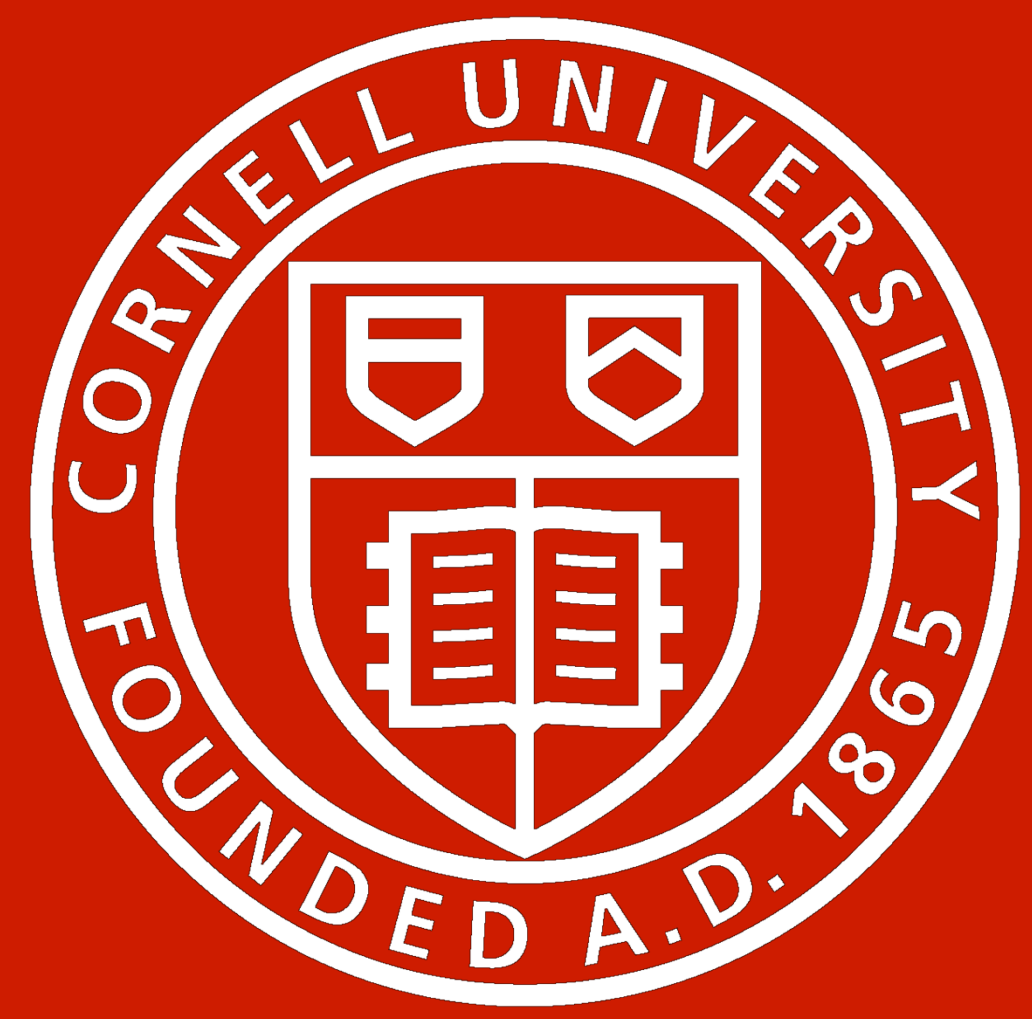


# Bluetooth Low Energy Door Lock with Ambient Noise Number Generation

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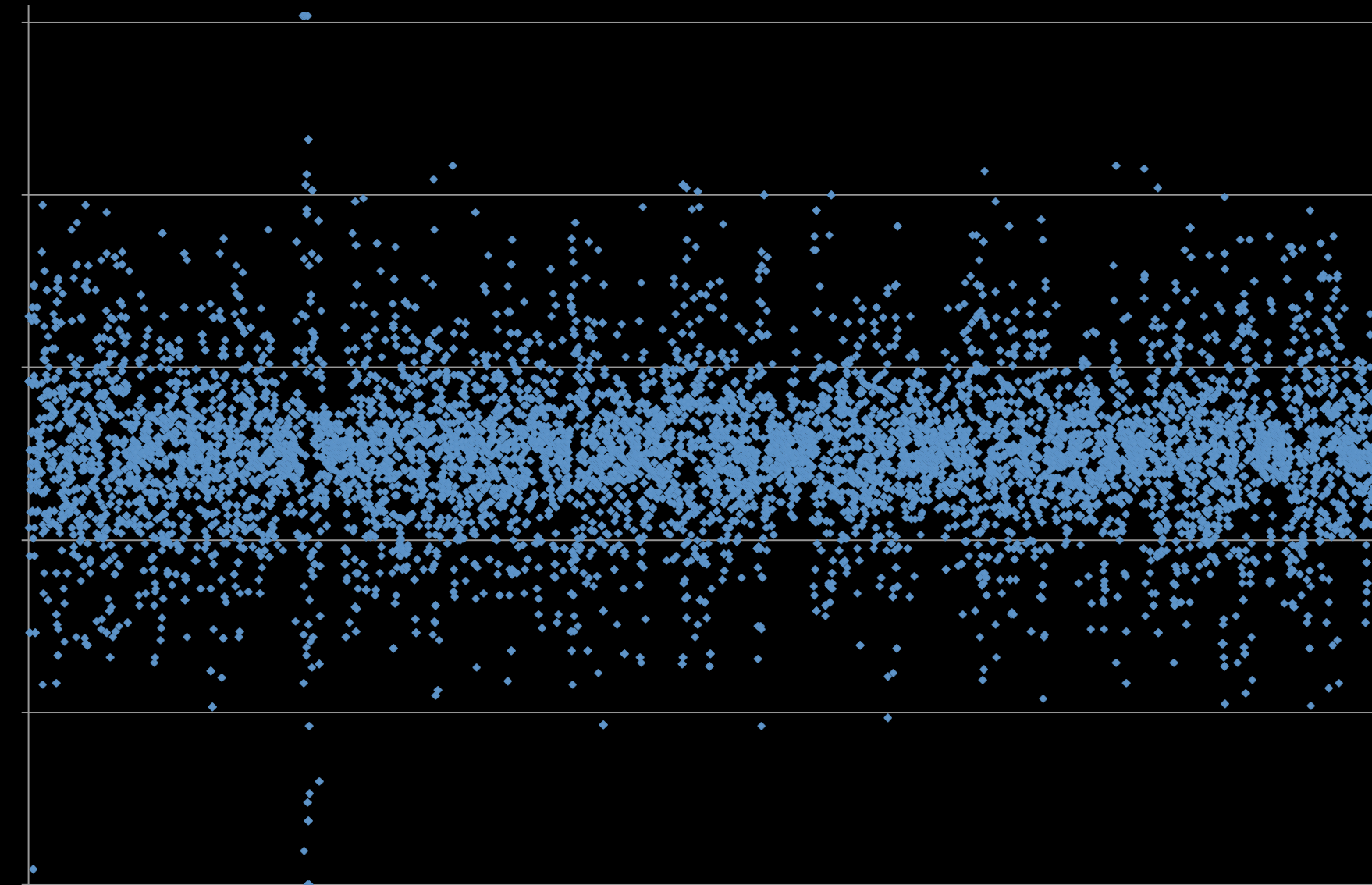
## I Want a Better Lock

- Bluetooth Low Energy (LE) was chosen for the communication between the phone and the door lock because Bluetooth LE requires there to be communication within a finite range from the device. This is an additional layer of potential security for the system over that of a system that communicates across the Internet.
- The system created wont be able to be easily opened by a third party because even if the 4 digit entry code is guessed, the following screen's random number wont be able to be guessed within 4 seconds.
- The random number is generated from the ambient noise in the room. A microphone is used to collect the noise in the room, and it is then translated into a number. The translation is to be done by analyzing the frequencies present in the room over a finite amount of time

