



# ArcGIS GeoEvent Extension for Server: The Internet of Things (IoT)



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Technical Workshop

# The Internet of Things (IoT)

## *Everything Connected*

- More things are connecting to the Internet than people
  - Over 12.5 billion devices in 2010 are tying together the physical, digital, and analytic worlds



**Predictions are that 25 billion devices will be connected by 2015, and 50 billion by 2020.**

(Cisco, <http://share.cisco.com/internet-of-things.html>)

# Connected Cars

## *Smart Phone on Four Wheels*

- AT&T Drive Studio
- Nissan, Tesla, GM, Ford, BMW, Audi



# Connected Homes

## *Smart Homes*

- Smart Appliances, Thermostat (Cooling/Heating), Security Monitoring



# Connected Homes

## Smart Thermostat



**Learning Thermostat™**  
Programs itself.  
Control from anywhere.

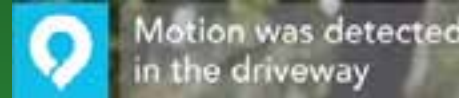


# Connected Homes

## Smart Security Monitoring



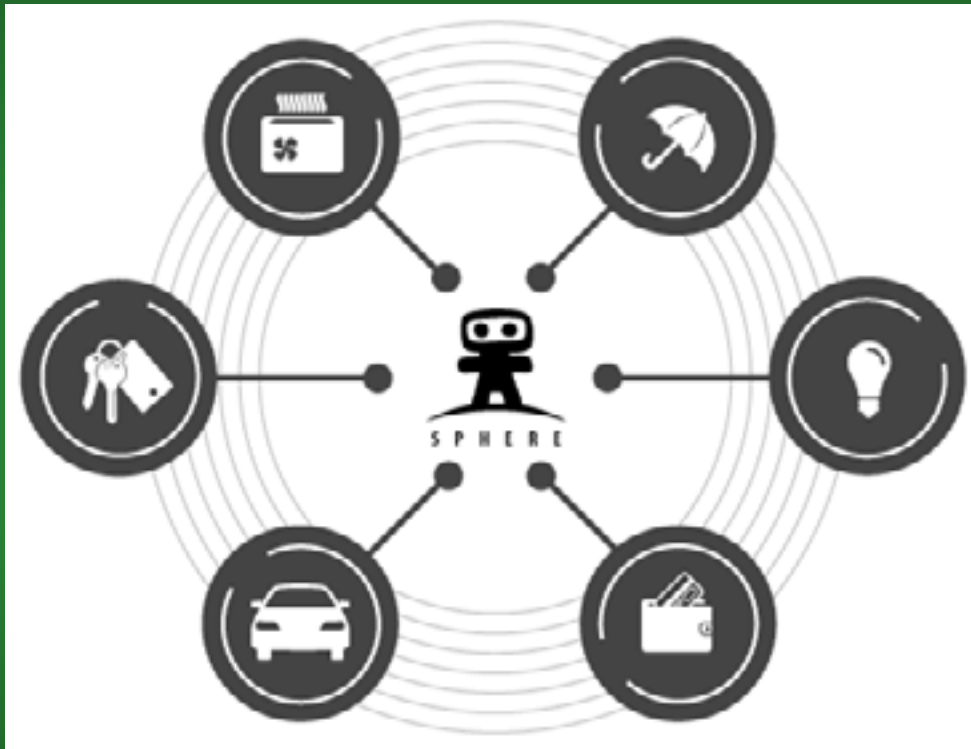
Custom Activity Zones



# Connected Homes

*Bluetooth Low Energy (BLE) Tags*

## Ninja Sphere



Ninja Spheramid – IoT gateway (*open source*)



Uses trilateration, the intersection of 3 overlapping signals, to determine location and presence of an object.



