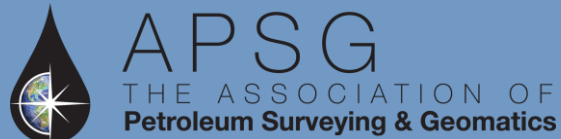


# A Hitchhikers Guide to the GeoWeb



Keith Fraley  
Team Lead Corporate GeoInformation, Shell

**PUG 2018**  
May 7<sup>th</sup>, 2018

[ex nihilo nihil fit]

Parmenides

[simplicity is the ultimate sophistication]

Leonardo Da Vinci 1480

# [What the hell happened in 2007?]

Thomas Friedman

[in short, software is eating the world...]

Marc Andreessen 2011

# What is the GeoWeb?

“Not only did we fail to imagine what the web would become, we still don’t see it today.” ~Kevin Kelly

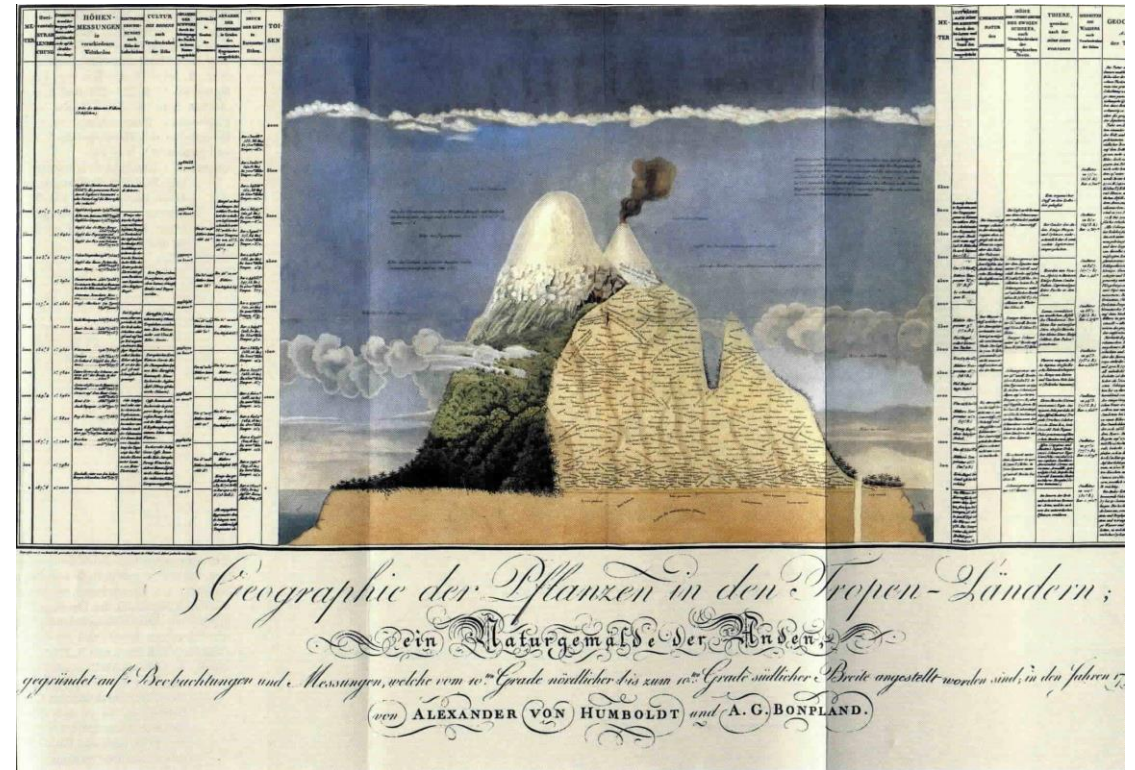


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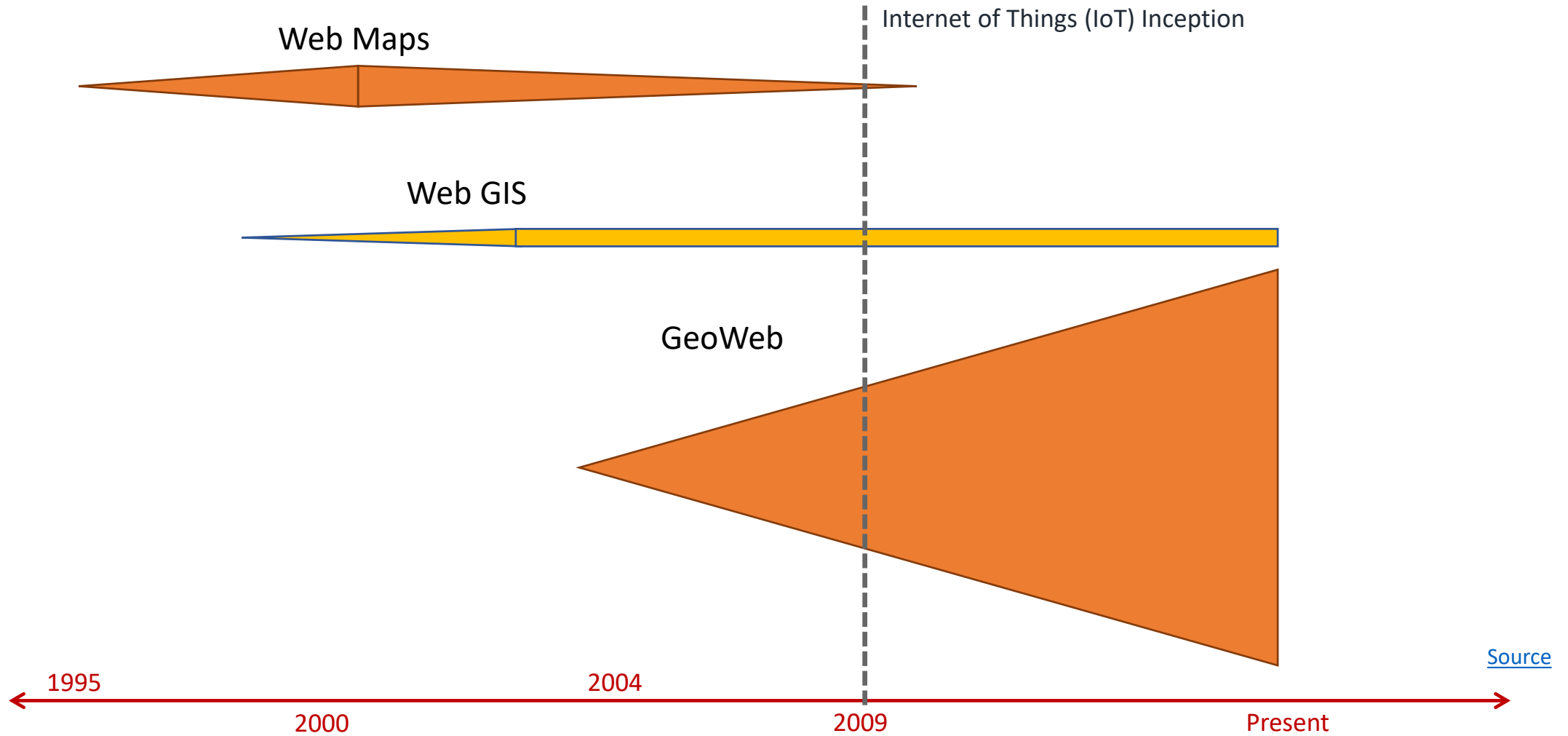
# What is the GeoWeb?

