Cyber-Physical Clouds: Risks and Opportunities

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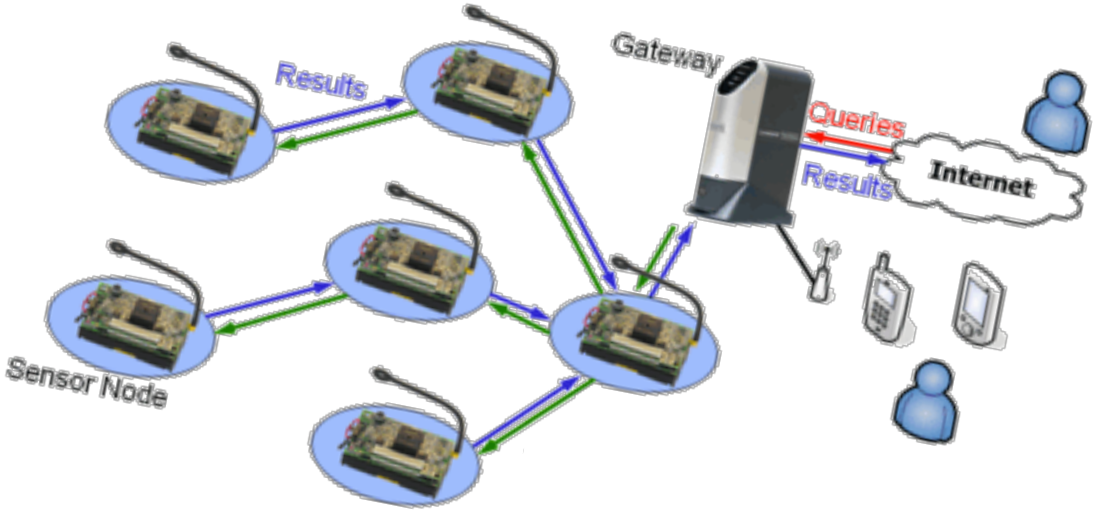
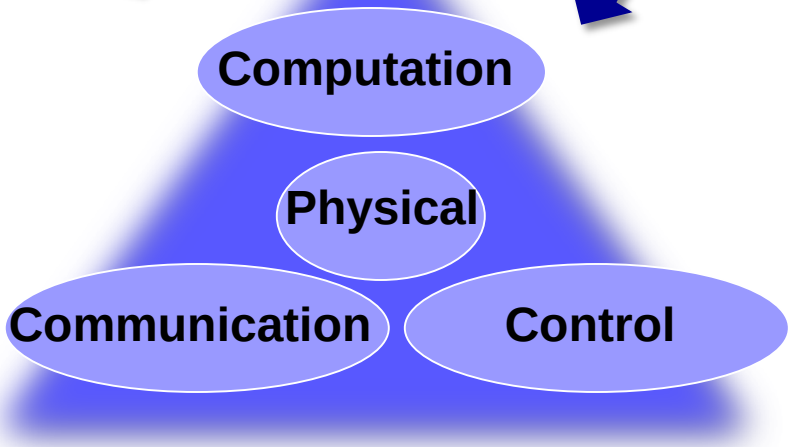
Embedded System



Wireless Sensor Network

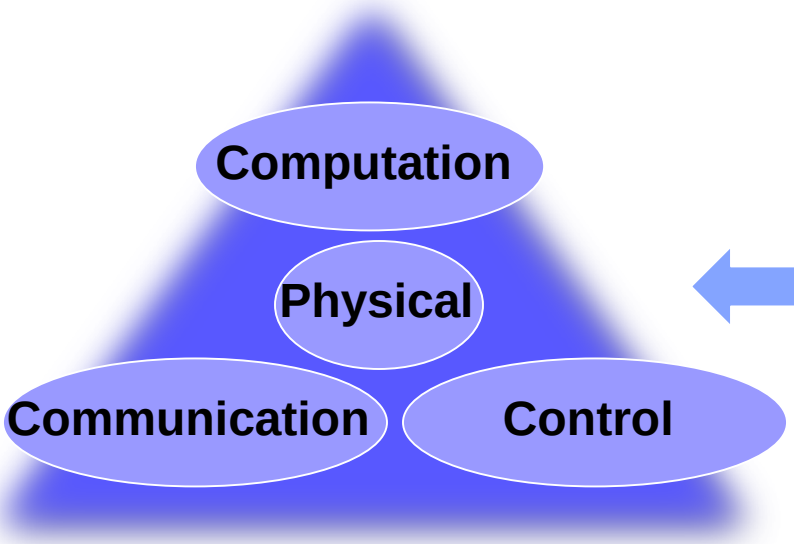
increasing the adaptability, autonomy, efficiency, functionality, reliability, safety, and usability



