DNS over IPFS

A Very Stupid Idea You Should Not Use

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Outline

- W.. why?
- Overview of DNS
- Overview of IPFS
- Using IPFS for DNS
- Improving the Design

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- Censorship resistance

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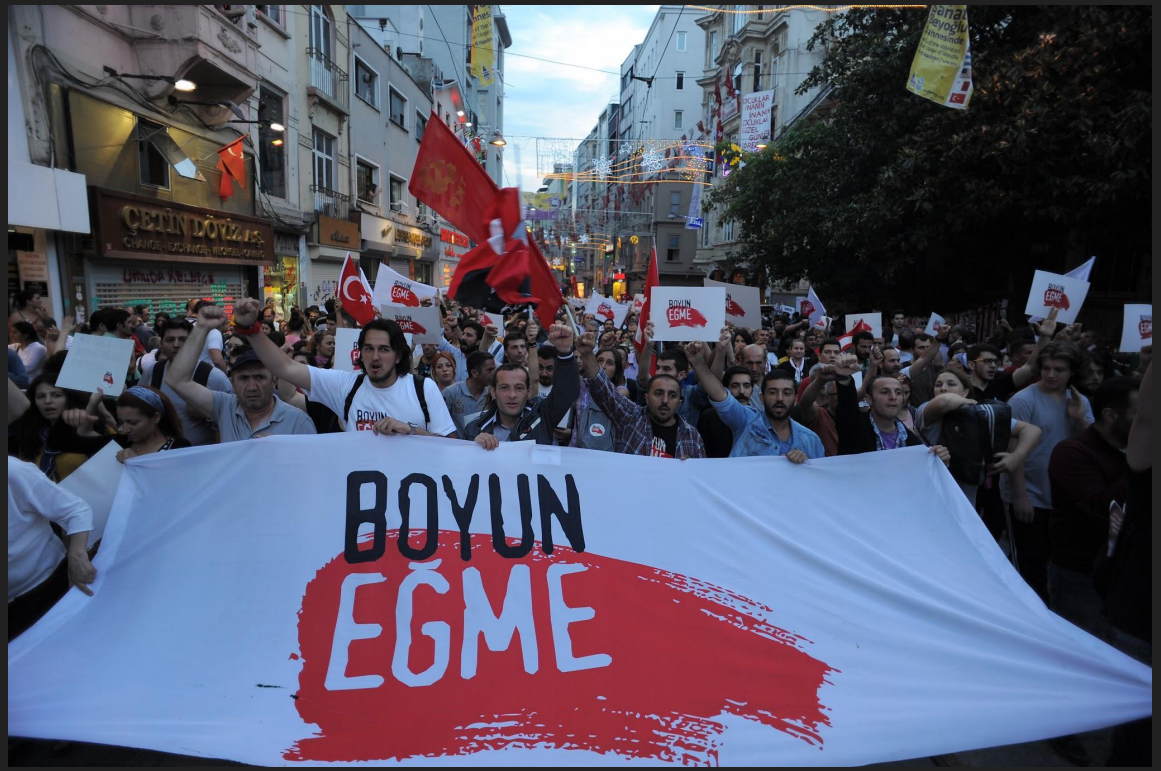

