The Motivation
- Columbia’s CS department has approximately 20-30 door locks
- The Schlage door locks on campus are old, expensive, must be manually and individually programmed

The Result
An integrated locking system that allows CS department administrators to remotely monitor, control, and configure the door locks in CEPSR

Added Features
- Real Time Monitoring
- Bluetooth and Wifi
- Online Programming
- Commonly Available Platforms
- Open Source Software/Hardware
- Custom Sensors
- Reuse Schlage Hardware

Smart Lock Architecture
- Raspberry Pi
- Mounted in a separate enclosure on inside of the door
- Powered by AC (wall)
- Powers the Master Unit via USB
- Contains WiFi/Bluetooth Interface
- Unit is optional for operation
- Maintains a secure encrypted connection to the server
- Custom designed PCB featuring a Teensy USB-based microcontroller
- Kept the original Schlage enclosure
- Drop in replacement for Schlage Master Unit
- Teensy runs our own “Smart Lock Application”
  - Online Mode (app delegated to the server)
  - Offline Mode (emulates Schlage lock)

Smart Lock Infrastructure
- Uses original Schlage hardware
- Swipe card reader, Status Indication LEDs, Keypad, MCU, Lock actuator
- Reverse engineered communication protocol to gain access to these components
- Added two new sensors
  - Magnetic lock/unlock sensor
  - Door close/open contact sensor

Smart Lock Infrastructure
- TEXT-TO-SPEECH NOTIFICATIONS
- WiFi
- Tablets
- PC
- Drop in replacement for Schlage Master Unit
- Teensy runs our own “Smart Lock Application”
  - Online Mode (app delegated to the server)
  - Offline Mode (emulates Schlage lock)

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