

物聯網感測元件實務

Apple iBeacon

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iBeacon

From welcoming people as they arrive at a sporting event to providing information about a nearby museum exhibit, iBeacon opens a new world of possibilities for location awareness, and countless opportunities for interactivity between iOS devices and iBeacon hardware.

iBeacon for Apps

Give your iOS apps the ability to determine its proximity to iBeacon-enabled hardware with Core Location APIs.

- ▶ [What's New in iOS Notifications](#)
- ▶ [Taking Core Location Indoors](#)

iBeacon Hardware

iBeacon-enabled hardware and accessories must integrate iBeacon technology to ensure a reliable and consistent experience for customers. For information about deploying devices, read [Getting Started with iBeacon](#).

<https://developer.apple.com/ibeacon/>

- iBeacon 是 Apple 公司在 2013 年的 Apple Worldwide Developers Conference (WWDC) 提出的一套可用於室內定位系統協議
- 可以讓附近手持電子設備檢測到的一種新的低功耗、低成本信號傳送器

<https://zh.wikipedia.org/wiki/IBeacon>

- 此技術可以使一個智慧型手機或其他裝置在一個 iBeacon 的感應範圍內執行相應的命令
- 幫助智慧型手機確定他們大概位置或環境的一個應用程式

- 在 iBeacon 的幫助下，智慧型手機的軟體能大概找到它和這個 iBeacon 的相對位置
- iBeacon 能讓手機收到附近售賣商品的通知，也可以讓消費者不用拿出錢包或信用卡就能在銷售點的 POS 機上完成支付

- iBeacon 技術通過低功耗藍牙（Bluetooth low energy, BLE）來實現
- iBeacon 為利用低功耗藍牙可以近距離感測的功能來傳輸通用唯一識別碼的一個 app 或作業系統

- 識別碼可以在網上被查找到用以確定設備的物理位置或者可以在設備上觸發一個動作比如在社交媒體簽到或者推送通知

動手試試看

- Android 4.3 以上，藍牙 4.0
- iPhone 4S 以上 / iPad 3 以上，iOS 7.1 以上

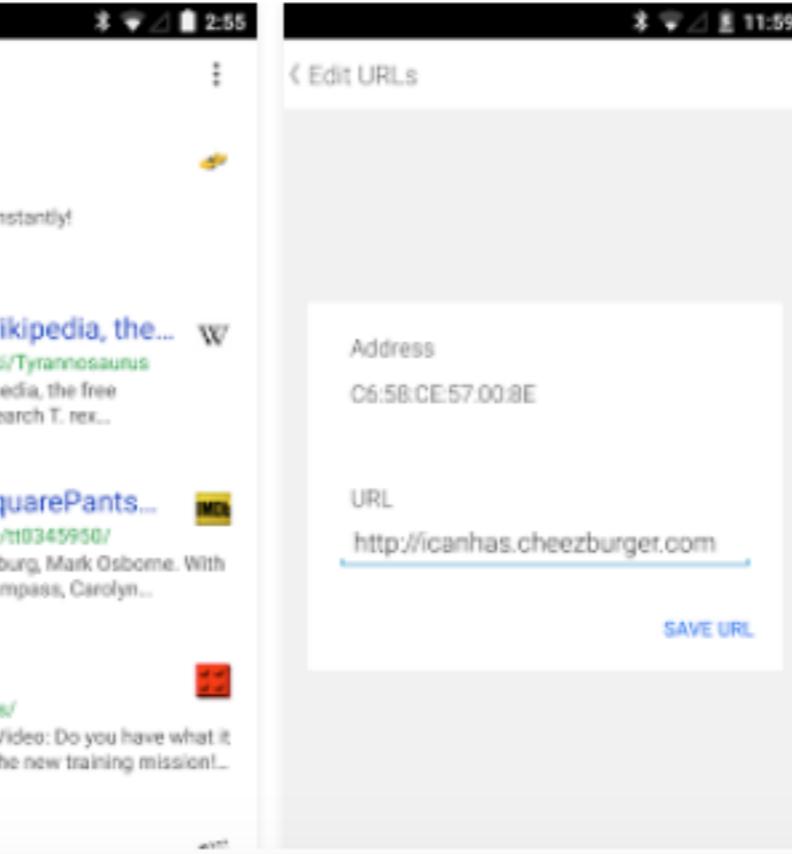
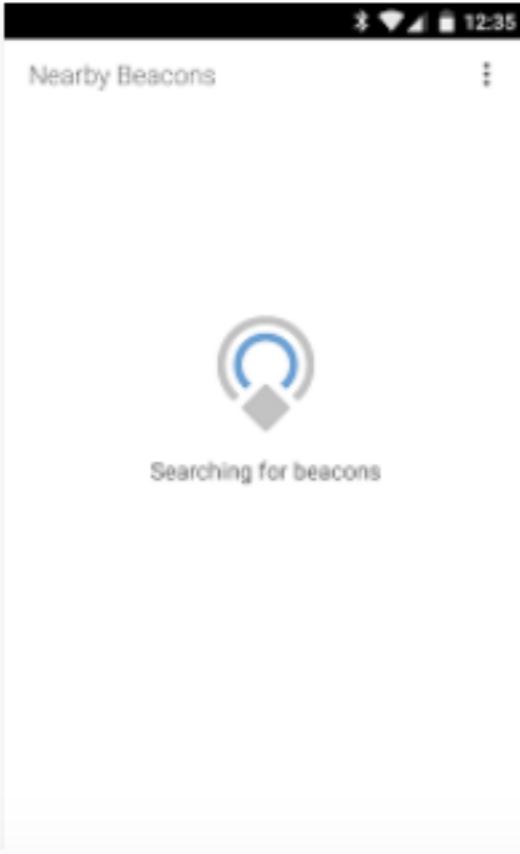


Physical Web

The Physical Web Team 工具
3+

★★★★★ 182 人

加入願望清單 安裝



https://play.google.com/store/apps/details?id=physical_web.org.physicalweb&hl=zh_HK

Physical Web

[View More by This Developer](#)

By Viet Hoa Dinh

Open iTunes to buy and download apps.

[View in iTunes](#)

+ This app is designed for both iPhone and iPad

Free

Category: Utilities

Updated: 30 April 2015

Version: 0.1.4

Size: 1.6 MB

Language: English

Developer: Viet Hoa Dinh

© 2014 Hoa Dinh

You must be at least 17 years old to download this application.

Unrestricted Web Access

Compatibility: Requires iOS 8.0 or later. Compatible with iPhone, iPad, and iPod touch.

Customer Ratings

We have not received enough ratings to display an average for this app.

