Using Standardization as a Springboard for Academic Research: The Case of E-Impact and the Environment

The IETF edition

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The Environment

Photo: *Yannick LE GAL*
Source: https://www.camping-saint-briac.com/en/beaches/

Your Research

Hypothesis

Ideas

Models

Your Research

Papers

Evaluation

Results

Hypothesis

Ideas

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Your Research

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Papers

Internet & Co

Environment

Internet & Co

Hypothesis

Ideas

Models

Your Research

Papers

Evaluation

Results

Environment

Internet & Co

Writing the (industrialized) code

Making the hardware

Standardizing

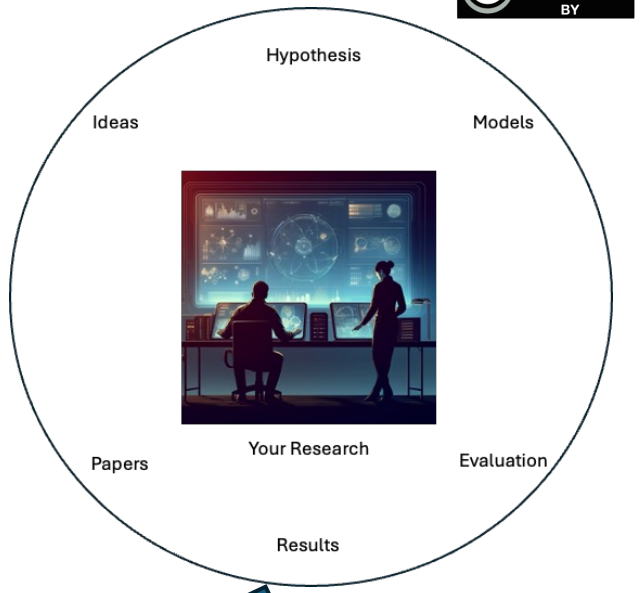
Understanding the benefits

Understanding the limits

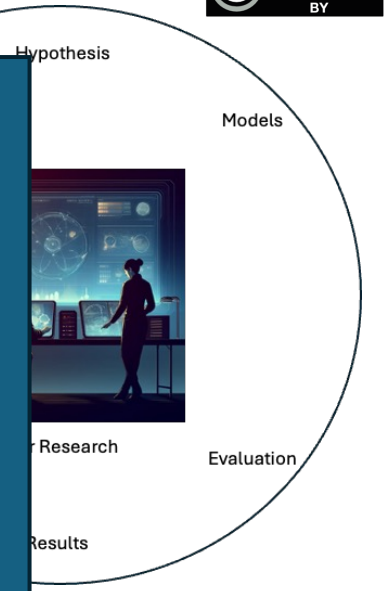
Getting the solution to be known

4-12 years

18 months



18 months



Environm

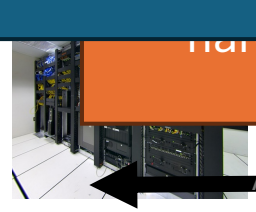
Internet &

Most of the times, your research cannot be implemented.

Things like: “my protocol is 25% better than IETF’s” doesn’t matter on their own.

In lots of cases, the 25% come from unreasonable operational assumptions, or don’t cover the full communication stack (e.g. no security), or don’t work in all scenarios, or require rewriting the whole Internet, etc. etc. etc.

