

# SpyLoc: A Light Weight Localization System for Smartphones



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## Localization based App

- Advertising Products /Services.
- Making physical object searchable.
- Personal tracking.
- Social interaction .

## Challenges

- Achieving  $\leq 1m$  accuracy.
- Dependency on anchor points or Infrastructure.
- Expensive to deploy.
- Highly mobile environment.

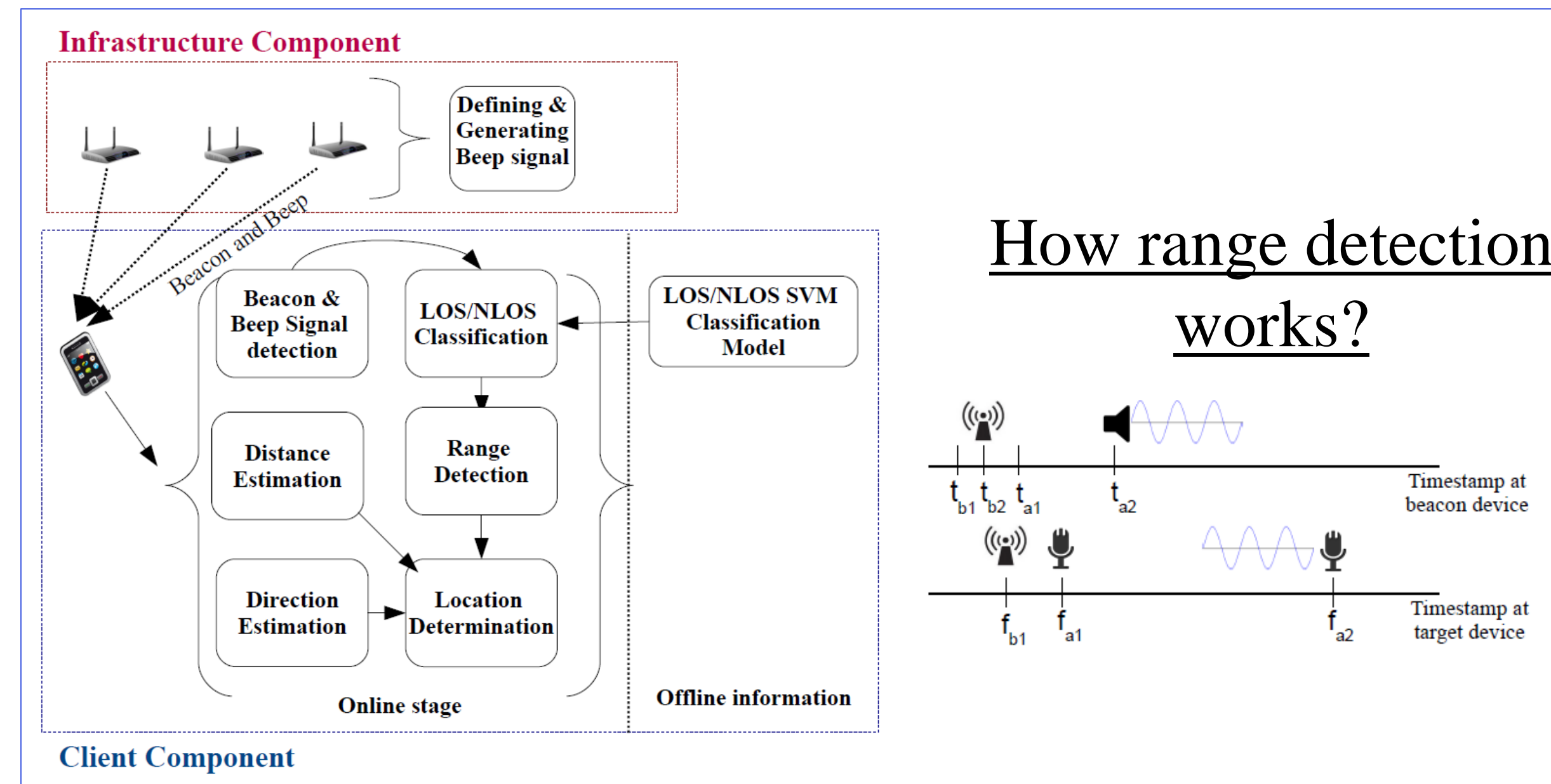
## What is SpyLoc

- Leverage both the **dead reckoning** and the **ranging scheme**.
- RF-Beep[1]** is used as ranging scheme.
- Fuses **inertia sensors** to estimate the direction and the distance travel.