Description

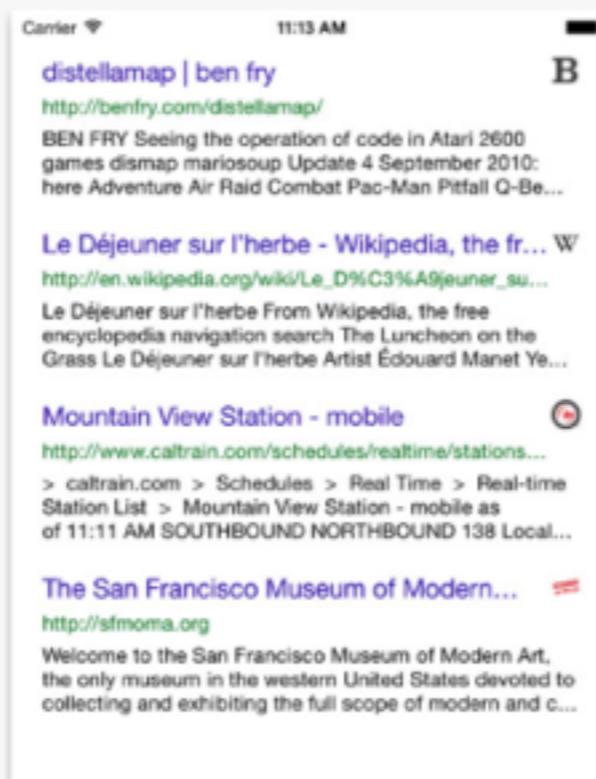
The Physical Web is a utility to find and configure physical web bluetooth devices. If you are a Maker and want to experiment with the Physical Web, go to physical-web.org and learn about the possible devices that you can program.

[Viet Hoa Dinh Web Site](#) ▾ [Physical Web Support](#) ▾

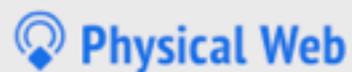
What's New in Version 0.1.4

- new icon,
- fixed issue with automatic URL shortener.

Screenshots

[iPhone](#) | [iPad](#)

The Physical Web



Start Building Now! > [RESOURCES](#) [FAQ](#) [EXAMPLES](#)



The Physical Web is an open approach to enable quick and seamless interactions with physical objects and locations.



<https://google.github.io/physical-web/>

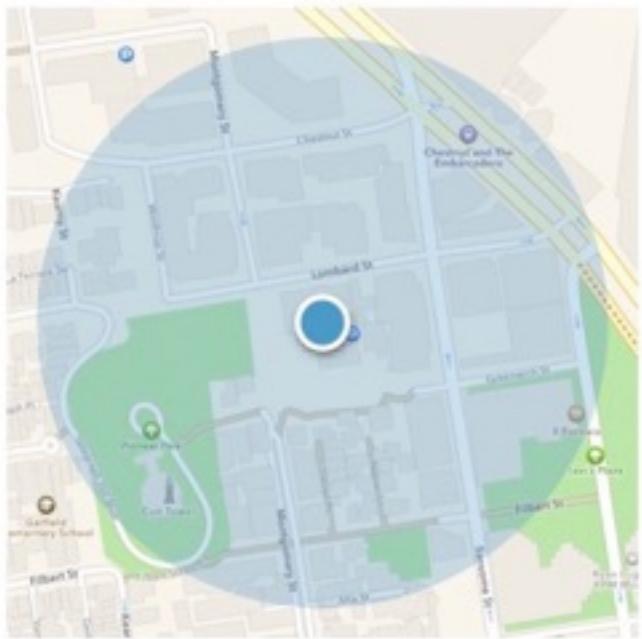
About iBeacon

- iBeacon 是 iOS 中延伸定位服務的一種新技術
- iBeacon 基地台透過低功耗藍牙技術 (Bluetooth Low Energy，也就是 Bluetooth Smart) 建立一個訊號接收區域

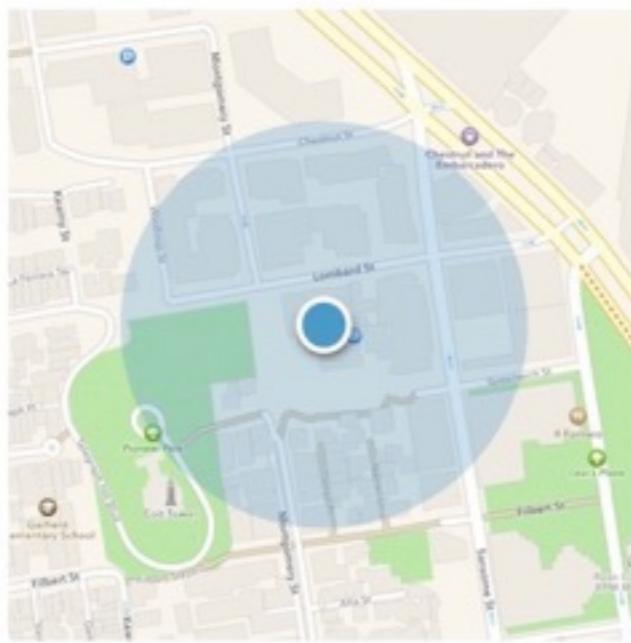
iBeacons

- Core Location monitors Bluetooth LE beacon signals
- Various hardware can be a beacon
 - Third-party Bluetooth LE emitters
 - iOS devices
- Advantages
 - Accuracy and range awareness
 - One beacon ID can cover multiple locations

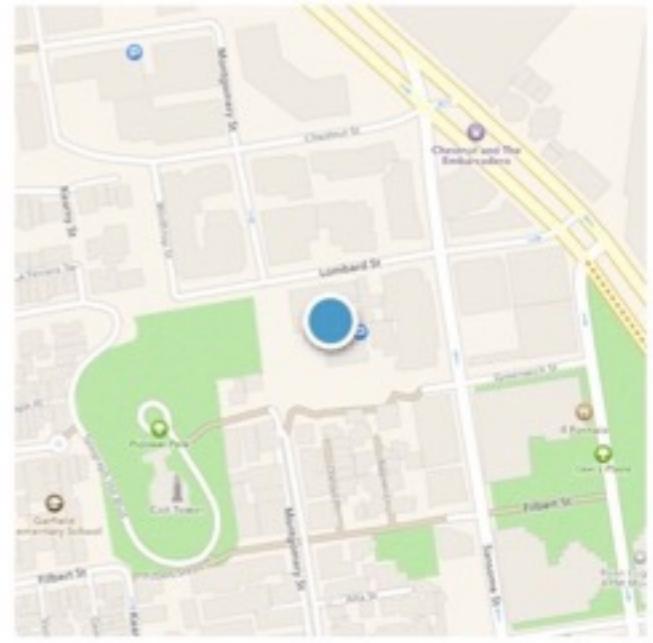




Device indoors, low accuracy depicted by large blue circle. The device may be anywhere in the circle.



Device outdoors, but in a backpack. Greater accuracy than indoors represented by a smaller, but still present, blue circle.



Device outdoors, held in hand with clear view to the sky. Greatest level of accuracy.