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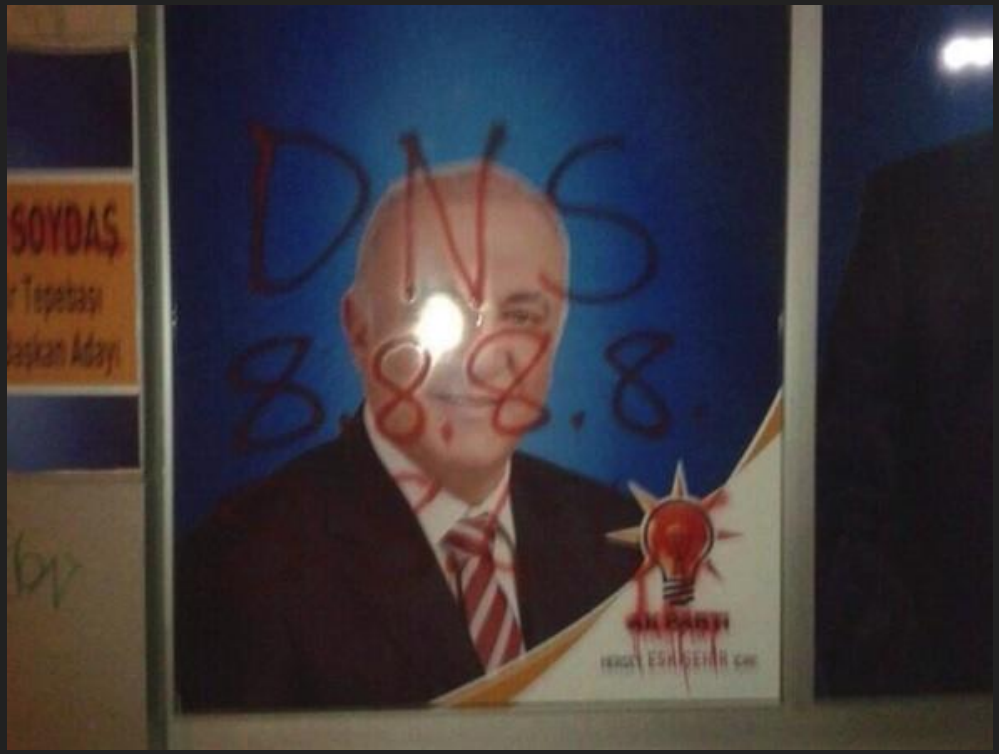

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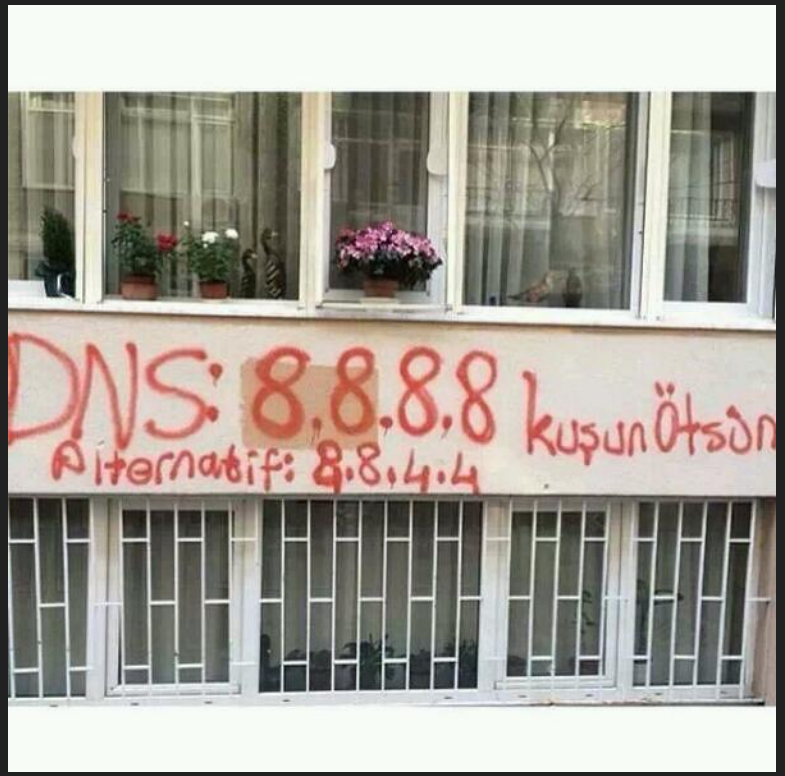

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- What if names?
- Hierarchical name resolution

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- Learn the `www.google.com` data is at 13.14.15.16
- Ask 13.14.15.16 for the data (this is done with HTTP or whatever else)

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- IPNS Peer IDs are just public keys, so their values can be changed but only by the owner of the pubkey

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        { “com”: { “NS”: “/ipns/$VERISIGN”, … }, … }

