TELKOMSEL iot

Internet of Things in Supply Chain and Logistics

IoT Illustration

IoT Definition

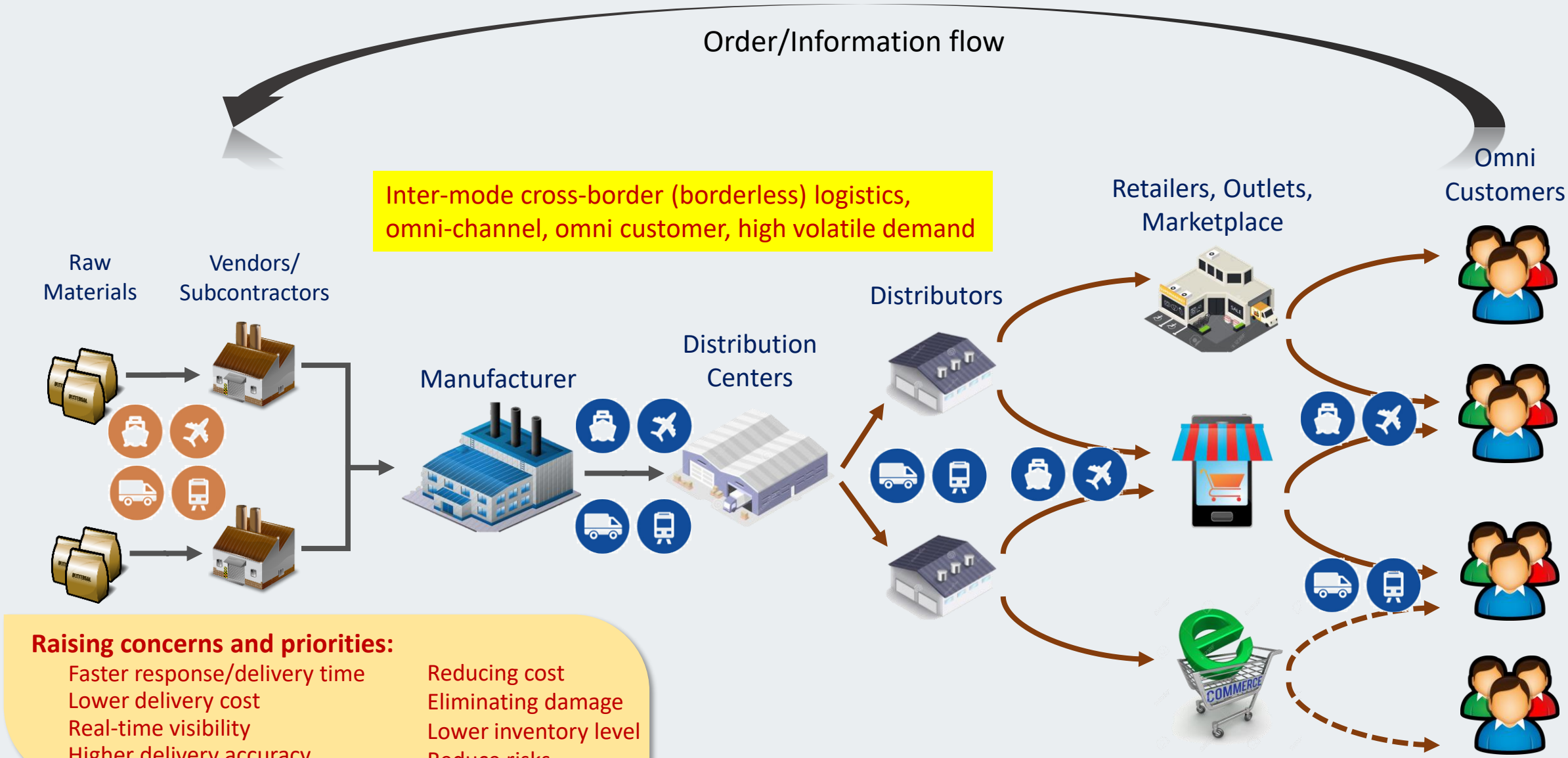
IoT : What is involved

Sense	**Data is gathered,** processed, filtered, & **transmitted by a connected device**.
Transport	Data **passes over networks**, which may be Wi-Fi, cellular, mesh radio, satellite, or Transport fixed line.
Store	**Information from across the IoT network is** gathered and **stored, often in the cloud.**
Insight	Through analysis or automated processing, **insights are extracted and presented.**
Action	**Based on insights, alerts sent to people,** enterprise systems, **or devices to take action.**
Share	**IoT data is exchanged** with other systems, **monetizing and enriching it** with 3rd party data.

IoT : Solution characteristics "AAA"

Aware	• Connected asset able to sense something about its surroundings (e.g. location, proximity, temperature, humidity, light levels or motion...) • If it doesn't sense something, it might not IoT
Autonomous	• Data from an asset transferred to processing application automatically • Without connectivity, it's not IoT.
Actionable	• IoT isn't just about gathering data – its about using it for better decisions • Analysis of the data must be integrated into business processes • If the data is not actionable, by you or a third party, it's not IoT

Typical Supply Chain Nowadays



Raising concerns and priorities:

- Faster response/delivery time
- Lower delivery cost
- Real-time visibility
- Higher delivery accuracy
- Reducing cost
- Eliminating damage
- Lower inventory level
- Reduce risks

Typical Challenges in Supply Chain & Logistics

Unscheduled stop

Location tracking accuracy

Transportation accident

Hijacking

Route violation

Visibility on current cargo location

Safety & Security

High maintenance cost due to unscheduled breakdown

Less visibility on shipment/delivery milestones/delays

Cargo damage due to uncontrolled condition

Less visibility on fuel expenses

Inventory/cargo losses

High fuel cost due to inappropriate operation : excessive idle, unauthorized overtime, fine

Cost Control

Ineffective route

Visibility on actual inventory level

Low assets utilization

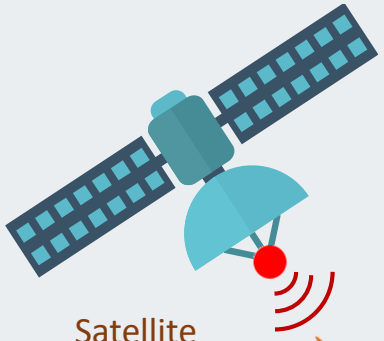
No real-time visibility on delays

Inventory location accuracy

Low driver productivity

Productivity

IoT works by orchestrating assets, telematics, sensing & actuator devices, network connectivity and application platform



