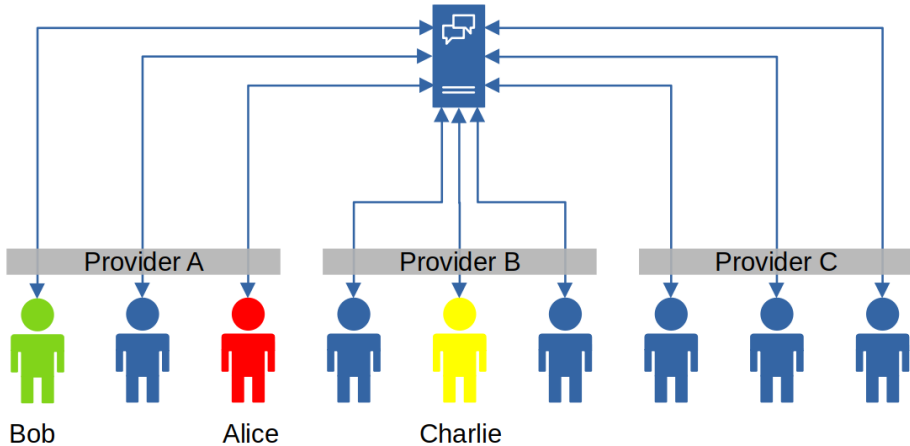


A Privacy Preserving Networking Approach for Distributed Digital Identity Systems