Stick 'N Find



Tile



Gecko

# Connected Sports

## Smart Equipment

- Infomotion 94Fifty smart sensor basketball
- Sony smart tennis racket sensor

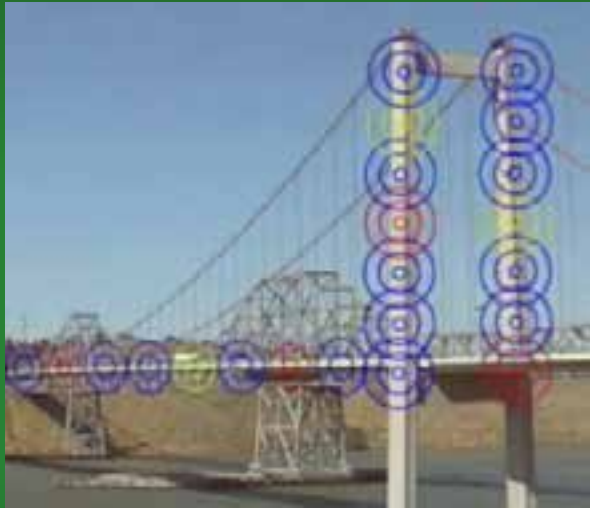




# Connected Environment

## Nature to Machine Interface

### HP Labs – CeNSE



Central Nervous System of the Earth:  
Feel, taste, smell, see, and hear

### Cisco Planetary Skin



Billions of networked sensors on land,  
sea, air, and space to detect and predict  
changes to the environment.

### IBM Smarter Planet



# Connected Environment

## Nature to Machine Interface



### Micro-Weather Station



Reports ambient temperature, relative humidity & barometric pressure

### Chemical Sensor



Reports volatile organic compounds

### Air Quality



Reports carbon dioxide (CO2)

