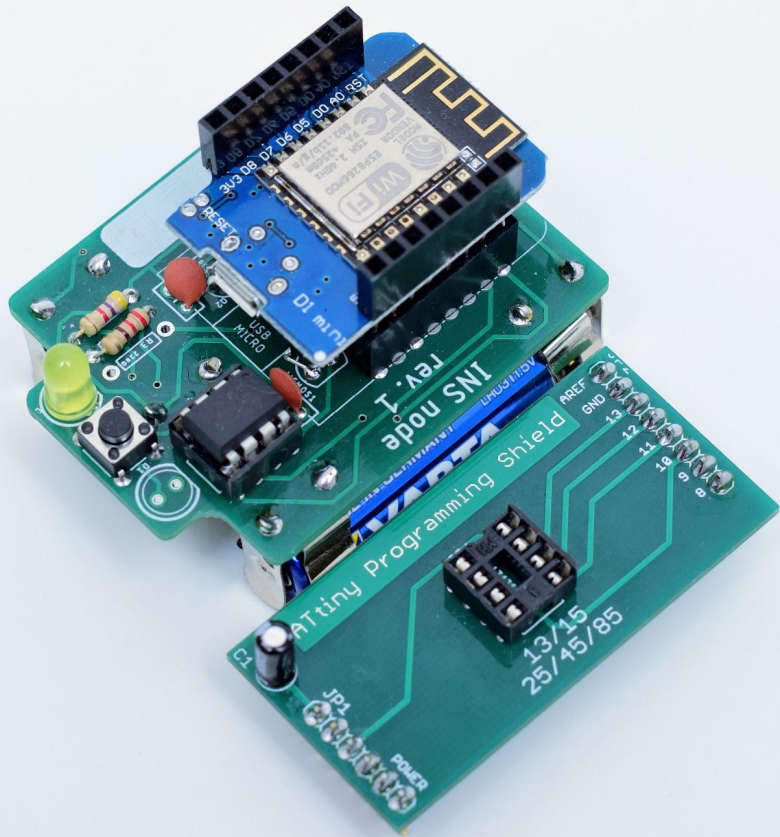




Indoor Navigation System

Kickoff Event

<https://github.com/platisd/indoor-navigation-system>



Agenda

- Introduction to INS
- Current status
- Vision
- How to get on board
- Demo
- Questions & Feedback

How we got here



- Initiative to form a hobbyist group.
- Enhance developer community in Aptiv.
- Network to share ideas, knowledge base & skills.
- Group Members :
 - Alex, Dimitris, Samuel.



