Commercialization of an IoT Big Data Value Chain: Lessons Learned from IoT Implementations

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Our Talk Today

- **Occam Family**
- **OccamSmart Projects Overview**
- **Big Data Summary**
- **H-E-B Project in Depth**
- **Some Other Opportunities**
- **More on Big Data**
- **Acknowledgements**

Occam is a Commercial Lab

In-House Laboratory

- Occam's business is to develop products and services for customers

- Full-service engineering firm creating technological innovations across multiple industries

- Experience level of the engineering team is high

- Pace of work is quite fast

Cerca Trova is a holding company that focuses on technology groups that provides organizations with secure IT products and services. Our partner companies provide expertise in end-to-end secure IoT design, development, and cybersecurity services.

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Some of Our Great Clients

Abacode is fundamentally different from most Cybersecurity providers. We address company risk from a business strategy first and cyber-technologies second. Abacode understands that IoT devices are growing rapidly and security is top priority. We provide business driven security and compliance solutions to protect your data.

Cybersecurity Applied Research Lab

Abacode leverages our applied research lab to regularly evaluate industry leading cybersecurity products and solutions.

WHY ABACODE?

GLOBAL | CUSTOMER-CENTRIC | HIGH QUALITY PROFESSIONALS

Abacode is an industry-recognized MSSP experienced in providing holistic cybersecurity and compliance services to customers throughout the Americas, Europe, and the United Kingdom. With current clients in over 10 countries, our visibility into global threats adds incredible insight and value to our customers. Our team regularly speaks at national and international cybersecurity, business, and compliance conferences and has been recognized as one of the fastest growing MSSPs by empowering companies to have a Cyber Capability Maturity Model (CCMM) and consolidate all cyber-risk and regulatory compliance initiatives under one roof.
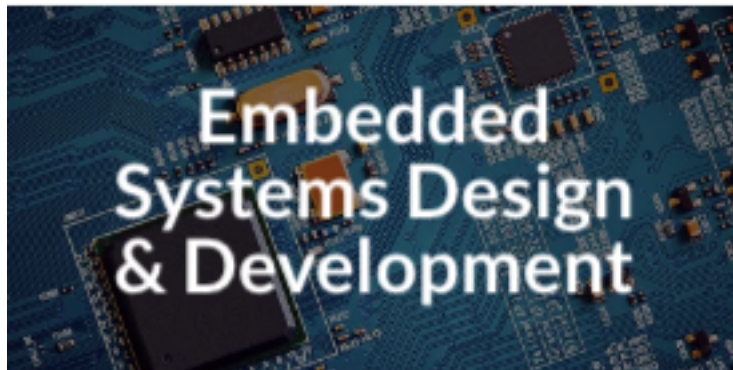
We provide product design, development, and engineering services to assist our clients and stakeholders in creating the technological innovations that build the foundation for a better tomorrow.

Occam Services

Occam Technology Group strives to provide services that exceed the expectations of our customers while meeting regulatory requirements and improving the effectiveness of our quality system through the use of measurable quality objectives. We offer a range of engineering capabilities with a team of experts that solve the most complex issues companies face today. Our engineers will be with you through every step of the process and will ensure your product gets to market fast and effectively.

Embedded Systems Design & Development

Communication Solutions Design & Development

IoT Device Design & Communication

Products

Product Development

Engineering Services

OccamSmart is focused on smart products that enable IoT solutions. We have the proven skills and experience in IoT engineering to solve the most challenging problems for our clients.

OccamSmart Projects

OccamSmart is a leading provider of IoT engineering services through expertise in design and product development to deliver quality end-to-end solutions for clients.

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Fully Integrated Bionic Pancreas

The Beta Bionics iLet offers a closed loop automated Glucagon and Insulin Delivery System to more effectively regulate Blood Sugar in Type 1 Diabetics.

Life Sciences

- Motor Control for drug delivery pumps
- Host Control Code development
- Prototype creation
- Code Validation Support

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Spec Ops Finder

The X3 Finder Detection System is a heartbeat and respiration detection system designed for military, law enforcement personnel and search and rescue.

Military

- Motor Controls
- Communication
- Software development
- Electrical engineering

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Oil Conserving Fryer

The FryMaster is used by the largest fast food chains to conserve oil, report oil levels, monitor performance, and calculate cook counts.

Food Processing
- Design engineering
- Mechanical engineering
- Hardware development
- Sensory design

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Innovative Theater Seat Tracking

The Syniverse Seat Tracking System allows attendees at a conference to interact with the sensors while demonstrating Class 0 or Class 1 devices in a non-IP based environment.

