

I E T F[®]

IETF Annual Report 2022

A summary of Internet Engineering Task Force,
Internet Architecture Board,
Internet Research Task Force, and
RFC Editor activities
as of 31 December 2022

IETF by the numbers in 2022

Participation

6,654 Participants in all IETF activities
(mailing list posters, meeting participants, I-D authors)*

3,839 Registered participants at IETF Meetings

104,000 email messages sent to IETF mailing lists

3,604 Individuals posting to IETF mailing lists

Documents

811 Internet-Drafts (I-D) submitted†

2,728 I-D authors

194 RFCs published

Working Groups

126 Active Working Groups

8 New Working Groups chartered

5 Working Groups concluded

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

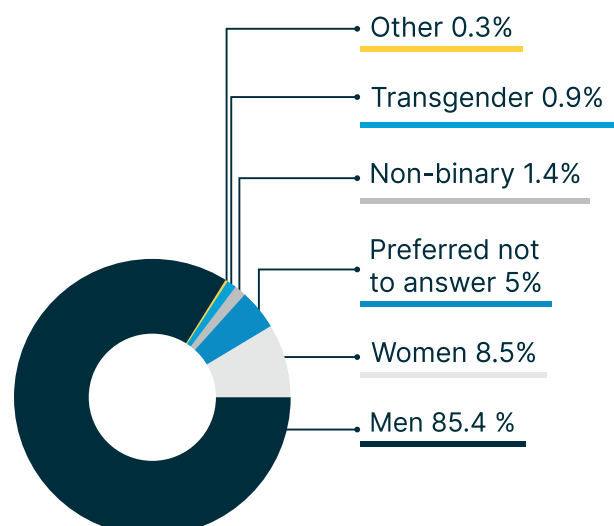
† Unique I-D names not counting different versions of the same I-D submitted to the IETF I-D archive

IETF Community

By Geography

40.6%	Europe
37.7%	North America: US, Canada
12.3%	Oceania: Australia, New Zealand, Pacific Islands
11.6%	Asia
3.9%	Latin America
2.5%	Africa
1.1%	Middle East
0.4%	Not answered

By Gender





I E T F®

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 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 mechanism 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 re-chartered to take on subsequent related work. In 2022, 8 new working groups were chartered and 5 were concluded.

New IETF Working Groups

The following new Working Groups were chartered during 2022:

[Privacy Preserving Measurement \(PPM\)](#)

The PPM working group is developing and standardizing protocols for deploying techniques that can collect and aggregate sensitive data at scale, while preserving individual privacy.

[Source Address Validation in Intra-domain and Inter-domain Networks \(SAVNET\)](#)

The SAVNET working group is defining routing-protocol-independent architectures and procedures to accurately determine the valid incoming router interfaces for specific source prefixes, mitigating source address spoofing attacks in the data plane.

[Transfer diGital cREdentialS Securely \(TIGRESS\)](#)

The TIGRESS working group is defining a protocol to facilitate credential transfers from one person's device to another person's device to address situations common today in which it is desirable to transfer a copy of a digital credential to another person, such as when a private car owner may want to provide access to their vehicle to a friend or a family member.

NomCom Eligibility Update (ELEGY)

The ELEGY working group is chartered to define the criteria for IETF Nominating Committee eligibility, taking into account the move to online-only and hybrid meetings, and increased remote participation in meetings.

Revise Universally Unique Identifier Definitions (UUIDREV)

The UUIDREV working group is updating RFC 4122, which defines UUIDs (Universally Unique IDentifiers)—also known as GUIDs (Globally Unique IDentifiers)—which can guarantee uniqueness across space and time without requiring a centralized authority to administer.

Media Over QUIC (MOQ)

The MOQ working group will develop a simple low-latency, efficiently-scaling solution for ingestion and distribution of media, including audio, video and timed metadata such as closed captions and cue points to address use cases including live streaming, gaming and media conferencing.

Stub Network Auto Configuration for IPv6 (SNAC)

The SNAC working group is defining how an IPv6-only stub network—which is a network that can be connected to, and participate as part of, an existing infrastructure network without modifications to the infrastructure network—can connect automatically to an existing infrastructure network without any address translation, so that hosts and services on the stub network can communicate as if they were connected directly to the infrastructure network.

