Utilization of IoT Temperature Sensors in Warehousing & Distribution

Subtitle | Date

Is it hot in here or is it just me?

Extent?

Frequency?

Location?

What do we know about ambient health commodities?

- Temperature/humidity limits

- Absence of monitoring systems

- Massive number of products

- Many storage locations

- Often transported with no climate control

- Focus on central warehousing

- Guidance exists: WHO, USP, and others

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Development works here.

Challenge

Lack of temperature/humidity data limits visibility, increases likelihood of product degradation, and prevents opportunities for corrective action
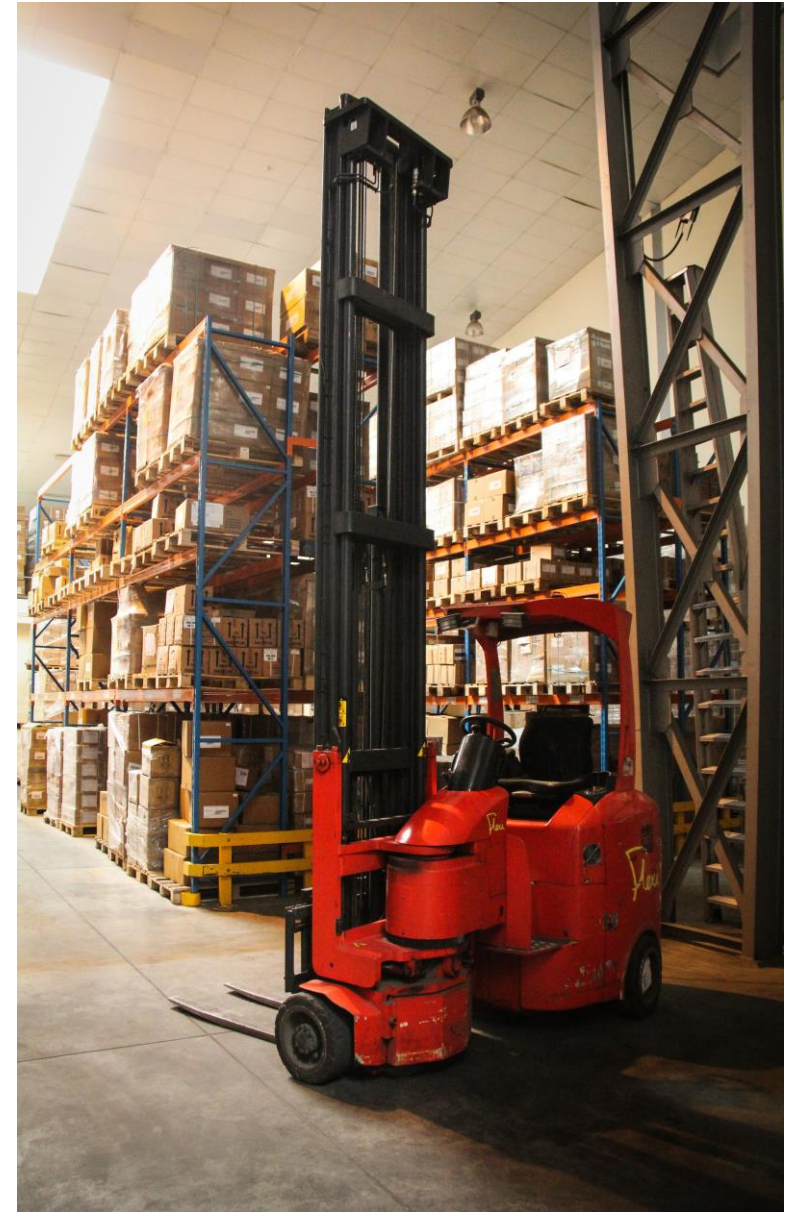
Solution

Utilize "internet of things" technology to monitor temperature and humidity

- Sensors

- Network

- Platform

Ambient supply chain research objectives

- Sensor selection and considerations
- Determine commodity environment
- Determine external to internal correlation
- Develop recommendations

Mozambique

3 Regional Warehouses

3 Provincial Warehouses
1 Intermediate Warehouse

8 District Warehouses

3 Hospitals, 2 Pharmacies

7 Health Centers

11 Community Health Workers

8 Trucks

Burkina Faso

1 Central Warehouse

2 Regional Warehouses

6 Health Districts

11 Health Centers

5 Trucks

10 Community Health Workers

Mauritania

3 Central Warehouses

1 Public Health Research Institute

11 Regional Stores

1 Blood Bank

4 Trucks

International Shipments

- Selection of shipments
  - We are currently working with our Delivery and Return team to identify shipments for this quarter

- Collection and placement of beacons
  - Beacons for the RDC collected and sent to South Africa

- Procurement of sensors for international shipments

- Sensors placed on international shipments
  - Sensors sent to 3PL/manufacturers for first shipments
  - Placed on first international shipments around 3/15-3/22

