Smart Locker

By Tap Lock Inc.

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TapSock

Outline

- Motivation
- Background
- Technologies Overview
- Software
- Hardware
- Conclusion
- Acknowledgement

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Motivation

- Current locking system in campus
  - Lots of paper work
  - Time-consuming
  - Inconvenient for users (eg. Forget password)

- NFC (Near-Field Communication)
  - Popular technology (contactless payment, media sharing, etc.)
  - Easy to access (smart phones)
  - Easy to operate

Smart Locker

Background

- Smart Locker
- RFID & NFC & Bluetooth
- Advantages:
  - Easier to use (tap to open)
  - Easier to access
  - Multi-functions

- Potential Users
  - School's lab locker
  - Hotel
  - Gym

Technologies Overview

- NFC
- Short distance comparing to other existing technology

- Android Application
  - Many resources online
  - Most of us use Android
  - Cheap to develop

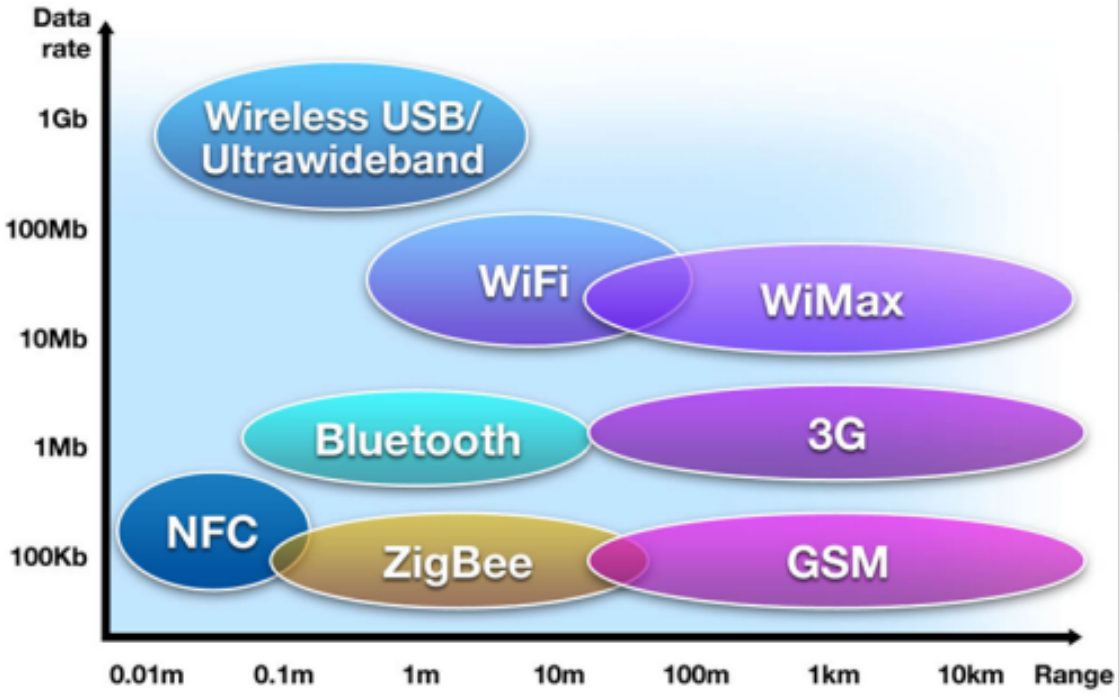

Figure 1: Range comparison between NFC and other existing technologies

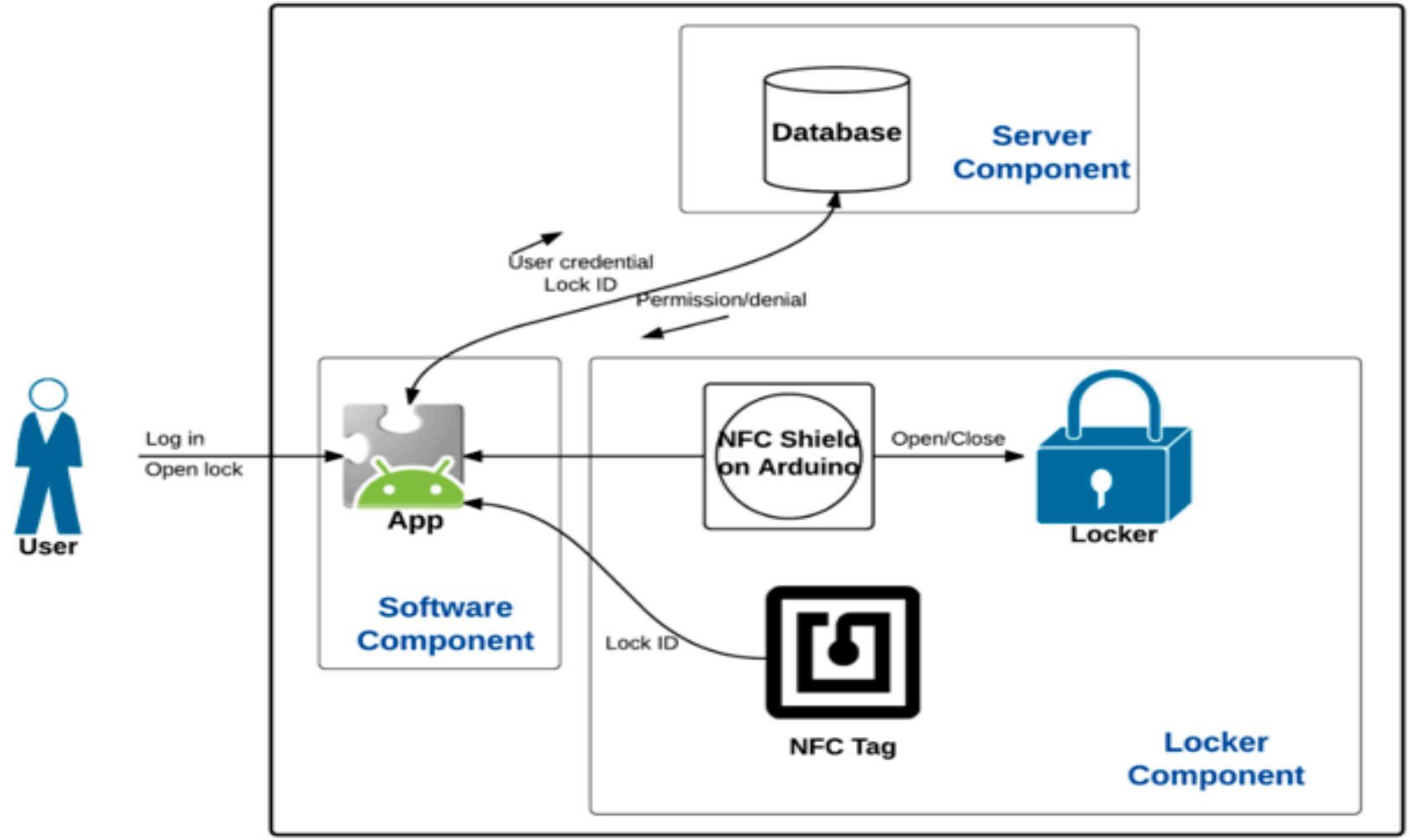

Figure 2: Smart Locker Functional Block Diagram

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Advantages

- For user:
  - Fast way to open the locker
  - Friendly user interface
  - Easy to register
  - Easy to get back when phone lost/change
  - Alarm system to secure locker

- For company:
  - Low cost and easy to maintain
  - Easy to install and use
  - Hard to hack to the locker
  - Easy to control the whole system
  - Easy to check login history

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Software Overview

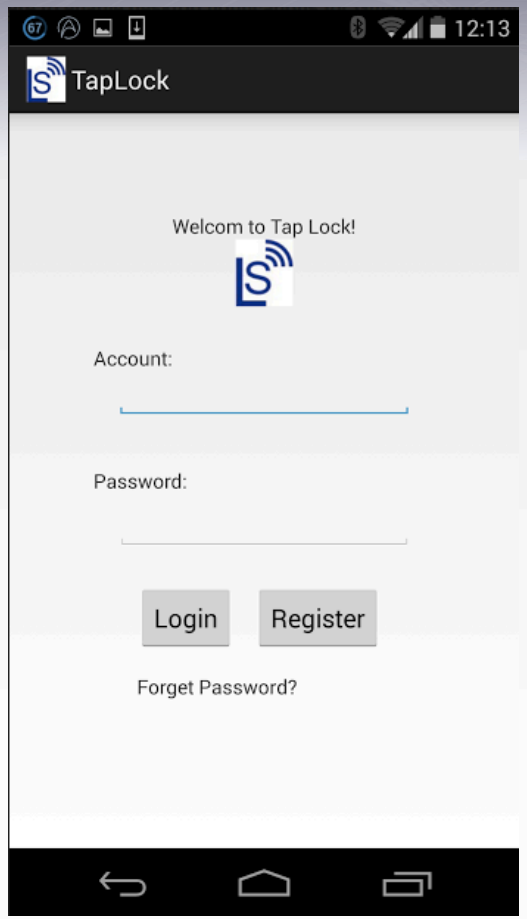
- UI
- Server (PHP server and MySQL Server)
- NFC

