

# On the persistence of wireless advertising without infrastructure support

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## Introduction

- Framework:**  
**D2D infrastructureless connectivity + Opportunistic communications [1]**
- Purpose:**  
**Support infrastructureless distributed content sharing** over a certain geographic area to ensure **availability of content** items for a given time period.
- Methods:**
  - Take advantage of data detected locally to be disseminated.
  - Offload information transfers from current infrastructure.
- Evaluation through experiments:**
  - real **mobility patterns** of users,
  - communication protocols**,
  - specific **propagation characteristics** in the chosen area.

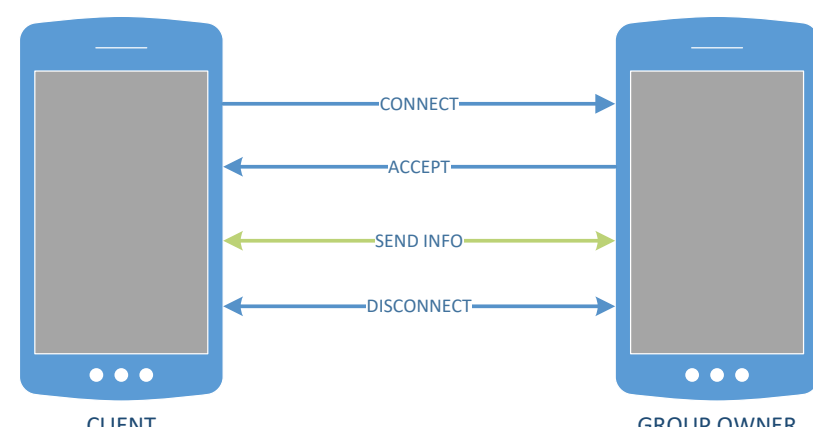
## Implementation

- Development of an **Android app** that uses **Wi-Fi Direct** to spread messages:
  - within an area marked by means of a **geofence**,
  - within a fixed time horizon.



- Dynamic setting:**
  - Devices move in space and time.
  - Devices create and join networks on the fly.

- The app can be used to **advertise events and share contents without requiring cellular or hot spot connectivity**.

