



# Indoor Location Primer

**Sean O Sullivan**

twitter: @sos100

localSocial™

blog: [blog.mylocalsocial.com](http://blog.mylocalsocial.com)

## Why

Indoor Location and Positioning

1

## How

Quick tour of current approaches

2

## What

Applications and uses

3

## Resources

Digging in

4

# Why

Indoor Location and Positioning

1

# How

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# GPS

Great Outdoors



**90%**

Time most Americans spend indoors



# Retail

Indoors, underground, few external windows...

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# Indoor Location Current Approaches

## How

## Comment

	How	Comment
<b>WiFi</b>	Either fingerprint or triangulate WiFi Access Points or Beacons	All mobile platform vendors use this (see next)
<b>BLE Beacons</b>	Dedicated Beacons used to mark areas or zones	Apple iBeacon currently the poster child for this
<b>Light</b>	Special Lights emit a unique code invisible to human eye	Front facing camera detects the code
<b>Sound</b>	Sound inaudible to the human ear	ShopKick pioneered this in US
<b>Magnetic</b>	Fingerprint of magnetic field variations used to fix position	Area is first mapped in order to create a magnetic field fingerprint
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<b>Camera++</b>	Camera, Direction, Speed, Turns	ShopCloud/Inside, Google



# Indoor Location Current Approaches

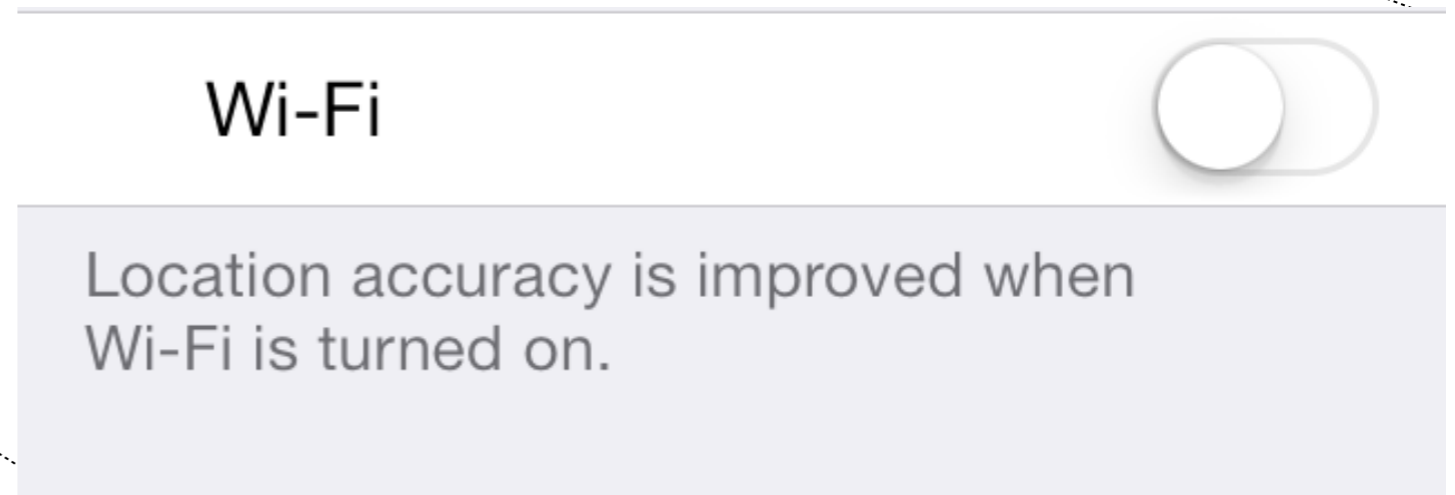
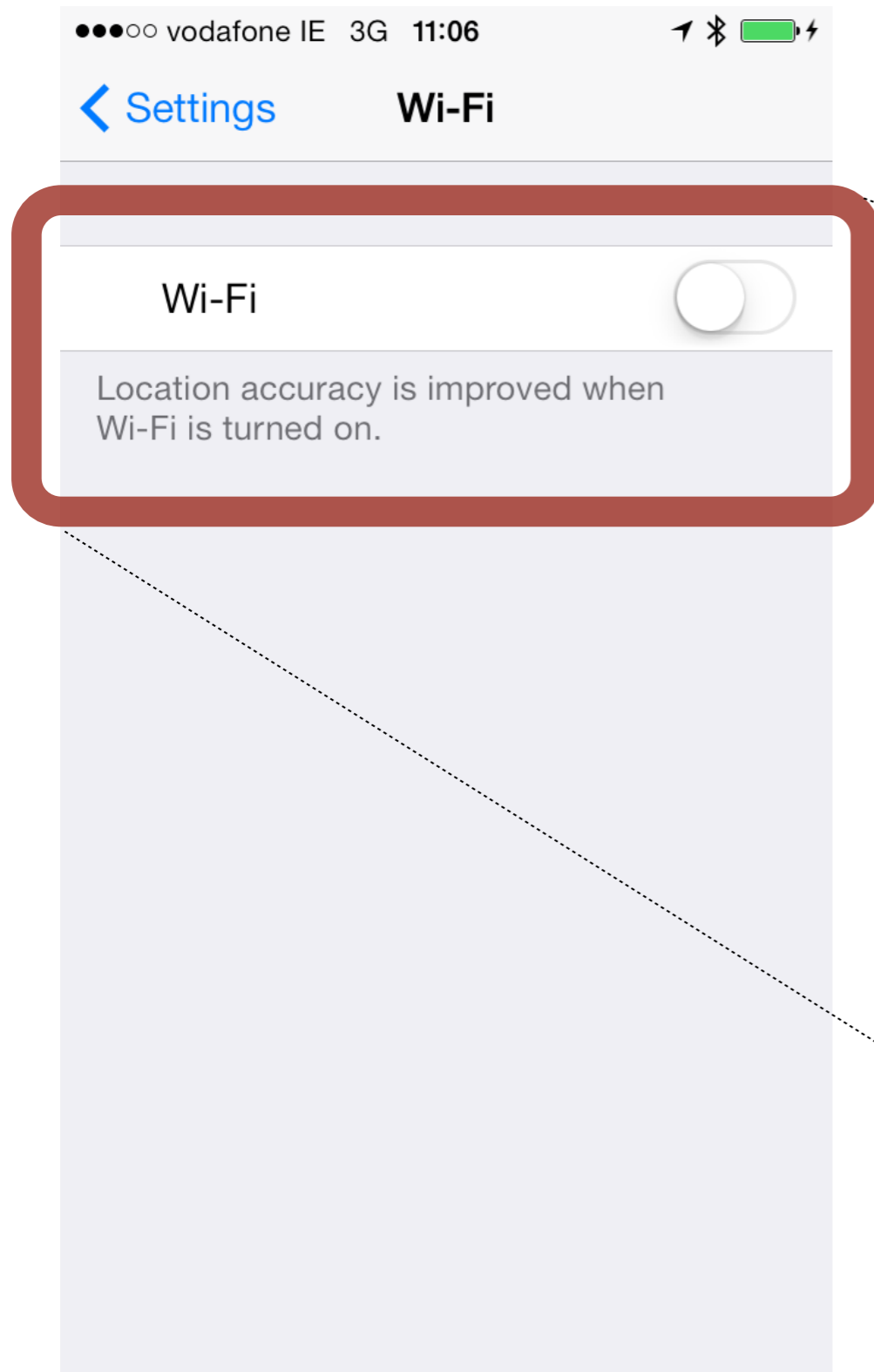
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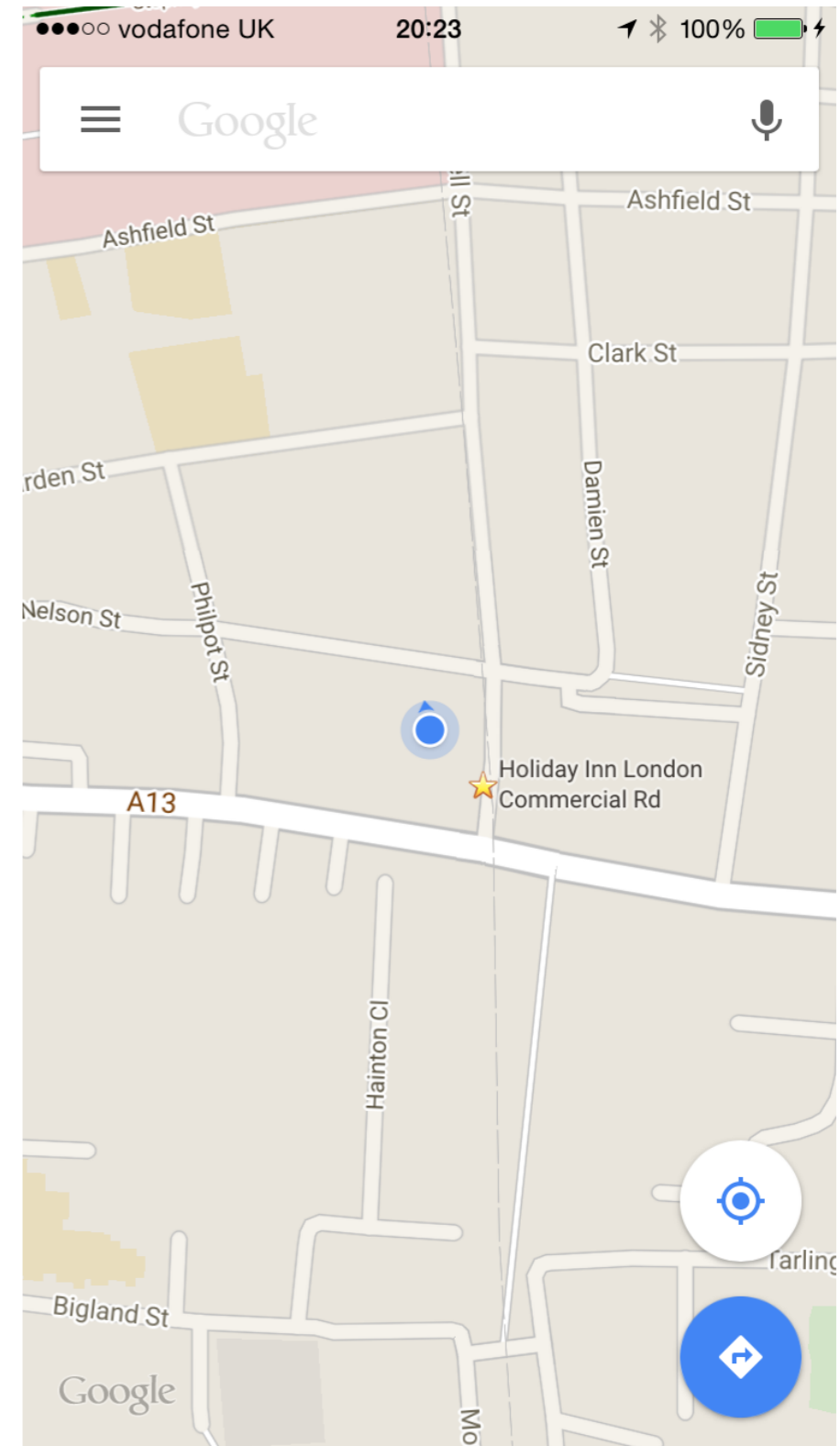
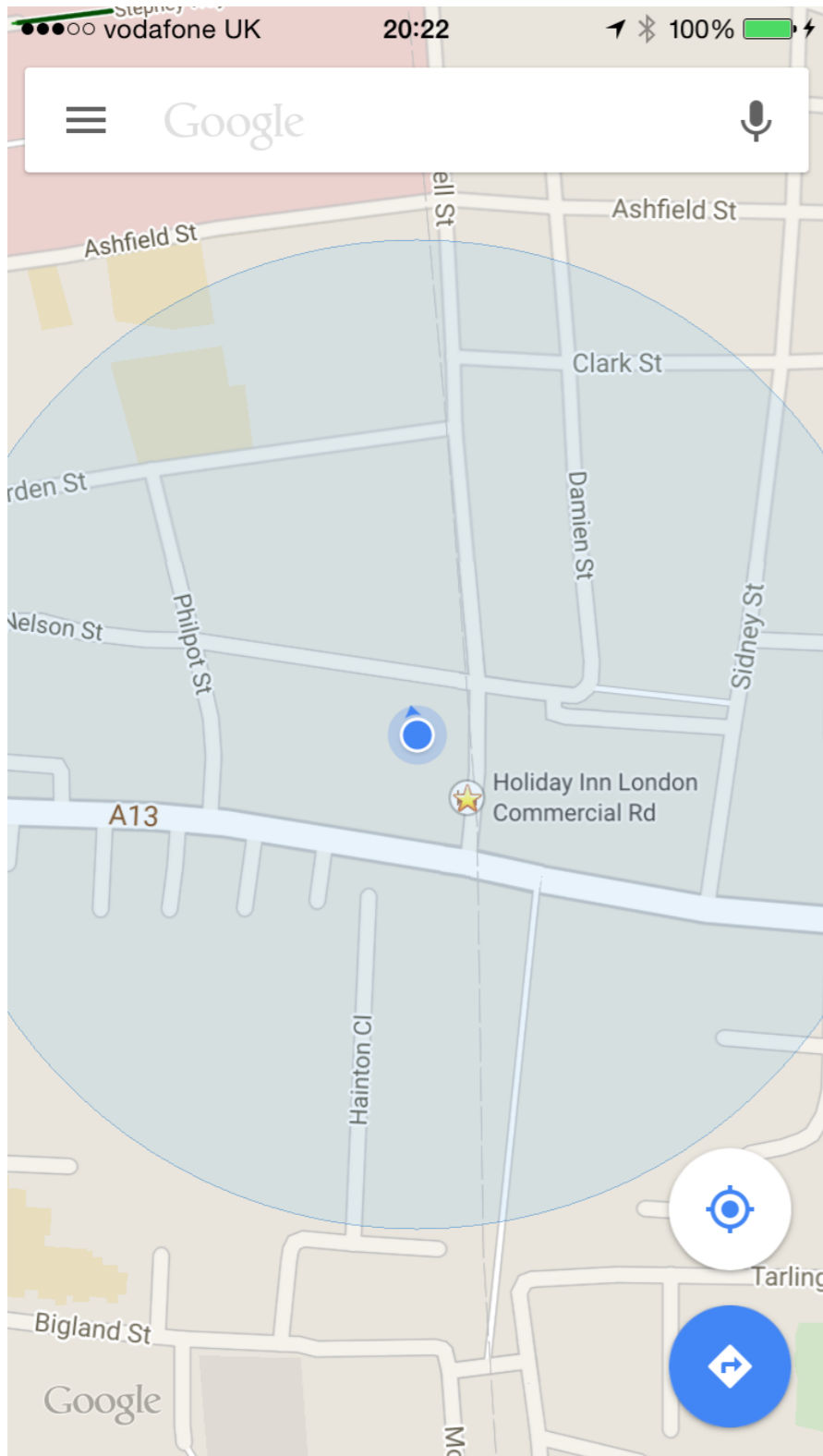
# Ever wondered about this?

