
Congratulations!
This browser is configured to use Tor.
You are now free to browse the Internet anonymously.
Test Tor Network Settings
Search securely with Disconnect.me.
What Next?
Tor is NOT all you need to browse anonymously! You may need to change some of your browsing habits to ensure your identity stays safe.
Tips On Staying Anonymous »
You Can Help!
There are many ways you can help make the Tor Network faster and stronger:
• Run a Tor Relay Node »
• Volunteer Your Services »
• Make a Donation »

Anonymity Online for Everyone

What is missing for zero-effort privacy on the Internet?

Dominik Herrmann
Universität Siegen

Ephraim Zimmer,
Jens Lindemann and
Hannes Federrath
Universität Hamburg

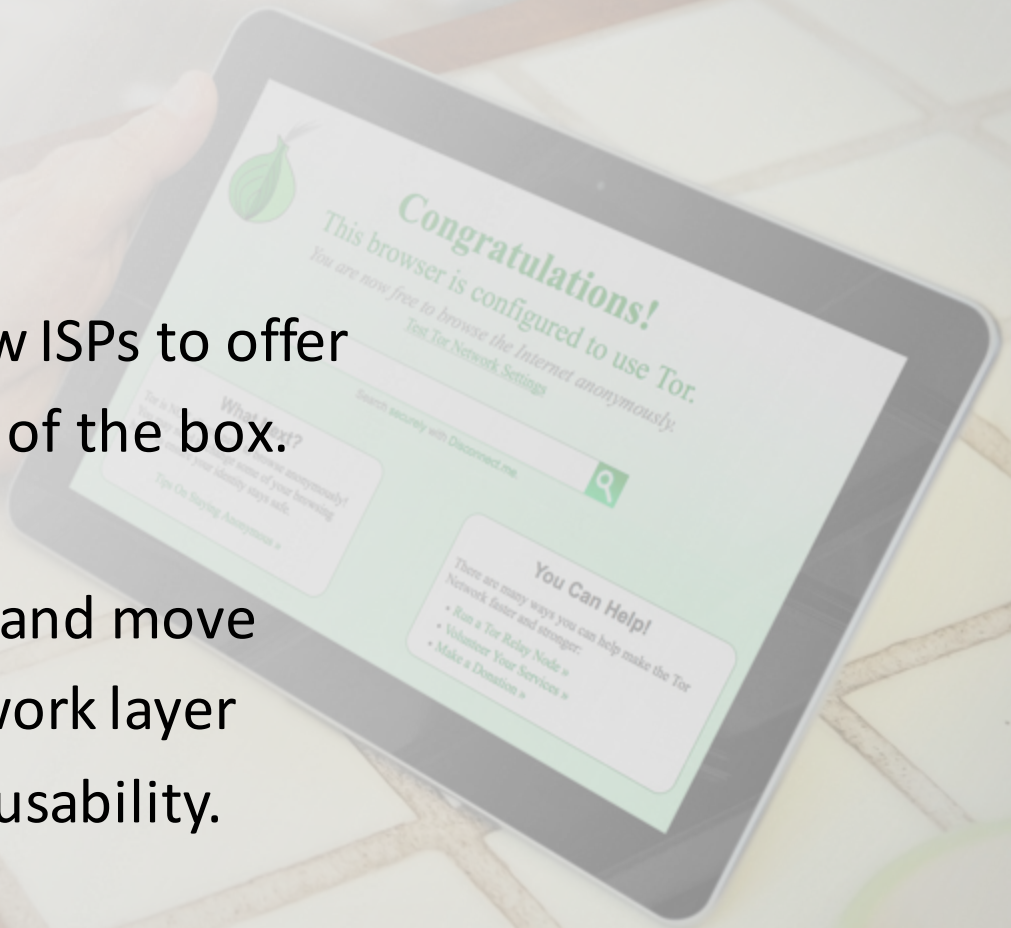
Slides: http://dhgo.to/inetsec15slides

Anonymity Online for Everyone

What is missing for zero-effort
privacy on the Internet?

Technical solutions that allow ISPs to offer
a decent level of privacy out of the box.

How? Relax attacker model and move
anonymization into the network layer
for better performance and usability.



Anonymity Online for Everyone

What is missing for zero-effort
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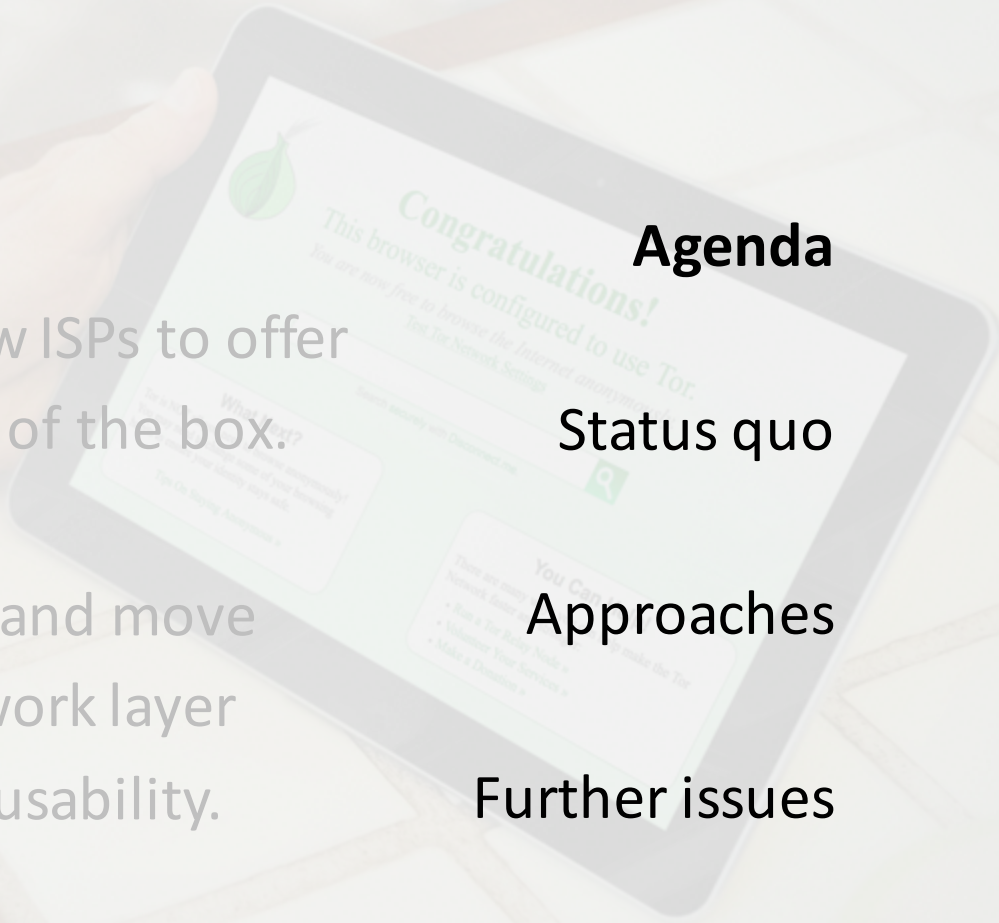


