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Your Time Is Now

Connected Mobile Experiences (CMX) Aligning Use Cases and Technology

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Session: PSOEWN-3246

Agenda

- Introduction
- The CMX Location Accuracy Continuum
- Leading with the Use Case
- Wi-Fi and Hyperlocation
- BLE and Virtual Beacon Solution
- Q&A
- Conclusion

Indoor Location Accuracy Continuum

GOOD

BETTER

BEST



Greater Location **Granularity**

Increased Business **Value**

Good Location

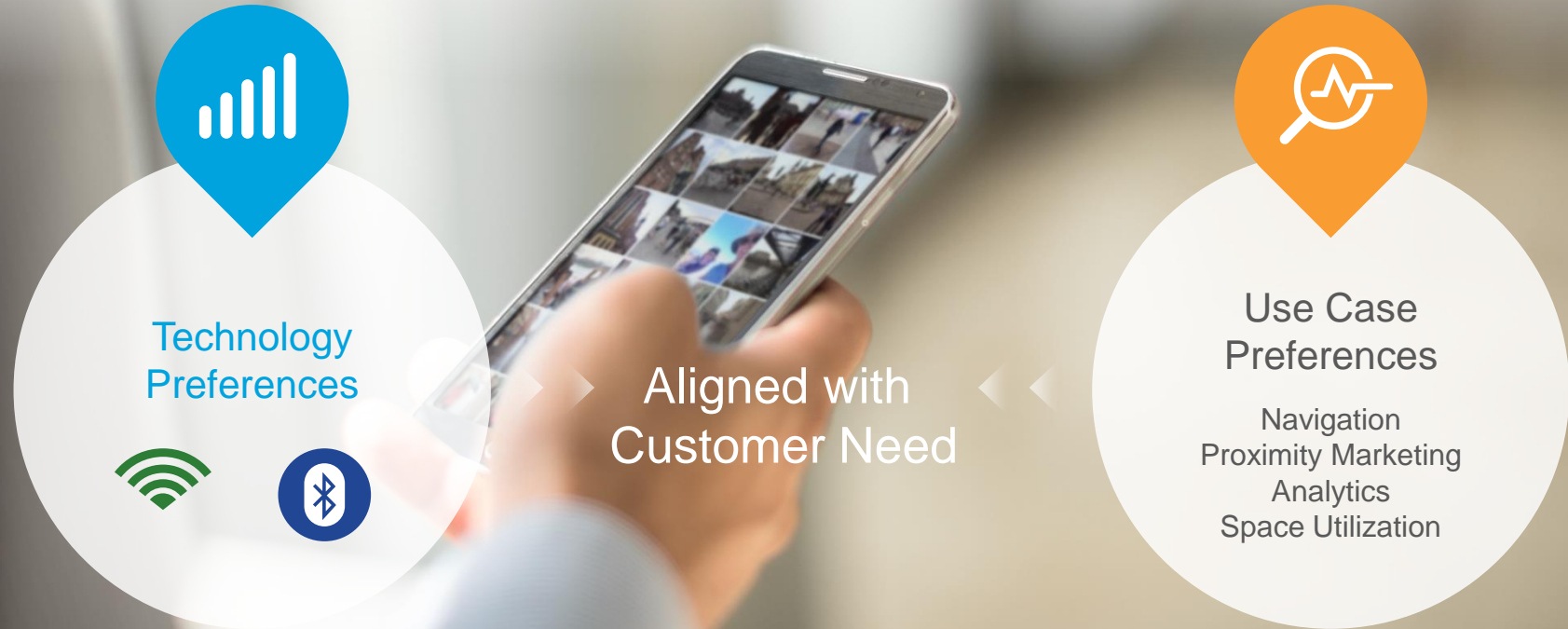
- Presence-level detection
- Easy, entry-level deployment
- No map required
- No Prime Infrastructure
- 1-5 Access Points per location
- No site survey

Better Location

- X,Y Location
- Digital map of venue
- Prime Infrastructure
- More than 3 Access Points
- Site Survey to place Access Points on map