Cyber-Physical Systems

Intersection between computational and physical systems

Cyber-Physical Clouds

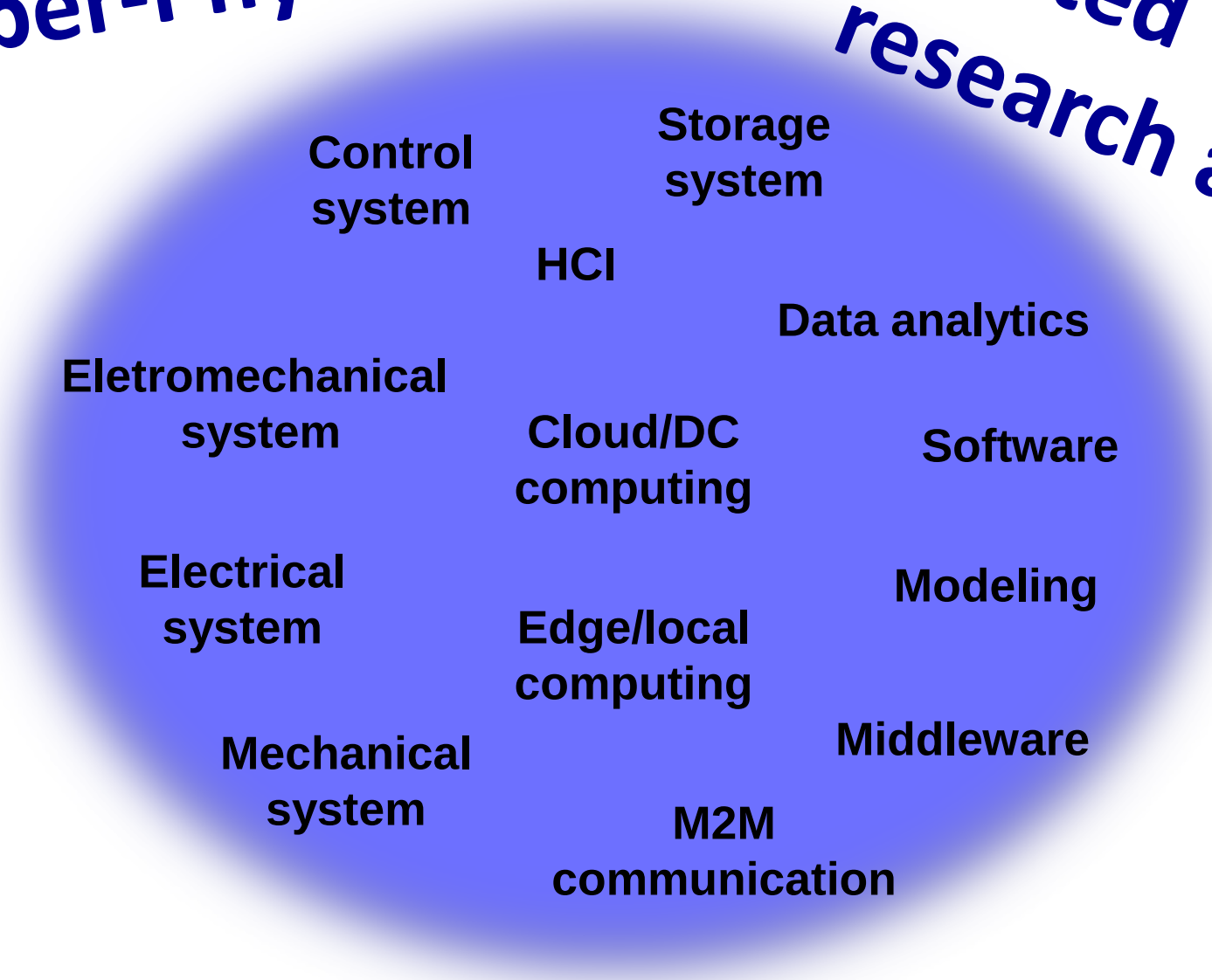


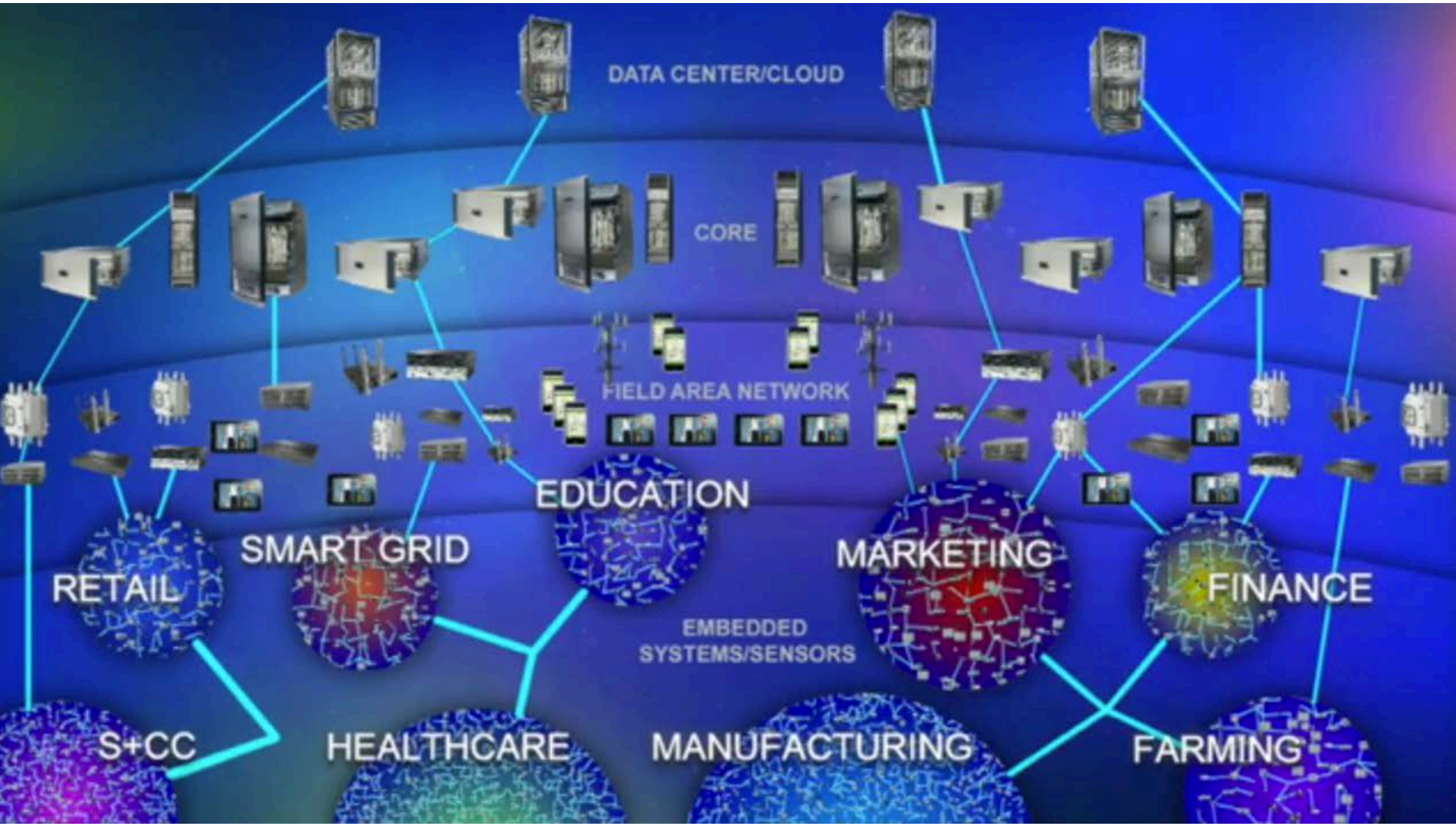
Involving large scale of analytics, storage, users…

Delay-sensitive, real-time decisions,
Data fusion/aggregation/computation in small scale

Cyber-Physical Cloud Application areas

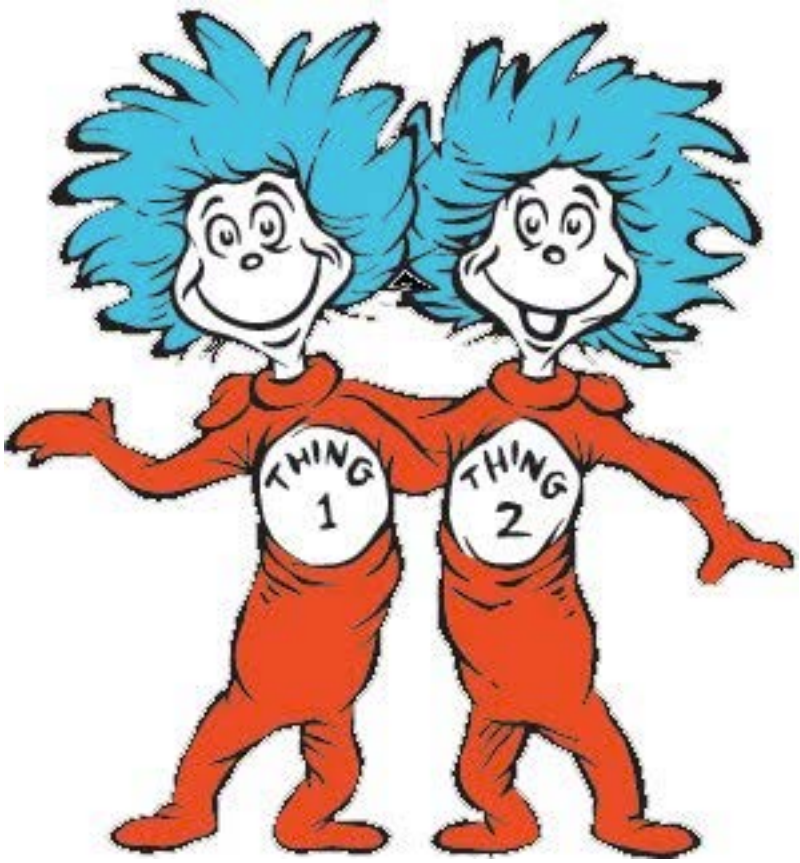
Cyber-Physical Cloud Related research areas



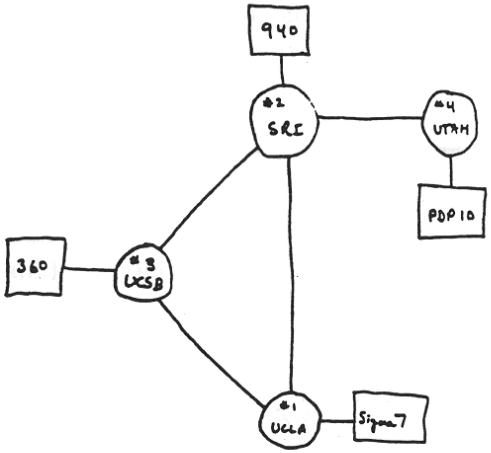

DATA CENTER/CLOUD
CORE
FIELD AREA NETWORK
EDUCATION
RETAIL
SMART GRID
MARKETING
FINANCE
EMBEDDED
SYSTEMS/SENSORS
S+CC
HEALTHCARE
MANUFACTURING
FARMING