Agenda

Technical solutions that allow ISPs to offer a decent level of privacy out of the box.

Status quo

How? Relax attacker model and move anonymization into the network layer for better performance and usability.

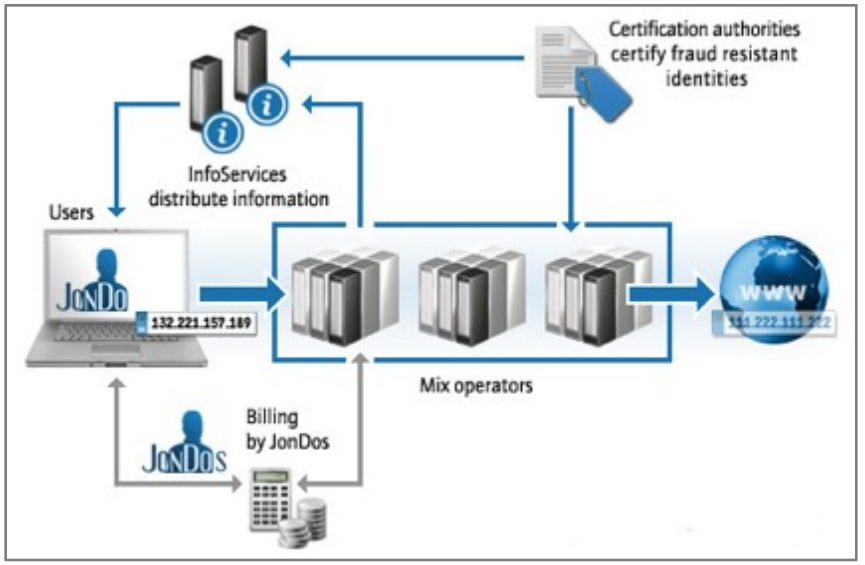
Approaches

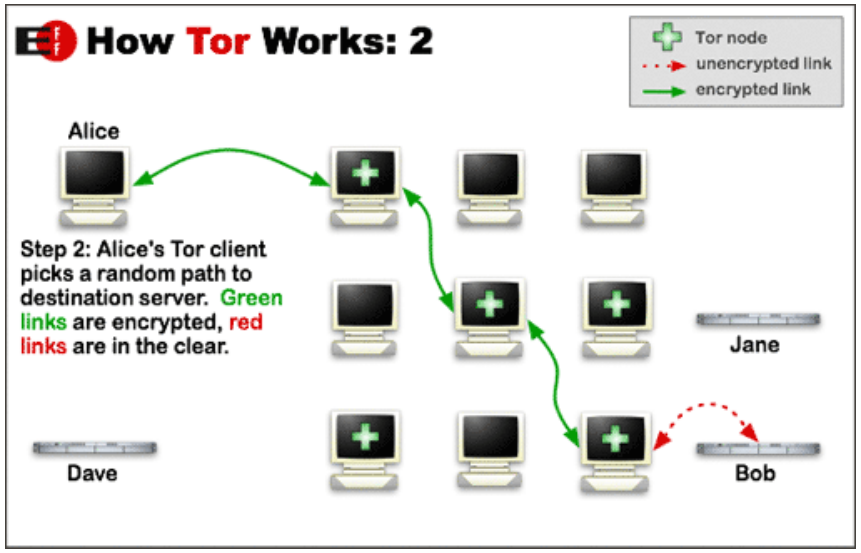
Further issues

Self-defense tools offering relationship anonymity via onion routing and web mixes have been available for >10 years.

Relationship anonymity:
Observers cannot determine what services a user accesses.