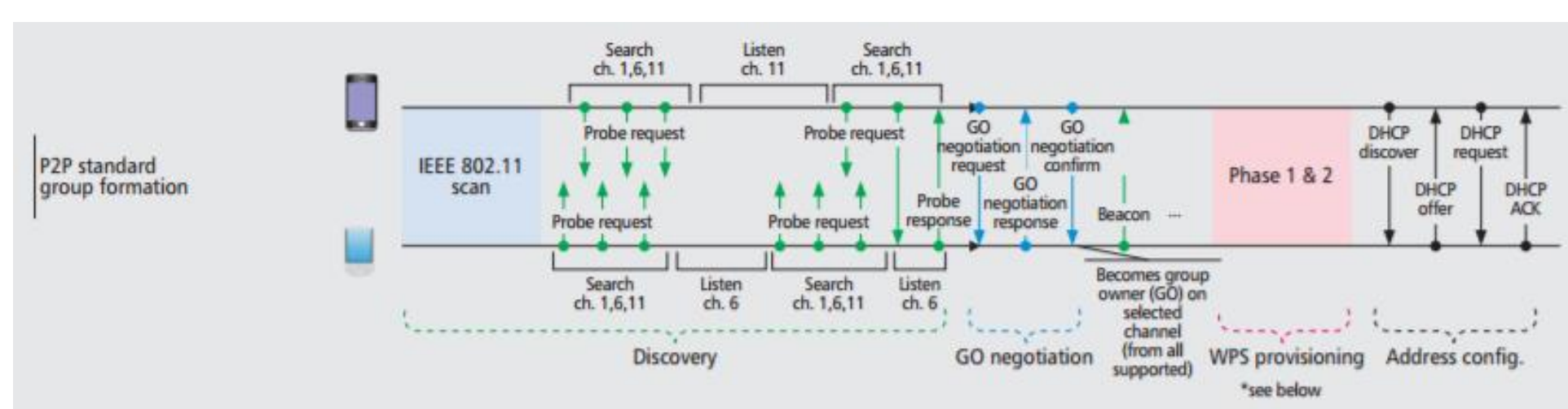


**Time calibrator**  
Uses the internal GPS to extract Atomic Time

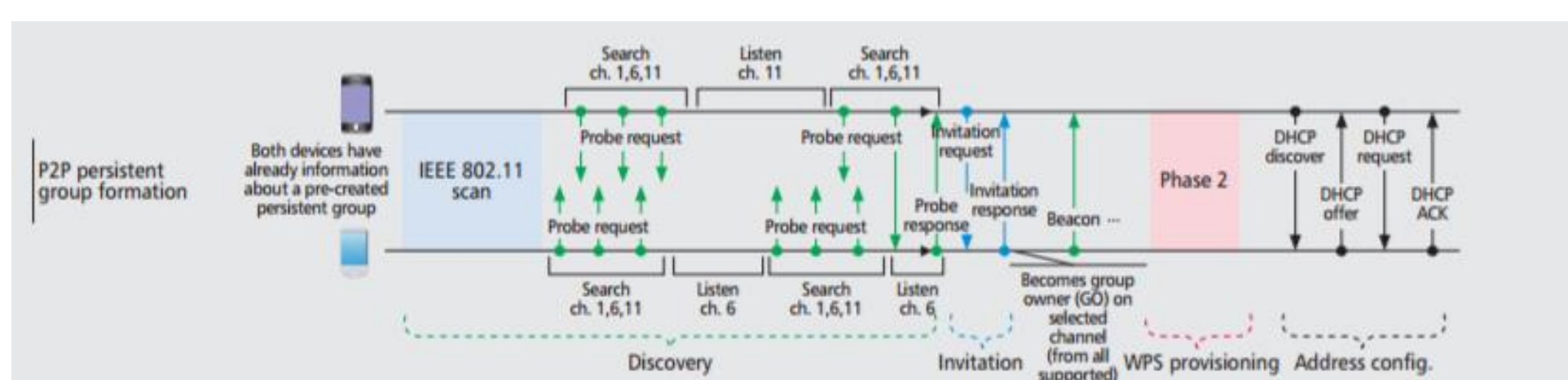
- Characterize some performance aspects:
  - Availability** of devices.
  - Contacts** among users.
  - Efficiency** with which content items are accessed by users.
- Predict** the effectiveness of services in a campus/large office setting.
- Our approach is limited by the specific features of available **protocols for opportunistic D2D communications**.

