

1. Summary of the Paper

The paper discusses the ideas behind the Domain Naming System and how it was initially designed in 1983. It then goes on to discuss its evolution and to how it's being implemented today. The authors discuss how the mapping between host names and addresses were previously practised with a simple text file. The distribution of those files to all the hosts and its costs eventually became difficult and costly and did not fit the evolution towards a more distributed management of the Internet. The authors of the DNS laid out some fundamental design decisions that they wanted to introduce in the DNS design like that of independent network topology and apply to a range of OSe and architectures. With these assumptions, a new DNS was designed with two major active components, name servers and resolvers.

Thus, a new Domain Naming Systems was thought of and evolved incrementally in various phases. The paper then highlights how this system has seen its usages over the period of time, noticed surprises, successes, along with where the design decisions fell short. The paper then attempts to predict how the DNS system could potentially evolve in the future.

2. Critical Review

a) What problem(s) did the paper address?

Originally, the mapping between the host name and the IP addresses were managed with a single text file. As the number of hosts grew rapidly, it became very difficult of maintaining the file and distributing it access different hosts due to the cost it bore. The paper addresses how the introduction of the DNS system addressed two fundamental issues:

i) growing number of hosts, the distribution of the text file to hosts due to larger size, and the inability of the then existing distributed systems like the XEROX Grapevine and Clearinghouse systems to solve the problem.

ii) interoperability across the different networking environments.

b) Why would anyone care about this particular problem? Who is the intended audience?

The paper outlines how the today's internet naming has essentially been derived from the concept of single text file to a more distributed system for managing the names.

It's intended audience are the researchers and the system architects who are responsible in designing the Internet's naming architecture. The paper can be an insight into the today's system and how it was designed to address the then existing problems and how it could potentially be shaping today's needs or falling short on some design choices.

c) What are the existing gaps that necessitate this work?

The paper outlines how the then existing distributed systems all had weaknesses like being too host specific, or not appropriate for the heterogeneous combination of different networking environments. The introduction of the DNS addressed many of these issues like maintaining network interoperability and distributed management of database.

d) What is the authors approach in solving this problem?

The authors outline the development of Domain Naming System and it's architecture and how fundamental design assumptions were laid out to address the challenges of the internet naming. This design has seen success in many areas like variable depth hierarchy, caching and datagram access. However, the author has also been critical about the shortcomings like difficulty in application upgrades and type and class growths.

e) Does the evaluation support their hypothesis?

Yes, the genesis of the Domain Naming System did address many issues like network interoperability, distributed maintenance of database, etc. While the author described how it majorly shaped the internet's naming, the paper has also been analytical about where the deficiencies lie.

f) What are the possible inefficiencies in their approach?

While the authors point out many shortcomings seen on the DNS design, there are few other sectors that can be seen where the design will fall short.

i) There is virtually no security built into the Domain Naming System and a fake DNS system can be easily setup and redirect users to wrong sites. [2]

ii) Server Breakdown. While there are redundancies in the DNS servers, the World Wide Web is dependent on the DNS server and it will break down if the DNS server crashes.

g) In your opinion, how can we address those inefficiencies?

There is possibility of introducing security to DNS systems with Domain Name System Security Extensions (DNSSEC). While it does not stop someone from viewing the data in the request and reply, it provides origin authentication of DNS data, along with data integrity.

h) What are the future research questions left unanswered (explicitly or implicitly)?

Implicitly, since DNS evolved out of IP based networking there are few questions on the fundamental design of IP and thus DNS based systems:

1) How to ensure data security instead of data container security only?

2) How can we possibly think of introducing stateful forwarding in the network? One of the future possible research directions that has been heavily looked upon is the concept of Named Data Networking [3]. By naming the data instead of their locations, NDN secures the data itself while the current internet only focuses on security the data container. It also introduces stateful forwarding with the help of which we can measure performance of different paths, quickly detect failures and retry alternative paths [4].

i) Judging from all of the above answers, do the authors justify the conclusions they reach? Why or why not?

In general, yes, the authors have outlined how the DNS evolved and where it proved to be success. The paper seems critical and stands on an open end discussion as if the DNS design has been a good idea considering the shortcomings it tried to argue.

This can be a good reference point for researchers and engineers to think critically on where the Internet naming stands and be analytical about the future possibilities.

3. References

[1] https://en.wikipedia.org/wiki/Domain_Name_System

[2] <https://medium.com/asecuritysite-when-bob-met-alice/the-greatest-flaw-in-the-internet-dns-3964ddb77f1>

[3] <https://named-data.net/project/>

[4] <https://named-data.net/publications/comcom-stateful-forwarding/>