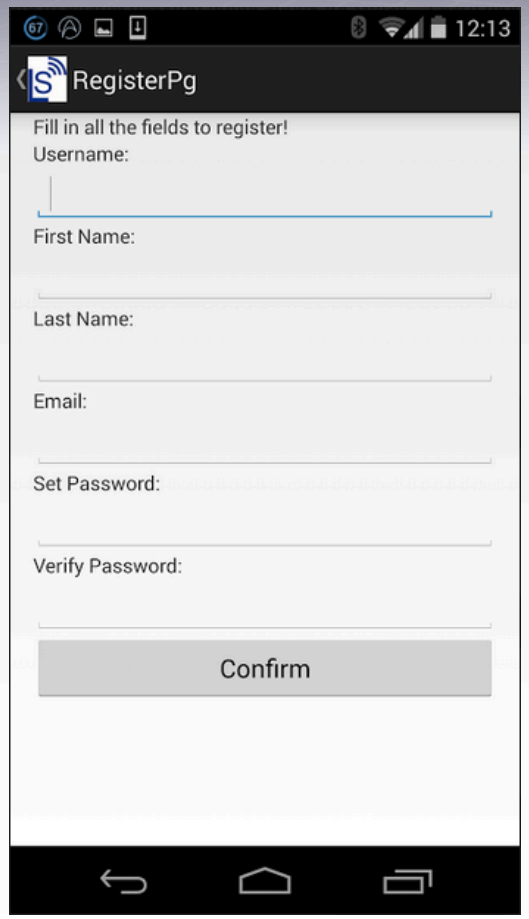
Software - UI

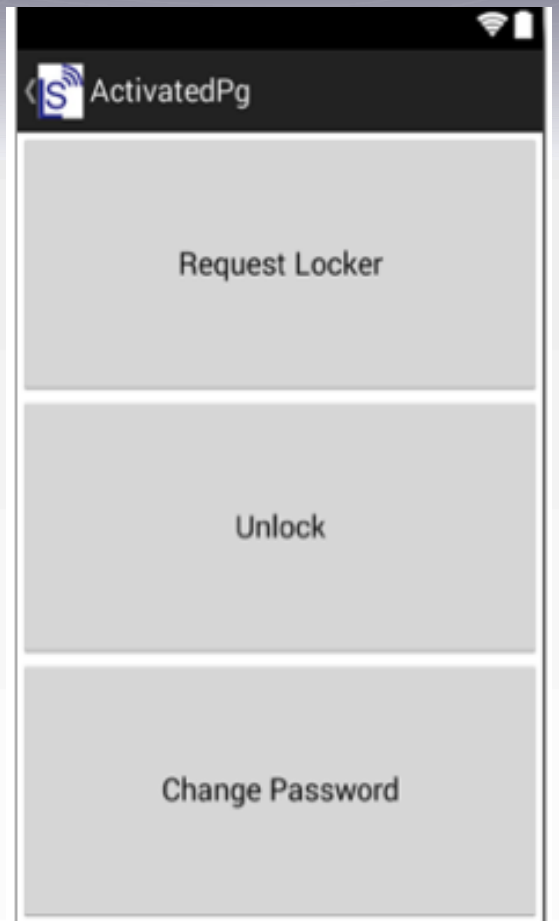
- Tools
  - Android SDK (Eclipse, API libraries)

- Programming Language
  - XML (layout)
  - Java (activities)

Software - UI


12:13
TapLock
Welcom to Tap Lock!
Account:
Password:
Login
Register
Forget Password?


12:13
RegisterPg
Fill in all the fields to register!
Username:
First Name:
Last Name:
Email:
Set Password:
Verify Password:
Confirm


