Indoor Tracking

(An example of integrating IoT into ArcGIS)

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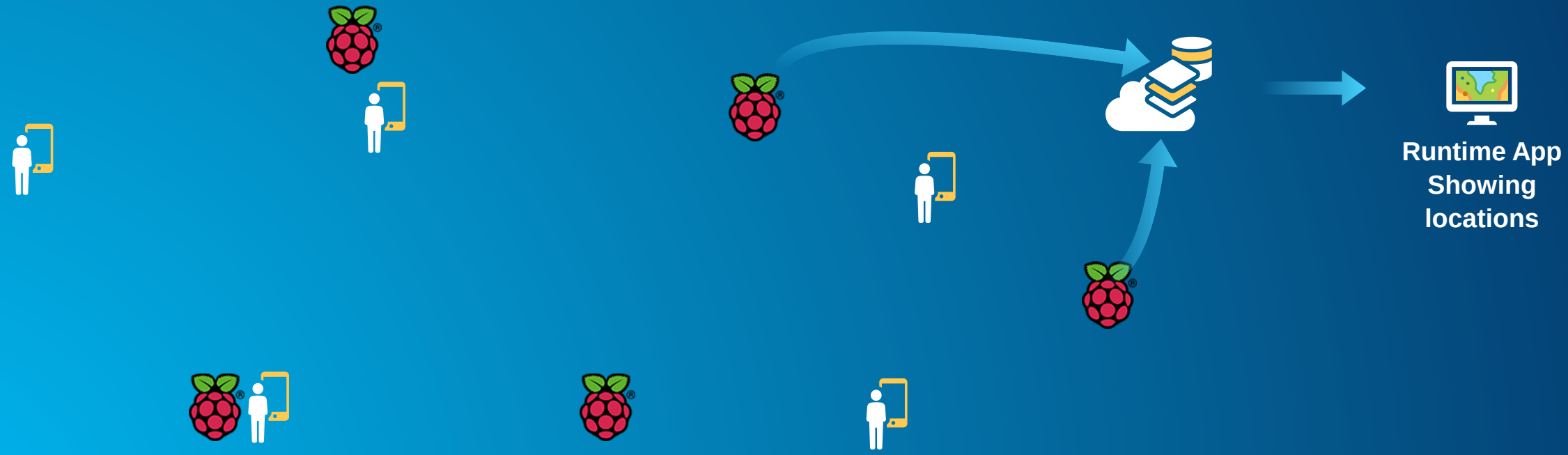
Indoor Tracking

- Fun stuff with IoT!
- How do I find someone?
- Raspberry Pi
- Data collection from IoT into ArcGIS
- Visualize using ArcGIS Runtime
- Live demo and someone could get hurt!

Goal : Indoor GPS?

- I want to find Eric, Morten, Rex, Mike, Will, Tyler…
- A network of devices listening to Bluetooth signals
- Each sends the signal levels received to a feature service
- All signal levels are post processed to visualise locations in a Runtime app

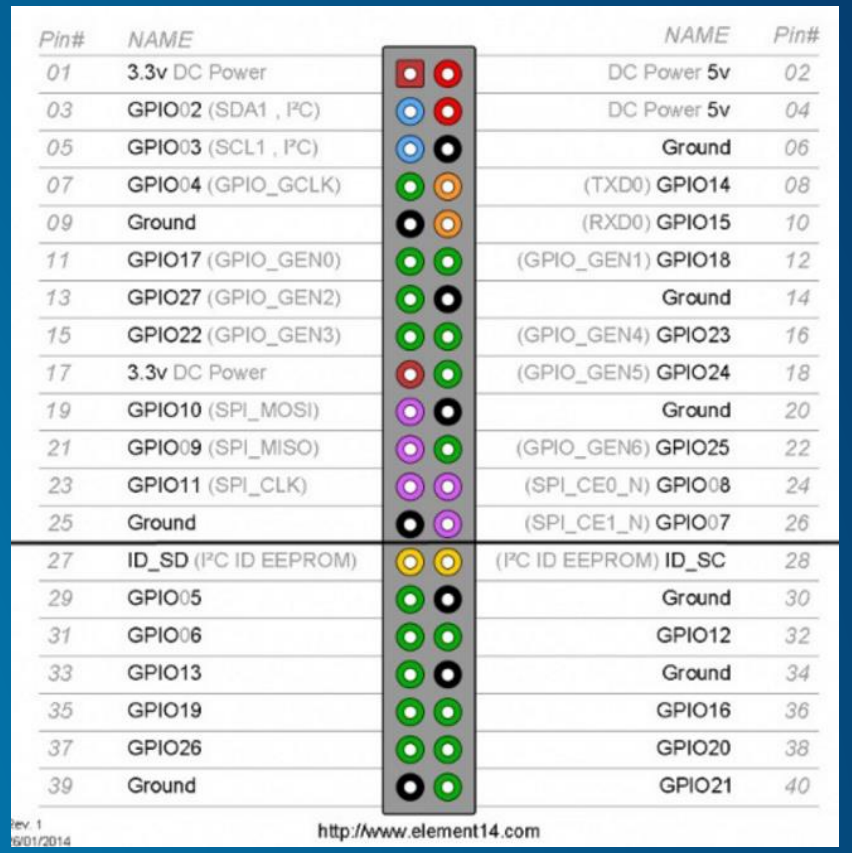


A closer look at the Raspberry Pi!

