

iBeacon - Frequently Asked Questions

1. What is iBeacon?

iBeacon is a new technology developed by Apple that has been built into its operating system and devices since 2013. It is based on BLE (Bluetooth Low Energy).

iBeacon functions as an indoor positioning system, that allows businesses to advertise their presence to nearby smartphones. With iBeacons set up, businesses can send messages to potential customers (such as special offers or goods) when they walk past an iBeacon.

2. What are iBeacons?

iBeacons are standalone devices that constantly send out a UUID (Universally Unique Identifier) using Bluetooth 4.0 Low Energy. The iBeacon devices can come in different form factors. You can turn any device that has a Bluetooth 4.0 LE radio onboard into an iBeacon device, therefore you can find them on:

- iPhones
- Android phones
- Small PCBs
- USBs
- MAC laptops
- Apple TVs
- ...

Here are some examples of iBeacon suppliers and iBeacon software drivers:

<http://beekn.net/2013/10/arduino-based-bluetooth-le-with-ibeacons-potential/>
<http://estimote.com/>
<http://roximity.com/>
<http://www.radiusnetworks.com/macbeacon-app.html>

3. What are the 3 identifiers in iBeacon?

- Proximity UUID:
 - A unique ID to distinguish the iBeacons from one another
- Major (optional):
 - Used to specify a specific iBeacon in a group
- E.g. location in NY is 1 and in San-Fran is 2

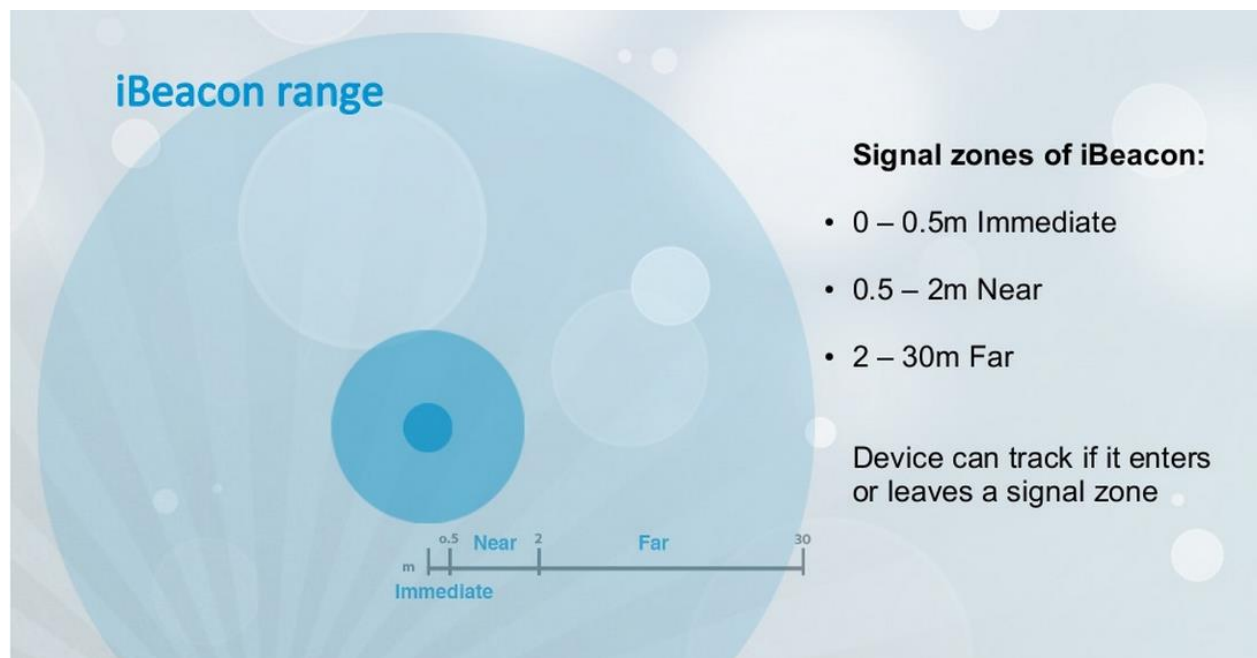
- Minor (optional):
 - Used to group related sets of iBeacons
- E.g. Entrance is 4 and Gardening is 8

4. What is Bluetooth Low Energy or BLE?

BLE communication consists of two main parts: **advertising** and **connecting**. Advertising is a one-way discovery mechanism (used by iBeacon). Devices which want to be discovered can transmit packets of data in intervals from 20 ms to 10 seconds. The shorter the interval, the shorter the battery life, but the faster the device can be discovered.