Introduction to INS

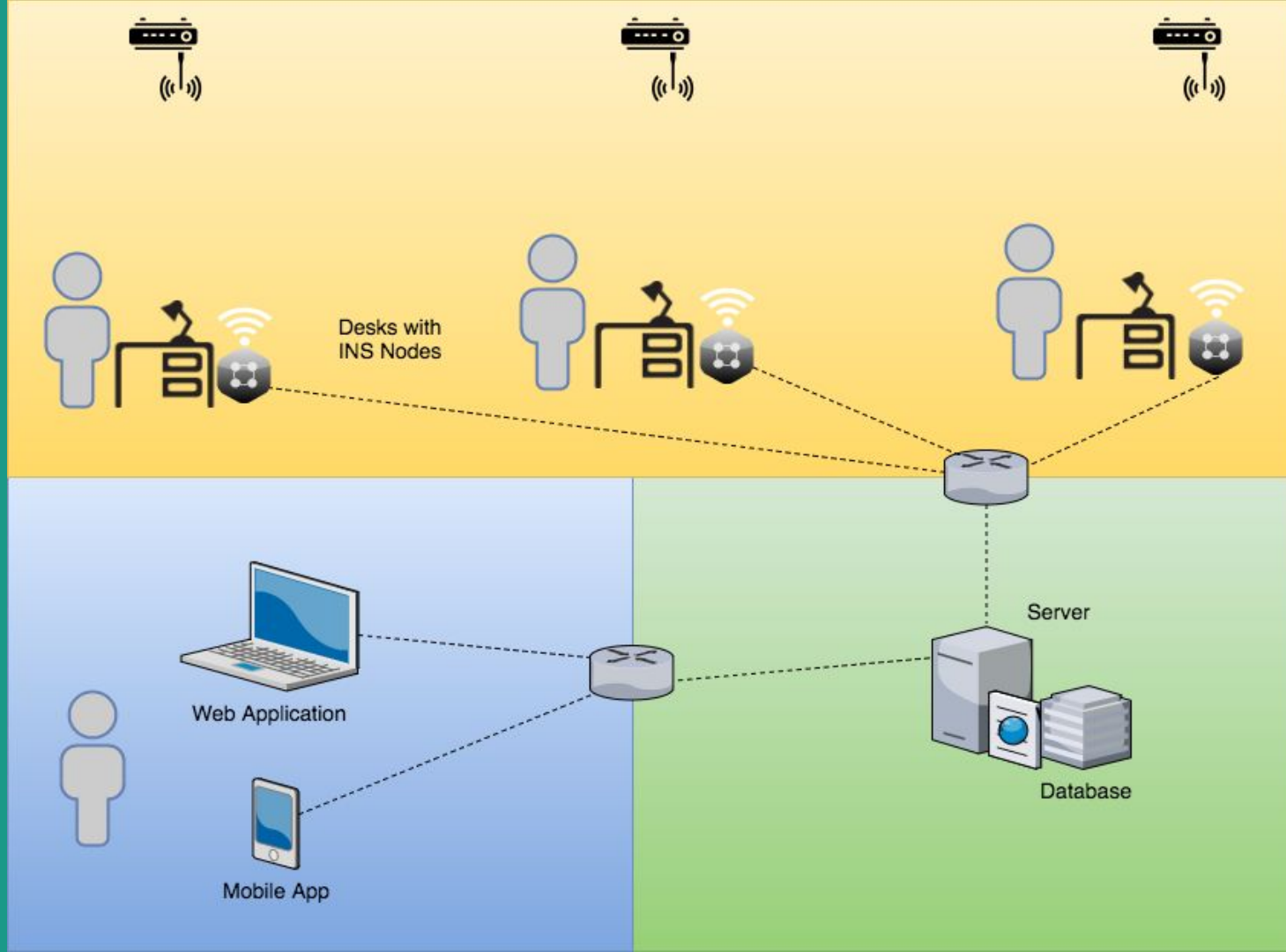
An indoor navigation system that guides you to the desk of your colleagues.

- Initiative to form a hobbyist group
- Locate colleagues' desks, resources easily
 - Coordinate point on map..
 - Navigation aid to point on map