ActivatedPg
Request Locker
Unlock
Change Password

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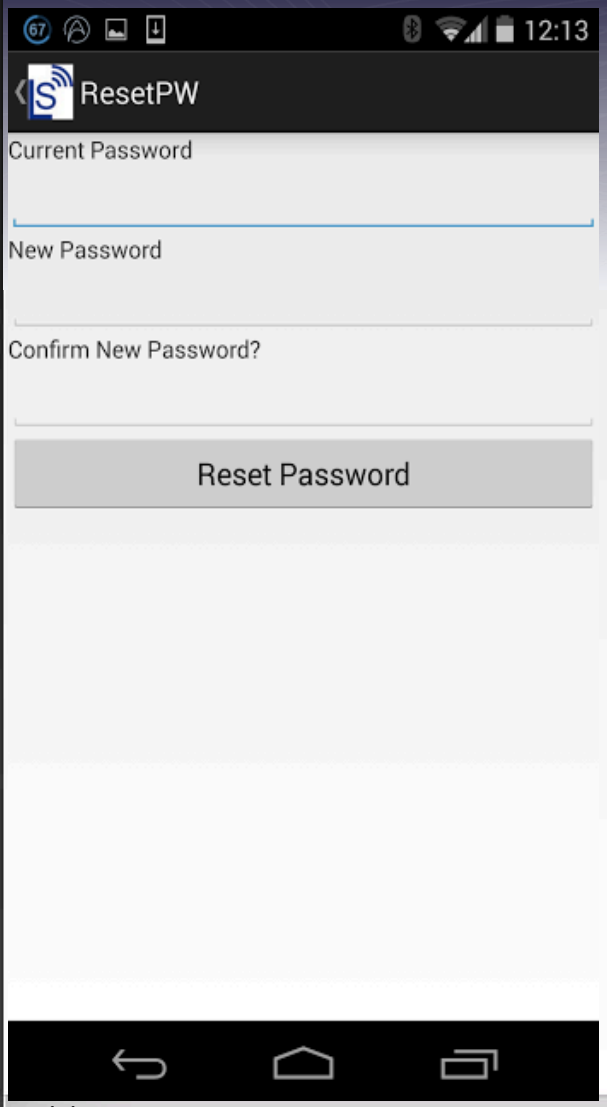
