

# *End-to-End Cold Chain Safety & Security Monitoring*

*for*

- 1. Real-Time Alerts of Exceptions*
- 2. End-to-End Verification and Certification*
- 3. "FEFO" vs. "FIFO" vs. Unverifiable "History"*

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# **“Fresh and Safe” are the Goals of all Asian Cold Chain Food Retailing**



# End-to-End Pedigree & Life History of Vaccines and Some Healthcare Products can be Life-critical



**Processed foods may have a “larger window” in maintaining the goals of “Fresh and Safe”**



**Documented and Verifiable “Temperature-Humidity  
Directly “On-and-Of” the Produce and Products  
Starts when they are “Harvested” and “Processed”**



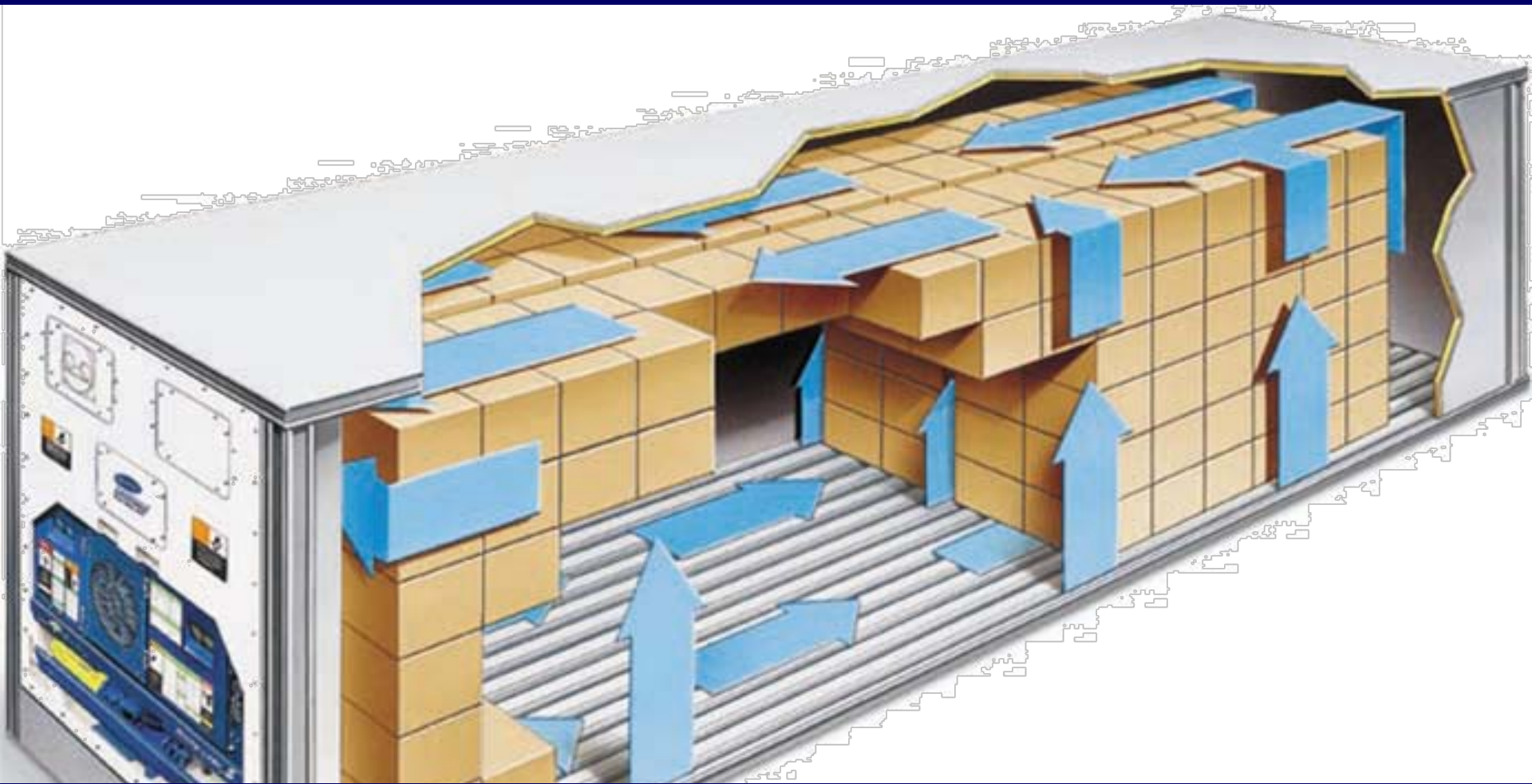


**Verifiable “temperature-humidity” directly “on-and-of” produce and products monitoring may need to go beyond the refrigerated storage space monitoring**





# Traditional Cold Chain Monitors the “Environment” Near the Measuring Zones and Not on Products

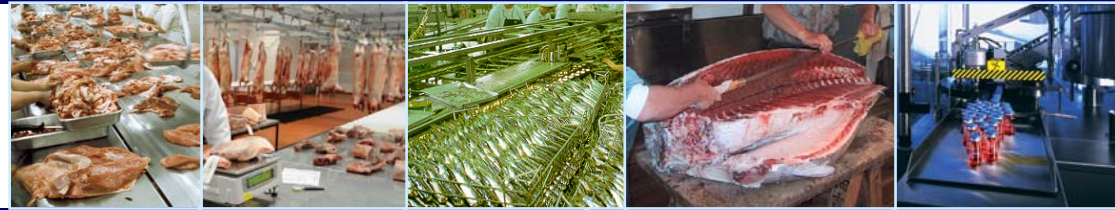


**Verifiable End-to-End Cold Chain Monitoring must include “Temperature-Humidity” Directly “On-and-Of” Produce and Products during Transits**

# Verifiable End-to-End Cold Chain Safety & Security Management

## Product Source Safety-Security:

1. Harvest date-time, temperature-humidity?
2. Manufacturing temperature-humidity and water-chemical environment?
3. Who are performing the function?