WiFi already being used to help position you...

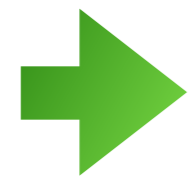


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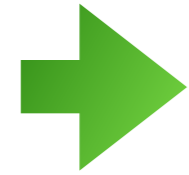
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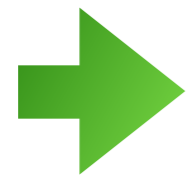
# How?



See MAC Address(es)



Lookup global MAC Address DB



Location Returned (with accuracy)



# Go inside with Indoor Maps

Create a more convenient and enjoyable visitor experience at no cost, available on Google Maps across all devices.



## Indoor Maps from Google

Mapping (and Street View?) goes inside

# Indoor Location Current Approaches

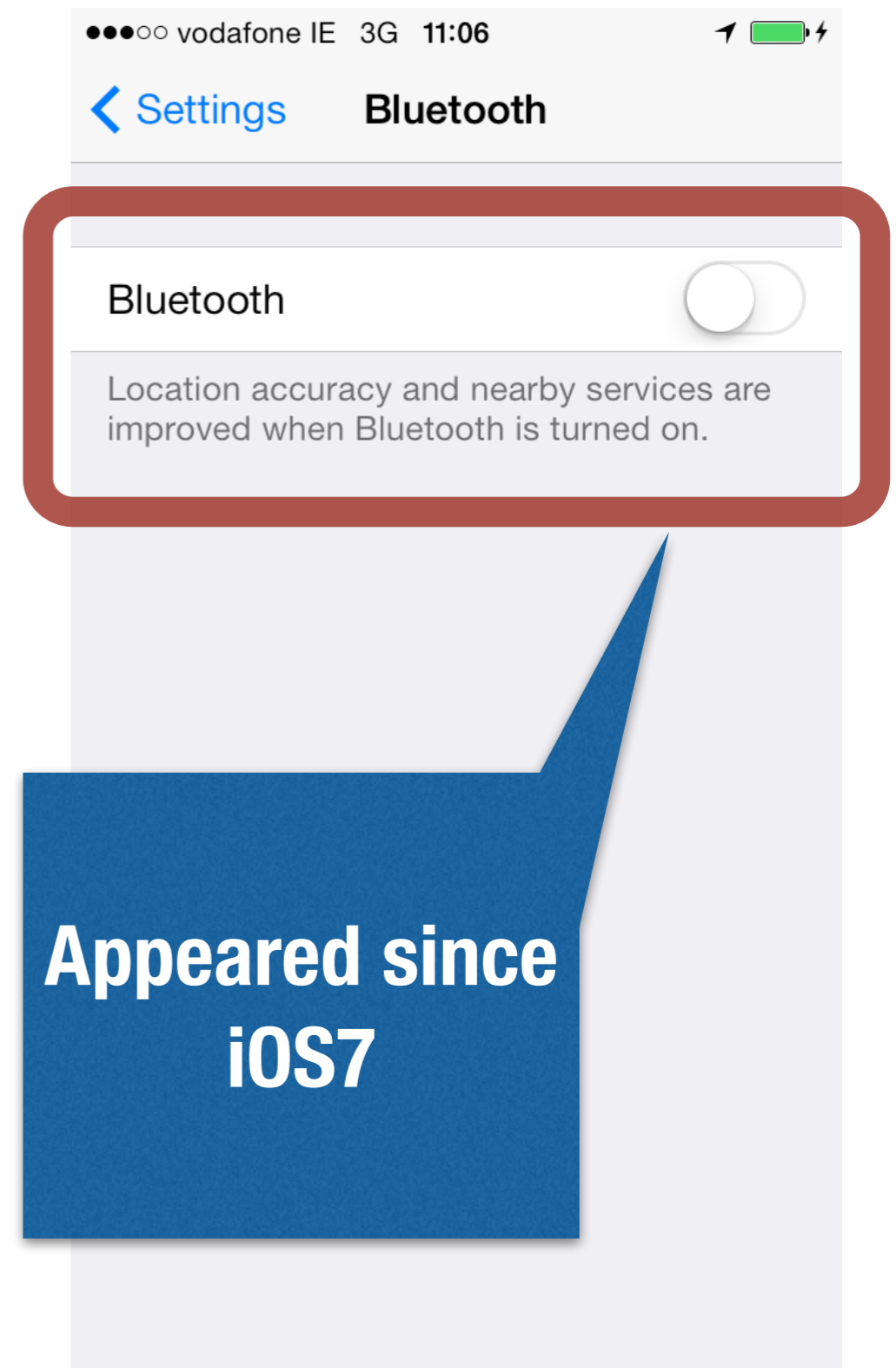
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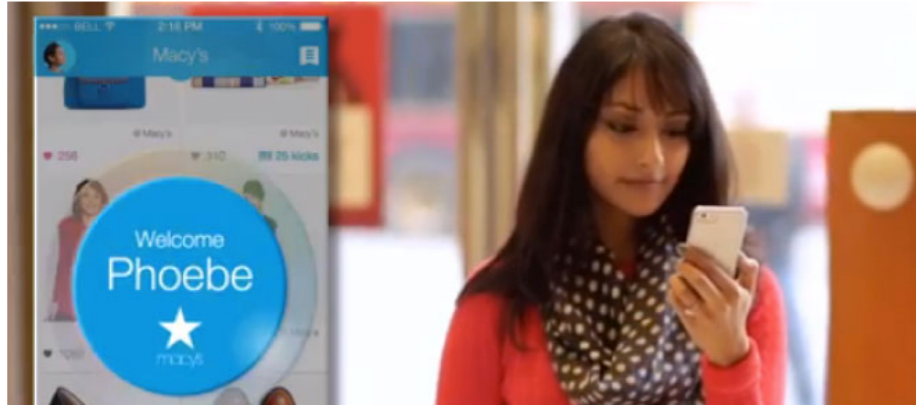
WiFi already being used to help position you...