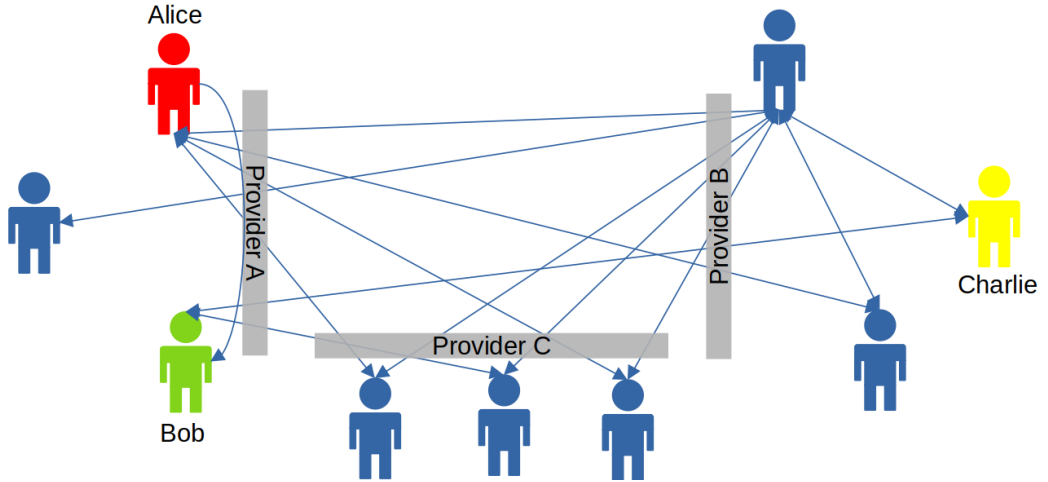


PhD Defense
Tobias Höller

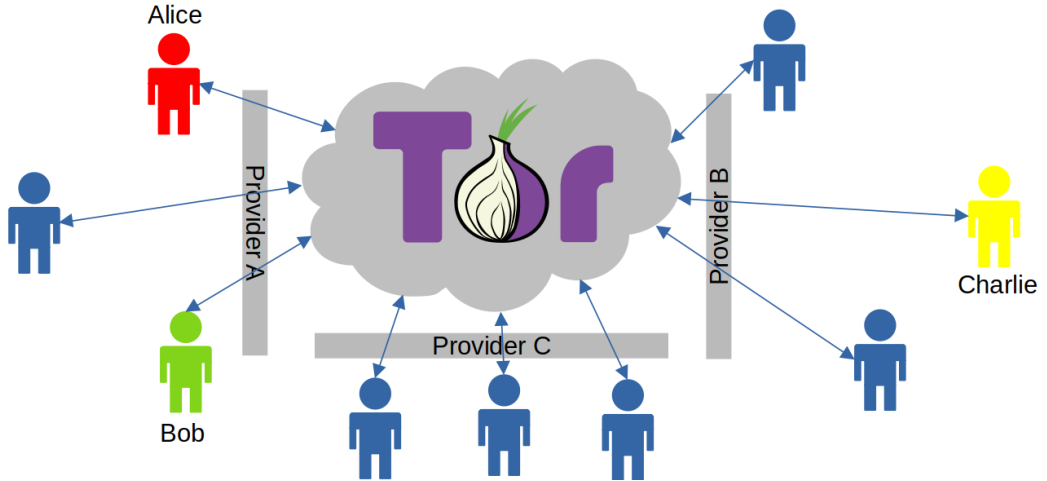
Most Messaging Services



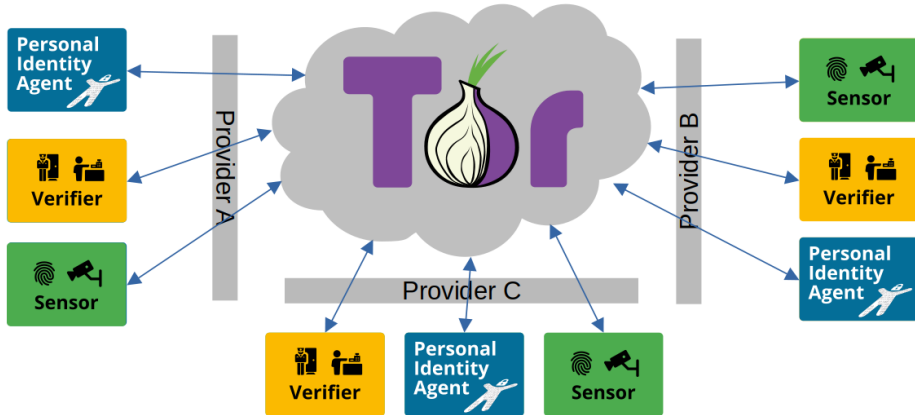
Peer-to-Peer Messaging Services



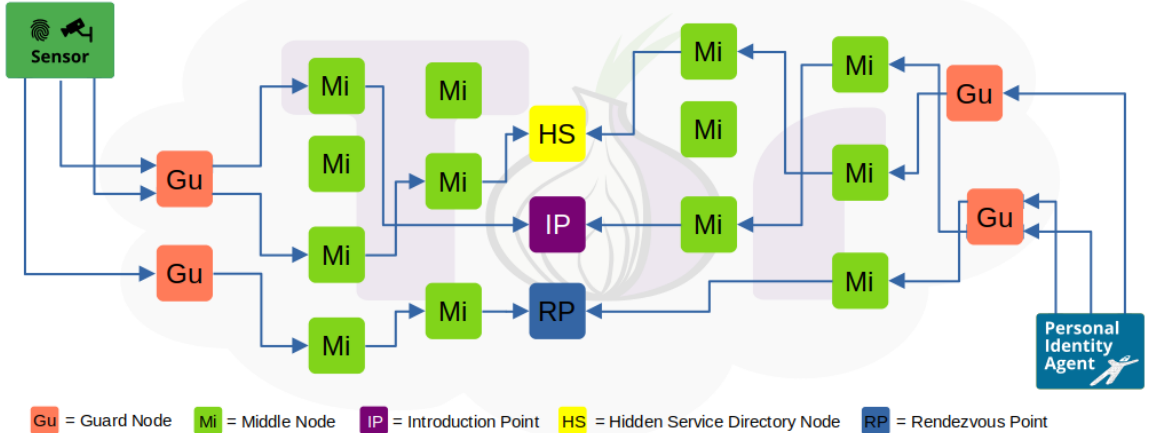
Metadata resilient Messaging Services