## Wi-Fi Direct API modifications for our purpose

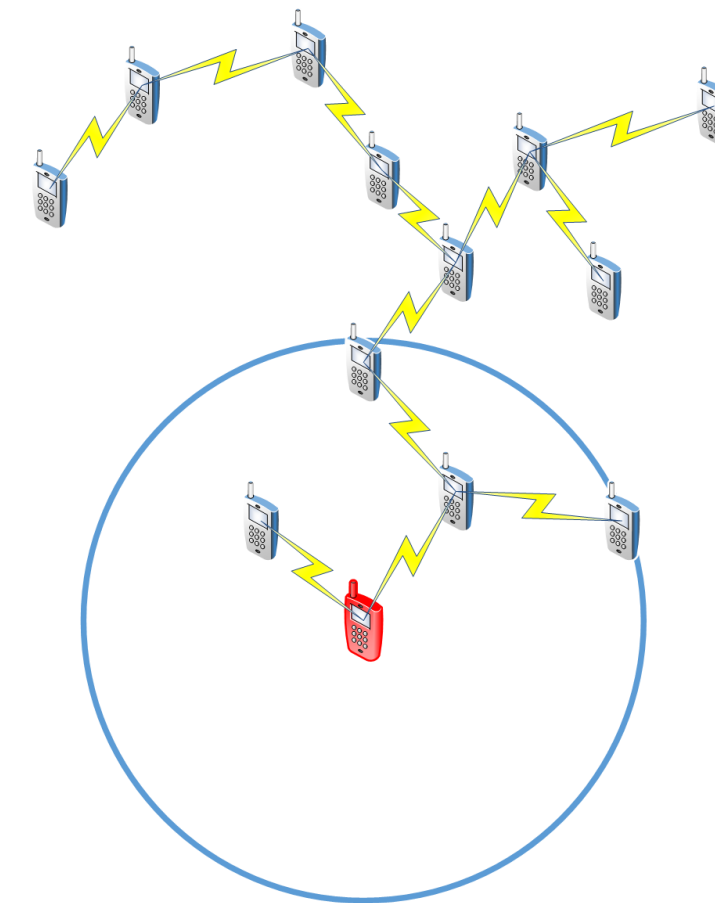
- How do devices form a group? [2]**



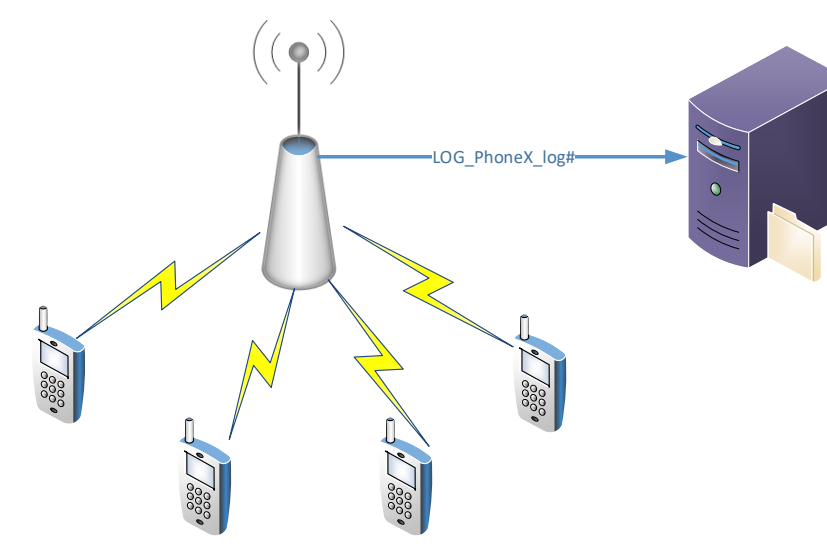
- Periodic scans and automated connections between devices through the use of persistent groups. No user interaction needed. [2]**