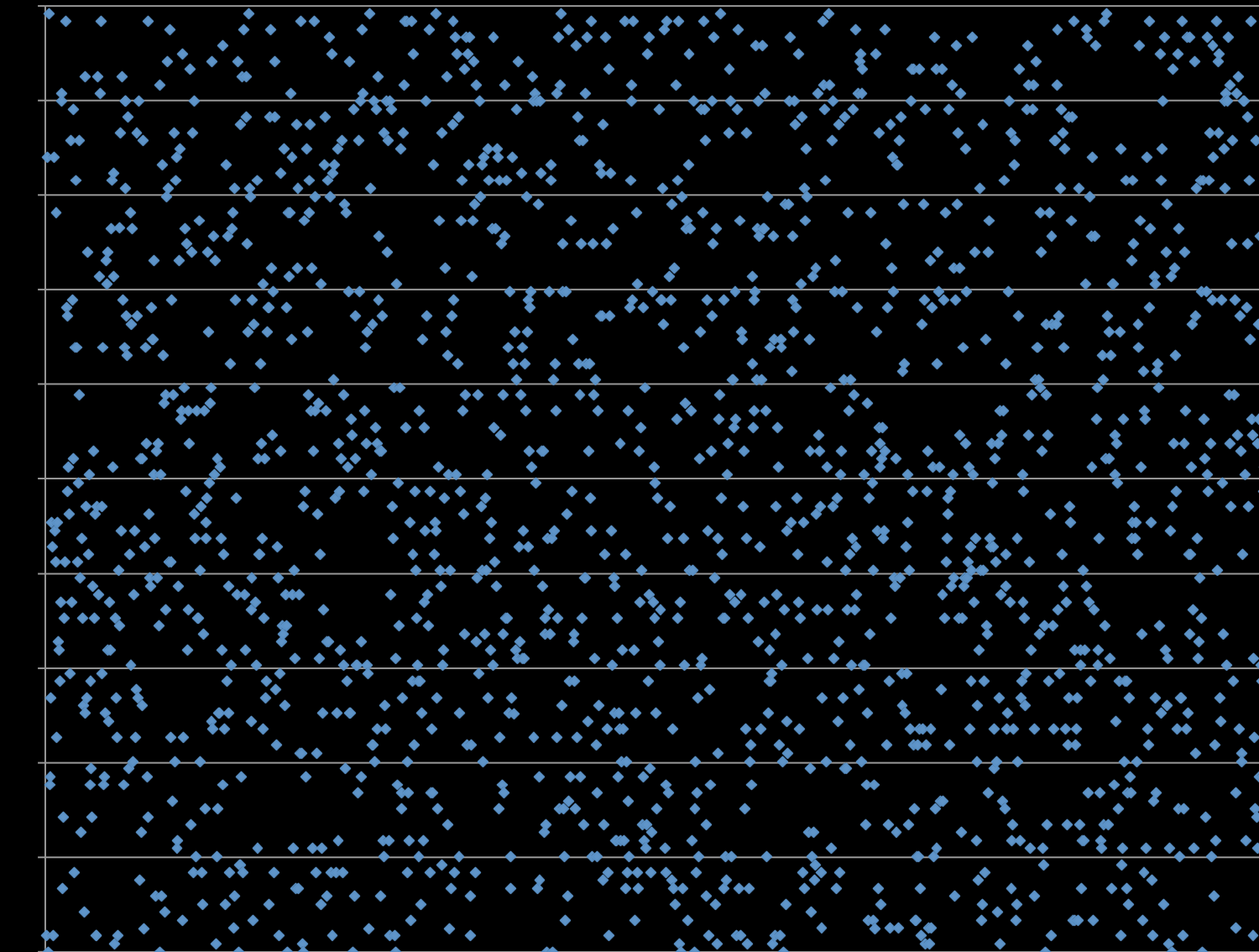
## Security in IoT is Important

- Security within devices such as the Bluetooth LE door lock being created is becoming more important as IoT becomes increasingly more popular in society. Although this is only a door lock, the IoT has applications that are far more expansive and impactful. The applications today are only the tip of the iceberg in regard to its uses.
- IoT provides access, and control of data and information which promotes a heightened level of awareness about our world. Just to name a few applications, IoT can help with smarter natural disaster management, smarter healthcare, and smarter urban management.
- Despite this project only focusing on a door lock, it's the exploration of randomly generated numbers being sourced from ambient noise that is most important. The protection of the communication, and data of IoT devices is important thus discovering more secure ways to encrypt this information is important.