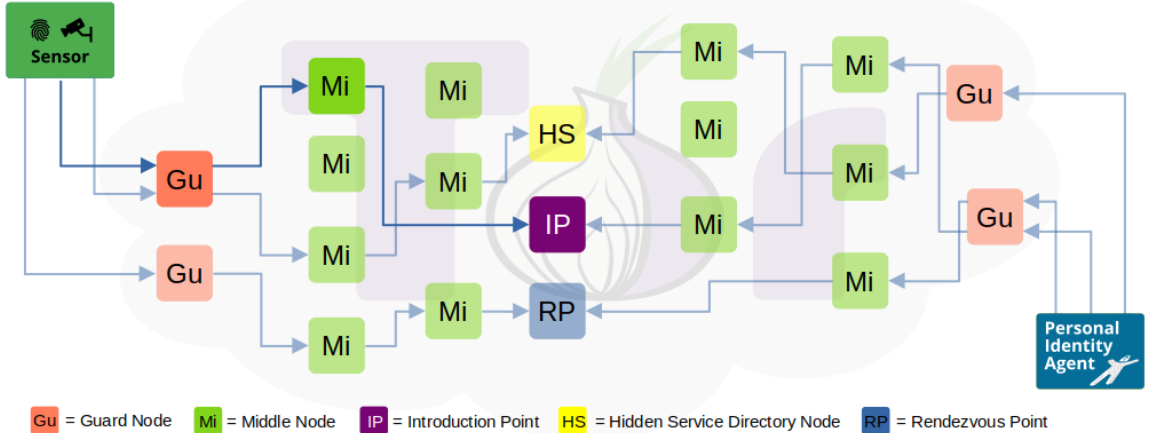
Privacy Preserving Digital Identity Systems



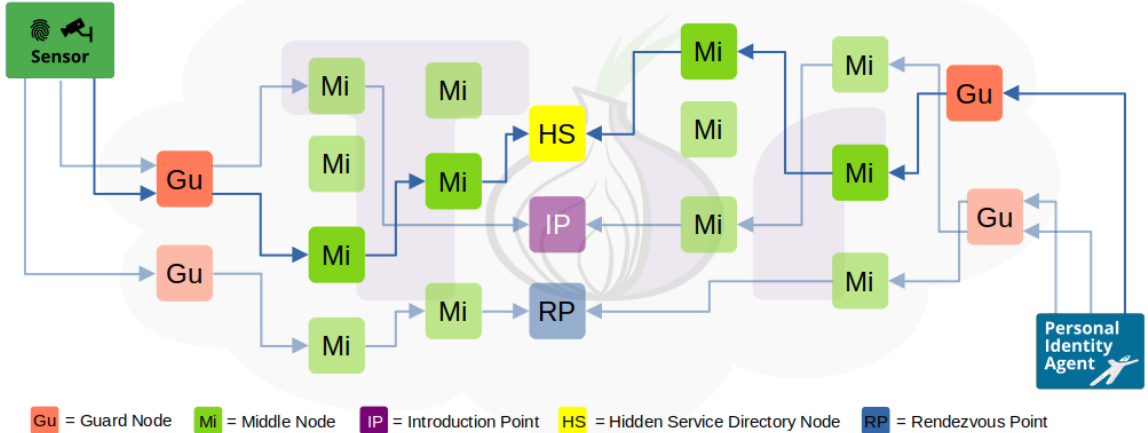
Limitations of Privacy Preserving Messengers



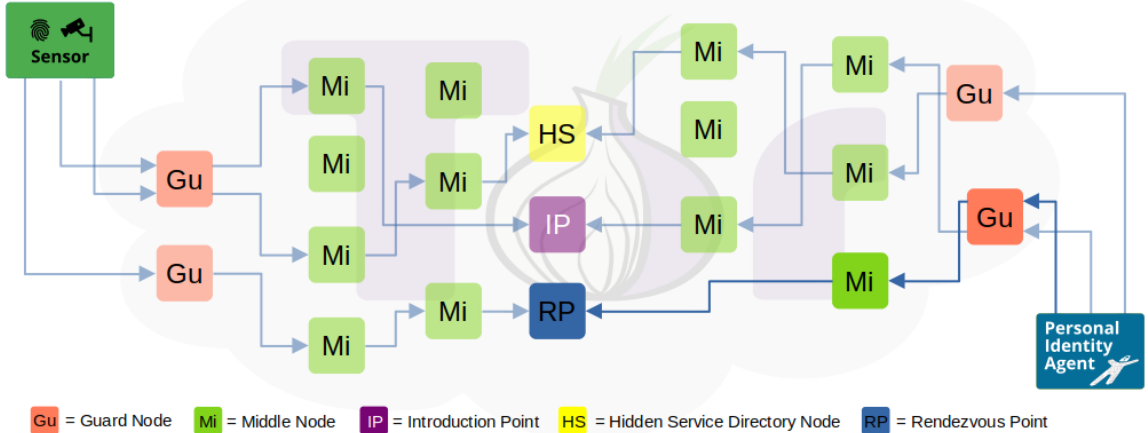
Limitations of Privacy Preserving Messengers