Satellite

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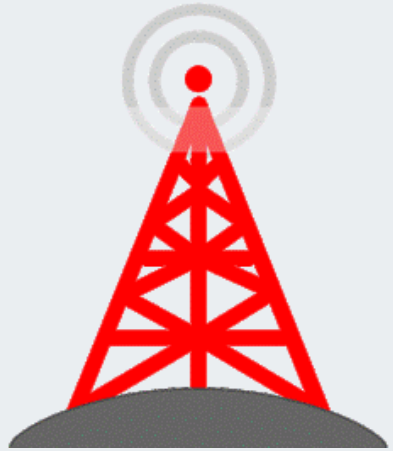
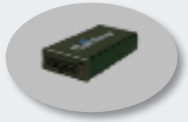
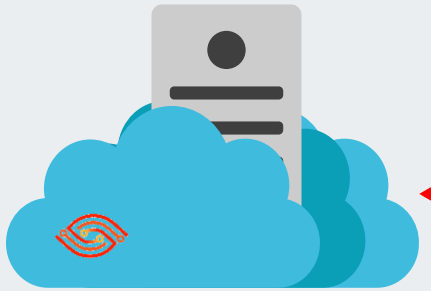
2G/3G Smart Connectivity



Vehicle/Cargo with telematics unit, sensors, actuators



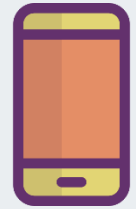
telematics unit, with high sensitivity GPS



Application Server

Internet Connection

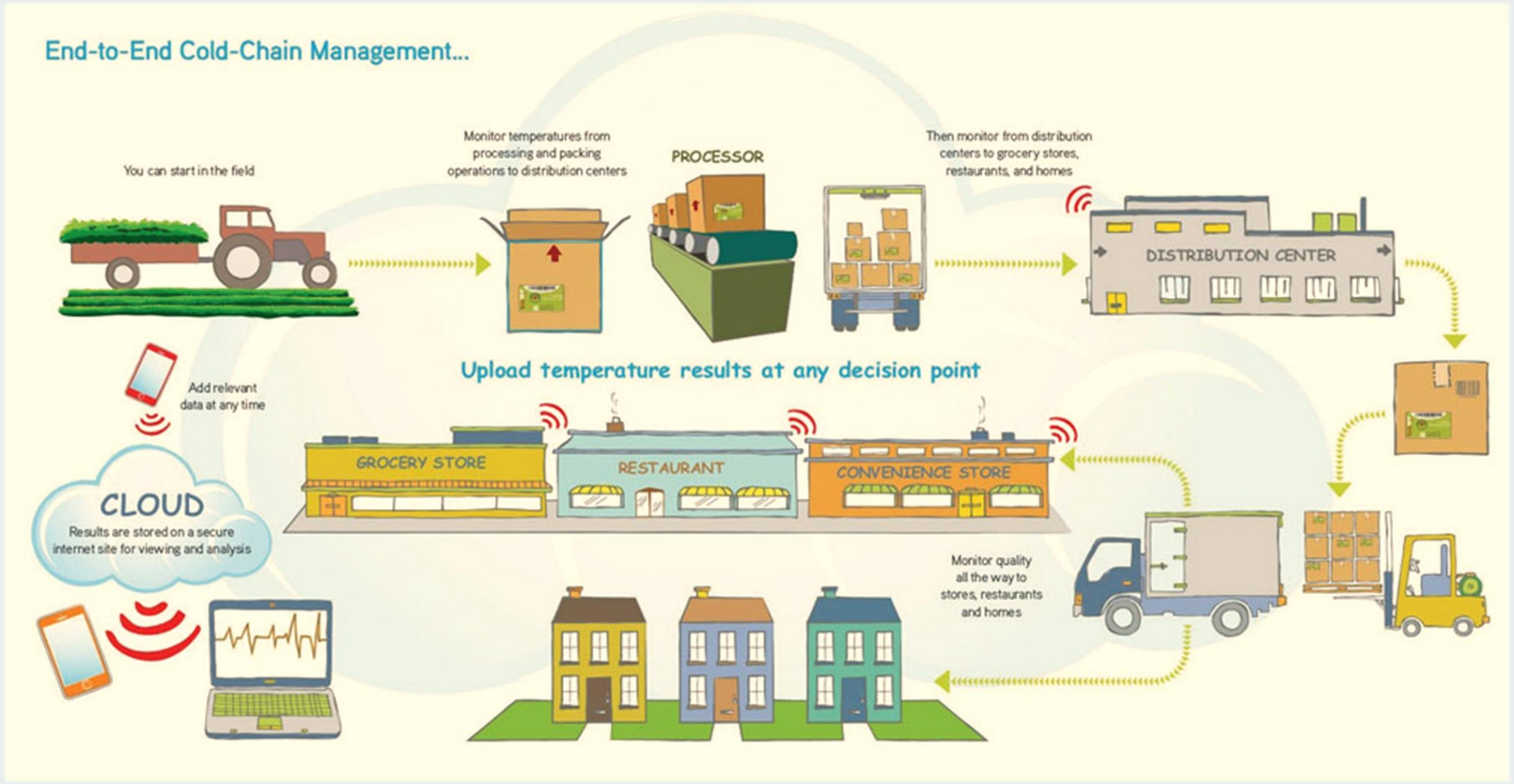
Web Application



Mobile Application

Integration through API

IoT Use Cases in Cold Chain Logistics



IoT Use Cases in Cold Chain Logistics

In Warehouse, In-Transit, and In-Stores

Data loggers, *which have dominated the cold chain industry for decades, have major drawbacks. For example, you only have "**after the fact**" temperature trails. These are less meaningful, since your goods may already have been **compromised, spoiled, or contaminated**.*

IoT for Inventory & Asset Monitoring Solution provides end to end visibility and condition monitoring across your temperature-sensitive supply chain – in your warehouse, in-transit, or the point of customer sale. Using smart Gateway and smart Beacon solutions, users can **monitor perishable goods at an item-level granularity**. Plus, with the central IoT Platform, users can **take immediate action across the chain of custody** when any of the package conditions, such as changes in temperature or humidity, threaten its integrity.

Truck based GPS and or warehouse temperature monitoring systems can provide data about the cold storage at a macro level (such as a truck or a particular region in the warehouse), and not at a package level despite temperature variations even within enclosed environments.

INDUSTRY APPLICATION

- ✓ Pharma & Life Sciences
- ✓ Consumer Goods
- ✓ Food & Beverage
- ✓ 3PL & Logistics
- ✓ Fresh & Frozen Foods

REPORTS

- ✓ Temperature with accuracy of ±0.1 °C
- ✓ Humidity with accuracy <2%
- ✓ Pressure with accuracy ±0.25% (1m in 400m)
- ✓ Package-wise reports

ALERTS

- ✓ Temperature excursion (including MKT)
- ✓ Humidity excursion
- ✓ Pressure excursion
- ✓ Door open sensing (using light sensor)
- ✓ Package-level excursion alerts