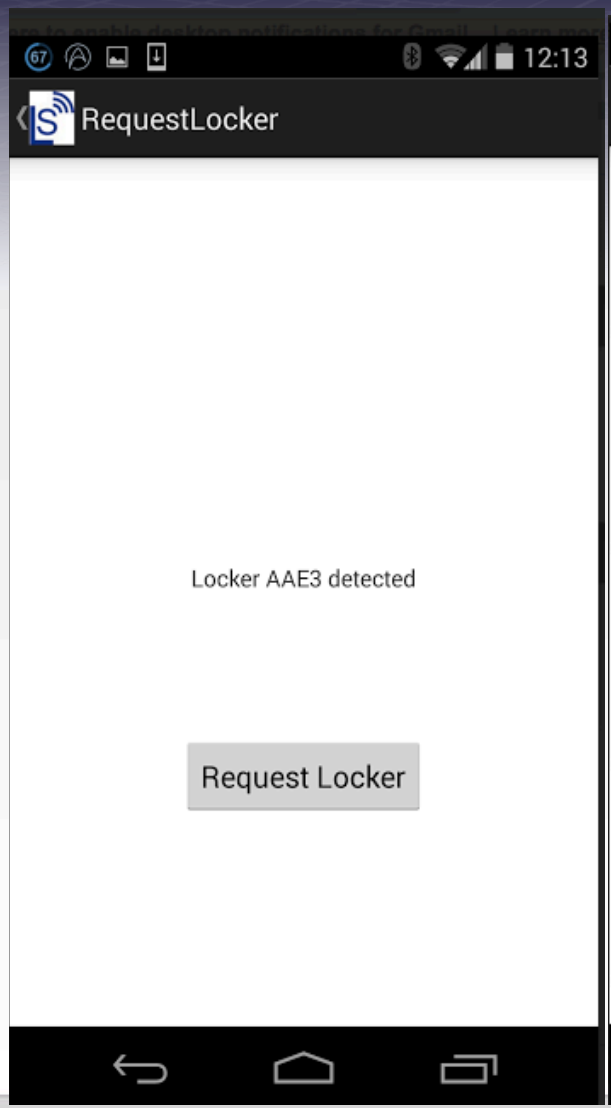
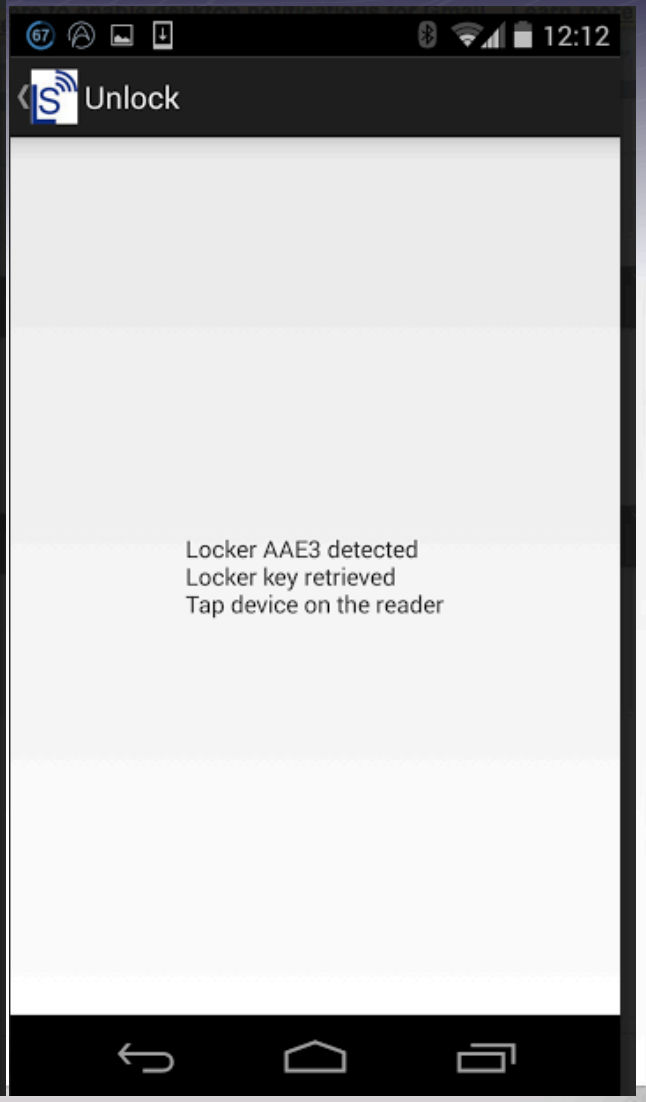
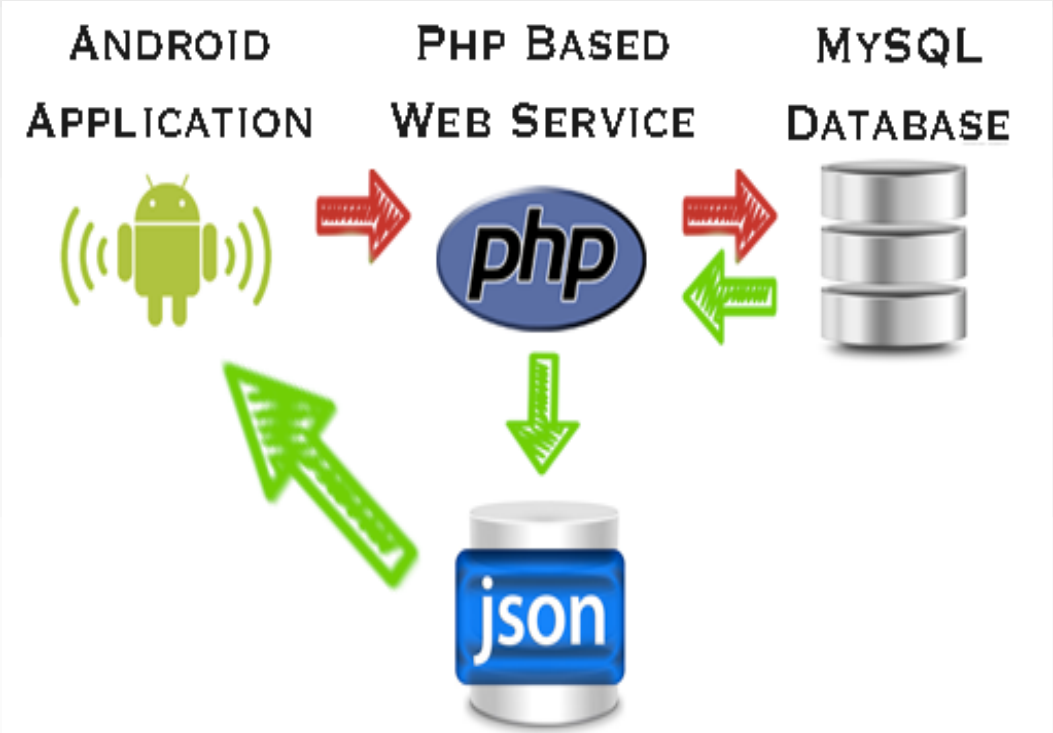