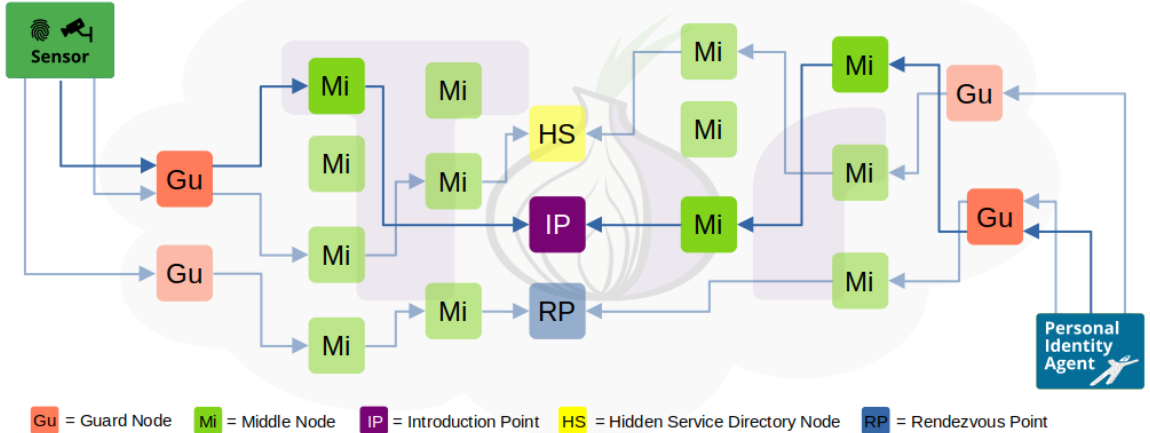
Limitations of Privacy Preserving Messengers



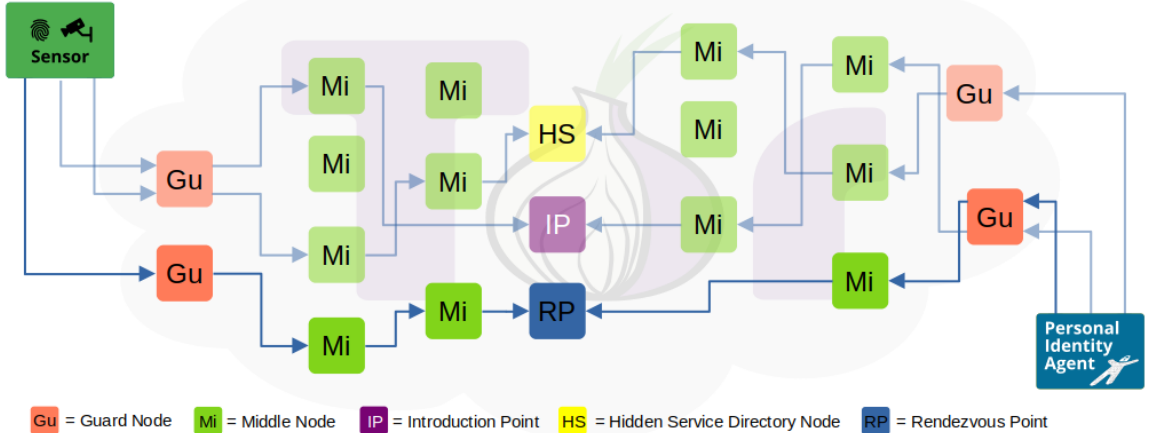
Limitations of Privacy Preserving Messengers