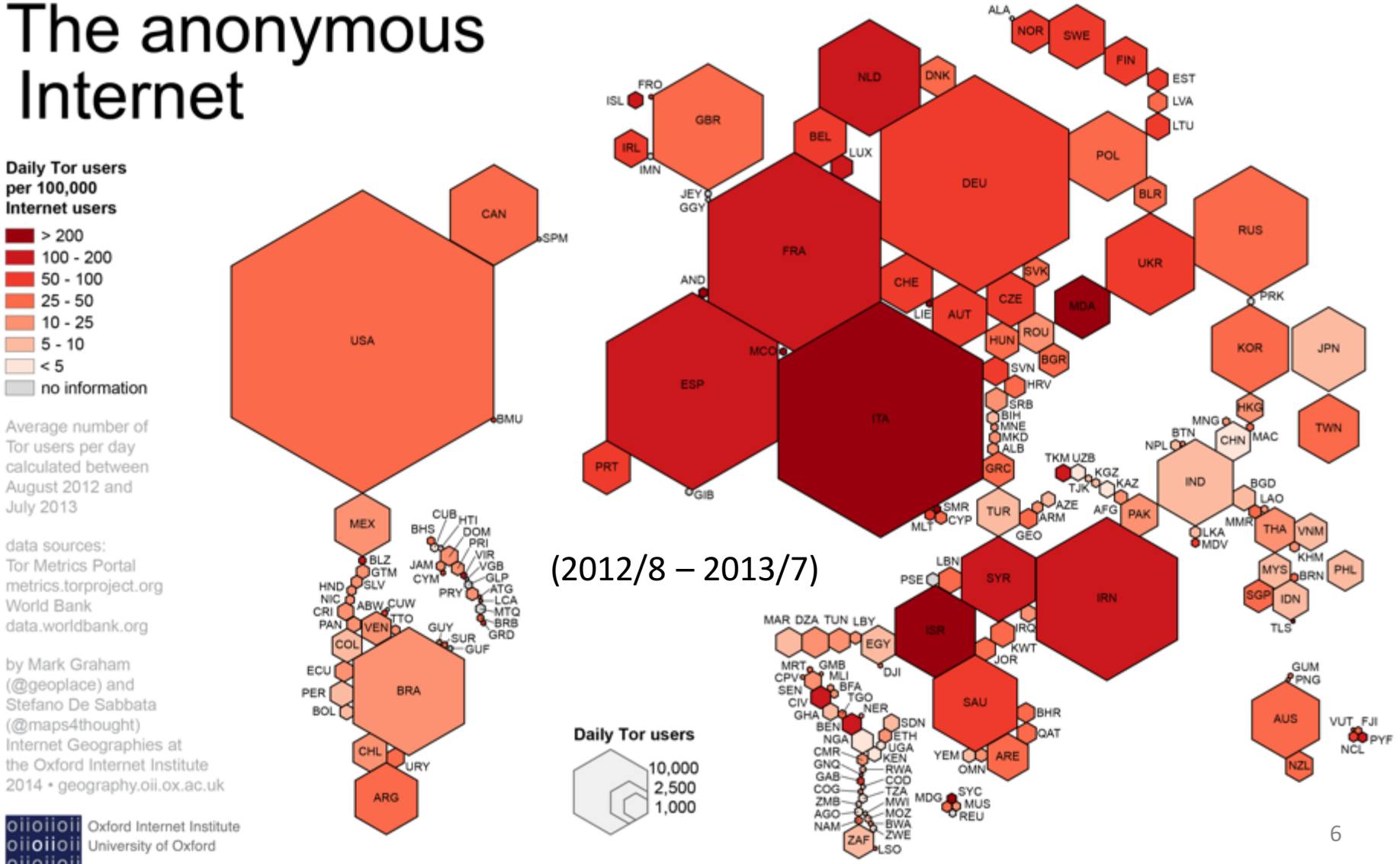
Sender anonymity:
Destinations do not learn source IP address of user.





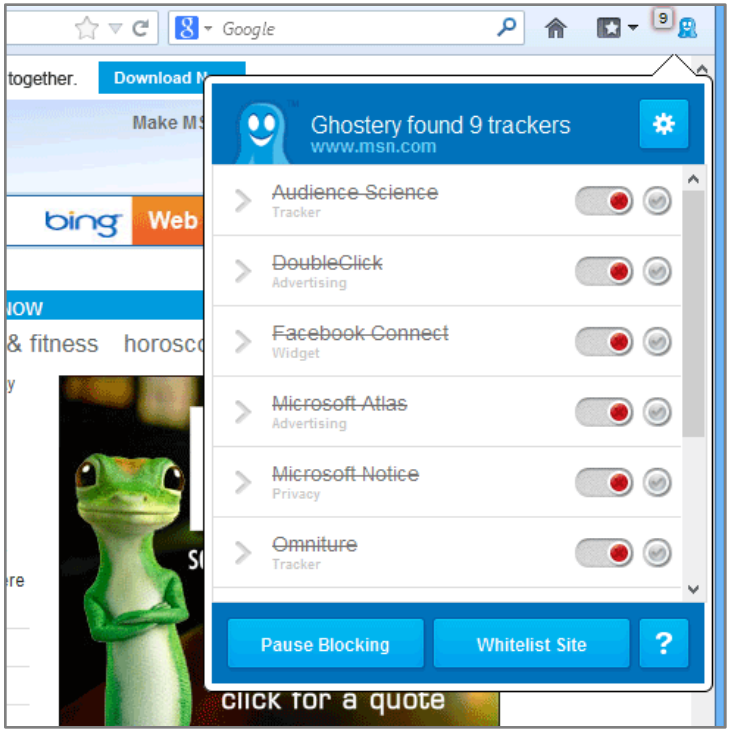
mainly an issue on IP layer
but also on application layer

However, self-defense tools are not used by "normal" citizens.



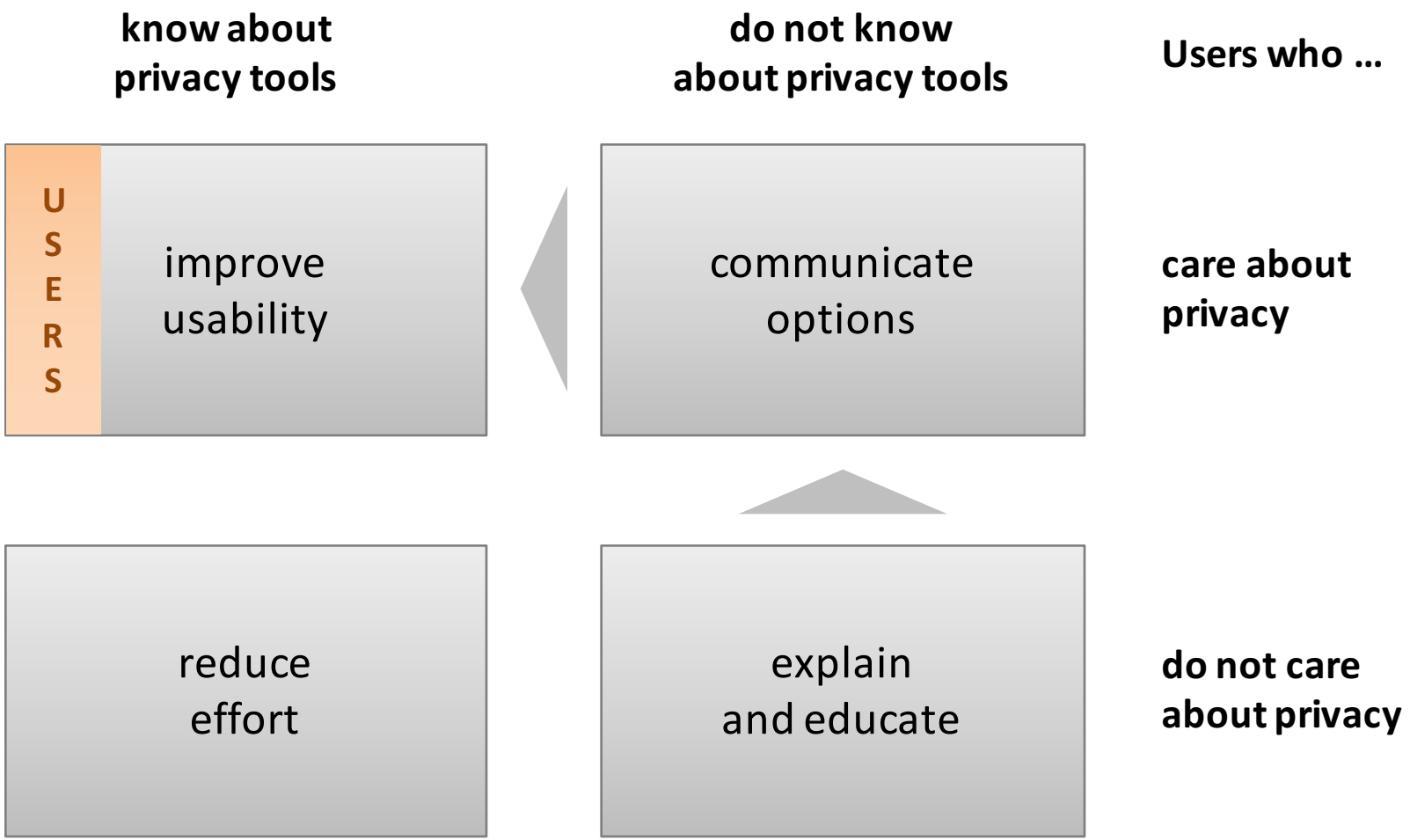
Popular browser plug-ins target a less complex privacy problem, but this may be sufficient for some users.