- 只要我們帶著 iOS 裝置走入這個訊號區域後，相對應的 APP 就會發出提醒詢問我們是否要接受訊號
- 一旦接受 iBeacon 訊號後，他就會偵測我們所在的位置
- 除了室內定位之外，還可以透過無線感應器和藍牙通知我們附近有什麼樣的產品或是距離櫃台的距離

優勢

- Beacon 技術來源低功耗藍牙技術，不須要網路連接，只要有兩個藍牙點就可以運作
- 且低功耗藍牙的使用範圍約在 200 公尺內，也就可以直接從點與點連結形成一個面



- 而 iPhone、iPad、iPod touch...等 iOS 裝置使用的 Beacon 技術就稱為 iBeacon
- 使用時 iBeacon 時，還是必須透過 APP 才可以接收，因此手機必須下載相對應的 APP，才能使用這項功能

- 特別的是 iPhone、iPad、iPod touch 不只可以接受低功耗藍牙的訊號，同時也可以成為發送器，也因此讓全球的 iOS 裝置可以透過 iBeacon 串接起來



- 從 Android 4.3 開始，Android 也開始使用 Beacon 技術，只是 Android 裝置目前僅能當作接收器使用，並不能當成發送訊息的裝置
- 除了 iOS 和 Android 兩大系統都開始推廣 Beacon 技術的優勢之外還有個絕對優勢就是「省電」

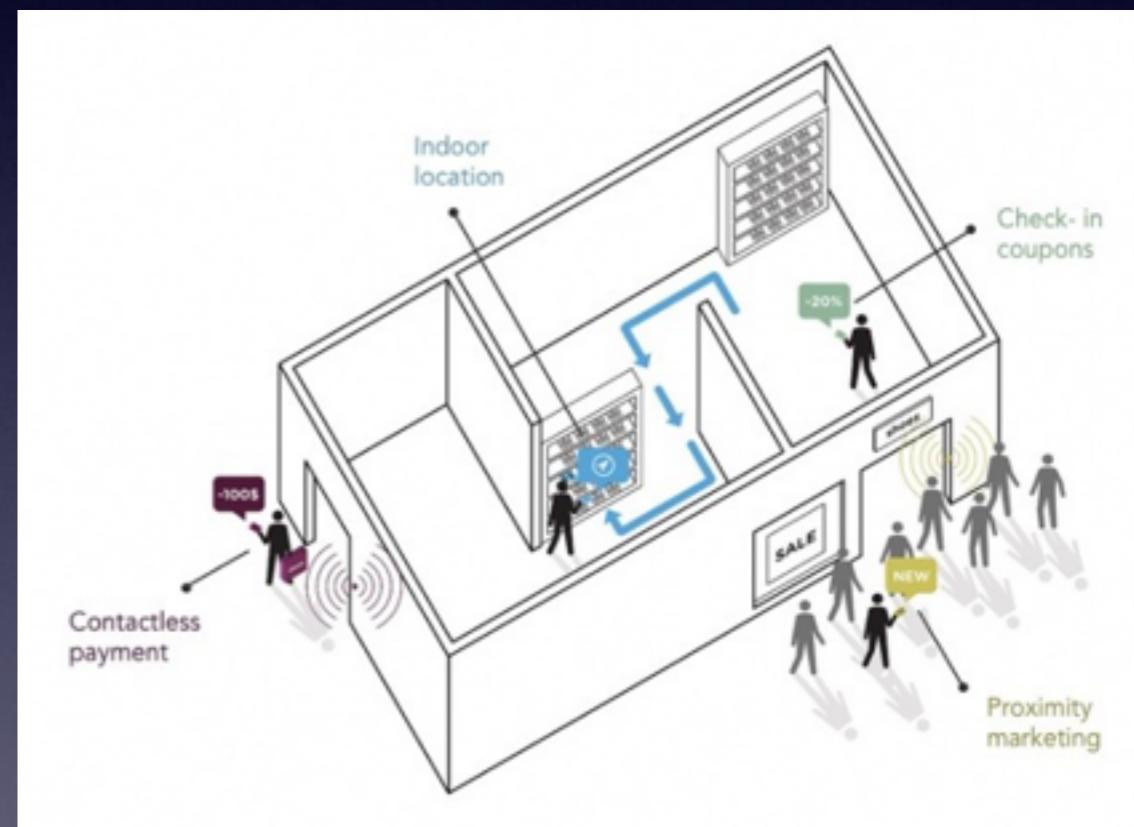
- 之前的定位服務大多是以 GPS 全球定位系統，必須要透過衛星才能定位，而且戶外的定位是最清晰精準的
- 但只要打開有 GPS 的 APP，就會發現手機電力快速下降



- 至於 Beacon 使用的是低功耗藍牙所以耗電量低，在室外也許沒有什麼用途，但只要有接收器就可以快速定位，並大幅度提升室內定位的精準度

應用

- 想將 iBeacon 技術應用在生活中，並不是只要開啟藍牙就可以使用，而須要搭配 APP
- 只要在室內放置 iBeacon 發送器，並開啟我們 iPhone、iPad...等裝置的藍牙，透過相對應的 APP，我們就可以接到訊號進而收到訊息

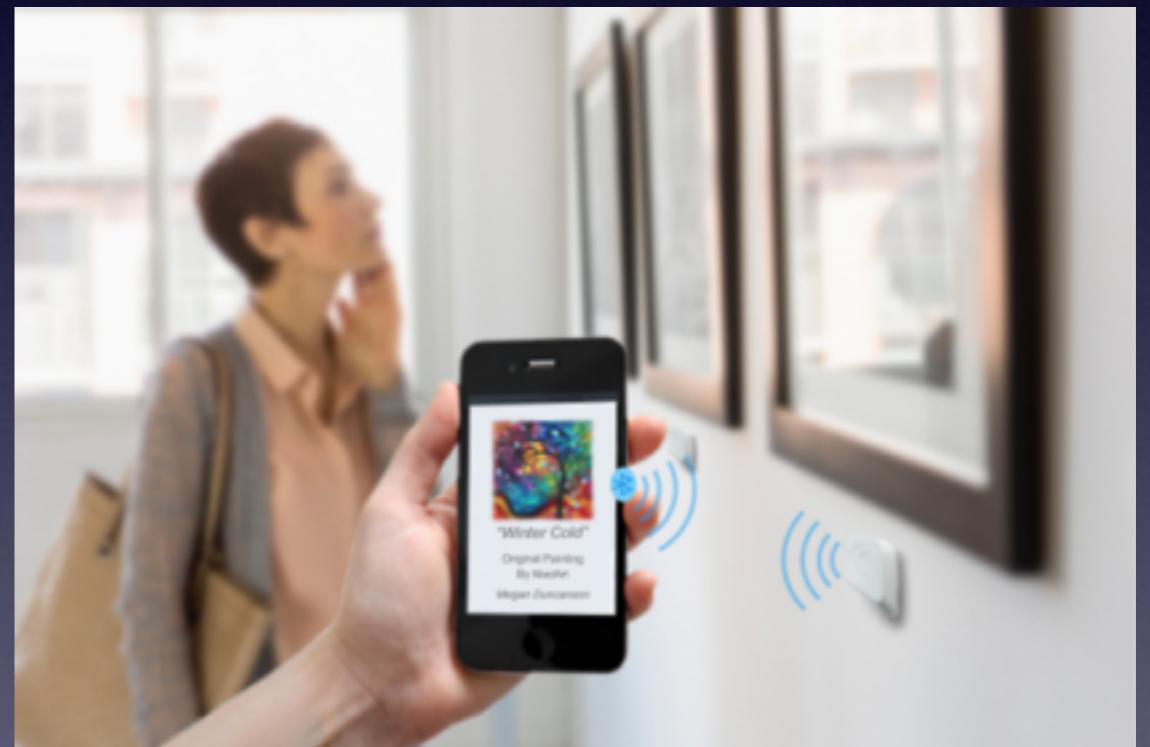


- 只是目前為止，每一款發送器的外型、續航力...等都不一樣，甚至連相對應的 APP 都不一樣，也為這個新市場投下了新商機

- 有了 iBeacon，以後當走進一家有使用 iBeacon 的商店，只要手機接收到藍牙訊號，APP 就會自動推播通知店裡有什麼特價品、有哪些是購物清單上要購買的東西



