

Measurements with the masses

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ABSTRACT

The network measurement community has produced an impressive set of network measurement tools to which a few are added each year. A few prominent examples have seen wide-spread deployment covering large parts of the Internet but there is arguably one network segment which is extremely difficult to cover: host-to-host measurements with measurement instrumentation on "regular" end devices. The problems in this space are manifold, but the main challenge is non-technical: incentivising "regular" Internet citizens to take part in an experiment. In this paper, we look at the challenges, examples of measurements which involved end users and conclude with potential actions which would make measurements involving end users easier.

Keywords

1. INTRODUCTION

A large set of network experiments have been carried out in the past on networks which are open for experimentation, where a large set of end-devices are under the control of an experimenter but which are neither attached to "regular" Internet access networks nor are these devices "common" end-user devices. A prominent example of such a network is PlanetLab. For many experiments such a network is not only sufficient but ideal because of the tight control and root access on these devices. For other experiments, these environments are not suitable because the Internet experience for real Internet users cannot be captured. But involving real end users in network measurements is challenging to say the least and the reasons are manifold - many of which are addressed in the following.

2. CHALLENGES

The following list of challenges is certainly not complete nor is the ordering to be understood as a prioritization. Also, for some measurements a certain challenge might not apply.

2.1 Access-rights on end devices

A number of measurements need root access on an end device. This is difficult to explain to regular end users since it would potentially allow an application to see all traffic sent

by a device and is unusual for typical applications installed by end users.

2.2 Cross-platform development

A large set of platform/operating systems are being used by end users. Different device capabilities (Android etc.), different APIs, different low-level access. (Ping from Glimpse).

2.3 Incentivizing the user

repeated and constant use measurement as by-product vs. measurement as main cause.

2.4 Potential Interference

User-devices are used constantly (how to make sure measurements are accurate).

2.5 User privacy

EULAs, legal aspects, different countries - different rules, explaining to users what is being collected why.

2.6 Non-annoyingness

2.7 Data collection

Lot's of devices... lot's of data... lot's of noise?

3. EXAMPLES

DASU, MPTCP experiments

4. CONCLUSIONS

IPMP?? GLIMPSE?