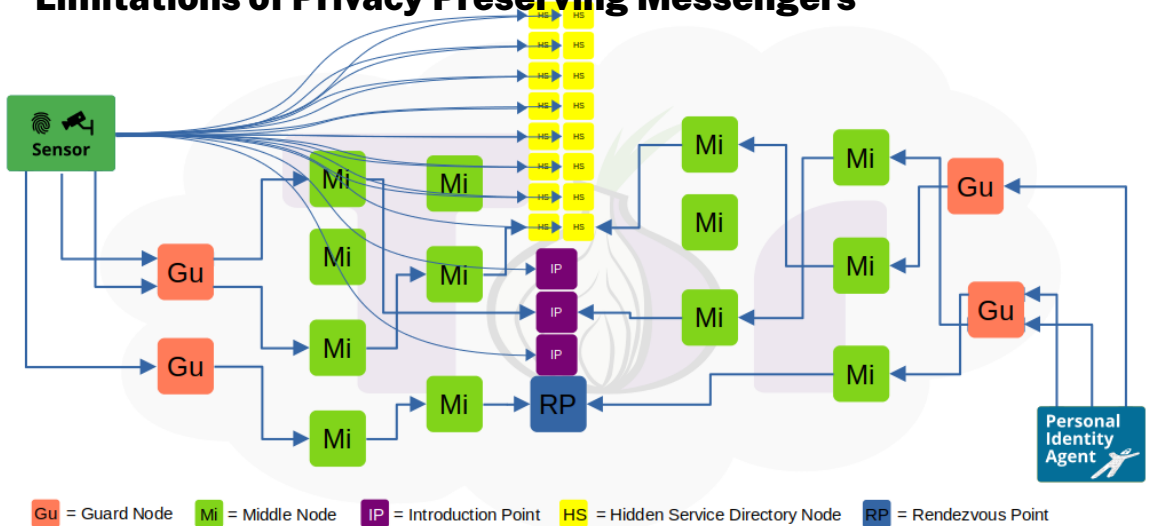
Limitations of Privacy Preserving Messengers



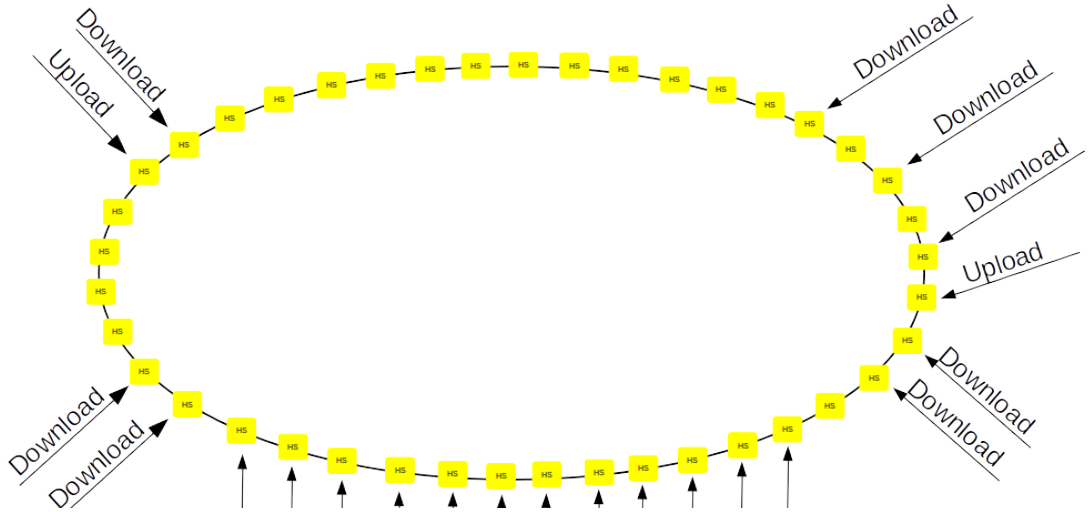
Limitations of Privacy Preserving Messengers



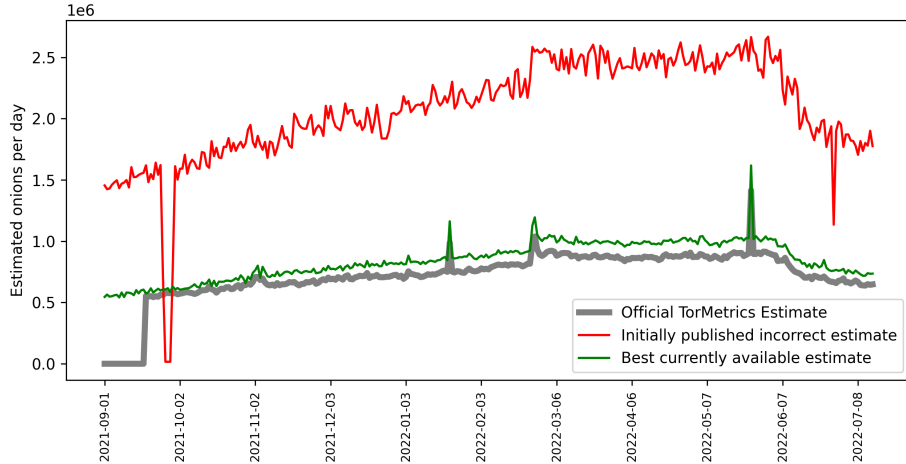
Limitations of Privacy Preserving Messengers