Getting the solution to be known



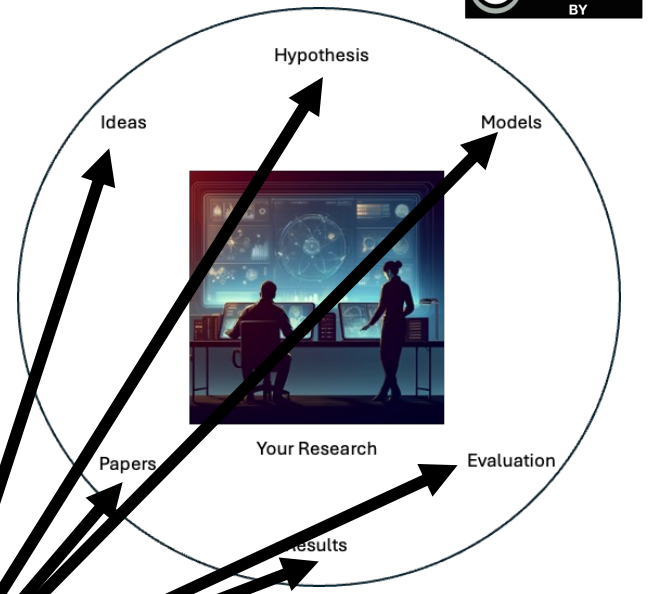
hardware

4-12 years-**Never**

Environment

Internet & Co

1 (or more) papers
+ Getting experience and contacts
+ Maybe multiple drafts / standards



Writing the (industrialized) code

Making the hardware

Standardizing

Understanding the benefits

Understanding the limits

Getting the solution to be known

2-5 years*

Some real-world examples

Bruce Nordman <bnordman@lbl.gov>

- In 2005 I co-proposed Energy Efficient Ethernet to IEEE 802.3.
- In 2006 a working group was created and in early 2007 it had its first meeting.
- Final approval was early 2010 by my recollection but products were appearing in late 2009.

Early on I did an estimate that showed on the order of $1 billion/year of savings globally, but over a few years the chips became significantly more efficient in general and so the EEE savings dropped - ballpark I would guess to a third but I really don't know.

Static Context Header Compression – SCHC

- LoRa™ ,and Sigfox™ born in France ~2005-2012
- Up to 90% less data, 70% less energy, 7x more devices per cell
- The research on SCHC started roughly in 2012/2013
- IETF WG forming in 2016
- RFC 8724 published in 2020
- Adopted by other SDOs in 2020
  - LoRa Alliance & DLMS UA & IEC
- First smart meters deployed in a pilot – 2021
- Today, there are 20k+ gas meters, 1k+ electric and 1k+ water meters deployed
- In 2026: 7M in Italy, 560k in Greece

- 8 RFCs, 8 drafts in work, many more in related WG
- Multiple standards from other SDOs
- Current work for the future:
  - SCHC for 6G and WiFi Zero-Energy devices

If you are working on networking (in any way),
you SHOULD participate in the standardization process

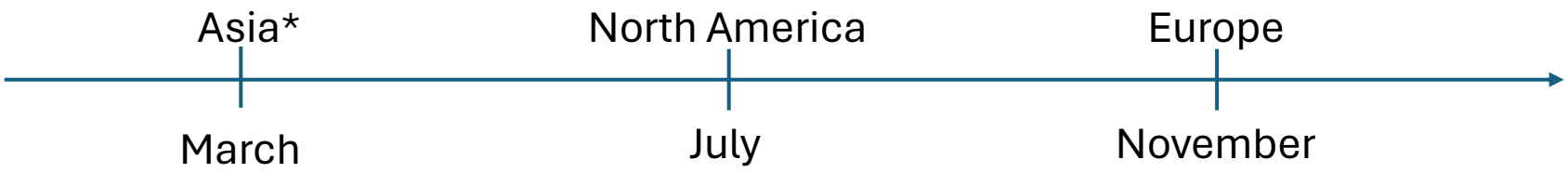
If you want your work to have larger impact,
you SHOULD participate in the standardization process

If you want to confront your ideas and research,
you SHOULD participate in the standardization process

What is the IETF?
Internet Engineering Task Force

- The IETF makes *voluntary* standards that are *often* adopted.
- The overall goal of the IETF is to make the Internet work better.
- There is no membership in the IETF. Anyone can participate by signing up to a working group mailing list.
- Mantra:
  - “We reject kings, presidents and voting. We believe in rough consensus and running code.”
- https://www.ietf.org/participate/get-started/