Supply Chain Integrity, Transparency, and Trust (SCITT)

Reusing work from existing IETF working groups and coordinating with other standards bodies, such as the Open SSF, W3C, ISO and the Trusted Computing Group, the SCITT working group is defining a set of interoperable building blocks that will allow implementers to build integrity and accountability into software supply chain systems to help assure trustworthy operation.

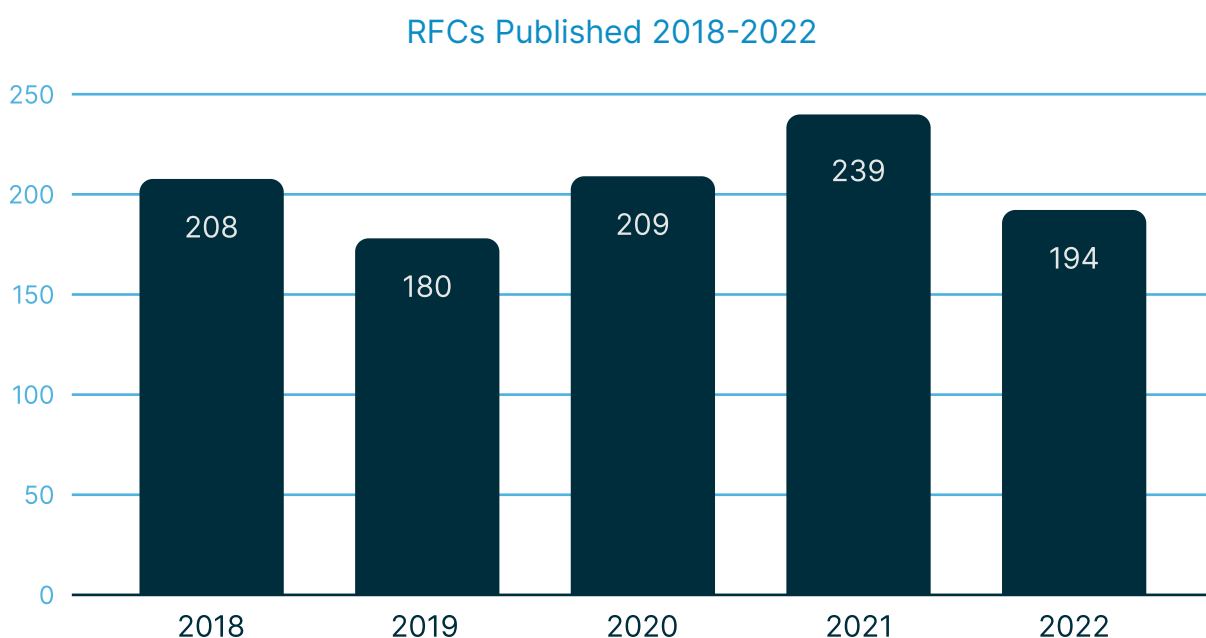
Concluded IETF Working Groups

The following Working Groups were concluded during 2022:

- CURves, Deprecating and a Little more Encryption (CURDLE)
- RADIUS EXTensions (RADEXT)
- Privacy Enhanced RTP Conferencing (PERC)
- Security Automation and Continuous Monitoring (SACM)
- IP Wireless Access in Vehicular Environments (IPWAVE)

RFCs

The RFC document series contain 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), as well as individual submissions. In 2022, 194 RFCs with 6,676 total pages were published.



Internet-Drafts

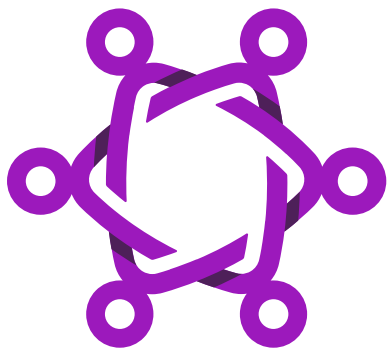
Internet-Drafts (I-Ds) are working documents of the IETF, its Areas, and its Working Groups, as well as groups such as IRTF Research Groups. While only some I-Ds eventually become RFCs, I-Ds are the focal points for much of the day-to-day work and discussion of the IETF. During 2022, I-Ds posted to IETF I-D repository included:

- 1026 I-Ds of all types*
- 2730 Different I-D authors†
- 302 I-Ds adopted by Working Groups‡

* This is a count of unique “-00” versions of I-D submitted to the IETF I-D repository during 2022, 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 2022.

‡ This is a count of “-00” versions of I-Ds with WG names submitted to the IETF I-D repository during 2022, not counting different versions of the same I-D.