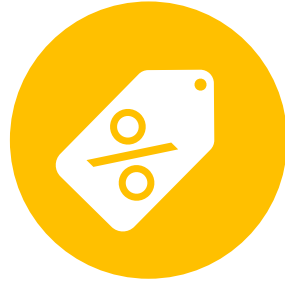
No Single Technology Delivers for All Use Cases



Use Cases—Representative



Navigation/
Wayfinding



Proximity
Marketing



Analytics/
Insights



Space Utilization



Hyperlocation

- Three or more access points with antenna and module
- Site survey for placement
- No device application required
- Improved accuracy and refresh with device application

Virtual Beacon

- Three or more Beacon Points.
- No physical beacons
- Highly flexible management with Cloud-based Beacon Center
- Requires device application



Wi-Fi and BLE Use Case Recommendations

Use Cases	Wi-Fi		BLE	
	Triangulation	Hyperlocation	Physical	Virtual
Presence Analytics Passer-by, Conversion, Dwell Times	✓			
Geofence – Alerts	✓	✓		
Location Analytics Zone Based Position, Footfall, Traffic Heatmap, Path and Correlation	✓	✓		
Location Analytics Wait/Queue times		✓	✓	
Proximity Messaging, Engagement				✓
Indoor Wayfinding/Navigation (“Turn by Turn”)				✓

