NDSS DNS Privacy 2021

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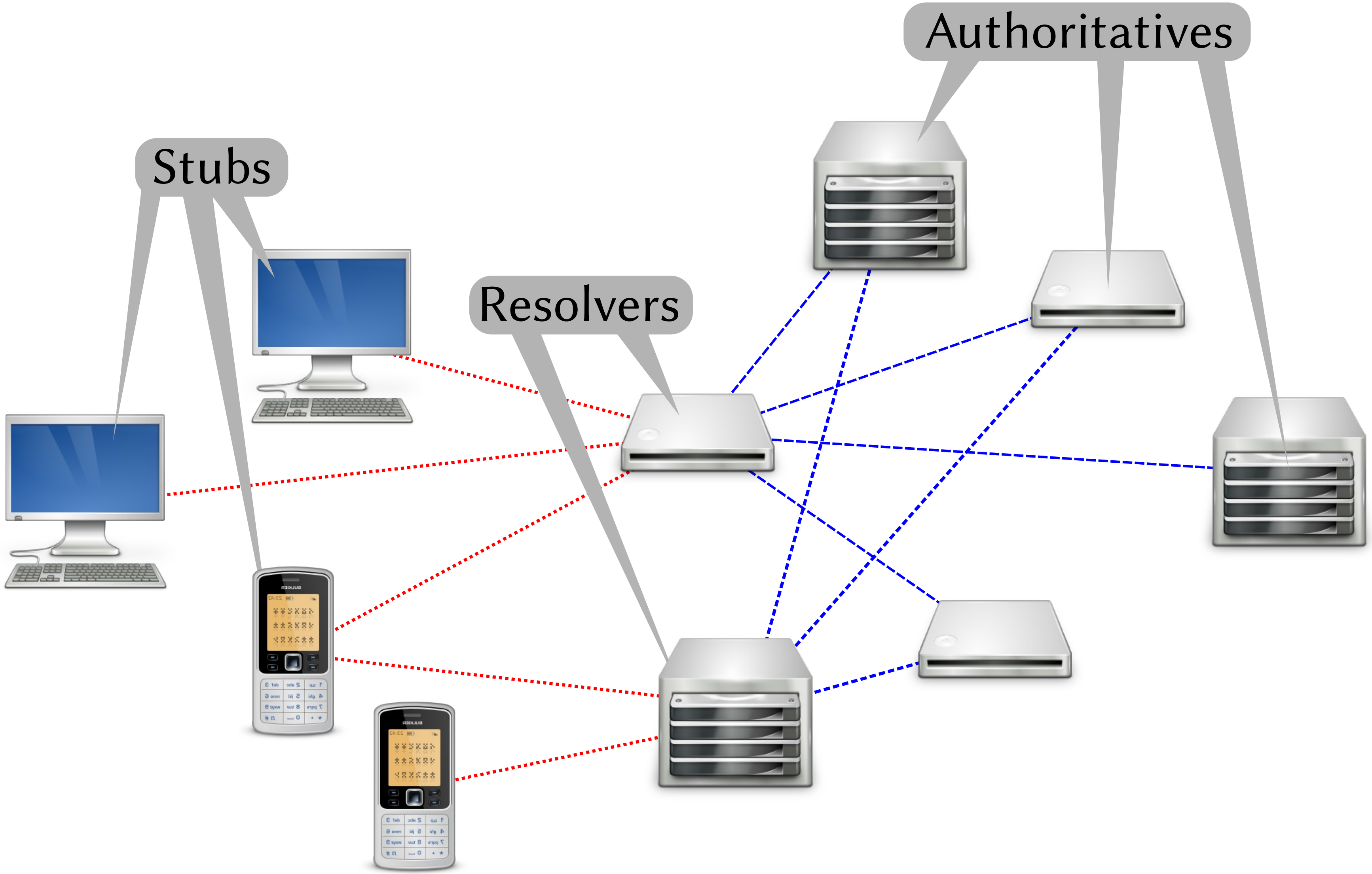