Smart Technology
- IoT Infrastructures
- Hardware Integration
- Software Development
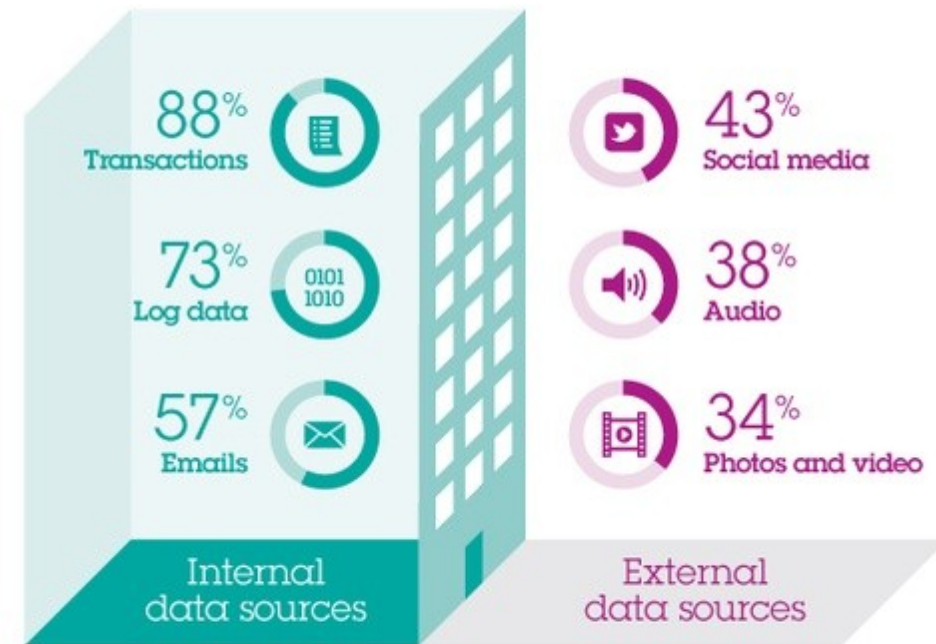- Prototype creation

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Where Does Big Data Come From?

Occam is a leader in Big Data by creating smart products that enable IoT solutions. Big Data delivers insights to an organization and provides algorithms to improve their practices. Much of today's Big Data comes from social media, machinery, and daily transactions.

Where does big data come from?

Most big data efforts are currently focused on analyzing internal data to extract insights. Fewer organizations are looking at data outside their firewalls, such as social media.

88% Transactions

73% Log data

57% Emails

43% Social media

38% Audio

34% Photos and video

Internal data sources

External data sources

IBM

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IoT Devices
We tackle the challenges of next-generation innovation when it comes to designing hardware and software for IoT solutions and implementing IoT platforms using today's communication and wireless technologies.

Embedded Systems
We can step into the development process at any point through cross-functional operations with specialists in electrical, software, compliance, and mechanical engineering.

Communication Solutions
Whether you need a refresh for your current system or an entirely new platform or infrastructure, our team has comprehensive expertise and experience to provide seamless integration.

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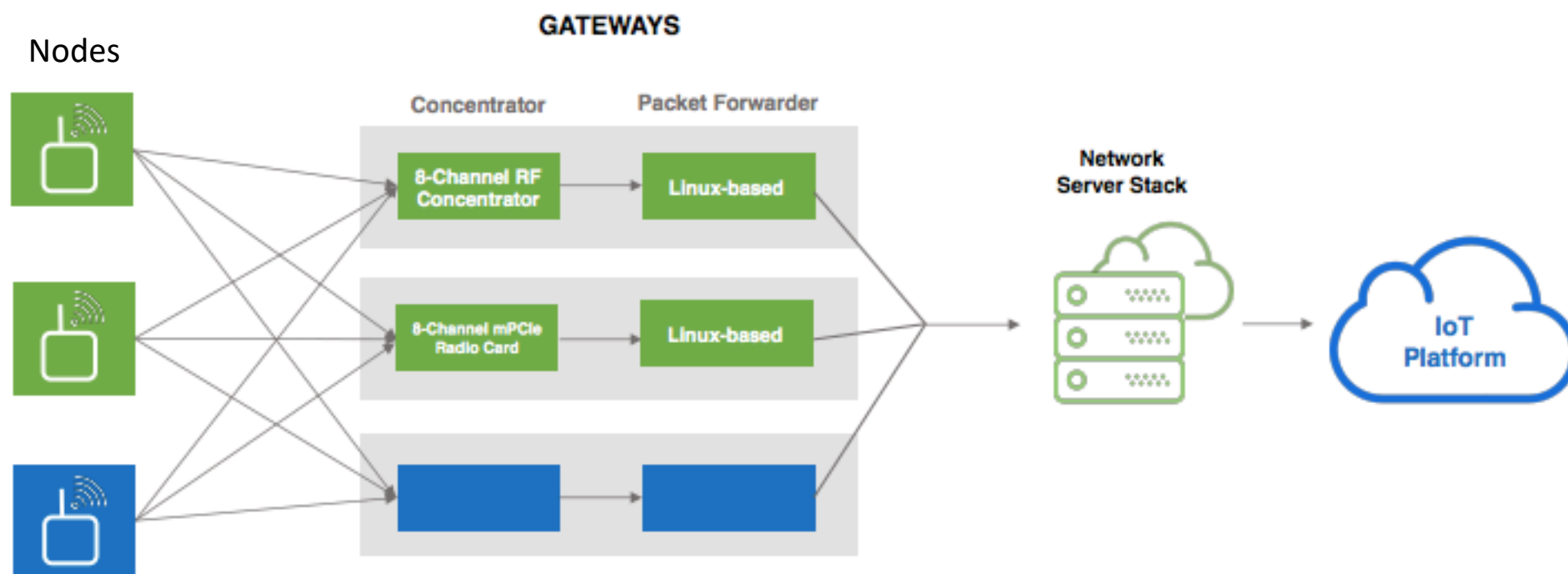
H-E-B Curbside Pick-Up

H-E-B is one of the nation's largest independently owned food retailers with over 340 stores in Texas and Mexico. They are committed to exceptional service, low prices, and a friendly shopping experience.