BLE (iBeacon) devices can operate in a non-connectable advertisement-only mode (where all the information is contained in the advertisement), but they can also allow connections (and usually do).

After a device is discovered, a connection can be established. It is then possible to read the services that the BLE device offers, and for each service there are characteristics. Each characteristic provides some value, which can be either read, written, or both read/written.



5. What are the differences between classic Bluetooth and BLE?

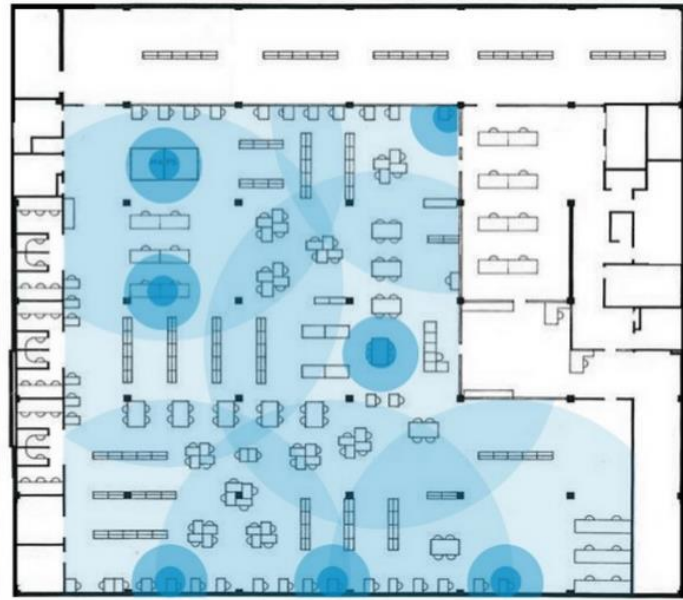
Technical Specification	Classic Bluetooth technology	Bluetooth low energy technology
Distance/Range (theoretical max.)	100 m (330 ft)	50 m (160 ft)
Over the air data rate	1–3 Mbit/s	1 Mbit/s
Application throughput	0.7–2.1 Mbit/s	0.27 Mbit/s
Active slaves	7	Not defined; implementation dependent
Security	56/128-bit and application layer user defined	128-bit AES with Counter Mode CBC-MAC and application layer user defined
Robustness	Adaptive fast frequency hopping, FEC , fast ACK	Adaptive frequency hopping, Lazy Acknowledgement, 24-bit CRC, 32-bit Message Integrity Check
Latency (from a non-connected state)	Typically 100 ms	6 ms
Total time to send data (det.battery life)	100 ms	3 ms , <3 ms
Voice capable	Yes	No
Network topology	Scatternet	Scatternet

Power consumption	1 as the reference	0.01 to 0.5 (depending on use case)
Peak current consumption	<30 mA	<15 mA
Service discovery	Yes	Yes
Profile concept	Yes	Yes
Primary use cases	Mobile phones, gaming, headsets, stereo audio streaming, automotive, PCs, security, proximity, healthcare, sports & fitness, etc.	Mobile phones, gaming, PCs, watches, sports and fitness, healthcare, security & proximity, automotive, home electronics, automation, Industrial, etc.

6. How does iBeacon work?

iBeacon can be compared with Geofencing in Wi-Fi. iBeacons use only the advertisement channel. As the “beacon” name suggests, they transmit packets of data in regular intervals, and this data can be then picked up by devices like smartphones. iBeacons are simply a specific usage of BLE advertisements.

Placing Beacons for indoor services



By placing beacons transmitters the receiving unit can be tracked and guided indoor.