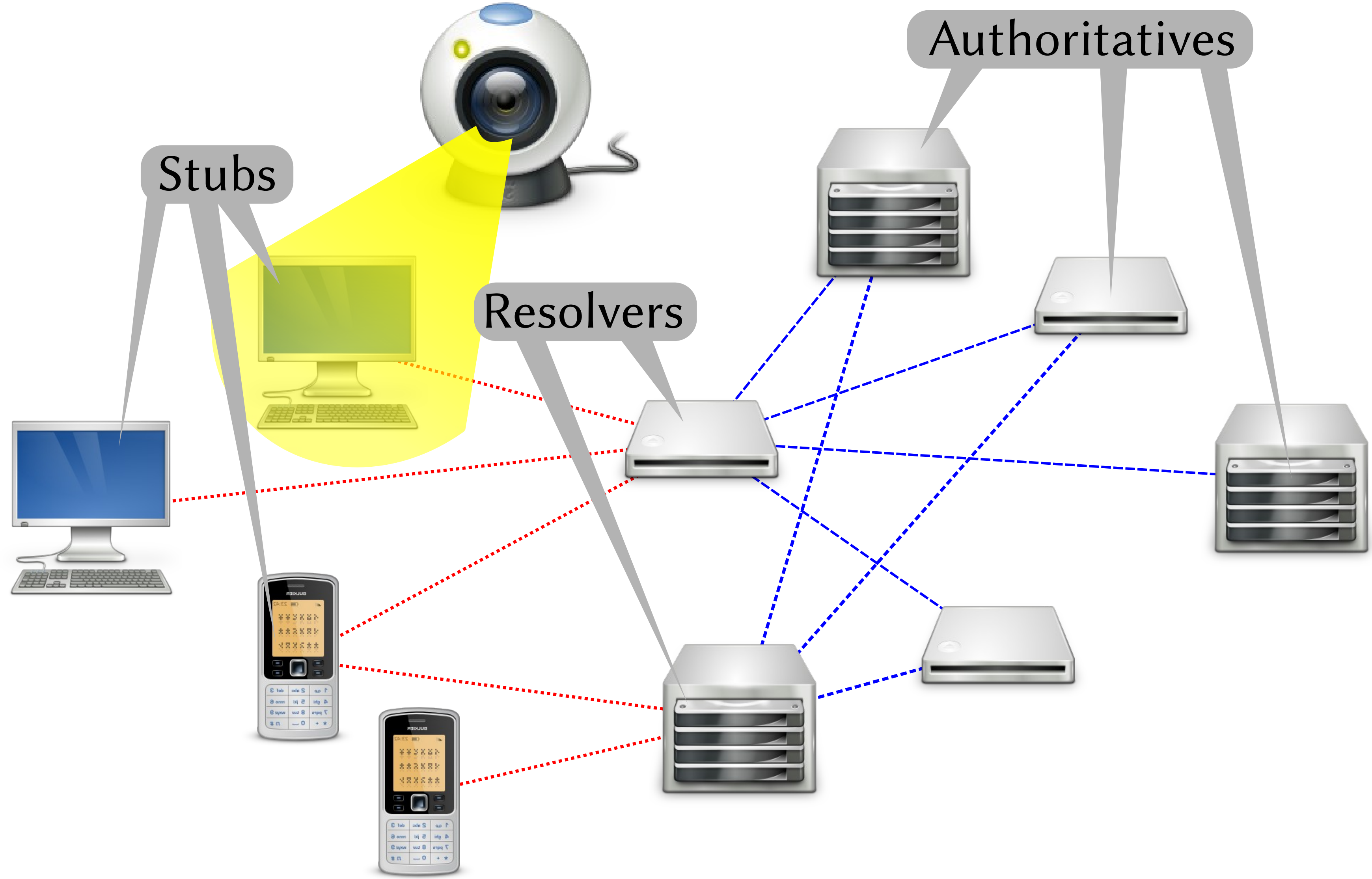
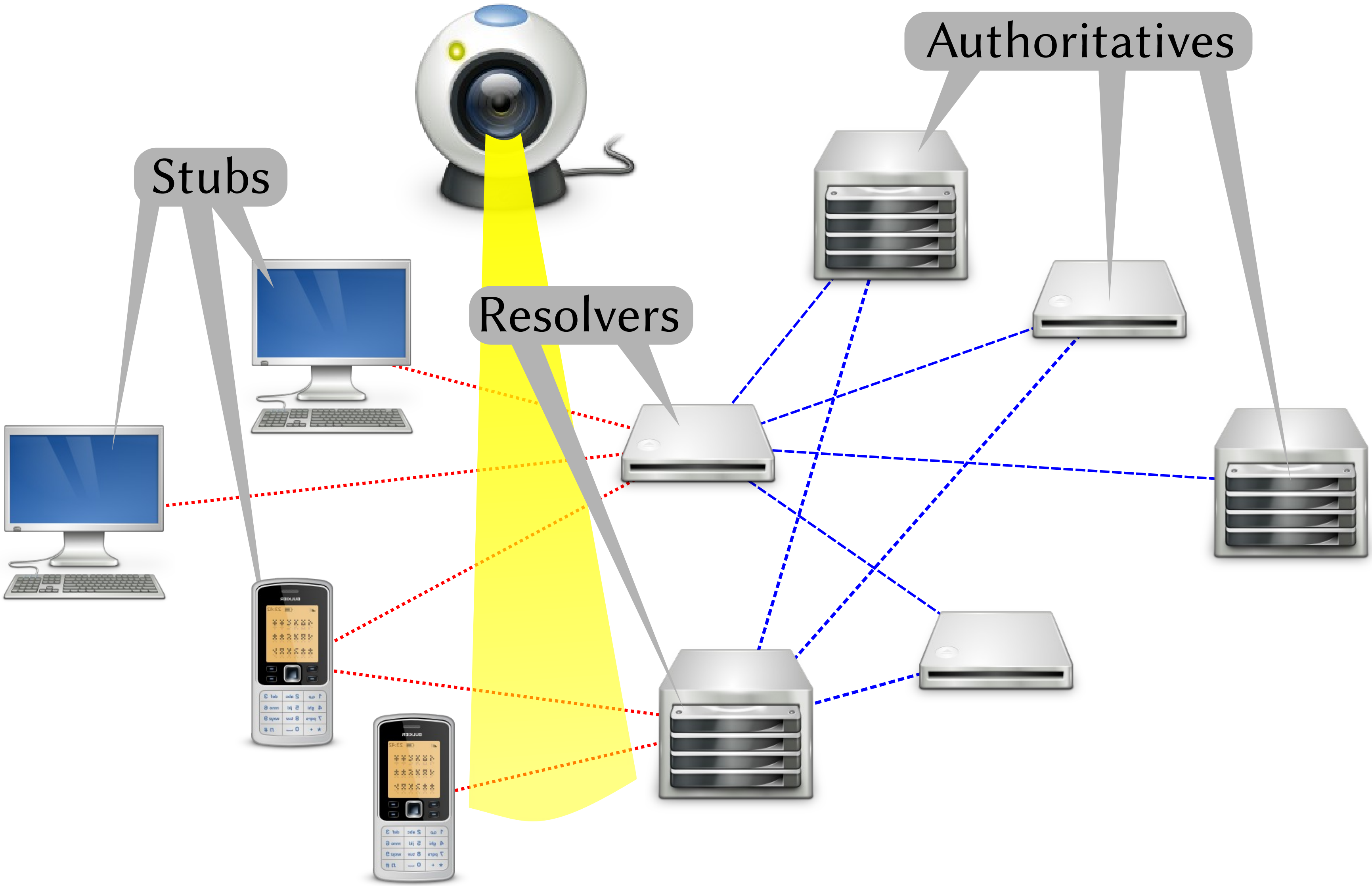
Protecting the Back Half of the Camel