Internet of Things

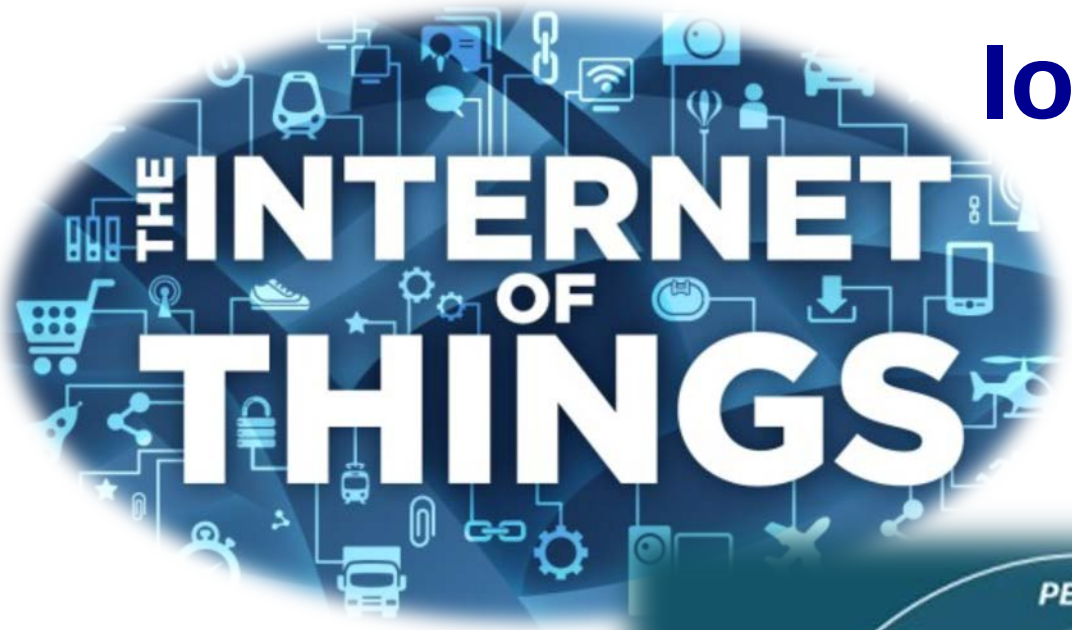
“Recently, many people have asked me about the Internet of Things (IoT). I am tempted to say that, while I know a thing or two about the Internet, I don't know much about Things in general.”
– Jennifer Rexford



“Check with my under-undergraduate advisor, Dr. Seuss.”

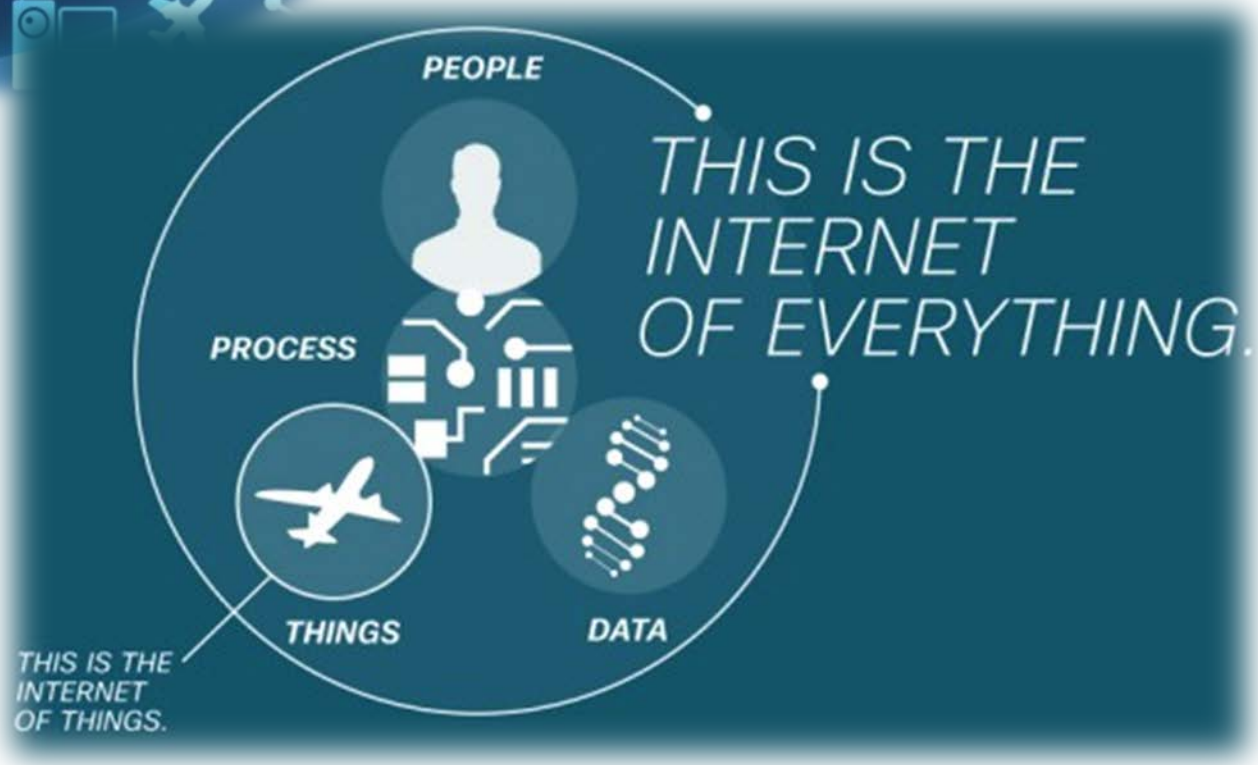


THE ARPA NETWORK

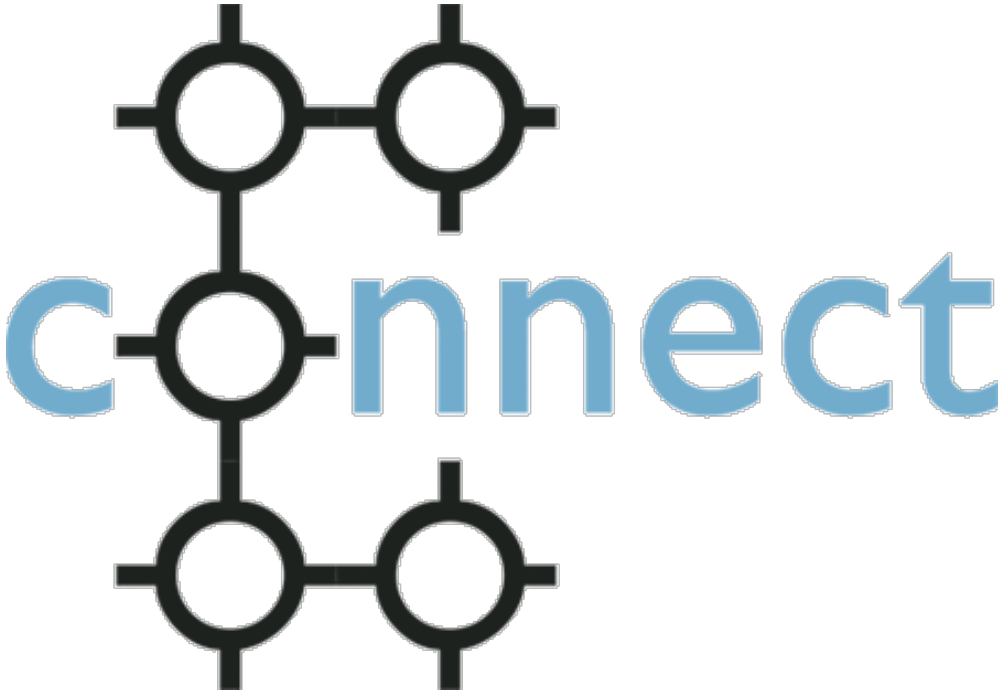

THE INTERNET OF THINGS

IoT

IoE


PEOPLE
PROCESS
THINGS
DATA
THIS IS THE INTERNET OF EVERYTHING.
THIS IS THE INTERNET OF THINGS.

