Indoor Locationing with Wi-Fi and Bluetooth

N Venkatesh
Sr. Vice President, Advanced Technologies
Redpine Signals, Inc.
n.venkatesh@redpinesignals.com
Navigation – Outdoors to Indoors?
Navigation – Outdoors to Indoors?
Indoor Navigation and Positioning
Tracking Other People
Tracking Objects
Solution: Indoor Locationing

Also called Real Time Location Systems - RTLS
World RTLS Market

Source: Frost and Sullivan
RTLS Applications

- **Mining**
  - Personnel Safety
  - Operational Efficiency

- **Airports**
  - Locate equipment
  - Locate personnel
  - Increase operational efficiency
RTLS Applications - Healthcare

- Safety - detection of
  - Patient wandering
  - Entry into unauthorized zones
  - Infant abduction attempt

- Workflow Automation and Efficiency
  - Optimize equipment utilization
  - Enable staff to be located quickly
  - Streamline emergency response
  - Provide for staff duress alarms
  - Infection control - enforce hand sanitization
  - Prevent theft, misplacement and hoarding
  - Asset management
Locationing Technique – Trilateration

- Based on distance measurement from known reference
- Distance measured by
  - Path loss
  - Time of flight
- Similar to GPS!

A, B, and C are wireless transmitter/receivers placed at known locations.

The intersect point of the circles of radius equal to the measured distances is where the ‘tag’ is.
Summary of Navigation Techniques - Triangulation

- Requires multiple antennas and Line of Sight (LoS)
- Uses Angle of Arrival (AoA) from known reference points

\[
d = \frac{L \sin(\alpha) \sin(\beta)}{\sin(\alpha + \beta)}
\]
BLE for Proximity Detection

- Beaconing device sends out BT 4.0 beacons periodically
- User devices (Smartphones or other special purpose devices) discover the beacons and process them
- Discovery happens at close proximity – this is the intent
Emerging Features in Wireless for Locationing

Time of Flight based Locationing

Angle of Departure

Angle of Arrival
RTLS Implementation

*Software pieces may run on the same server, or be distributed
Business Analytics and Data Visualization

Business Analytics

Redpine Signals Cloud/Server SaaS

Real Time Dashboard Updates using Push Technology

Graphs, Pie Charts, Maps and other Visualization Tools

Content Delivery to Multiple Platforms and Display Sizes

Indoor Asset Tracking
Complete Solution From Redpine Signals

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- **Data Aggregator**
- **Location Engine**
- **Messaging**
- **Site Survey**

- **Asset Tracker**
- **Location based Intelligence**
Questions?

Thank you!

n.venkatesh@redpinesignals.com