- 博物館也可以陳設發送器，這麼一來就可以透過 iBeacon 為民眾進行導覽

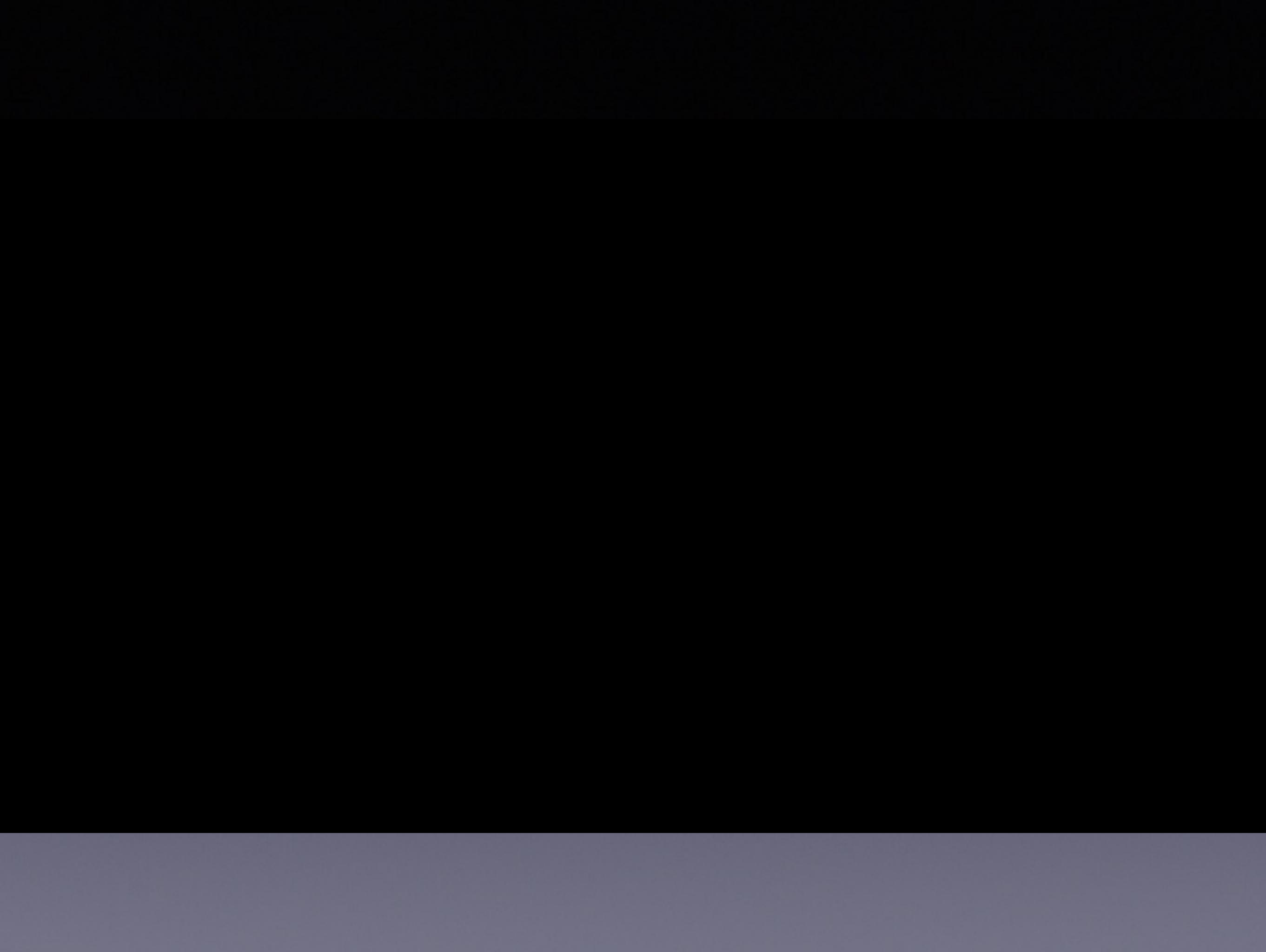


- 知名的線上交易支付平台 PayPal 也將把 iBeacon 應用在 實際生活中了
- 只要商店、景點或展覽有設置 iBeacon 發送器，就可以透過 它支付小費、門票



- 線上點名 BeHere
- [http://www.beelieve.com.br/
behere/](http://www.beelieve.com.br/behere/)







NO
PARKING
8 A.M. - 10 A.M.
TUESDAY
STREET CLEANING

1
HOUR
PARKING
9 A.M. - 6 P.M.
MON. - SAT.

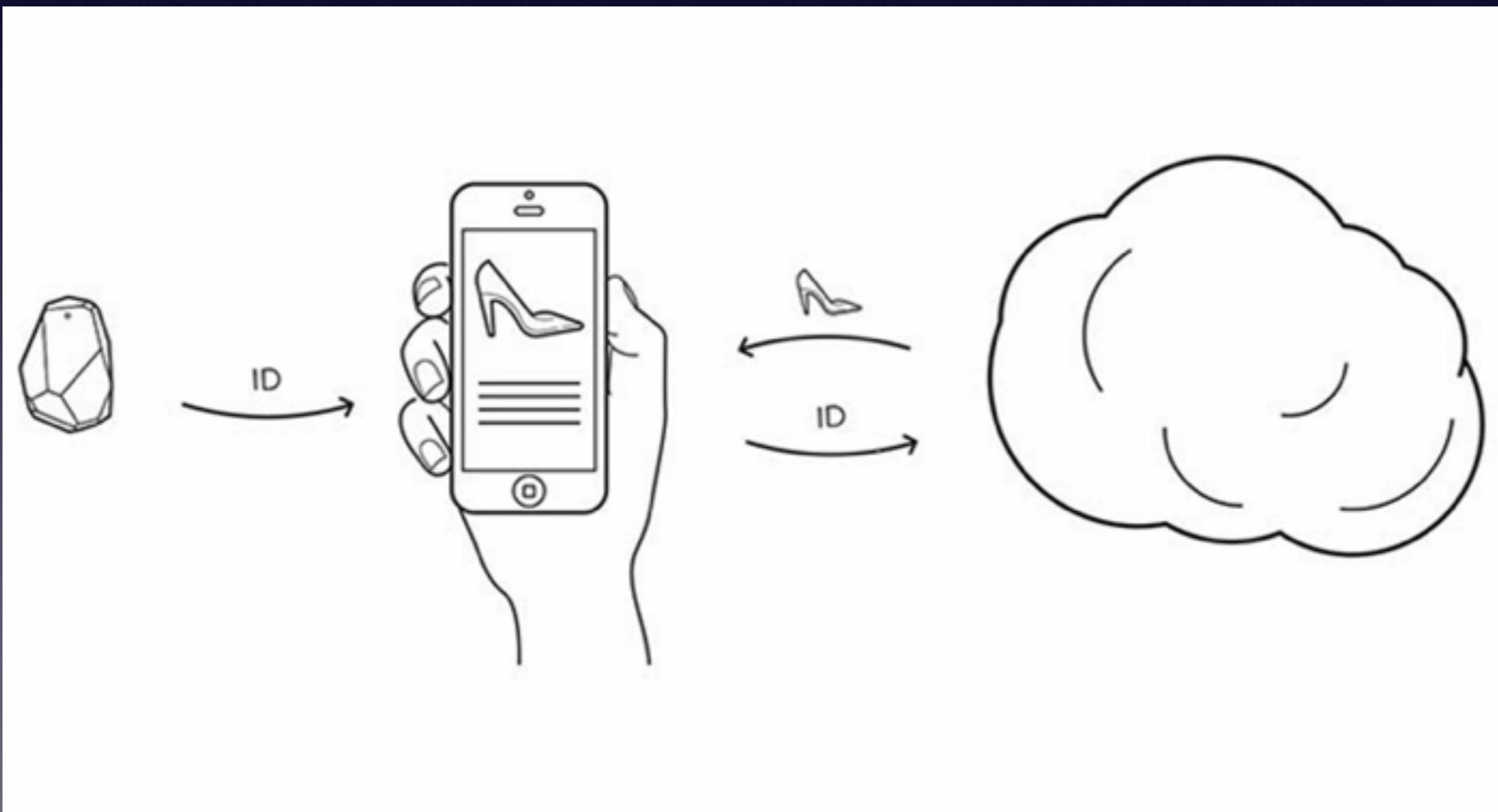
REAR ON
01 - 10 A.M.
402301
1
ONE HOUR
MON. - SAT.