## Experimental Setup

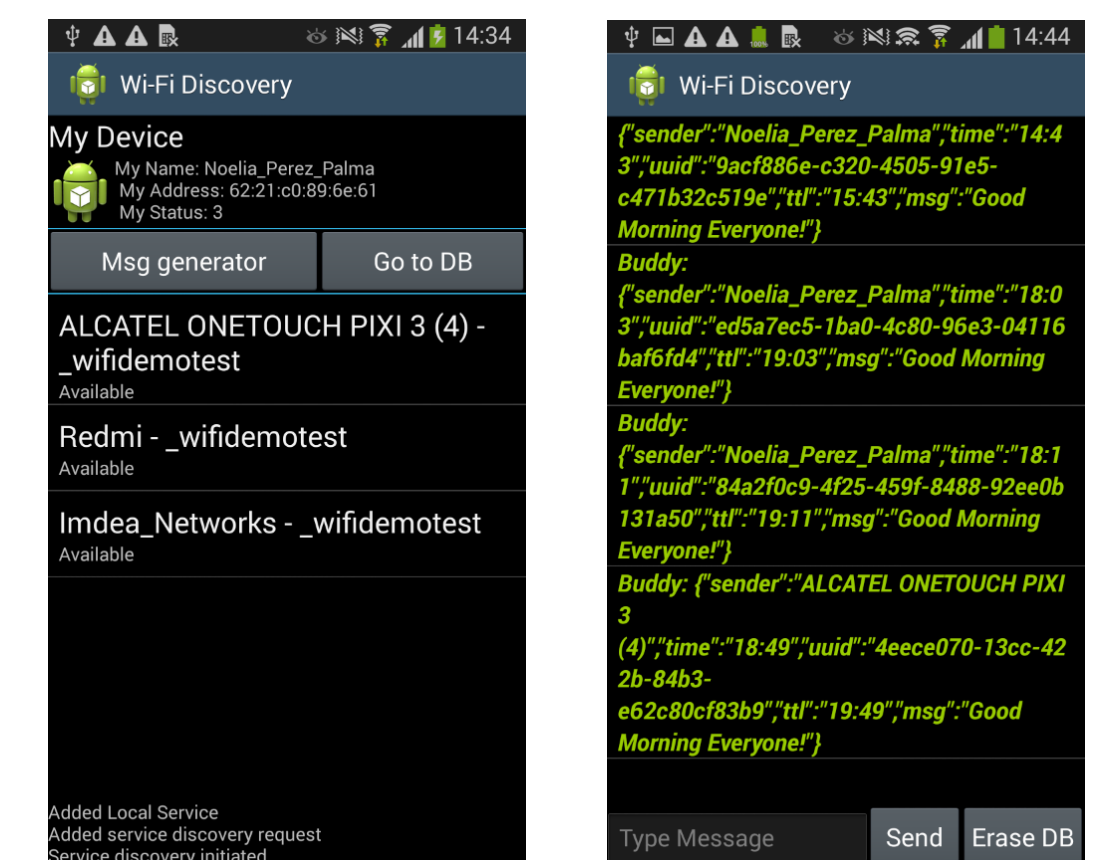


Messages dissemination in an ad-hoc wireless network



Events log uploading to the server