Approximate order of places of in-person meetings (can vary):

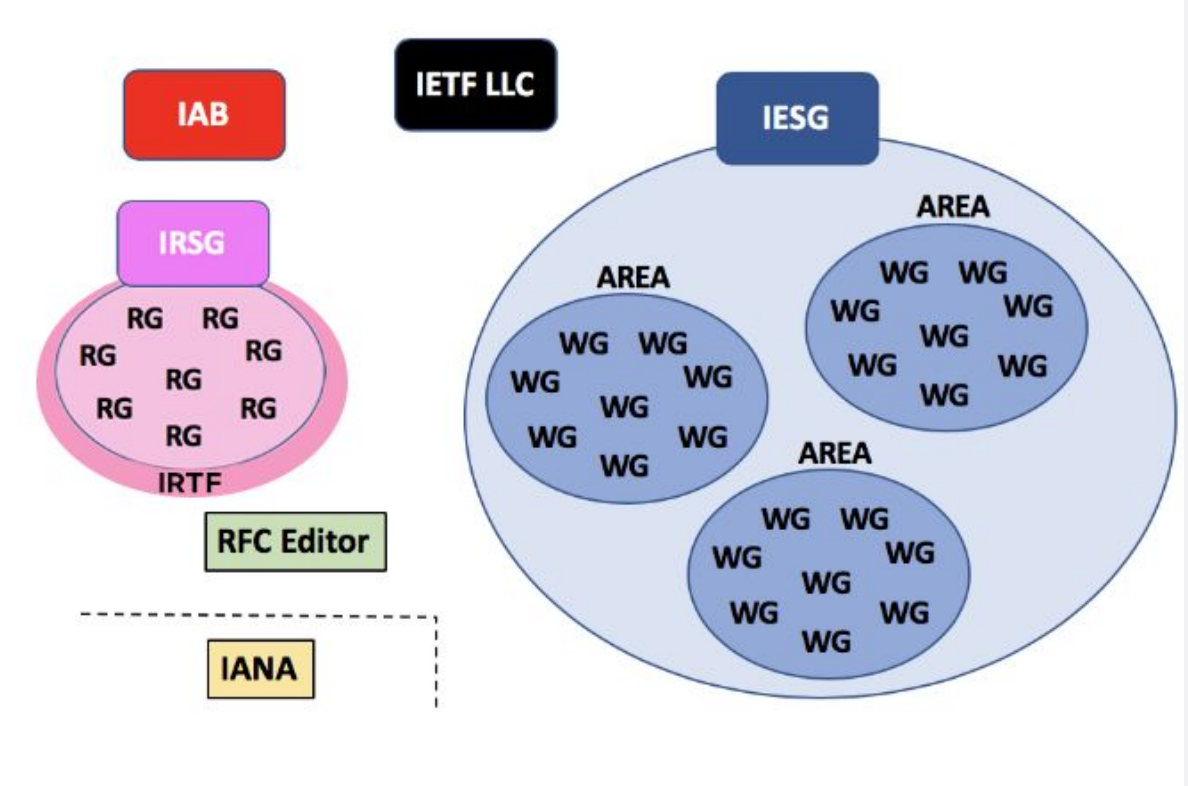


See RFC3935 (« Mission Statement ») and RFC7282 (« On Consensus and Humming in the IETF »)

*Or South America, Africa, Australia

The Big Picture

- **Internet Engineering Steering Group (IESG)** responsible for technical management of IETF activities and the Internet standards process
- **Internet Research Steering Group (IRSG)** steering group for the Internet Research Task Force (IRTF), focused on longer-term Internet research topics
- **Internet Architecture Board (IAB)** provides oversight of the Internet architecture and the standards process
- **IETF Administration LLC** corporate home for the IETF, the IAB, and the IRTF; provides fiscal and administrative support



Making the Internet work better

Source: https://www.ietf.org/meeting/new-participants/ Document: https://www.ietf.org/media/documents/NewParticipant-Overview-Recordings_2022.pdf