Stub to Recursor

Recursor to Authoritative


Stubs
Resolvers
Authoritatives


Authoritatives
Stubs
Resolvers


Authoritatives
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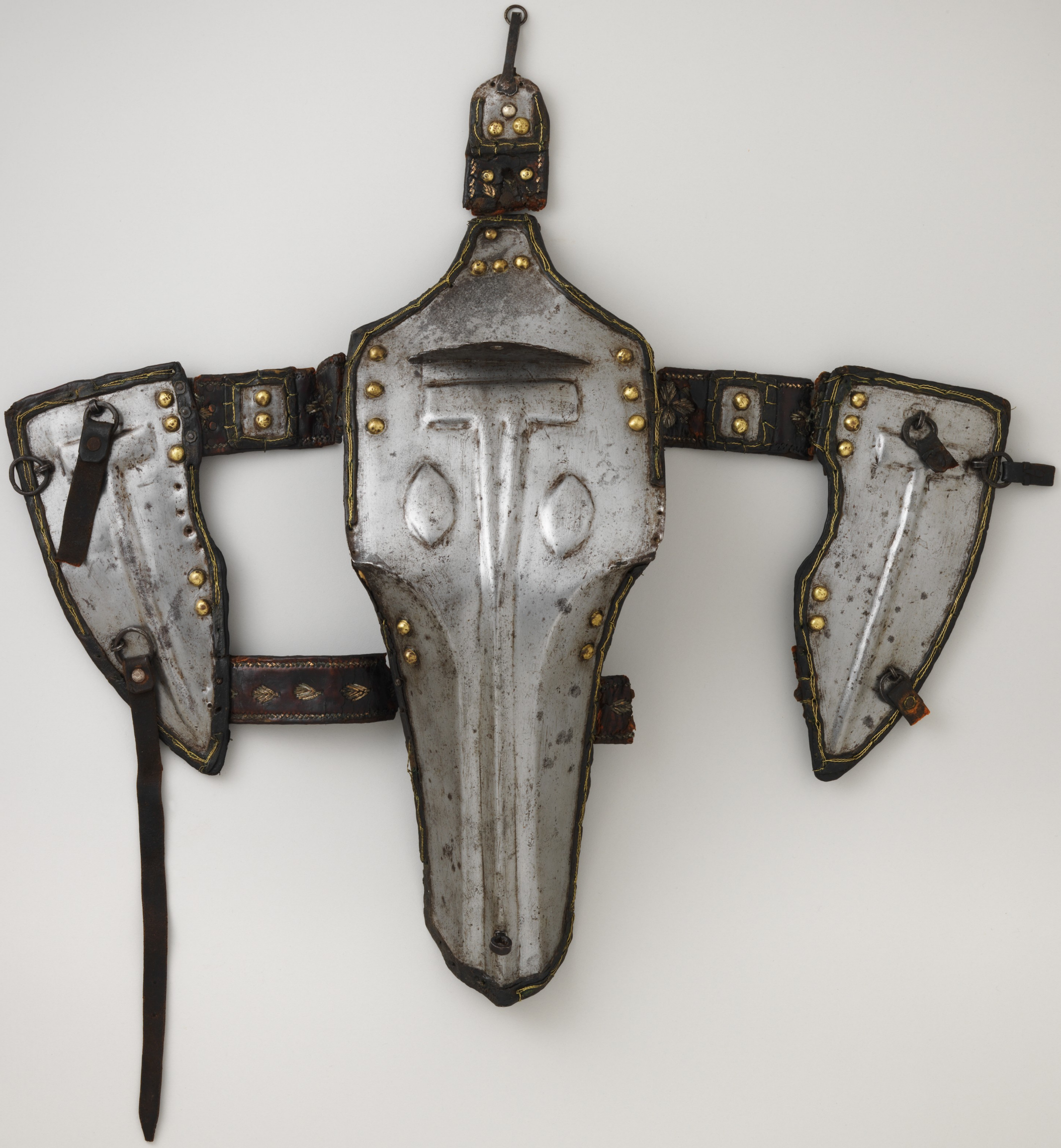