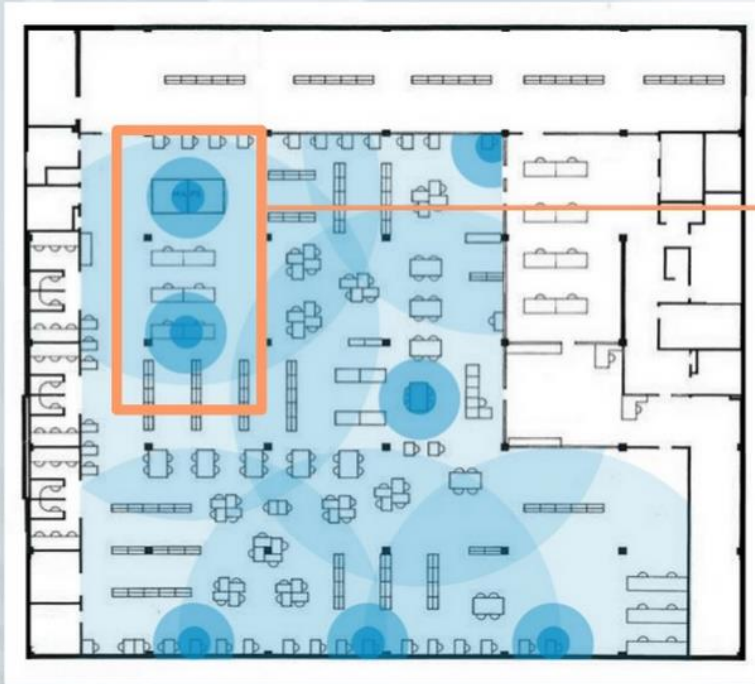
Position can be calculated by overlapping Zones.

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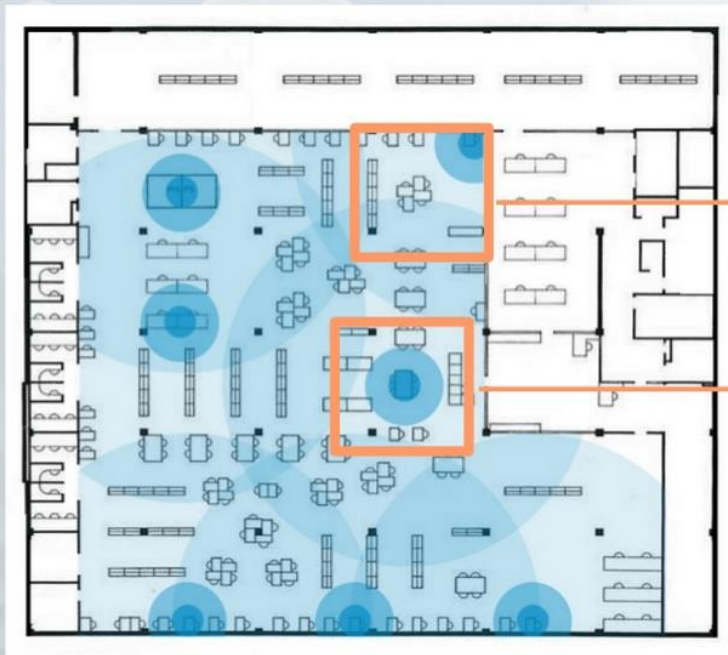
Beacon Group tracking the entrance area: entering / leaving

Placing Beacons for indoor services



Single Beacons
on POI / POS
for push services

Placing Beacons for indoor services



Beacon Group tracking
areas: e.g. heat maps

Print screen from a presentation at this link:

<http://www.digital-worx.de/ibeacon.html>

7. How does iBeacon detect proximity?

TX power is used to determine how close you are to a beacon. This can be presented either as rough information (immediate/far/out of range) or as a more precise measurement in meters. The TX power in the beacon protocol is the strength of the signal measured at 1 meter from the device (RSSI – Received Signal Strength Indication). As the strength of the signal decreases predictably as we get further, knowing the RSSI at 1 meter, and the current RSSI (we get that information together with the received signal), it is possible to calculate the difference. iOS has this built-in, for other platforms, it needs to be hand-coded. Obstacles such as furniture, people or communication congestion can weaken the signal. Keep in mind the distance is only an estimate.

8. Some challenges with iBeacon?

Interference is the primary challenge with iBeacon technology as there is not a CleanAir equivalent, and it is low energy that can easily be cancelled out with stronger interference such as Microwave Ovens, DECT phones, etc..

These challenges aren't uncommon and include behavior that you might not expect:

- Your app might detect a beacon, find a second beacon, and then toggle between the two
- Your app might toggle between different distances, thinking that it's near a beacon and then far
- Your app might lose all contact with beacons for a very brief interval
- There might be delays in receiving lock screen notifications
- Your app will behave differently when it's in background mode versus "in front" and won't detect beacons at all if the user has hard closed the app
- When using iBeacon in combination with cloud based processing, 3G-4G connectivity is required and can turn out to become very expensive for the end user.