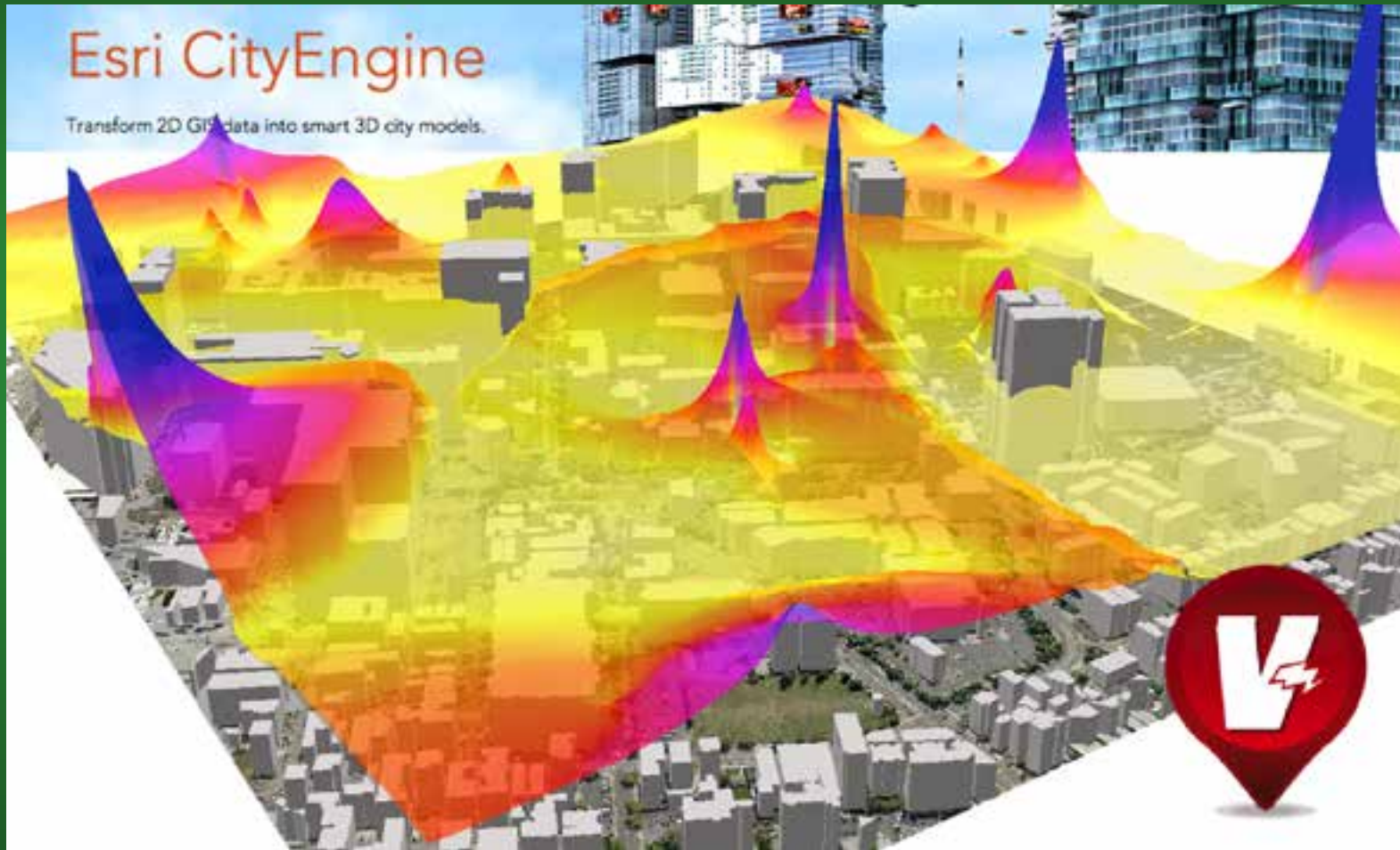
### Light Sensor



Reports luminosity

# Connected Environment

## Nature to Machine Interface



Android



Micro-Weather Station



CO2 Air Quality



### Sensor Network on a Board

Chemical Sensor



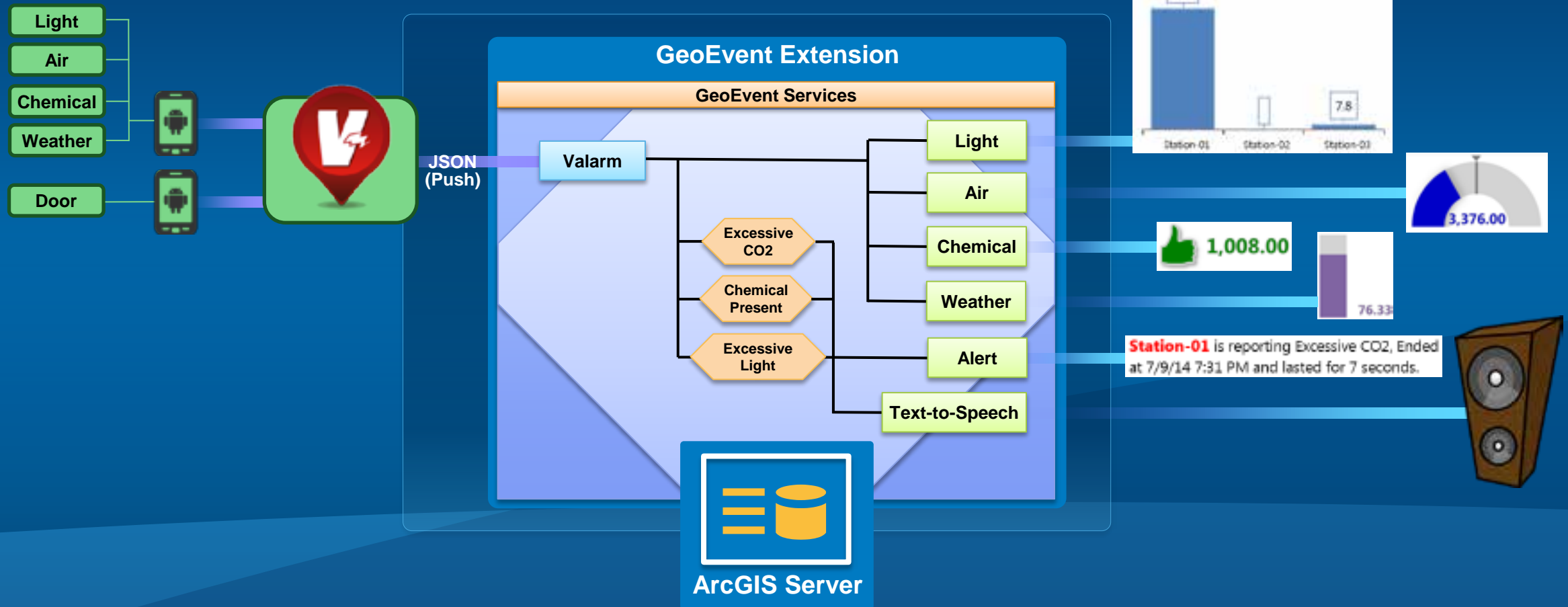
Light Sensor



Demo

# Nature to Machine Interface

## Real-Time Analytics on the IoT



# Personal Area Connectivity

## *Wireless Personal Area Networks (WPANs)*

- Zigbee