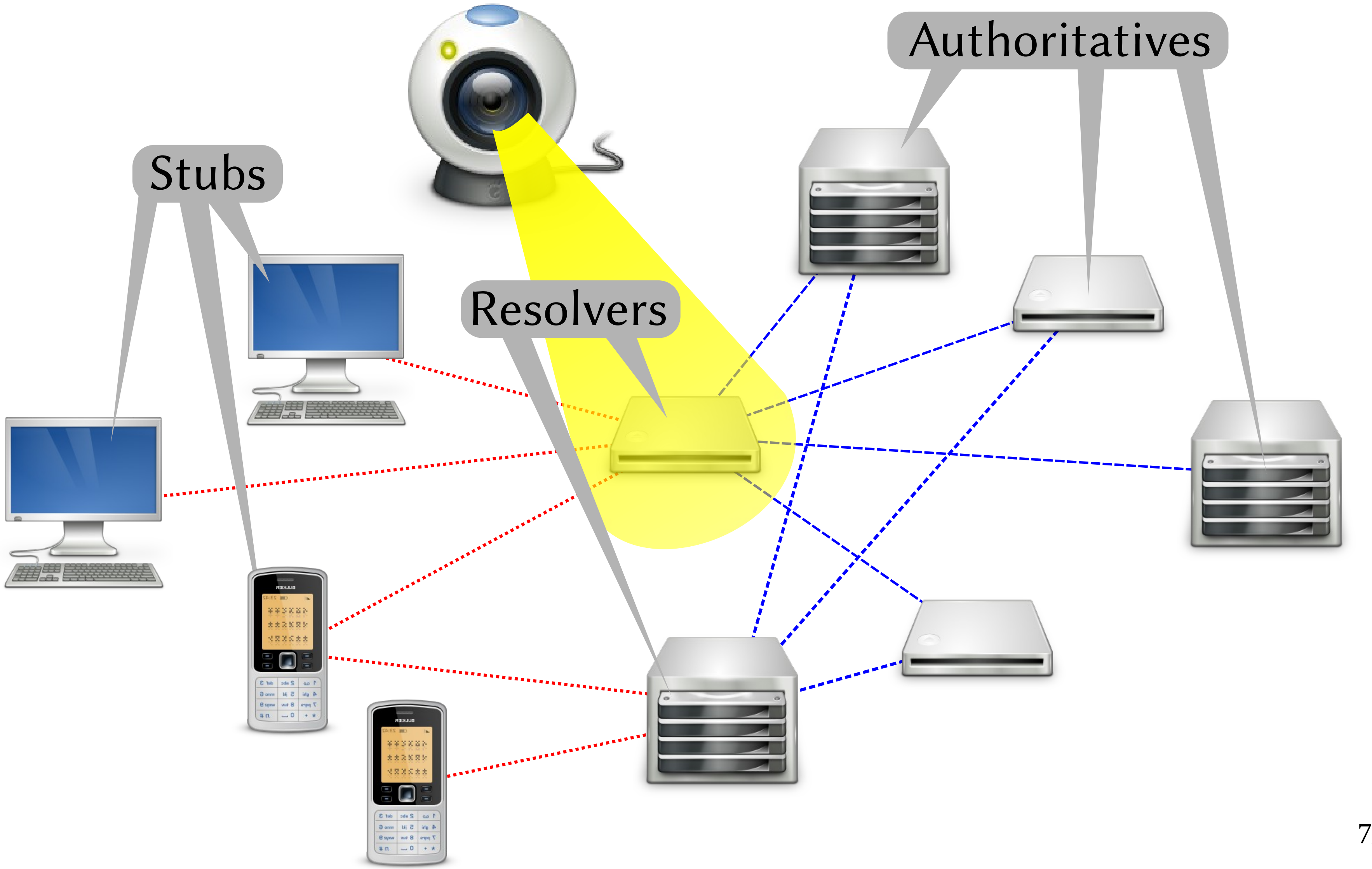
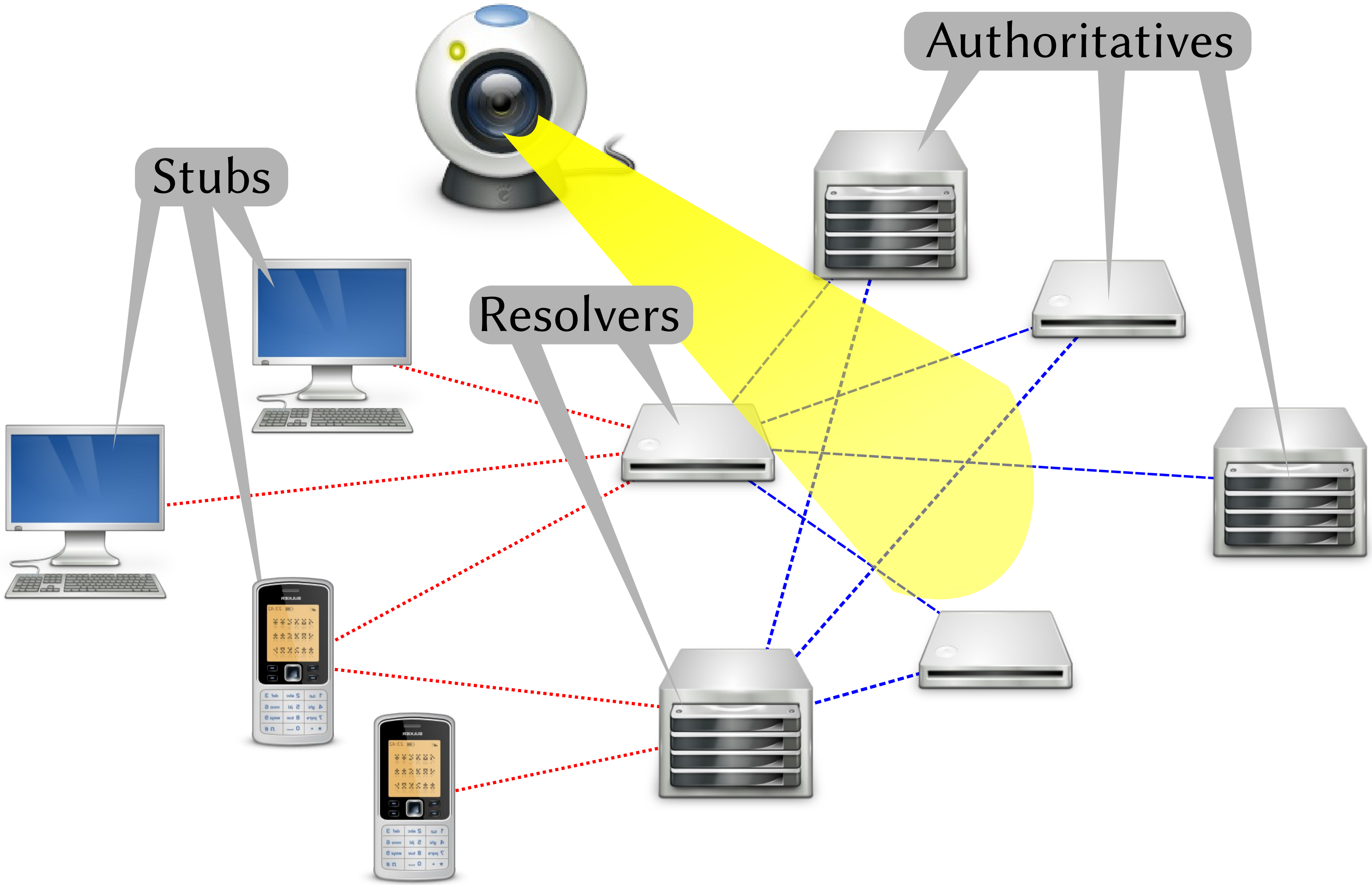