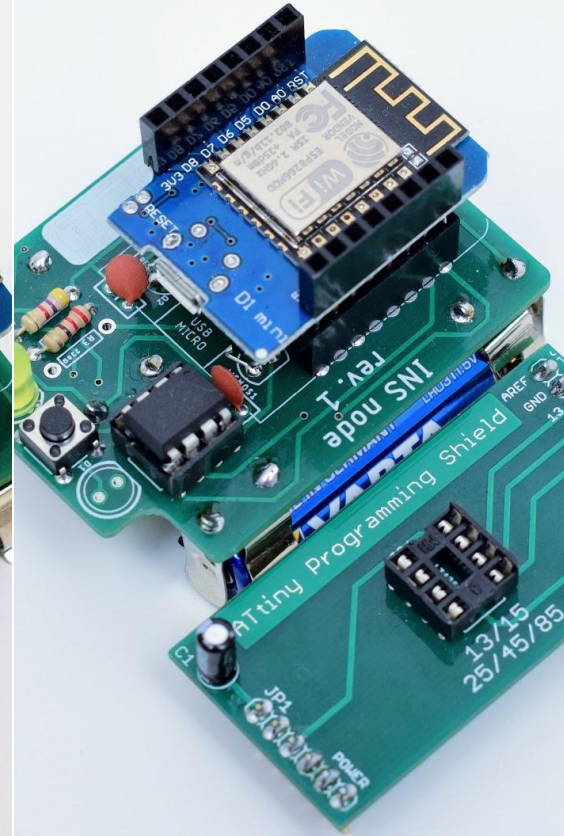
How it works

- Three layers
 - Nodes
 - Server
 - Client App



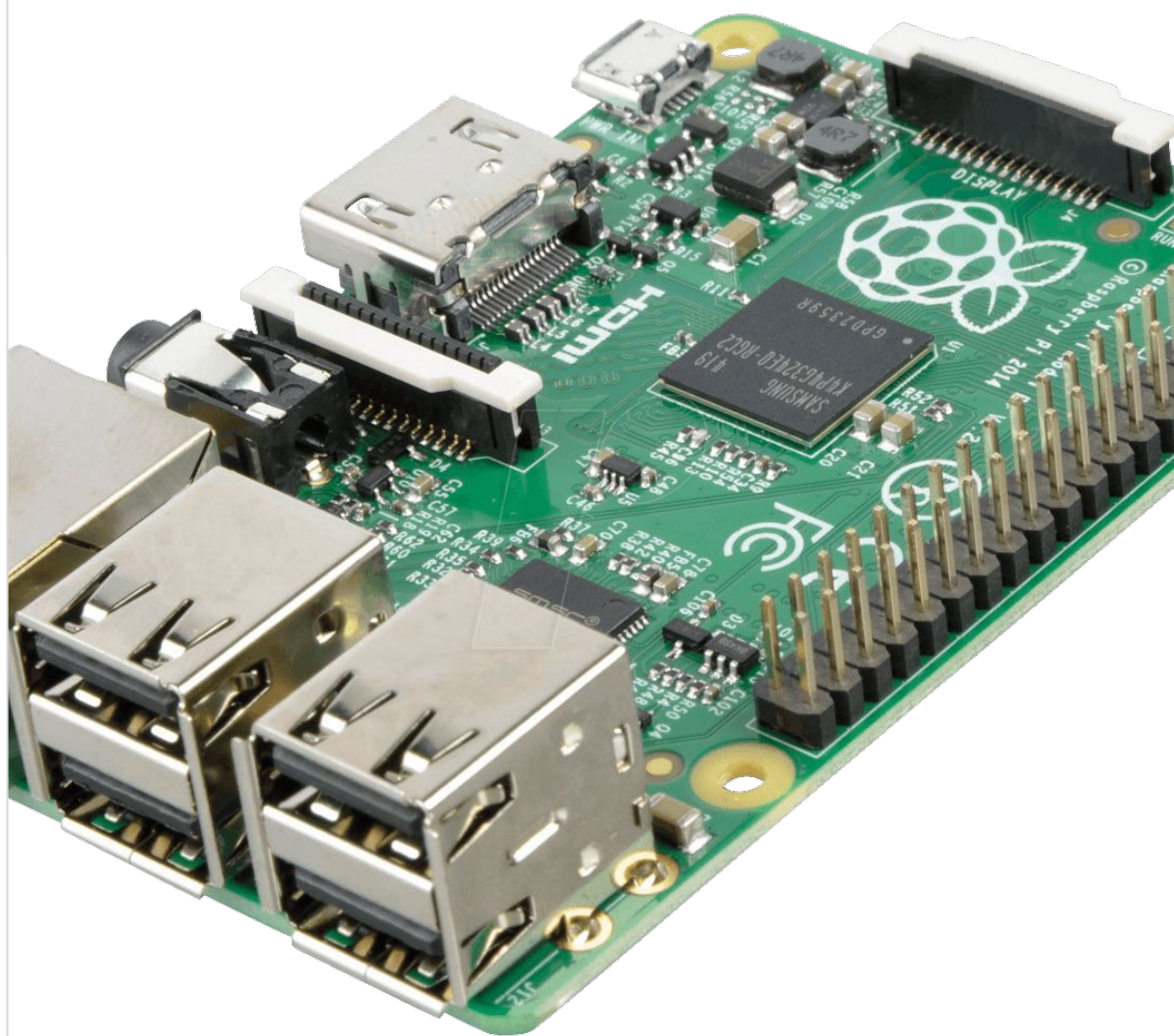
INS Node

- Portable device
- Transmits WiFi signal strength
- WiFi Module (ESP8266)
- Power Controller (ATtiny85)