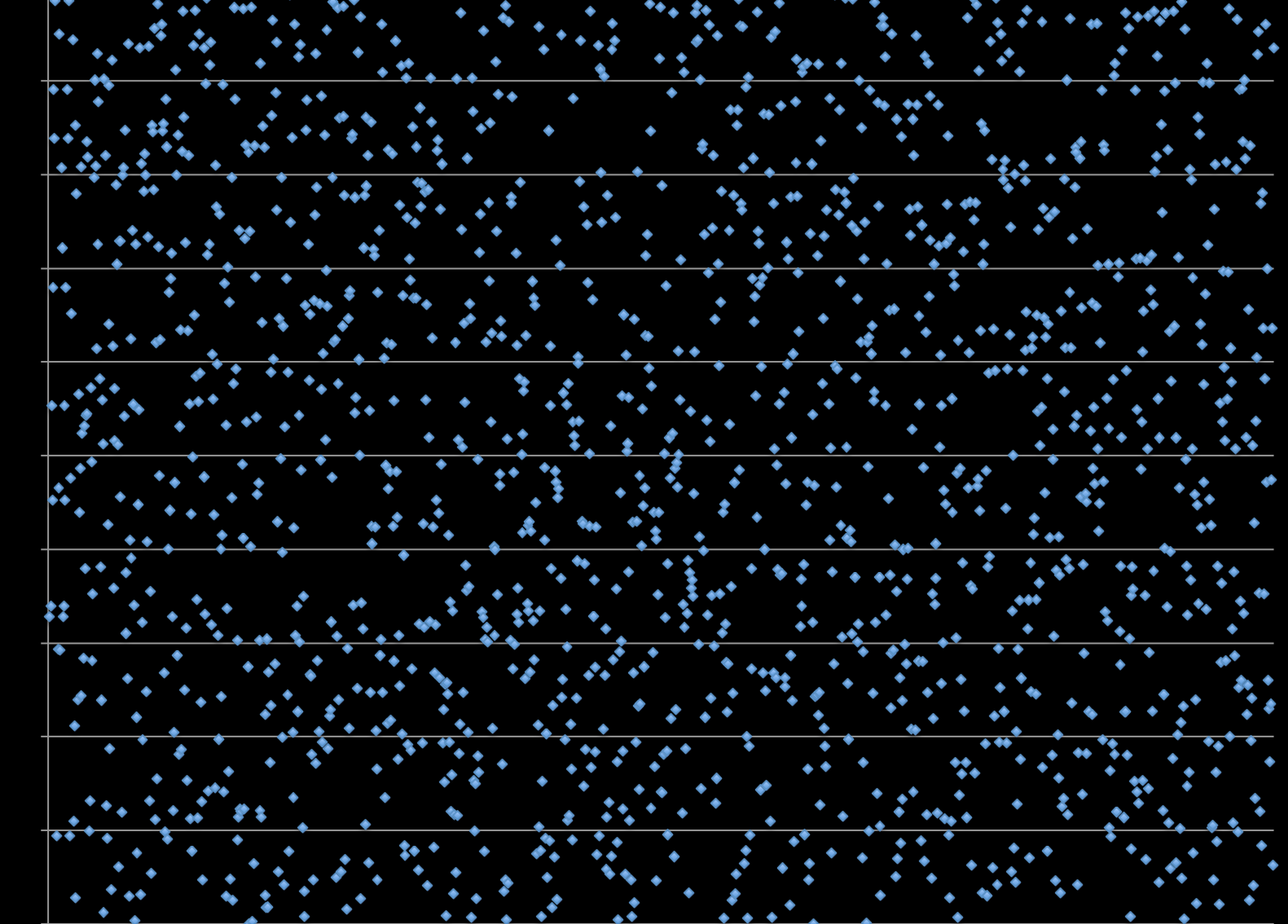
## Random Number Generation



Original audio output

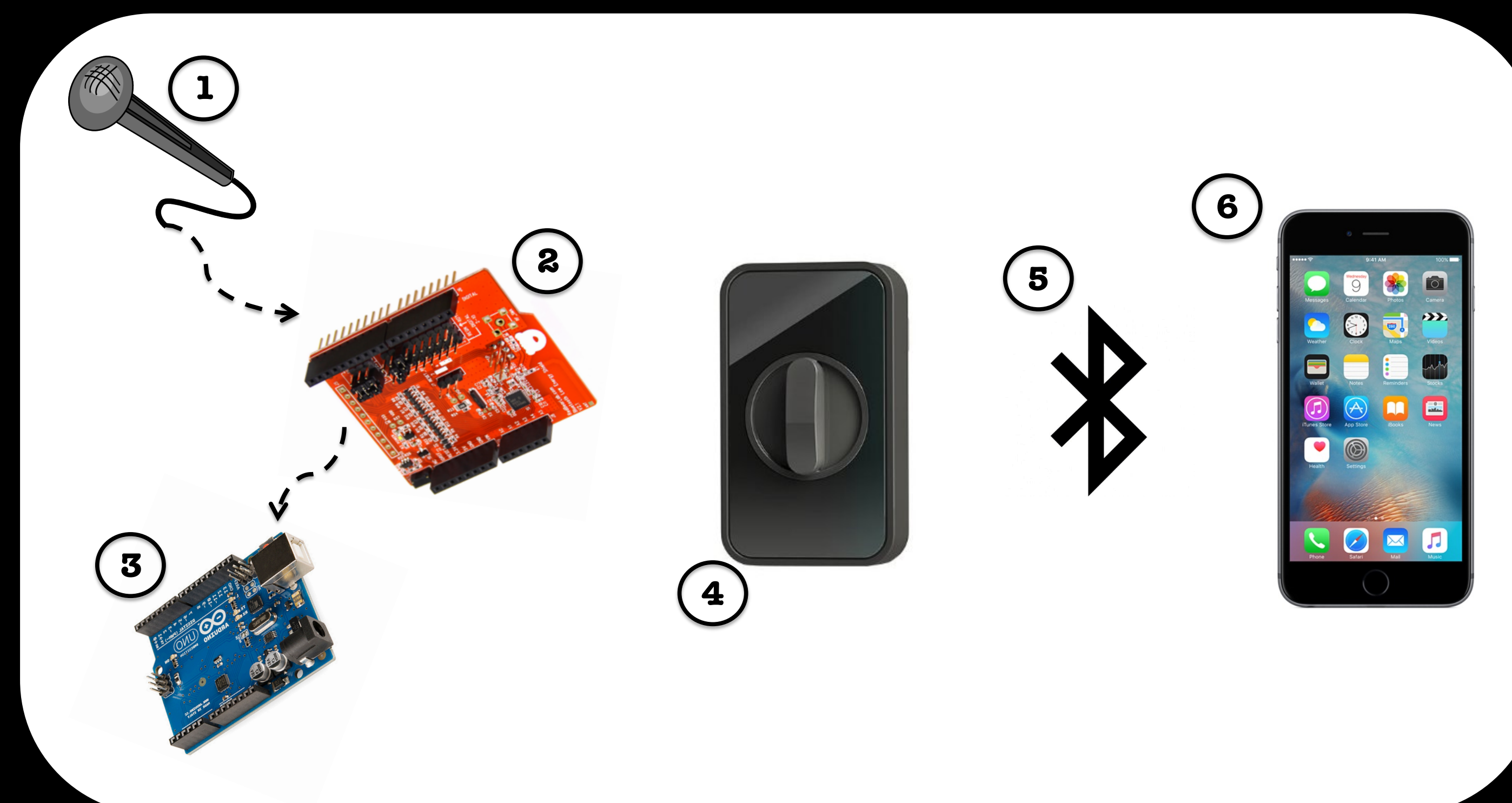


Random() with audio seed



Standard Arduino random()

## Secure Design



- ① Microphone to collect the room's noise as an input
- ② Bluetooth Low Energy shield for Arduino Uno
- ③ Arduino Uno
- ④ Lockitron Door lock body
- ⑤ Bluetooth Low Energy
- ⑥ iPhone application to run to open lock

## Results

This is a lock that only the user has access to!

- Only the application is able to open the lock.
- The application is only opened when the user's password is entered.
- Over Bluetooth LE a random number is sent from the Arduino to the application.
- The user then retypes the number within 4 seconds to gain access to the lock.
- The Arduino's random number generator created an even distribution showing that it could be used once the seed provided by the audio had sufficient entropy.