Shipments from Europe and Asia to Southern and Western Africa

Sensor Placement

CAMEC Central Warehouse
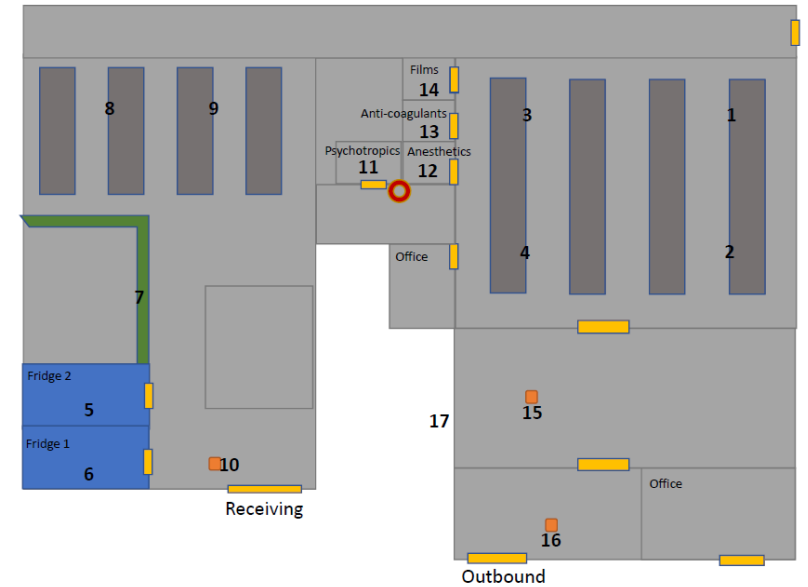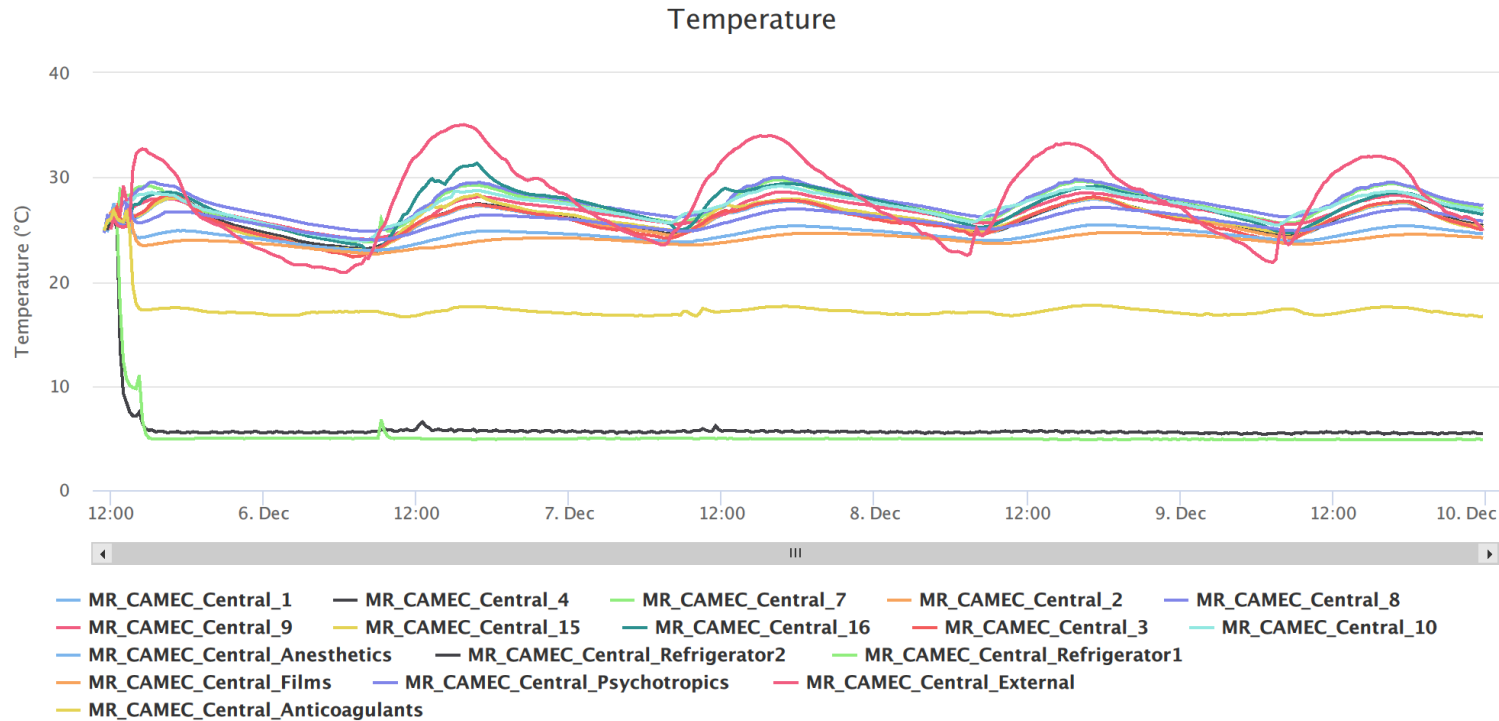
CAMEC Central – Radiography Room