# Macy's begins pilot test of Apple's iBeacon in flagship New York, San Francisco stores

By Shane Cole

One of America's oldest retailers is among the first to deploy Apple's iBeacons as Macy's has begun a pilot program with the state-of-the-art Bluetooth-based microlocation system.



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The Philanthrop

TECH | 10/31/2013 @ 12:49PM | 8,374 views

## How Apple's iBeacon Will Change Everything For Retail Analytics

Natasha Baker, CenturyLink

+ Comment Now + Follow Comments

The experience of shopping in a brick-and-mortar store hasn't changed much during the past 100 years: Consumers walk into a store, find the items they want, pay for the items and then lug their purchases out of the store in a shopping bag or cart.



But in-store experiences are on the cusp of a transformative shift, with Apple's iBeacon technology acting as a catalyst. Introduced in



theguardian

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## Technology in retail hub

From the Media Network

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## Apple iBeacons: what are they and do they mean for retail?

Retailers take note, iBeacons can provide a simple, cost-effective way of connecting with customers in-store

BloombergBusinessweek  
Technology



Global Economics | Companies & Industries | Politics & Policy | Technology | Markets & Finance | Innovation & Design | Lifestyle

SEE WHAT OTHERS ARE THINKING.

## Apple's Secret Retail Weapon Is Already in Your Pocket

By Sam Grobart | October 16, 2013

SEND TO kindle



Devices have traditionally relied on GPS and Wi-Fi triangulation location. The range for iBeacons is up to 50 metres. Photograph Sullivan/Getty Images

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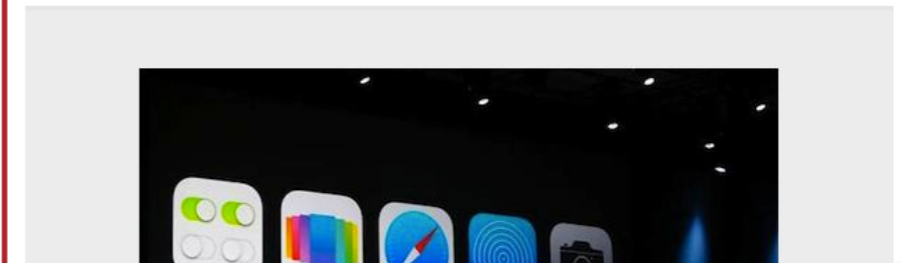
## MarketingWeek

home | news | opinion | trends | in depth digital | strategies &

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## Retailers eye Apple's iBeacons to combat showrooming

Tue, 12 Nov 2013 | By Ronan Shields





# So what *\*is\** an iBeacon?



Bluetooth Low Energy Device

Repeatedly transmits a message in an agreed way (it advertises itself)

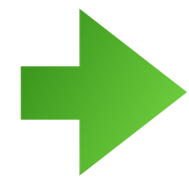
All iOS and all new Android devices can “see” this message

Battery powered, mains powered, solar powered, passive powered

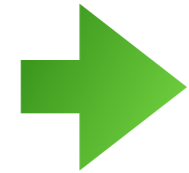
Range : 10M / 30 feet

4 Notions of “nearness”

# How?



See Beacon ID



Lookup Beacon ID



Payload Returned (Zone, Actions, ++)



Background notifications

# Beacon Evolution : embedded



Embedded use of Beacons will likely drive the real long term volume in deployments

**WE'LL PREPARE ANY FISH YOU CHOOSE**  
*Just the way you like it*



**Fishmonger**

**100% BRITISH MEAT PREPARED IN STORE JUST THE WAY YOU LIKE IT**



**Butcher**



**OUR BAKERS USE TRADITIONAL METHODS TO PREPARE FRESH BREAD DAILY**



**Bakery**

**WE'LL CUT YOUR CHEESE AND DELI MEAT JUST THE WAY YOU LIKE IT**



**Delicatessen**

**WE BUY, WASH, SELECT & PACK**



**British potatoes and carrots**

**Greengrocer**



*MARKET FRESHNESS. MARKET PRICES.*



**Market Street**

**MARKET ST. MORRISONS est. 1899**



**Pizza**



**Specials**



**Welcome!**

Check the Butcher's Blackboard for Specials!