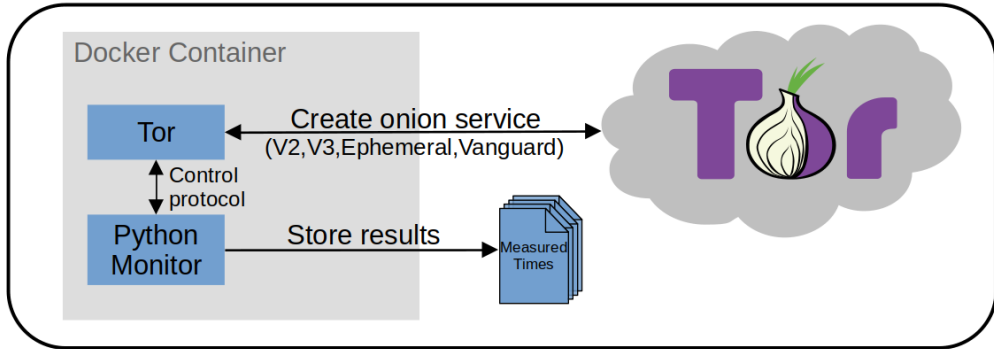
Limitations imposed by the HSDir



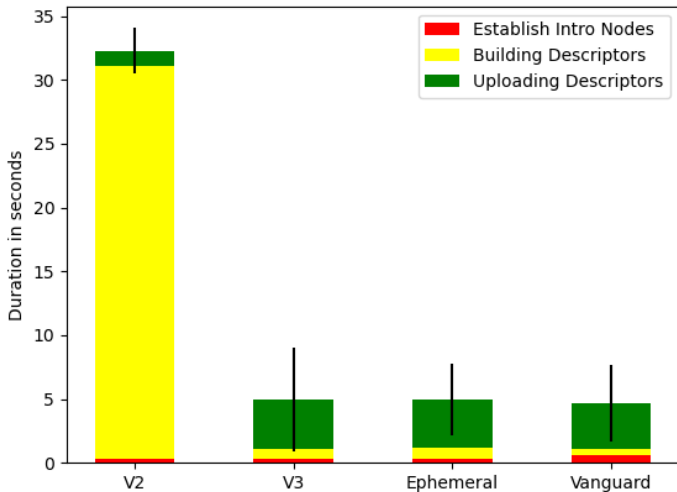
Number of running V3 onion services



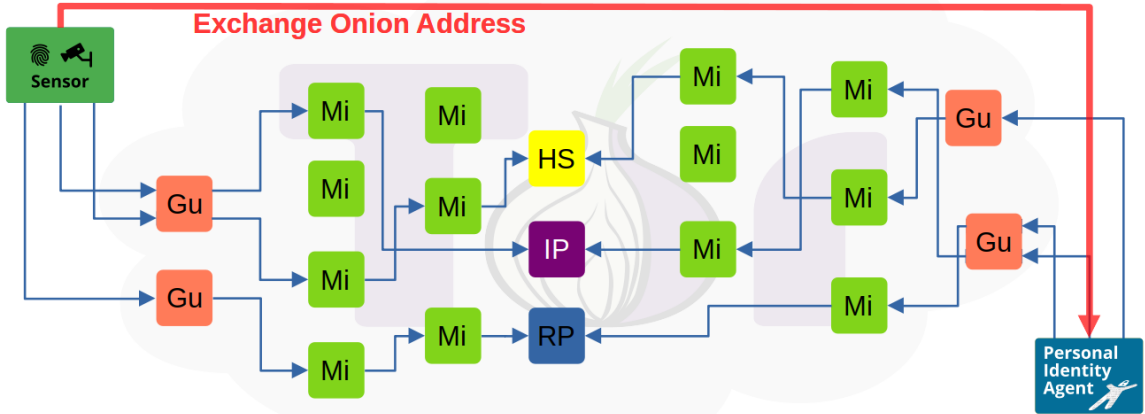
Measure Onion Service Creation Times