- Continuously available geoinformation content (e.g., spatial data, functions, and location-aware devices/sensors) and geospatial capabilities accessed through a services-based interface [ESRI]
- The ability to locally/globally integrate and share geospatial information via the internet [wikipedia]

*Planetary digital nervous system  
on a massive scale*

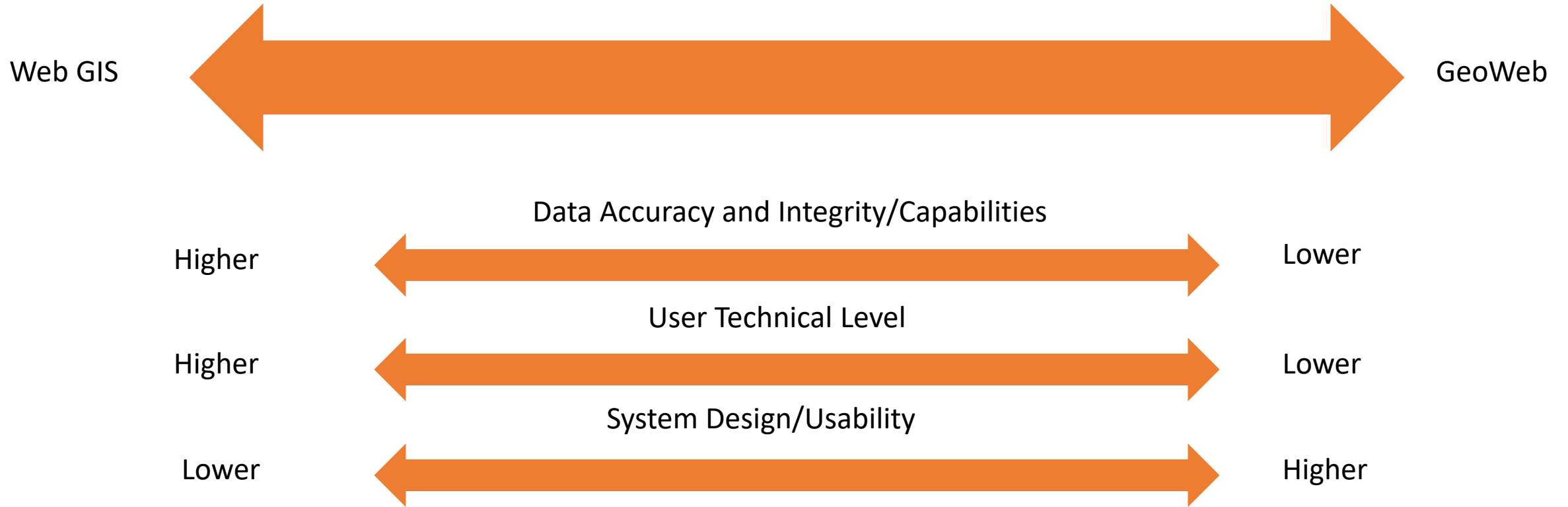


# Evolution of the GeoWeb





# Principles of the GeoWeb



# Geoweb & Geodetics

An Analogy: Hunting for Prime Numbers

Primality testing options:

- Deterministic (Eratosthenes Sieve 200 BC)
  - Effective, but terrible inefficient
- Non-Deterministic (Rabin-Miller 1980)
  - Fast and practical
- Who cares about prime numbers??!
- Encryption on the web starts with the hunt for very, very large prime numbers

## Algorithms to Live By



The  
COMPUTER SCIENCE  
of  
HUMAN DECISIONS

Brian Christian and Tom Griffiths

## Primality testing

$x$  – the number that we want to test

• **Sieve of Eratosthenes** (ca. **240 BC**): takes  $\sqrt{x}$  steps, which is exponential in  $|x| = \log_2 x$ .

• **Miller-Rabin test** (late **1980**) is **probabilistic**:

- if  $x$  is prime it always outputs yes
- if  $x$  is composite it outputs yes with probability at most  $\frac{1}{4}$ .