**Dismiss**

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# How?

LED emits pattern (code)

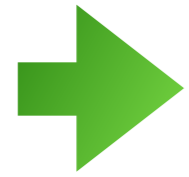


**LED Light emits  
pattern (invisible  
to human eye)**

**Front facing  
camera on phone  
can see the  
pattern**



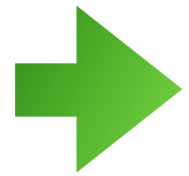
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See Light ID



Lookup Light ID



Payload Returned (Zone, Actions, ++)

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# ShopKick

Pioneered Audio “beacon” usage



shopkick

DOWNLOAD



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OLD NAV

# How?

Audio Beacon emits pattern (code)



**Audio Beacon  
emits pattern  
(inaudible to  
human ear)**

**Microphone on  
phone can hear  
the pattern**



# Indoor Location Current Approaches

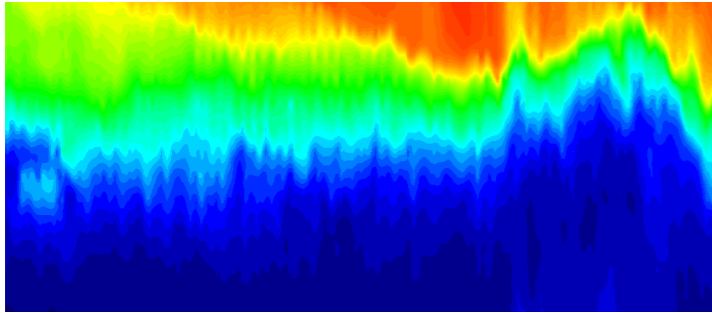
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# Magnetic Signature