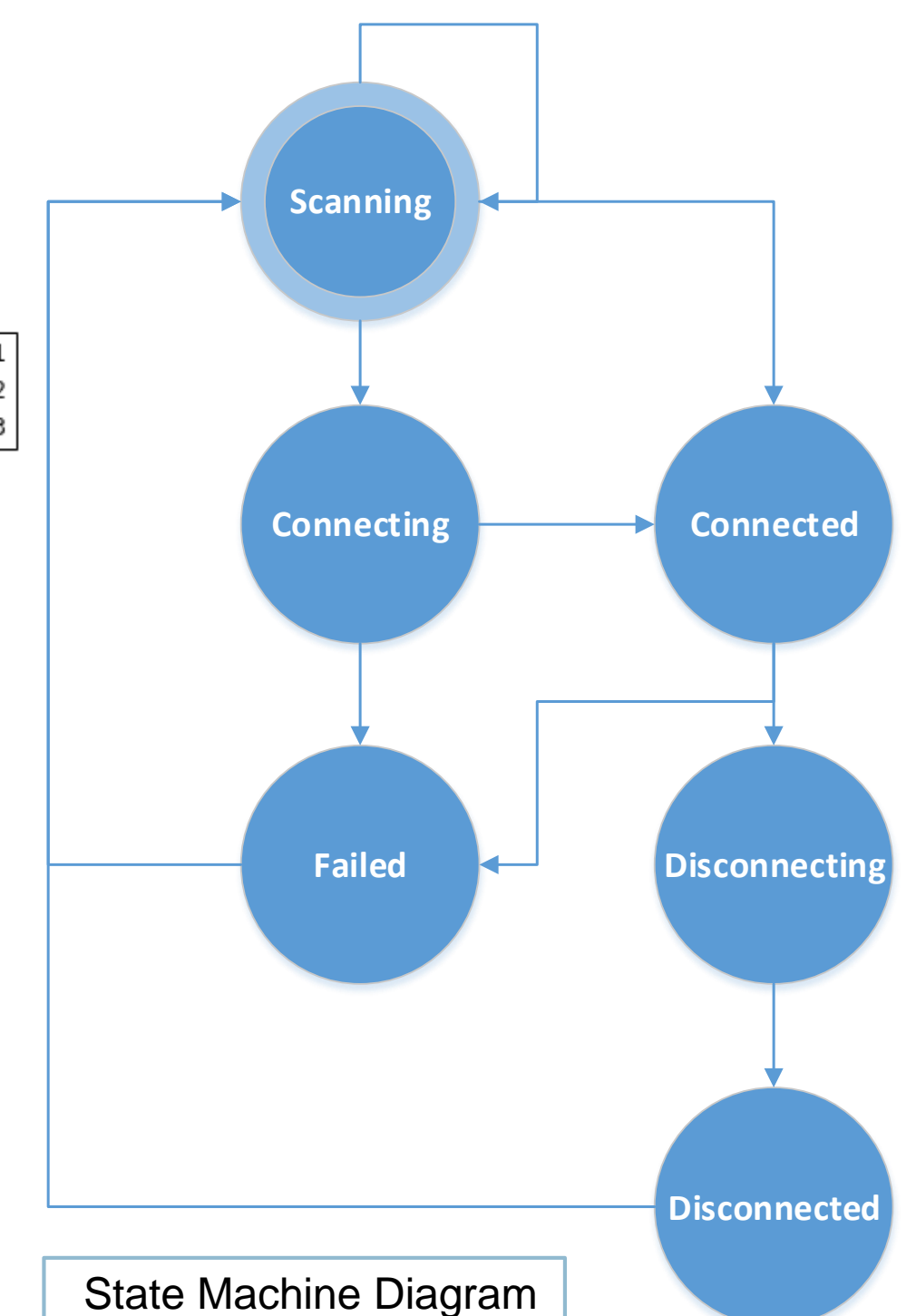
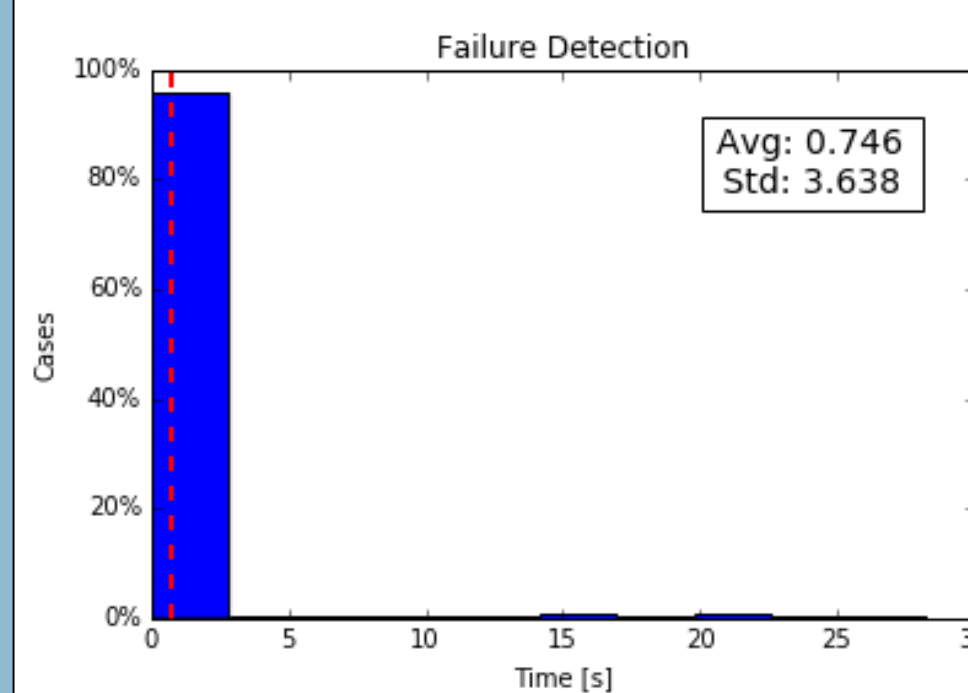
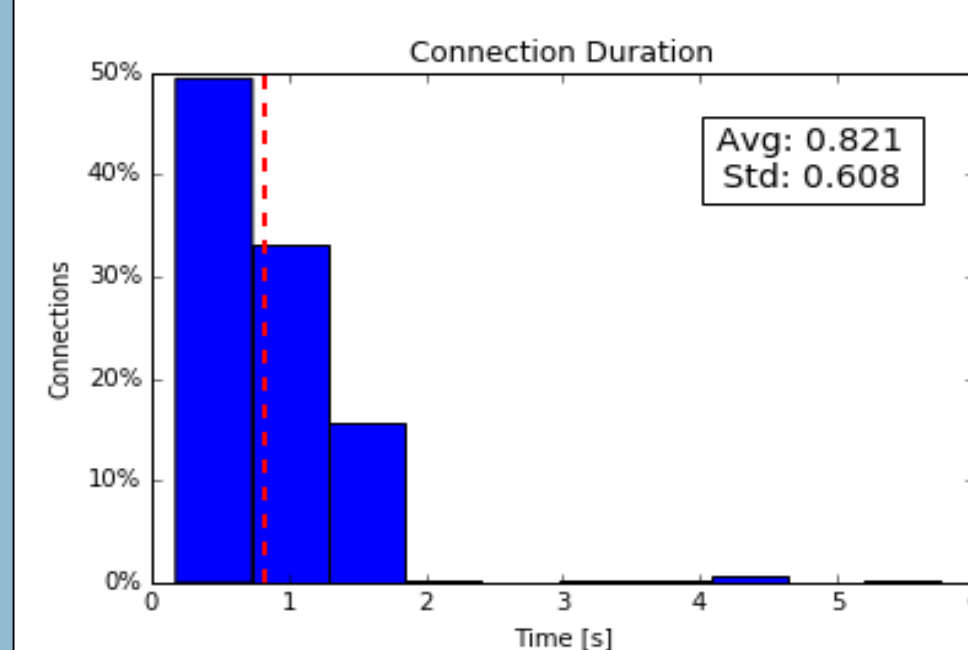
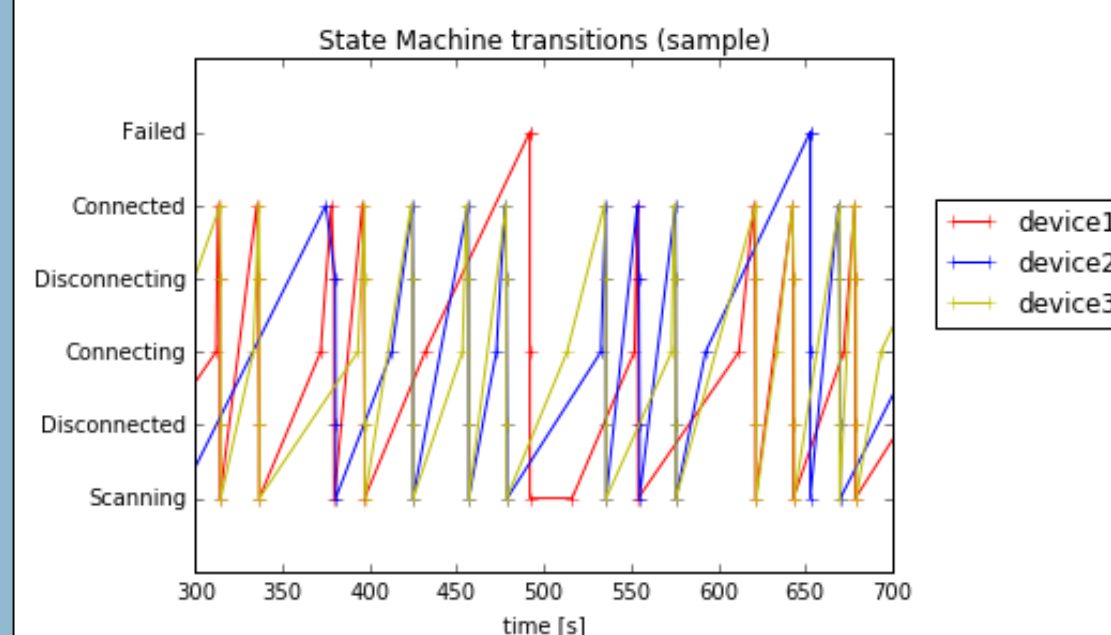
- Ads generation every 10 minutes.
- Maximizing the number of devices infected.
- User interaction allowed in any part of the process but not mandatory.