Real time Asset & Inventory Monitoring

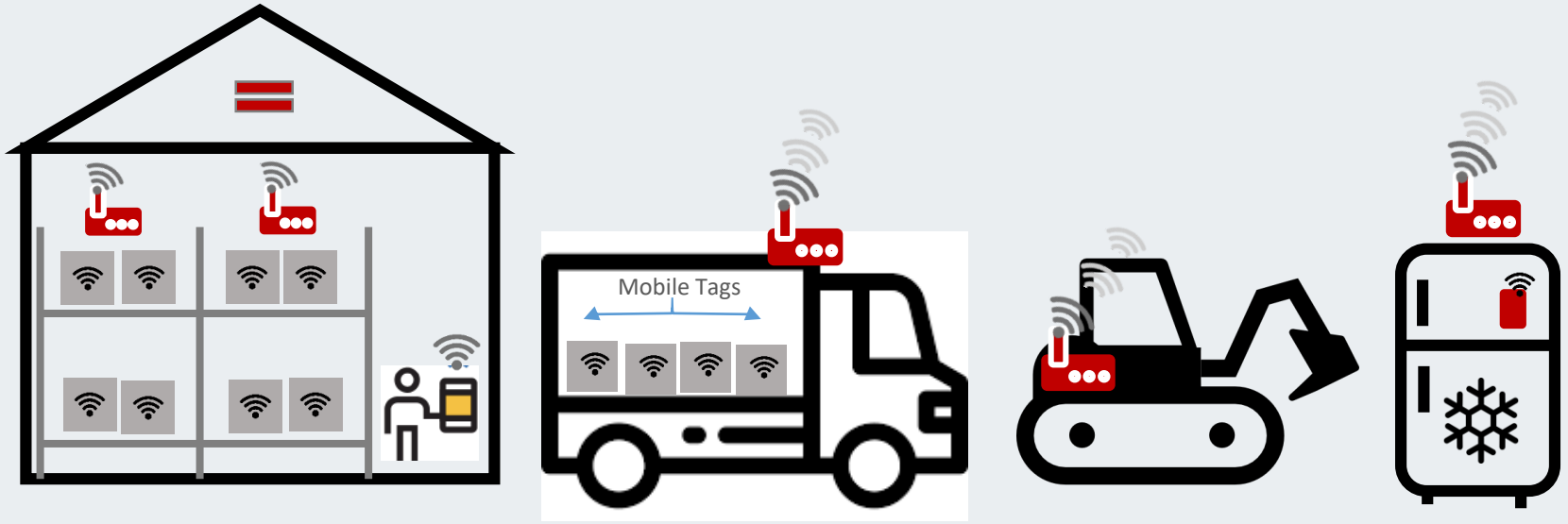
Warehouse, Yard, Field, In-Transit and more

Telkomsel Inventory & Asset Monitoring Solution is used to track, alert, analyze and improve security, condition, and efficiency with individual asset-level visibility both inside buildings and at outdoor facilities.

Monitoring Goods, Assets, and More..

IoT API Platform

(Processing gateway data and 3rd party data into actionable intelligence for better decisions)



Warehouse | **In-Transit** | **Moving Asset** | **Fixed Asset**

Supply Chain Solution | ***Asset Solution***

Worldwide real-time location and condition monitoring

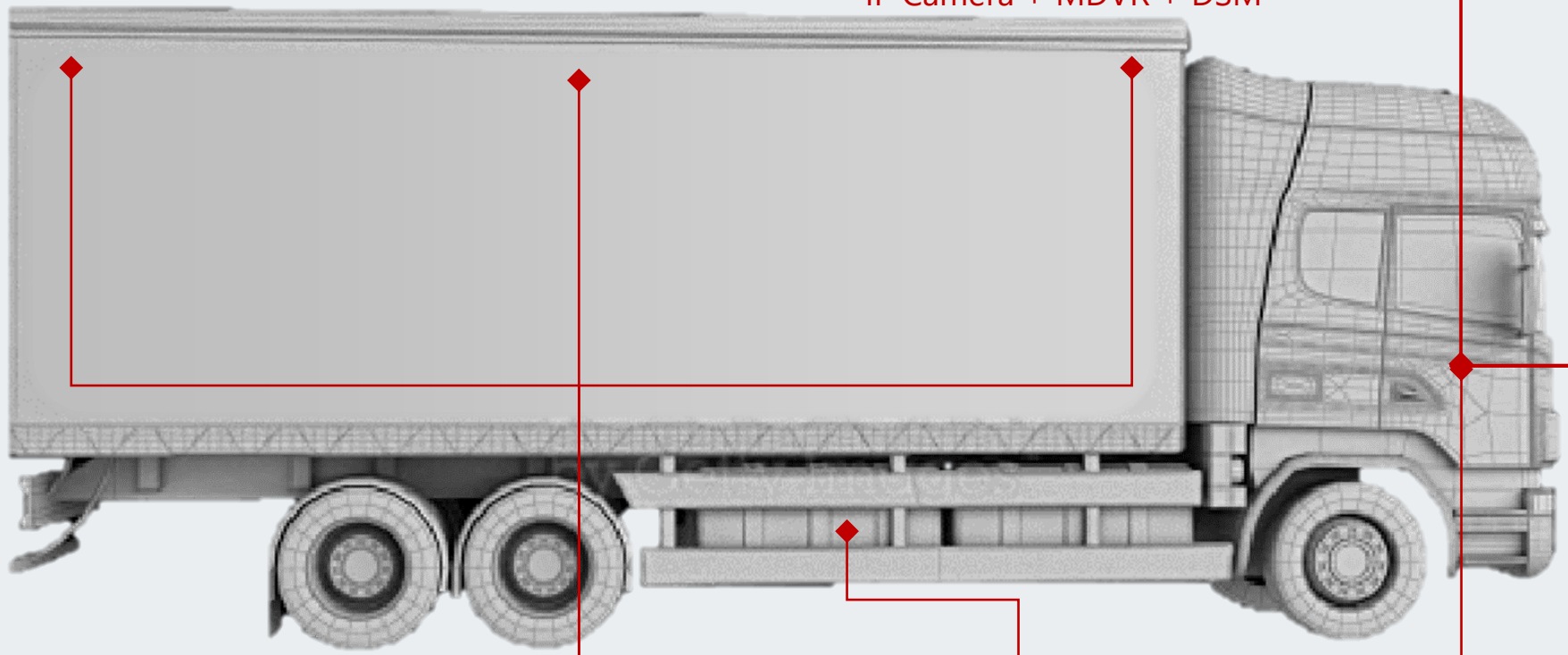
- **Cloud-based** technology for easy integration quick deployment
- **Cost-effective**, scalable on-demand service business model
- **Enterprise-class IoT** as a fully managed service