9. How can Cisco help in fixing those challenges?

Thanks to our SAgE chip (CleanAir) we can detect:

- Sources that interfere with your iBeacon devices
- The footprint of your iBeacon device – allowing you to tune and adjust

- Overlapping of iBeacon coverage
- Check the battery level of an iBeacon device, by detecting a coverage degradation of a device
- Check for rogue iBeacon devices
- Check for missing iBeacon devices
- 802.11u to roam from a 3G-4G network to a Wi-Fi network.

10. Is iBeacon only running on Apple iOS devices?

iBeacon is invented by Apple, but since it is based on BLE, it can be supported by other vendors or operating systems such as Android.

Apple Developer:

<https://developer.apple.com/wwdc/videos/?id=307>

Android iBeacon library:

<http://developer.radiusnetworks.com/ibeacon/android/configure.html>

11. What is the Core Location framework in (Apple) iOS?

The iBeacon Core Location framework lets you determine the current location or heading of a device. You use the classes and protocols in this framework to configure and schedule the delivery of location and heading events. You can also use it to define geographic regions and monitor when the user crosses the boundaries of those regions. In iOS, you can also define a region around a Bluetooth beacon.

https://developer.apple.com/library/ios/documentation/CoreLocation/Reference/CoreLocation_Framework/index.html

12. iBeacon compatible devices?

Apple iOS devices with Bluetooth 4.0 (iPhone 4S and later, iPad (3rd generation) and later, iPad Mini (1st generation) and later, iPod Touch (5th generation)).

Android devices with Bluetooth 4.0 and Android 4.3 and later (Samsung Galaxy S3/S4/S4 Mini, Samsung Galaxy Note 2/3, HTC One, Google/LG Nexus 7 (2013 version)/Nexus 4/Nexus 5, HTC Butterfly (aka Droid DNA).

Macintosh computers with OS X Mavericks (10.9) and Bluetooth 4.0 using the MacBeacon application from Radius Networks.

13. What are iBeacon's capabilities?

- Proximity marketing: iBeacons can probe information that can be picked up by the phone and pushed to the screen or can be processed alternatively by a phone app or can be send to a cloud based server, processed in the cloud and specific info can be send back to the device.
- Micro-Location targeting: location based offerings can be sent to the device based on the location of the user. Also this can go via an app or cloud based
- Customized marketing: beacons picked up by the device can be sent to a (private)-cloud based application and processed based on the user, the preference, location,...
- Indoor-mapping: navigation through large areas, here iBeacons work as a sort of choke point
- Self-Guided tour: landmarks that can be used to deliver location specific content.

14. iBeacon vs GPS?

Where GPS is globally used as location technology, it has some disadvantages in terms of reaching the GPS signal inside buildings or basements, precision of the location, battery usage; iBeacon is more precise (within 150 feet), works indoor and underground, virtually no signal obstruction.

15. iBeacon vs NFC?

NFC works only with NFC enabled devices, the device has to be really near the field of the other communicating device (<4inches), it can only handle transactions, mainly focus for payment. iBeacon on the other hand works on every Bluetooth 4.0 enabled device, the signal can go up to 150 feet, it can publish info, but also (in combination with an app or compute service) can be used as a communication technology.

16. iBeacon vs WLAN?

In many cases it looks like iBeacon is a competing solution with Wi-Fi based location services. However, imagine following scenario: an iBeacon tag can reach 150 feet, when deploying multiple iBeacon devices, there is a possibility that the iBeacon devices are overlapping, so to which device should the iBeacon app listen? Here our LBS service can come in handy, as we can actually “see” the users exact location, and based on this info, direct the client to listen to the best iBeacon information.

Also, when iBeacon needs to communicate to a cloud service, it will use the 3G-4G connection of the device and those connections can be slow and costly, therefor technology as 802.11u can become handy to automatically move to WiFi.