Fundamentally, it is about

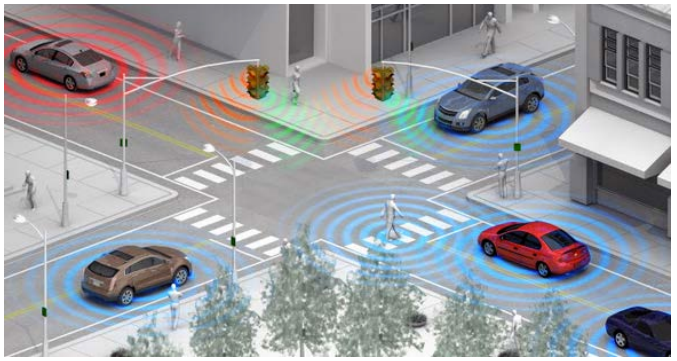


WiFi-Honk!

Connected Roads

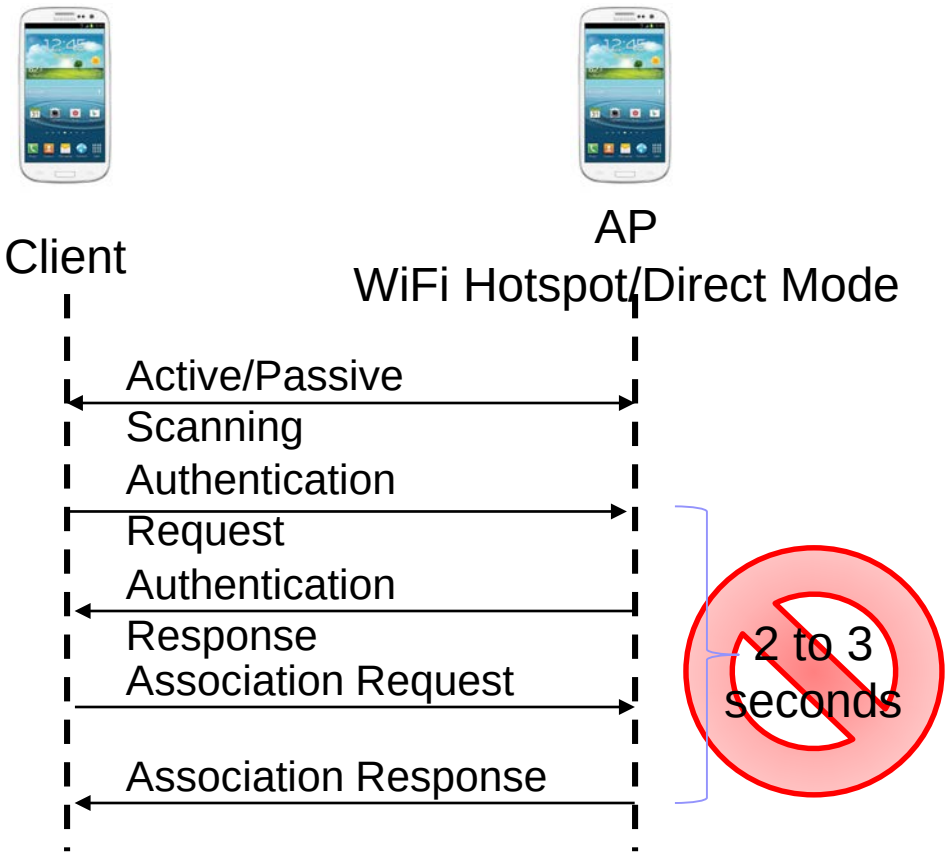
- Distracted pedestrians
  - Smartphone: music, video, game, SMS, camera, ...
  - Shut out external audio warning
- Automakers (Honda, Audi, GM, etc.) are investing big
- Our Idea: Give alerts to smartphone using WiFi!

Vehicular Communication Protocol?

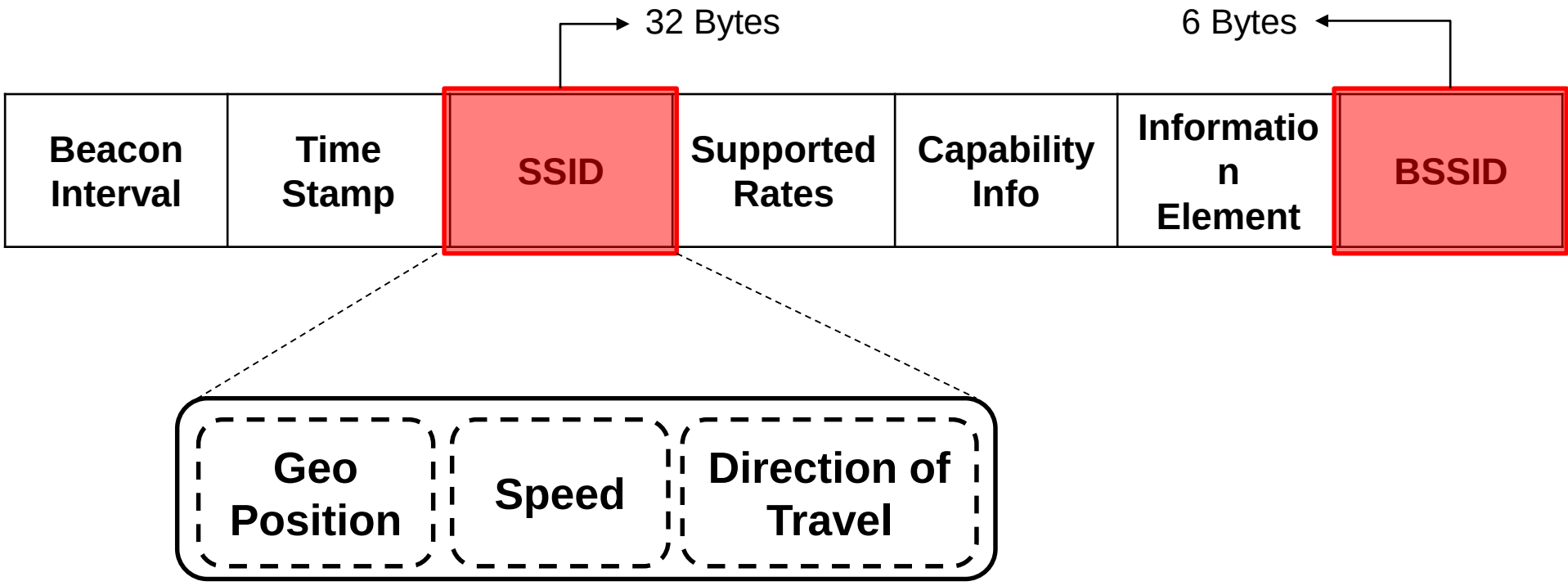


Protocol	Range	Mobility	Deployment
DSRC	< 1 Km	> 60 Mph	Expensive Hard to retrofit
WiFi	< 100 m	< 5 Mph	Long association time Unsuitable for Car2X communication
Cellular	< 10 Km	> 60 Mph	Long association time