## SpyLoc Features

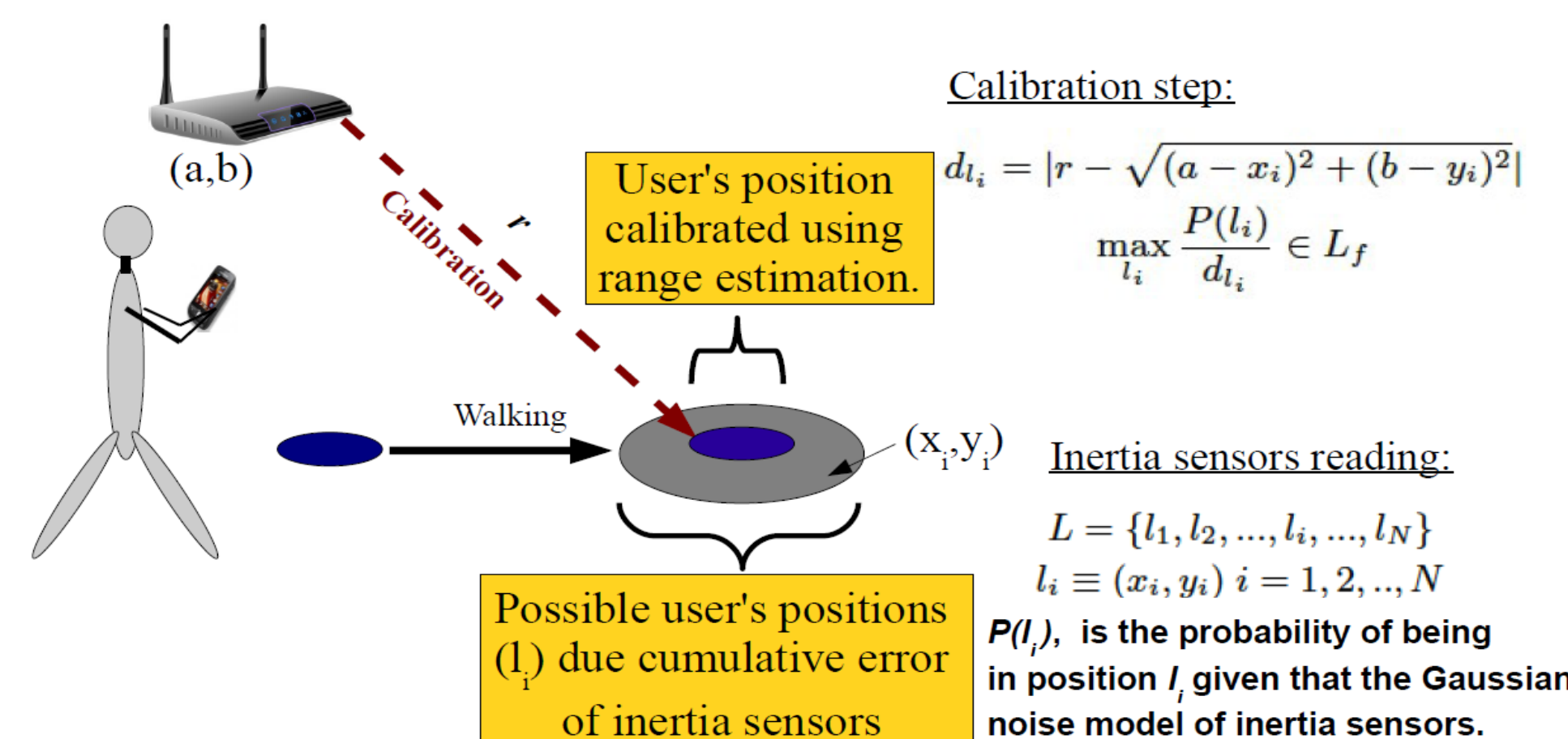
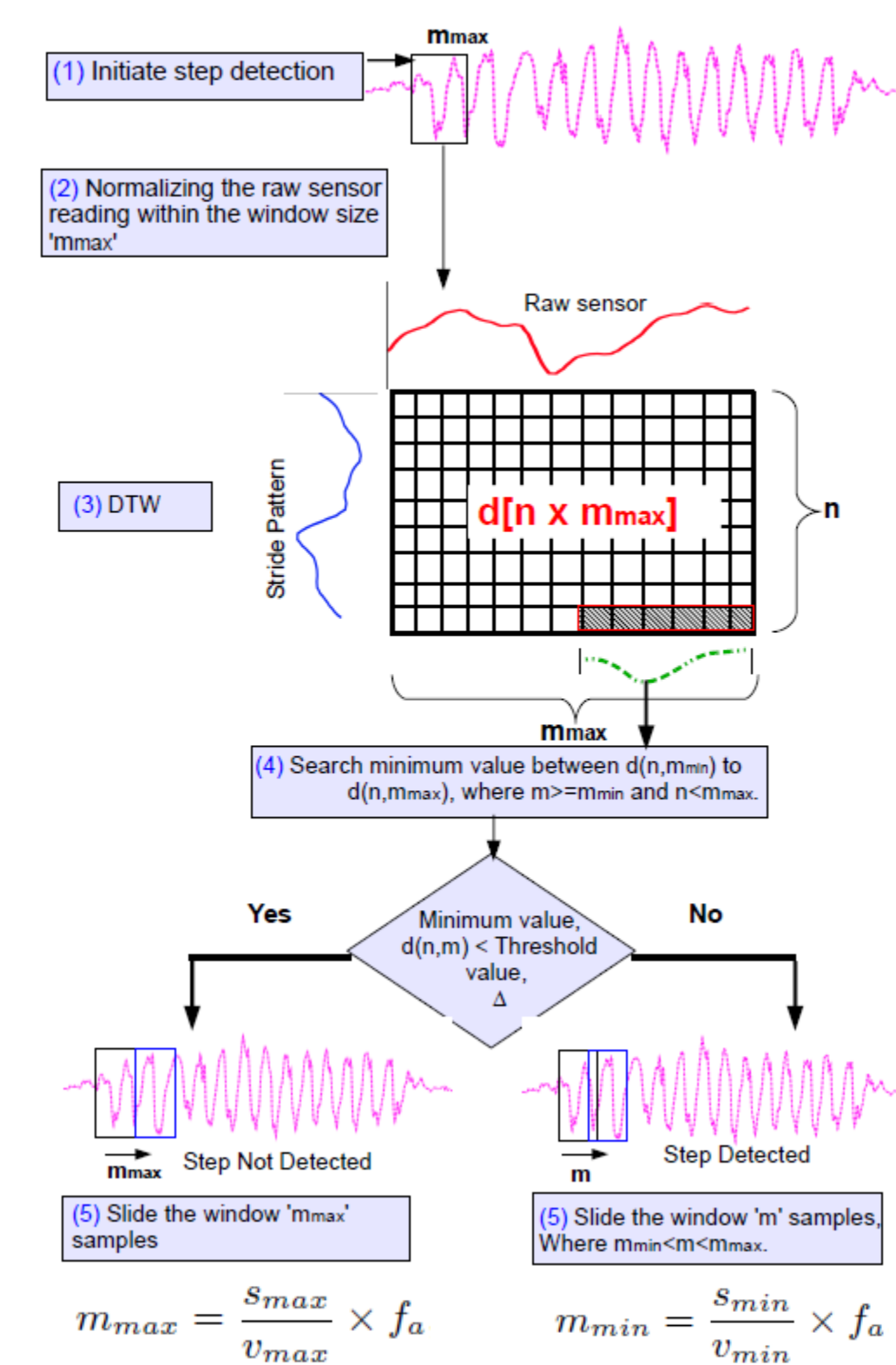
- Exploits the **acoustic interface** and the **WiFi interface** of the Smartphone.
- Reduce dependency on **anchor points**.
- Support **high mobility** environment.
- Less complexity** even the number of user's devices increases.

