Your Time Is Now
Connected Mobile Experiences (CMX)  
Aligning Use Cases and Technology  

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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

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

Technology Preferences

Aligned with Customer Need

Use Case Preferences
- Navigation
- Proximity Marketing
- Analytics
- Space Utilization
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

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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

- **Office Building**
- **1:28 pm**
- **Today - Dec 20, 2016**

**Insights**

- **Week of Dec 19, 2016**
  - **Higher**: Visitor count today higher than average (hourly: 0)
  - **12am-1am**: Busiest hour of day
  - **12am-1am**: Hour of day with most first time visitors

- **Month of December 2016**
  - **Higher**: Visitor count today higher than average (hourly: 0)
  - **12am-1am**: Busiest hour of day
  - **12am-1am**: Hour of day with most first time visitors

**Proximity**

- **Proximity Distribution**

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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

- 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

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

“The benefits of this Hyperlocation deployment is customer engagements … customers enjoy special personalized promotions through their location …”

• 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

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 $\geq -67$ dBm
  - SNR $\geq 20$ 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 ≤ 15 ft
- 40-60 ft separation
- Phone: App & BLE on

Cisco Cloud
Machine learning and location engine

Beams Data
Location Estimate

Virtual Beacon

Beams Data
Location Estimate