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Current H-E-B Curbside Pickup System Design

- Store is tracking the customers phone using 4G
- Once customer enters 10-mile radius, the store is alerted that purchases need to be ready
- Geo-fence Wi-Fi connection as customers enter parking lot and it is time to get order in parking lot
- Wi-Fi beacons in lot used to triangulate customer car position

H-E-B

Wifi Geo Location

Wifi Based Geofence

10 Miles radius 4G

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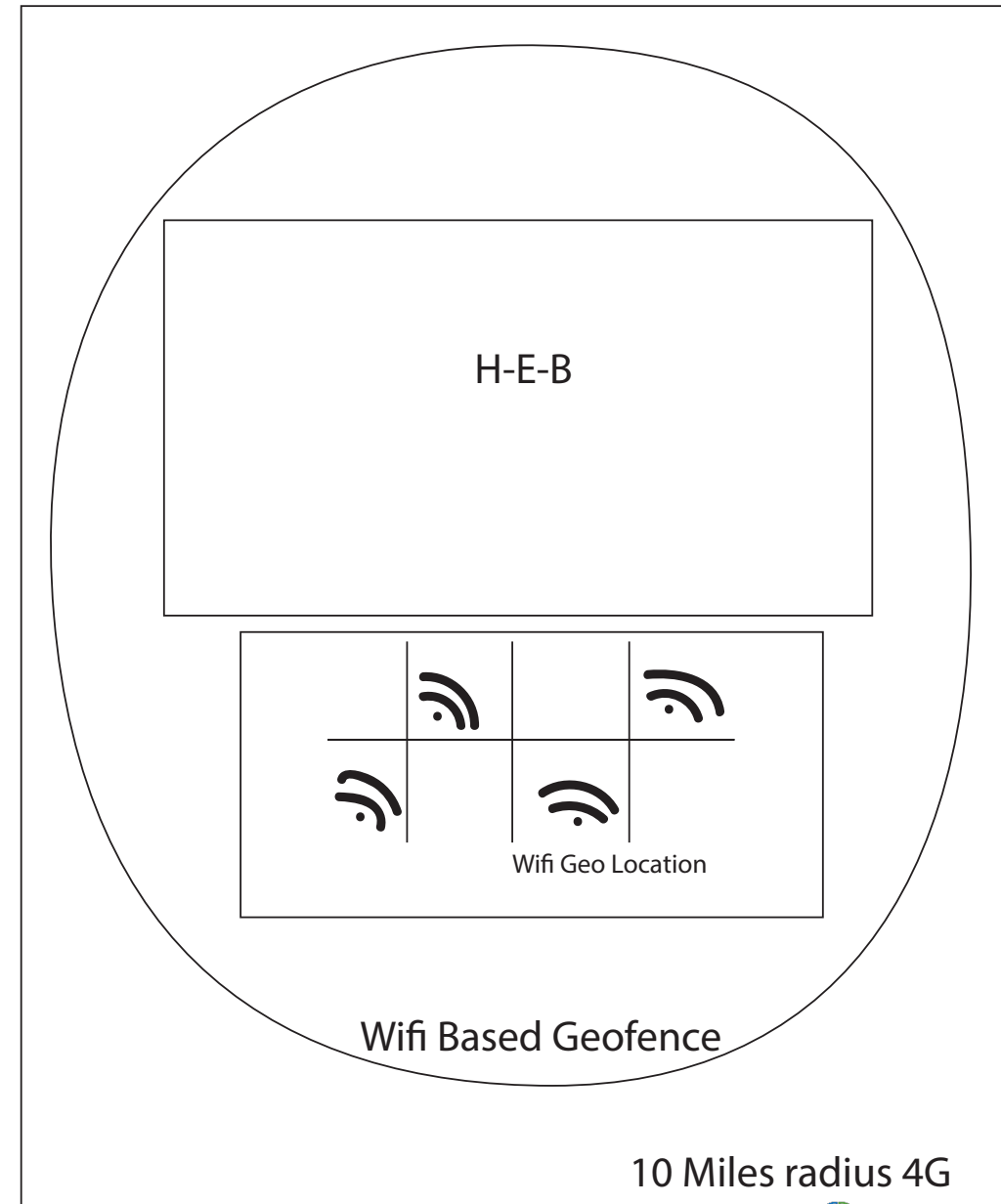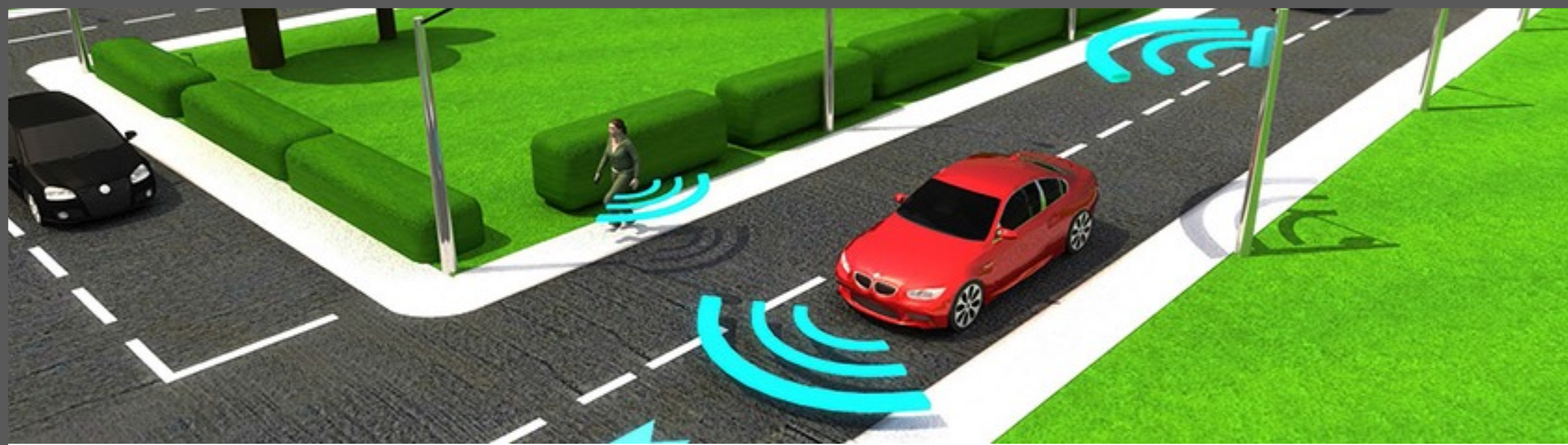
H-E-B Current Performance Metrics