Server

- REST server
- Persistent data storage
- WiFi RSSI localization
- Raspberry Pi (or NUC)





Client

- Queries INS for location
- Visualizes nodes location
- Provides navigational instructions
- Android (Currently), Web (TBI)



Current Status

 .gitattributes	Add INS-node board prototype	3 months ago
 .gitignore	Add coverage reports for ins-app	21 days ago
 .travis.yml	Use android target version as a variable	16 days ago
 CODE_OF_CONDUCT.md	Add code of conduct document	2 months ago
 CONTRIBUTING.md	Add contribution guidelines	2 months ago
 ISSUE_TEMPLATE.md	Add issue template	2 months ago
 LICENSE	Initial commit	3 months ago
 PULL_REQUEST_TEMPLATE.md	Fix wording	2 months ago
 README.md	Fix wording	6 days ago
 get_dependencies.sh	Make script executable	2 months ago
 run_coverage.sh	Add coverage report for unit tests	16 days ago

Github Project - Repository

 [README.md](#)

Indoor Navigation System

build passing

codecov 71%

[WIP] An indoor navigation system that guides you to the desk of your colleagues.

Filter cards

+ Add cards

In progress 2

- Backend Impl - Data analytics
#7 opened by samup4web
[epic] server
- Low ins-service (server) coverage
#78 opened by platid
[epic] server [bug] help wanted

Ready for internal acceptance 20

- Missing readme in project's root
#76 opened by platid
documentation good first issue
- Frontend Android App
#9 opened by samup4web
[epic] front end duplicate
- Allow multiple positioning networks
#80 opened by platid
[epic] ins-node
- Android application setup missing
#73 opened by platid
[epic] front end integration
- Extend DataStore helper functions
#61 opened by samup4web

Automated as Done

Ready for customer acceptance 1

- Missing initial implementation of power controller
#23 opened by platid
[epic] ins-node

Done 16

- Add New REST API for Resolving Device F
#28 opened by samup4web
[epic] server
- Apply corrections to board
#29 opened by platid
[epic] ins-node [bug]
- Server related files repository
#2 opened by platid
good first issue inter
- Modify database schema
#27 opened by samup4web
[epic] server
- Backend Impl - RE
#4 opened by platid
[epic] server

GitHub Project Board

GitHub Project - Pull Requests

The screenshot shows a GitHub Pull Request (PR) page for the repository 'platids / indoor-navigation-system'. The PR is titled 'Setup android app #75' and is in the 'Merged' state. It shows that 'platids' merged 15 commits into the 'dev' branch from the 'setup_android_app' branch, 15 days ago. The PR has 10 conversations, 15 commits, and 41 files changed. The description of the PR details the setup of an initial Android front-end application, including basic GET requests, Travis CI build, initial tests, and initial test coverage. It also mentions that the PR fixes issue #73. The right sidebar shows the 'Reviewers' section with two reviewers: 'samup4web' and 'lexious89'. The 'Assignees' section shows 'No one—assign yourself'. The 'Labels' section shows 'None yet'. The 'Projects' section shows 'None yet'. The 'Milestone' section shows 'No milestone'. The 'Notifications' section is also visible.

platids / indoor-navigation-system

Unwatch 2 Star 1 Fork 3

Code Issues 14 Pull requests 0 Projects 1 Wiki Insights Settings

Setup android app #75

Merged platids merged 15 commits into dev from setup_android_app 15 days ago

Conversation 10 Commits 15 Files changed 41 +864 -12

platids commented 16 days ago

Owner

Description

- Sets up an initial android front-end application that allows users to locate the desks of their colleagues
 - Basic Android application that executes GET requests
 - Travis CI build
 - Initial tests (need to learn more on how to do this!)
 - Initial test coverage (need to increase coverage!)
- Changed server responses, for getting the location of a node or an employee, to well-formatted JSON strings for easier parsing on the front-end. See [8e7a4a5](#).

