BISMark: A Platform for Studying Home Networks

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1. THE BISMark PLATFORM

Little is known about the performance delivered by broadband ISPs and the factors that affect performance. Previous works [1] have studied access networks from the outside in, or from end hosts. While such studies give us valuable insight into the performance of access networks, they are unable by design to account for various confounding factors that have significant impact on performance. Examples of such factors are the home wireless network, the local loop, and even equipment such as modems. We present BISMark, a platform for measuring access network and home network performance. BISMark is a deployment of instrumented wireless routers in homes. The routers are capable of running both active and passive measurements from a vantage point between the home network and the access ISP, as shown in Figure 1. This design offers an unobstructed view of the ISP network, and the ability to run continuous measurements, enabling us to account for many of the confounding factors that affect other measurement studies. Table 1 summarizes the measurements that we currently obtain from the deployments.
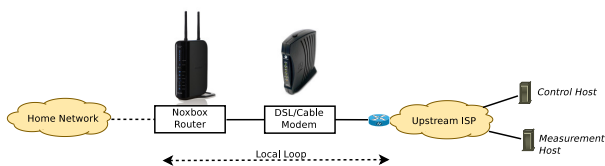

Figure 1: The router sits directly behind the modem in the home network. It takes measurements to the local loop, hosts in the wide area, and also the home network.

Type	Parameters	Comments
Active	Throughput, Latency, Loss, Jitter	Network characteristics
	DNS lookups, Traffic shaping	ISP characteristics
Passive	Wireless signals, Access points	Home network characteristics
	Aggregated traffic information	Usage characteristics

Table 1: Measurements obtained from BISMark.

The gateway is based on the NOX Box [2], a small-form-factor computer resembling an off-the-shelf home router/gateway. The hardware is an ALIX 2D13 single board computer with a 500MHz AMD Geode processor, 256 MB of RAM, and three 10/100 Ethernet ports. We equip the NOX Box with an Atheros AR5004 802.11a/b/g chipset, enabling the box to act as an access point, and 2 GB of flash memory. The box runs a standard Debian Linux distribution. The configurability and programmability of the NOX Box, coupled with its reliability and performance, make it an ideal platform for our measurement infrastructure.

The router "calls home" to our control host every two minutes, by sending a UDP packet to the control host. The UDP packet effectively punches a hole in the NAT, if the router happens to be behind one. This is particularly important for home routers because we do not have direct control over where they are deployed, and the control host needs to be able to communicate with the router. The router, by means of this control packet, sets up an ssh session if required. Active measures are synchronized to avoid excessive overlapping toward the same destination. No personally identifiable information is stored, and IP addresses are anonymized to /24s. Users are given the option of turning off passive data collection.

2. STATUS AND FUTURE WORK

We have currently deployed 16 boxes in homes in the Atlanta area. The deployment spans three ISPs (AT&T DSL, Comcast Cable, and Clear WiMAX), and multiple service plans. We are currently studying the effect of access technology and home equipment on performance. **Factors affecting home broadband performance.** We are studying the impact of the local loop, the access technology, latency to the ISP, time of day, and other factors on user performance. These factors affect not just throughput, but also latency and jitter which in turn affects real-time and interactive applications like VoIP, gaming and video streaming.

Impact of ISP policy. We would like to study the existence of traffic shaping and application specific throttling and its impact on user performance.

Impact of home network. We are studying the impact of Wi-Fi and the home network on end-host performance.

Usage profiles. We are studying the prevalence of different usage profiles (heavy-download, gaming, interactive), and also the impact it would have on perceived user performance.

Walter de Donato and Srikanth Sundaresan are student authors. There is no demo alongside this submission.

3. REFERENCES

[1] M. Dischinger, A. Haeberlen, K. P. Gummadi, and S. Saroiu. Characterizing residential broadband networks. In *Proc. ACM SIGCOMM IMC*. San Diego, USA, 2007.

[2] NOX Box. http://noxrepo.org/manual/noxbox.html.