12:13
ResetPW
Current Password
New Password
Confirm New Password?
Reset Password


12:13
RequestLocker
Locker AAE3 detected
Request Locker


12:12
Unlock
Locker AAE3 detected
Locker key retrieved
Tap device on the reader

Software - Server

- Tools
  - MySQL database (XAMPP)
  - PHP based web service
  - JSON
- Programming Language
  - SQL
  - PHP

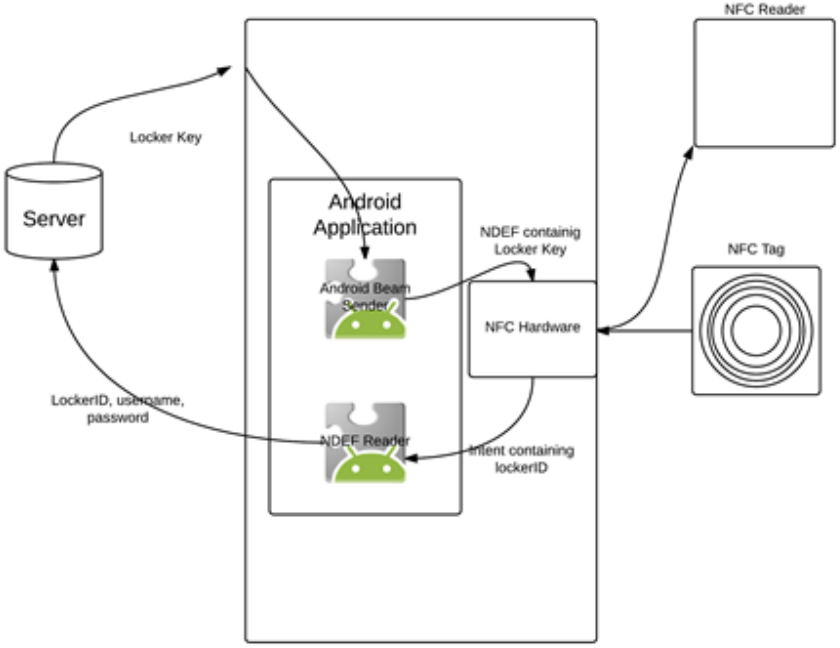


Software – Kevin-NFC

- Tools
  - Android SDK
  - Eclipse