Each indoor space has a unique magnetic signature



Survey



Signature



Match

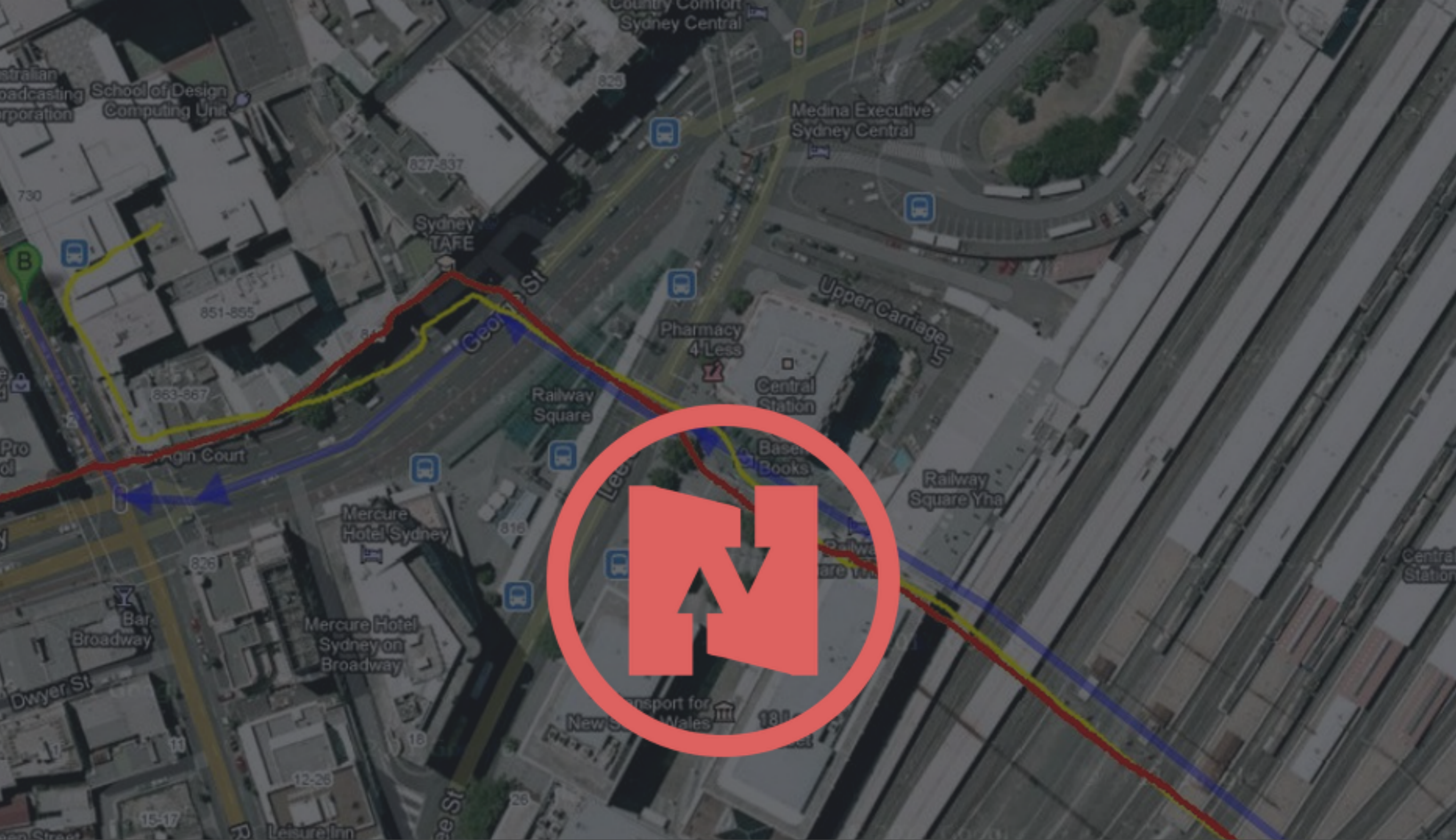


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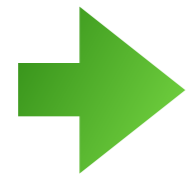
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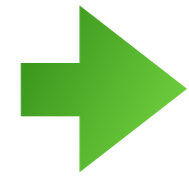
# Inertial Navigation

Navisens, ingredient of other systems

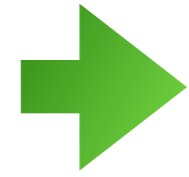
# How?



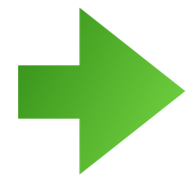
Known starting point



Sensors used to extract movement



Position movements calculated



Position updated

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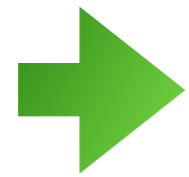




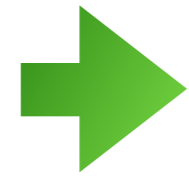
# Camera for survey

Images used (in combination) for location

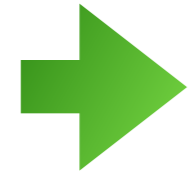
# How?



Video Scan plus sensor data



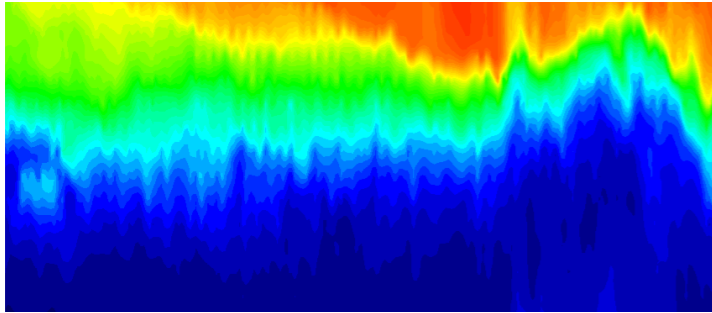
Matched against “seen” data



Location extraction

# Video/Image+Sensor Signature

Video provides the “secret sauce” to add to other data



Survey



Signature



Match



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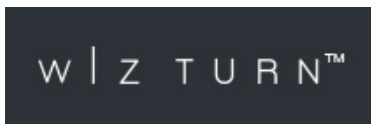
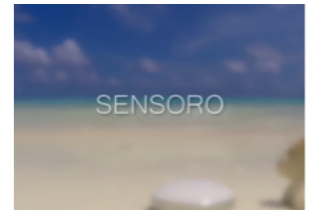
Applications and uses