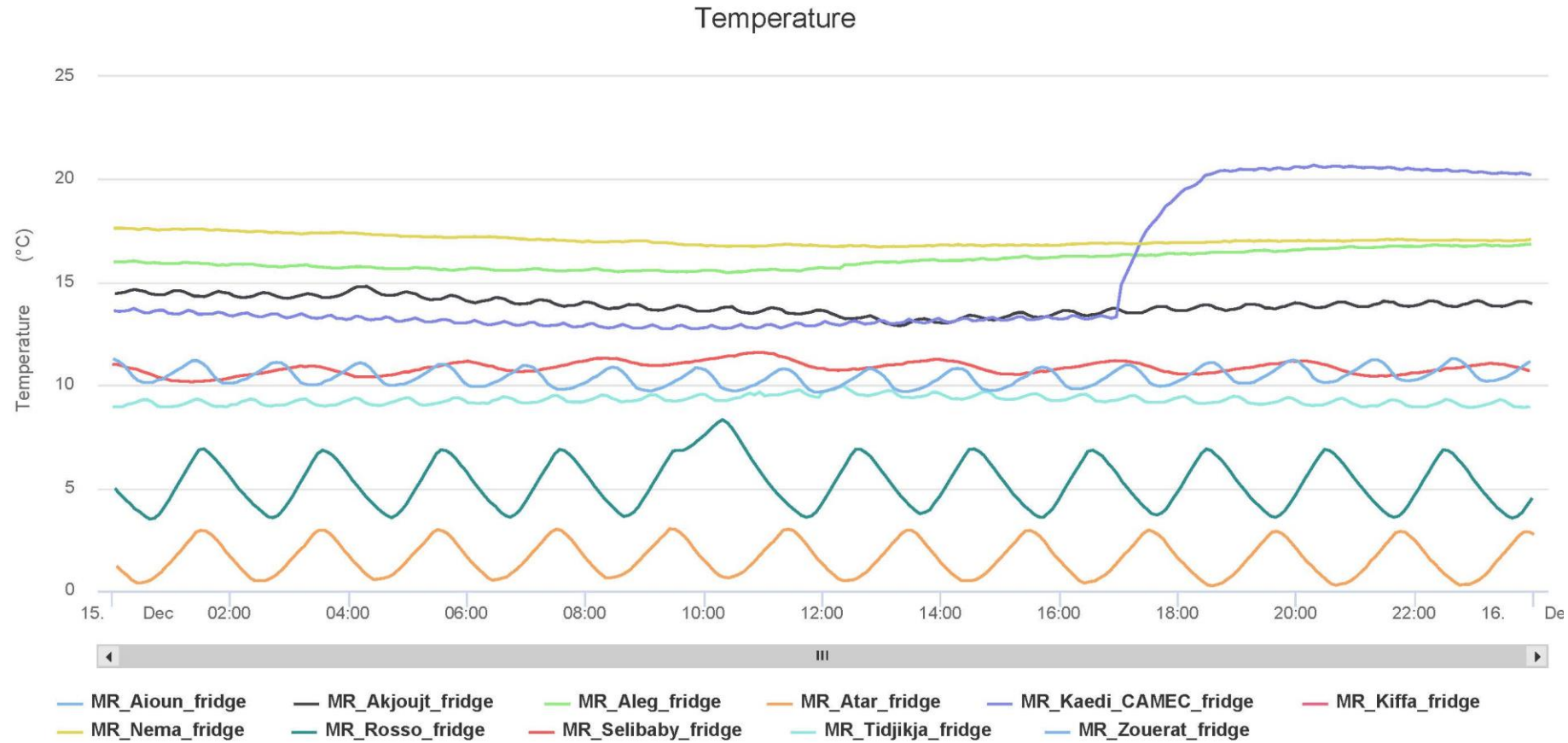# CAMEC Central Trucks

Temperature

Temperature (°C)

— MR_CAMEC_Central_Truck_15811TRIM_ext
— MR_CAMEC_Central_Truck_15811TRIM_internal_back
— MR_CAMEC_Central_Truck_5856AV00_internal
— MR_CAMEC_Central_Truck_5302AV00_external
— MR_CAMEC_Central_Truck_5856AV00_external
— MR_CAMEC_Central_Truck_15811TRIM_internal_front
— MR_CAMEC_Central_Truck_5302AV00_internal