- Programming Language
  - Java
  - XML

Software - NFC



Software – NDEF Reader

- Extract NDEF message from Intent
- Parse payload
- Send to server

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Software – Beam Sender

- Obtain Locker Key from Server
- Send Locker Key with Android beam

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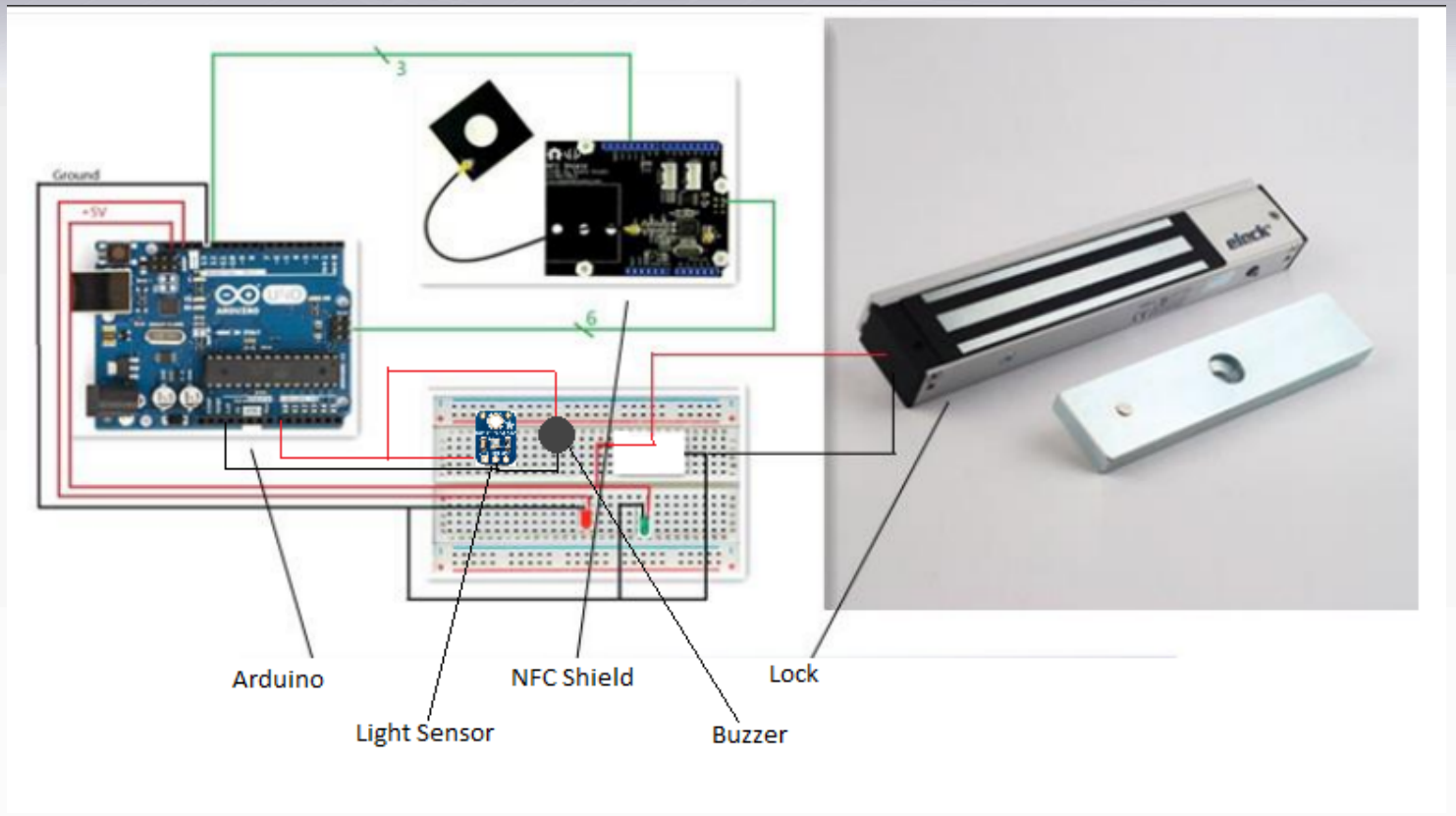
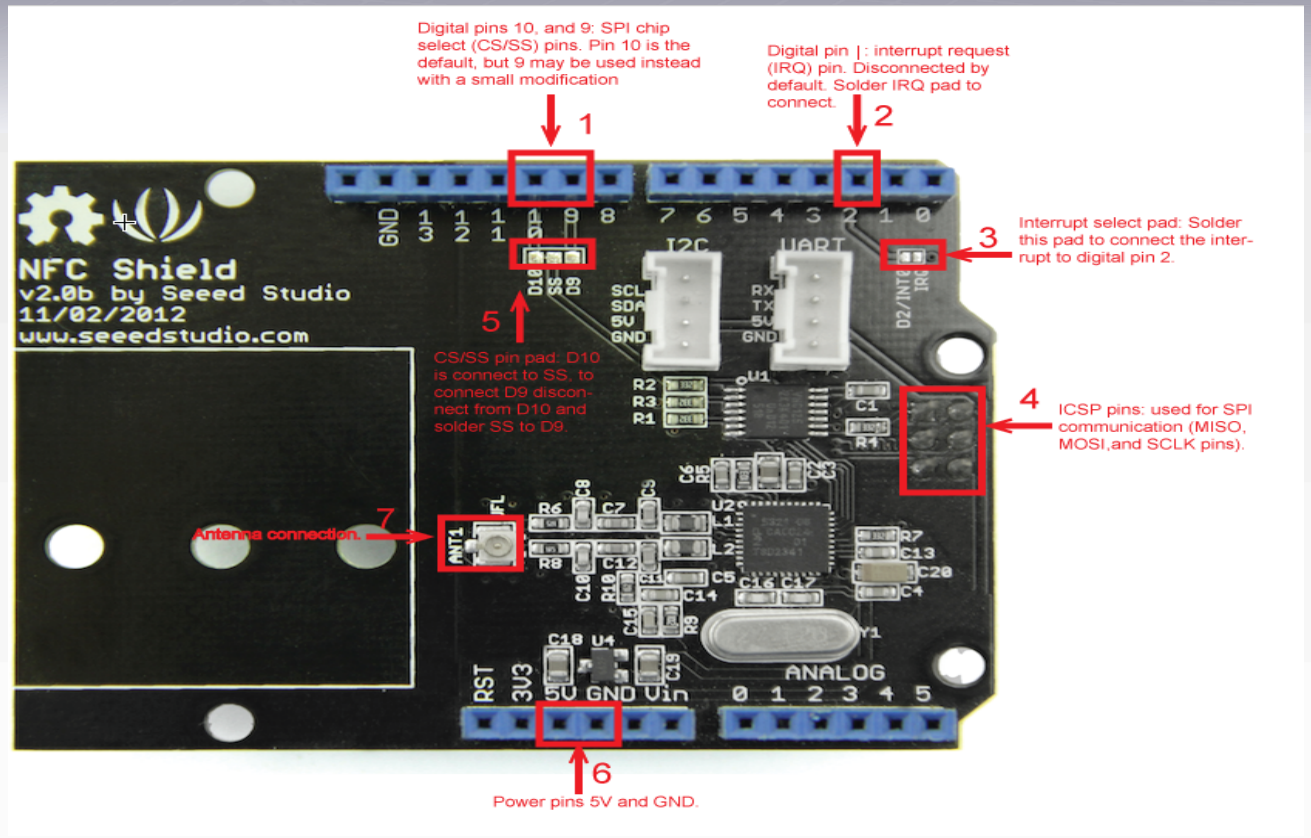
Hardware Overview