Enabling High Accuracy Wi-Fi

Using Wi-Fi for Highly Accurate and Near-Real Time Location

Hardware Hyperlocation Solution



Module
and/or Antenna



Applies to
Aironet AP3700,
AP2800*, AP3800*



Uses 16 to 32
antennas to
determine mobile
client location

Client Side Application Phunware Software

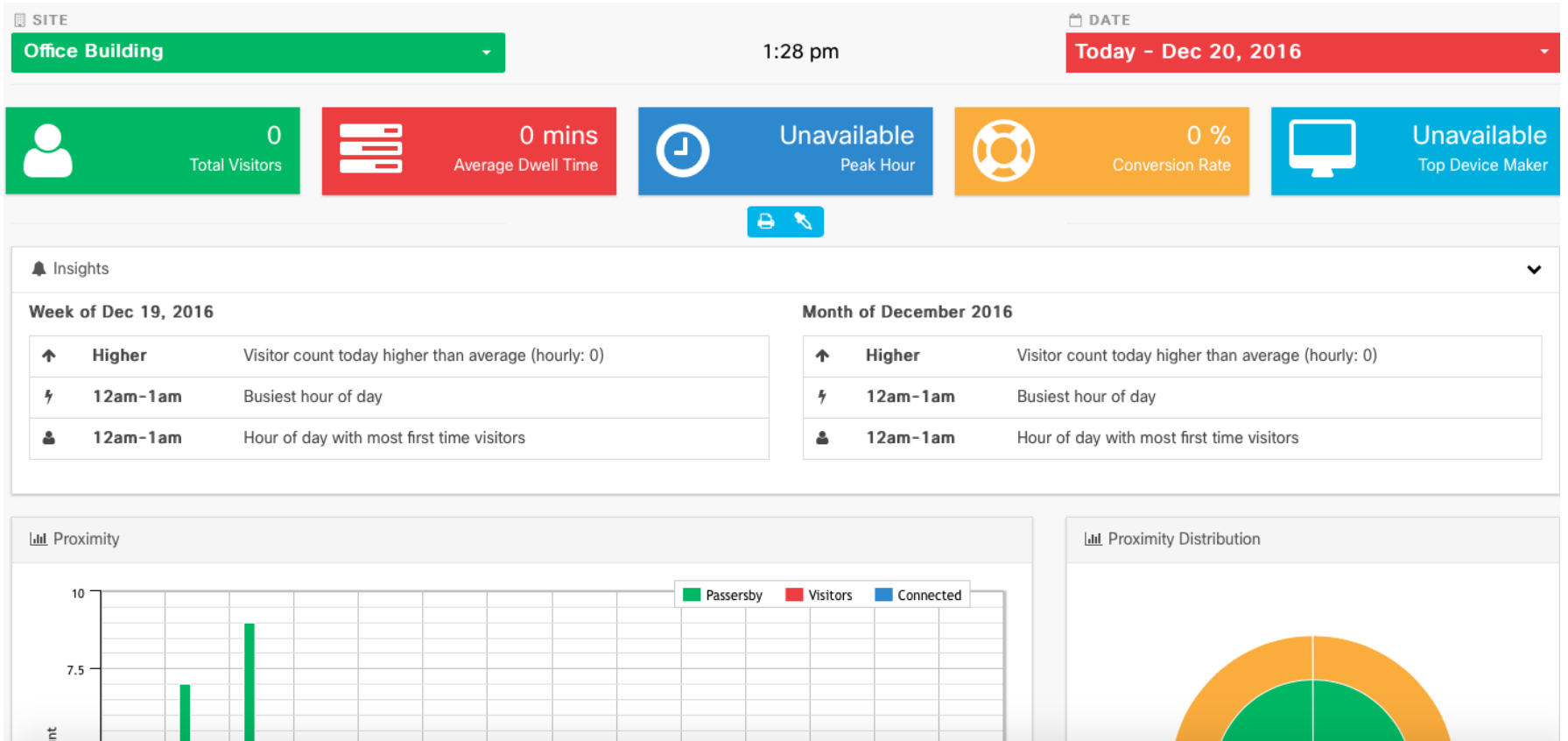


Uses Wi-Fi and BLE from
Hyperlocation plus device
sensors to enhance location
and refresh rate



Delivers
mobile experience

CMX Presence and Location Analytics



Enabling High Accuracy Location



Using BLE for Highly Accurate and Near-Real Time Location

Software-defined Beacon
Cisco Virtual Beacon Solution



Cisco Beacon Point



Cisco Beacon Center

Client Side Application
Phunware Software

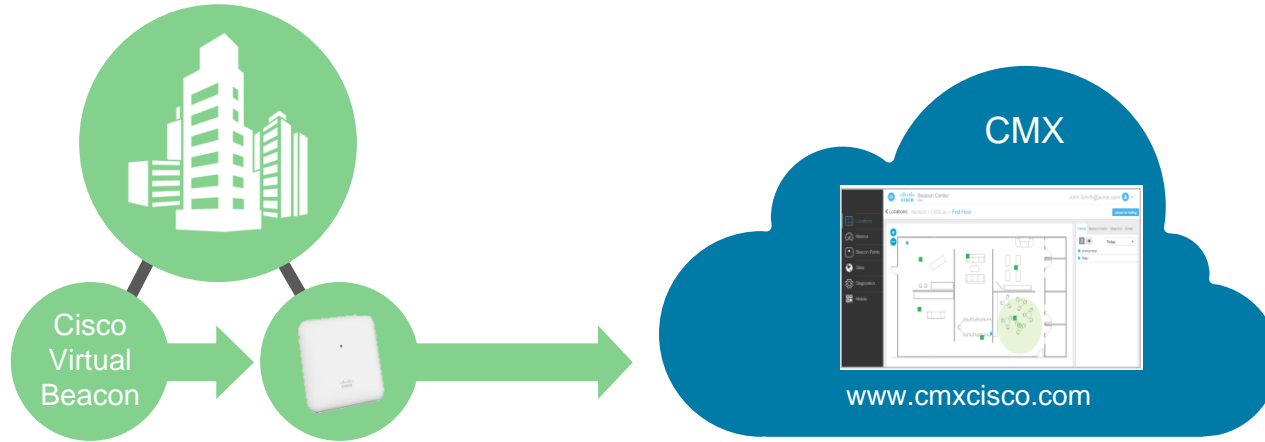


Uses BLE to enhance location
and refresh rate



Delivers
mobile experience

CMX Virtual Beacon Solution



What is it?

- **Beacon Point** generates BLE beams
- **Beacon Center** creates virtual beacons and manages beacon points via Cloud. Priced per beacon point per year

Customer Benefits

- Eliminates battery operated BLE beacons
- Operational Simplicity with virtual beacons
- Proximity Engagement and Indoor navigation