Authoritatives
Stubs
Resolvers

Resolver Operators are Stewards of Client Activity

- Timing analysis
- Traffic size analysis
- Correlations


Authoritatives
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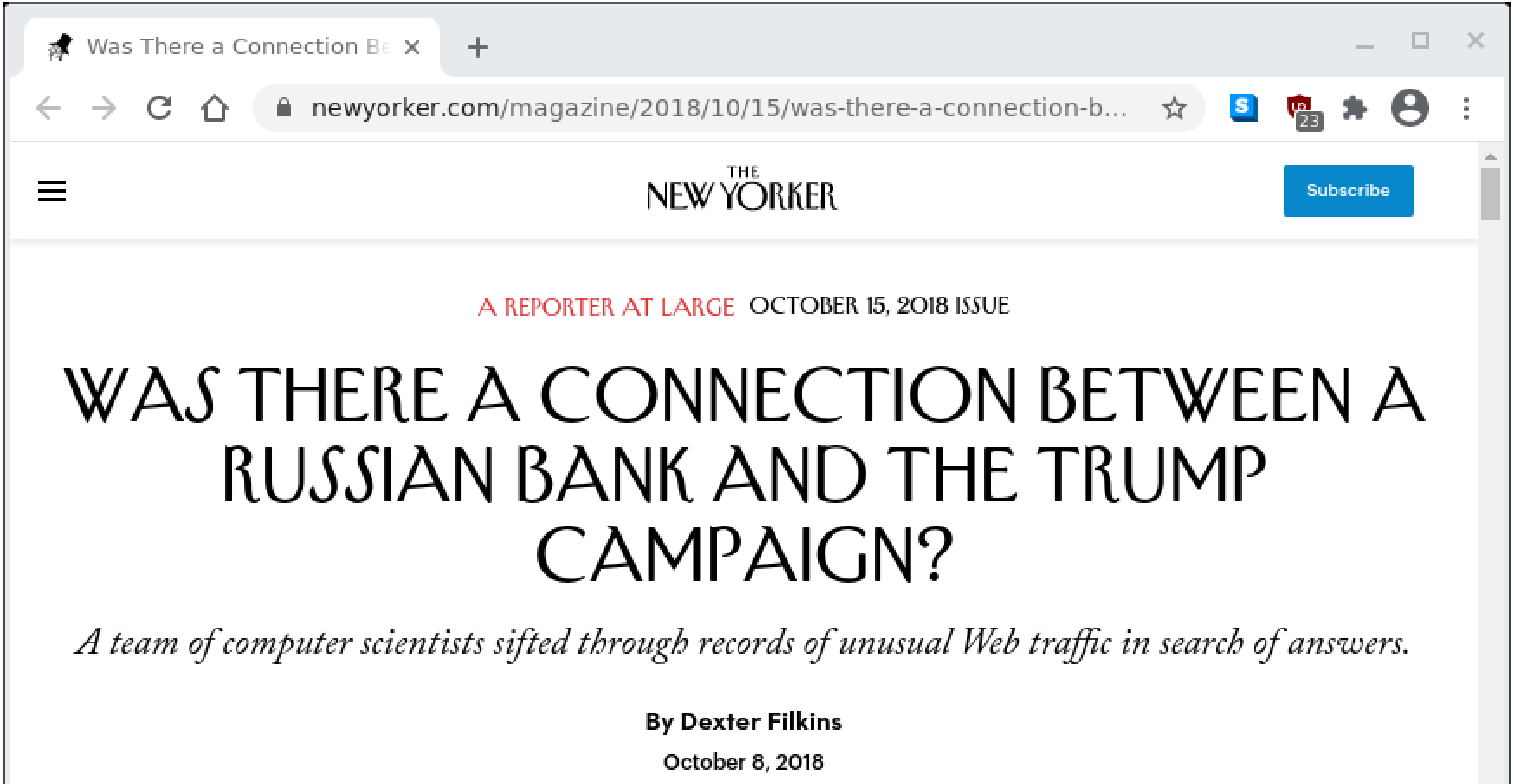
Associational Metadata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A REPORTER AT LARGE OCTOBER 15, 2018 ISSUE