## SpyLoc Architecture



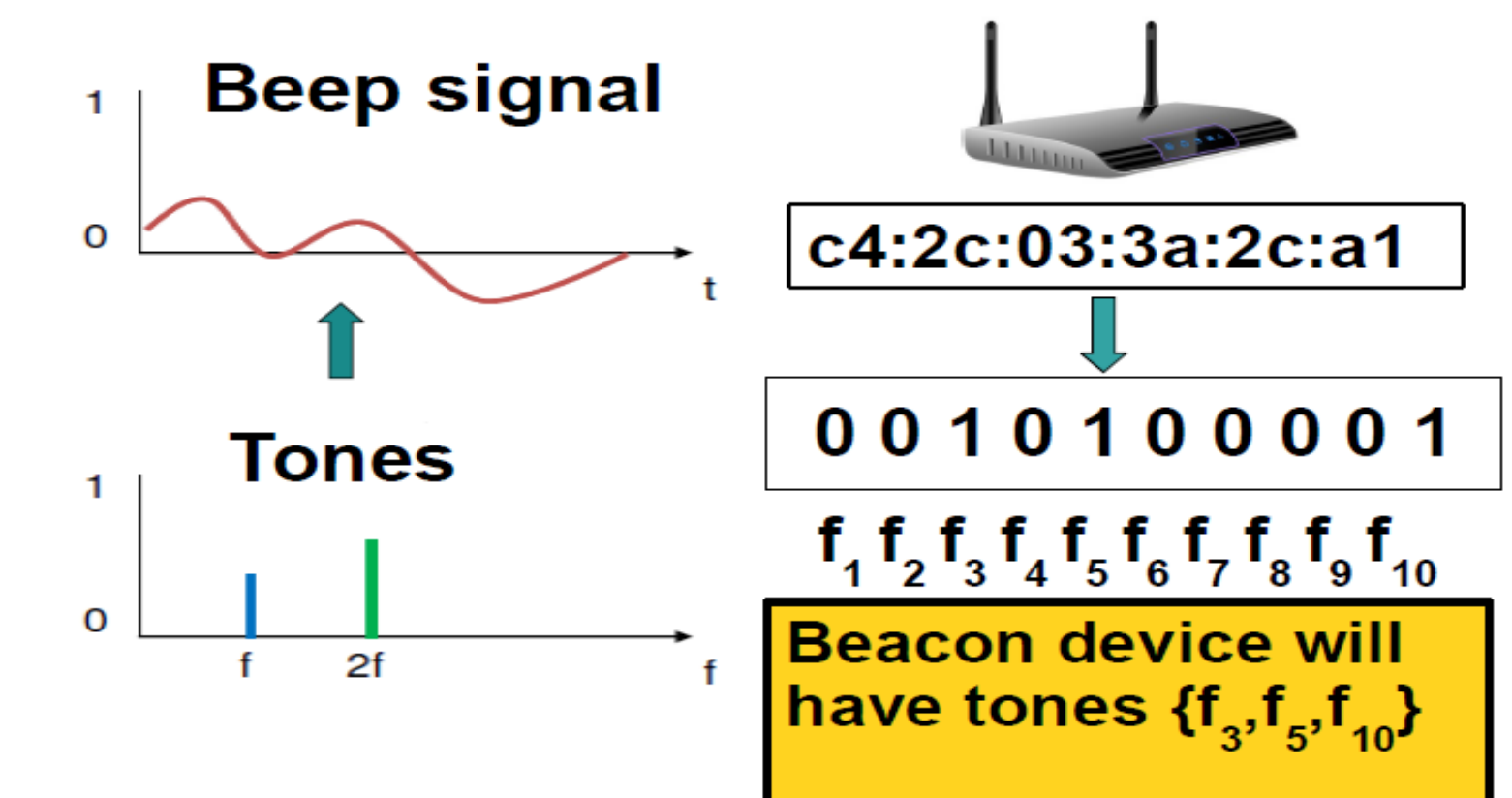
## SpyLoc Client

- Customized **DTW** algorithm to detect **steps**.
- Geomagnetic** and **gyroscope** sensor reading to detect **rotation/direction**.
- Calibrate** the sensor reading using at least **one range estimation**.



