**Figure 9: Avg. no. of third party cookies set per domain**

The above figure explains the average number of third party cookies set on each site visited with respect to domain. As we can see the sites in the news domain have a maximum of average third party cookies set at 11. Shopping, Social Media have fewer third party cookies set and it is the lowest for University domain. On analysing the expiry date of the cookies we found that many of these cookies were set to expire far in the future or indefinitely long. That is the users data is stored for long periods of time and is used to track the user over time.

## 5.5 Network diagram to understand the common trackers

To understand the common trackers from the Open-WPM crawl we plotted the network diagram of the common trackers.
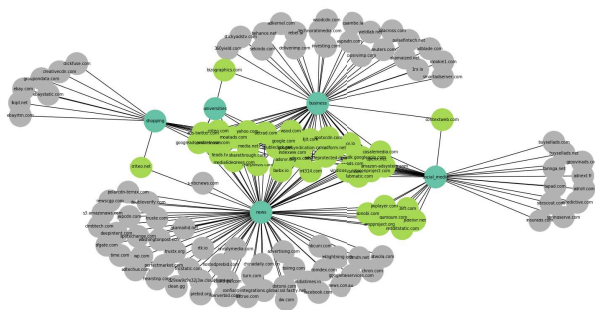
Figure 10: Network diagram of the trackers in OpenWPM on 150 sites

In the above network diagram, the dark green nodes represent the five domains and all the other nodes represent the trackers found on the 150 sites. The nodes colored in light green represent the common trackers across all the domains.

To understand the common trackers found between 30 sites analysed using Lumen on android apps and the websites of the same crawled using OpenWPM, we constructed a similar network diagram.
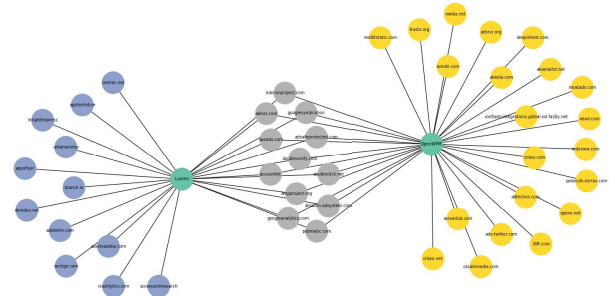
Figure 11: Common trackers in mobile app and desktop across 30 websites

The above figure showcases the common trackers across Lumen and OpenWPM crawl on mobile apps and websites. The blue nodes in the diagram represent the trackers unique to the Android apps and the yellow nodes represent the trackers unique to websites. The grey nodes represent the common trackers across the apps analysed through Lumen and websites analysed through OpenWPM.

6 LIMITATIONS AND FUTURE WORK

The limitation that we faced in our study was that Lumen does not use the same blacklist as does Ghostery. Hence we could not do a comparative study between Android apps through Lumen and websites through Ghostery. Lumen only works for Android ecosystem and there is a lack of apps for iOS Operating system that would monitor the trackers and block them. Hence a comparative study between different operating systems was also not feasible.In the future we would like to increase the total number of websites that we crawled. Also automating the manual process of using Lumen on each Android app should also be automated. We would