7 Evaluation

7.1. Measurements

7.1.1. Bitcoin faucet

To examine the responsiveness of the Bitcoin faucet, we used timeline data from the Google Play store console. This dashboard shows the amount of app installations per day. In addition, we inspected the blocks in our Bitcoin regtest environment in order to show all transactions outgoing from our Bitcoin faucet.

When there are x app installations on some day, there should be yx transactions outgoing from our Bitcoin faucet. In the graph shown by 7.1, this is not always the case. On 01/19/2021 there was (at least) one transaction missing. This was due to a server outage where the Bitcoin faucet was running. There are also cases in which there are transactions but no installations. This may be due to multiple app installations from one device on the same day (which is measured as one by the Google Play store console) or app installations outside of the Play store.

7.1.2. Downloading and streaming

7.4 shows the download time of each stage in the bittorrent downloading process. By running 10 runs per network configuration, we inspected the effects of a bittorrent tracker. The measurements show that a bittorrent tracker significantly reduces transfer times, for a small bittorrent swarm with 5 seeders. The largest difference is in the *fetching metadata* stage, during which the device under test must find and connect with seeders. Discovering seeders over DHT requires asking multiple peers, and as such requires more time and messages before the download can start. Once the download starts, the runs using a tracker also reach significantly higher throughput, as the tracker assists the device in finding more seeders and healthier seeders.

7.3 shows 5 traces of downloading a 38 Megabyte album. The red line shows the moving average over these 5 runs. The slow-start nature of bittorrent can be observed here. Roughly the first 5 seconds are used for fetching the bittorrent metadata (see also 7.4).

Note that all devices evaluated in experiments 7.4 and 7.3 use Bittorrent Local Peer Discovery. This means that some of the data transfers may be over local area network, which reaches considerably higher throughput than regular transfers.

7.1.3. Content discovery

6.3 shows measurements of a phone discovering content, after installing and running MusicDAO for the first time. More specifically, it is a measurement of music metadata, received as TrustChain blocks. All participating devices are configured as follows: Every device sends 2 random release blocks to a random peer every 10 seconds.

A Nokia 7 Android device was given a fresh installation of MusicDAO, after which it ran the app in an idle state for 10 minutes. The app measured the amount of release blocks in memory every 2 seconds.

7.2. Devices behind NATs

During experimentation, some of the Bittorrent traffic on Android devices were blocked by Network Address Translators (NATs). MP3 transfers over Bittorrent were slowed down by this. The NAT Port Mapping Proto-

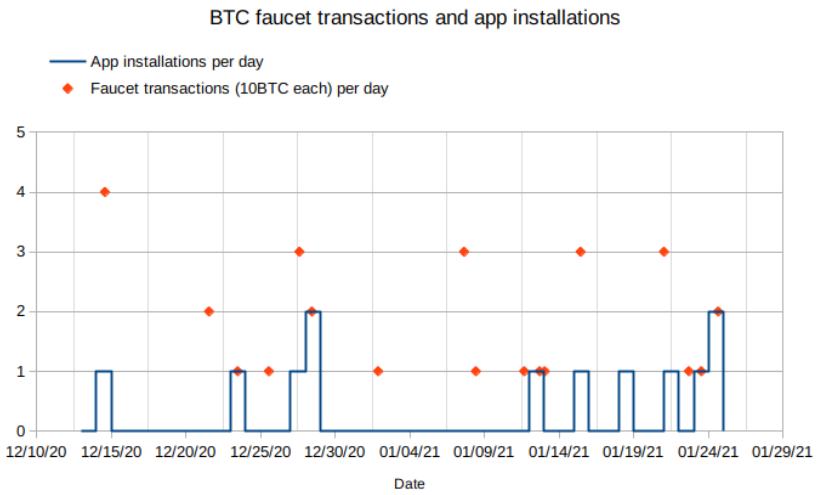

Figure 7.1: Graph showing the relationship between faucet transactions of 10BTC and app installations. Every app installation should correspond to at least one faucet transaction.