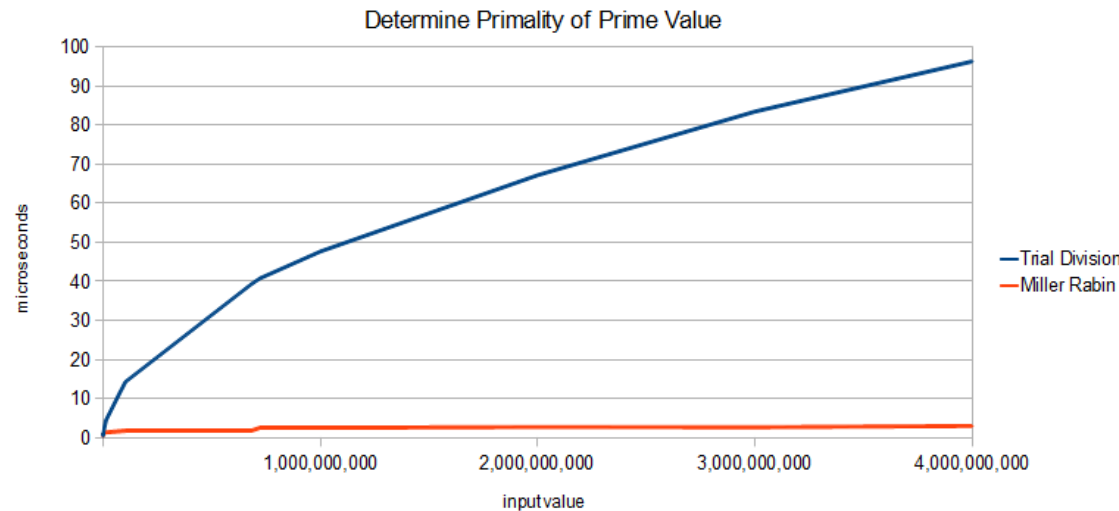
Probability is taken only over the internal randomness of the algorithm, so **we can iterate!**

The **error goes to zero exponentially fast**.

This **algorithm is fast and practical!**

In summary, sometimes close enough is close enough!

“There is no such thing as absolute certainty, but there is assurance sufficient for the purposes of human life. —JOHN STUART MILL”



[Source](#)



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14-Jun-18

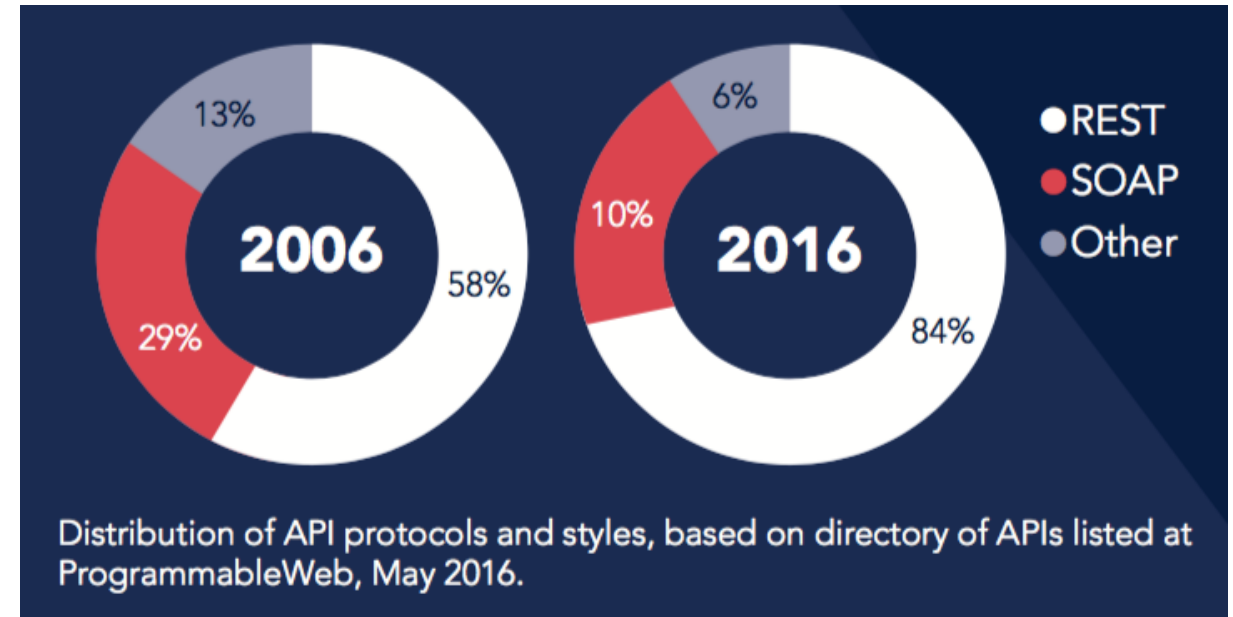
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# GeoWeb: A Platform Based on (some) Standards