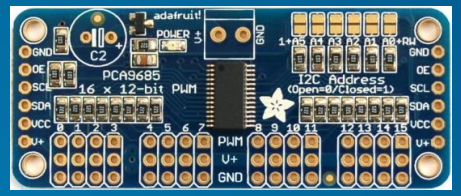
- It’s a small computer!
- 1.2GHz Quad-Core ARM Cortex-A53 (64Bit)
- Powerful GPU : OpenGL ES 2.0
- 1Gb Memory
- Boots from SD card : Lunix or Windows 10 IoT
- 4 USB ports
- WiFi and Bluetooth
- HDMI port
- Network port
- GPIO

GPIO : The interface to the outside world

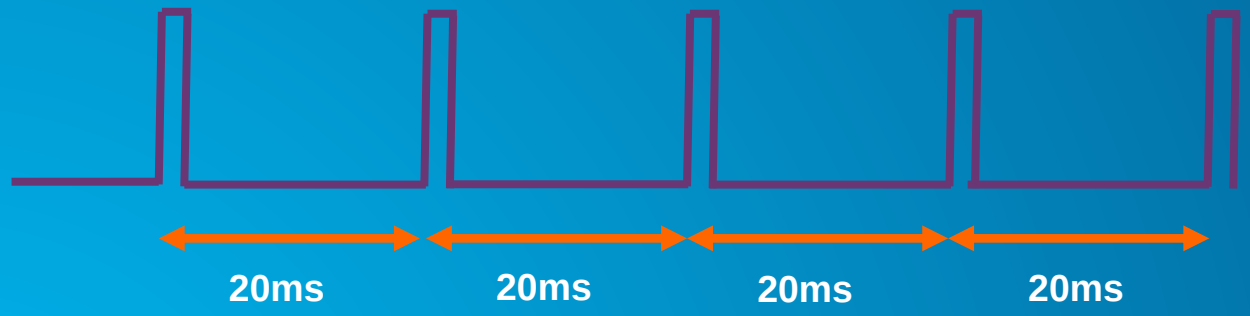
- General Purpose Input / Output pins
- Interface with data collection sensors:
  - GPS
  - Temperature
  - Light
  - Compass
- Control motors or servos
- GSM communications
- And endless more things



Controlling servos



- Spindle can be controlled to angle the control arm
- 0 – 180degrees
- PWM signals
- Vary pulse width length between 1 and 2ms



Bluetooth

- View Bluetooth enabled devices
- Most are not discoverable
- All I need is the Mac address
- For each person I want to track (from their Mac address)
  - Connect
  - Read RSSI
  - Disconnect