WAS THERE A CONNECTION BETWEEN A RUSSIAN BANK AND THE TRUMP CAMPAIGN?

A team of computer scientists sifted through records of unusual Web traffic in search of answers.

By Dexter Filkins

October 8, 2018

Non-encryption Mitigations

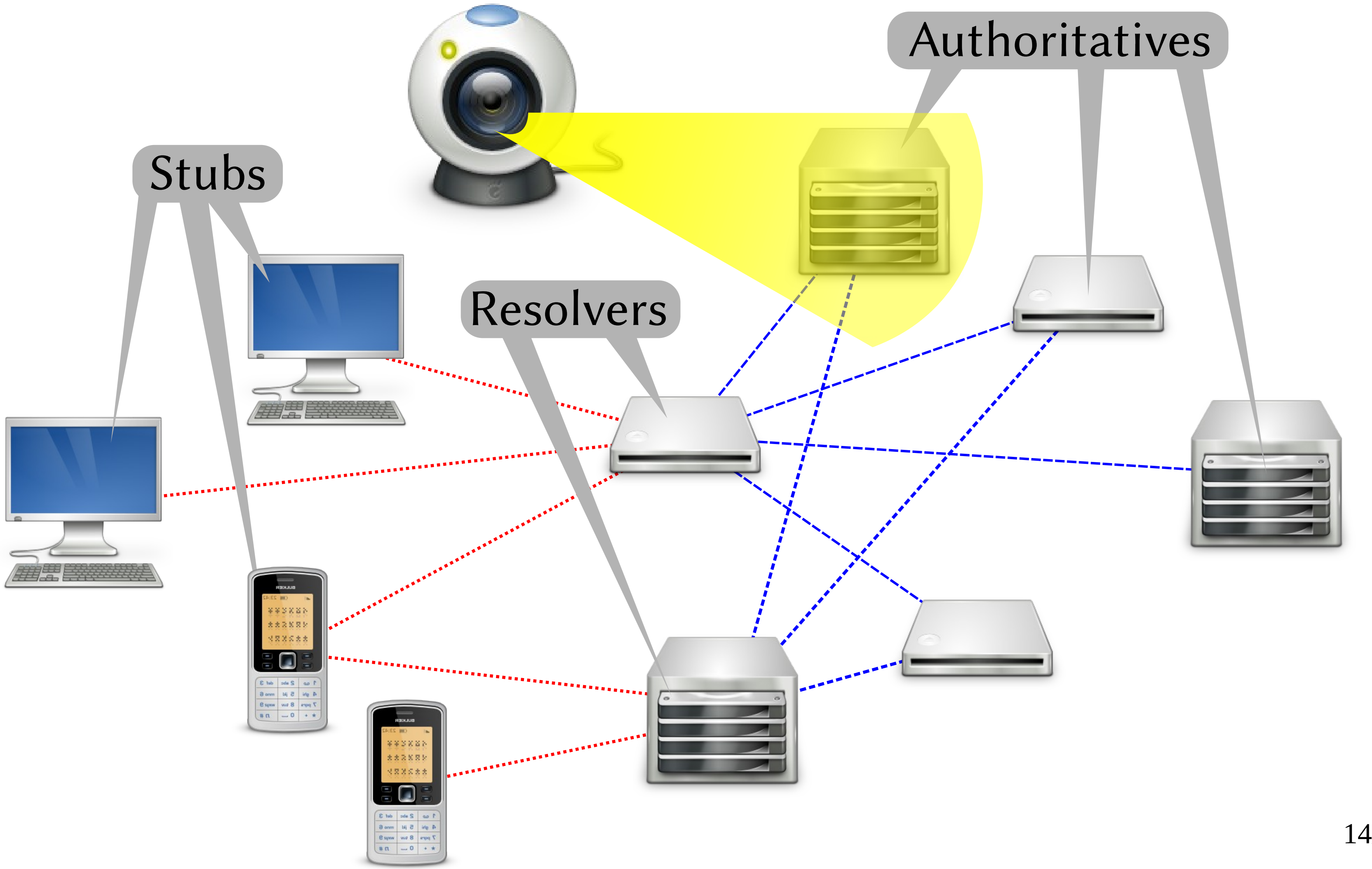
- QNAME Minimization
- NXDOMAIN synthesis (RFC 8198)
- NXDOMAIN cuts (RFC 8020)
- Pre-fetching
- Request pooling (delays)
- ...