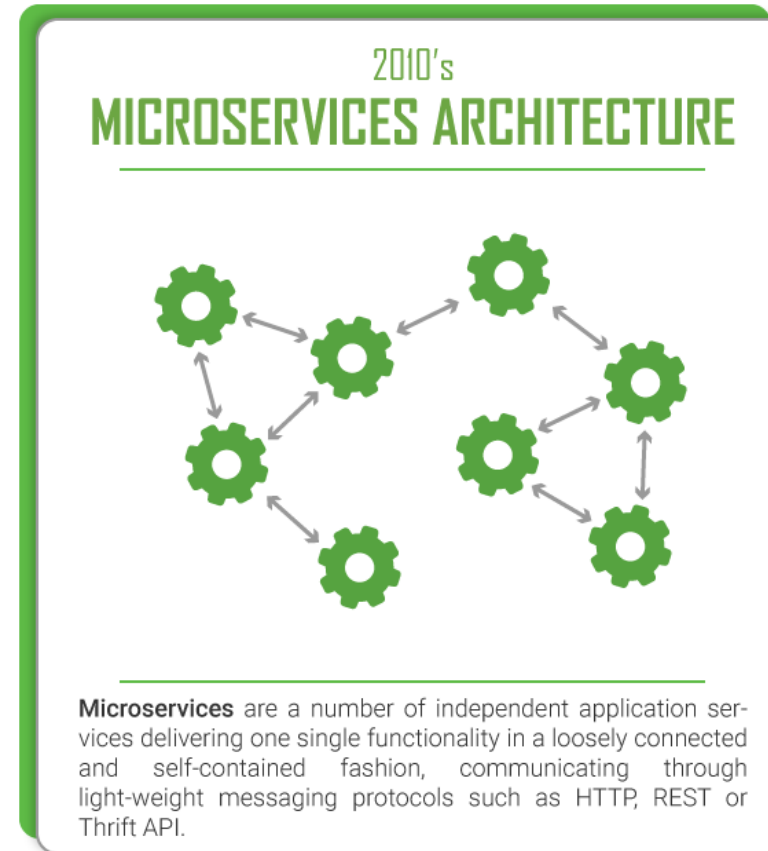
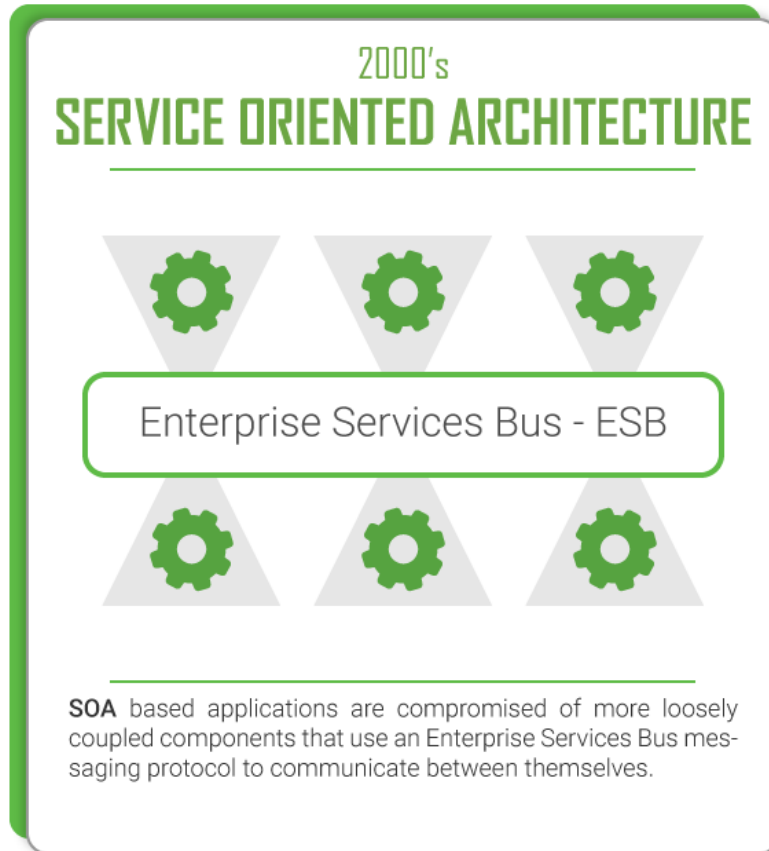
- Application Programming Interfaces (APIs)
  - REST vs SOAP
    - Representational State Transfer (REST)
    - Simple Object Access Protocol (SOAP)
- Data-Interchange Formats
  - JSON vs XML
    - JavaScript Object Notation (JSON)
    - eXtensible Markup Language (XML)
- Do you notice what is missing?
  - WMS, WFS, GeoRSS, GeoJSON, KML, ESRI Rest
  - Metadata (SDI vs RESTful Discovery)



Simplicity wins again...



# Microservices FTW



# GeoWeb: A Platform for Geoinformation Accessibility



Uber, the world's largest taxi company, owns no vehicles.



Facebook, the world's most popular media owner, creates no content.

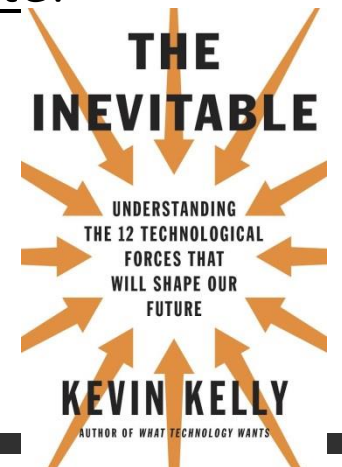


Airbnb, the world's largest accommodation provider, owns no real estate.