Overall, most time was spent in trying to make the Android app build on Travis and to get coverage reports show up correctly. This commit decreases the overall coverage since I currently lack the knowledge related to the gimmicks of Android testing. However, this should not be an extremely difficult task and once this pull request is merged, I will open a relevant issue.

Solved issue(s)

Fixes [#73](#)

Reviewers

- samup4web ✓
- lexious89

Assignees

No one—assign yourself

Labels

None yet

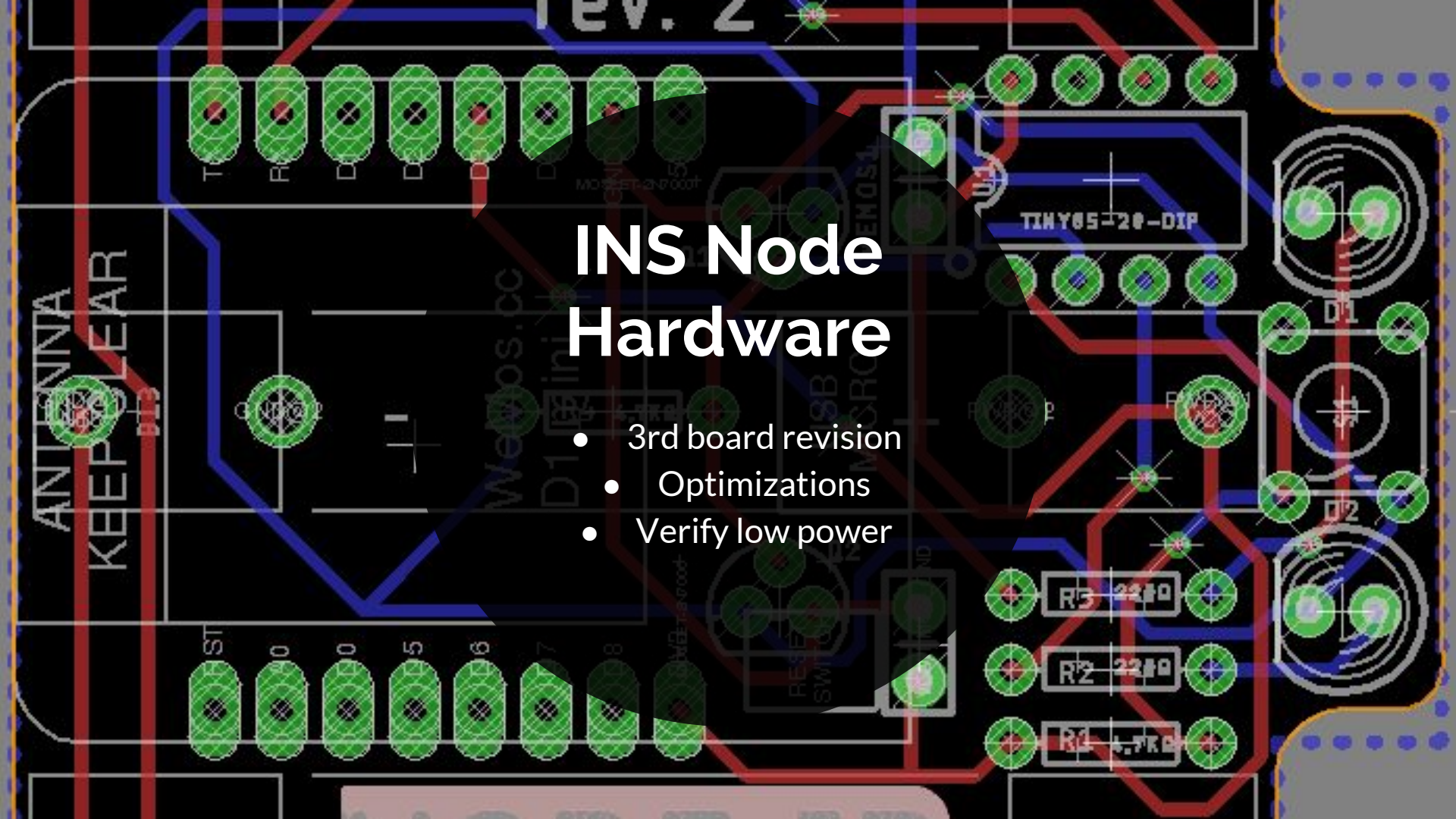
Projects

None yet

Milestone

No milestone

Notifications



INS Node Hardware

- 3rd board revision
- Optimizations
- Verify low power

HTTP REST Server

- Pistache - <http://pistache.io/>

INS NODE

```
POST http://localhost:9080/set_rssi/15/23:43:3d:3e:5e:f5/12.323/5a:4e:44:ff:5a:6e/44.3434
```

```
POST http://localhost:9080/resolve_pos/15