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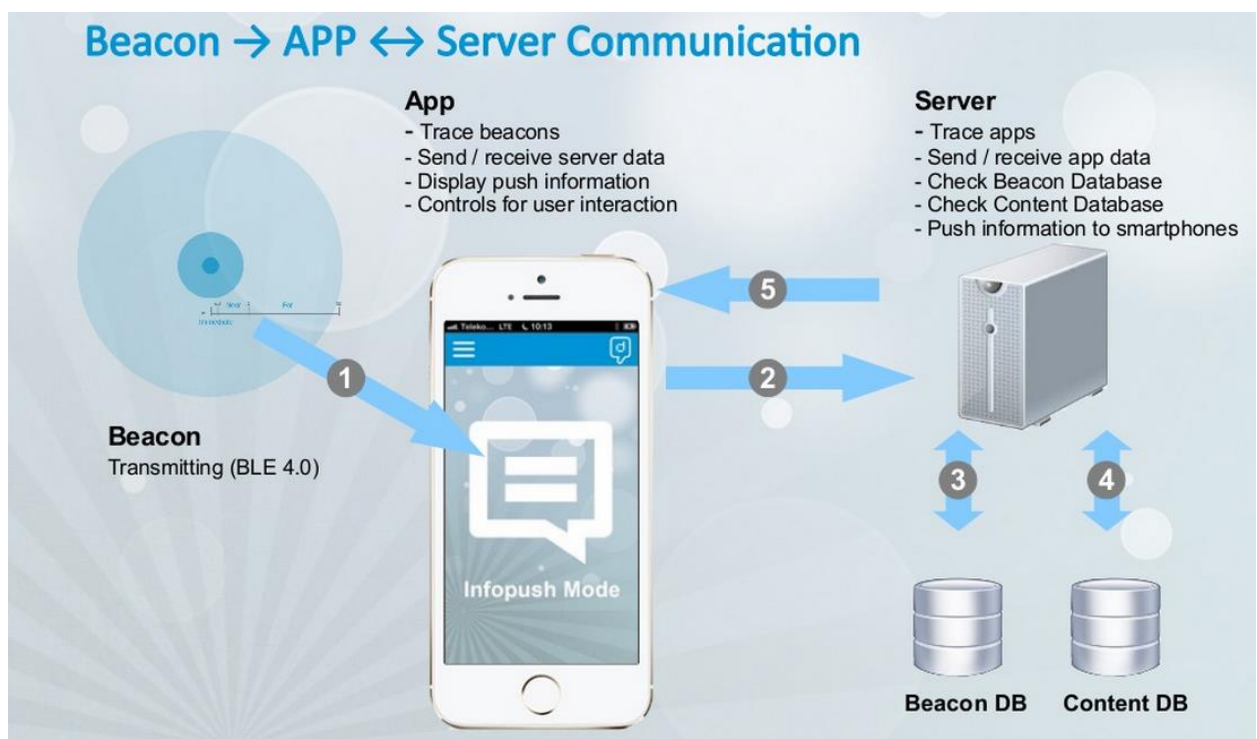
17. Do I need to develop an app in order to use iBeacon?

Not if you are Apple as they have can use it natively with applications already on the iPhone, but pretty much yes if you are everyone else.

18. How is iBeacon communicating with an application?

iBeacon can be used in following scenario's:

- Direct with the iBeacon service on the iPhone
- Direct with an application that has access to the BLE protocol stack
- Direct with an application that is communicating with a cloud service
- Direct via a browser and a cloud service.



19. iBeacon and security?

It comes fully loaded with AES128 encryption featuring a robust connection that has cyclical redundancy checks and adaptive frequency hopping.

20. iBeacon and our Sage chipset?

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21. Privacy concerns on iBeacon?

From the Apple website:

If you allow third-party apps or websites to use your current location, you agree to their terms, privacy policies, and practices. You should review the terms, privacy policies, and practices of the apps and websites to understand how they use your location and other information. Information Apple collects will be treated in accordance with Apple's Privacy Policy.

