User Perceptions of the Privacy and Usability of Smart DNS

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What is geoblocking?

Content not available

HTTP GET:
streaming.net
Source: 1.2.3.4

Ottawa, CA
Unblock your favourite websites, music and streaming services

You can now visit any blocked website restricted in your place.
Smart DNS (SDNS) relies on SDNS resolvers

Using normal DNS:

Client

IP for streaming.net?

4.5.6.72

DNS

streaming.net

4.5.6.72

Geofence
Smart DNS (SDNS) relies on SDNS resolvers

Using SDNS:

Client → SDNS Resolver

IP for streaming.net?

13.66.13.66

6.6.6.66

SDNS Proxy

13.66.13.66

streaming.net

4.5.6.72

Geofence

6.6.6.66

13.66.13.66
SDNS ≠ VPN

- Different stand-alone setups
- No added encryption
- No significant security/privacy benefits
SDNS ≠ VPN

- Fainchtein et al. [PETS 2021]
  - SDNS for geoblock evasion = threat to security & privacy

  - Attacks:
    - Content provider can trivially discover client’s actual IP
    - For some SDNS services, any party can enumerate all clients’ IPs
Threat: Customer IP enumeration attack
Our focus:

How do users perceive SDNS?
Services could be confused

- SDNS often bundled into VPN subscriptions
- Ambiguous and possibly misleading advertisement
Services could be confused

● SDNS often bundled into VPN subscriptions

● Ambiguous and possibly misleading advertisement
Study Procedure
Study overview

\[ n = 63 \text{ Participants (SDNS users) overall} \]

\[ n = 58 \text{ Participants included for likert (quantitative) response analysis} \]

- R = 10 Reddit
- P = 48 Prolific
Focused on participants’…

- Motivation to use SDNS
- Perceived impacts of SDNS usage
- Trust/distrust of SDNS services and their providers
- Perceived ethics and legality of using SDNS
Results
Motivation for using SDNS

- Unblocking \( n = 52 \)
  - Geoblock evasion \( n = 38 \)

- Online security/privacy protection \( n = 12 \)
Participants were familiar with basic SDNS functionality

- Unblocks websites/content
  - Strongly Disagree: 1
  - Somewhat Disagree: 9
  - Neither Agree Nor Disagree: 48

- Can make traffic go through proxy
  - Strongly Disagree: 1
  - Somewhat Disagree: 15
  - Neither Agree Nor Disagree: 33
  - Somewhat Agree: 19
…but did not understand how it works and what that means

SDNS’ Perceived Effect on Internet Browsing

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Somewhat Disagree</th>
<th>Neither Agree Nor Disagree</th>
<th>Somewhat Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
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<tr>
<td>Adds security</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>18</td>
<td>17</td>
<td>13</td>
</tr>
<tr>
<td>Adds privacy</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>12</td>
<td>22</td>
<td>16</td>
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</table>
Participants overestimated security properties

SDNS Security/Privacy Properties

- SDNS makes it hard for blocked site to learn my IP
  - Strongly Disagree: 4
  - Somewhat Disagree: 2
  - Neither Agree Nor Disagree: 7
  - Somewhat Agree: 18
  - Strongly Agree: 27

- SDNS Enc.’s my Web Traffic
  - Strongly Disagree: 6
  - Somewhat Disagree: 14
  - Neither Agree Nor Disagree: 12
  - Somewhat Agree: 15
  - Strongly Agree: 11

- SDNS hides my browsing from my ISP
  - Strongly Disagree: 12
  - Somewhat Disagree: 11
  - Neither Agree Nor Disagree: 10
  - Somewhat Agree: 14
  - Strongly Agree: 11
Participant choices, thoughts and decision processes

SDNS provider selection
Participants care about price, and trustworthiness

Key Factors in SDNS Provider Choice

<table>
<thead>
<tr>
<th>Factor</th>
<th>Top Factor</th>
<th>Second Factor</th>
<th>Third Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>24</td>
<td>18</td>
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<tr>
<td>Prov. Trustworth.</td>
<td>12</td>
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<td>12</td>
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<td>Rev. Site Rtg.</td>
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<td>Addt’l. Services</td>
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<td></td>
</tr>
<tr>
<td>First one found</td>
<td>12</td>
<td></td>
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</tbody>
</table>
Participant Trust of SDNS Provider to:

- Bypass geoblocking:
  - Definitely Do Not Trust: 4
  - Probably Do Not Trust: 24
  - Might or Might not Trust: 30
- Abide by privacy policy:
  - Definitely Do Not Trust: 4
  - Probably Do Not Trust: 14
  - Might or Might not Trust: 26
  - Definitely Trust: 15
- Respect & guard user privacy:
  - Definitely Do Not Trust: 1
  - Probably Do Not Trust: 5
  - Might or Might not Trust: 16
  - Definitely Trust: 21
- Use industry best practices in security:
  - Definitely Do Not Trust: 6
  - Probably Do Not Trust: 17
  - Might or Might not Trust: 20
  - Definitely Trust: 15

GEORGETOWN UNIVERSITY & THE GEORGE WASHINGTON UNIVERSITY WASHINGTON, DC
How did participants assess provider trustworthiness?
Positive factors

- Projected image of security ($n = 7$)
- Reviews ($n = 6$)
- Provider reputation ($n = 4$)
Positive factors

“The companies involved do seem to be primarily based around online security, so being trustworthy is fundamental to their businesses. Many have been around for a long time now and have excellent reviews/ratings, so this gives me some reassurance.” (P51)
Lack of negative factors

- Service worked well ($n = 10$)
- Nothing noticeably bad ($n = 7$)

“... They must have the best kinds of security measures to protect their user's data, so that their whole client base doesn't get backstabbed by [the] company [to whom] they are giving basically all their network traffic information.” (P36)
Ethics and legality of using SDNS
Most participants found SDNS ethical and legal
Beliefs on ethics of unblocking with SDNS

- Geoblocking is unethical \( (n = 27) \)
  - Free and open Internet \( (n = 8) \)
  - Geoblocking = discrimination \( (n = 3) \)

“I believe in free use and free access

I [sic] believe it to be unfair and bordering racism if you don't provide [some] users with the same content that you would other [sic] if there is no legitimate reason otherwise.”(P11)
Beliefs on ethics of unblocking with SDNS

- Still paying to access content \((n = 5)\)
- Not doing harm \((n = 4)\)

“I still paid for them so I think it’s a **better option than piracy** because the company got their money.” (P37)

“I'm not doing any harm to anyone. I'm just watching Netflix.” (P57)
General lack of clarity on legality of using SDNS

- Don’t know ($n = 17$)

  “I'm not aware if its completely legal in my country. [I have] Never seen anything talking about this topic.” (P39)
General lack of clarity on legality of using SDNS

- Normalization/lack of enforcement \( (n = 4) \)
  - Widely used and publicly advertised \( (n = 2) \)
    "...I would guess it has to be legal for them to be so popular, and advertised on mainstream media (like YouTube)." (P1)
  - Lack of enforcement:
    "I think it is legal, but if its [sic] not noone is going to come to your house 'cause a lot of people do worst [sic] things in the internet..." (Q2)
Conclusion

- Gap between perception and reality of SDNS puts users at increased risk
- User education sorely needed
  - When geoblocking is/is not legal
  - When geoblock circumvention poses legal risk
  - Security and privacy risks of SDNS
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