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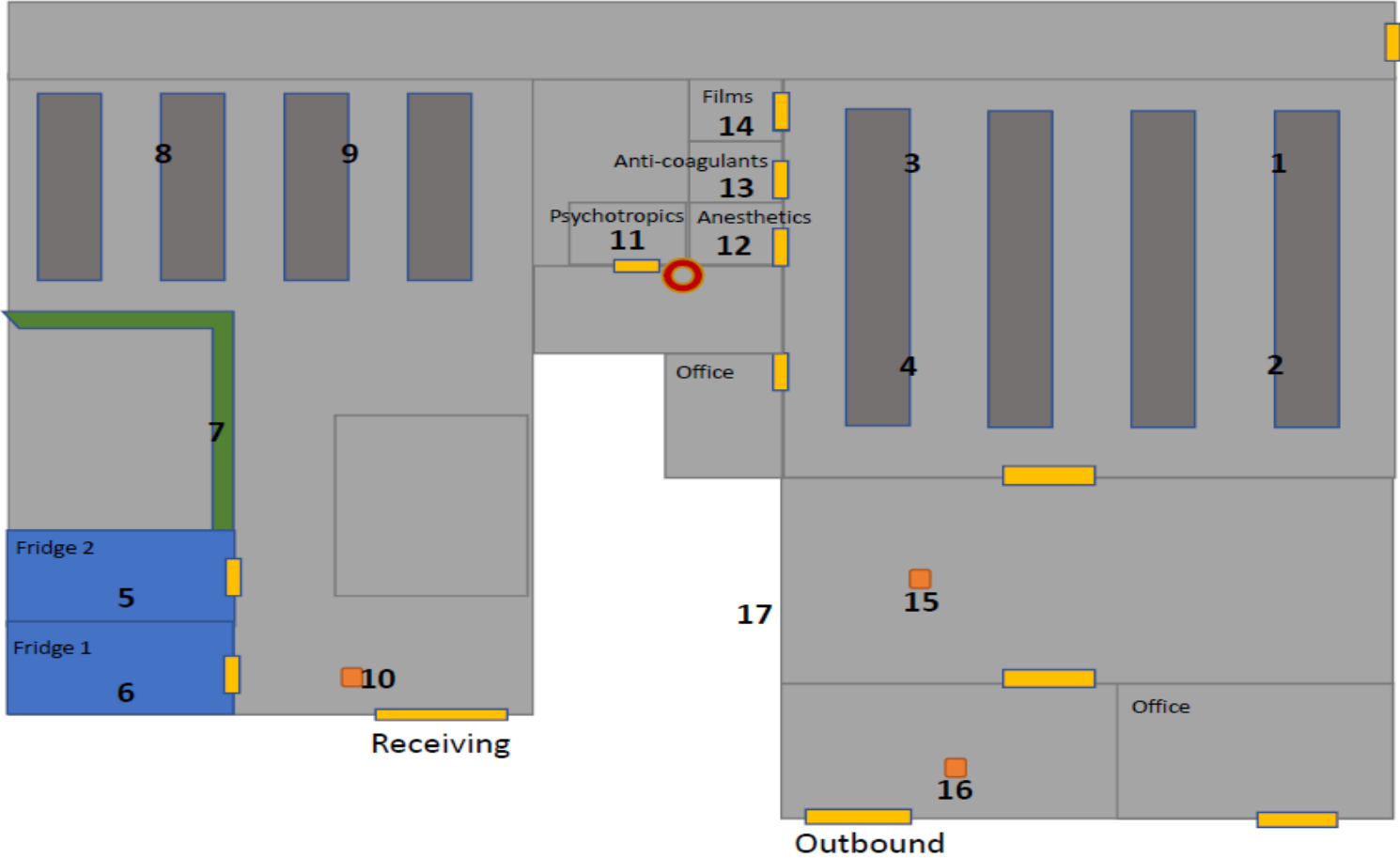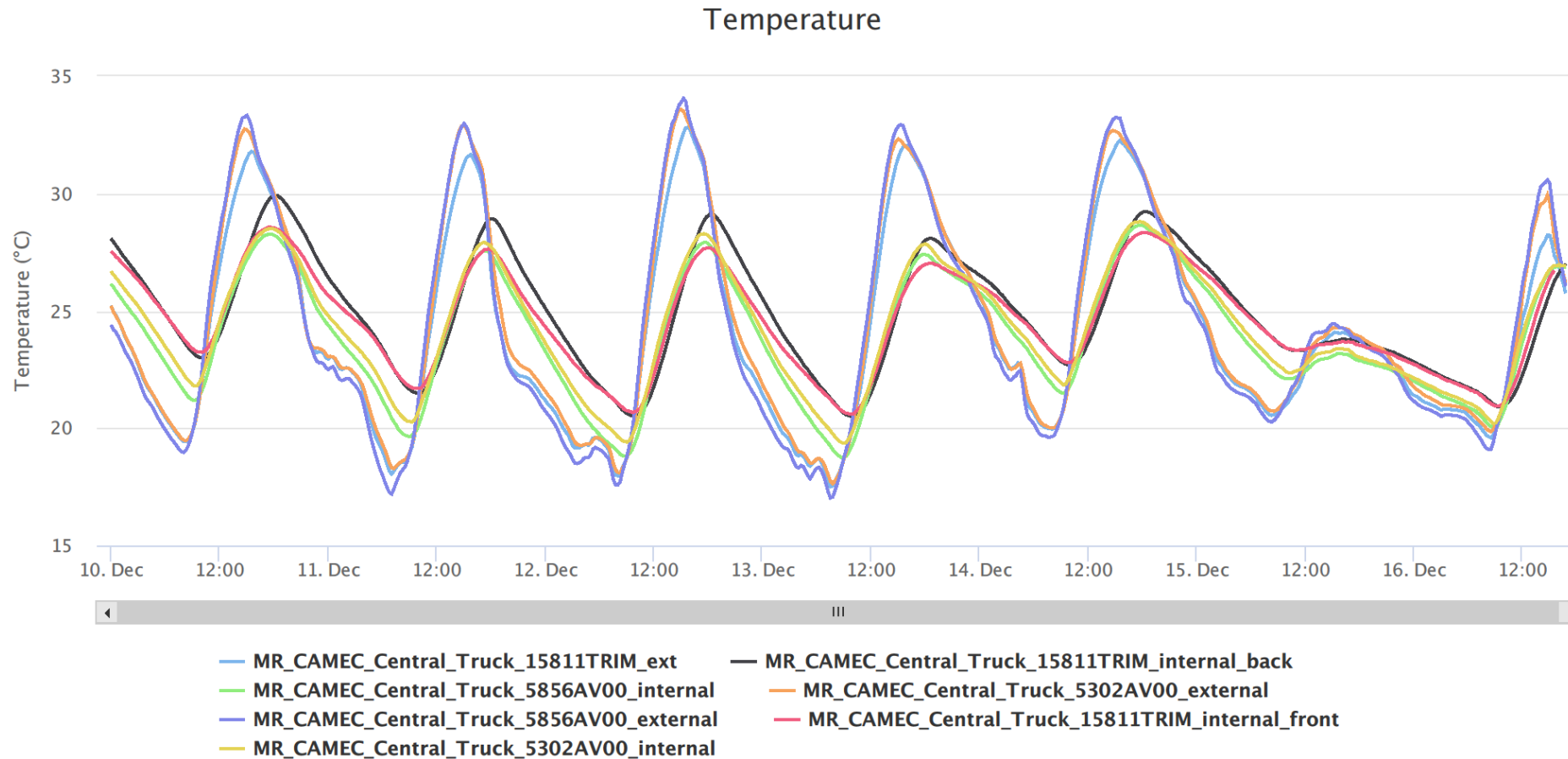