Current
- 93% accuracy
- 9 minutes between parking and groceries delivery

Goal:
- 100% accuracy
- 2-minute delivery

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Practical Limitations of Wifi Geolocation

1. Signal Strength Problems
   - environmental interference
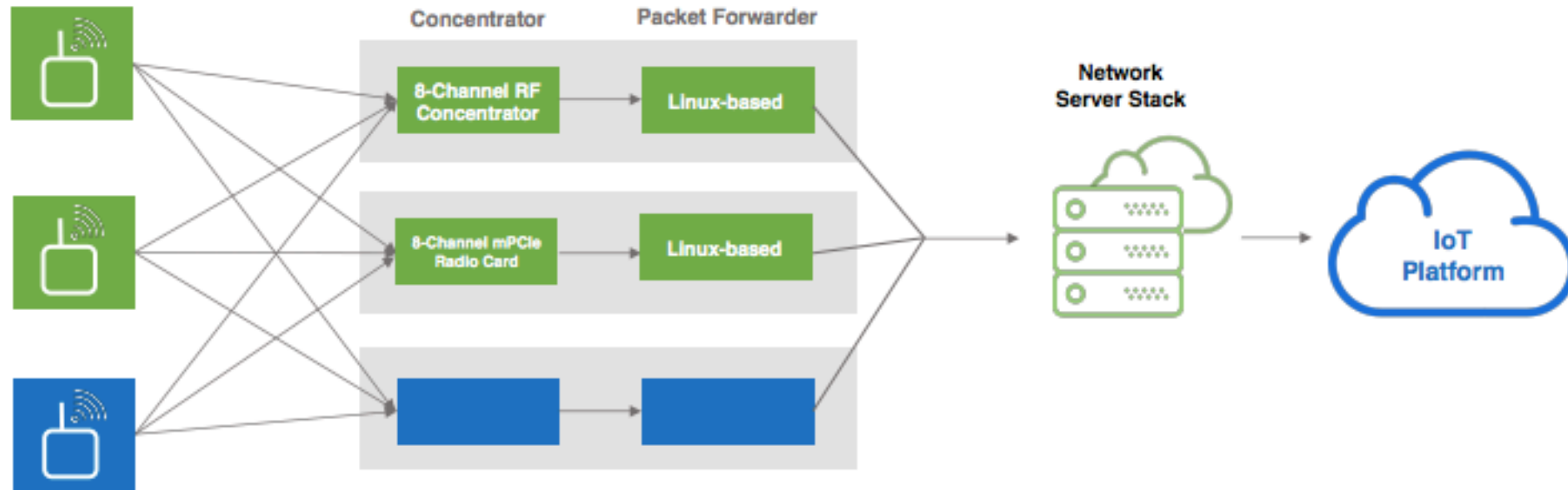   - signal path distortion