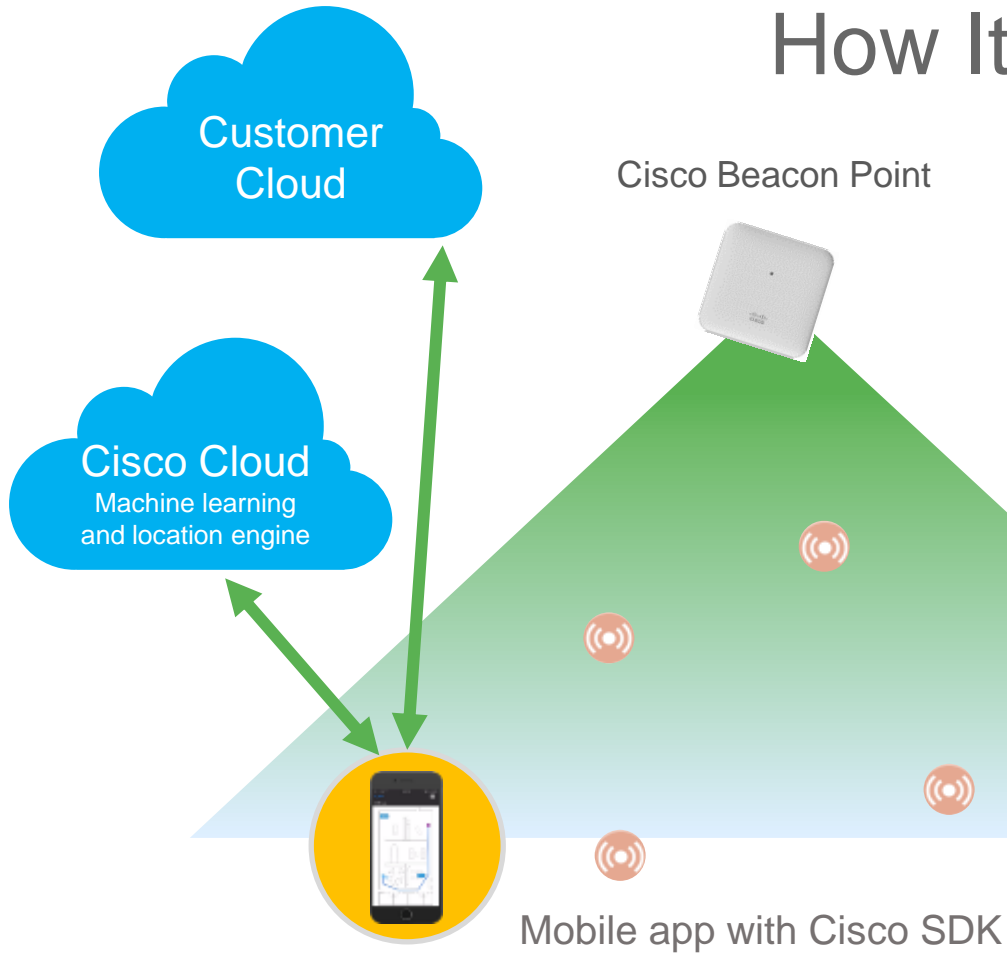
CMX Virtual Beacon – Value Proposition

Proximity Engagement

Turn-by-Turn Navigation

- Create multiple Virtual Beacons
- Network Based & Managed
- Remotely Reconfigurable; Add or move beacons with a click
- Eliminate batteries
- Eliminates site surveys with advanced machine learning
- Operational simplicity
- Accuracy (< 3m)
- Latency (< 3 s)

How It Works



- 1 Mobile device listens to beacons generated by Beacon Points
- 2 Cisco SDK sends data to the Cisco cloud (via WiFi or 3/4G)
- 3 Cisco Cloud sends location & map information to the mobile app.
- 4 Cisco Cloud can interact with Customer cloud for user, location and content
- 5 When in proximity of a beacon, notifications or URLs can be sent
- 6 Virtual Beacons can be created anywhere in the coverage area

Simplify Beacons – CMX Beacon Center

The screenshot displays the Cisco Beacon Center interface. At the top left, the Cisco logo and 'Beacon Center Beta' are visible. The user's email, 'John.Smith@acme.com', is shown at the top right. The breadcrumb navigation indicates the current location: 'Locations: Nortech > CMXLab > First Floor'. A sidebar on the left contains navigation icons for Locations, Metrics, Beacon Points, Sites, Diagnostics, and Mobile. The main area shows a floor plan with two highlighted zones, 'Zone 1' and 'Zone 2', and a specific beacon labeled 'VBEACON 6'. A right-hand panel lists beacon points under the 'vBeacons' tab, including 'CMX Classroom', 'CMX Clinic', 'CMX Restaurant', 'CMX Retail', 'vBeacon 6', and 'Welcome to the Lobby'. A 'Unlock for Editing' button is also present.