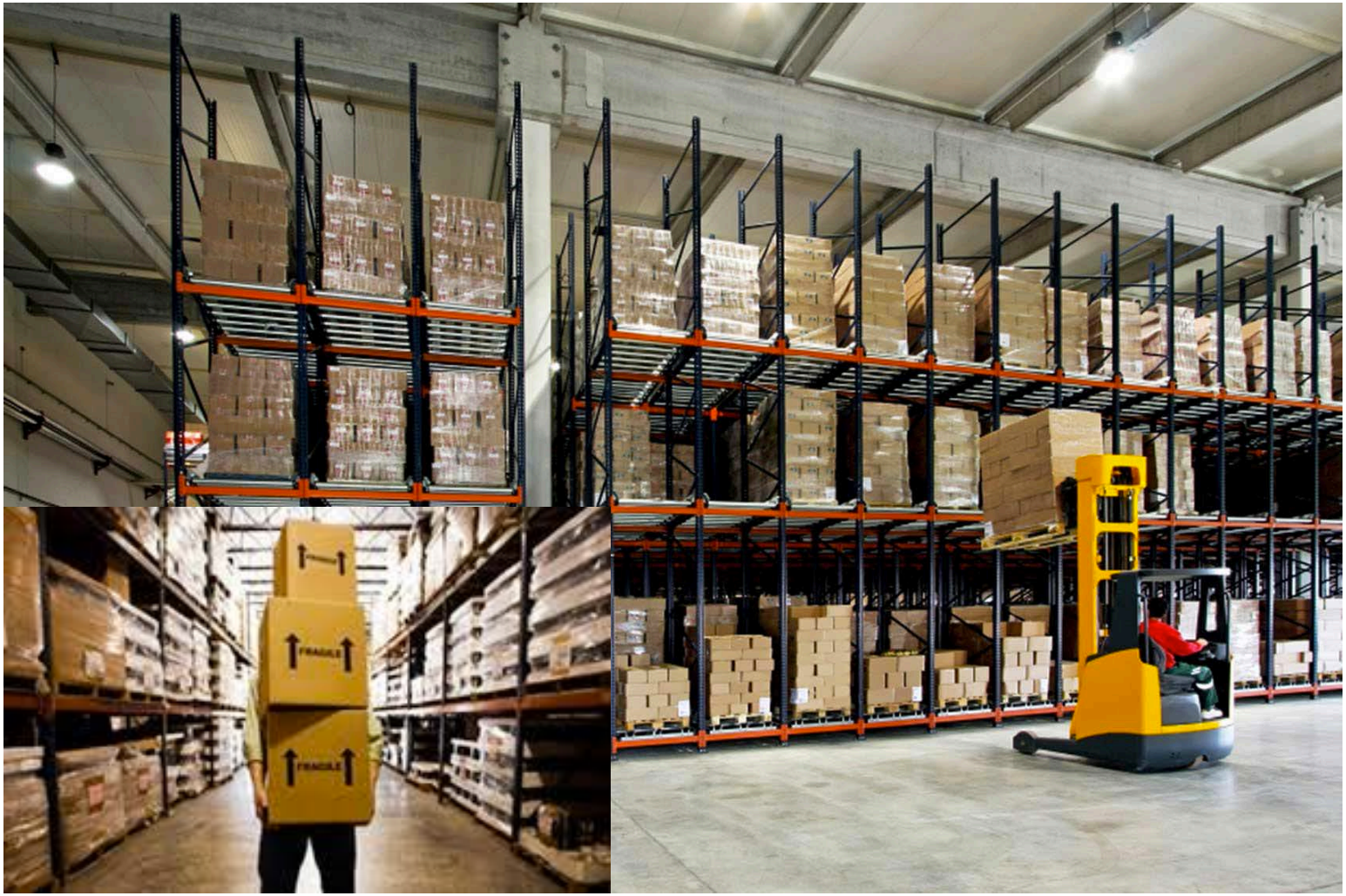
WiFi is Everywhere, But…



WiFi Beacon Stuffing



Inventory/Factory Safety



More Safety Applications

Finding People of Interest in a Crowd with Their Names

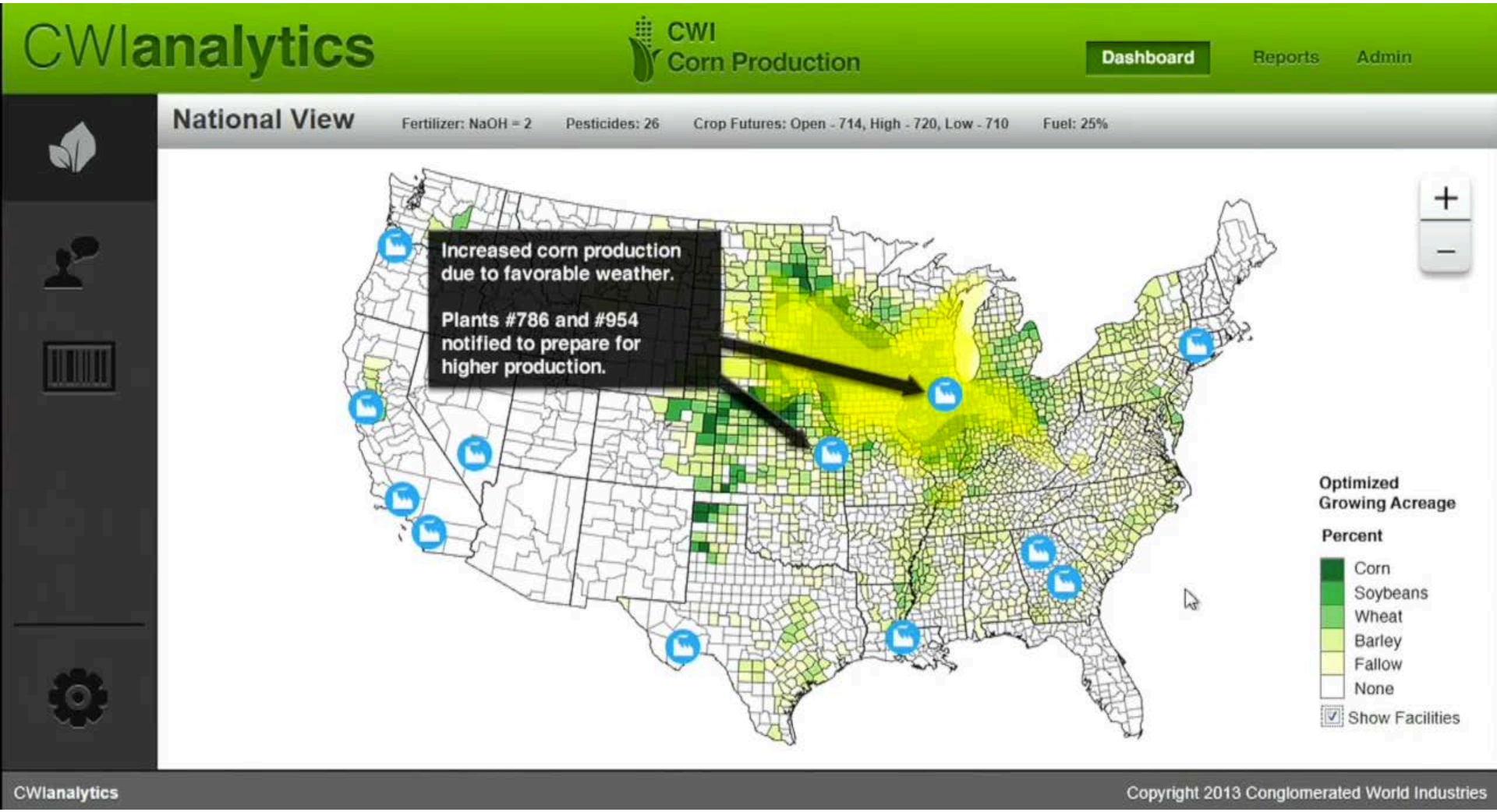
A Cyber-Physical Cloud Example

- Coke production
  - Connects the whole process of
    - Farming corns
    - Manufacturing high fructose corn syrup and coke
    - Distribution
    - Retail centers
    - Social network
    - Potential customers