2. Time of Flight Problem
   - requires highly accurate timing
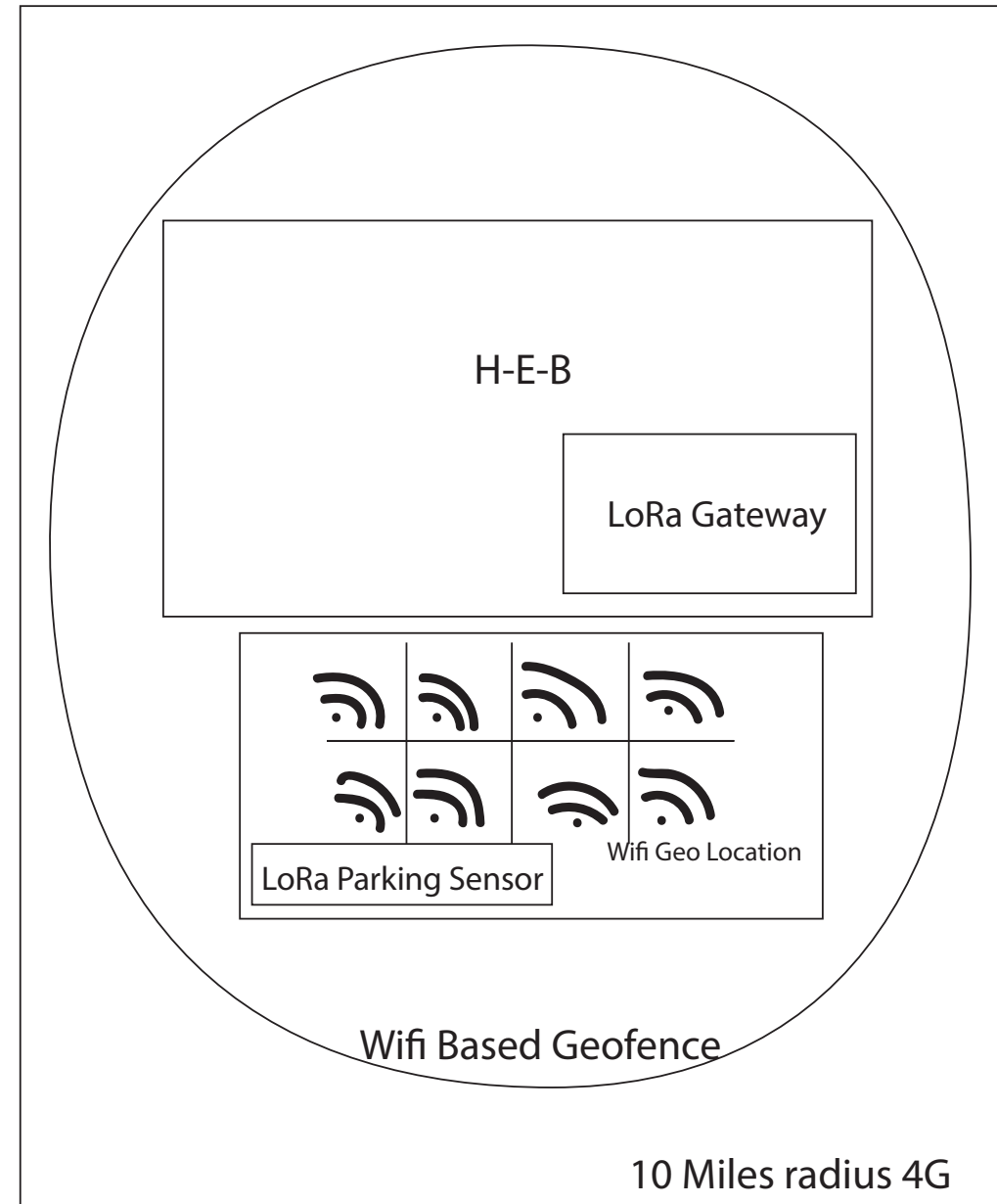   - signal path distorted
   - needs computing power

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New Solution

- Bluetooth and LoRa parking sensors connect to customer phone
- Data is sent to LoRa Gateway inside stores

H-E-B

LoRa Gateway

LoRa Parking Sensor

Wifi Geo Location

Wifi Based Geofence

10 Miles radius 4G

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H-E-B Parking Sensor Project

High-accuracy smart parking sensor technology

Hardware components:

- Parking sensor
- CL200 Industrial PC
- OccamSmart mPCIe LoRa Gateway Module

Software Components:

- OccamSmart Gateway Module Packet Forwarder
- OccamSmart LaRaWAN™ Network Server Stack

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PlacePod Parking Sensor

Features & benefits:

- The industry's most accurate magnetic sensing system for vehicle detection

- Provides a dashboard for managing and monitoring all parking resources and data

- Data can be shared with third-party applications

- Capability for wireless configuration and software updates using Bluetooth Low Energy

- Optimized for IoT with built-in LoRa radio that communicated wirelessly to a gateway

SURFACE-MOUNT

https://www.pnicorp.com/placepod/

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LoRa mPCIe Smart Gateway Card SG800x and SG900x

OccamSmart's mPCIe Smart Gateway Card, for use in LoRa®-based and LoRaWAN™ networks, allows you to easily add low- power long range capabilities to your new gateway design or existing gateway infrastructure by simply installing the card into your device.

- Single operating voltage: 3.3 VDC +/- 10%
- Available for industrial (SX1301) and commercial (SX1308) temperature ranges
- 125 kHz Bandwidth (BW)
- Supports LoRa®-based and FSK (EU only) modulations
- Integrated frequency matched RF front end, RF transceiver, baseband processor, and MCU for reduced host overhead

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Fanless Industrial USFF Edge Device w/ Dual LAN (Pre-configured LoRa)

This industrial fanless gateway brings the ease of x86 architecture to the Ultra Small Form Factor with dual LAN and dual Mini DisplayPorts.

- Single operating voltage: 12V
- Fanless Industrial Line
- Supports LoRa®-based modulations
- Integrated frequency matched RF front end, RF transceiver, baseband processor, and MCU for reduced host overhead

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LoRaWAN™ Network Server Stack

- Cloud-based LoRaWANTM network and application server

- Docker-based deployment

- Allows LoRa® end-devices to be registered via OTAA or ABP by using a browser-based user interface

- Device data can be pushed via MQTT to the IoT platform of choice

- Provides big data to servers in stores

- Data is managed by IT at corporate

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Results

- Data goes to cloud
- Merge occupancy of parking spot to geotag in phone
- Faster response times
- Higher accuracy
- Happier customers

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What can we do with the data?

