



ekahau
Innovation Through Location

Location Tracking using Standard 802.11 Networks

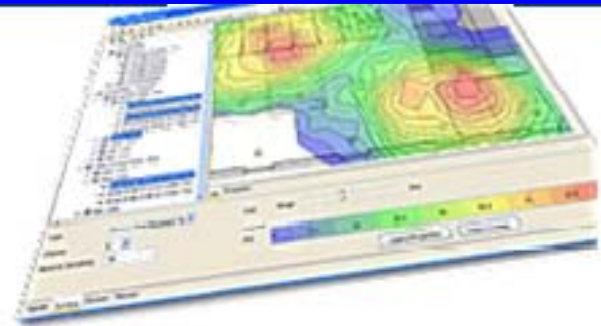
International Symposium
on Advanced Radio Technologies
March 3rd 2005
Boulder, CO



ekahau

Company Overview

- Ekahau is the leading provider of software-based positioning technology for WiFi networks.
- The company was founded in 2000 and spun out of the CoSCo group at the University of Helsinki, Finland
- Funded by Nextit Ventures and Tekes (National Technology Agency in Finland)
- Offices in Helsinki Finland, Saratoga CA and Herndon VA and Hong Kong China
- Partnerships in place and forming worldwide with leading technology companies and integrators across a wide variety of industries.



Use Cases for Tracking



Healthcare:

Real-time patient, caregiver and asset tracking

- = time savings
- = improved workflow
- = increased patient satisfaction

Supply Chain:

Forklift, personnel and inventory tracking

- = faster, more accurate picking
- = improved work flow
- = asset visibility



Process Industry:



Field engineer/consultant tracking

- = improved safety in emergency
- = better resource utilization
- = location-based alarms, work orders



Manufacturing:

Work in progress vehicle body tracking

- = faster throughput
- = improved asset visibility
- = improved workflow



Tracking - Why ?

- Where is it Now ?
- Where is the closest piece of equipment I need ?
- Where can I find a piece of equipment ?
- Where was its last location ? History ? Utilization ?
- When is the last time a piece of equipment was calibrated, and where can I find it ?
- How many of each type of equipment are out there and where are they ?
- What's on the 3rd floor ?
- Do we have everything we need in OR#6 ?
- The rental company wants their pumps back....