Onion Service Creation Times

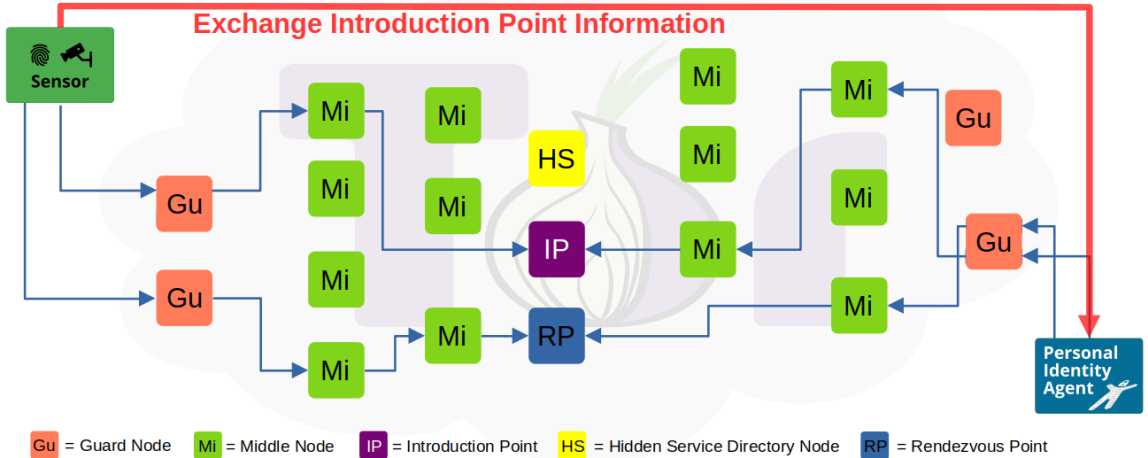


Improving Onion Services

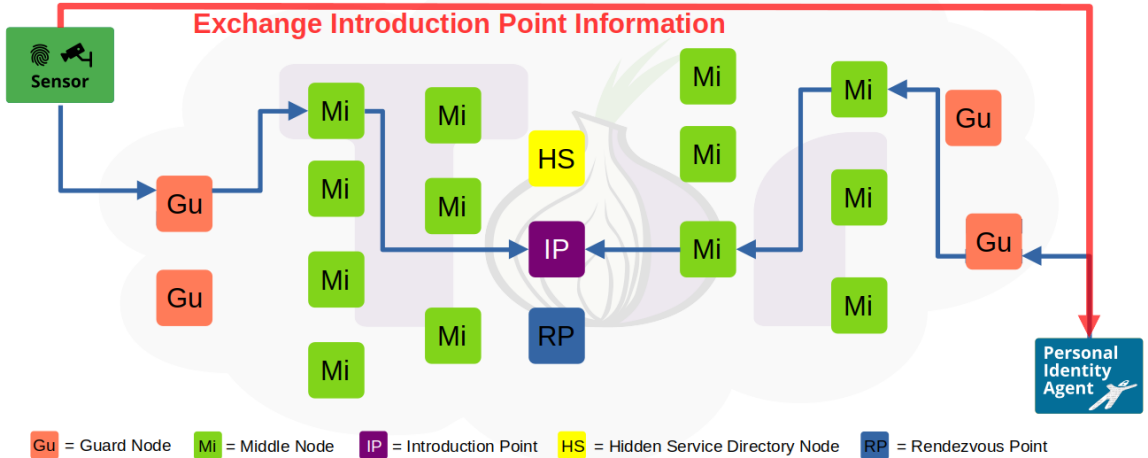


Gu = Guard Node Mi = Middle Node IP = Introduction Point HS = Hidden Service Directory Node RP = Rendezvous Point