Writing data into ArcGIS Feature Services

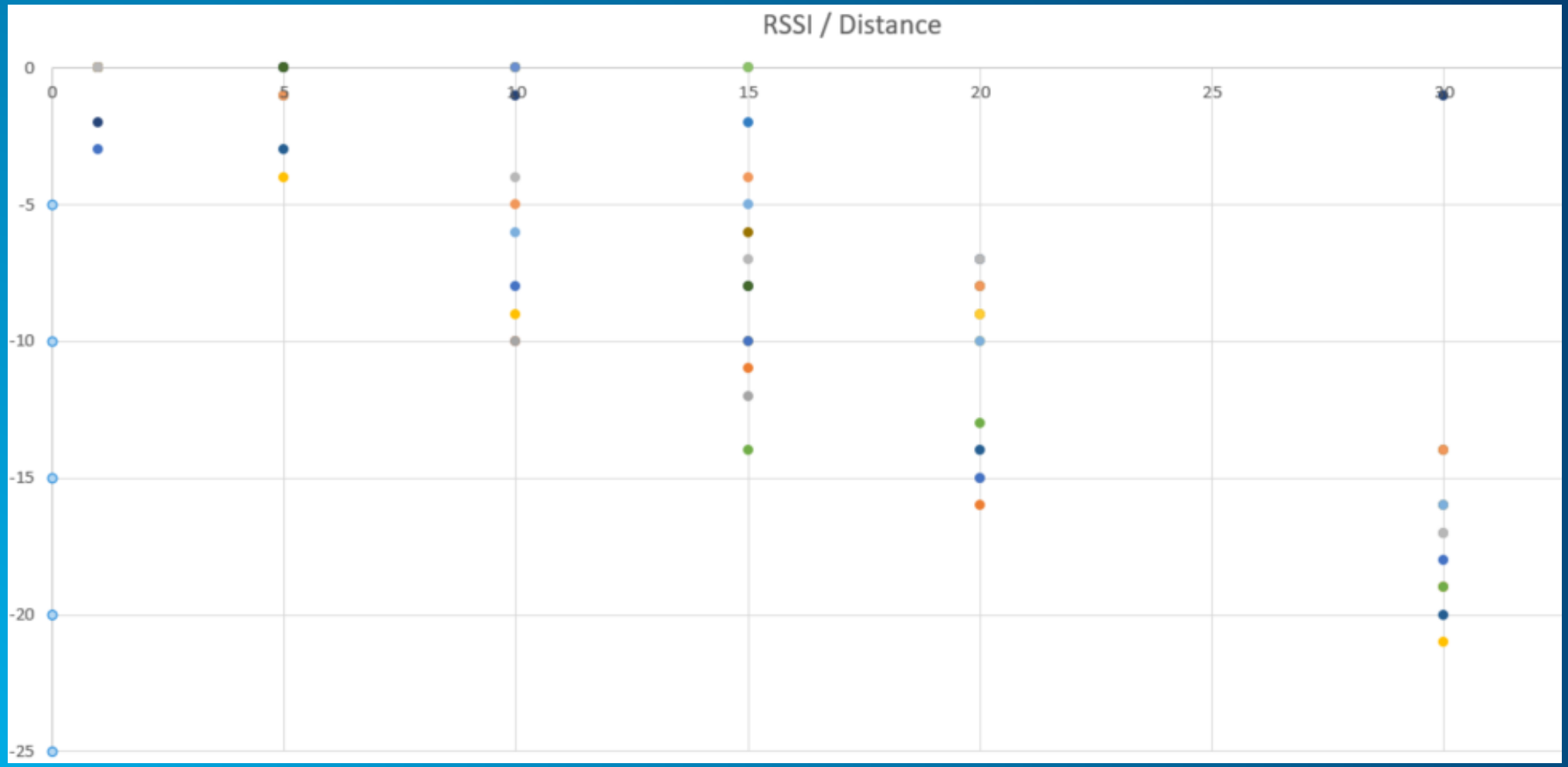
- **Feature service in ArcGIS online**
- **Access achieved via:**
  - **Rest API**
  - **Runtime SDK (.Net is supported on Windows 10 IoT)**

SensorID	SensorIP	PersonName	RSSI	DetectDate	FID
marktrack2	127.0.1.1	Mike	-5	2/22/17, 5:41 PM	14
marktrack3	127.0.1.1	Mark	-15	2/22/17, 5:42 PM	15
marktrack3		Eric		7/28/09, 6:23 AM	16
marktrack3	127.0.1.1	Tyler	-4	2/22/17, 5:43 PM	17

A dot on a map?

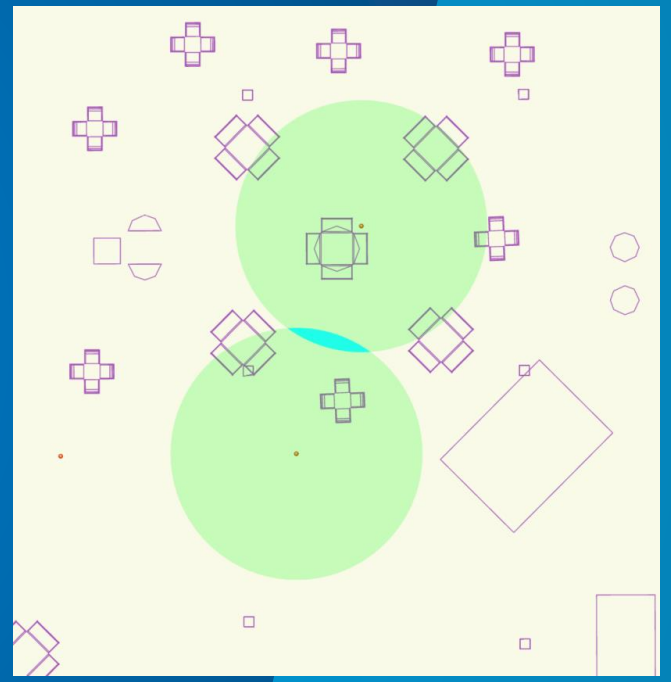
- Converting RSSI into a distance
- Range of signal strengths equate to given radius
- Varied for tested phones
  - iPhone 5s – stronger signals
  - Motorola Moto G – weaker signals

Signal strengths





Does it work?



IoT security?

- Internet of **insecure** Things
- Secure storage of data
- Intercepting remote sensor communications
- Privacy issues
- Access security of IoT devices
- Updating for new threats
- Physical security!!!!!!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