  - Form a mesh network
  - Low data rate
  - Long battery life
- Bluetooth Low Energy (BLE)

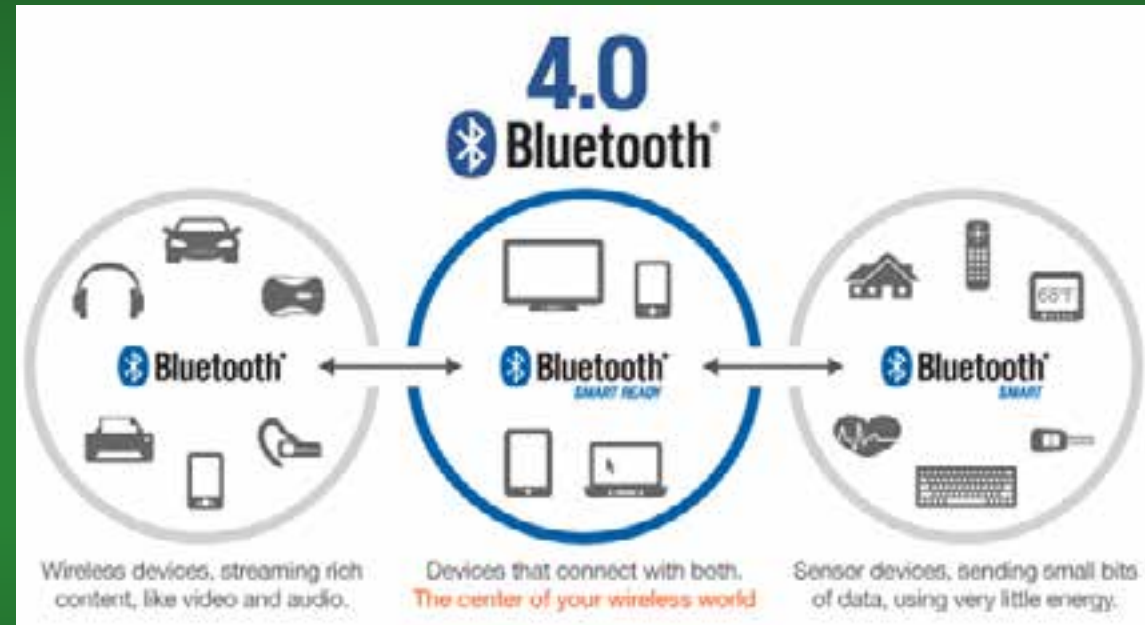


# Bluetooth Low Energy

*Bluetooth Smart – a wireless personal area network*



- IOS 5
- Android 4.3
- Windows Phone 8.1
- Linux 3.4



# Beacons

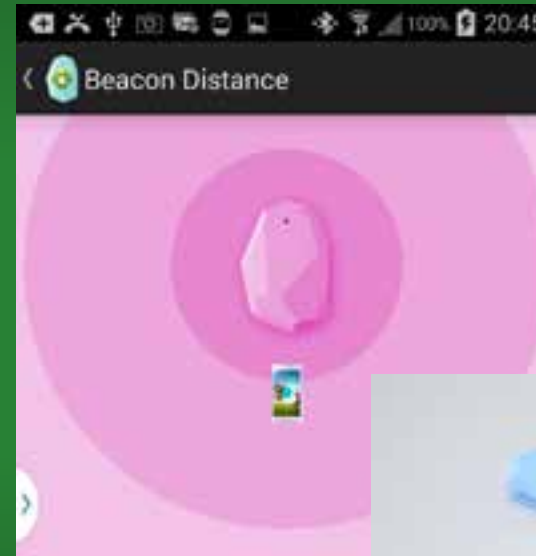
*iBeacon – Apple Standard for Beacon broadcast format*

## Gimbal Beacons

Context Awareness platform a product of Qualcomm Retail Solutions, Inc.