Drag and Drop
Virtual Beacons

Create
Proximity Message

Engagement
Metrics

Manage
Beacon Points

Machine Learning
Across Device Types



Leading with the Use Case

Workplace Analytics



- Leverages the power of location based analytics
- Dashboard of :
 - Actual utilization vs design capacity
 - Underutilization vs congestion
 - Employee mobility patterns
 - ‘Before’ and ‘after’ analysis
 - Cost savings opportunities
 - Predictive analytics
- Rifiniti, a Cisco development partner, uses CMX to deliver workplace analytics



CMX delivering business outcomes –

University of British Columbia uses CMX to reduce energy cost

Business Objectives

- Build upon the university's green reputation
- Save costs and reduce carbon footprint
- Use the university's existing network to accomplish

Solutions

- Cisco Wireless Network with 5,000 access points
- Cisco Connected Mobile Experiences
- Siemens HVAC System
- Sensible Building Science Application

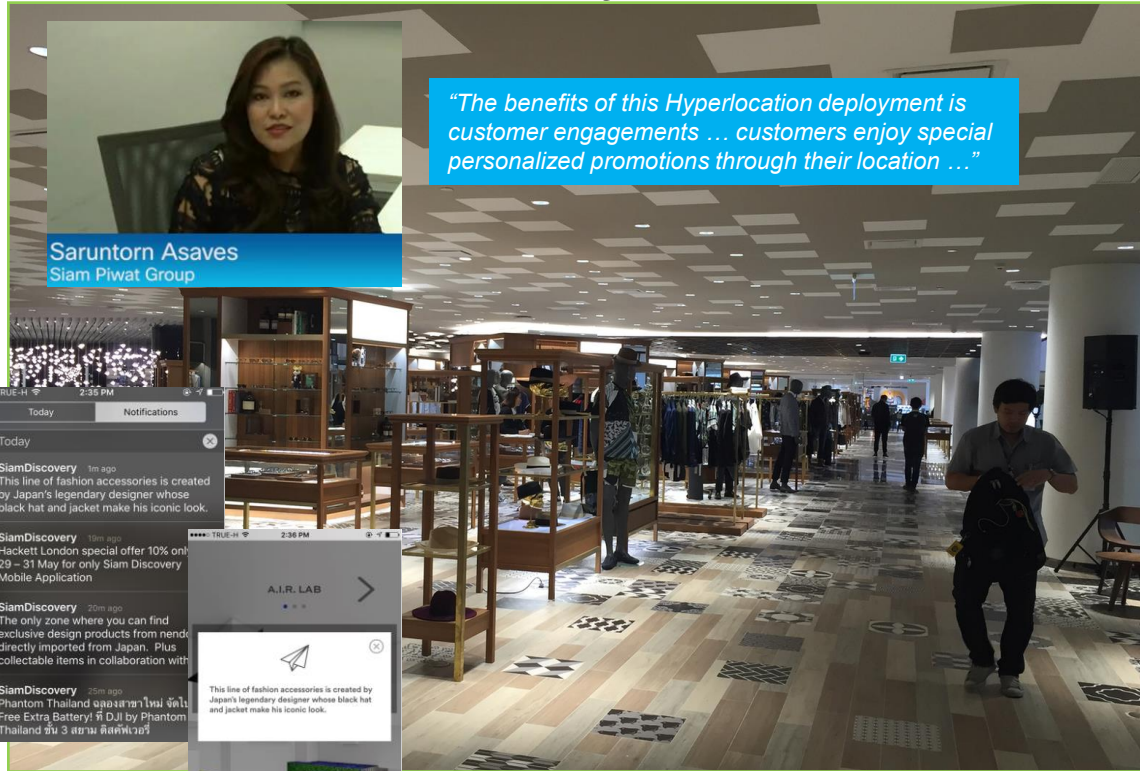
Business Outcomes

- UBC saved 7-10% total energy costs and expects greater than 10% savings through further refinements
- Return on investment within three years