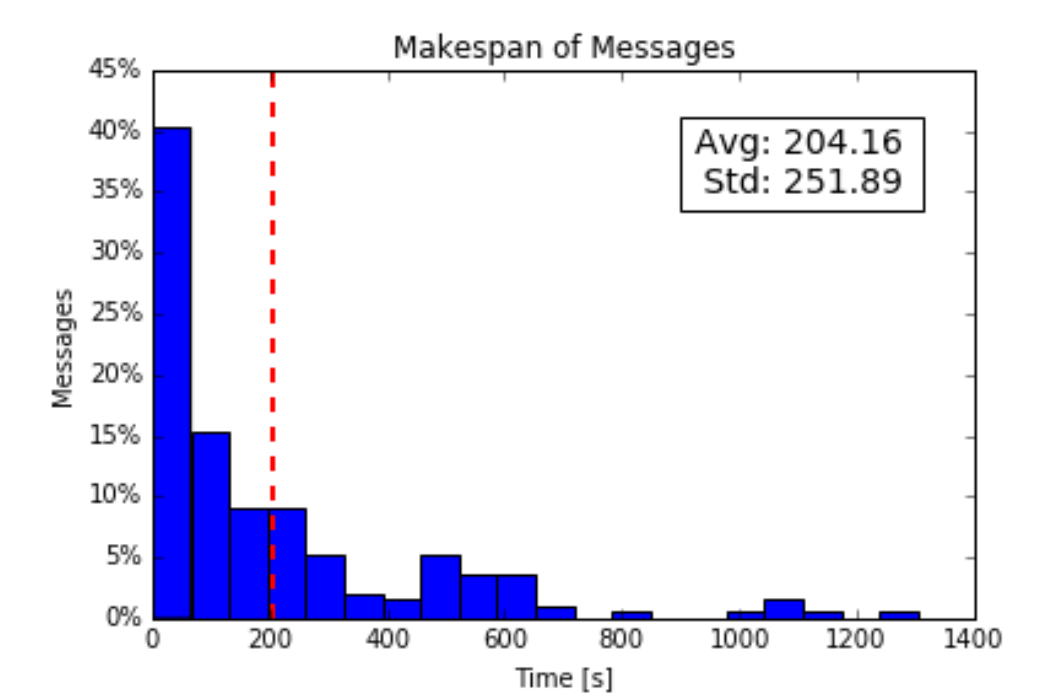
- Logs collected from the app (JSON).
- Parser in Python to study the results.

## Results

- Results collected over one week of operation.
- 1 hour experiments.



State Machine Diagram



## References

- [1] Ali, S., Rizzo, G., Mancuso, V., & Marsan, M. A. (2015, April). Persistence and availability of floating content in a campus environment. In 2015 IEEE Conference on Computer Communications (INFOCOM).
- [2] Camps-Mur, D., Garcia-Saavedra, A., & Serrano, P. (2013). Device-to-device communications with Wi-Fi Direct: overview and experimentation. *IEEE wireless communications*, 20(3), 96-104.