Unlinkability:
Destinations and their partners cannot track activities of a user.



mainly happens on application layer
but also possible on IP layer

Why isn't everyone using Tor et al.? What can we do to increase their adoption?



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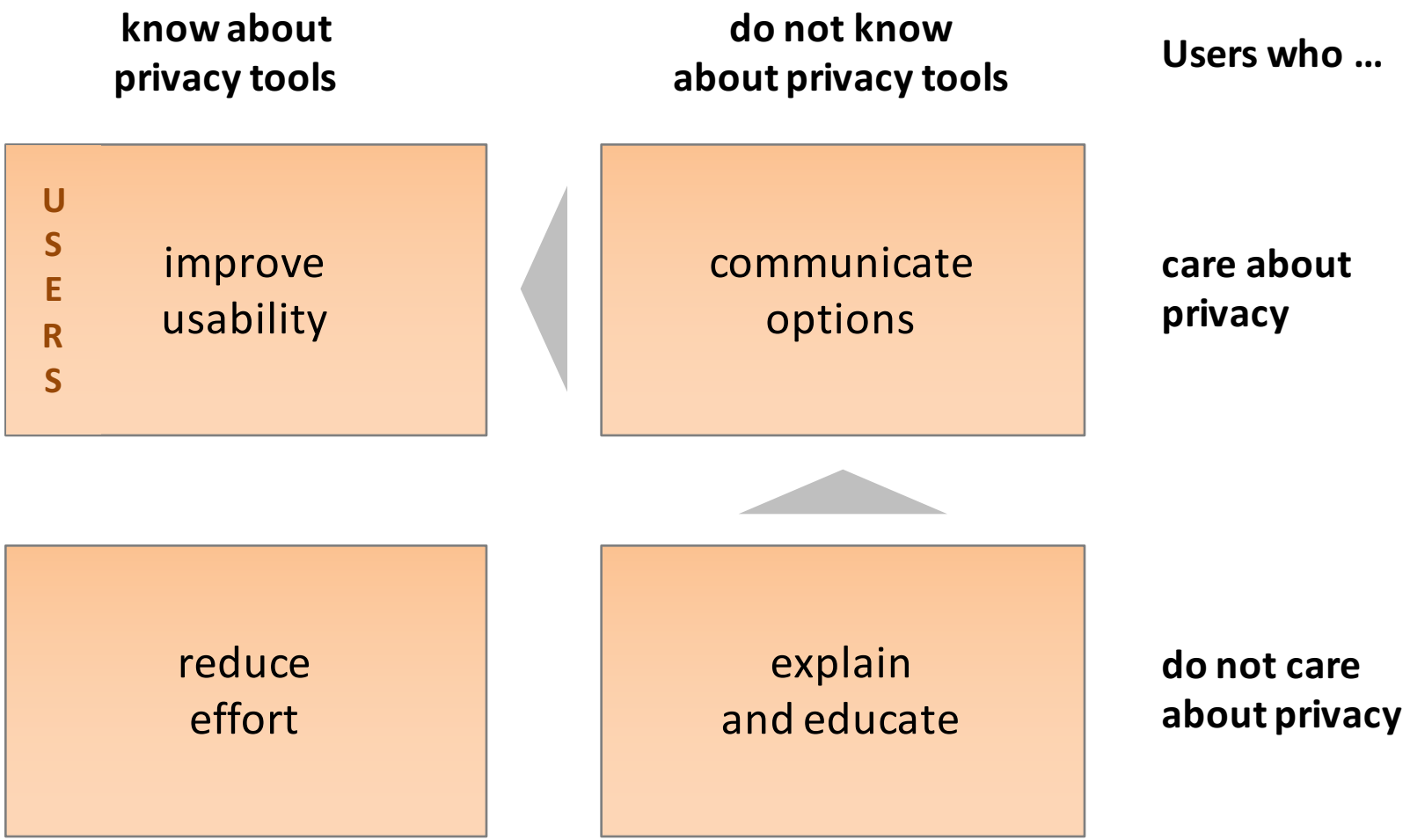
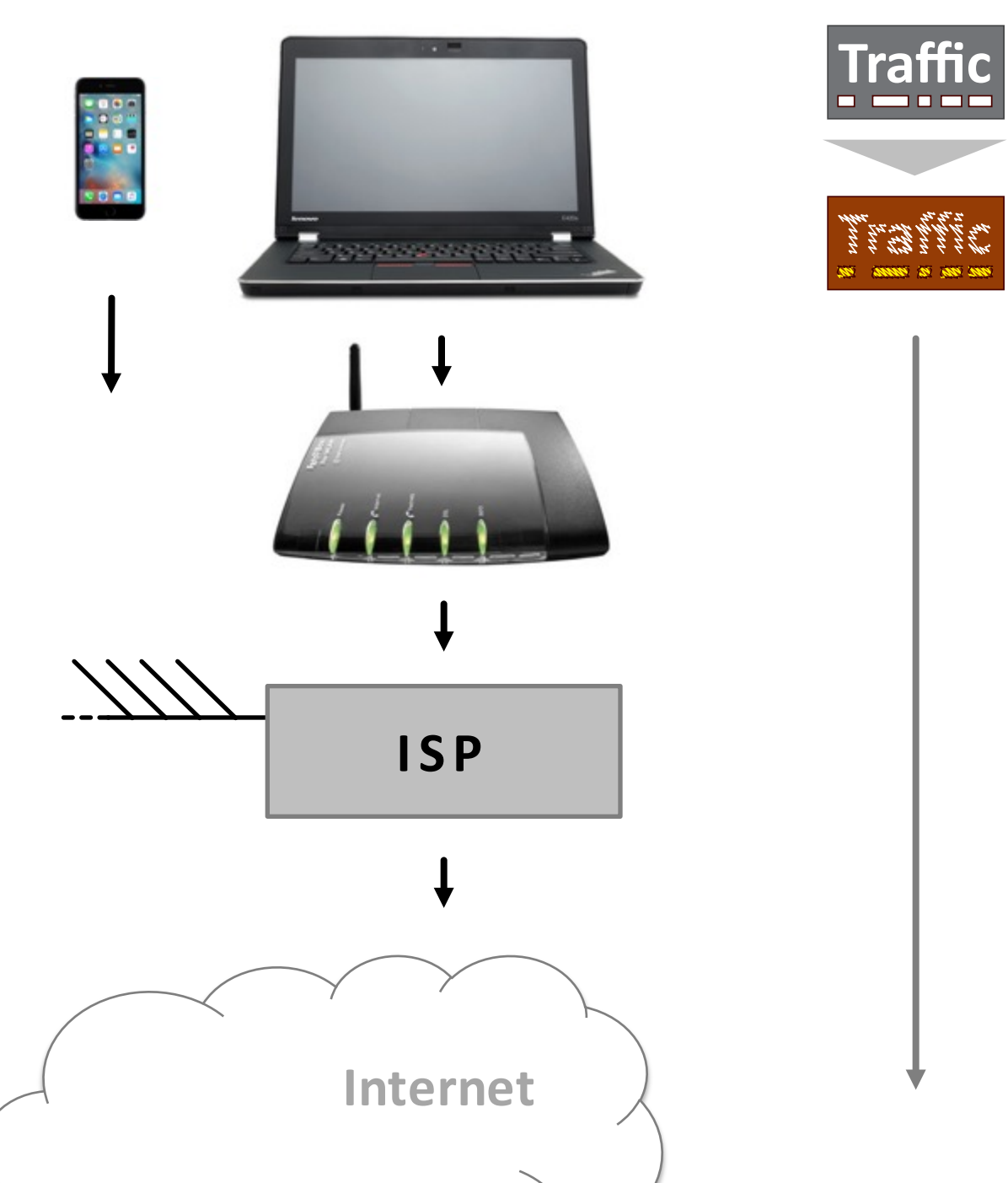
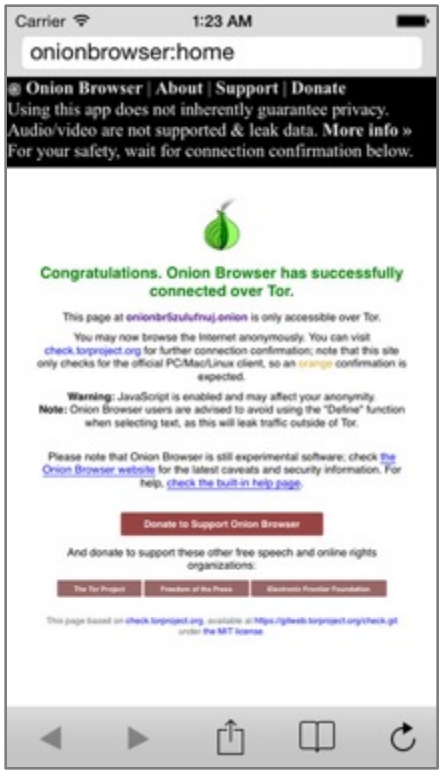



Traffic
ISP
Internet

Users are going mobile. Anonymous Internet access and tracking protection are difficult to realize on smartphones due to limitations of the OS.



OnionBrowser for iOS
limited to special browser

Orbot for Android
offers local proxy/VPN,
(requires rooted device)

Status quo

Approaches

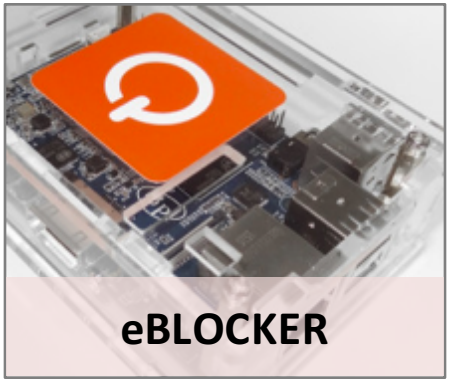
Further issues

Privacy-enabled home routers appear to be *the* solution – or are they just yet another workaround?