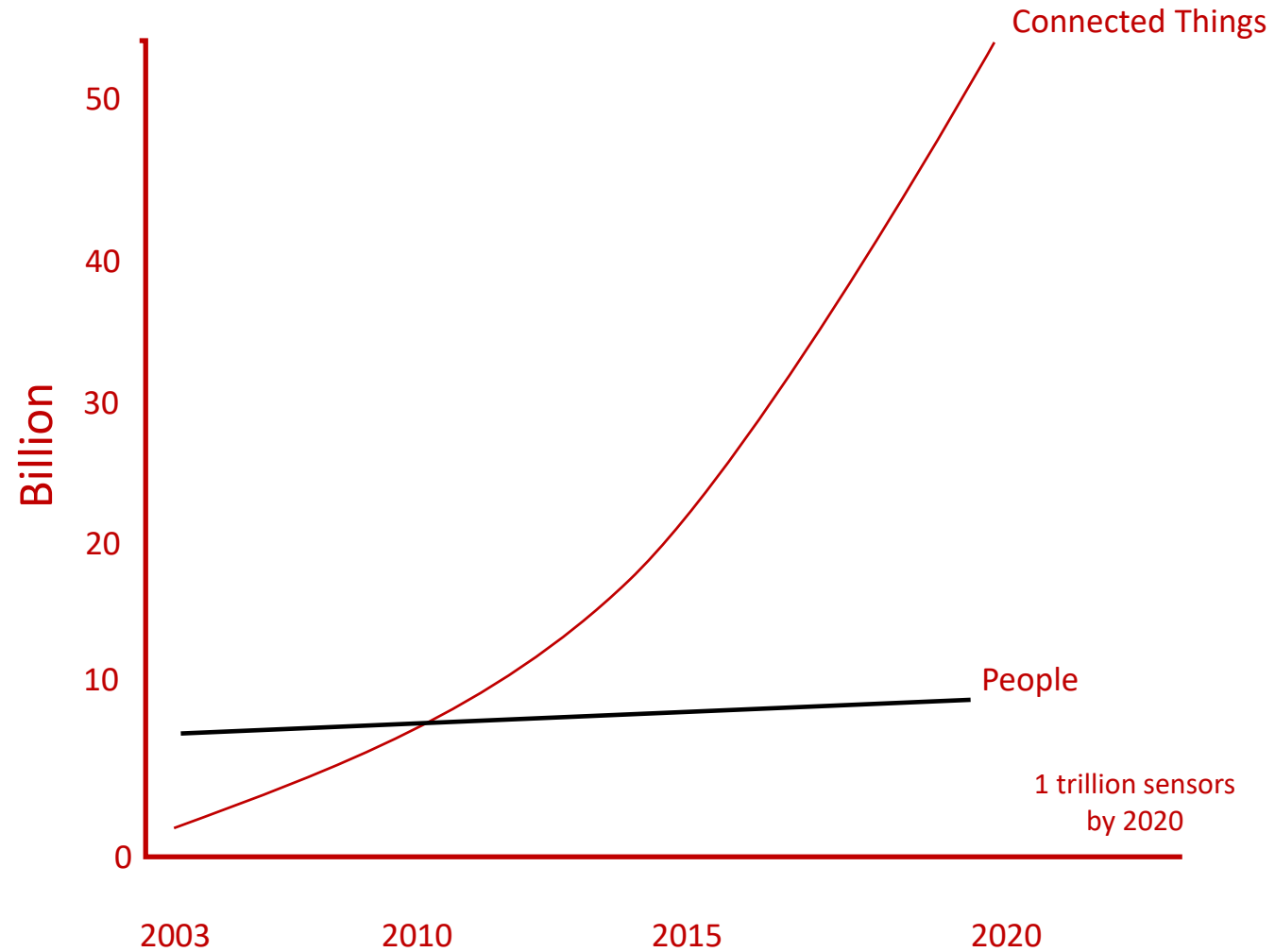
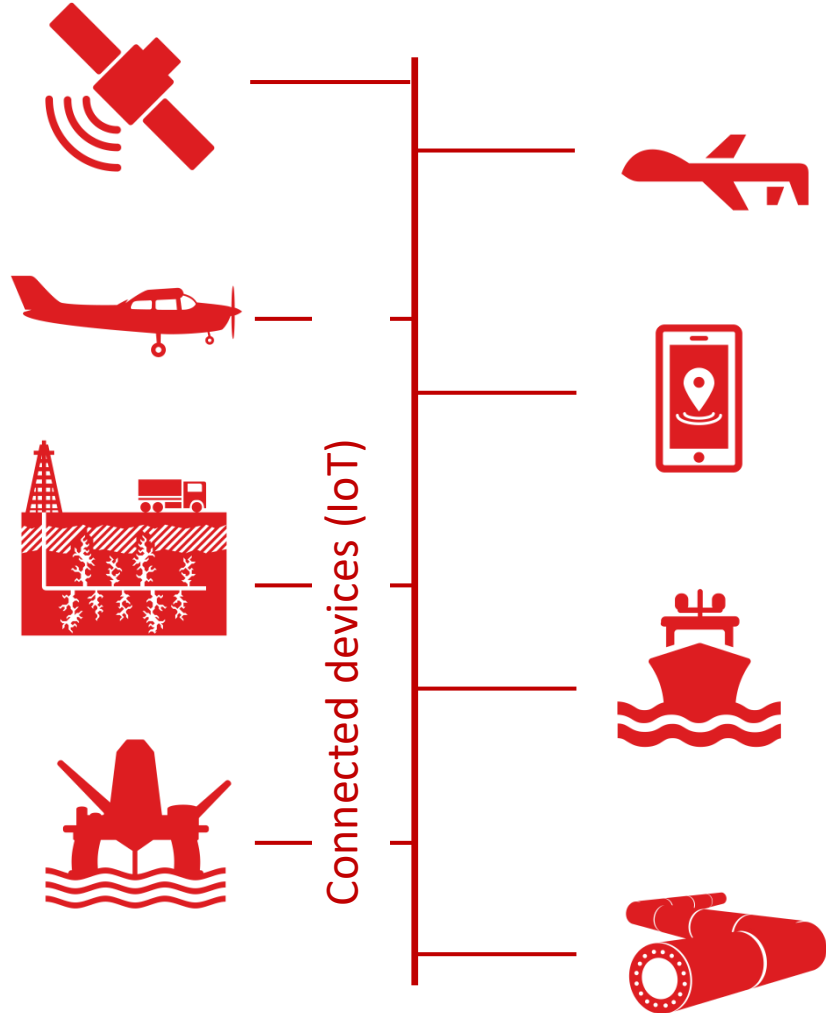


Alibaba, the world's most valuable retailer, has no inventory.












