Securely Retrofitting Door Locks for Cheap Control through Mobile Devices

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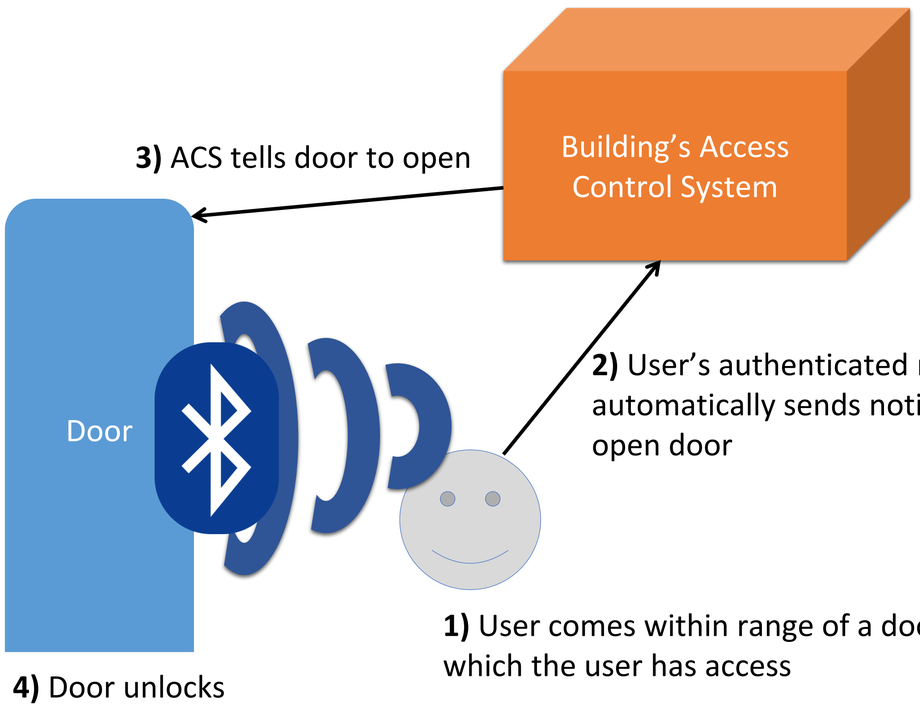
Introduction

- The internet of things is a fast growing space
  - Nonstandard Authentication mechanisms
- There is **a large install base** of existing infrastructure for **building automation**
- Bluetooth low energy beacons allow for affordable retrofitting of legacy systems
  - Secondary authentication mechanism necessary
- Contributions:
  - Attack model for BLE devices requiring authentication
  - **Low cost** method to retrofit door lock systems for mobile control
  - Prototype implementation of protocol