Various Instruments Used for IoT on Mobile Assets

In-Transit Tracking & Monitoring

IP Camera + MDVR + DSM

Driver Identification

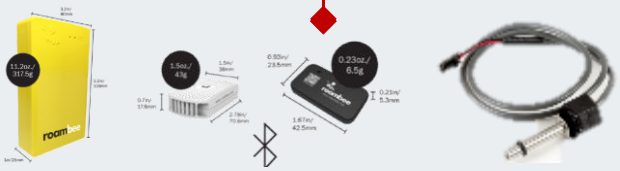


On Board Display

Buzzer/Alarm

Panic Button

Door Sensor/
Smart door lock



Smart Gateway + Beacon, temperature & humidity sensor

Ultrasonic Fuel Sensor

Telematic Device

FleetSight telematic unit with leading technologies

CERTIFICATION

Fully certified FCC, CE, IC, PTCRB, Applicable Carriers

KEY FEATURES

- Packet data (GPRS, CDMA 1xRTT, or HSPA) and SMS-based messaging
- Internal or external cellular and GPS antennas
- High sensitivity GPS (-162 dBm tracking)
- Low power sleep modes
- Internal or external cellular and GPS antennas
- Internal 1000 mAh back-up battery
- 3-axis accelerometer for motion, hard braking/acceleration, and impact detection
- Voltage monitoring and low battery notification
- 20,000 buffered messages for data logging during coverage loss
- 32 built-in geo-fences
- Dual serial ports
- PEG™ exception-based rules
- Automatic, over-the-air unit configuration on power-up (PULS™)
- Over-the-air firmware download (PULS™)
- Web-based device management (PULS™)

COMPREHENSIVE I/O

- Digital Inputs : 5 (1 fixed bias low, 4 programmable bias)
- Digital Outputs : 3 relay driver (200 mA)
- Serial Interface : 2 (1 TTL serial, 1 switched power TTL)
- Analog Inputs : 2 (1 internal VCC monitor, 1 external A/D input)
- 1-Wire® Interface : Driver ID, temperature sense
- Status LEDs : GPS and cellular

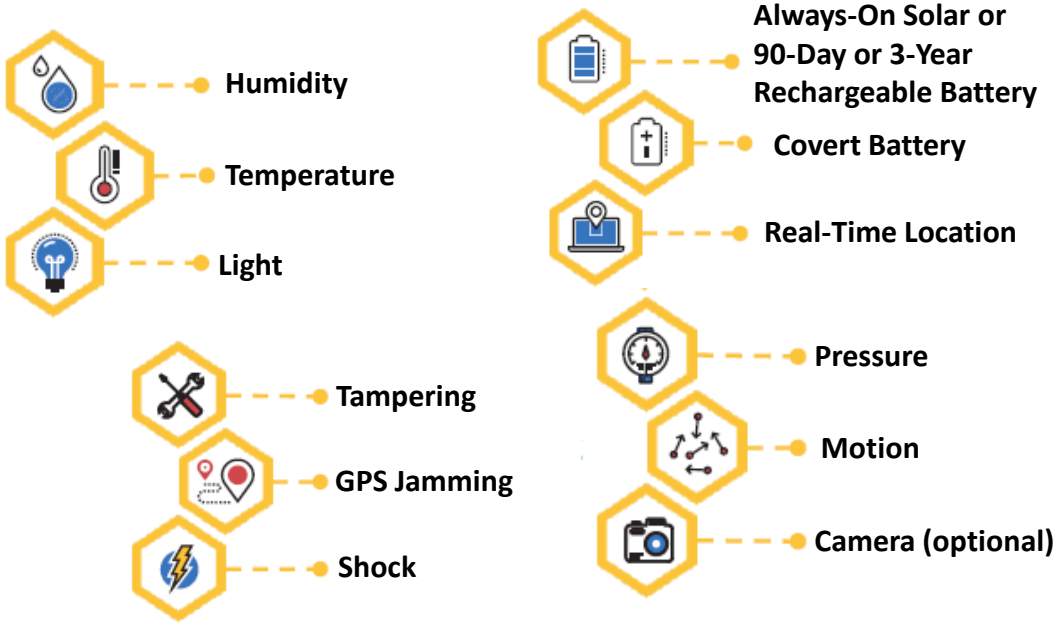
OPTIONAL FEATURES/FUNCTIONS

- Driver ID with 1-wire® protocol
- Temperature sensing via 1-wire® protocol
- Internal or external GPS and cellular antennas
- NMEA data via serial
- External A/D input
- Serial cables
- Piezo speaker (buzzer) & panic button
- Power harness with two (2) 3A fuses

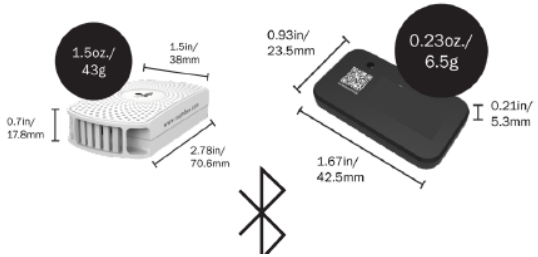
Hardware Specification

Smart Gateway

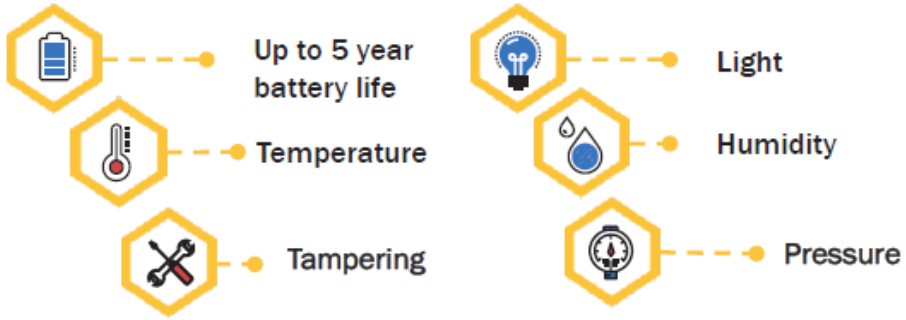
- Rugged, wireless device
- Full array of sensors
- Multi-modal
- GPS + Cellular triangulation
- Battery operated BLE/Wi-Fi/GSM hotspot



Smart Beacon



- Bluetooth Low Energy (BLE) based discreet, lightweight wireless package/item monitoring device
  - Location reporting through the Smart Gateway or Smartphone
  - Sensor data logging (11,000 readings) & buffering
- NIST traceable and 3-point calibration certificate of validation for pharma and cold chain applications
- Non Lithium Ion AAA battery for shipment compliance
- IP 66 Rated
- Disposable, reusable, or returnable



Event-triggered Delivery Milestone Update

Data captured :

- Vehicle/driver matching & availability
- Realtime location and status of vehicle
- Transit data (mileage, speed, route, acceleration, braking, etc)
- Productivity data : travel time, waiting time, loading time, unloading time
- Door open/closed
- Cargo temperature (for cold chain)

Event for alert :

- Driver acknowledge order assignment
- Truck enrouted to pick up point via designated route (defined as route geofence)
- Vehicle leaving truck pool (defined as Point of Interest)
- Vehicle arriving at pick-up point warehouse (defined as Point of Interest)
- Door truck opened for loading
- Door closed and sealed
- Truck leaving warehouse and enrouted to drop point via designated route
- Truck arriving at drop point
- Truck waiting and queueing for unloading
- Door truck opened for unloading
- Truck leaving drop point and enrouted to next stop.

