What has the IETF ever done for Energy ?

IETF114 Philadelphia

NMRG / OPSAWG

draft-eckert-ietf-and-energy-overview-03

(new draft for IETF114)

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https://github.com/toerless/energy/draft-eckert-ietf-and-energy-overview

Overview: Goal

- Summary / Overview of what the IETF has done for Energy
  - Saving, Sustainability, ... (waste ?!)
- Goal: Community Enlightenment
  - Understand, apply, best use
  - Look for gaps, close, look for new areas (STD AND RESEARCH!)
  - Also enlightenment of outside (lots of interest beyond IETF to understand Internet and Energy consumption)
- Positioning
  - Most simple: individual submission
  - If there is more interest, maybe it can get some sponsorship (AD, IAB, ...)
  - Example of “GEN” sponsorship: RFC6272 (Protocols for Smart Grid)
  - But content of this document may become more useful when it can more freely express authors opinions without attempting to make them IETF consensus
- Varied set of areas
  - Best with support / input from wide set of expert holders for different subjects / topics (IMHO)
  - “Ok” if this looks like a book with chapters from different authors (not a single story to tell!)
  - Main challlenge: what degree of detail for each topic

What has the IETF ever done for Energy ?

Well, obviously, *“the IETF has never done anything for energy”*

Oh wait !

There are all these “IoT” groups, that where driven by limited energy as much as limited compute and limited bitrates/radio (often driven by limited energy)

And was there not also....

And ...

And ...

“Monty Python’s Life of Brian”

What have the Romans ever done for us...

ALL RIGHT, BUT APART FROM

THE SANITATION, THE MEDICINE, EDUCATION, WINE, PUBLIC ORDER, IRRIGATION, ROADS, THE FRESH WATER SYSTEM AND PUBLIC HEALTH.

WHAT HAVE THE ROMANS EVER DONE FOR US ?

What has the IETF ever done for Energy ?

Scope Intentionally (recently) or Incidentally (since inception)

- Finished (RFC) or attempted/abandoned (drafts)

Digitization of non-digital / pre-network workflows

- Packet multiplexing principle
- e.g.: evolution from ftp, mail (SMTP), group-communications (NNTP), HTTP/HTML
- Both often reducing instance energy consumption
  but increasing overall consumption by exploding number of instances

Energy Savings Through Scale

- Joule/Bit going down with each faster network generation
- The Internet as Network of Networks drives large amounts of this scale
  - The more smaller network we would have in its absence the more energy waste we would have ?!
- Datagram + End-to-end transport as lowest cost network, most easily scaleable technology (TCP/IP)
- Convergence => Converged Networks via TCP/IP
  - DiffServ, IntServ, DetNet (probably more)
  - Example: Voice / SIP -> background noise/energy utilization now in networks

What has the IETF ever done for Energy ?

Energy Savings Through Scale (continued) ... And Waste

- Often complex comparisons of total energy consumption:
- Many network based workflows show easily calculated energy saving (Streaming,..)
- ... Extreme opposite, e.g.: “Proof of Work” crypto mining (easily calculated extreme bad)
  - Network itself only “enabler” (both when the net result is good or bad)
- Common case: network is better per transaction, but network enables fast growth of transactions

Energy saving vs Sustainability – what’s the difference ?

- A) Different metric re. “Good” (renewable) vs. “Bad” energy
- “Follow the (green) energy” cloud scheduling (“Proof of Work” in underutilized african solar park” ?!)
- “Minimize Heat generation” / energy waste through cooling (“Data center in cold climates”)
- “Heat recovery” (Mini-DC doubling as heater in single family homes with fiber Internet)

- B) More interesting metrics than just “energy” for the non-network alternative
- Telecollaboration
  - Long history: email, nntp, Mbone, SIP, ?telepresence? RTCweb, ...
  - Difficult comparison of sustainability of travel (found example paper attempting to do this):
  - Planes, Trains, Automobiles and bicycles...
  - Global Warming impact of energy burned in planes 3x worse then when burned at sea level

The lower cost network traffic is, the more saving/sustainability opportunity it opens

- But also the more waste as an enabler (at application level)
- Net beneficial ?! (I think so).

What has the IETF ever done for Energy ?