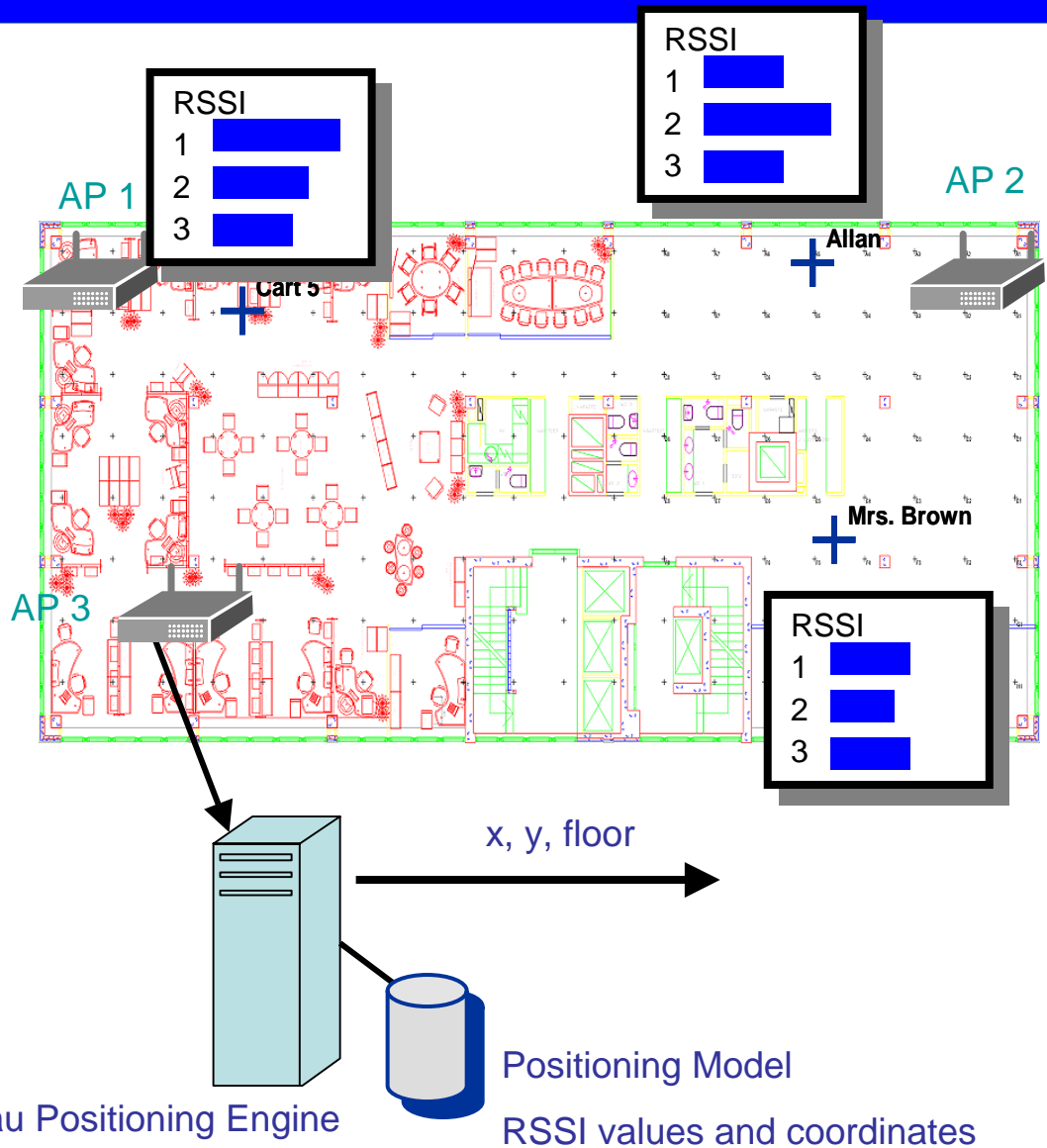
Indoor Tracking Technologies

- Cell-ID
 - Cell size accuracy
- TDOA
 - Requires additional hardware
 - Sensitive to multipath effect
- RFID
 - Requires additional hardware
 - Position known only temporarily (at the gate)
- Ekahau RSSI Technology
 - Utilizes standard 802.11 infrastructure



Ekahau Technology

1. Tracked Devices Measure Received Signal Strength Indicators (RSSI)
2. Send them to Ekahau Positioning Engine (EPE)
3. EPE Matches the RSSI pattern to values stored in the positioning model
4. EPE uses probabilistic algorithm for calculating location estimates
5. EPE sends location estimates to applications



Ekahau Enhancements

- Basic pattern matching is not enough for 3ft accuracy
- Ekahau has created following patented technologies that improve the accuracy significantly:
 1. Ekahau Site Calibration™
 - Process of collecting site specific Positioning Model
 2. Ekahau RailTracking™
 - marks possible routes
 3. Normalization of RSSI values from different network cards and devices
 - Improves accuracy by adjusting the variation between different device's RSSI measurements