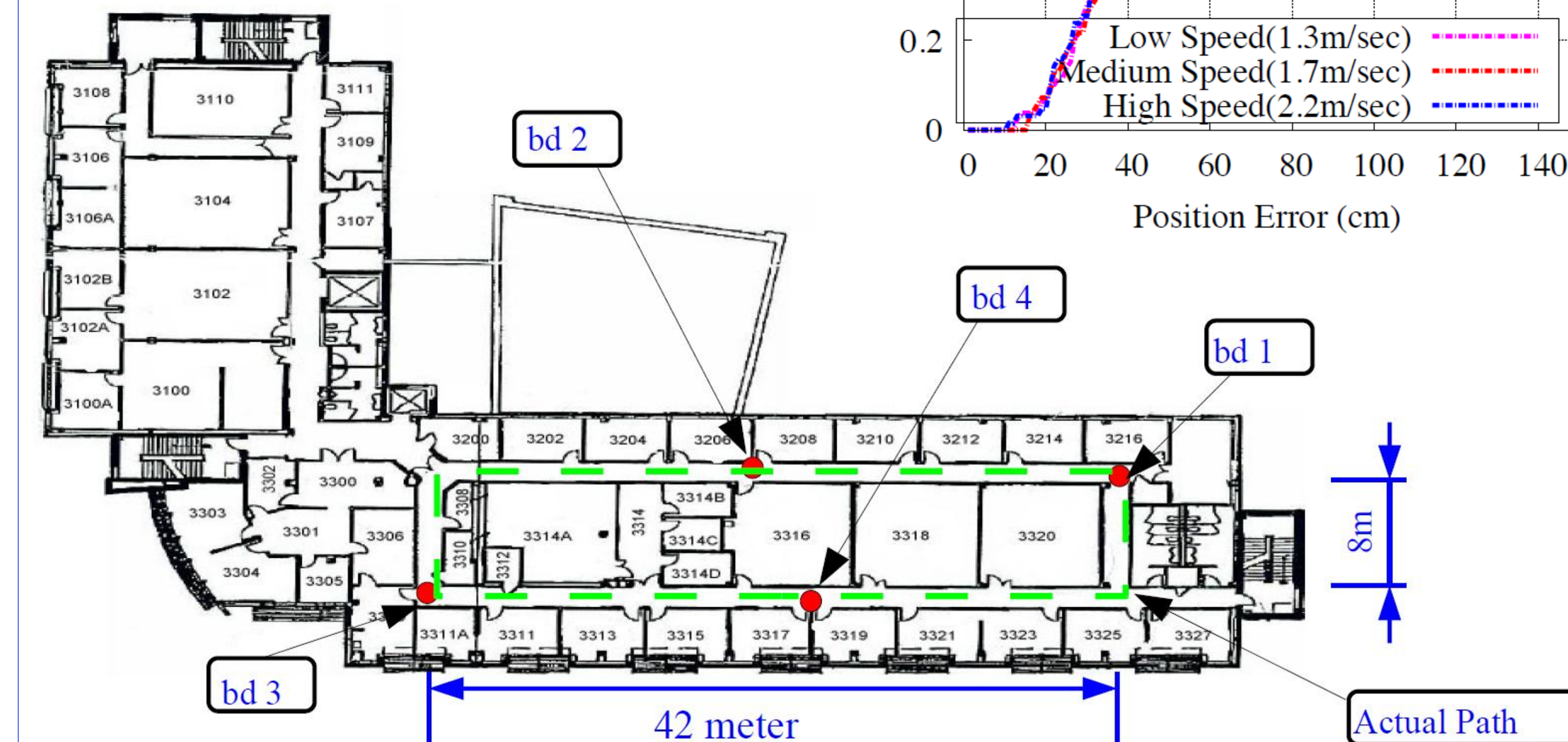
## SpyLoc Infrastructure

- Beacon devices** periodically generate a RF beacon message followed by a **beep signal**.



## Evaluation

Estimation error less than 90cm for 90% of times



## Ongoing Work

- Build personalized step model.
- Collect more cleaner rotation/direction reading
- Differentiate NLoS beep signal.
- Estimate the temperature of surrounding.

[1] M. Uddin and T. Nadeem, "Rf-Beep: A Light Ranging Scheme for Smart Devices." in PerCom 2013