 2033, and so on.

IT infrastructure transition

In 2023, the deployment and implementation of a new, cloud-based infrastructure approach for services supporting the work of the IETF was begun. That work continued in 2024 and was all but completed by the end of the year. Services, such as the IETF mailing lists, Author Tools, and the YANG Catalog were included in the transition effort, as were websites, including wikis and www.ietf.org. The transition of email services, which is key to the many processes of the IETF, required extra attention and was deferred to 2025.

Tracking towards a net zero IETF

Using the calculator developed and delivered in 2022, the IETF calculated its carbon footprint for 2024. As it did for 2023, calculations included the CO_2 footprint for each of the IETF plenary meetings, as well as the ongoing operations that support the work of the IETF community. In 2024, food waste reduction was a primary goal. Data collected in 2023 was used to adjust food orders for certain events, resulting in drastically reduced waste. An effort to employ more sustainable materials for meeting supplies began in earnest, with IETF 120 in Vancouver being the first meeting to use only entirely nonplastic and recyclable materials for everything from badges to signage.

IETF Administration LLC 2024 Financials

The IETF LLC received an unqualified audit opinion in the IETF LLC 2024 audited financial statement, indicating that the IETF LLC financial statements were fairly and appropriately presented, without any identified exceptions, and in compliance with the generally accepted accounting principles (GAAP). This year's Statement of Activity is below, followed by important footnotes.

Statement of Activity, 2024

	2024 ACTUAL	BUDGET
NONMEETING REVENUE		
Contributions	$8,614,013	$8,420,000
ISOC Contribution Cash	7,000,000	7,020,000
Endowment Contributions[1]	1,121,024	1,000,000
ISOC Endowment Match	492,989	400,000
Administrative In-Kind Contribution[2]	**58,050**	**58,050**
Other (including Investment Interest and Unrealized Losses)[3]	**2,347,719**	**793,123**
TOTAL NONMEETING REVENUE, NET OF UNREALIZED LOSSES	**$ 11,019,782**	**$9,271,173**
MEETING REVENUE		
Registration Fees	$2,316,920	$1,992,375
Sponsorship (including In-Kind)	1,572,500	1,755,000
Hotel Commissions/Rebates/Comps	397,917	358,329
Miscellany (including Host Recharge)	20,000	42,000
TOTAL MEETING REVENUE	**$4,307,337**	**$4,147,704**
TOTAL REVENUE	**$15,327,119**	**$13,418,877**
MEETING EXPENSES		
Venue Costs	$1,617,494	$1,868,342
Travel and Expenses	598,415	628,120
Meeting Support	1,210,400	1,274,918
NOC Support	852,843	851,000
Other	337,159	397,752
Site Visits	35,075	56,100
TOTAL MEETING EXPENSES	**$4,651,386**	**$5,076,232**

Continued on next page.

	2024 ACTUAL	BUDGET
OPERATING EXPENSES		
Administration	**$2,256,278**	**$2,307,134**
Staff Costs	994,863	1,018,165
Operations	358,177	345,272
Board Costs	39,591	82,000
Secretariat–Admin	488,056	481,097
CPA Services	208,102	194,600
Legal Services	167,489	186,000
RFC Services	**$1,876,862**	**$1,884,586**
RFC Production Center	1,744,463	1,745,686
RFC Series Editor	132,399	132,900
Independent Submissions Editor	–	6,000
Community Leadership	**$696,489**	**$902,829**
Secretariat–Community Leadership	631,068	658,829
IESG Support	18,493	41,500
IAB Support	25,676	41,500
IRTF Support	9,378	18,000
NomCom Support	1,916	3,000
Community Leadership Training	9,258	40,000
Outreach and Diversity Programs	700	100,000
IETF Trust Contribution	**$150,000**	**$150,652**
Special Projects	**–**	**$100,000**
Tools	**$1,414,981**	**$1,577,962**
Staff Costs	974,021	1,001,884
Secretariat–IT	399,500	166,020
Management/Planning	171,728	116,000
Research/Analysis/Design	235,072	273,000
Software Development	96,919	340,000
Operations (nonSecretariat)	259,496	647,000
Review/Audit	–	50,000
Capitalisation Adjustment	(721,755)	(1,015,942)
Depreciation	**$484,727**	**$200,000**
TOTAL OPERATING EXPENSES	**$6,879,337**	**$7,123,163**
TOTAL EXPENSES	**$11,530,723**	**$12,199,395**
NET INCOME/LOSS (AFTER CAPITAL EXPENDITURE)	**$3,796,396**	**$1,219,482**
Capital Investment	**$721,755**	**$1,015,942**

[1] Endowment Contributions include a $1m donation from ARIN.

[2] In-Kind Contribution is calculated at $4,875 a month for 150 Webex users.

[3] Realized and unrealized gains were $1,743,203.

Internet Architecture Board Activities

The Internet Architecture Board (IAB) provides long-range technical direction for Internet development, ensuring that the Internet continues to grow and evolve as a platform for global communication and innovation. The IAB provided the following reports in 2024:

IAB report to the community for IETF 119

This report included the announcement of reports from the Barriers for Internet Access of Services (BIAS) fully online workshop and an interim meeting of the Technical Program on Environmental Impacts of Internet Technology (eimpact).