- NFC Reader
  - NFC Shield
  - Arduino
  - Read Procedure
- Add-one Features
  - LED Lights
  - Light Sensor
  - Buzzer

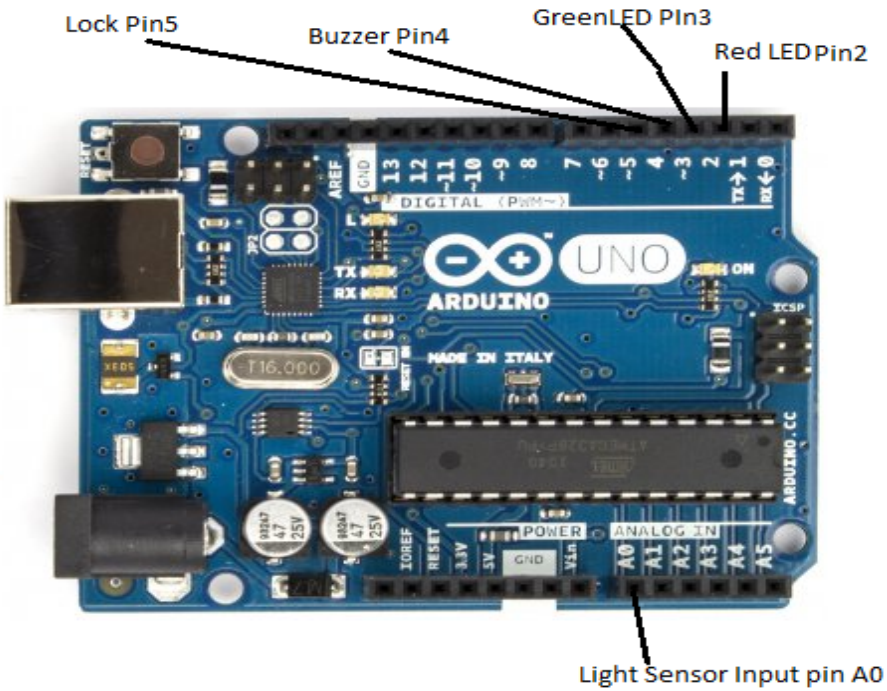
Hardware – Overview



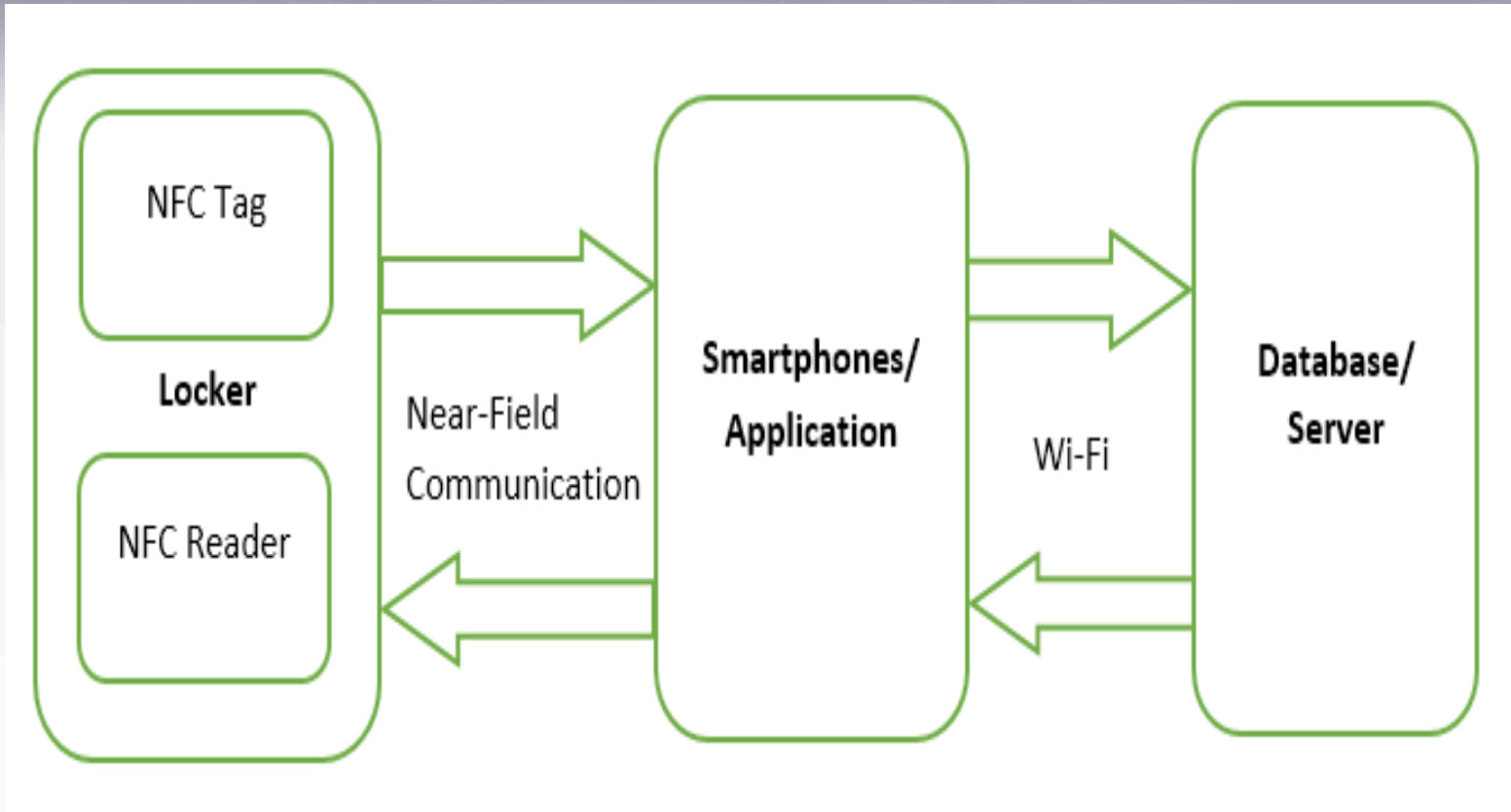
Hardware – NFC Shield



Hardware – Arduino



Hardware – Read Procedure



Hardware – Read Procedure (Cont.)

- Key Check:
  - Unique Identifier(UID): First 8- bytes
  - Type of Message: Text in our case.(other type: URL, Email)
  - Actual Key

Hardware – LED Lights

- Red LED
  - On when closed
  - Off when open
  - Flashing when denied

- Green LED
  - On when open
  - Off when close

Hardware – Light Sensor and Buzzer

- Light sensor
  - read the changing of light

- Buzzer
  - Turn off when the locker closed
  - Turn on when locker open without send any messages(force break in lock)

Conclusion

- What we learnt from this project?
  - Be able to apply all we have learnt from previous years
  - Making a product of our own interest
  - Collaborate with friends and team members
  - Research abilities
  - Real life experience

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Acknowledgement

- Professors
- TA
- Machine workshop

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Questions?