Even Second-level Domains can be Sensitive

- **`falundafa.org`**
- **`nra.org`**
- **`plannedparenthood.org`**
- **`parler.com`**
- **`disruptj20.org`**
- …

Resolver Operators are at Risk

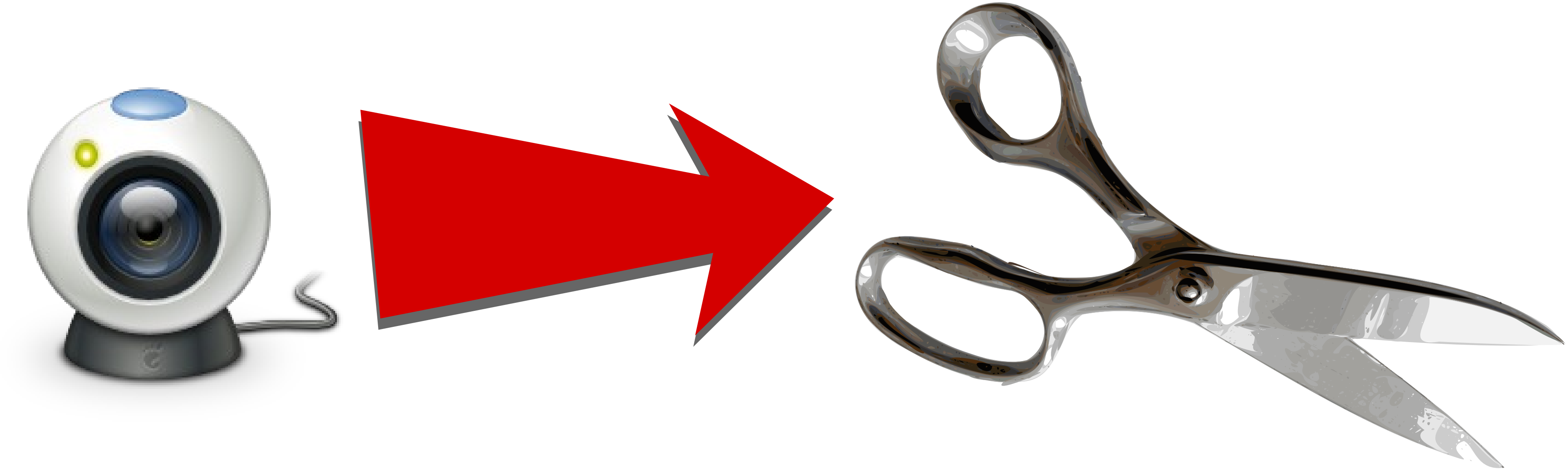
- Legal demands
- Extralegal investigation


Authoritatives
Stubs
Resolvers

Resolver Operators are Stewards of *Subject* Activity

Beyond IP address lookups...

- SMIMEA
- OPENPGPKEY
- DNS UPDATE
- TXT (e.g., DKIM selectors)
- ...



Surveillance enables Censorship

- Tampering
- Blocking
- *Affects subject, regardless of querier*

What can we do?

How to get there (easy/unilateral)

- Augmenting Authoritatives (DoT? DoQ? DoH?)
- Opportunistic strategies for resolvers: probing, pooling
- Resource management (resolvers & authoritative)

How to get there? (riskier, needs coordination)

- Authentication (WebPKI or DANE)
- Who signals? (Nameserver or Domain)
- How to signal? (special NS label or separate record)
- What to signal? (Avoid, Report, Require)

Questions?

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