59,000 students and 15,000 faculty

Siam-Piwat Discovery Mall - Thailand



- **Analytics**
Floor, Shops & Zones
- **App Engagement**
Developed by Excel
- **Zone Engagement**
Based on location & shopping history

CMX delivering business outcomes –

University of Melbourne powers smart campus with Wi-Fi Analytics

Business Objectives

- Prepare traffic plans for planned street excavation
- Reduce congestion for better on-campus experience
- Determine occupancy for future facilities modernization

Solutions

- Cisco Wireless Network with 4,500 access points
- Cisco Connected Mobile Experiences
- CMX Presence and Location Analytics

Business Outcomes

- Substantial savings -- \$15,000 per day for surveys – and more complete picture of traffic patterns
- Increased revenue by determining most effective on-campus advertising placement
- More effective analytics for business decision making throughout the campus



65,000 students and 6,500 faculty

CMX powers personalized student experiences—

Deakin University uses Cisco to digitize the physical campus

Business Objectives

- Provide rich, personalized experience to students
- Use location to provide context and relevance to interactions
- Boost student satisfaction through digitally enabled campus facilities

Solutions

- Cisco Wireless Network with Aironet access points
- Cisco Connected Mobile Experiences
- CMX Presence and Location Analytics

Business Outcomes

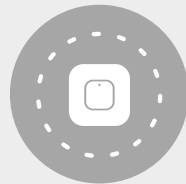
- Library occupancy app helps students identify open study spaces
- #1 in student satisfaction in Victoria, Australia
- Interactive app lets students call for library assistance



<http://www.cisco.com/c/en/us/solutions/enterprise-networks/connected-mobile-experiences/deakin-university-connected-mobile-experiences-prototypehd.html>

Q & A

Thank You



Good—Presence Best Practices

- Based on Probe requests send by mobile device: RSSI
- Accuracy: 20m
 - Device is inside or outside the store
- Works for non-associated devices
 - BUT: Device might use Random MAC*
- 1 AP for small locations:
 - Small shop / restaurant / café
- Good for
 - CMX Presence Analytics
 - Dwell time
 - Repeat visitors



Better—Standard Location Best Practices

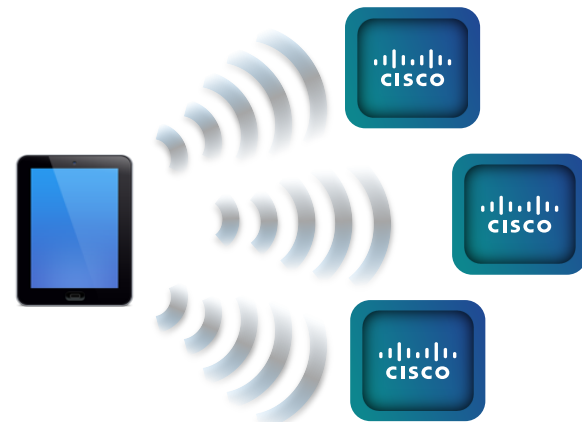
- Based on Probe Requests send by mobile device: RSSI
- Works for non-associated devices
 - BUT: Device might use Random MAC*
- Update Frequency depending on device probing (30sec – 5min)
 - Update Frequency depending on application behavior or wakeup frames from AP (5 – 20 sec)
 - Works only for associated devices