MLS

Tech Spotlight: Messaging Layer Security

Messaging Layer Security (MLS) is a new standard for end-to-end security that will make it easy for apps to provide the highest level of security to their users. End-to-end encryption is an increasingly important security feature in Internet applications: it keeps users' information safe even if the cloud service they're using has been breached. The MLS working group finished the basic architecture and protocol documents, sending them to the Internet Engineering Steering Group in September 2022.

During 2022, implementations based on draft MLS specifications were developed and deployed to inform the MLS Working Group's efforts. These early deployments provide validation of MLS's ability to work well in real-world scenarios, at the scale of major communications services. Since then, MLS has been deployed at scale to protect sensitive real-time conversations in [Webex](#) and [RingCentral](#) communications products. Other apps, such as [Wire](#), [Wickr](#) and [Matrix](#), are planning to transition to MLS.

MLS is also extensible, meaning it can be easily updated in a number of ways. Work is continuing in the MLS Working Group in a number of areas and the IETF More Instant Messaging Interoperability ([MIMI](#)) working group, created after a Birds of a Feather session held at the IETF 115 meeting in November 2022, is looking to build on MLS as they aim to specify the minimal set of mechanisms required to make modern Internet messaging services interoperable.

IETF Meetings

While the work of the IETF is largely conducted over mailing lists, the IETF community holds a variety of online and in-person meetings to make progress. After being fully online during 2021, IETF meetings adopted a hybrid approach in 2022, with increased remote registrations leveraging significant investments in online participation capabilities.



[IETF 113 Vienna](#)

19-25 March 2022

Hosted by Huawei

314 onsite participants

976 online participants



NBCUniversal

[IETF 114 Philadelphia](#)

23-28 July 2022

Hosted by Comcast and NBCUniversal

618 onsite participants

679 online participants



[IETF 115 London](#)

5-11 November 2022

Hosted by Cisco

849 onsite participants

666 online participants

[Interim Meetings](#)

Complementing the three IETF-wide meetings held each year, interim meetings are a way for groups to allocate dedicated time to make progress on issues that haven't been amenable to resolution on mailing lists. In 2022, IETF groups held more than 238 interim meetings throughout the year. This is about the same number as were held in 2021, and more than double the number of interim meetings held just a few years ago. More details, including agendas, minutes, and other materials for each interim meeting can be found on the past meetings page in 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 the standards that power the Internet remain open for permissionless innovation. See the IETF website for more information about IETF sponsors and how they support the IETF.



Diversity and Inclusivity Sponsors

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

Gold Sponsors



Bronze Sponsors



Running Code Sponsors

"We believe in rough consensus and running code" is an 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 day-to-day by IETF participants.

Silver Sponsor



Bronze Sponsors



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. With the support of Sustainability sponsors, the IETF is becoming a more sustainable organization by sourcing and using eco-friendly materials in all of its meeting materials.

Gold sponsor

ORACLE
Cloud Infrastructure

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.