- Measure occupancy
- Lot spacing availability
- Accurate parking spot locater
- Information for parking officials to identify violations
- Provides data on customers interaction with store
- Customers purchases
- Frequency of purchases
- Target specific customers to product specials
- Increase customer store visits

The Cloud

LoRa gateway

LoRa embedded sensors

Network server 2-way communication with parking manager

Share real-time parking data with other city services

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ADDITIONAL BIG DATA OPPORTUNITIES

Fruit Replenishment Project
General Parking College Campus
General Asset Tracking

Fruit Replenishment Project

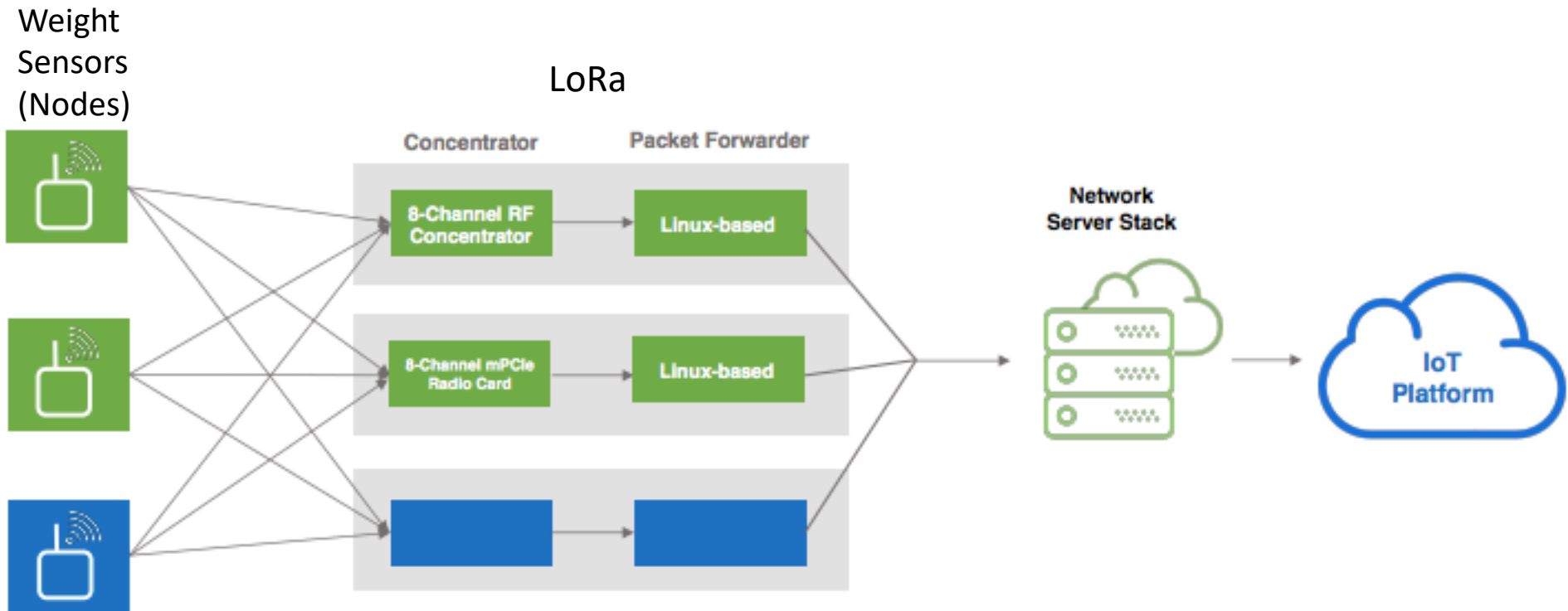**High-accuracy smart produce tracking sensor technology**

Features & Benefits:
- Automatic display of inventory levels
- Track product sales velocity
- Improve replenishment efficiency
- Easy product transfer
- Flexible shelf configuration

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H-E-B Fruit Replenishment Summary

Sheet Sensors

Project Outline:

- Instrument each fruit/vegetable bin with weight sensors

- Identify product type using UPC code (or other identifier)

- Collect weight information from each bin

- Determine product "level" based on product type

- Display information on user dashboard

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What can we do with the data?

- Never run out of produce
- Less wasted products
- More efficient
- Frequency tracking
- Notify when food replenishment is needed