Refrigerator Data (2-8 degrees Celsius)
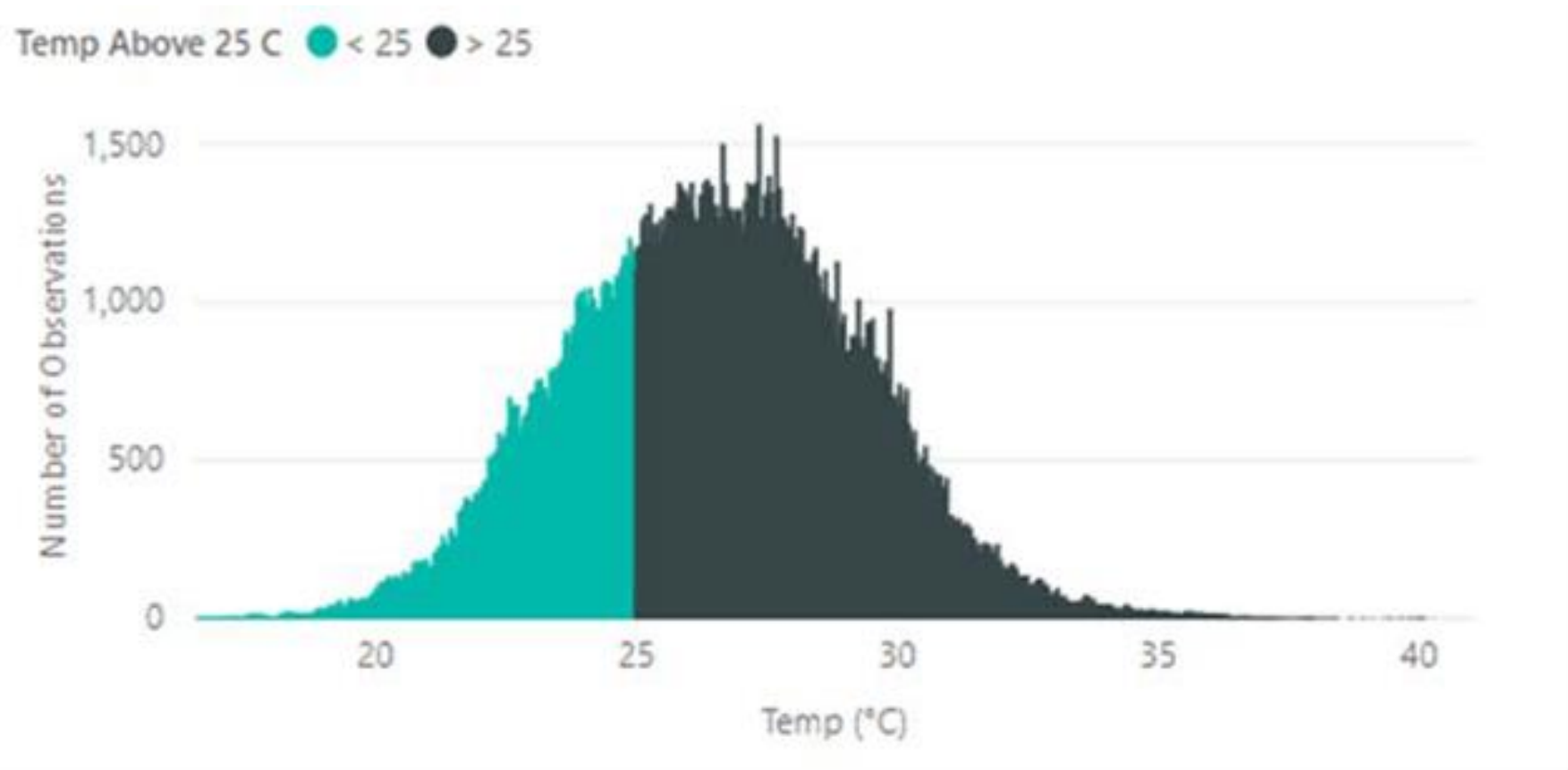
Set and View Alarms Online, Get Notifications