Useful insights generated from data :

- **Vehicle/Driver productivity**
- **Fuel consumption during in-transit or idle**
- **In-transit time for each trip**
- **Waiting time for each activity at pick up/drop point**
- **Loading/unloading time**
- **Driving behavior**
- **Route adherence**
- **Details of unauthorized stops/route**
- **Details of unauthorized door open**

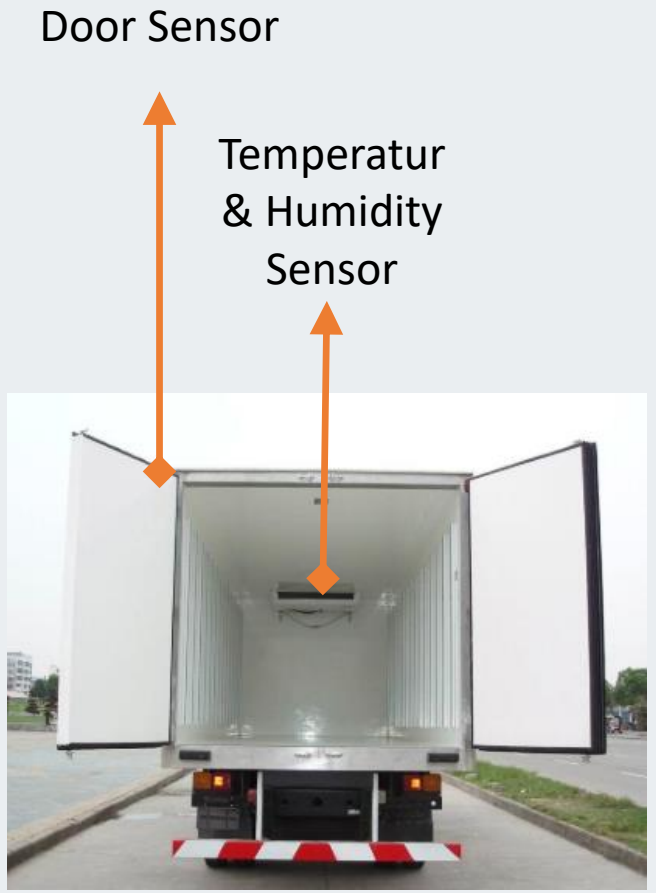
Condition Monitoring for Refrigerated Vehicle

Solutions :

- Real-time location ☑
- Temperature monitoring ☑
- Door (open-close) activity ☑
- Refrigerator engine activity (on-off) ☑
- Fuel management & monitoring ☑
- Detailed activity reporting ☑

Optional Solution :