4 — Sensors signal stock reduction

5 — Retailer application platform

3 — Customer picks items from shelves

2 — Sensors monitor shelf stock

1 — Items stacked on shelves

6 — Low stock alert
Low Stock

7 — Shelf replenishment

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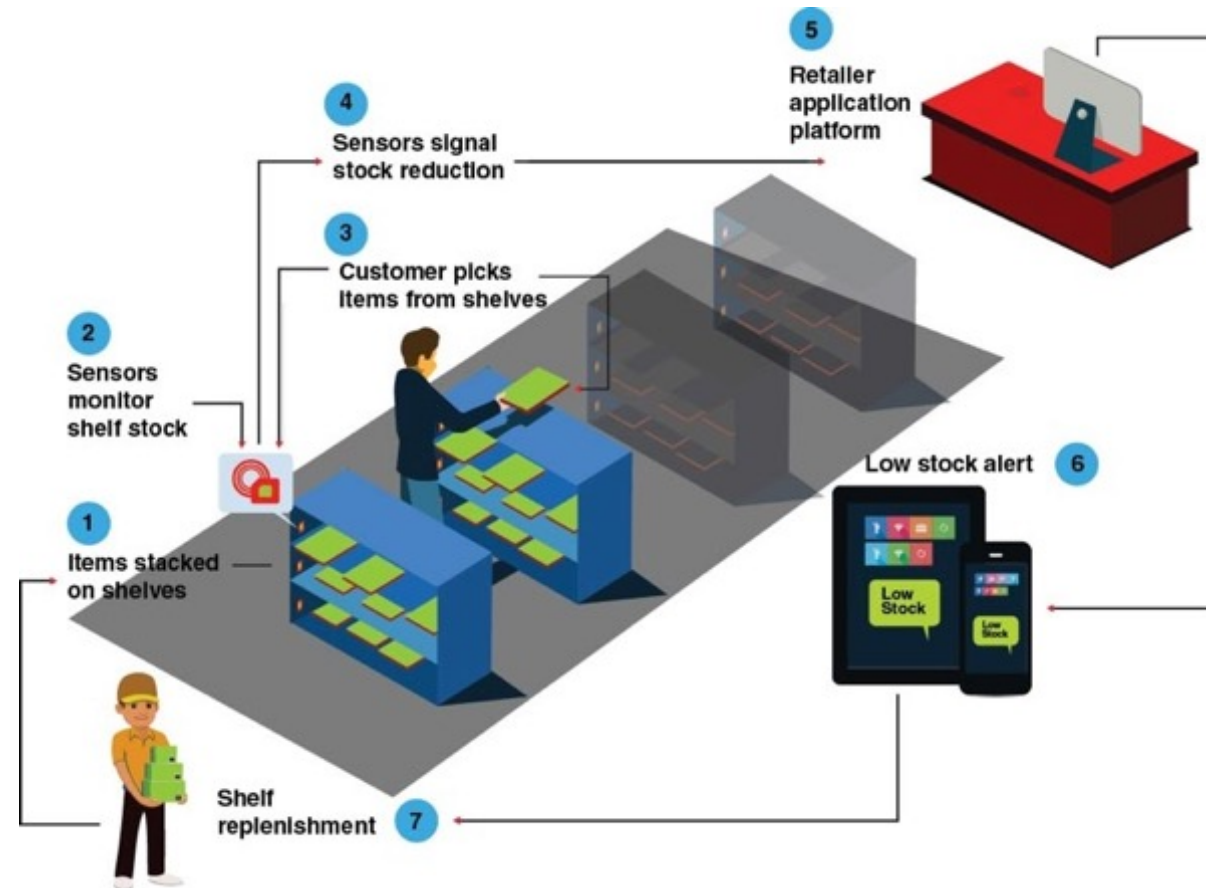
General Parking College Campus

- Less traffic
- More on-time arrival to classes
- Track underutilized lots
- Option to preregister for parking

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General Asset Tracking
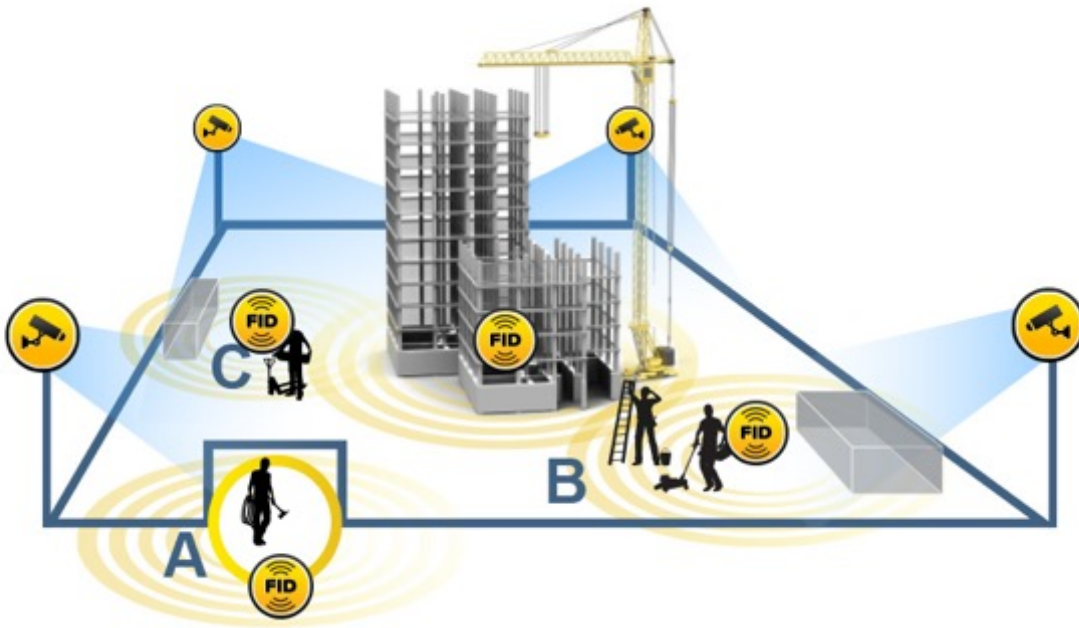
- Utilization of equipment
- Quality Control
- Usage tracking
- Speed/Impact of equipment
- GPS Positioning
- Improve customer service
- Increase productivity and reduce labor waste

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Future of Big Data

As cloud technologies continue to grow, more data needs to be analyzed. Ways to analyze data will improve and more tools will emerge. Big data privacy will become a huge challenge and that is where we come in!

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Future of the Internet of Things (IoT)

- About 2.5 quintillion bytes of data is created each day and continues to grow with the Internet of Things
  - Half of our web searches are conducted through cell phones
- There are about 5 billion searches a day worldwide
  - By 2025, there is estimated to be over 21 billion IoT devices (~4 devices per person)
- Autonomous cars will generate over 300 terabytes of data per year