Data Observations

Data below is from a warehouse over a 12-month period.

Data Observations
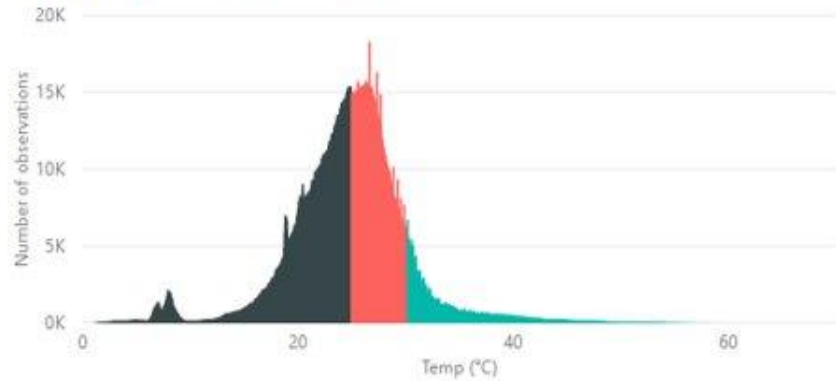
Data below is from a warehouse over a 12-month period.

Data Observations

Data below is from multiple locations across the in-country supply chain.
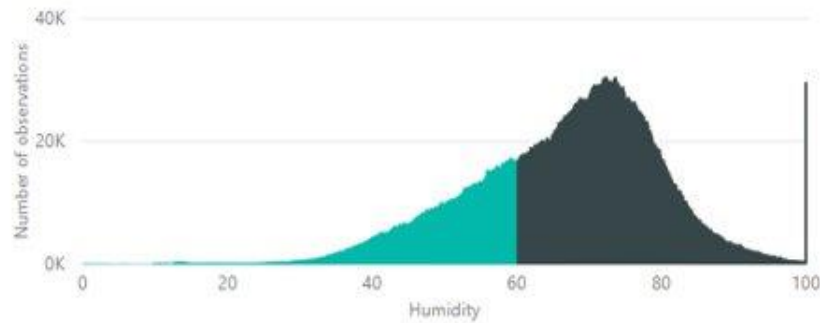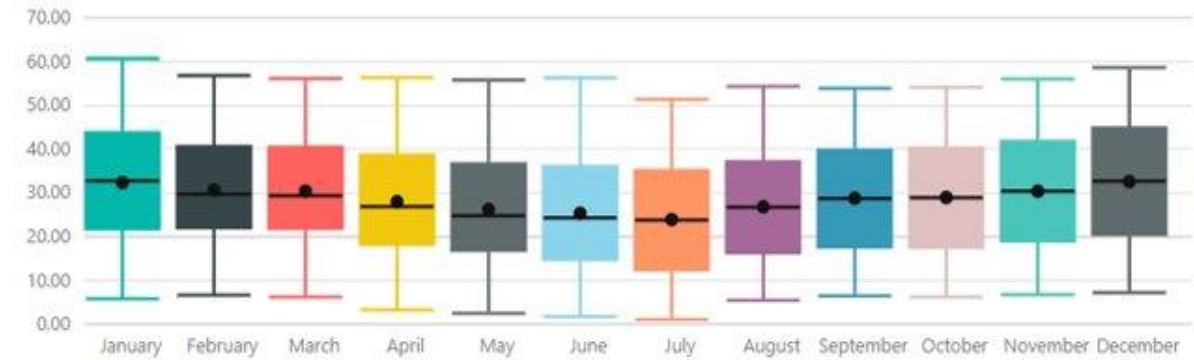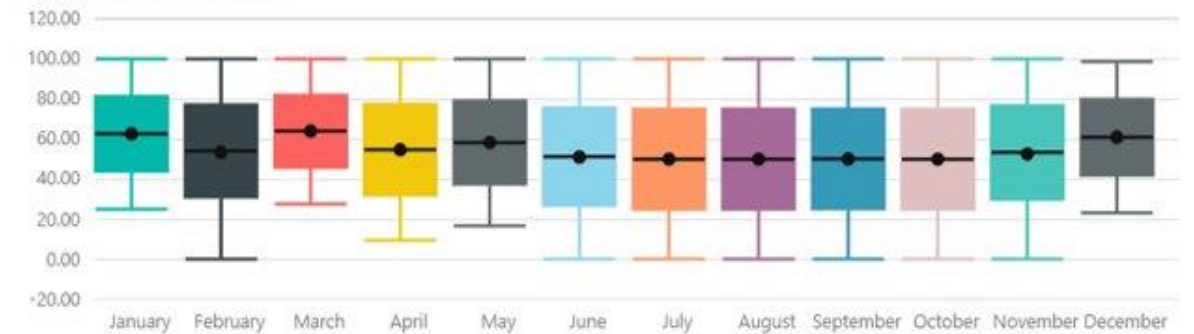
Data Observations