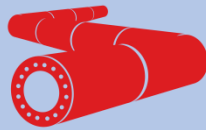





***Possession is not as important as it once was.  
Accessing is more important than ever.***



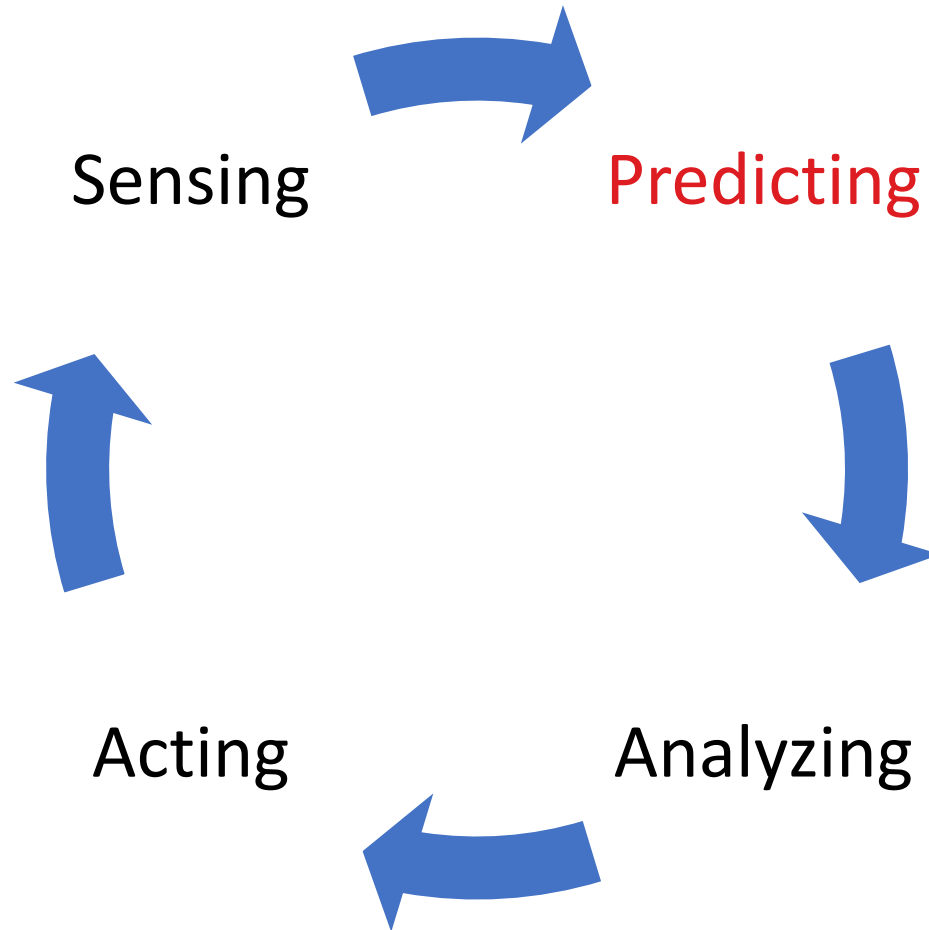
# The GeoWeb + Internet of Things (IoT) + Big Data (Event Streams)



# Static and Dynamic Sensing in an IoT GeoWeb Big Data World

	In-Situ Sensing	Remote Sensing
Dynamic Positions	   	    
Static Positions	   	   

# Sensing - Analyzing - Acting



“Predictions based on correlations lie at the heart of big data.” - Viktor Mayer-Schönberger



# These concepts are not new...



Robert FitzRoy

- Captain of Darwin's Beagle to the Galapagos Islands
- Horrified by 7,210 lives lost at sea due to bad weather 1854 – 1860
- Invented the term forecast
- Established the Met Office in 1854
- “The weather is not subject to chaos – if we can predict it we can save lives”