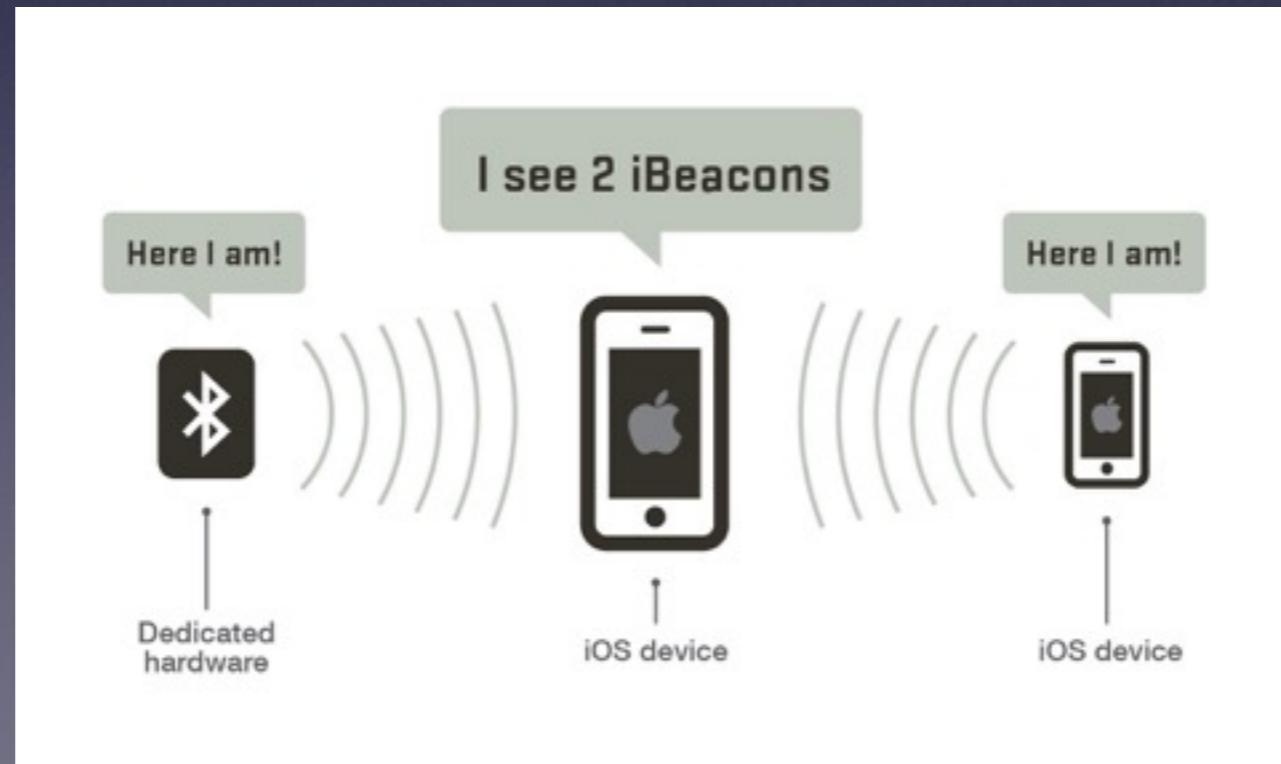
核心技術

- iBeacon 其實是配備“低功耗藍牙（BLE）”通信功能的裝置
- 該裝置利用 BLE 向周圍發送 ID，接收到 ID 的 App 會根據 ID 做出反應

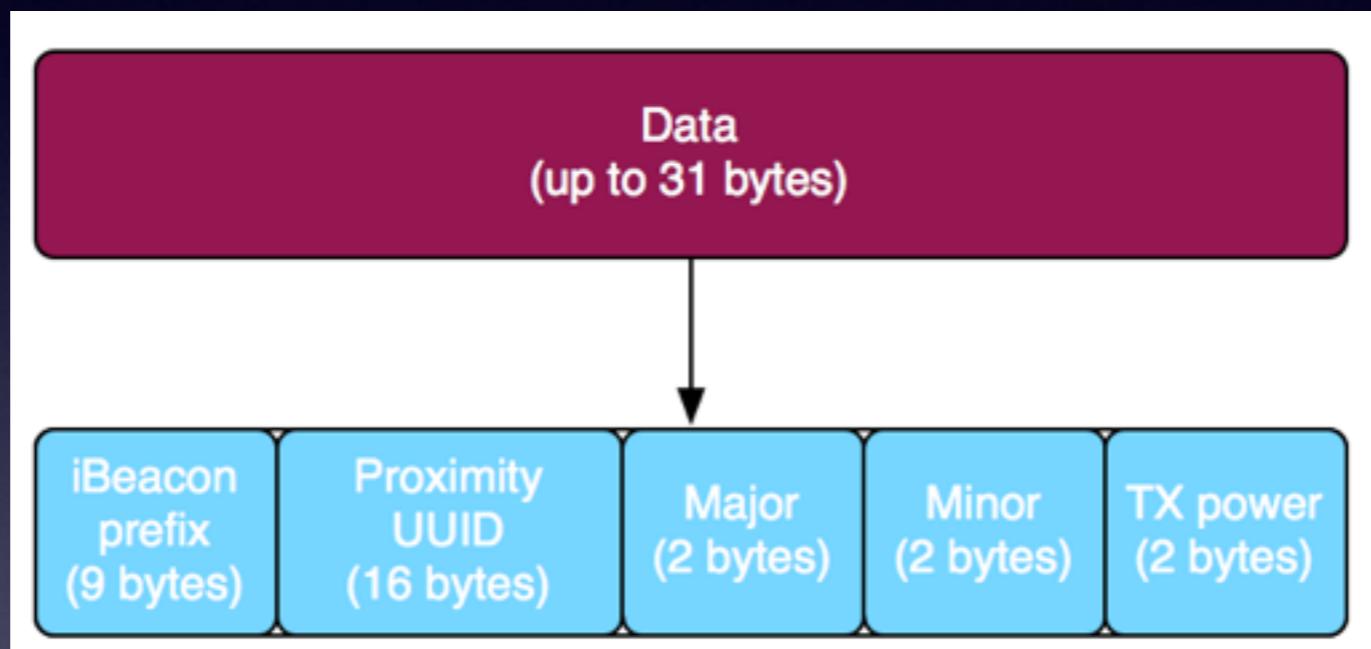
- 例如，在店內設置用來發送 iBeacon 的 ID 的通信模塊（以下稱作“Beacon 模塊”）後，iPhone 和 iPad 就會收到 ID 信息，在 ID 的觸發下，與 ID 掛鉤的 App 就會接收到來自服務器的信息



- iBeacon 利用的是 BLE 的廣播封包中的“通告封包” (Advertising)
- 通告封包由配備 BLE 的設備定期發出，只要是支援 BLE 的終端，都可以接收到信號
- 通告封包的有效載荷部分，寫入了由 Apple 定義的數據資料



- iBeacon 的數據大致由四部分信息組成：
 - (1) UUID (universally unique identifier)
 - (2) Major
 - (3) Minor
 - (4) TX Power



Field	Size	Description
UUID	16 bytes	Application developers should define a UUID specific to their app and deployment use case.
Major	2 bytes	Further specifies a specific iBeacon and use case. For example, this could define a sub-region within a larger region defined by the UUID.
Minor	2 bytes	Allows further subdivision of region or use case, specified by the application developer.