Deployment

Download

2

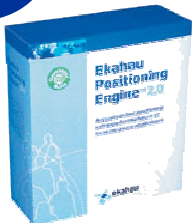
Floor Plan map



- png, jpg, pdf, acad, etc

Install

1

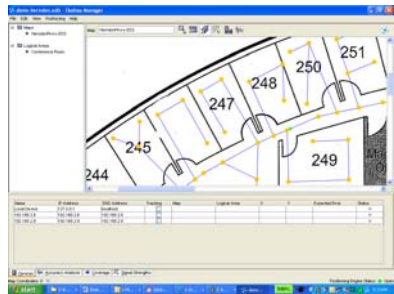


- Ekahau Positioning Engine SW
- Ekahau Client SW

Draw Tracking Rails

3

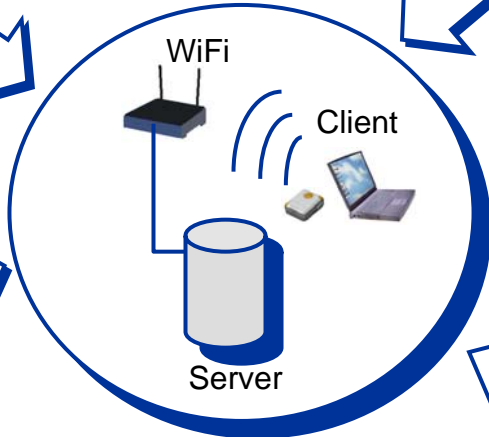
- on computer screen, draw lines on floor plan representing the typical pathways of mobile people/devices



Perform Site Calibration

4

- walk around the site once for RF pre-survey



Start Tracking

5

Start Tracking!

The screenshot shows the Ekahau Manager interface. The main window displays a floor plan with several rooms labeled 244, 245, 247, 248, 249, 250, and 251. A red circle is placed in room 247. Blue lines connect various points on the floor plan, representing the tracking path. Below the map is a table with the following data:

Name	IP Address	DNS Address	Tracking	Map	Logical Area	X	Y	Expected Error	Status
Local Device	127.0.0.1	localhost	<input type="checkbox"/>						<input type="checkbox"/>
	192.168.2.6	192.168.2.6	<input type="checkbox"/>						<input type="checkbox"/>
	192.168.2.9	192.168.2.9	<input type="checkbox"/>						<input type="checkbox"/>

TRACK PDAs!



TRACK Laptops!

TRACK VoWLAN Phones!



TRACK Barcode/RFID scanners!

TRACK hospital wireless equipment!



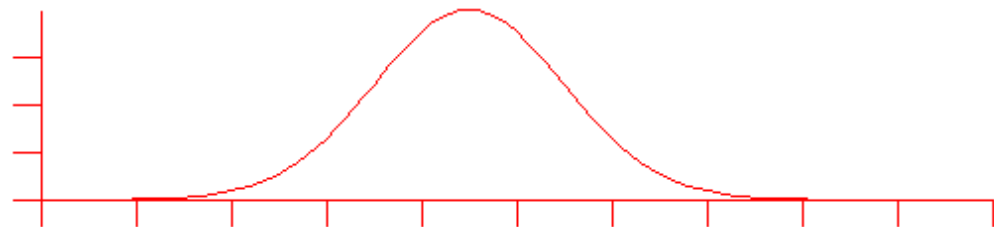
Ekahau T201 WiFi TAG!



Rail-tracking

- RailTracking is a positioning algorithm used in the Ekahau Positioning Engine (EPE)
 - possible routes marked with rails
 - movement capabilities taken into account
 - using observation history
- The following graphs illustrate how RailTracking probabilities evolve in different cases
- Visualized on a straight rail with 100 sample points:

Probability

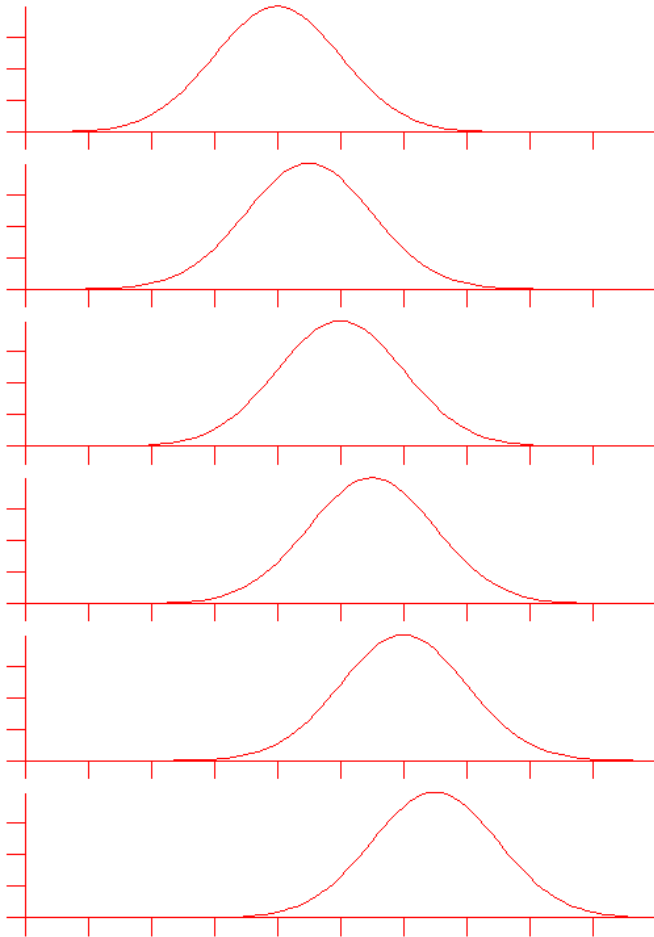


Position on the rail

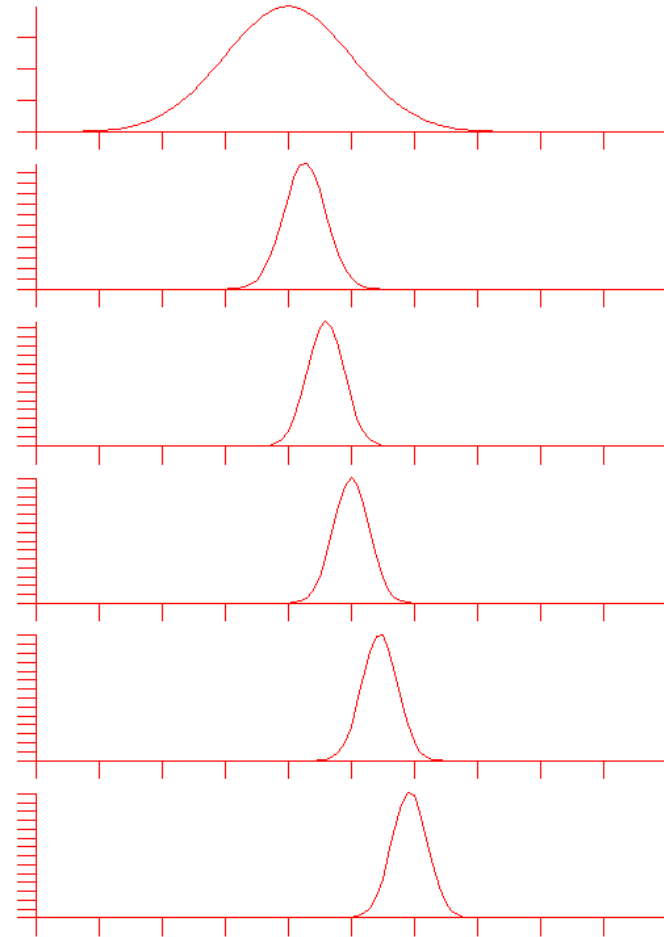


Moving

Without RailTracking

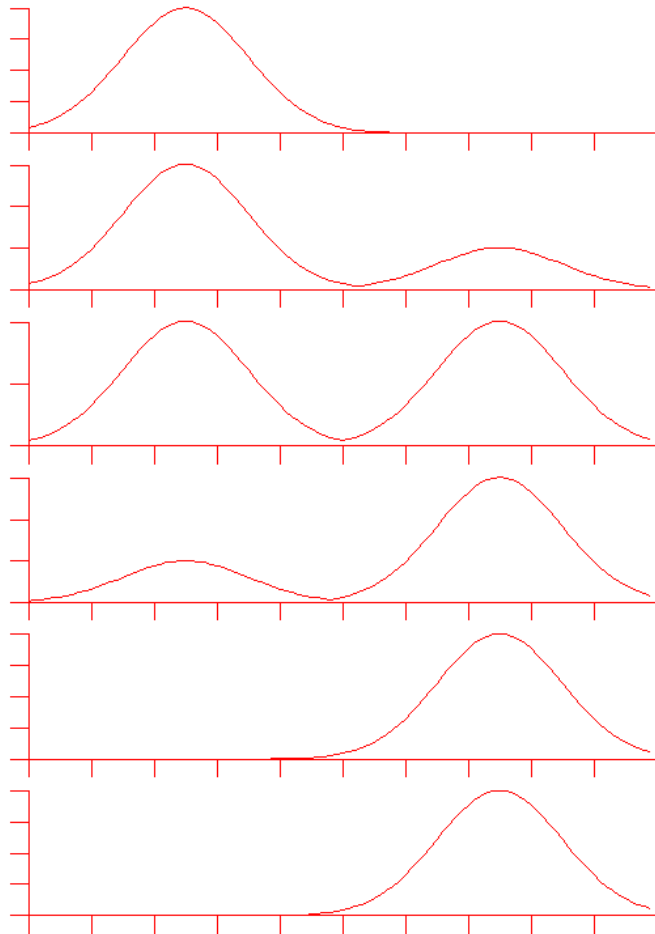