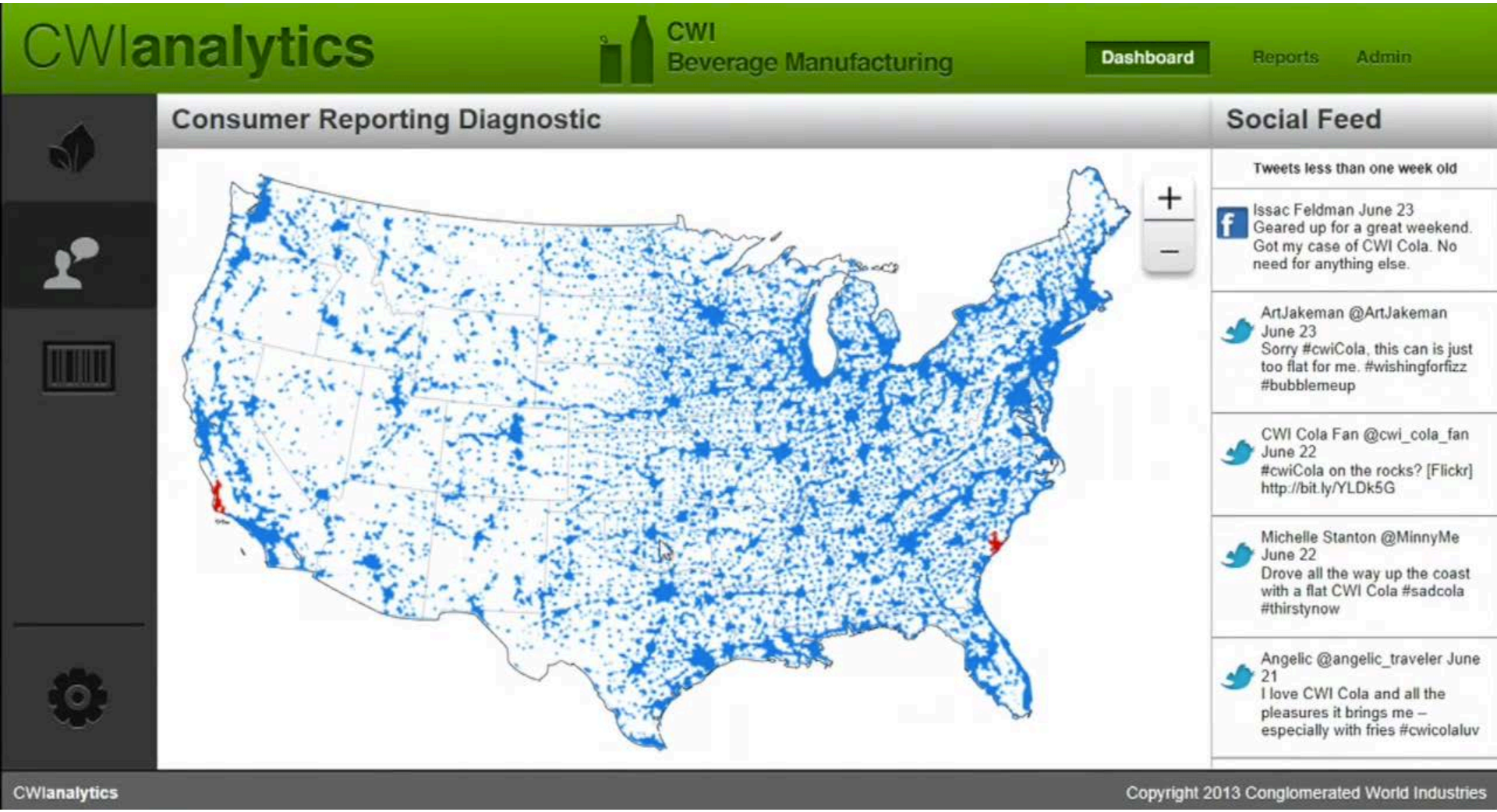
Sensors in corn field monitors growing condition

Through *local computing/connectivity*, the system tells Irrigation system to water the corn

Field can tell facility to be prepared for more load such as more workers/machinery



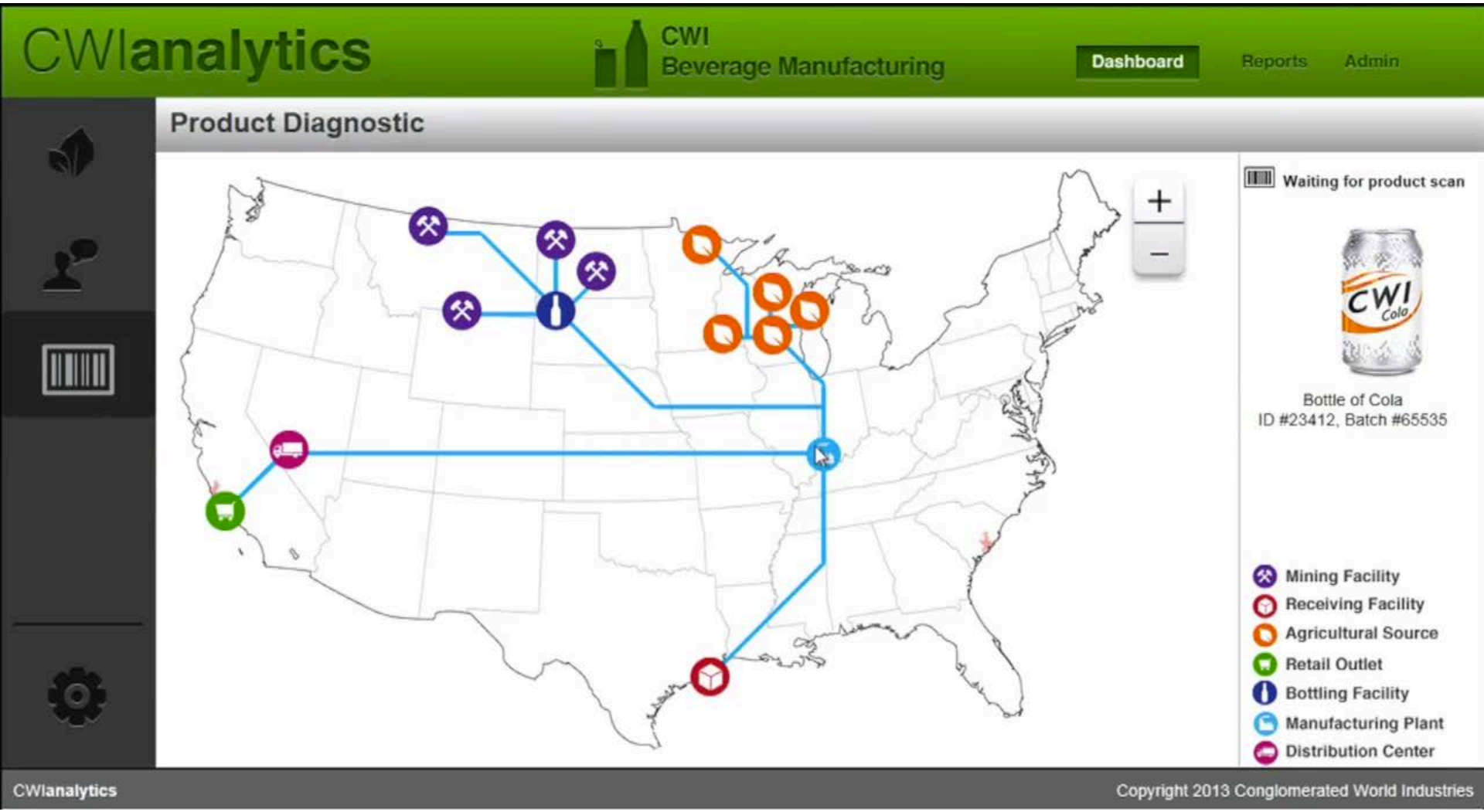
Customer sentiments collected from social feed



Sample soda from that place to find out route that soda took in the supply chain

Shows the supply chain:

purchase, distribution, bottling plant, where the corn was grown,



Identify the commonality of problem:

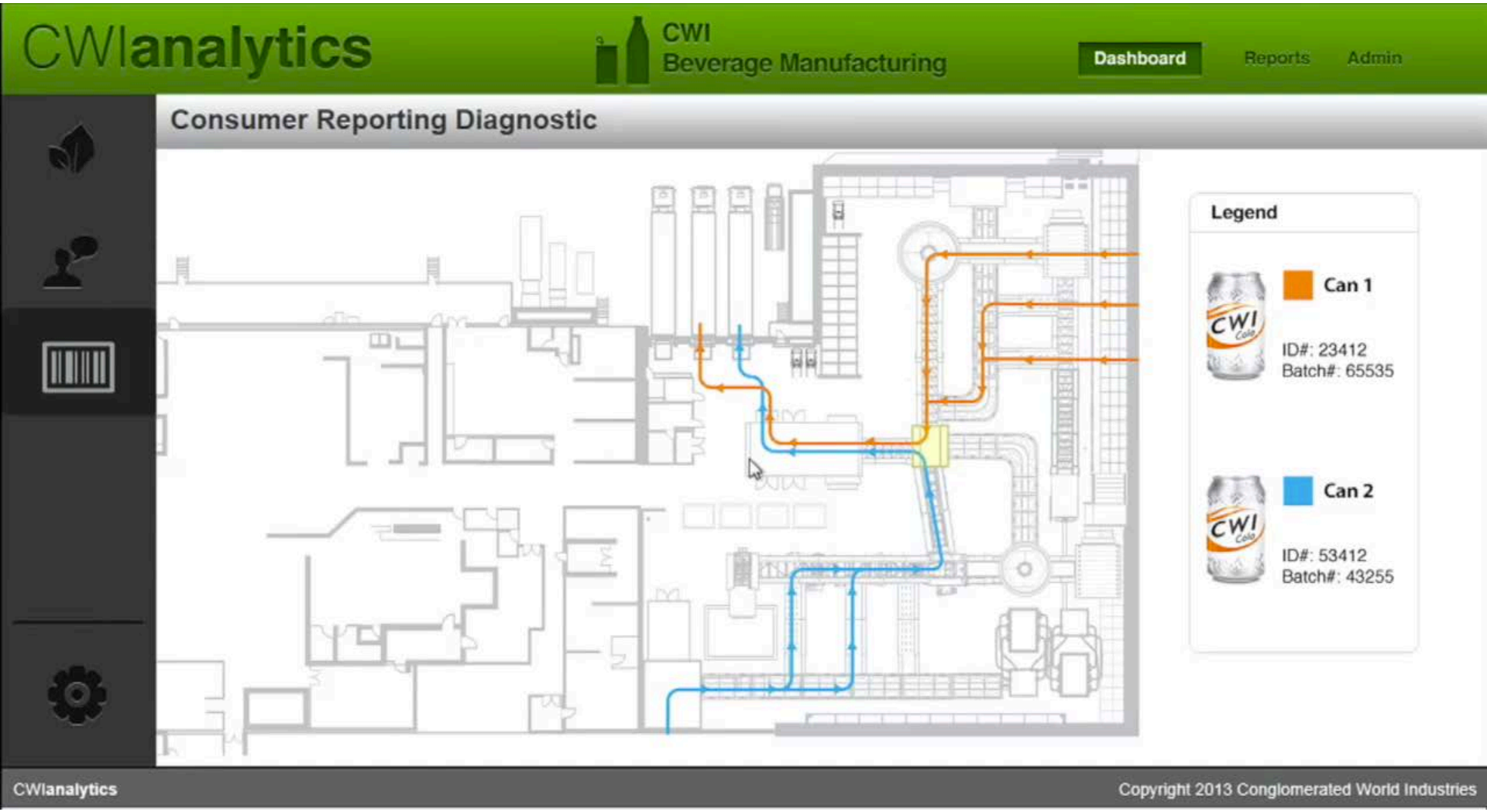
The bottling plant

Identify the commonality of problem:

The bottling plant

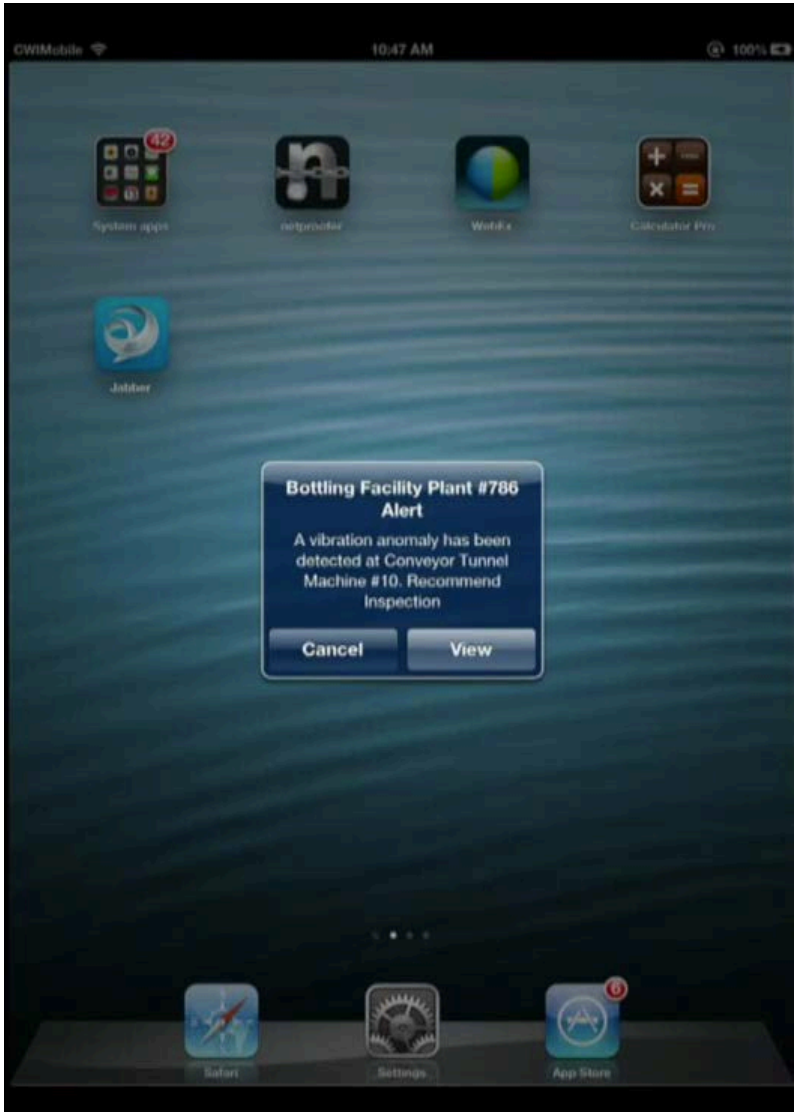
Identify the problem area within the plant:

One common machine



Identify the problem source and Notify technician

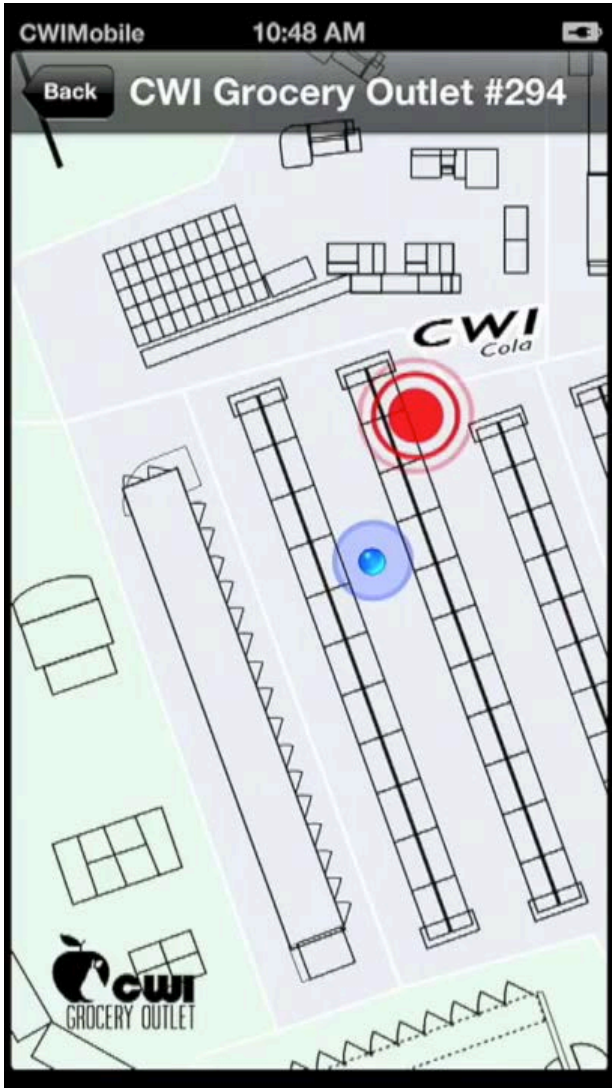
Technician receives an alert for inspection