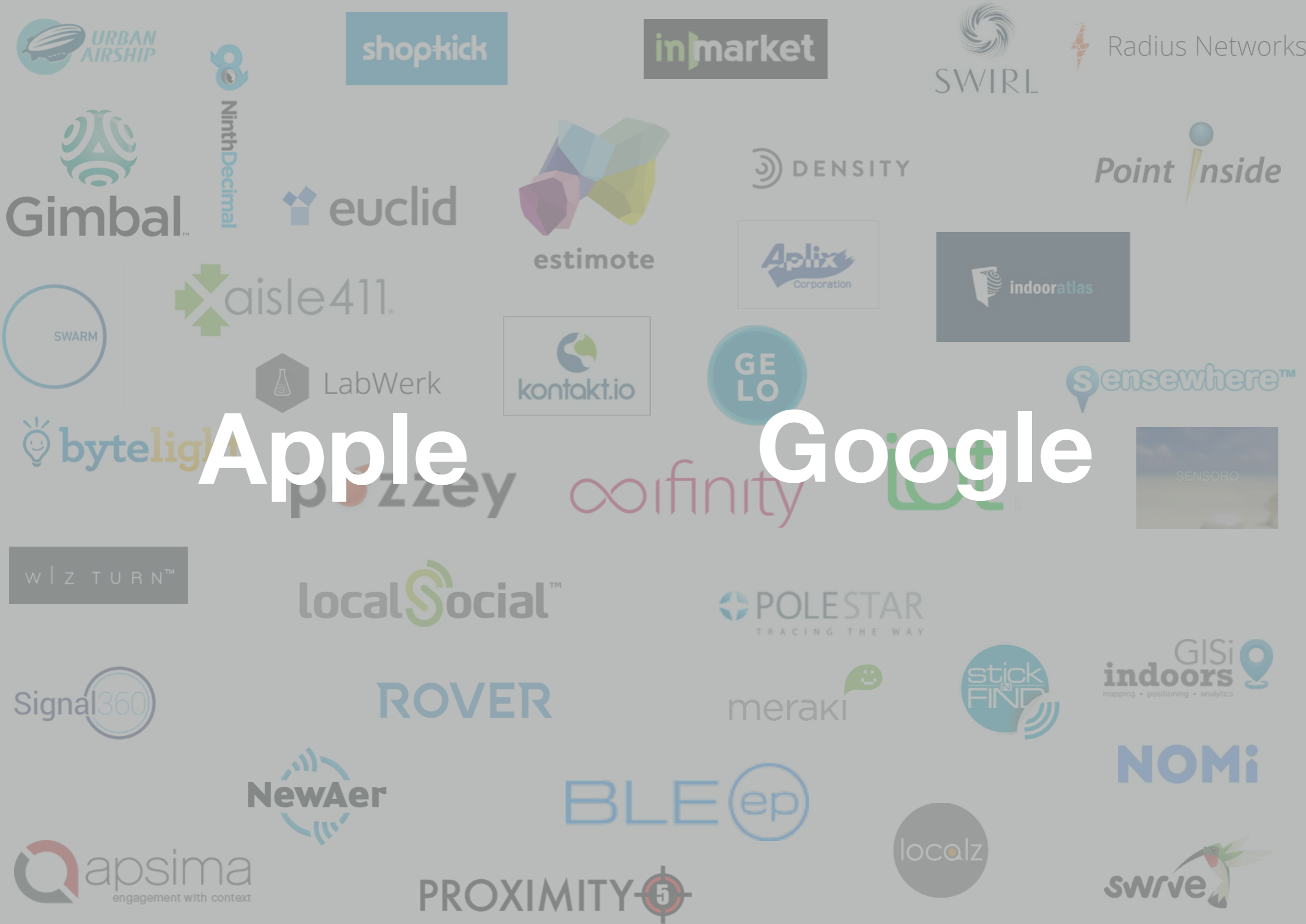
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Digging in

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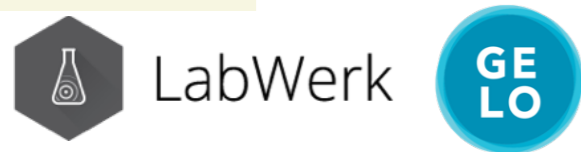
Apple

Google

Location Analytics



Museums



Beacon Hardware



Marketing Automation



Proximity Platform



Retail Centric



Indoor Location



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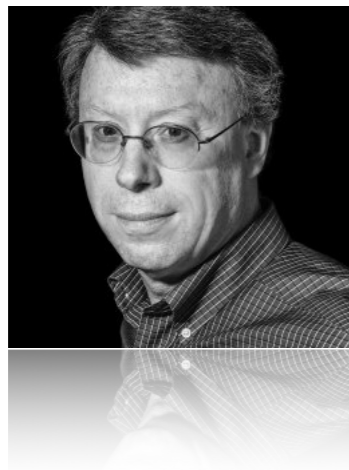
4



# Some Resources

# More information

## Don Dodge



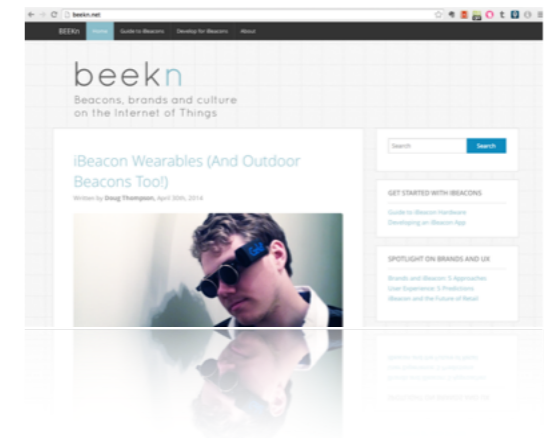
Works @ Google, Developer Advocate, Google Ventures, Investor

## StreetFight



Covers nearly everything that moves involving HyperLocal Ads, Publishing, indoor advertising, etc.

## BEEKN



Great Blog - also active twitter @dusanwriter

“Be the Beacon” :-)

# More information

## ABI



Research on Indoor, Proximity,  
Location, iBeacon

## PLACE / OPUS



Indoor marketing, advertising,  
positioning conference

(Nov, Lon)

## @Launch



From @Jason and the  
@Launch Team

(Mar, SF)

# More information

## MobisFera



[http://www.mobisfera.com/  
summary-real-cases-close-  
real-using-ibeacons/](http://www.mobisfera.com/summary-real-cases-close-real-using-ibeacons/)

## TI



App, Source, iBeacon-able,  
inexpensive, great support

## Radius



SDK, active on GitHub

# LocalSocial™

## Powering Proximity

twitter: @localsocial

blog: [blog.mylocalsocial.com](http://blog.mylocalsocial.com)