- *Distribution Management Solution*

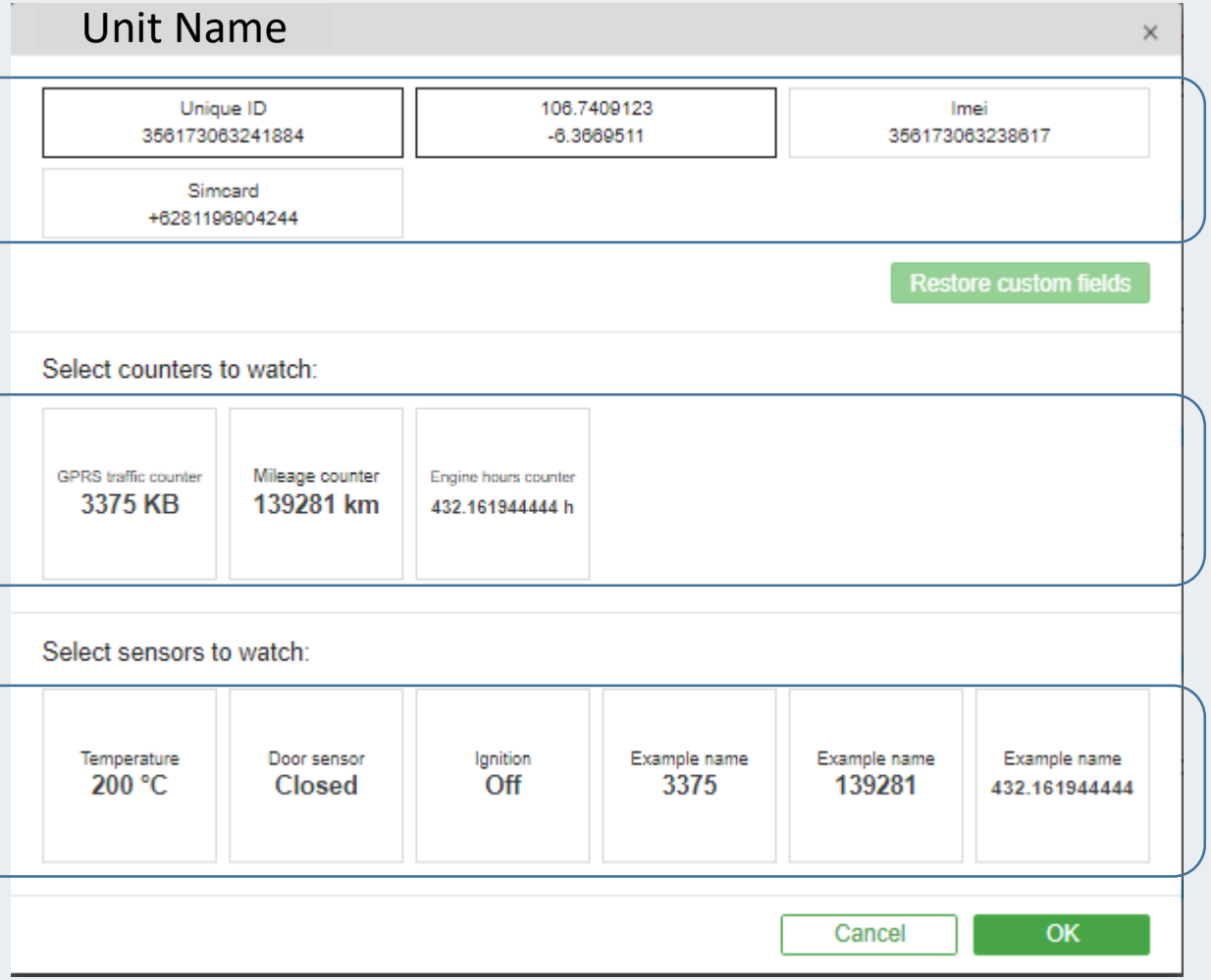


Sensor Value Visualization
Profile and All Sensor Value

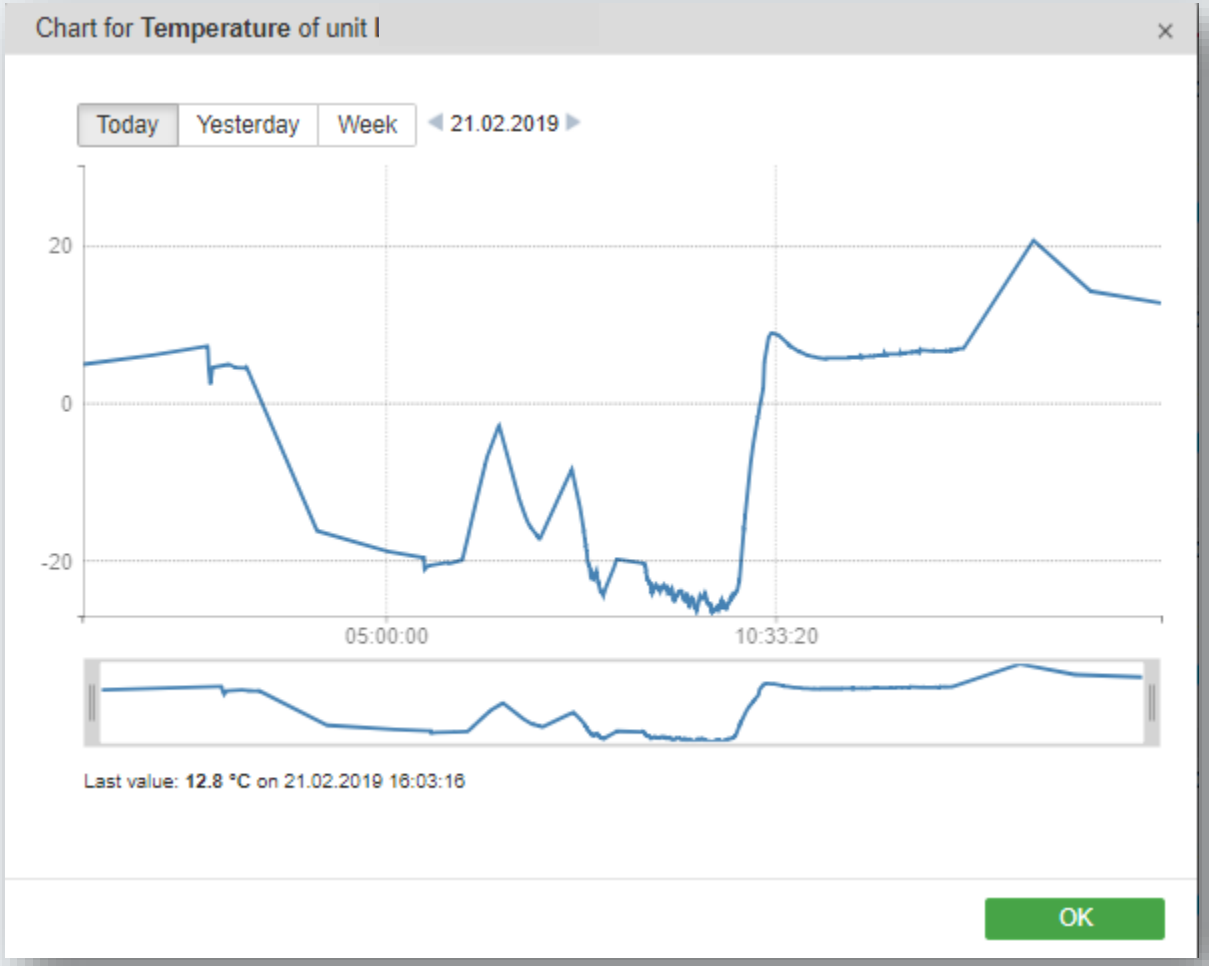
Device Profile

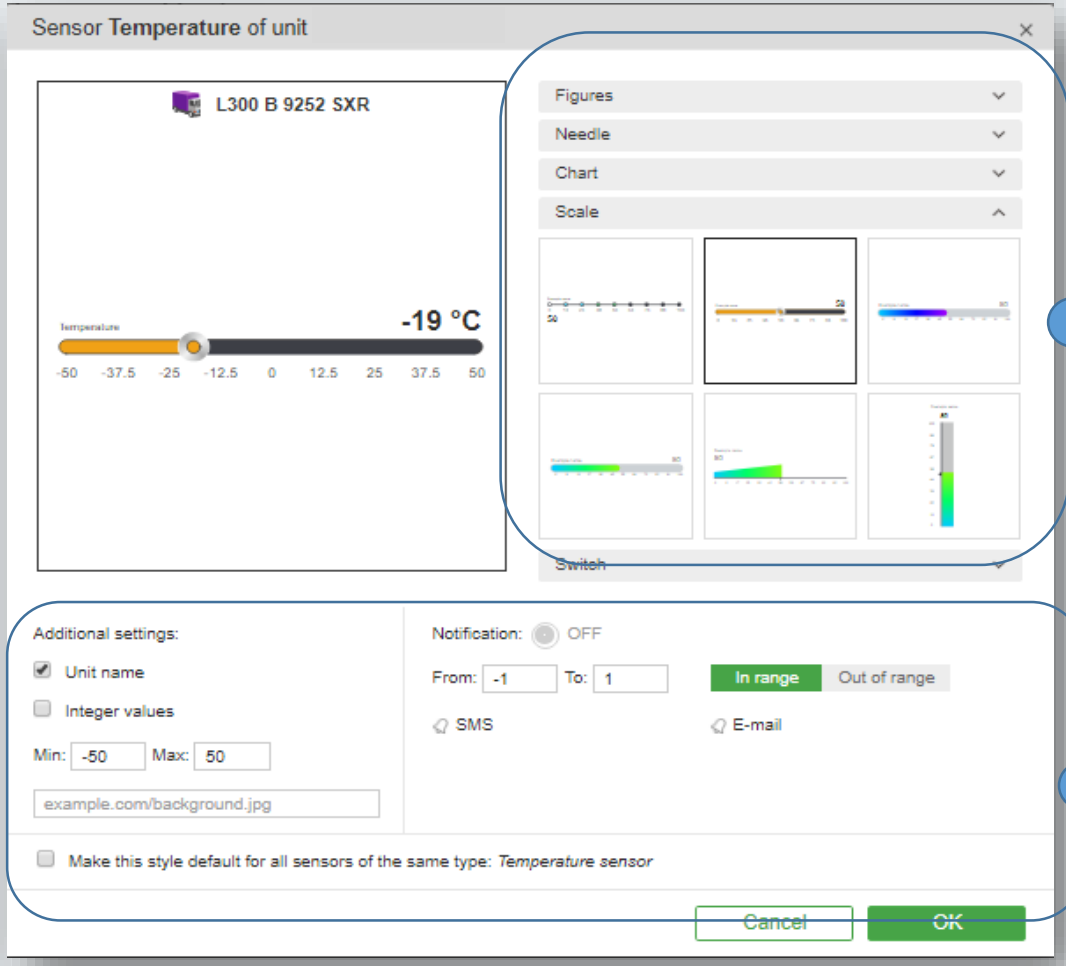
Counter Sensor

Sensor Value



Sensor Value Visualization
Temperature Sensor Chart

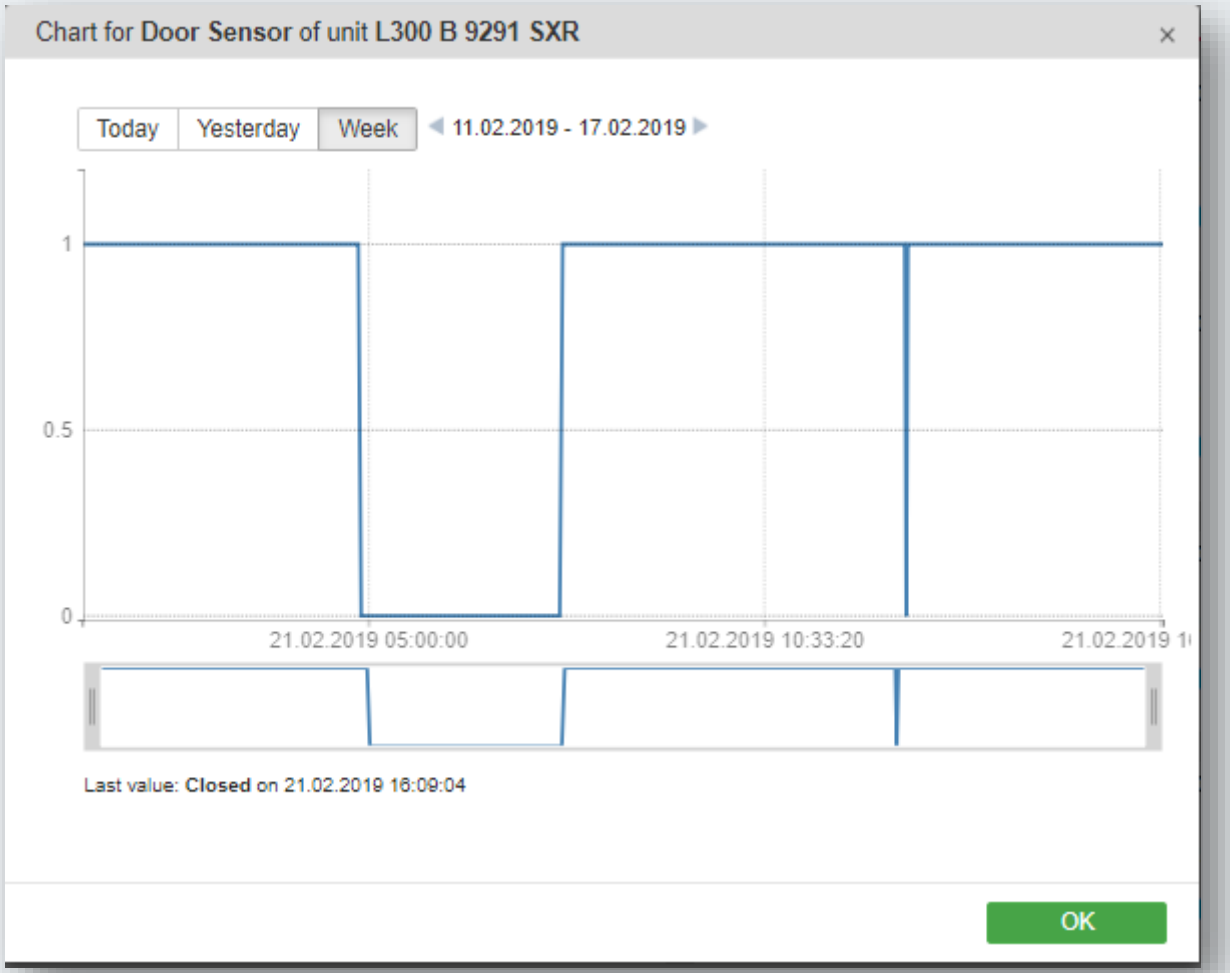




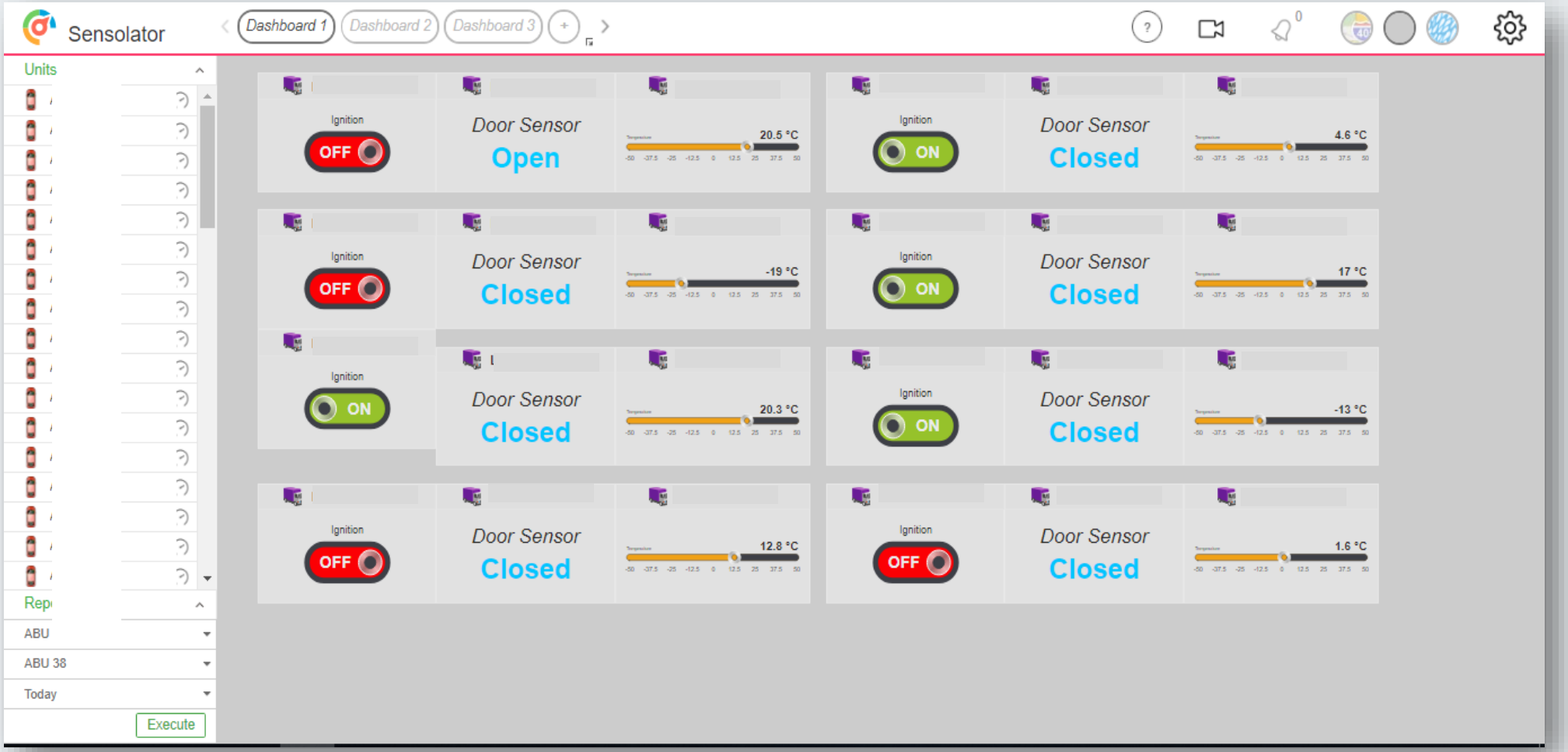
Visual Mode

Visual Setting

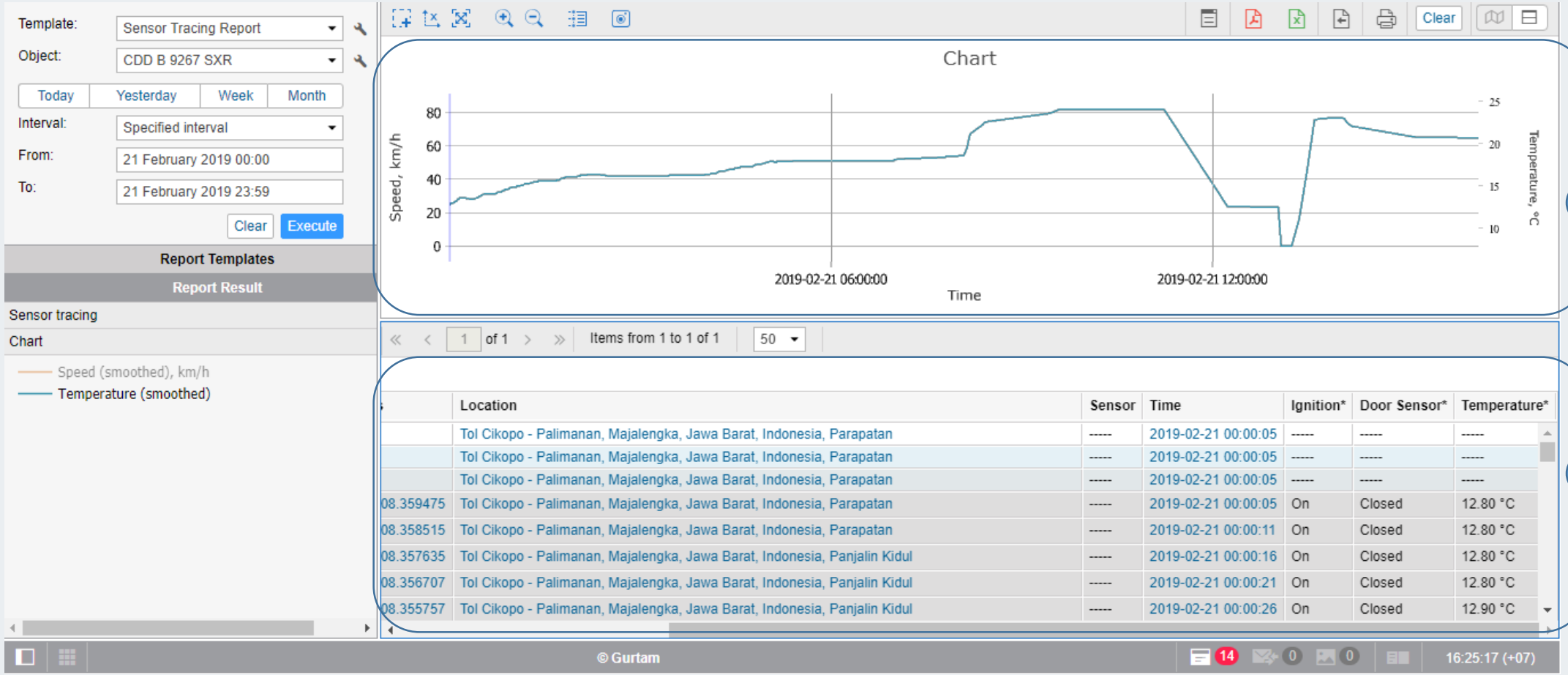
Sensor Value Visualization
Door Open/Close Activity



Condition Monitoring for Refrigerated Vehicle



Sensor Tracing Report



Cold Chain Monitoring (1/2)

Use Scenario

Pain Points

- No real-time temperature data from data-loggers: Spoilage is known but not preventable
- Dependence on vehicle based sensors for real-time info: Prone to outage or tamper