UUID

- UUID 是用來識別設置 iBeacon 模塊的企業的 128 位識別碼
- 識別碼並非由蘋果定義，而是直接採用 “ISO/IEC11578:1996” 的標準
- UUID 包括 Version 1~5 五種
 - Version 1 由 MAC 地址、UUID 生成的日期等組成。因為 MAC 地址唯一，所以可以確保 UUID 的獨特性
 - Version 2 是以 MAC 地址和生成時間為基礎，利用 POSIX 的 UID 和 GID 等生成的數據

- Version 3 的基礎是通過 MD5 函數輸出的哈希值，表示 URL 和郵件地址等唯一命名空間
- Version 4 是隨機數
- Version 5 與 Version 3 基本相同，使用的是 SHA-1 的散列函數

Major / Minor

- Major 與 Minor 由 iBeacon 的發送者自由設置
- 均為16位識別碼

Store Location		San Francisco	Paris	London	
UUID		D9B9EC1F-3925-43D0-80A9-1E39D4CEA95C			
Major		1	2	3	
Minor	Clothing	10	10	10	
	Housewares	20	20	20	
	Automotive	30	30	30	

TX Power

- TX Power 是 iBeacon 的發送模塊與接收器之間距離為 1 米時信號強度 (RSSI : received signal strength indicator) 的參照值
- 接收器根據作為參照的 RSSI 和接收信號的強度，推測發送模塊與接收器之間的距離

傳輸距離

- 一個 iOS 設備接收一個 iBeacon 的傳輸可以近乎於 iBeacon 的距離，iBeacon 的傳輸距離分為 3 個不同的範圍：
 - Immediate : < 5cm
 - Near : 5cm ~ 2m
 - Far : 2m ~ 30m
 - Unknown : > 30m



Proximity State	Description
Immediate	This represents a high level of confidence that the device is physically very close to the beacon. Very likely being held directly up to the beacon.
Near	With a clear line of sight from the device to the beacon, this would indicate a proximity of approximately 1-3 meters. As described in the section on accuracy, if there are obstructions between the device and the beacon which cause attenuation of the signal, this Near state may not be reported even though the device is in this range.
Far	This state indicates that a beacon device can be detected but the confidence in the accuracy is too low to determine either Near or Immediate. An important consideration is that the Far state does not necessarily imply "not physically near" the beacon. When Far is indicated, rely on the accuracy property to determine the potential proximity to the beacon.
Unknown	The proximity of the beacon cannot be determined. This may indicate that ranging has just begun, or that there are insufficient measurements to determine the state.

電力消耗

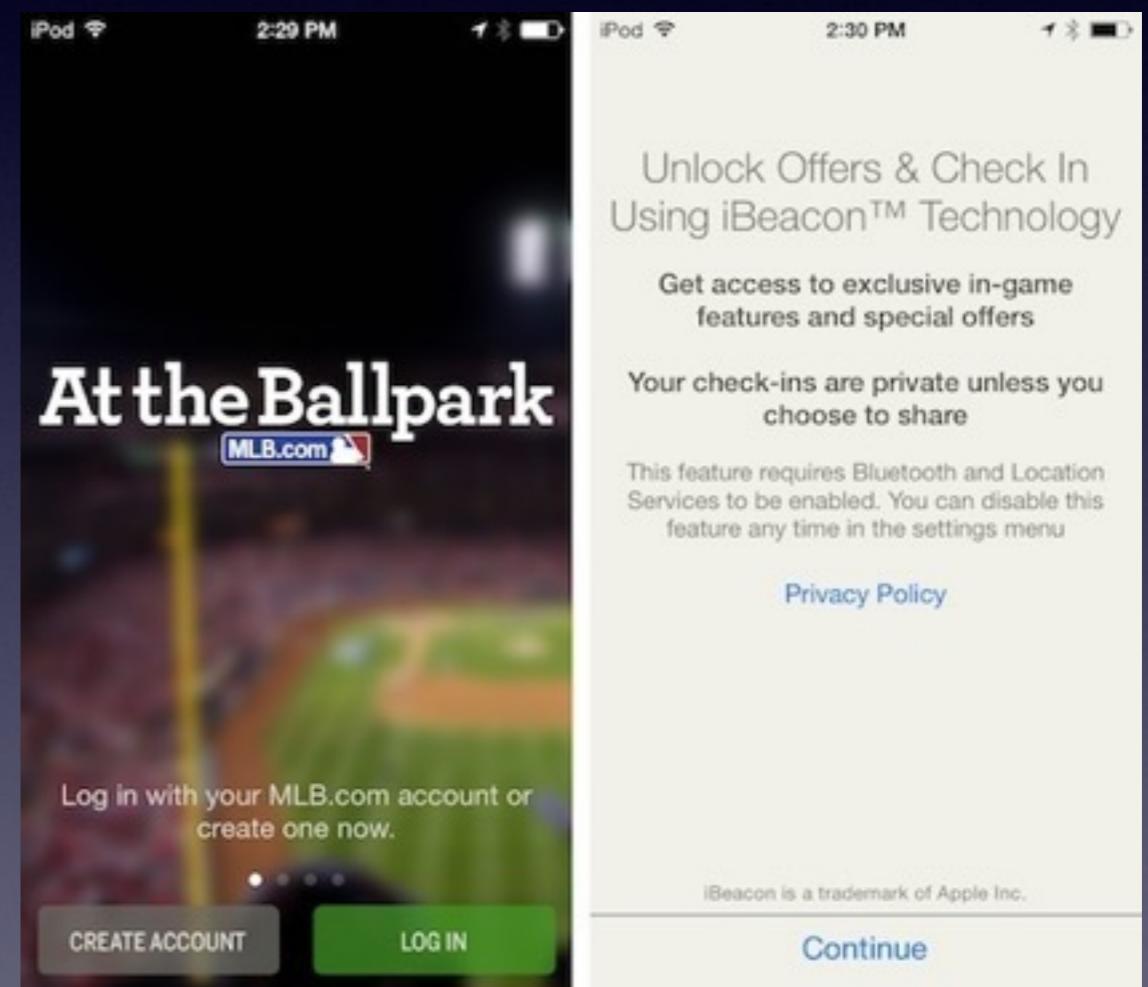
- 低功耗藍芽相比於傳統藍芽在功耗和效率方面有顯著提高
- 在 16 個不同的 iBeacon 廠商的一項研究報告稱，電池的壽命在 1 到 24 個月的範圍之內
- Apple 用一枚紐扣電池提供了 1~3 個月的運作，設置了 100ms 的廣播頻率，如果電池提供時間增加到 2~3 年就相當於廣播頻率增到到 900ms
- 在部署 ibeacon 啟用手機 app 時，手機電池的消耗是一個必須要考慮的因素