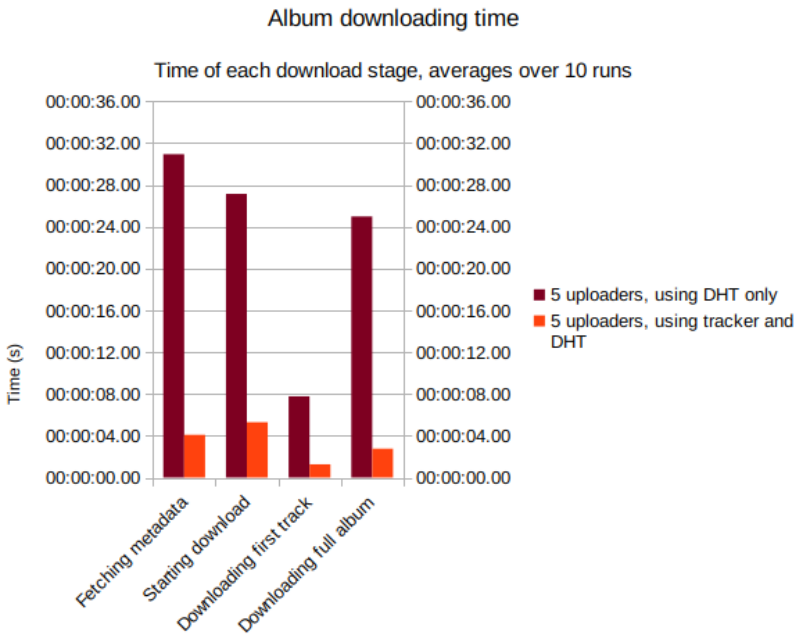

Figure 7.2: Average time spent per download stage. Measured by 20 runs in total, in two different network configurations.

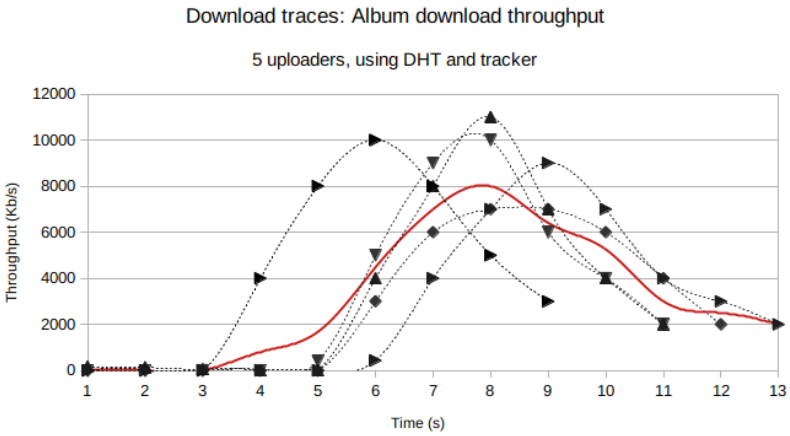

Figure 7.3: 5 traces of download throughput, downloading an album of around 38 Mbs. Measured with Nokia 7.

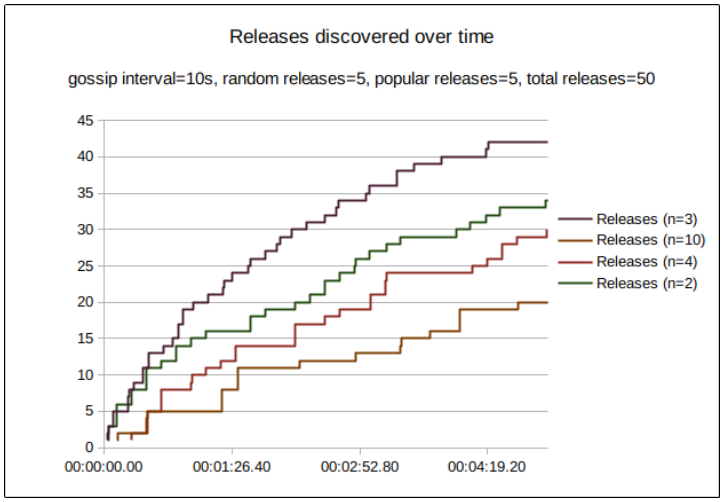

Figure 7.4: Measurements of content discovery: releases discovered after a fresh installation. n: network size (amount of Android devices)

col (NAT-PMP) was used to be able to establish connections between different devices. NAT-PMP establishes connections using port scanning and port forwarding. However, this is a lengthy process: we observed that establishing such a connection usually takes more than 2 minutes. This should be investigated in other research.