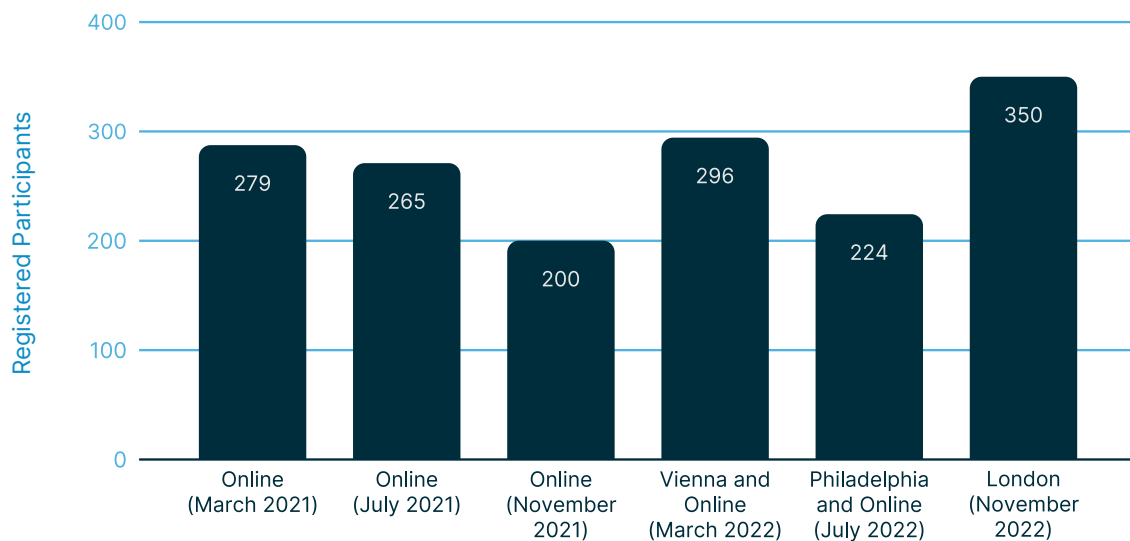


IETF Hackathons

IETF Hackathons encourage developers to collaborate and develop utilities, ideas, sample code and solutions that show practical implementations of IETF standards. IETF Hackathons 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 beginning in 2015 with approximately 50 participants, IETF Hackathons have grown dramatically. During 2022, three IETF Hackathons averaged more than 290 in-person and online participants, with a peak of 350 registered participants at the event in London. Support for IETF Hackathons is provided by Cisco DevNet.

IETF Hackathon Participation 2021-2022



IETF Endowment

The IETF Endowment, a designated investment fund created in support of IETF and its activities, marked a decade of existence in 2022. Established in 2012, the IETF Endowment was created to ensure the long-term financial sustainability for the work of the IETF. Building on the 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 through a generous 2:1 matching program by the Internet Society. Between donations raised in 2022 and the Internet Society matching funds program, nearly \$640,000 will go into the IETF Endowment. More information about the IETF Endowment and ways to support it are at:

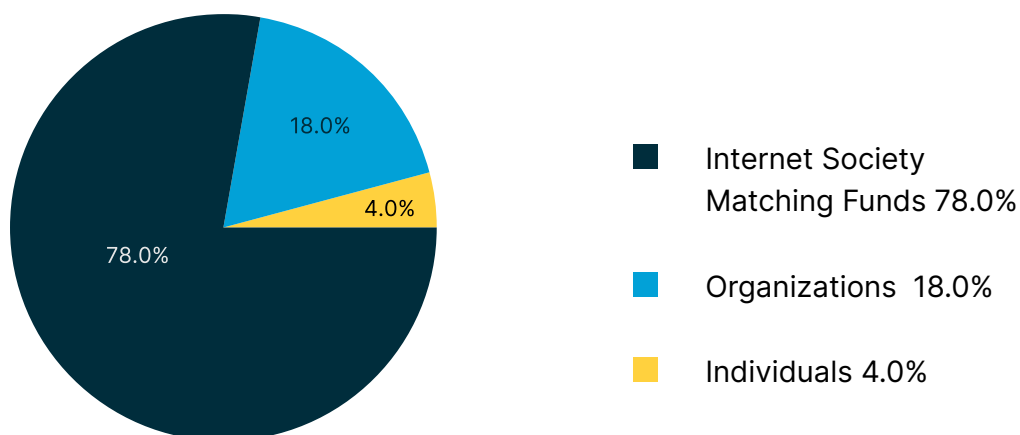
www.ietf.org/endowment

IETF Endowment Donors



Sources of IETF Endowment Contributions in 2022

Total raised: US\$639,464



IETF Administration LLC Updates

Established in 2018 after an extensive community process to update the administrative arrangements supporting the work of the IETF, the IETF Administration LLC (IETF LLC) completed its fourth full year of operation in 2022.

The IETF LLC provides the corporate legal home for the IETF, the IAB, and the IRTF. It is responsible for supporting ongoing operations, managing finances and budget, raising money, and establishing and enforcing policies to ensure compliance with applicable laws, regulations, and rules. Key principles guiding the IETF LLC include trust, responsiveness, and transparency. To that end, board meetings are open to observers except for items such as legal, contracts, and personnel matters, with meeting agendas published prior to the meeting and minutes published afterwards.

Noteworthy accomplishments and developments during 2022 include:

Resuming In-person IETF Meetings

After two years of online-only meetings, in-person meetings resumed in 2022. While the resumption of in-person participation was welcome, it brought challenges of ensuring meetings were supported and structured so that online participants could contribute, undertaking new onsite measures to manage COVID, and adjusting processes and planning to accommodate reduced in-person participation. Investment to improve online participation tools continued throughout the year in response to lessons learned and feedback received from the community.