IAB report to the community for IETF 120

The IAB announced the in-person AI-CONTROL workshop held in September 2024. The goal of the workshop was to discuss mechanisms that will allow data on the Internet to opt-out of being used by AI-oriented crawlers.

IAB report to the community for IETF 121

This report highlighted the opportunity to submit papers to the Next Era of Network Management Operations (NEMOPS) workshop held 3–5 December 2024. The workshop reviewed how network management has evolved over the past 20 years and looked towards future directions in management.

IAB Technical Programs and Administrative Support Groups

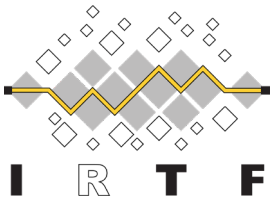
IAB Technical Programs and Administrative Support Groups are structured approaches managed and maintained by the IAB in order to support the IAB in more effectively executing its chartered responsibilities (see RFC2850 Section 2.1); in particular, improving the long-term perspective on the Internet informed by technical and architectural considerations.

Active Technical Programs

- Evolvability, Deployability, & Maintainability (edm)
- Environmental impacts of Internet Technology (eimpact)

Administrative Support Groups

- IAB-ISOC Policy Coordination
- IETF-3GPP
- IETF-IANA
- IETF-IEEE
- IETF-W3C



Internet Research Task Force Activities

The Internet Research Task Force (IRTF) promotes research of importance to the evolution of the Internet protocols, applications, architecture, and technology.

The IRTF is managed by the IRTF Chair in consultation with the Internet Research Steering Group (IRSG).

Research Groups

The IRTF consists of a number of focused and long-term Research Groups (RGs) that work on topics related to Internet protocols, applications, architecture, and technology. Research Groups have the stable long-term membership needed to promote the development of research collaboration and teamwork in exploring research issues. Participation is by individual contributors, rather than by representatives of organizations.

The following Research Groups were active as of 31 December 2024:

- Crypto Forum Research Group (cfrg)
- Computing in the Network Research Group (coinrg)
- Decentralization of the Internet Research Group (dinrg)
- Global Access to the Internet for All (gaia)
- Human Rights Protocol Considerations (hrpc)
- Internet Congestion Control (iccrg)
- Information-Centric Networking (icnrg)
- Measurement and Analysis for Protocols (maprg)
- Network Management (nmrg)
- Path Aware Networking RG (panrg)
- Privacy Enhancements and Assessments Research Group (pearg)
- Quantum Internet Research Group (qirg)
- Research and Analysis of Standards Setting Protocols (rasprg)
- Thing-to-Thing (t2trg)
- Usable Formal Methods Research Group (ufmrg)

Applied Networking Research Prize

The Applied Networking Research Prize (ANRP) is awarded for recent results in applied networking research that are of potential interest to the Internet standards community. Researchers with relevant, recent results are encouraged to apply for this prize, which offers the opportunity to present and discuss their work with the engineers, network operators, policy makers, and scientists that participate in the IETF and the IRTF. Out of 59 nominations received for the 2024 edition of the ANRP, awards were presented to the following 6 researchers: Dongqi Han, Siva Kakarla, Harjasleen Malvai, Yevheniya Nosyk, Ram Sundara Raman, Dennis Trautwein, Mingshi Wu, and Xieyang Xu.

Applied Networking Research Workshop

The ACM/IRTF Applied Networking Research Workshop (ANRW) provides a forum for researchers, vendors, network operators, and the Internet standards community to present and discuss emerging results in applied networking research. The workshop offers an opportunity for academics to transition research back into IETF standards and protocols, and to find inspiration from topics and open problems discussed at the IETF. To foster this cross-community collaboration, the workshops are co-located with IETF meetings once a year and organized in a way that allows ample time for discussion and interaction.

The ANRW 2024 was held in conjunction with the IETF 120 Vancouver meeting. The day-long workshop program consisted of a mix of invited talks, submitted talks, and submitted short papers. Video recordings from the workshop are available from the IRTF website. Workshop proceedings have been published by the ACM.

The ANRW series receives financial support from Akamai and Comcast.

Information Resources

Internet Architecture Board (IAB)

- IAB website
- IAB on Twitter

Internet Engineering Task Force (IETF)

- IETF website
- IETF Datatracker
- IETF Mail Archive
- IETF on Twitter

IETF Administration LLC (IETF LLC)

- IETF LLC webpages
- IETF LLC on LinkedIn

Internet Research Task Force (IRTF)

- IRTF website
- IRTF on Twitter

RFC Editor

- RFC Editor website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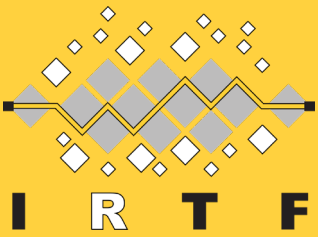
IRTF