```

```
POST http://localhost:5300/reset_pos/15
```

APP

```
GET http://localhost:5300/get_device_pos/15
```

```
GET http://localhost:5300/get_employee_pos/3405
```

Backend Database

SQLITE

```
-- Stores wifi access points information --  
CREATE TABLE access_points  
(  
  mac_addr TEXT PRIMARY KEY,  
  pos_x REAL,  
  pos_y REAL,  
  pos_z REAL  
);
```



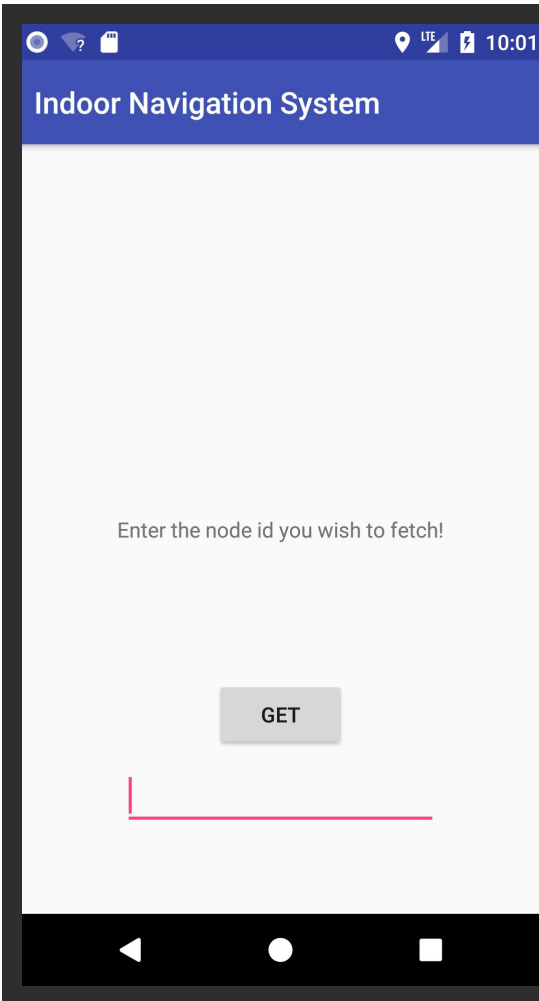
Localization



```
-- Stores mac_addr/rssi info from device id - dev_10 --  
CREATE TABLE sample_dev_10  
(  
  id INTEGER PRIMARY KEY,  
  mac_addr TEXT,  
  rssi REAL,  
  timestamp datetime default current_timestamp  
);
```



```
-- Stores location records --  
CREATE TABLE location  
(  
  device_id INTEGER PRIMARY KEY,  
  employee_id TEXT,  
  pos_x REAL,  
  pos_y REAL,  
  pos_z REAL,  
  timestamp datetime default current_timestamp  
);
```