Second Annual IETF Community Survey

More than 2000 respondents provided valuable input to the second-ever survey of the entire IETF community. Following on the first edition conducted in 2021, insights from this survey will be used to inform the actions of IETF leadership. Among notable results were the composition of the IETF community, preferences for modes of interaction, and aspects of individual participant affiliations and affinity with the IETF community in general.

Towards a Net Zero IETF

The IETF LLC launched a project in 2022 to calculate and potentially offset IETF carbon emissions. To undertake the project, the IETF LLC engaged an expert consultancy to produce a methodology for calculating the CO2 footprint of IETF activities, including meetings and ongoing operations, and to recommend a potential strategy for offsetting this CO2 footprint, informed by input from the IETF community broadly. The resulting CO2 footprint calculator was trialed using data from IETF meetings in 2022, and will be used in 2023 to further explore options for potential offsetting.

IETF Administration LLC 2022 Financials

The IETF LLC received an unqualified audit opinion for the IETF LLC 2022 audited financial statements, 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). The Statement of Activity for the 2022 year is below. Please see the following notes for important information about the 2022 IETF LLC financial statements.

	2022 Actual	Budget
NON-MEETING REVENUE		
Contributions	\$ 534,535	\$ 8,000,000
ISOC Contribution Cash ¹	\$ -	\$ 6,500,000
Endowment Contributions	\$ 534,535	\$ 1,500,000
Administrative In-Kind Contribution ²	\$ 58,500	\$ 9,000
Investment Interest & Unrealized Losses³	\$(2,499,892)	\$ 1,065,098
TOTAL NON-MEETING REVENUE, net of UNREALIZED LOSSES	\$(1,906,857)	\$ 9,074,098
MEETING REVENUE		
Registration Fees	\$ 1,449,964	\$ 2,057,000
Sponsorship (Including In-Kind)	\$ 1,368,666	\$ 1,280,000
Hotel Commissions / Rebates / Comps	\$ -	\$ 633,315
Miscellaneous	\$ 2,362	\$ 21,500
TOTAL MEETING REVENUE	\$ 2,820,992	\$ 3,991,815
TOTAL REVENUE	\$ 914,135	\$ 13,065,913
MEETING EXPENSES		
Venue Costs	\$ 1,451,002	\$ 1,671,836
Travel and Expenses	\$ 314,350	\$ 638,526
Meeting Support	\$ 1,212,173	\$ 1,069,622
NOC Support	\$ 715,169	\$ 750,413
Other	\$ 253,697	\$ 132,884
Site Visits	\$ 36,973	\$ 24,325
TOTAL MEETING EXPENSES	\$ 3,983,364	\$ 4,287,606

Continued on the following page

	2022 Actual	Budget
OPERATING EXPENSES		
Administration	\$ 2,217,277	\$ 2,132,811
Staff Costs	\$ 1,102,764	\$ 963,696
Operations	\$ 422,247	\$ 399,351
Board Costs	\$ 2,228	\$ 86,366
Secretariat - Admin	\$ 340,159	\$ 342,248
CPA Services	\$ 180,904	\$ 155,000
Legal Services	\$ 168,975	\$ 186,150
RFC Services	\$ 1,548,447	\$ 1,499,844
RFC Production Center	\$ 1,384,387	\$ 1,313,944
RFC Series Editor	\$ 164,060	\$ 176,900
Independent Submissions Editor	\$ -	\$ 9,000
Community Leadership	\$ 621,036	\$ 737,583
Secretariat - Community Leadership	\$ 553,800	\$ 570,414
IESG Support	\$ 15,894	\$ 38,795
IAB Support	\$ 2,472	\$ 38,795
IRTF Support	\$ 3,370	\$ 17,956
NomCom Support	\$ -	\$ 1,623
Community Leadership Training	\$ 45,500	\$ 50,000
EMODIR Support	\$ -	\$ 20,000
IETF Trust Contribution	\$ 94,893	\$ 94,893
Special Projects	\$ 17,176	\$ 100,000
Tools⁴	\$ 1,101,187	\$ 1,127,270
Staff Costs	\$ 211,801	\$ 273,165
Secretariat - IT	\$ 443,040	\$ 456,331
Management/Planning	\$ 51,565	\$ 161,256
Research/Analysis/Design	\$ 51,565	\$ 198,757
Software Development (Net of Capex)	\$ 65,381	\$ 322,700
Infrastructure Development	\$ 31,272	\$ 30,000
Operations (Non-Secretariat)	\$ 200,534	\$ 158,100
Review/Audit	\$ 46,029	\$ 100,000
Capitalisation Adjustment (Netted in Actuals)	\$ -	\$(573,039)
Depreciation ⁵	\$ 163,223	\$ -
TOTAL OPERATING EXPENSES	\$ 5,763,239	\$ 5,692,401
TOTAL EXPENSES	\$ 9,746,603	\$ 9,980,007
NET INCOME/LOSS (AFTER CAPITAL EXPENDITURE)	(\$ 8,832,468)	\$ 3,085,906
Capital Investment	\$424,062	\$573,039