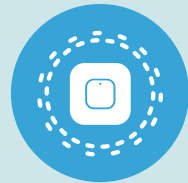
RF uncertainty

- AP Placement and RF environment
- Noise present in the RF environment

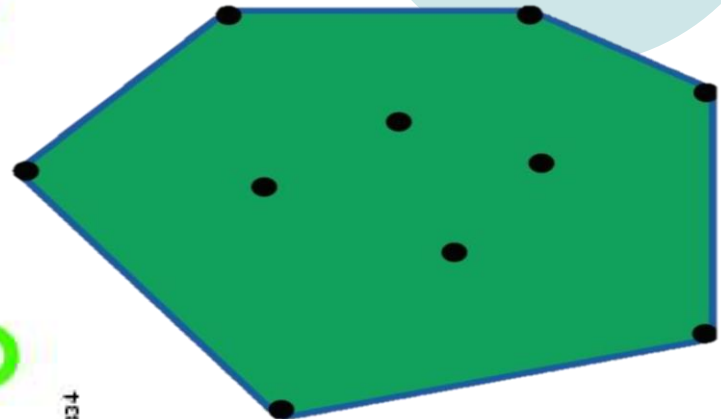
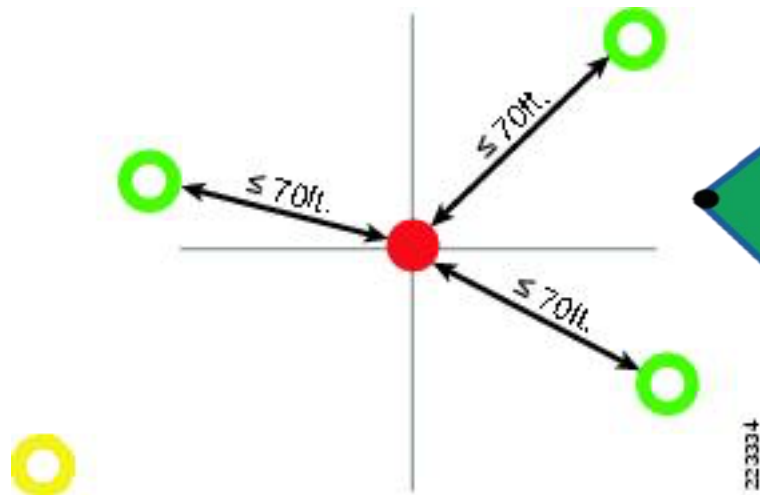
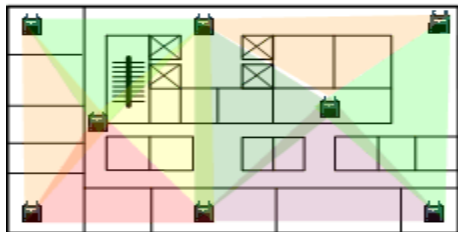
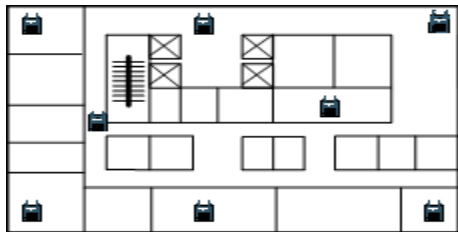
Client behavior

- Probing occurs when a client is discovering the network and, once connected, at regular intervals
- Frequency at which the client transmits probe requests





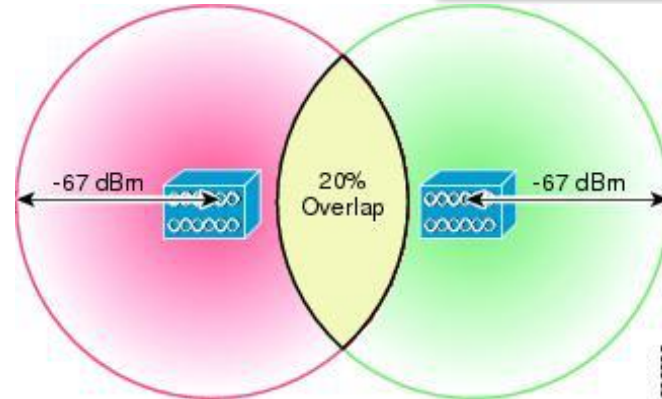
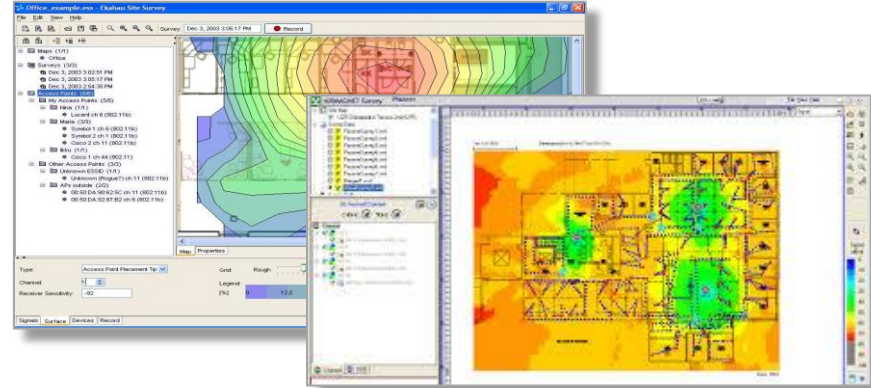
Location RSSI Best Practices