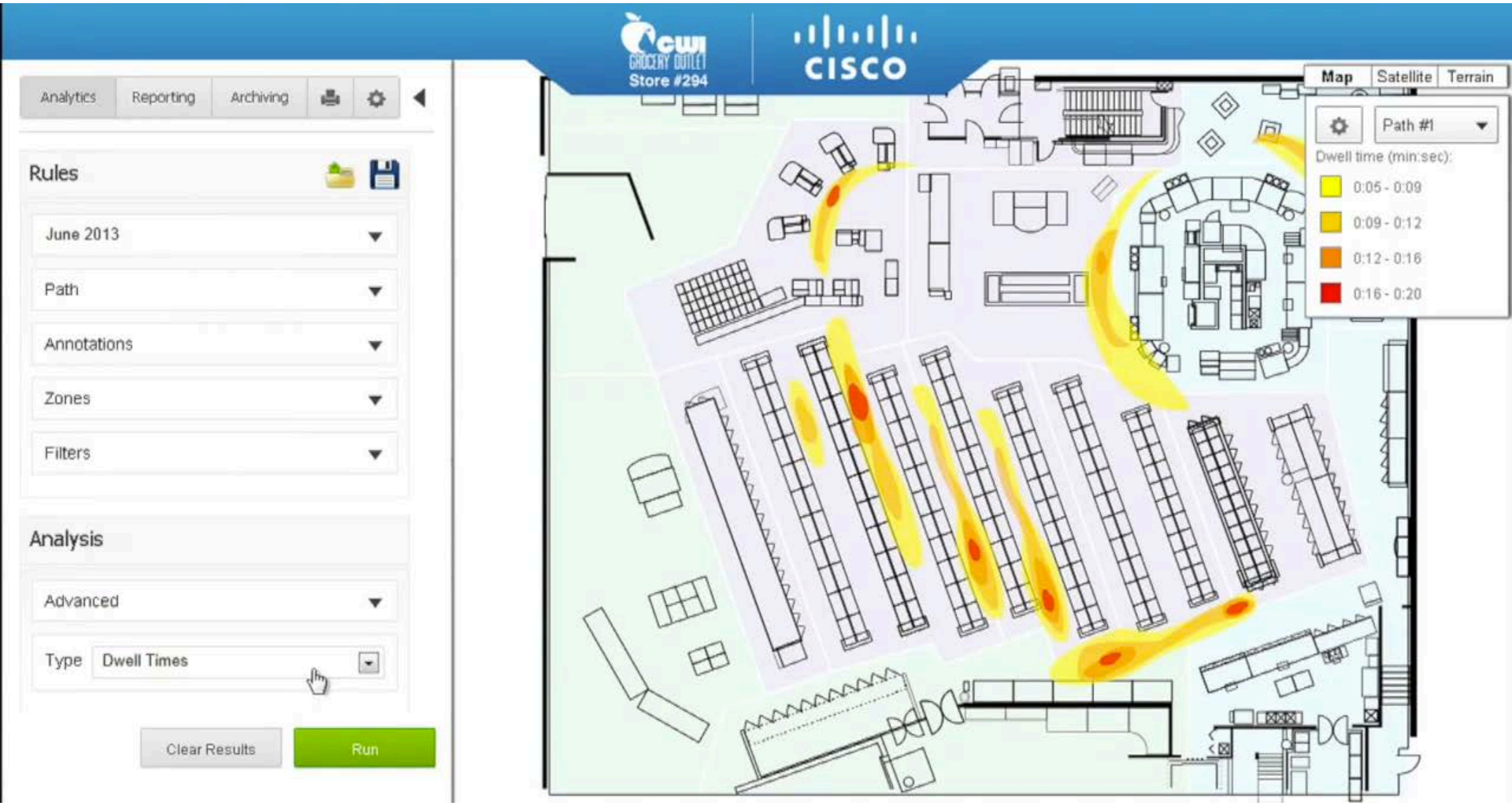
Customer at a retail store receives a data coupon

Customer can get a guide to find the product in the store

Customer can find the produce in the store



Retail store can see customers' dwell time in the store



Risks and Challenges

Risks

- Privacy and Security
- Model vs. Reality
  - Real system, human, and adversary are NOT deterministic
  - Resiliency
- Environmental Impact - eSmog

Challenges/Opportunities

- Battery
  - Energy efficiency/harvesting
- Verification of Software and Hardware
  - Realistic models and proof of correctness
- Failover Strategies
- Incentivization of Social/User Participation

Challenges/Opportunities cont'd

- Tradeoff between Local vs. Global Architecture
- Cloud-Fog Interface
- Global configuration consistency during the interactions of local action
- Research Interactions
  - Network engineering and data science
  - Architecture and algorithms
  - HCI and user experience
  - Economics and production process

Thank You!

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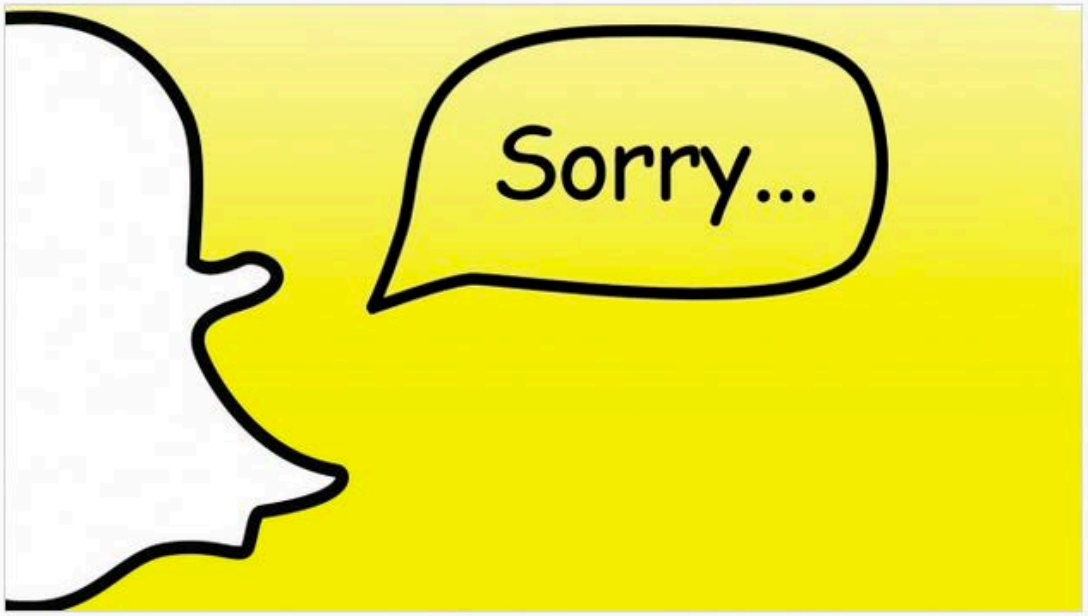
Snapchat Settles With FTC After Being Dishonest With Users About Privacy

Posted May 8, 2014 by Jordan Crook (@jordanrcrook)



Snapchat has entered into a consent decree with the FTC to address concerns over the company's privacy policy, app description, and in-app notifications after the ephemeral messaging service was at the center of a huge data breach last year, exposing 4.6 million usernames and phone numbers.

According to the FTC, the security breach was in direct contradiction to promises made by the service around security and disappearing messages.

FTC Chairwoman Edith Ramirez had this to say:

> *Snapchat's failure to secure its Find Friends feature resulted in a security breach that enabled attackers to compile a database of 4.6 million Snapchat usernames and phone numbers."*