With RailTracking

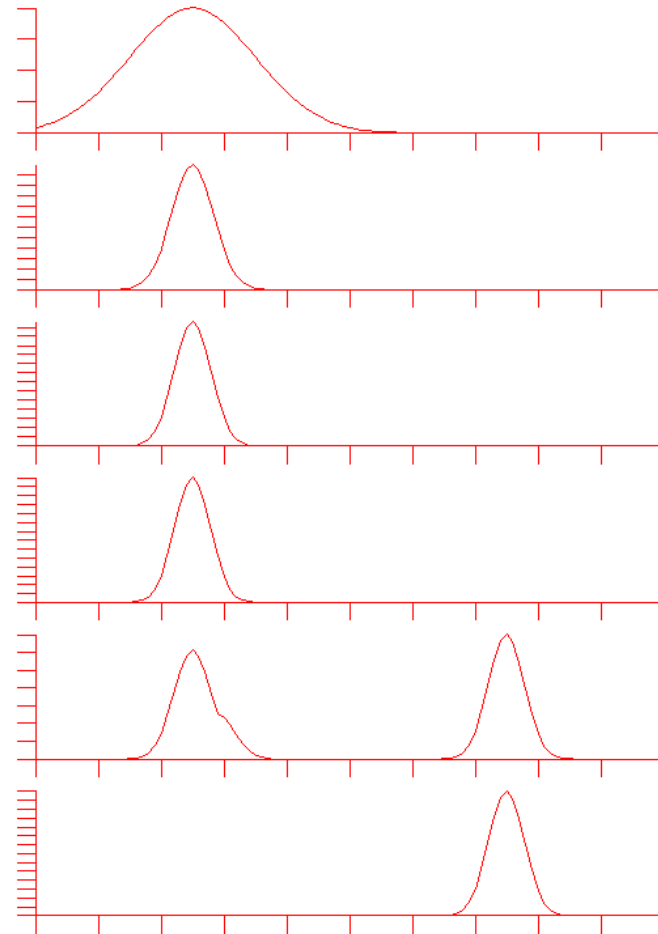


"Teleport"

Without RailTracking



With RailTracking



Thank you !

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