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- Then you query /ipns/$ICANN, and get /ipfs/$ICANNCID…
- Then query /ipfs/$ICANNCID, to get the JSON blob…
- Finally look at the “com” key, then the “NS” key, and learn that the `com` TLD’s “nameserver” is located at /ipns/$VERISIGN

Using IPFS for DNS

- Abstractly:

  /ipns/$ICANN points to /ipns/$VERISIGN along the key `(com,NS)`, using some indirection through the IPFS content level

  /ipns/$ICANN —(com,NS)—> /ipns/$VERISIGN

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- /ipns/$VERISIGN points to some CID, getting us to /ipfs/$VERISIGNCID
- Loading that, we'll get some DNS records that look like

```
{
    “google”: { “NS”: “/ipns/$GOOGLE”, … },
    “twitter”: {“NS”: “/ipns/$TWITTER”, … },
    …
}
```

Using IPFS for DNS

- Same for the next domain, `www`:

  /ipns/$GOOGLE has /ipfs/$GOOGLECID which stores the content

```
{
    “www”: { “A”: “142.250.191.36”, … },
    “gmail”: { “A”: “142.250.189.238”, … },
    “calendar”: { “A”: “142.250.191.46”, … },
    …
}
```

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Now you know that `www.google.com` lives at IPv4 address 142.250.191.36!

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- Namely uh…
- Literally over 100,000,000 .com domain names
- That’s one chonky JSON object!

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- /ipns/$VERISIGN points to /ipfs/$VERISIGNCID which contains the `com` TLD's DNS records
- Instead of just a giant blob like

```
{
    "google": …,
    "twitter": …,
    …
}
```

Improving the Design

- Option 1: Use prefix tries?
- /ipns/$VERISIGN points to /ipfs/$VERISIGNCID which contains the `com` TLD's DNS records
- We'll use some indirection:

```
{
    …,
    "g": "/ipns/$VERISIGN_G_DOMAINS",
    …,
    "t": "/ipns/$VERISIGN_T_DOMAINS",
    …
}
```

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- We'll use some indirection:

```
{   …,
    "g": "/ipns/$VERISIGN_G_DOMAINS",
    … }
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- If we look up /ipns/$VERISIGN_G_DOMAINS, we get some CID /ipfs/$VERISIGN_G_DOMAINS_CID

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- We'll use some indirection:

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- And if we look *that* up, we get another layer of the prefix trie

```
{   …,
    “o”: “/ipns/$VERISIGN_GO_DOMAINS”,
    … }
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- Each layer also can store a "records" field, which will have a JSON object that has all the DNS records for the domain name that terminates at that part of the trie
    - E.g. /ipfs/$VERISIGN_GO_DOMAINS_CID contains

      "records": $RECORDS_FOR_GO_DOT_COM

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- They can get quite deep if you’re doing only one character at a time, so maybe you want to use two or three characters instead
- But we can and should do better!

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- Sort all the registered `.com` domain names and divide them into some number of roughly equally sized groups, maybe 100
- Maybe that looks like

    a.com to azimuth.com
    azimuths.com to blond-roast-coffee-rules.com
    blond-roast-coffee-sucks.com to coffee-in-general-sucks-actually.com
    etc.

Improving the Design

- Each of those ranges would be keys in the Range Tree, and the value would point to IPNS IDs for the sub-tree for that range

```
{
    “a.com_azimuth.com”:
        “/ipns/$SUBTREE_FOR_A_TO_AZIMUTH”,
    “azimuths.com_blond-roast-coffee-rules.com”:
        “/ipns/$SUBTREE_RECORDS_FOR_AZIMUTHS_TO_ETC”,
    …
}
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- At the leaves, the keys aren’t *ranges*, but rather single domain names, and the values are the DNS records for those names
- This gives us a nice logarithmic depth. The 100-wide fanout gives us a depth of 4, and the size of each Range Tree node isn’t too big.

Improving the Design

- Options 3+: Lots of other possibilities for data structures!
- Also probably we want to have a better representation of DNS records, this was all just very hacky and quick and dirty

EOF