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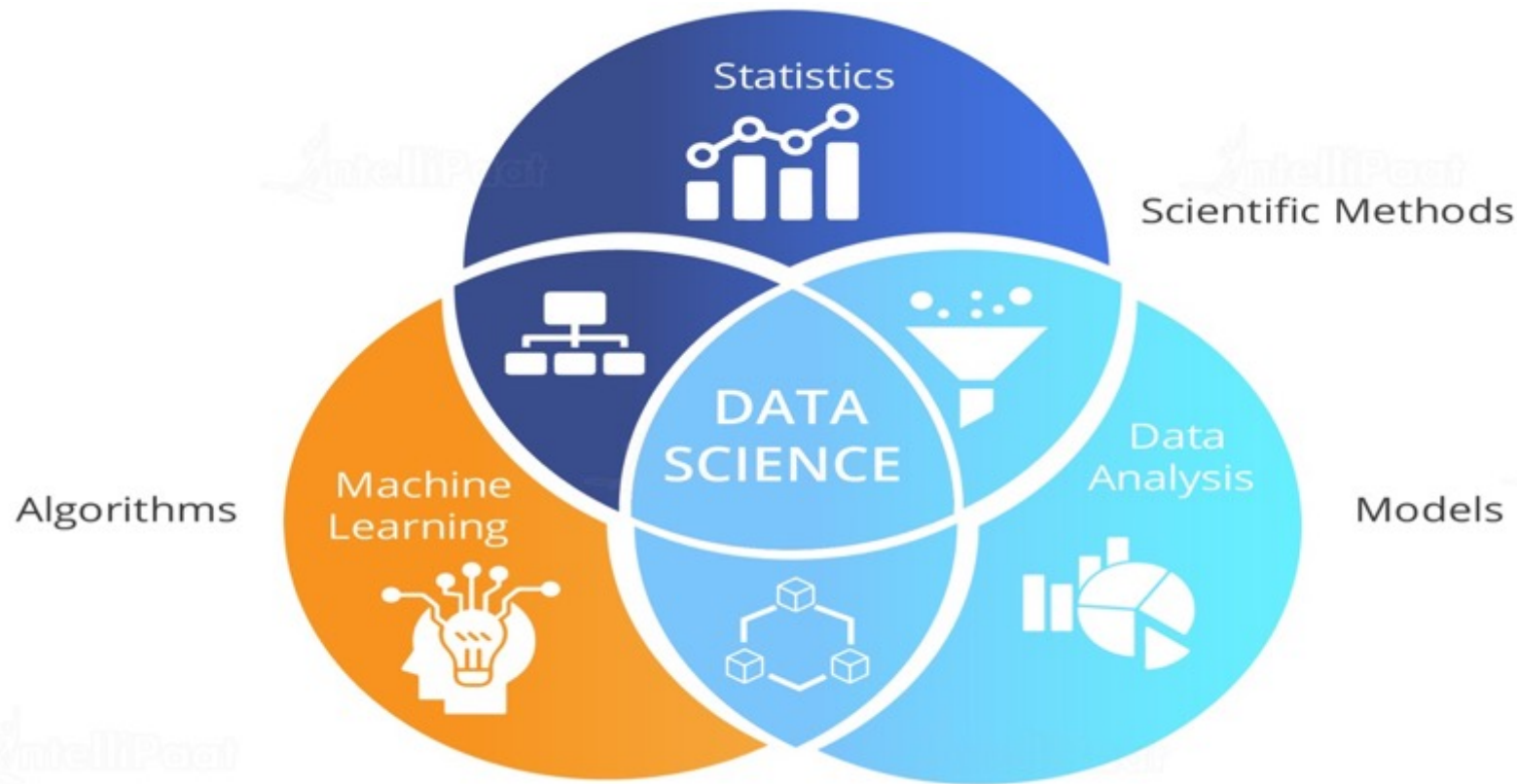
Big Data Scientists are analytical data experts who solve complex problems and explore what problems need to be solved.
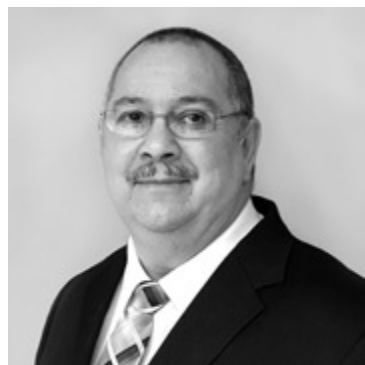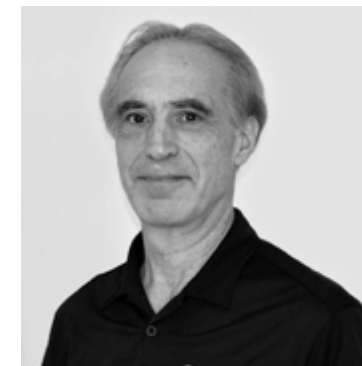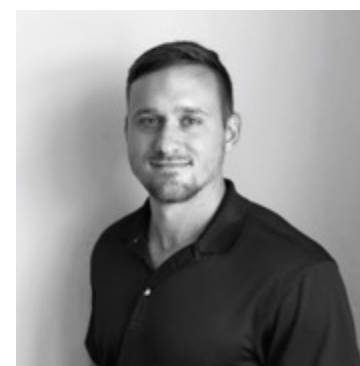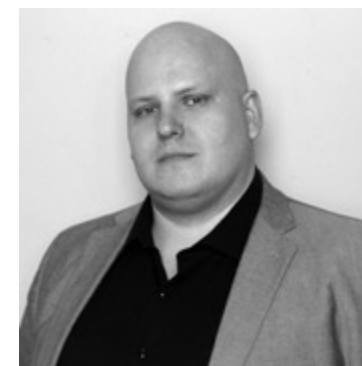
Why we need data scientists:
- Big data and business analytics will reach $260 billion in 2022
- Data cleaning
- Data analysis
- Modeling/statistics
- Engineering/Prototyping

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Acknowledgements

Our Team at OccamSmart

Our Team

Questions

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