22. Does iBeacon deliver content?

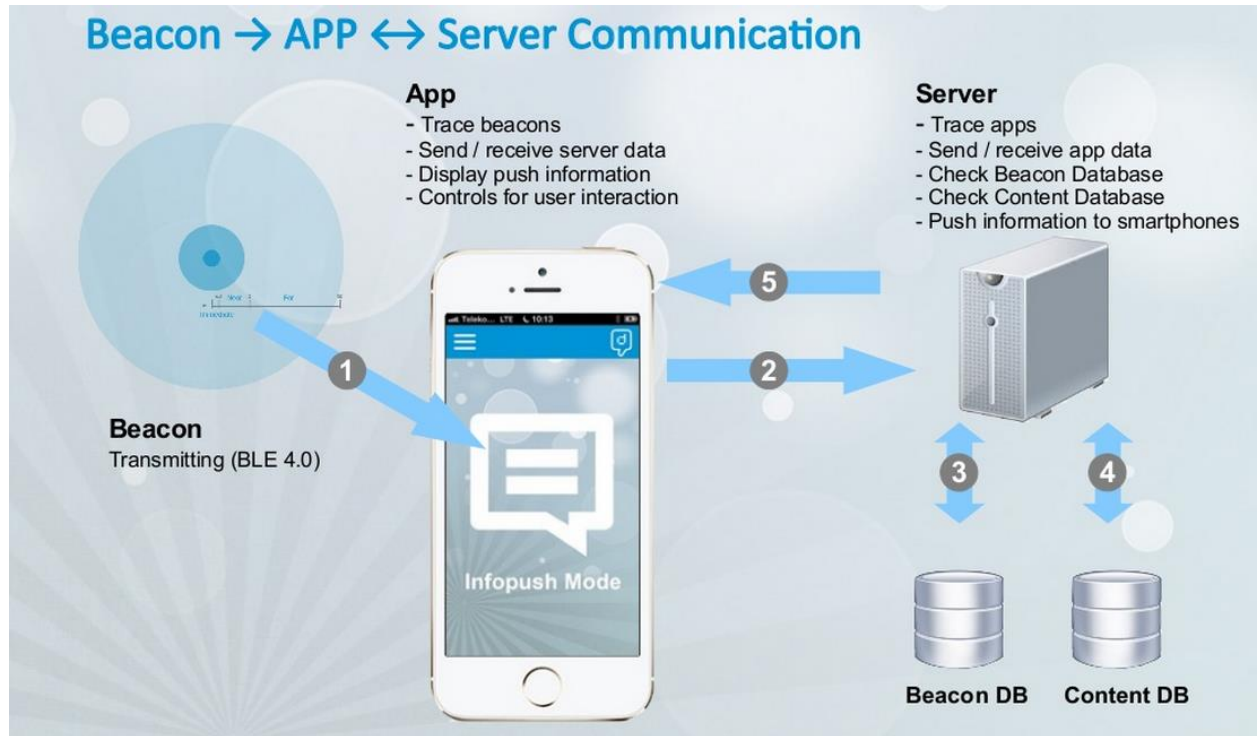
iBeacons don't actually transmit content - they transmit a UUID, enabling apps to retrieve and surface location-relevant content.

23. What does a store need to buy to install iBeacon?

In order to install iBeacon, it is not enough to buy the iBeacon tags, you will need:

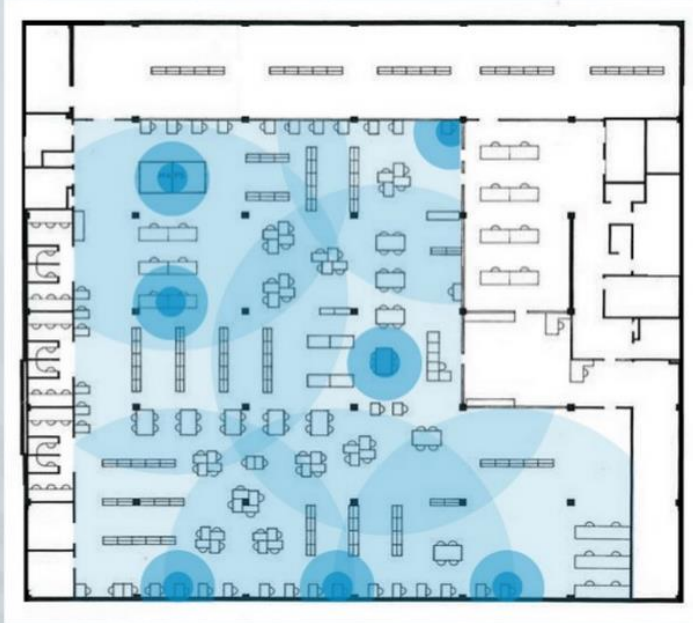
- Make a survey and determine what type of events you would like to cover with iBeacon:
 - Footfall?
 - Direct marketing?
 - Enter and leave store?
 - Way finding?
- Buy the tags
- Make an APP
- Make a (private)cloud service
 - App server

- iBeacon UUID Database
- APP content Database



24. Where would they install iBeacon technology?

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