Android App

- Basic app to find node location
- Node ID as parameter
- Location data



Current Branches Build History Pull Requests

More options



Default Branch

✓ dev

🔧 23 builds

277 passed

📅 6 days ago

e8f8019

GitHub



Active Branches

✗ increase_ins_service_coverage

🔧 3 builds

280 failed

📅 about 21 hours ago

c8cd8cd

Dimitris Platis



✓ resolveLocation

🔧 1 build

167 passed

📅 2 months ago

872acb1

Alex Sackey



✓ master

🔧 12 builds

102 passed

📅 2 months ago

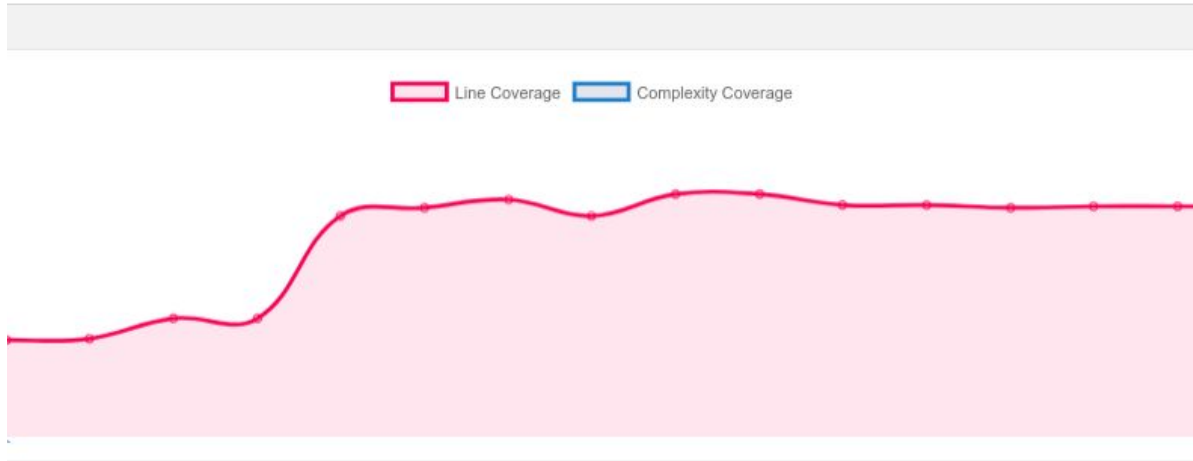
c540999

GitHub



CI

- Triggers on every commit
- Tests all platforms
- Builds app and server
- Simple configuration



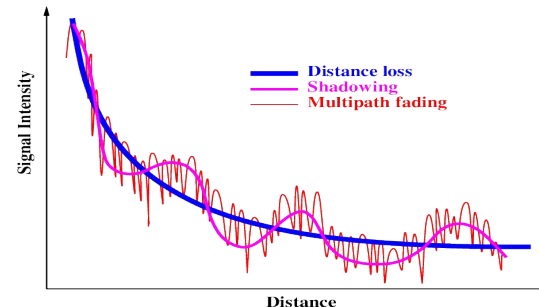
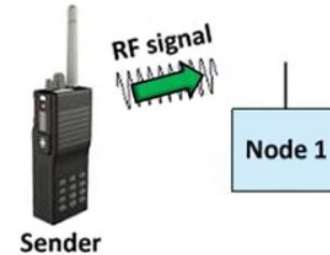
Test Coverage

- Fancy graphs
- Easy to access
- Triggered by CI

Position localization - Trilateration

- RSSI levels from wifi points to be used
- RSSI is mapped to received power level
- Multiple power levels measured over fixed sample times
- Random shadowing and fast fading is removed by filtering (Kalman) over time
- Distance computed with pathloss power received

$$\frac{P_r}{P_t}(dB) = 10 \log_{10} K - 10\gamma \log_{10} \left(\frac{d}{d_0} \right) + \psi_{dB}$$
$$\psi_{dB} \sim N(0, \sigma_\psi^2)$$