$82,643 @ indiegogo

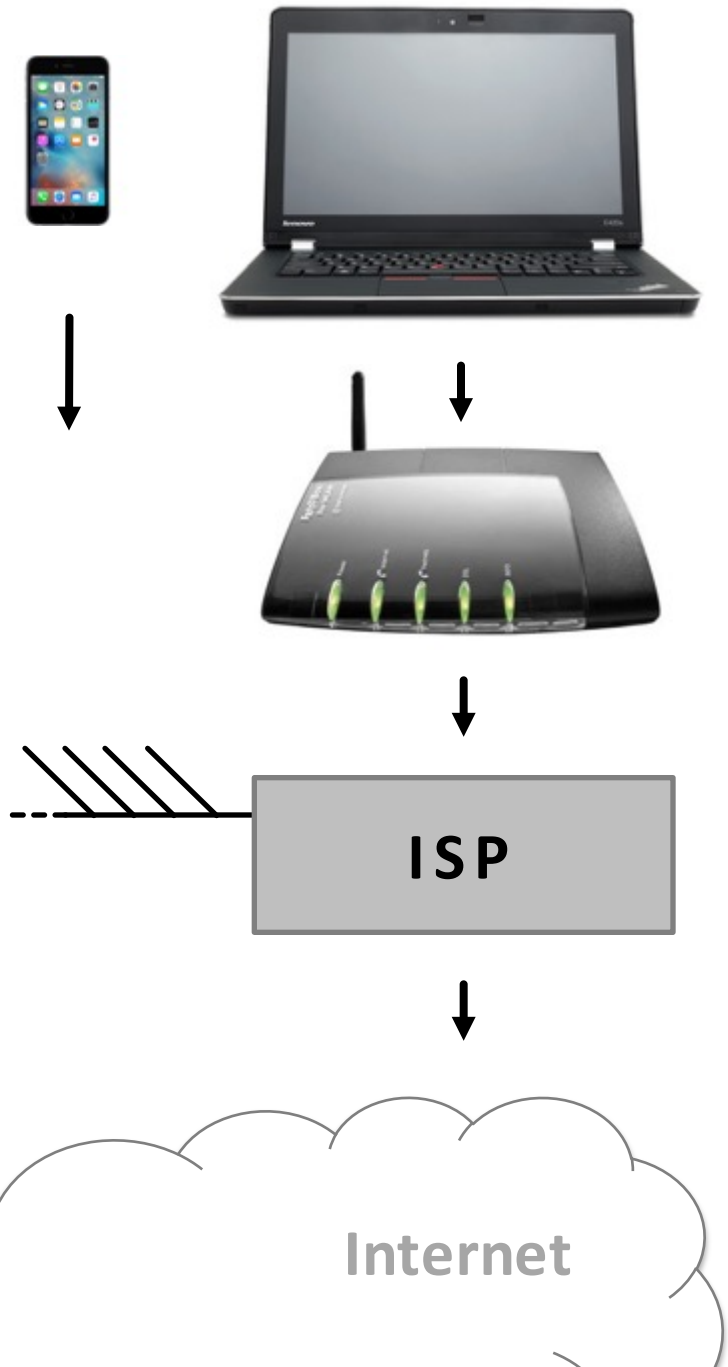
Price: $49,00

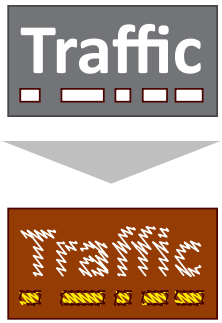
$20,960 @ indiegogo
101,420 € @ kickstarter



$81,000 @ indiegogo

Anonymizing routers do improve usability, but they have inherent limitations.





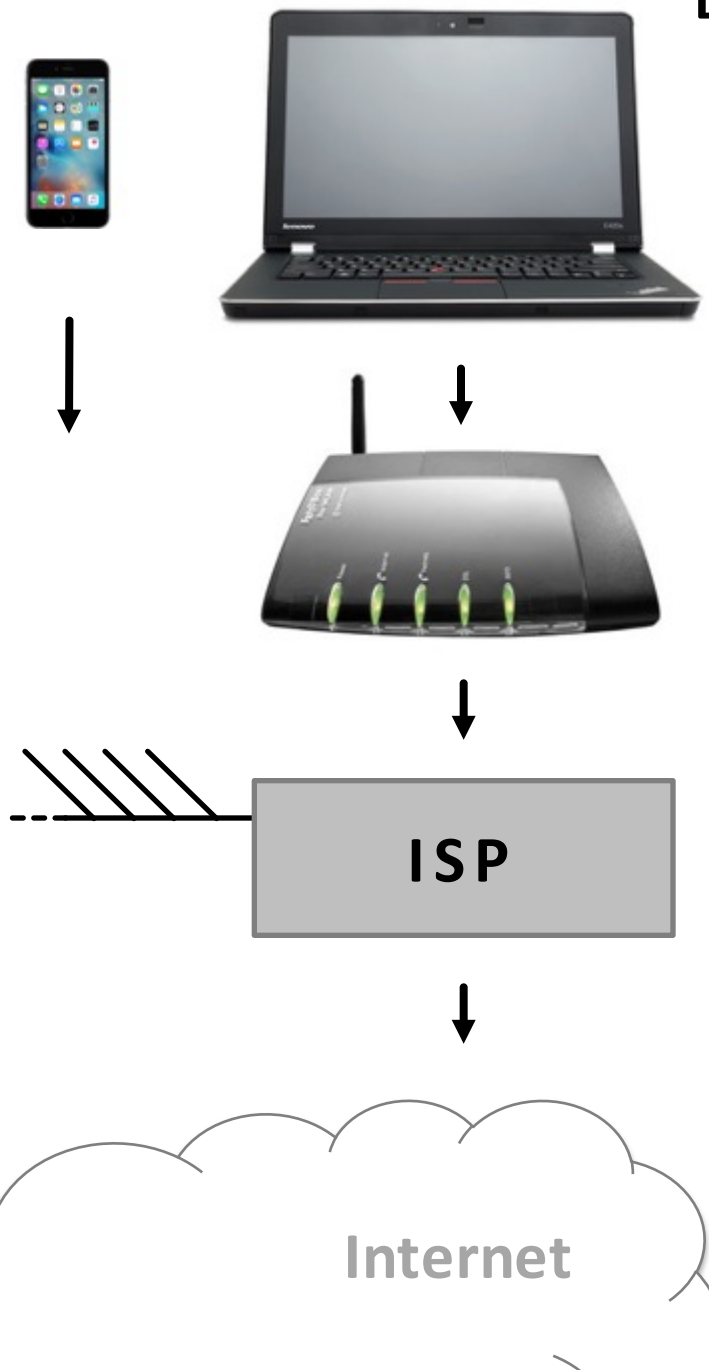
Ideally, works with any device out of the box

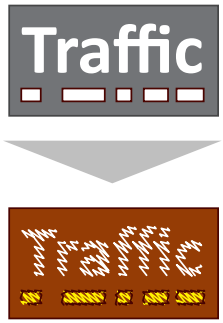
Unavailable on the road

Proxying all traffic (UDP!)