設備需求

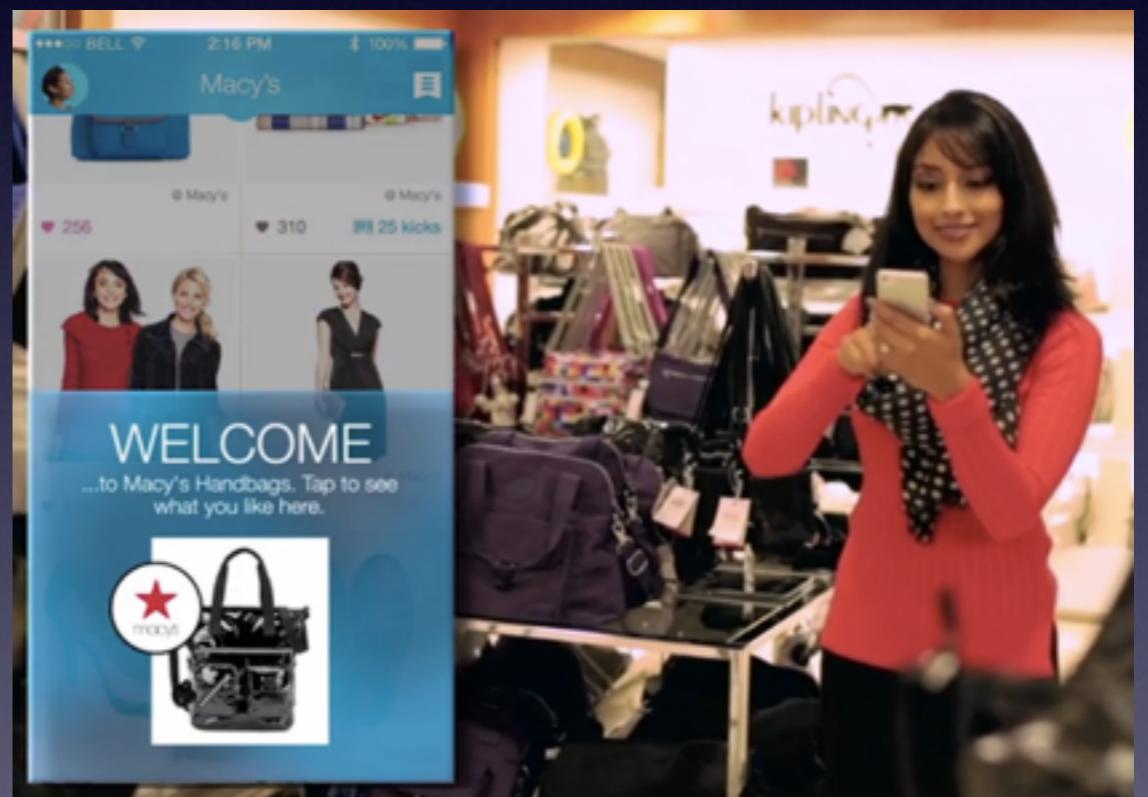
- 藍芽 4.0 的 iOS 設備 (iPhone 4s 及以上，iPad 第三代及以上，iPad mini 第一代及以上，iPod Touch 第五代)
- OS X Mavericks 10.9 作業系統和藍芽 4.0 的電腦
- Android 4.3 及以上
- Lumia Cyan 及以上更新服務 Windows Phone 設備

實際應用

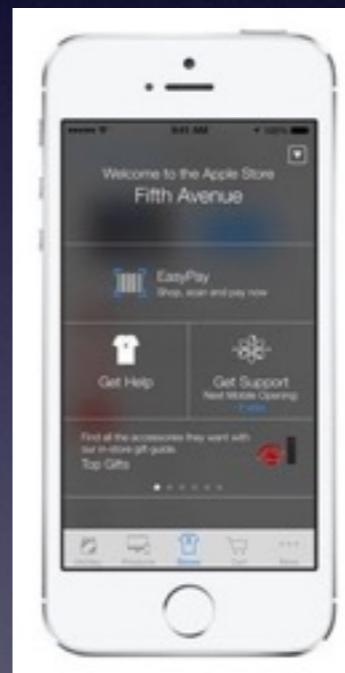
- 美國職棒大聯盟的 At the ballpark 程式會自動提供球賽資訊、場地設施、影片與促銷活動等資訊給球迷



- Macy's 百貨公司會在安裝了 Shopkick 程式的顧客上門時，對他們發送個人化的促銷活動與商品資訊



- Apple 更不用說了。全美 254 家 Apple 分店都安裝了 iBeacon 技術，提供顧客產品訊息，甚至手機更新提醒



Get In-Store
Notifications

JAL×NRI開始iBeacon以及智慧型手錶的實證測試

- 於羽田機場第一航廈大樓負責登機門職務的JAL職員，透過手中的智慧型手機接收各登機門設置的iBeacon所發射的訊號，讓擔任管制崗位的職員可遠距確認所有職員位置、調配情形，即時把握所有狀況
- 如此一來，得以實踐更迅速的旅客應對，以及更有效率的職員配置
- 職員不需使用攜帶型情報機或無線機，可透過穿戴型電子設備；也就是智慧型手錶，獲取或分享業務上所需情報