## Estimote Beacons





# Connected Schools

## *Student Proximity*

- Modern solution for frantic and frequent head counts



# Connected Museums

## *Smart Art*

- Context-aware
  - Art description/narration



# Connected Retail

## Smart Shopping

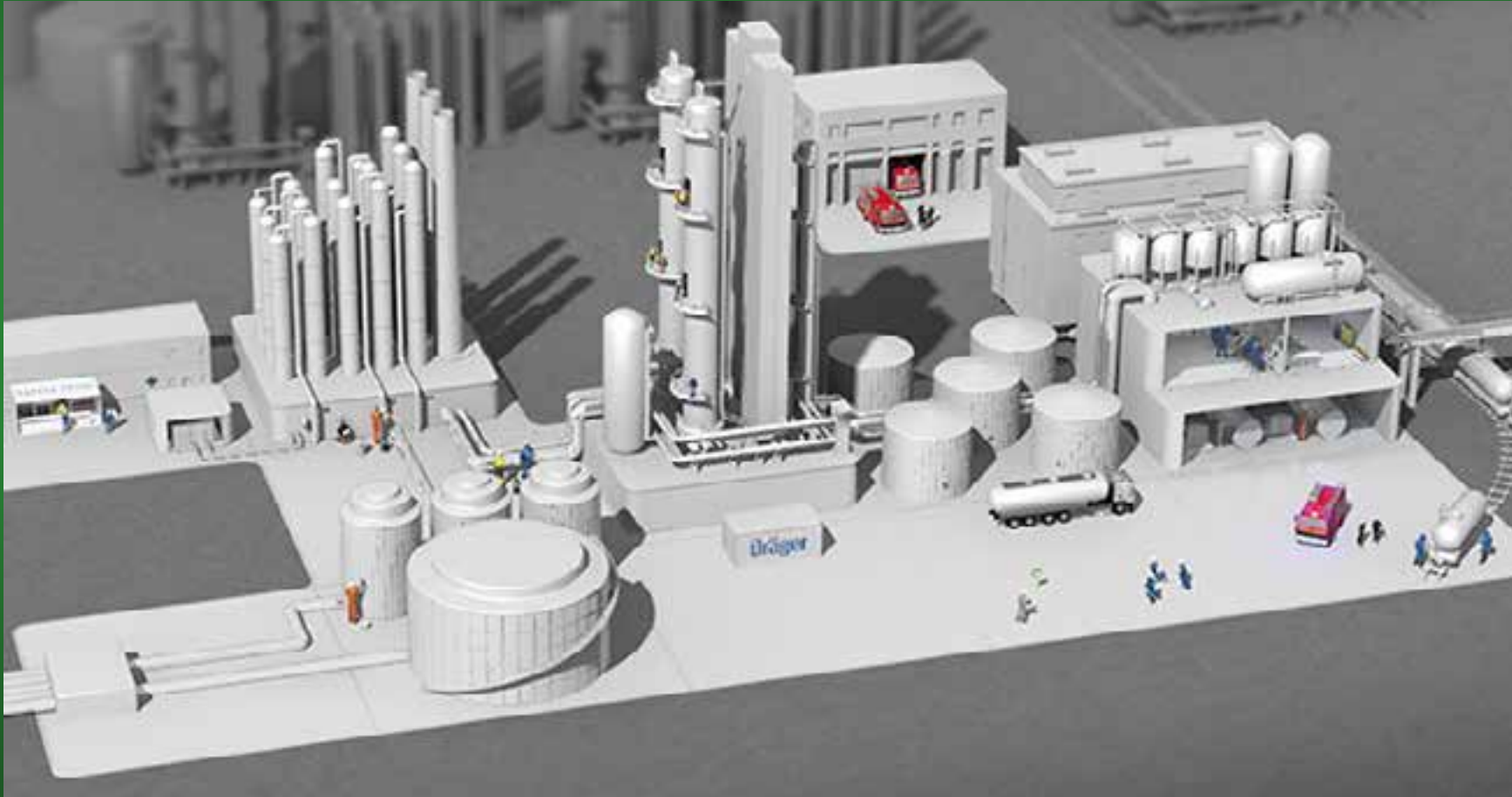
- Proximity to brand
- Interest sensing



# Connected Buildings

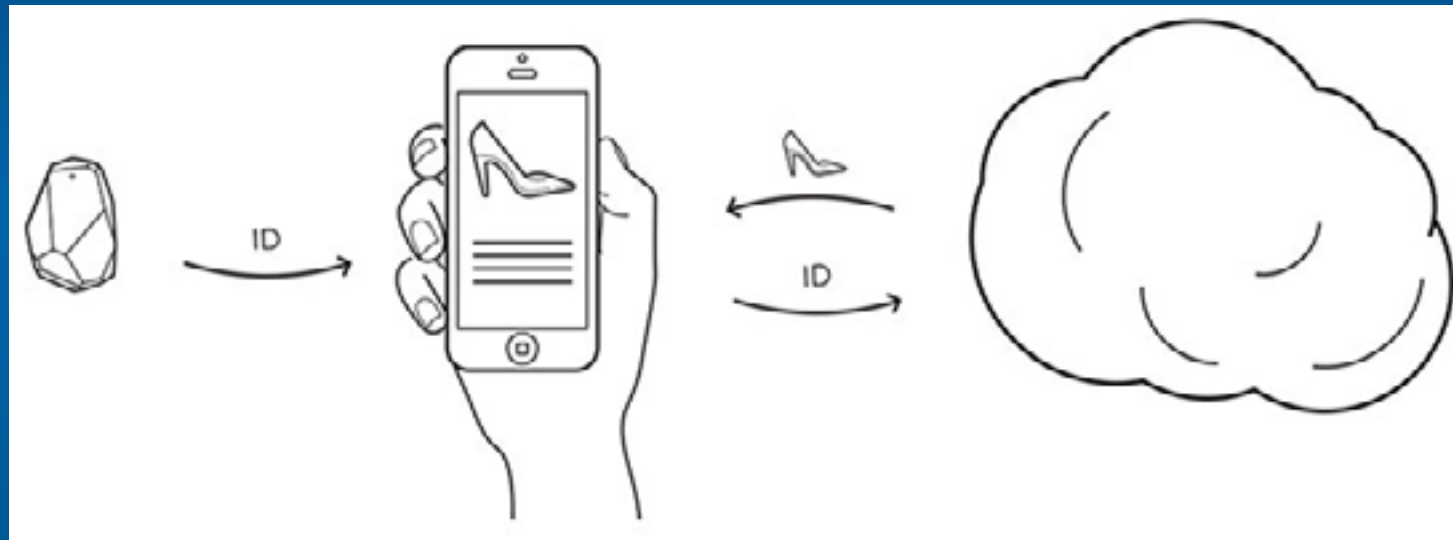
## *Smart Workplace*

- Workplace Safety