# Where do we even start? 10+2 Laws of Digitalization

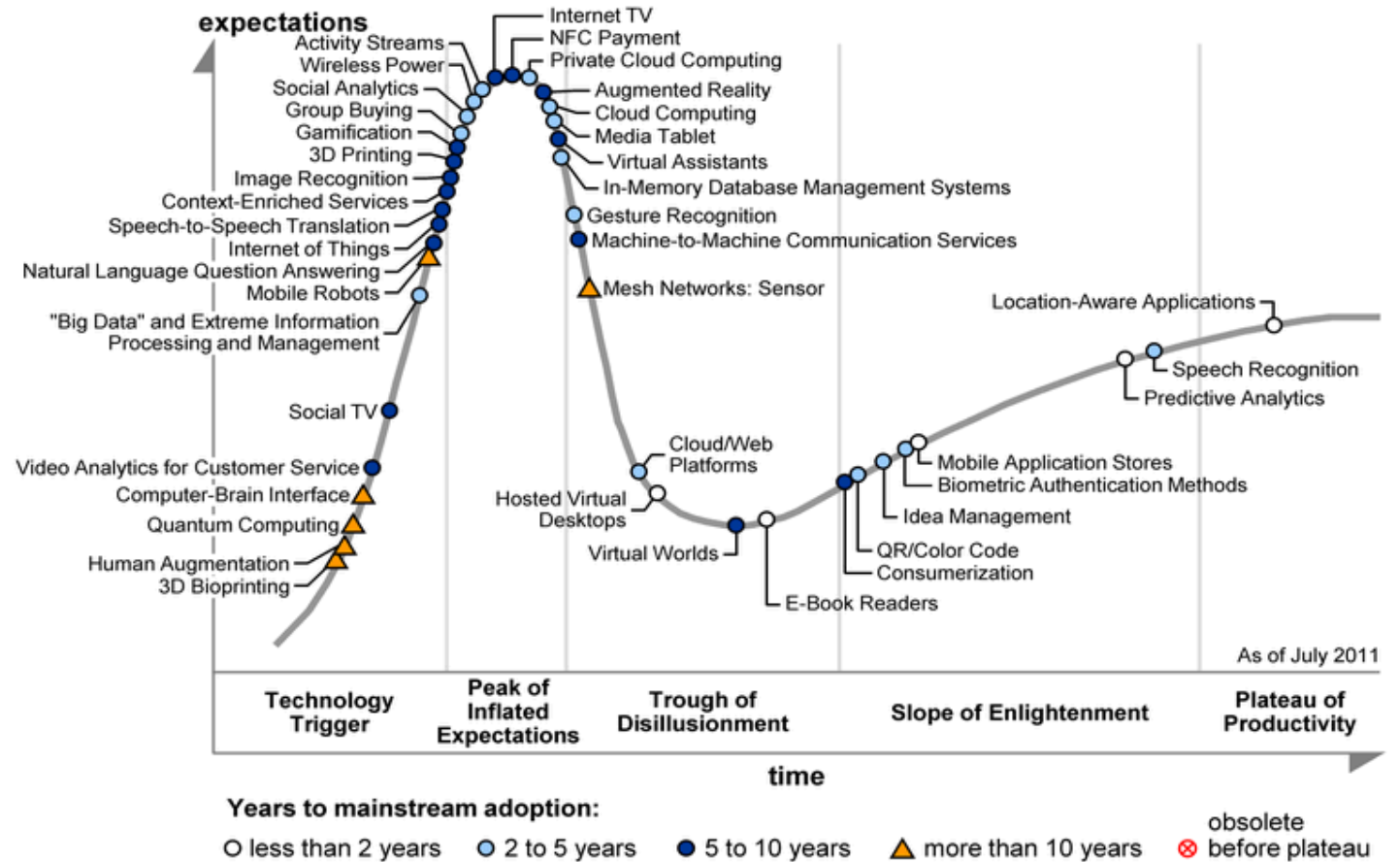
- Start with a familiar business process
- State the business challenge and work backwards
- Look for quick wins
- Simplicity is the ultimate sophistication
- Data Access > Data Ownership
- Data acquisition technologies are irrelevant
- It's not about the data, it's about what the data tells you
- Your organization is the domain SME
- Your organization is not the technology SME
- Presentation matters
- The second mouse gets the cheese
- Perfection is the enemy of progress

# Expounding on the mouse...

## 2012 Gartner Hype Curve

### Roy Amara's 'Law'

We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run



# Geoweb IoT Oil and Gas use cases

- Offshore Oil & Gas Rig Monitoring
- Refinery Monitoring
- Pipeline Monitoring
- Well Head Monitoring
- Vessel / Asset Monitoring

# The size of the prize

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## Global IoT in Oil and Gas Market Anticipated to Increase to \$30.57 Billion, at a CAGR of 24.65% During the Forecast Period, 2017-2026, Reports BIS Research



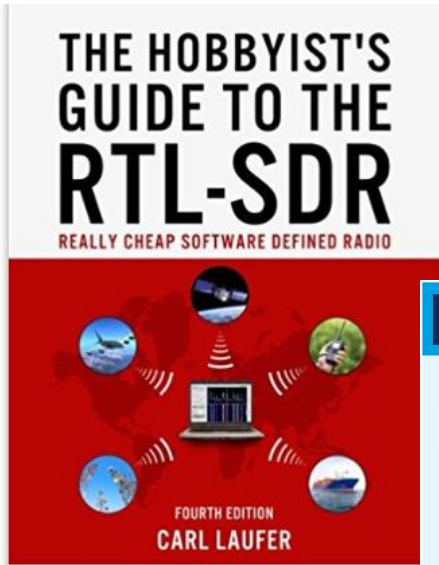
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BLOOMINGTON, Minnesota, August 31, 2017 /PRNewswire/ --

# At the edge...



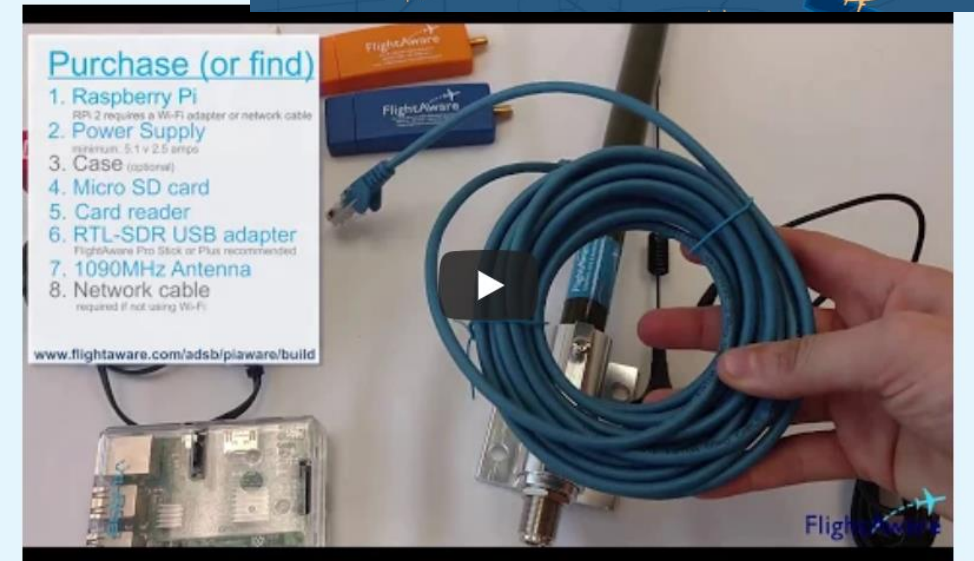
## 1 PiAware Shopping List

To build a PiAware, you must obtain the following components:

