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DISSECTING DNS STAKEHOLDERS In Mobile Networks

WHY TO STUDY DNS IN MOBILE NETWORKS?

- Complex scenario as domain owners, operators, app developers, and OSes operate autonomously
- DNS is prominent in mobile traffic, up to 50% of all flows [1]
- Performance wise, only query resolution time level has been considered [2,3]

[1] "Application Bandwidth and Flow Rates from 3 Trillion Flows Across 45 Carrier Networks" PAM'17

- [2] "QoE Doctor: Diagnosing Mobile App QoE with Automated UI Control and Cross-layer Analysis" IMC'14
- [3] "Behind the Curtain: Cellular DNS and Content Replica Selection" IMC'14

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QUESTIONSWho is responsible for all this traffic? Is it really needed? What is the role of DNS on users QoE?

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DATASETS





	Name	Туре	Dur	Apps	User	Domains	Flows	IPs
IN-NETWORK	MNO		1M	-	19M	198M	250M	4.2
ON-DEVICE	Lumen	٦	1.5Y	8,279	5k	35k	5.3M	99k



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AD-HOC PROBING	NexusPLT		1M	chrome	1	6k	46k	8k	static analysis Google Play

ANALISYS ROADMAP



Domains Footprint

- What are the relevant domains?

- What the role of the OS?
- What the role of Apps?



Domain Properties

- Original values at the ADNS
- How LDNS cache/mingle those properties
 - On-device caching performance

Configs & Apps Design

- Are explicit proxies widely adopted?
- Are developers using OS configurations?



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example d-2294771243204135673.ampproject.net

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5 services handle 80% of ephemeral domains



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DNS IMPACT ON WEBPAGES PLT

 Consider top-1k Alexa pages, and measure DNS latency over the critical path (i.e., content downloaded entirely/partially in isolation)



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QUICK OVERVIEW OF OTHER RESULTS

- Alexa rank does not well intersect with the popular domains
- iOS and Android share popular domains, but iOS devices are more "chatty"
- Aggressive TTL values, but domains have <10 IPs over 1 month</p>
- Almost no TTL violations found, but LDNS architecture can impact caching performance
- Explicit proxies are not widely adopted, nor developer bypass OS config

...SO DNS HAS AN IMPACT How do we reduce it?

DESIGN OPTIONS

Ideally one would like not to have any DNS traffic

Name	Popular	Stakeholder	Pros	Cons
Explicit proxy	No	Operator	No DNS on radio access	From tests, reduces only 50% DNS latency on PLT
Domains pre-fetching	No	Developer	Lower latency	More DNS traffic
Domains pre-staging	-	OS/Operators	From tests, is the best performing	Complex to engineer

GOING BEYOND THIS PRELIMINARY WORK

What is the "PLT" of generic mobile apps traffic?

What is on the "critical path" beyond DNS?