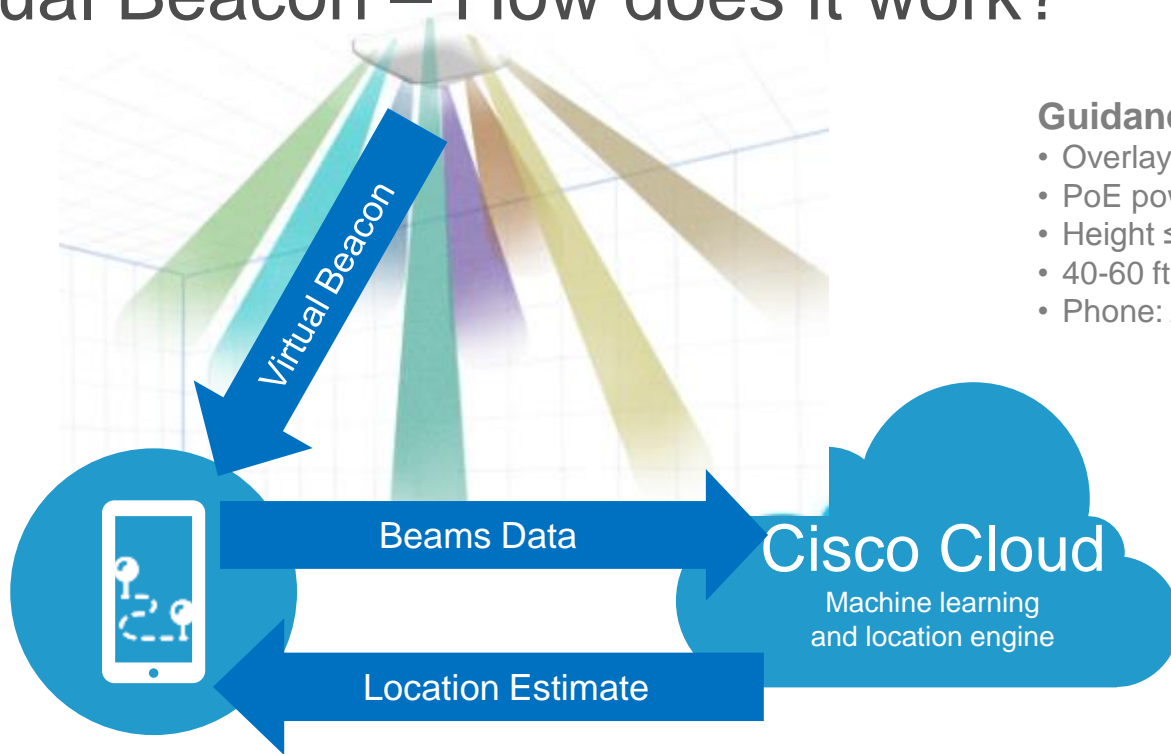
Distance 40 – 65 ft.
-75 dBm Client RSSI on 3 APs
(Line of sight - a must have for Hyperlocation)

Rule of Thumb for Site Survey

- Example for Predictive Site Survey with Ekahau or AirMagnet Planner
 - Design for 5 GHz
 - Signal Strength ≥ -67 dBm
 - SNR ≥ 20 dB
 - Number of APs = 3
 - Packet Loss = 10%
 - Transmit Power 10mW
 - Cell overlap = 15%-20%
- Rule of thumb is 1 AP per:
 - 460 m² (5000 sq ft) for Data
 - 230 m² (2500 sq ft) for Voice / Location



Virtual Beacon – How does it work?



Guidance

- Overlay
- PoE power/Daisy Chain
- Height \leq 15 ft
- 40-60 ft separation
- Phone: App & BLE on

