draft-zhu-dnsop-de-eeas-02
DNS Extensions to Energy Efficiency as Service

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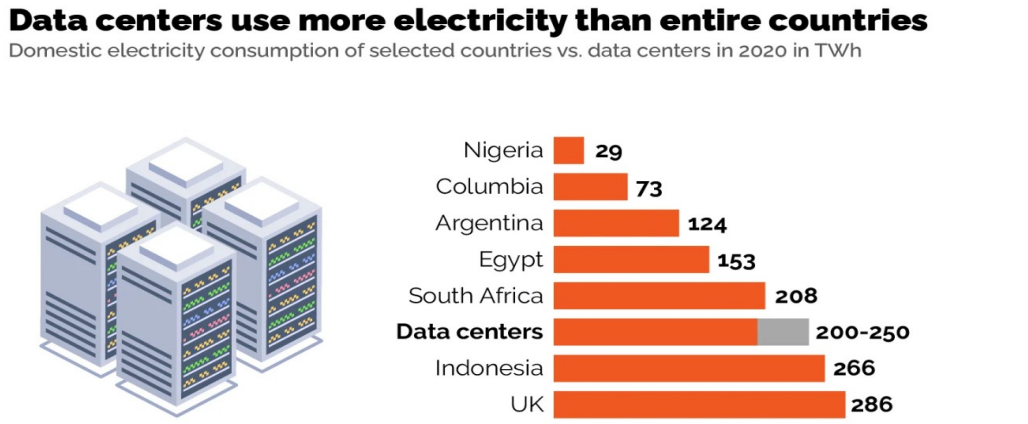
Agenda

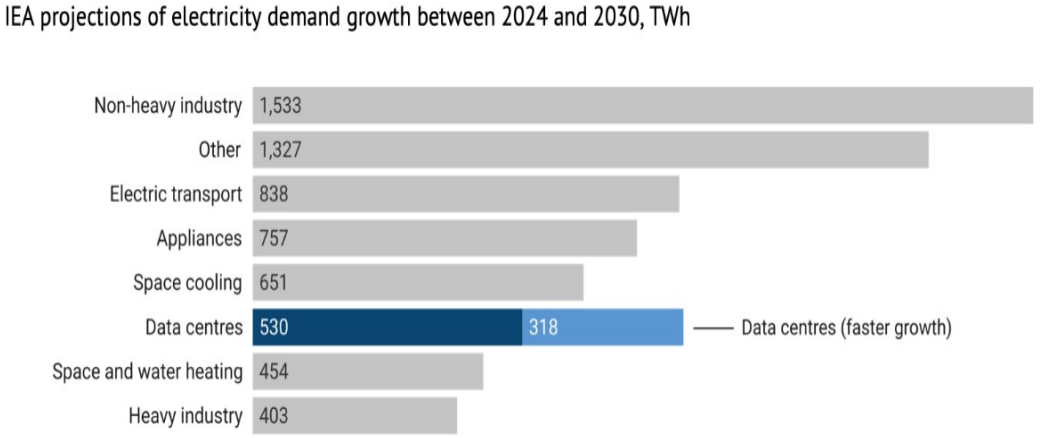
- Introduction & Motivation
- Problem Statement
- Proposal Introduction
- Discussion
- Q&A

Introduction & Motivation

- Net energy savings and green communication are crucial due to the effects of climate change and the global energy shortage.
- Data centres could account for half of electricity demand growth in some countries.
- Around a tenth of the electricity demand growth by 2030 is set to be driven by data centres.
- “AI revolution” – predicting “transformative” effects for humanity – while the environmental impact of AI, the intensive energy use and carbon dioxide (CO2) emissions of the data centres that power it.



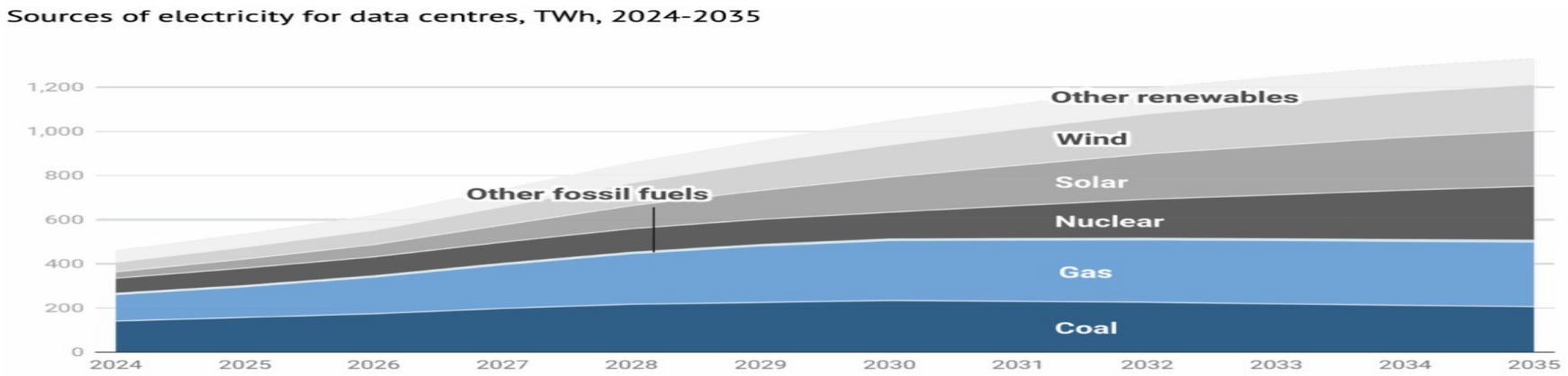
(Data source: Data center energy consumption)



(Data source: IEA energy and AI report)

Problem Statement

- Some warned that the rapid expansion of data centres could slow down or even reverse the global shift towards net-zero.
- Enterprises with large data centers, such as cloud providers, are increasing efforts to tackle climate change.
- Users who are more aware and sensitive toward environment may prefer reducing their carbon footprint by choosing more renewable energy sources than non-renewable sources for network services, even if it means compromised service performance.
- Reduction in energy usage and prioritizing usage of renewable energy sources over non-renewable energy sources need a coordinated solution at both user and application levels from the perspective of end-to-end.
- DNS can play an important role in the whole process as a scheduling bridge.