Notes for 2022 Financials

1. During the year ended December 31, 2020, the IETF LLC updated the way it accounted for the Internet Society's (ISOC) annual contribution as a result of the amendment of the agreement between ISOC and the IETF. Because the contributions for the year 2021 and 2022 are considered unconditional, they are required to be recorded in the year granted, which was 2020. Therefore, even though the cash for these contributions will come in subsequent years, the revenue was required to be recorded during 2020. Per the amended agreement between ISOC and IETF, contributions for the years 2023 through 2026 are conditional because they are required to be approved by ISOC's CFO before they will be authorized. Conditional contributions are not recorded until the conditions are met. Therefore, IETF expects to show revenue for these conditional contributions in the year the condition is met.
2. In-Kind Contribution is calculated at \$4,875 a month for 150 Webex users.
3. Realized and unrealized losses in 2022 were (\$3,088,771).
4. Capitalized expenses were budgeted gross with a contra account for transferring to the balance sheet. Actual expenses are shown net of capitalized amounts and a contra account was not used.
5. Depreciation expense was not budgeted for.



Internet Architecture Board Activities

The Internet Architecture Board (IAB) provides long-range technical direction for Internet development, ensuring the Internet continues to grow and evolve as a platform for global communication and innovation. The IAB provided reports to the community throughout 2022.

[IAB Report to the Community for IETF 113](#)

This report included the announcement of Eliot Lear as the new Independent Submissions Editor, as well as standard updates about appointments and liaison activities for which the IAB is responsible.

[IAB Report to the Community for IETF 114](#)

Notably, among other updates, this IAB report provided a summary of the various documents and activities resulting from the RFC Editor Future Development Program on how to evolve the RFC Editor model, including the formation of the RFC Series Working Group (RSWG) and the RFC Series Approval Board (RSAB).

[IAB report to the community for IETF 115](#)

In addition to the usual topics, this update noted that the Internet Threat Model (MODEL-T) program was closed in September 2022, pointed to the publication as RFCs of reports from the IAB workshops on Analyzing IETF Data (AID) and Measuring Network Quality for End Users (M-TEN).

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)

Administrative Support Groups

- IAB-ISOC Policy Coordination
- IETF-IANA
- IETF-IEEE

IAB Workshops

Workshops provide a way to bring together experts on a focused topic of interest to the work of the IAB. In 2022, the IAB held online workshops on the environmental impact of Internet applications and systems, and on the management of encrypted networks.

E-IMPACT

The online Environmental Impact of Internet Applications and Systems (E-IMPACT) workshop in December 2022 tackled various aspects—technical, economic, business, policy—of the environmental costs and benefits of the Internet and its use, with main goals being to call further attention to the topic broadly, and to bring together a diverse stakeholder community to discuss the issues raised.

M-TEN

Held online in October 2022, the Management Techniques in Encrypted Networks (M-TEN) workshop brought together individuals with a wide range of backgrounds to discuss ways to improve network management techniques in support of even broader adoption of encryption on the Internet.



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) working 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. Research Groups active as of 31 December 2022 were: Crypto Forum Research Group (CFRG).

- Computing in the Network Research Group (COINRG)
- Decentralized Internet Infrastructure (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)
- NetWork Coding for efficient Network Communications Research Group (NWCRCG)
- Path Aware Networking RG (PANRG)
- Privacy Enhancements and Assessments Research Group (PEARG)
- Quantum Internet Research Group (QIRG)
- Thing-to-Thing (T2TRG)



Applied Network 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. From the 59 nominations received for the 2022 edition of the ANRP, seven awards were presented to: Bruce Spang, Sangeetha Abdu Jyothi, Sam Kumar, Tushar Swamy, Daniel Wagner, Corinne Cath, and Guatam Akiwate.



Applied Network 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 2022 was held in conjunction with the IETF 114 Philadelphia 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](#)

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