Netalyzr for Android: Challenges and opportunities

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The problem:

People care about their cellular network performance … (and security)
... but cell nets are complex. We don’t really know what they look like/behave.

A speed test and a coverage map won’t say everything about the root cause!
Netalyzr
ICSJ - February 21, 2014
Tools

Installed

This app is compatible with all of your devices.

⭐⭐⭐⭐⭐ (157)

+162 Recommend this on Google
The ICSI Netalyzr for Android

- Native tool to diagnose connectivity characteristics and study the health of the Internet from the edge of the network
- Checks for behavioral anomalies and security issues
- Helps any user to understand and fix their network
- User-driven analysis
- Continuous evolution!
  - Desktop version launched in 2009 (Java applet)
  - Android native version launched in late 2013
The (current) test suite

- **Addressing**: NAT detection, port renumbering, network interfaces, gateways, …
- **IPv4/IPv6**: fragmentation, path MTU, dual-stack support, latency comparison, ..
- **Network Performance**: latency (including control-plane), bandwidth
- **DNS**: resolver identification, port randomization, glue policy, wildcarding, DNS MTU, lookup integrity, EDNS support, RTYPE behaviour, IPv6 support, performance, …
- **HTTP**: Hidden proxies, in-path caches, header manipulation, image transcoding, compression, HTTP type filtering …
- **Reachability and connectivity**: port filtering, traffic differentiation, fragmentation, SNR, WiFi/Cellular configuration,…
- **Network topology**: traceroute
- **Security**: TLS handshake, UPnP vulnerabilities on WiFi APs, …
- **Handset configuration**: clock drift, TLS default certificates, APN configuration, …
Mobile app design

Front-end (ICSI)

HTTP Server  DNS Server  Storage

Back-ends (Amazon EC2)

HTTP Server  DNS Servers  Latency Server  MTU Server  Echo Servers  Storage

ASK FOR HELP!

Android activity

JSON-based report

Background service
Advantages over other approaches

- Large footprint (large number of operators and countries)
- High fidelity data:
  - “You measure what you see”
  - Ability to collect contextual information
  - Cross-layer
Limitations, technical and research challenges

- Accessing control-plane information:
  - Hacking radio drivers [*RILAnalyzr*, IMC’13 (open source)]
  - Offline analysis of operator traces (privileged access)

- App maintenance can be hard. Do not trust anything!
  - Bugs are very common, there are many corner cases!
  - Handset idiosyncrasies (… APN misconfiguration)

- Flexibility and extensibility
  - Support new technologies (eg SPDY, IPv6)

- Multi-dimensionality of analysis: **HARD TO MAKE SENSE OF WHAT YOU COLLECT!**

- Market peculiarities: shared networks and MVNOs
“Crowdsourcing” means … “users”!

- +15K Android installs as of today
- 290 operators in 90 countries
- +25K sessions
- Geek bias (~60% have rooted handsets)
Attracting and keeping users

- Loyalty ($\text{#installs} \neq \text{#active users}$)
- Publicity is really important!
- Internationalization
- Go beyond Google Play coverage
- Clearer explanation of results
- Gamification and sharing capabilities
- Improve GUIs and reduce testing time
- Privacy and app permissions! Gain users’ trust!
App reviews and feedback

Reviews

User reviews

Fehmi Ben Abdesslem  November 1, 2013
⭐⭐⭐⭐⭐
Very useful Clear, fast, and complete. Very well implemented, and good UI. Extensive explanation of the results.

Ólafur Guðmundsson  February 13, 2014
⭐⭐⭐⭐⭐
The best network connectivity app! I have used this service since it started to evaluate networks. It just keeps getting better.

Stephen Webb  February 22, 2014
⭐⭐⭐⭐⭐
Must have! Helped diagnose an issue with DNS settings on my router.

February 4, 2014
Hi Seth, thanks for your review and for letting us know! We'll check that for the next release. Drop us a note at nalyze-help@icsi.berkeley.edu if you have any other questions or if you see that the problem continues.

James Kaszenek  October 27, 2013
⭐⭐⭐⭐⭐
Appears to be for mobile/cellular only See above.
Real case: T-Mobile’s Proxy

“I have the senior engineers at T-Mobile using the app now. They are impressed with it.”
— a Netalyzr user
Thanks for your attention!

Q&A

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