- Low Power and Lossy Networks
  - Low-bitrate radio /low performance compute driven by low power consumption needs
    - Some other factors too (radio regulation, chip cost,...), but energy IMHO prime.
    - ENERGY HARVESTING / Maximize battery lifetime
    - [RFC8352] overview, 802.15.4, Bluetooth LE, WiFi, DEC ULE,...
    - Summarizing key points of WGs 6LOPAN, LPWAN, 6TISCH, 6LO, ROLL
    - Few explicit energy related drafts too, not adopted (RPL routing metrics, path selection)
    - Low Power IETF technology proliferates into other IETF areas... Does that save energy ?
  - Constrained Nodes and Networks
    - Used by ‘higher than network” groups in IETF
    - LWIG (low-power guidance), CoRE (CoAP), ACE (constrained security) (Elyptic Curve lower compute/power cost), Satellite network initiatives (heavily power constrained)
    - Devices with Batteries
      - Minimize periodic network traffic vs. Hard-state protocols examples

What has the IETF ever done for Energy ?

- Sample Technology Enabler
  - IP Multicast – meant as a bandwidth saver. Should also save Energy
    - Lots of application of multicast (“discovery”) that waste Energy
      - Often simply not well applied
    - Multicast problems on wireless [RFC9119]– L2 optimization (buffer and send periodic)
      - MiMo makes multicast less attractive (“unicast like antenna focussing”).
  - Sleepy Nodes
    - Energy consumption reduced when compute/network transmission happens in short bursts rather than spread out – loss of energy on up/down high/low switching, minimize it
    - Variety of protocols partially considering the problem. Little adopted ?! (CoRE, DNS,...)
- (Lack of) Energy Benchmarking
- Energy Production/COnsumption Management networks
  - Smart Grid – intelligenet management primarily energy consumption, also some production (spec unclear)
    - Smart Metering, smart timing of consumers, LLN infrastructures to connect them etc. pp
  - Synchro Phasor Networsk
    - Synchronize wide-area interconnected power connectors (same phase, appropriate power levels)
    - Often initiated (15 ears ago ?) to avoid spreading brownouts, more reliable country wide power generation
    - Msec accurate latency measurement of packet propagation along powerlines to measure power propagration times.

What has the IETF ever done for Energy ?

- Energy Management: EMAN & Metrics / Benchmarking
  - Few Energy Metrics proposed for benchmarking (but now new work..)
    - Even Energy Pricing by time metrics proposed for managing time-shifting consumption
  - EMAN – Energy Management Working Group
    - 2010 - 215. 7 RFC: MIB based measurement of (primarily) current equipment power consumption
    - PoE port support. Aka: (i think) also power/on off of powers possible to signal.
    - Battery powered network support specifics
- Power-awareness in Forwarding and Routing Protocols
  - Power Aware Networks (PANET)
    - Ideas for minimizing networks power consumption by low-power/switching off components dynamically when not needed for current performance requirements of network
    - Not progressed (2013/2014) – due to concerns of reduced resilience in network switchig off redundancy,..
    - Also driven by rolling blackouts in India – reduce power consumption ONLY during critical energy supply times
  - SDN based forwarding semantics
    - Optimization of energy often NP complete problem, central entity often easiest way to manage. SDN semantic common way to think about this, variety of protocol/mechanisms from IETF to support building this, recent work on looking at this type of usec-ase
- Gaps
  - Before this year, few attempts to find/document gaps (for energy efficient networks).

Looking for contributors / co-authors

- How to engage
  - Draft-eckert-ietf
- Github: https://github.com/toerless/energy

- Mailing lists ?

  - recipe@ietf.org
    “Reducing Energy Consumption with Internet Protocols Exploration” (dead since 2011)
    Avoid mailing list energy waste, reuse old mailing lists ?

  - architecture-discuss@ietf.org ?

Goal, Target, Logistics, …

- Enlightenment
- Of course: raise interest in future Energy/Green-Networking work
  - Gaps, new areas of work ?
  - NOT SUBJECT OF THIS DOCUMENT!
    - Hard goals of this document: structure of aspects, level of detail – of what was done
- Target: individual submission ?!
  - Cross-IETF. Few “GEN” examples: RFC6272 (Protocols for Smart Grid)
- Looking for collaborators / contributors
- Feedback / Discuss via Issues on githu
  - Even if just “i read it and (part of) it was useful!”
- Mailing lists ?
  - recipe@ietf.org “Reducing Energy Consumption with Internet Protocols Exploration” (dead since 2011)
  - Avoid mailing list energy waste, reuse old mailing lists ?
  - architecture-discuss@ietf.org ?