IETF Areas

Applications and Real-Time (ART)	• Application protocols and architectures • Real-time (communication) and non-real-time
Transport (TSV)	• Mechanisms related to data transport on the Internet - Includes congestion control
Routing (RTG)	• Routing and signaling protocols
Internet (INT)	• IPv4/IPv6, DNS, DHCP, mobility
Operations and Management (OPS)	• Network management • Operations: IPv6, DNS, security, routing
Security (SEC)	• Security protocols and mechanisms
General (GEN)	• Activities focused on supporting and updating IETF processes

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The Internet Research Task Force (IRTF) focuses on longer term research issues related to the Internet while the parallel organization, the Internet Engineering Task Force (IETF), focuses on the shorter-term issues of engineering and standards making.

Group	Name
cfrg	Crypto Forum
coinrg	Computing in the Network Research Group
dinrg	Decentralization of the Internet Research Group
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 RG
pearg	Privacy Enhancements and Assessments Research Group
qirg	Quantum Internet Research Group
rasprg	Research and Analysis of Standard-Setting Processes Proposed Research Group
t2trg	Thing-to-Thing
ufmrg	Usable Formal Methods Research Group

Hackathon

Source: https://www.ietf.org/blog/ietf114-hackathon/

Plenary

Source: https://www.ietf.org/blog/highlights-ietf-100/

WG Session

Source: https://www.ietf.org/blog/highlights-ietf-102/

How to become visible and useful contributor?

- Review the WG charter, milestones
- Subscribe to mailing list
  - Don’t be overwhelmed
- Speak up, ask questions, provide answers
  - You are (most certainly) going to be wrong, or at least ignorant about many of the things
  - People will be happy to correct you or point you to useful resources
- Contribute
  - Reading drafts and asking questions, providing feedback, etc.
  - Taking notes
  - Writing drafts - A draft is not a paper
- Do this in parallel to your “normal” research
  - It’s more intense (publications are more often), but the steps are smaller
    - **Think “Continuous Assessment” vs “End Semester Examination” (research paper)**
  - Can feed into your research, and vice-versa

Environmental Impacts of Internet Technology

- The E-Impact Program is a venue for **discussing environmental impacts** and sustainability of **Internet technology**.
- Within this scope, the program looks at trends, issues, improvement opportunities, ideas, best practices, and subsequent direction of work related to Internet technology, architecture, and operations, including visibility and efficiency on energy and other environmentally-impacting attributes.
- In particular, the group focuses on Internet architecture's role in these topics.

https://datatracker.ietf.org/

New WG to be formed: **Getting Ready for Energy-Efficient Networking (GREEN)**

- As the desire to improve energy efficiency gains momentum, network operators increasingly focus on understanding energy consumption by different links, nodes, and devices/components within their networks. **Network Energy-efficiency management involves deploying and managing network infrastructures with the dual goals of optimizing energy use and minimizing environmental impact.** This will involve technologies to monitor energy consumption, evaluate the effectiveness of energy saving polices, use control strategies to improve energy efficiency, and foster sustainability in network operations.
- **This BoF is intended to discuss these objectives and determine whether there is a community of interest to work on these topics within the IETF through a new working group (provisionally called GREEN).**
- The BoF discussion should **identify a suite of short-term deliverables aimed at enhancing energy efficiency within networks**. Key objectives include standardizing terms and definitions for energy metrics, and YANG models for reporting energy consumption usage and performing energy management. Additionally, the group could create a framework to describe the effective collection and utilization of these metrics and attributes. The proposed approach is to tackle energy efficiency challenges in a systematic and incremental manner, focusing on practical building blocks that contribute to overarching energy efficiency goals.

https://datatracker.ietf.org/

If you want to go fast,
go alone.
If you want to go far,
Use rough consensus and running code

(Re-imagining proverbs the IETF way)

Questions?