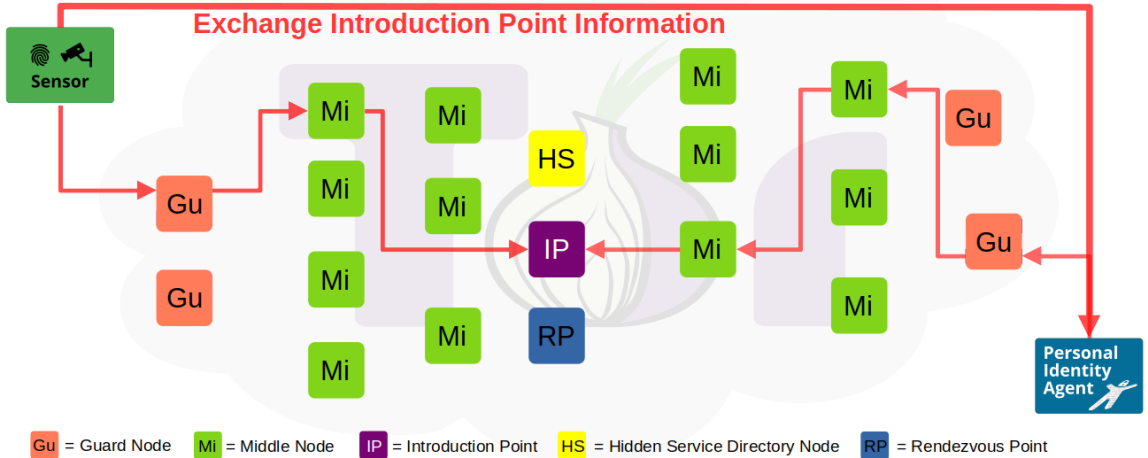
Skipping the HSDir



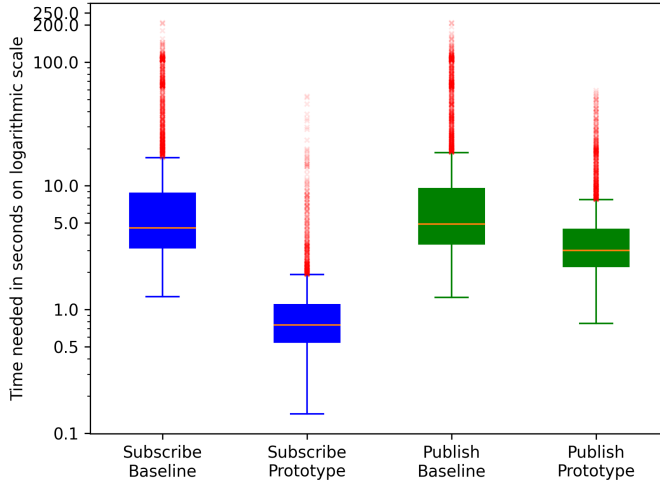
Sending Data via Introduction Points



Sending Descriptors via Introduction Points



Performance Gained



My Main Contributions

- Gathered new metrics on the Tor Network
 - Onion Service Creation Time
 - Statistics on Onion Service Downloads
- Improved estimate on running onion services
 - By increasing it by ~100.000
- Detected a set of malicious relays on the Tor Network
 - Attributed by the Tor Project to KAX 17

My Publications

- [1] **T. Höller**, M. Roland, and R. Mayrhofer: “On the state of V3 onion services”, in Proceedings of the ACM SIGCOMM 2021 Workshop on Free and Open Communications on the Internet (FOCI '21), Virtual, ACM, pp. 50–56, 2021.
- [2] **T. Höller**, T. Raab, M. Roland, and R. Mayrhofer: “On the feasibility of short-lived dynamic onion services”, in 2021 IEEE Security and Privacy Workshops (SPW), San Francisco, CA, USA, IEEE, pp. 25–30, 2021.
- [3] **T. Höller**, M. Roland, and R. Mayrhofer: “Analyzing inconsistencies in the Tor consensus”, in The 23rd International Conference on Information Integration and Web Intelligence (iiWAS2021), Linz, Austria, ACM, pp. 487–496, 2021.
- [4] **T. Höller**, M. Roland, and R. Mayrhofer: “Evaluating Dynamic Tor Onion Services for Privacy Preserving Distributed Digital Identity Systems”, Journal of Cyber Security and Mobility 11, 2, pp. 141–164, 2022. ISSN 2245-1439.

Number of running V3 onion services