Layer 7 filtering (TLS!)

Delegating anonymization to the ISP reduces effort for users (again, limitations apply).





Less effort for users:

No special router needed

Works on the road

Have to trust ISP

Proxying all traffic (UDP!)

Layer 7 filtering (TLS!)

Users will only accept privacy-enabled Internet, if there is no noticeable difference in performance and price. What are our options?

Reduce overhead of anonymous routing

tailor anonymization to individual applications

understand interference between overlay und underlay

move anonymization **into network layer**

cf. LAP, Dovetail, HORNET

Consider other approaches to achieve privacy

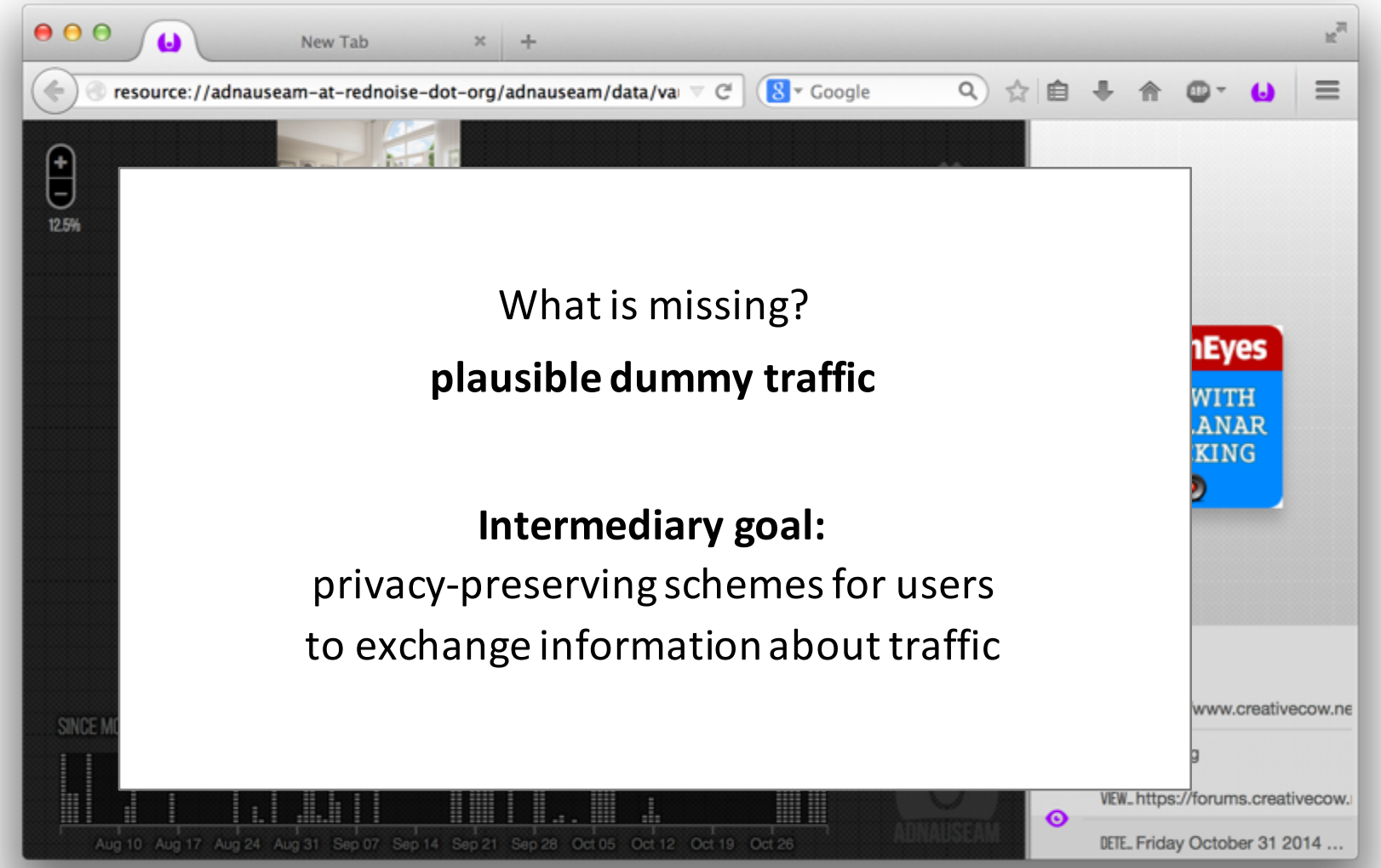
obfuscation via dummy traffic

unlinkable IP addresses to prevent tracking

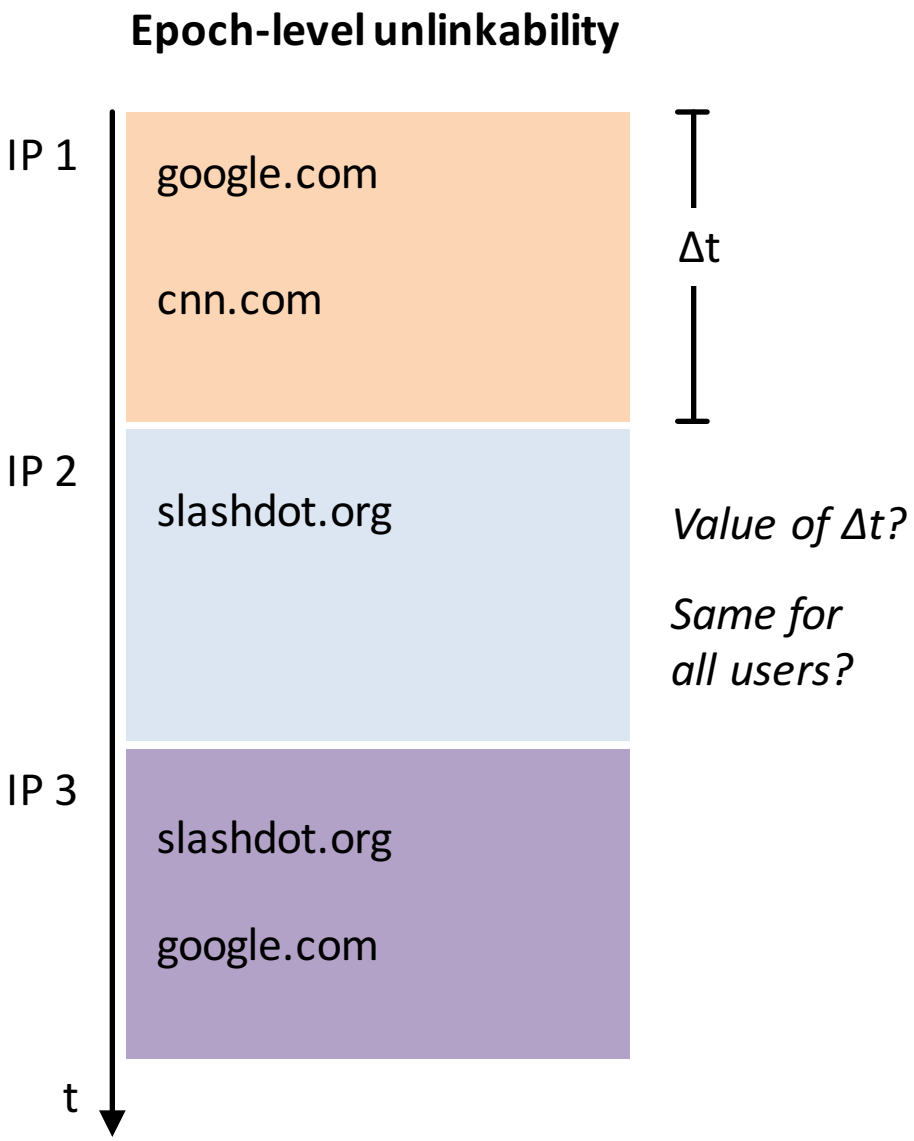
cf. Raghawan et al. and Herrmann et al.

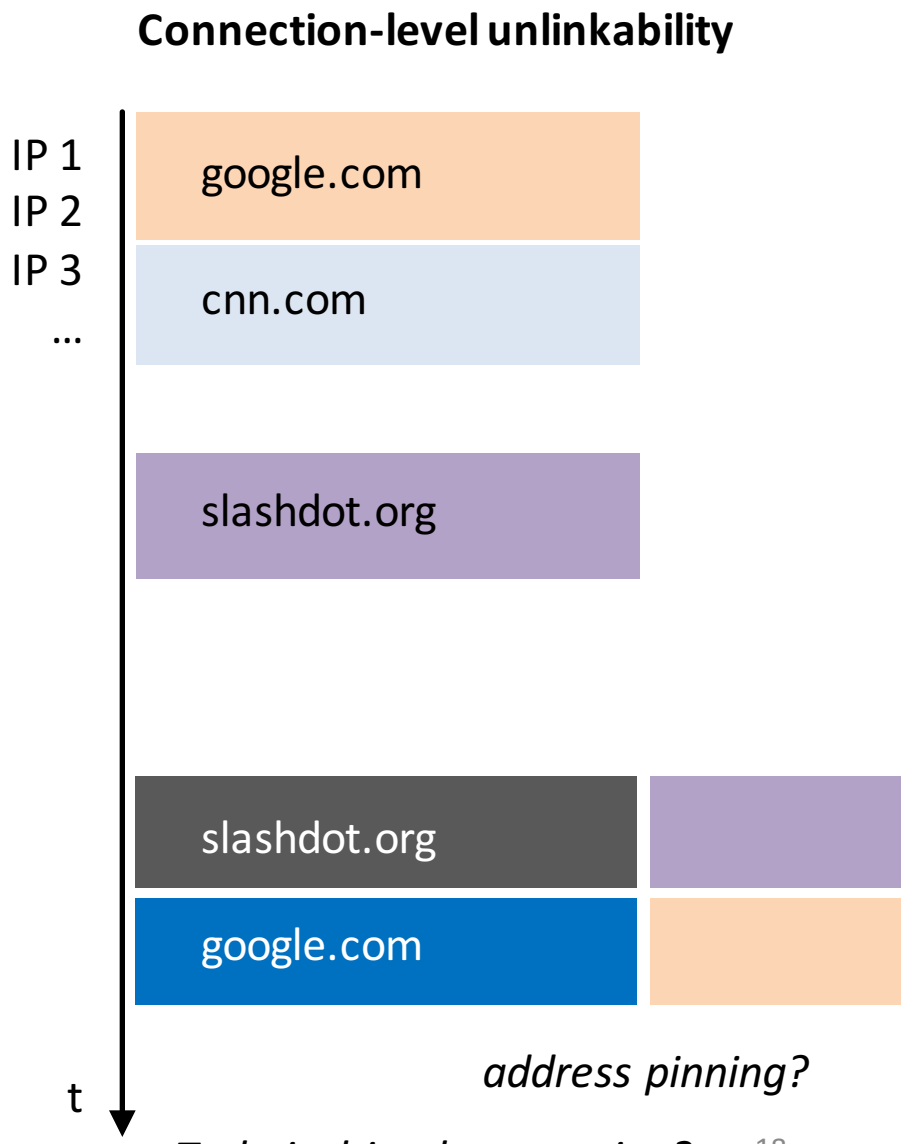
Obfuscation with dummy traffic is an interesting solution – but a controversial approach.

cf. AdNauseam and TrackMeNot



If sender anonymity is not necessary and unlinkability of actions is sufficient, we suggest that ISPs should improve IP address assignment.





Status quo

Approaches

Further issues

Apart from anonymizing IP addresses, there are at least three further issues to be considered.

Application layer filtering	Unclear effectiveness of parsing JavaScript Make TLS interception acceptable via whitelisting
Data retention	Ensure ISP can abide the law and does not misuse its power Devise efficient storage techniques
Verifiability of operation	

Zero-effort privacy means users will not notice, if their router or ISP fail to anonymize their traffic properly. How to verify correct operation?

Inject a toolbar into websites?

Router status indicator?

Anonymity Online for Everyone

Users either apathetic or
in state of analysis paralysis

Complement self-defense tools
for power users with decent level
of privacy out of the box for all users

Relaxing attacker model and moving
anonymization into network layer
interesting areas for future work