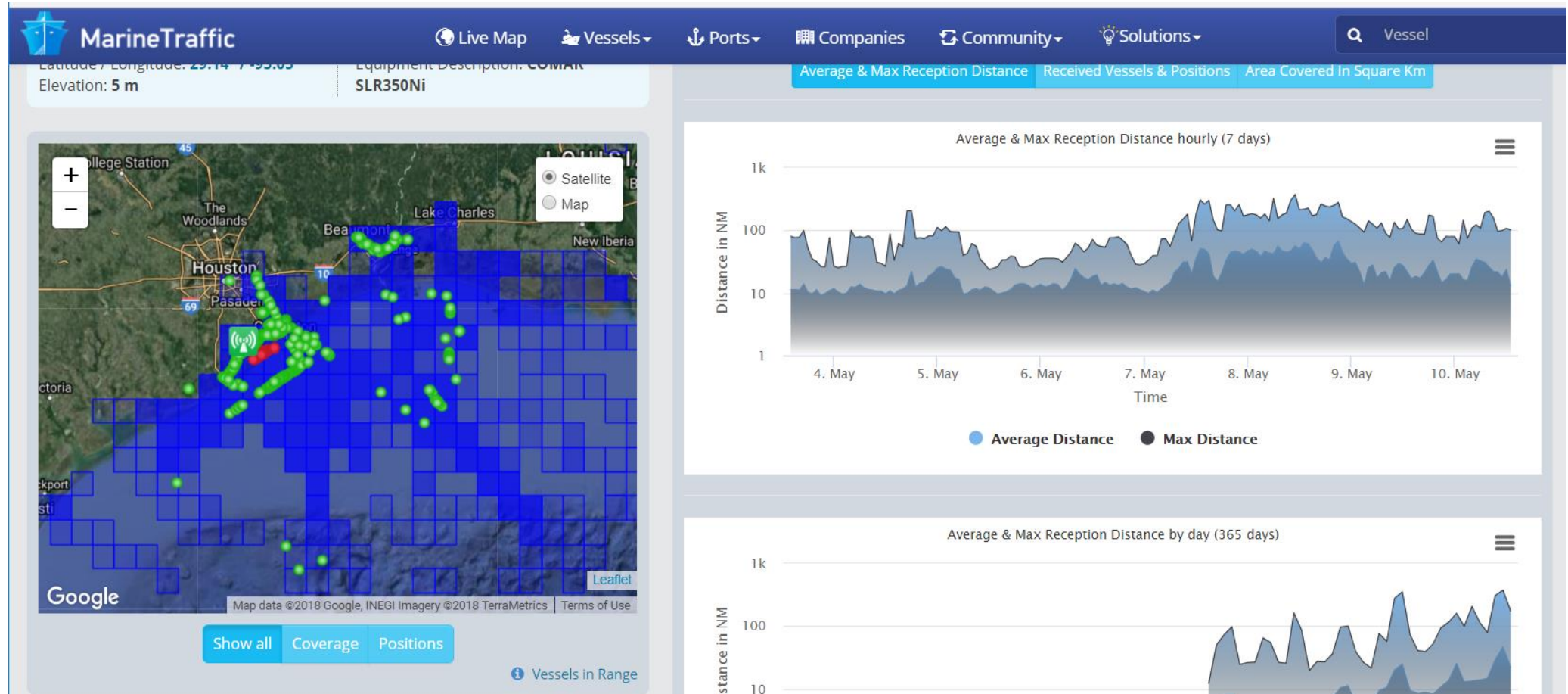
- Raspberry Pi 3**
  - Raspberry Pi 3B+ can be used, however the PiAware SD Card image does not yet support the 3B+ model. You must do a [package installation of PiAware](#).
  - Raspberry Pi 2 can be used but a USB Wi-Fi adapter will be needed to connect to the internet wirelessly
  - Raspberry Pi Zero W can also be used
- Power supply for the Raspberry Pi**
  - 5.1 Volts 2.5 Amps power supply recommended
- Micro SD Card (size: 8 GB or larger)**
- Micro SD card reader**
  - If your computer does not have a built-in SD card reader/writer, you will need the optional USB SD card reader/writer.
- USB SDR ADS-B Receiver (FlightAware Pro Stick or Pro Stick Plus recommended)**
  - The USB SDR (Software Defined Radio) ADS-B (Automatic Dependent Surveillance-Broadcast) receiver translates the 1090 MHz radio signal into something the computer can understand
  - Hint: If you are choosing between the FlightAware Pro Stick and the Pro Stick Plus remember the Plus has an on-board filter that works well in locations that have a lot of radio noise, such as urban environments.
- 1090 MHz Antenna**
  - An indoor antenna can be purchased to start. If using the FlightAware USB adapter be sure the antenna has an SMA connector.
  - If you use a telescoping mast antenna be sure to collapse it to a quarter wavelength of 1090 MHz (6.9 cm) to maximize reception.

Additionally, you can choose to purchase or find the following items but they are not required.

- Micro SD Card pre-loaded with PiAware
  - Skip the step to program the micro SD card
- Raspberry Pi Case
  - Protect the Raspberry Pi from shorts



# At the edge...



# Open source has arrived



mongoDB



elasticsearch



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# CONCLUSION / THANKS

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For more information about APSG, visit [www.apsg.info](http://www.apsg.info)



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