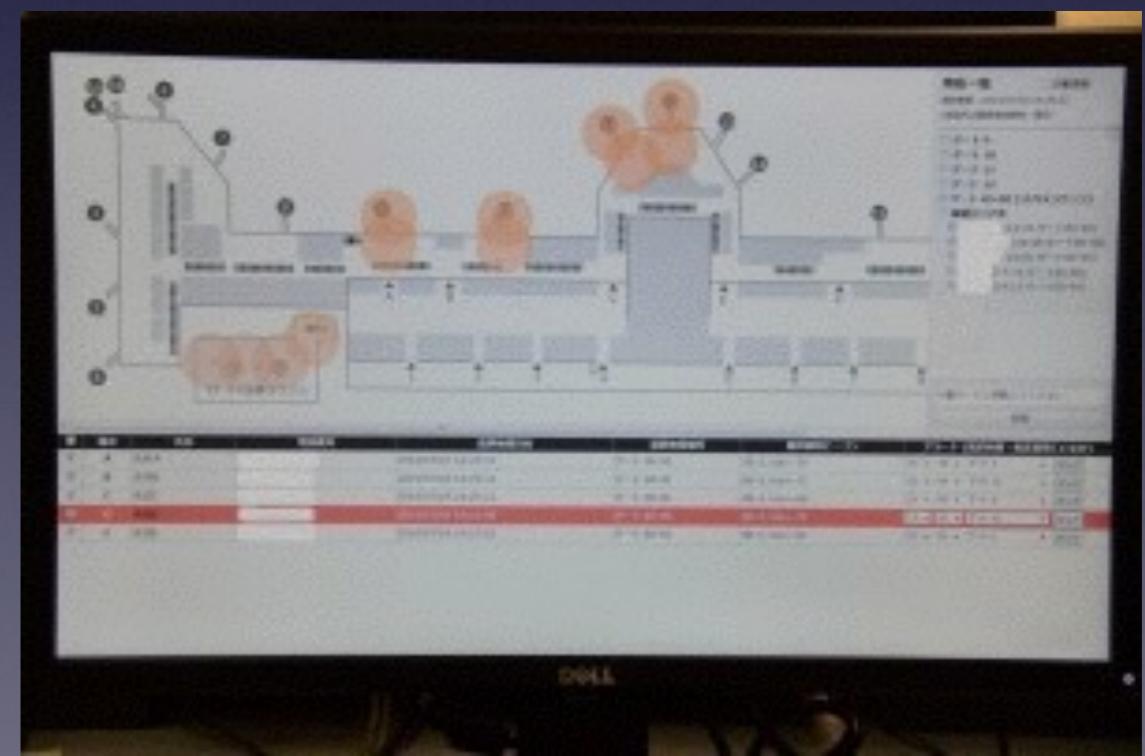
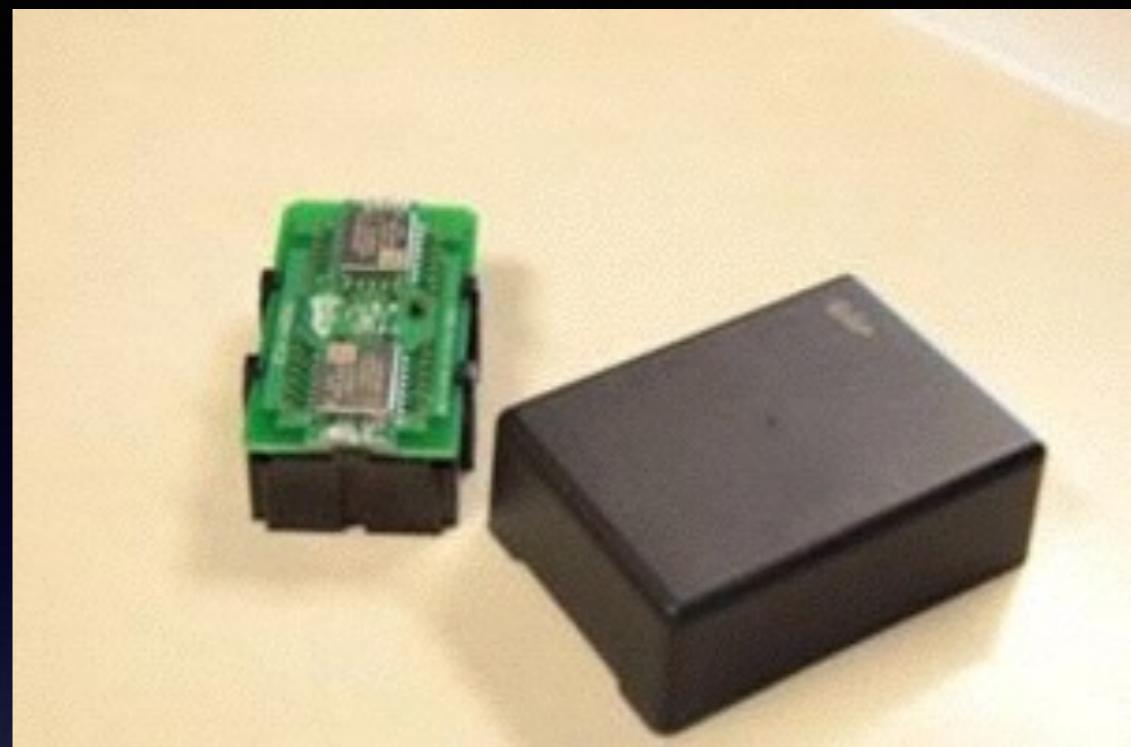
JAL×NRI開始iBeacon以及智慧型手錶的實證測試



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- 於本次的實證測試中，NRI擔綱開發，如何活用iBeacon偵測或顯示職員所在位置的訊息，發送到智慧型手錶的系統
- 實證測式中使用的「GALAXY S5」以及「GALAXY Gear2」外，為了對提升旅客便利性，亦將使用搭載Android Wear™的「LG G Watch」等最新型智慧型手錶，並活用於各種情境測式



iBeacon Hardware



GIMBAL™



The Hitchhikers Guide to iBeacon Hardware.

A Comprehensive Report by Aislelabs



Accent Systems

April Brother



Bluecats



Blue Sense



Bkon



Estimote



EMBC01



Gelo



Gimbal Series 10



Gimbal Series 21



Gliworm



HM-10 Dev Kit



Kontakt.io



KS Technologies



Lightcurb



Motorola Mpact



Minew MS63/i3



Minew i5



Minew MS54V3



Roximity



Radius Networks



RECO Beacon



RedBear



Sensorberg



SensorTag



Tod

Workings of a Beacon

Hardware, Firmware, Cloud Infrastructure & Mobile SDK



Bluetooth Chipset

Battery

Firmware



Cloud Server



Mobile SDK

Power supply options for Beacons



Small
240 mAh



Medium
620 mAh



Large
1,000 mAh
AA
2,000 mAh



Power Outlet

自製 iBeacon

- Arduino
- Raspberry Pi + iBeacon = piBeacon



10 Things About Beacons You Need To Know

10 THINGS ABOUT BEACONS YOU NEED TO KNOW

① What is a Beacon?



- Retail
- Museums
- Airlines
- Navigation

② Platform Independent



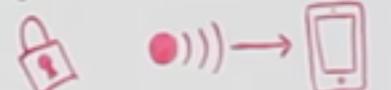
- Pioneered by Apple
- iBeacon vs ALT
- Eddystone

③ Not Internet Connected



- By default
- Meshing & Hubs
- Remote updating

④ They don't steal your data.

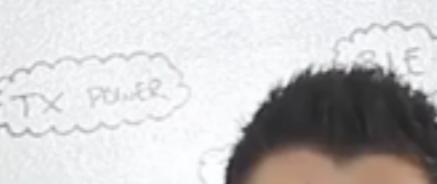


- Cannot see your device
- Does not steal data
- Need to have an app installed
- Opt-in required

⑤ They can detect distance



- RSSI
- Works only in foreground
- Not reliable
- Multiple beacons better
- Adjust antenna / use



Time vs Power -
Range -
Weather -
Frequency -
Use Case -
New options -

⑥ Come in many sizes



⑦ Customer Insights

- location analytics
- Typical spend
- Dwell time
- Shopping habits
- Preferred products
- Retargeting

Half of beacon messages -
= Coupons

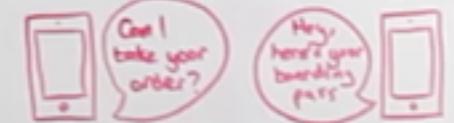
RMN, \$3.5 BN US -
Retail Sales (2013)

Loyalty -

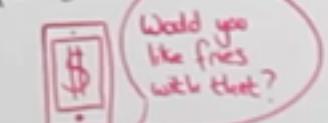
Click & Collect -

Product info -

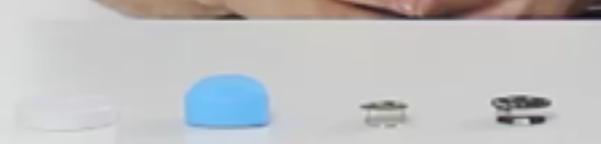
⑧ Help automate buying



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