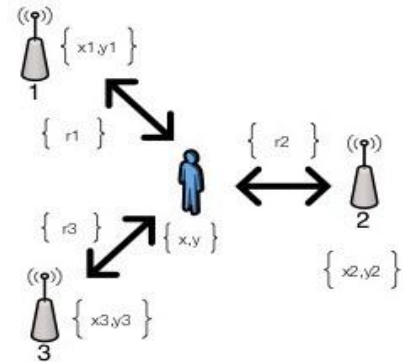
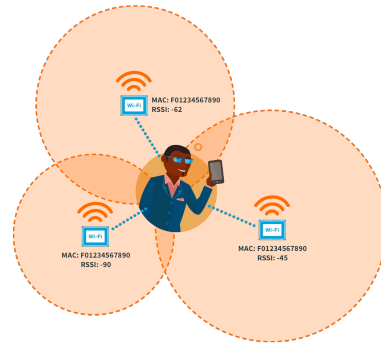
Position localization

- Known positions for all wifis in building
- With known positions of wifis as center of the circle, distance from received power, solve the three circle problem = $\{x,y,z\}$

$$(x_s - x_1)^2 + (y_s - y_1)^2 = (r_s - s_1 r_1)^2$$

$$(x_s - x_2)^2 + (y_s - y_2)^2 = (r_s - s_2 r_2)^2$$

$$(x_s - x_3)^2 + (y_s - y_3)^2 = (r_s - s_3 r_3)^2.$$





Mac address: a0:3d:6f:1e:4a:1c ->

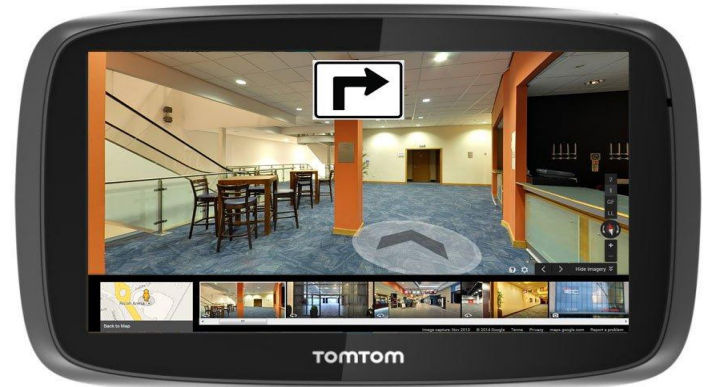
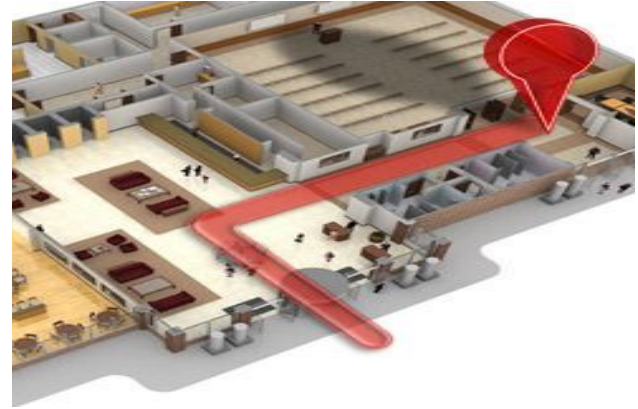
distance -> Power level to ins
node: |

↓

↓

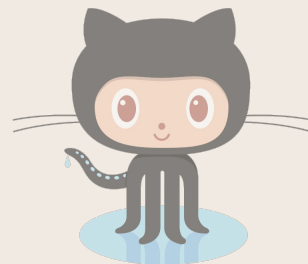
Vision

- **First phase**
 - Location detection with no navigation
- **Second phase**
 - Active navigation assist
 - Google Assistant or Alexa integration
 - Enhanced security
 - OTA updates / Continuous Deployment
 - Cool casing for nodes



How to get on board

- Create github account (or use existing account)
- Open issue on repository
- Request collaborator access
- Request Slack channel access
 - Provide your Aptiv username (e.g. johan.johansson)
- Github repo - [platisd/indoor-navigation-system](https://github.com/platisd/indoor-navigation-system)



GitHub

Time for
action!

DEMO



Questions?

github.com/platisd/indoor-navigation-system