- No reliable method for tracking temperature in multi-modal situations
- Loss and wastage of goods due to spoilage

Benefit

- ✓ Ability to prevent spoilage through real-time temperature, Mean Kinetic Temperature (MKT), humidity and pressure spikes
- ✓ Multi-modal in-transit, in-warehouse, and at point-of-sale cold chain integrity
- ✓ Ensuring top product quality standards throughout the supply chain

Approach

1. Configuration of rules of safe conditions thresholds –Temperature, Humidity, Pressure
2. Real-time foresights into location, time, cause and extent of excursions of including excursion of Mean Kinetic Temperature (MKT) violations of in-transit goods, warehouse or store refrigerators
3. Ops Team actions by contacting concerned parties and normalizes the excursion
4. Goods are saved from spoilage and quality standards met across the supply chain. Company sponsored refrigerators are well-utilized at point of sale

Cold Chain Monitoring (2/2)

Use Scenario

Dashboard

Vaccines manufacturer need an environment of 2-8°C. During excursions, their ground operations team coordinates with the logistics provider to fix the air-conditioning on the road or have the goods re-routed to the nearest warehouse. In rare cases where goods are not salvageable, re-shipments are planned on-time to ensure customer satisfaction.

Reports

- Temperature with accuracy of ±0.1 °C
- Humidity with accuracy <2%
- Pressure with accuracy ±0.25% (1m in 400m)

Alerts

- Temperature excursion (including MKT)
- Humidity excursion
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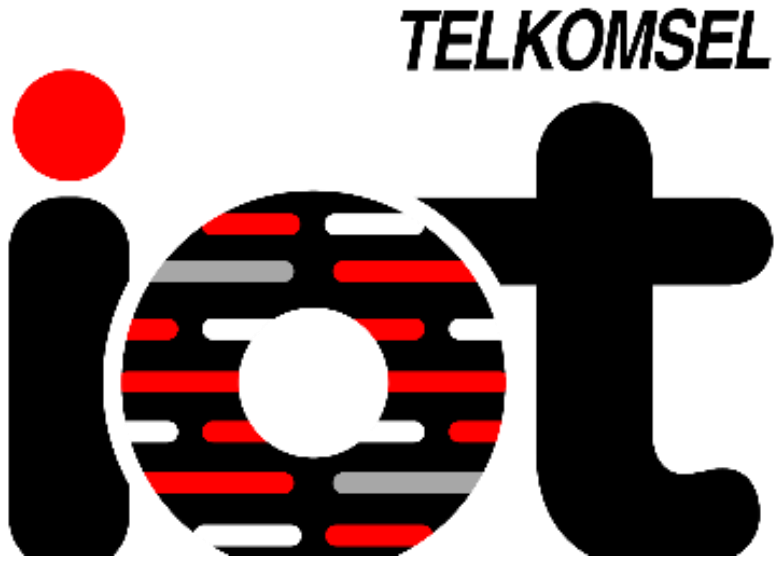
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