Data below is from several trucks across multiple countries
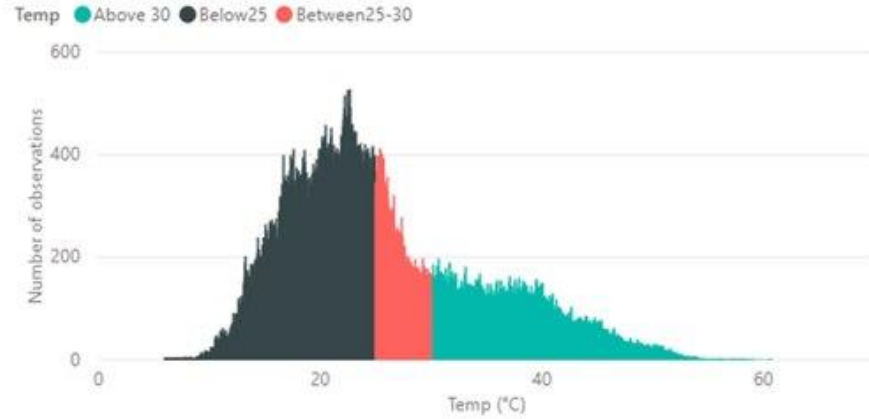
Data Analysis Vision

Collect Data

- Install sensors within in-country supply chains
- Install sensors within small sample of international shipments
- Expand data collection through the last mile

Analyze Data

- Descriptive Analysis ("Real-time" monitoring; Summary Stats)
- Diagnostic Analysis (Root cause analyses)
- Predictive Analysis (Regression; Climate data)
- Prescriptive Analysis (Optimization of routes or shipments?)