(Source: IEA energy and AI report)

Our proposal-overview

- To support Energy Efficiency as a service in the DNS, this document defines the following extensions:

✓ The "EE" ("Energy Efficiency") record type is defined that can be applied directly and efficiently to a wide range of services. The information helps make connectivity decisions with low carbon emissions by using more renewable energy source-operated servers.

✓ A mechanism is described how the "EE resolution" is performed by the client and DNS servers. If a client learns more about the origin energy before connecting (such as energy consumption, energy supply mix, power usage effectiveness, and availability conditions), it may be able to choose a greener endpoint without degrading the service experience.

✓ The "EE" ("Energy Efficiency") record's compatibility with other resource records is described.

Our proposal-structure and parameters

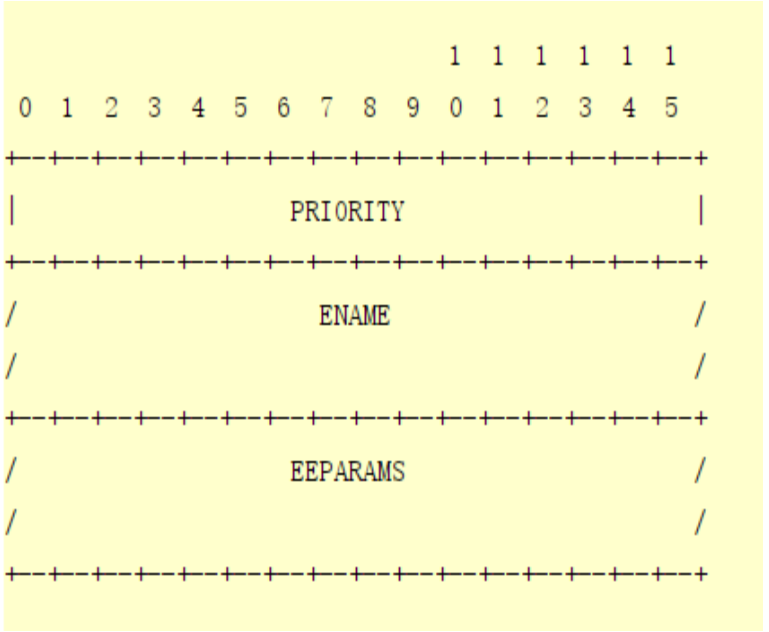
- EE RRs have the same top-level format as other RRs.
- The format of the RDATA:

✓ PRIORITY: An unsigned 16-bit integer that specifies the priority of this record.

✓ ENAME: A <domain-name> which specifies a host of an alternative endpoint.

✓ EEPARAMS: A <character-string> which specifies the energy parameters of the alternative endpoint.

- The "et" EeParamKey indicates the type of energy.
- The "eei" EeParamKey indicates the Energy Efficiency Index of alternative endpoints.
- The "pue" EeParamKey indicates the power usage effectiveness of the alternative data centers.



Our proposal- Behavior

- Client Behavior: "EE resolution" is the process of enumerating and ordering the available endpoints for a service, as performed by the client.
  - ✓ Carry a domain name as $QNAME for query in the Question section.
  - ✓ Issue an EE query for $QNAME.
  - ✓ If an AliasMode EE record is returned, set $QNAME to its ENAME and loop back to Step 2, subject to chain length limits and loop detection heuristics.
  - ✓ If one or more ServiceMode records are returned, these represent the alternative endpoints. Sort the records by ascending PRIORITY.
  - ✓ Otherwise, EE resolution has failed, and the list of available endpoints is empty.
- DNS Server Behavior
  - ✓ Authoritative Servers: When replying to an EE query, authoritative DNS servers SHOULD return A, AAAA, and EE records in the Answer section for any ENAME that is in the zone.
  - ✓ Recursive Resolvers: Whether the recursive resolver is aware of EE or not, the normal response construction process used for unknown RR types[RFC3597] generates the Answer section of the response.

Discussion-comments

- As the SVCB record is extensible, it seems to me that a better approach would be to register the EEPARAMS from your draft as additional SVCB Service Parameter Keys in the relevant registry.

✓ SVCB includes parameters such as protocol information, while energy information is about infrastructure information.

✓ With the development of AI, energy demand has grown significantly, the types and deployments have become more diverse. For example, satellites are equipped with photovoltaic panels.

✓ Environmental advocates have raised relevant requirements.

✓ DNS may evolve into an important link in intelligent agent communication and the energy Internet.

- So we propose using an independent parameter that can be requested on demand. This will also reduce issues related to excessive information volume caused by carrying it together with protocol and other parameters.
- It seems that the draft includes inter-WG area about DNS and GREEN， but our concept is how to keep the transmission of the energy information in the network and make decision based on it. Maybe DNSOP is more suitable.

Q&A

Thank You for Your Attention

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https://datatracker.ietf.org/doc/draft-zhu-dnsop-de-eeas/