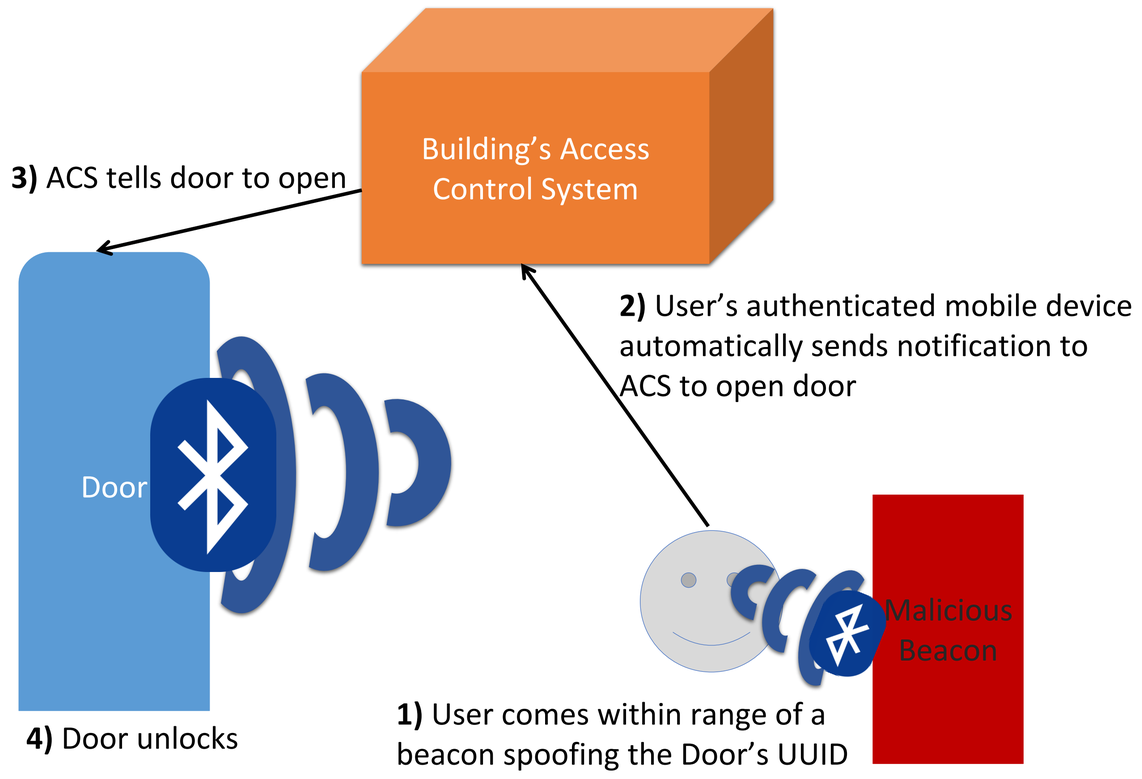
Overview & Components

- In a conventional door lock system, there are three actors:
  - The user, granted and revoked access to locks
  - The Access Control System (ACS)
  - An enterprise authentication mechanism
- Existing authentication:
  - Active directory syncs with building automation
  - Doors connected to via serial lines
  - Expensive to replace entire automation system
- Bluetooth Beacons:
  - Transmit a unique id & transmission power
  - No means of authentication
  - Passive Devices – no connections

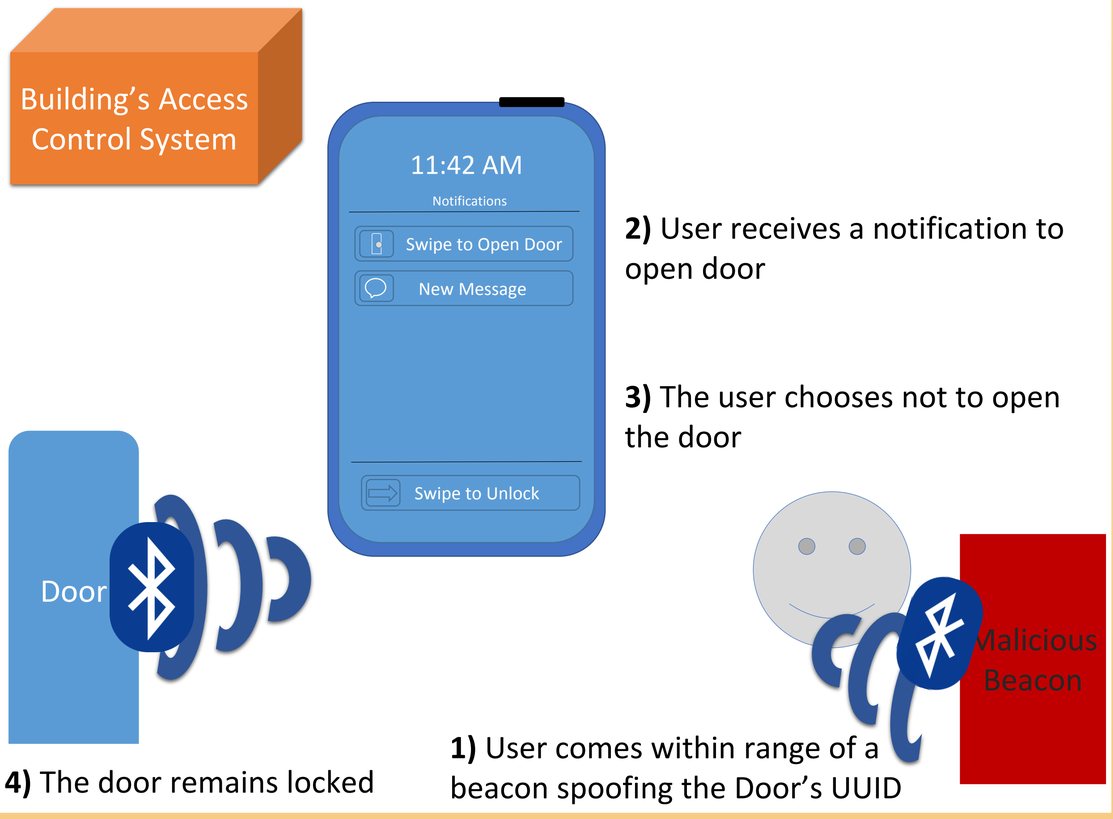
Naïve Protocol



Example Attack



Mitigation through User Interaction



Progress & Future Work

- Prototype implementation:
  - Building Automation & Serial Connection Representation
    - JSON API
  - System Authentication Representation
    - Ruby on Rails Backend
  - Legacy Door Lock
    - Raspberry Pi with LED as Lock
  - iBeacon for Retrofitting Door Lock
  - iBeacon as a Malicious Actor
    - First UUID intercepted and attack proven feasible
- Future Work:
  - Formally verified implementation
  - Integration into existing legacy systems
  - Alternative protocols:
    - RSA Token as UUID for beacon
    - Door locks with integrated Bluetooth receivers (active connection to devices)

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