# Proximity Sensing

## Estimote Beacons



# Connected People

## Smart Wearables

Google Glass



Platronics Headset



Sensoria Sports Bra/Shirt



Samsung Galaxy Gear



Under Armour Armour39



Jawbone Up



Sensoria Smart Socks



Demo

# Smart Wearables

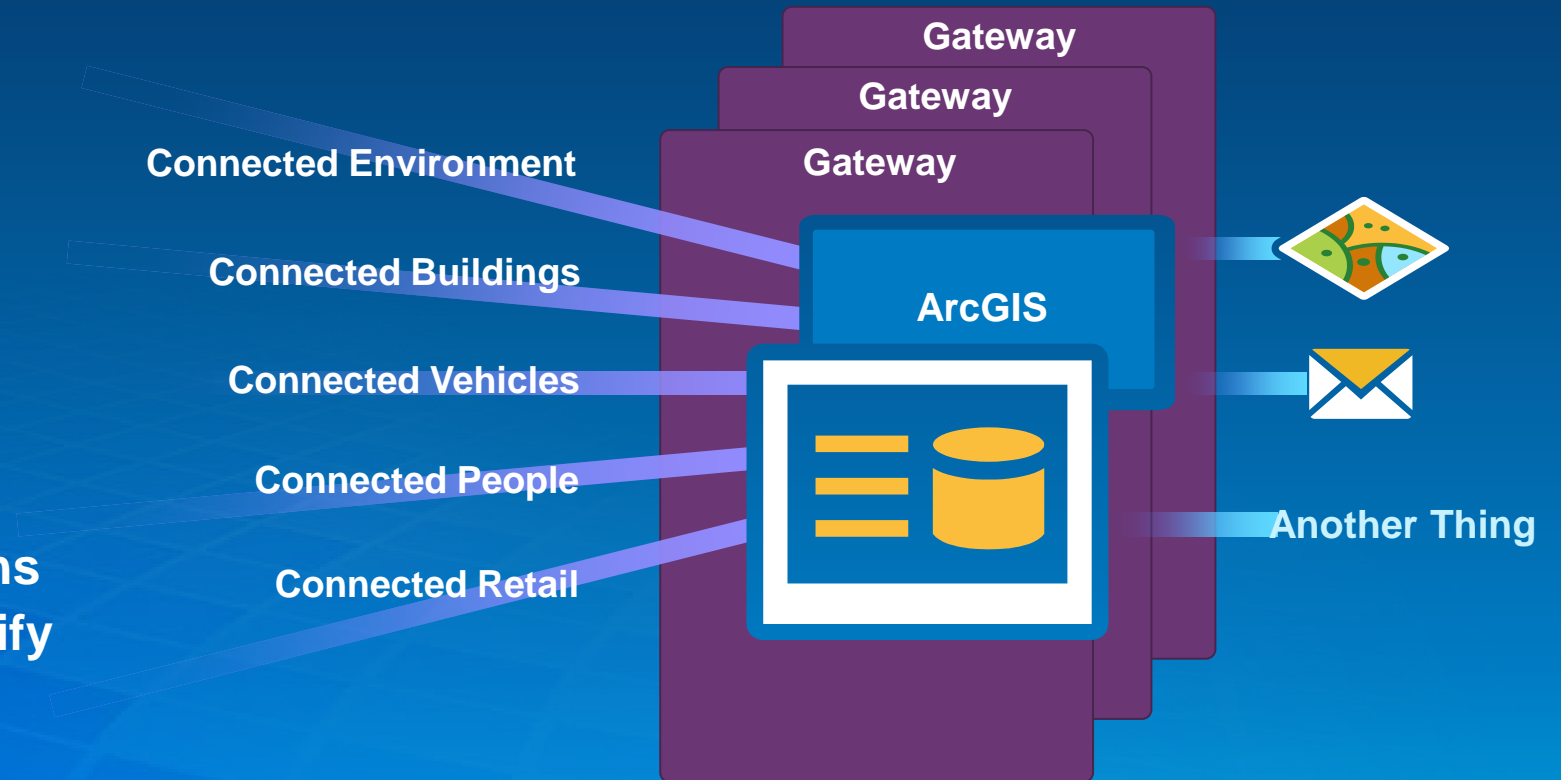
Firefighters



# The Internet of Things (IoT)

*Everything Connected*

- Geospatial reasoning is needed amongst the Internet of Things.
- Performing geospatial reasoning closer to the things can improve their ability to sense.
- When meaningful patterns are found things can notify people or even other things.





**Thank you...**

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**Paper – pick up and put in drop box**

# Questions / Feedback?

To learn more:

<http://links.esri.com/geoevent-processor>

<https://geonet.esri.com/community/gis/enterprise-gis/geoevent>



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