Interventions

- A/B testing of low-cost solutions
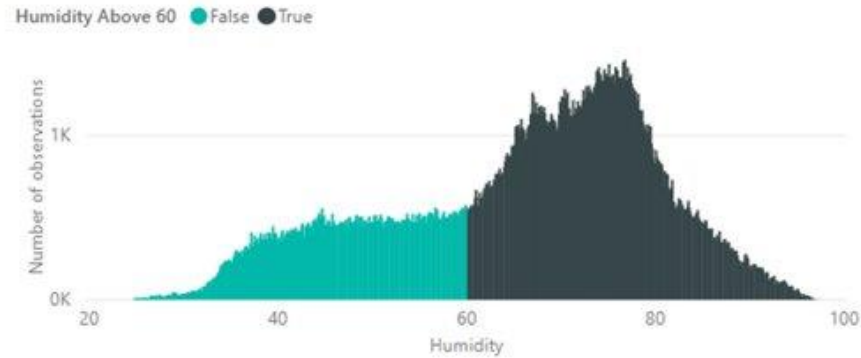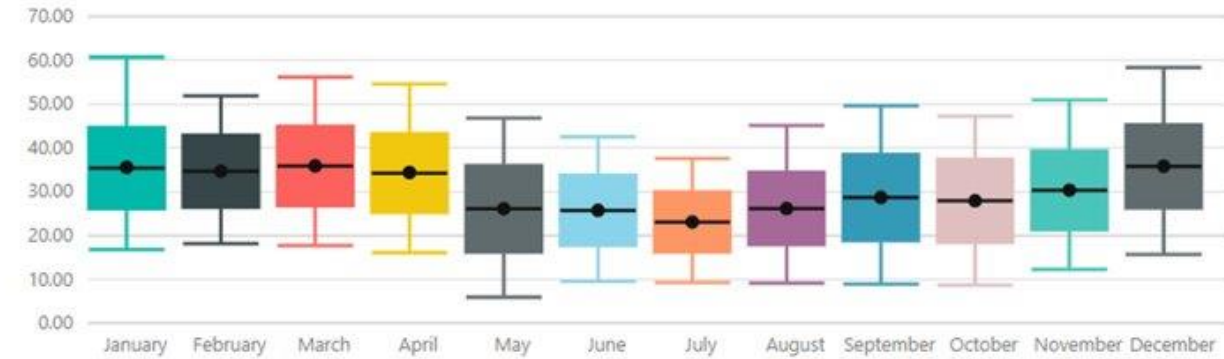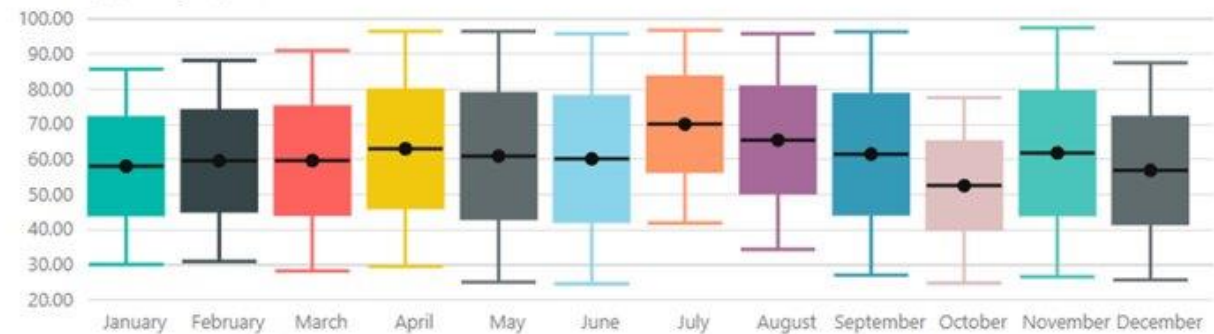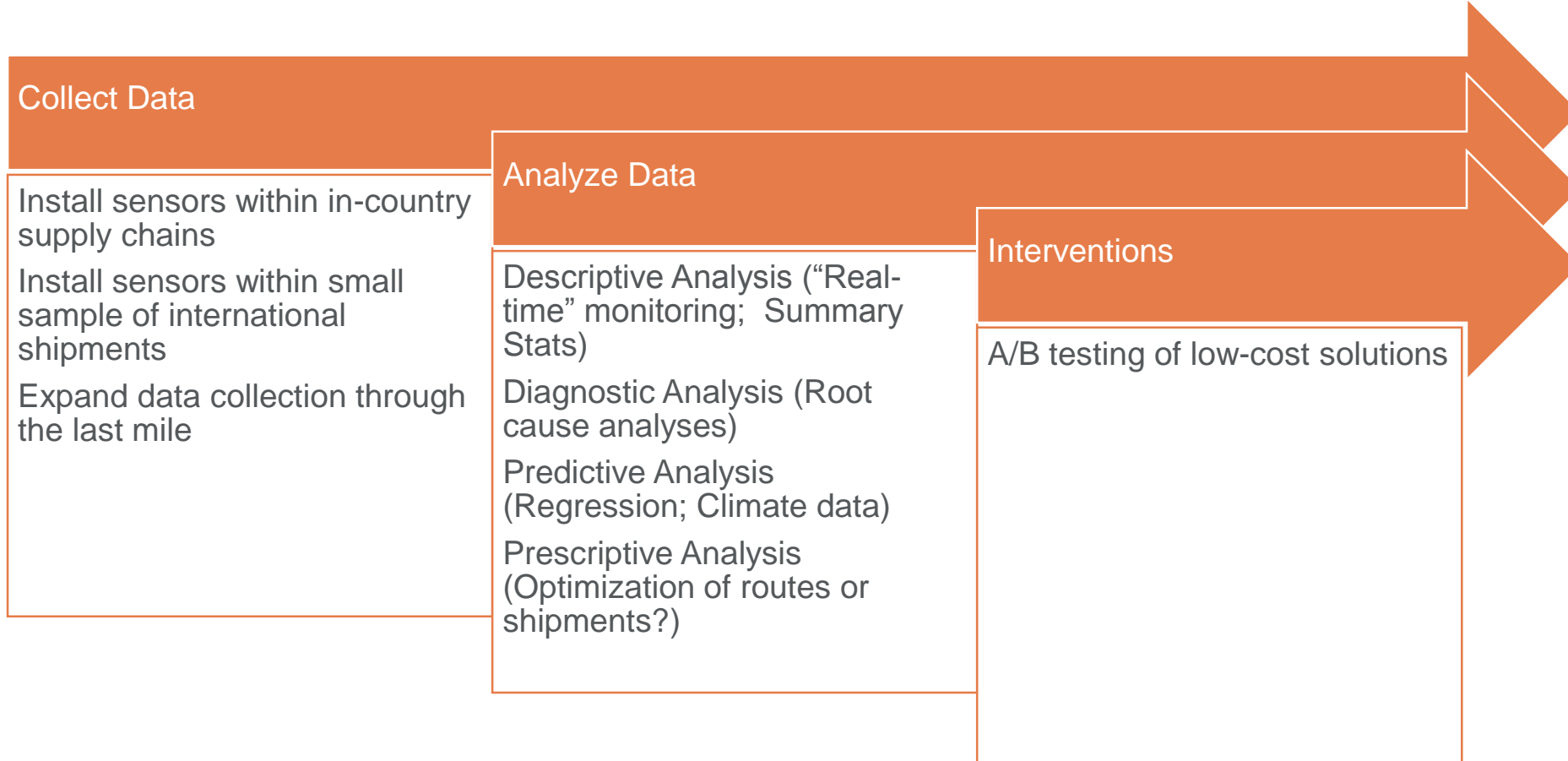
Questions?

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