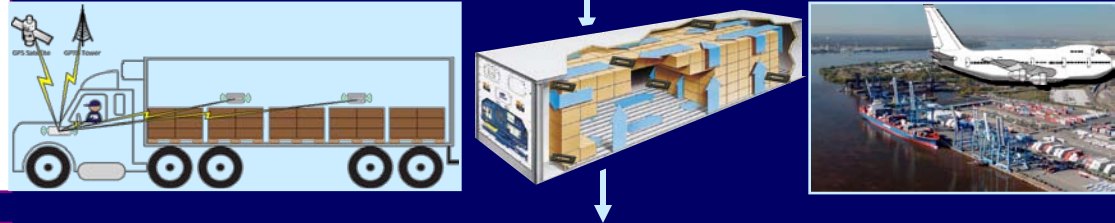
## Display-Shelving to Consuming:

1. On product temperature-humidity-time Control and Log of product?
2. First-Expire-First-Out logistics?



## Inland, Air and/or Sea Transport:

1. Temperature-humidity of products inside the container-trailer box?
2. Who transported the products?
3. Efficiency and possible theft, loss & damages?



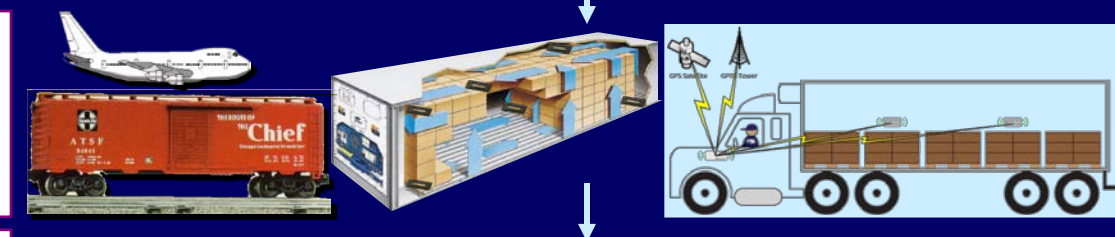
## Cold Storage & Warehouse:

1. Temperature-humidity uniformity and mapping of the storage facilities in all time?
2. Corrective action alerts in real-time?
3. Direct temperature-humidity on special products or products requiring special care?



## Additional Domestic Transport:

1. Temperature-humidity of products inside the container-trailer box?
2. Who transported the products?
3. Efficiency and possible theft, loss & damages?



## Display-Shelving to Consuming:

1. On product temperature-humidity-time Control and Log of product?
2. First-Expire-First-Out logistics?







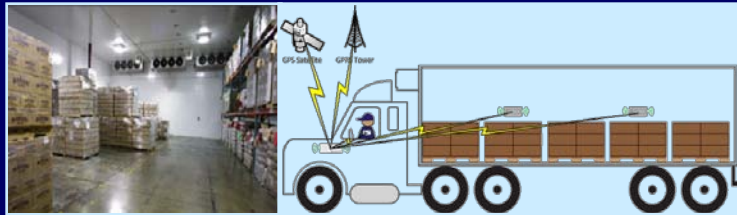
### Harvesting-Manufacturing-Processing:

1. Documented and verifiable temperature & time for each batch
2. Personnel, machinery, processing (chemical, water, etc.) accountability



### Retail Consumer Shelving and Display:

1. Documented and verifiable temperature & time
2. First-Expire-First-Out Management whenever product time-temperature pedigree are known



### Trucking Transportation & Warehousing:

1. Controlled and verifiable temperature-time (and optionally moisture) log
2. Theft, loss and damage prevention with real-time alerts for exceptions

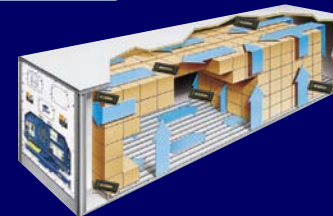


### Cold Chain Container: Transport:

1. Controlled and verifiable temperature-time (moisture) log
2. Loss, damage and theft prevention with real-time alerts for exceptions

### Inland Cold Chain Transportation:

1. Controlled and verifiable temperature-time (and optionally moisture) log
2. Theft, loss and damage prevention with real-time alerts for exceptions



### Retail Consumer Shelving and Display:

1. Documented and verifiable temperature & time
2. First-Expire-First-Out Management whenever product time-temperature pedigree are known



## End-to-End Cold Chain Safety & Security Management

# Traditional Electronic Track-and-Trace Technologies and Solutions Offer Little Benefits to Cold Chain Management



In a recent piece in Seapower magazine by David W. Munns here. Mr. Munns posits a scenario in which containers passing through Pakistan have had their **contents stolen by thieves who un-weld the seams of the metal containers, took the products from inside the container, and then re-weld the seams, apparently without breaking the seals on the boxes.**



## RELAYER™

(Mounted on Outside of Container Monitoring: Sensors-RSSI data via RFID incorporating GPS and Satellite Communications)

## RELAYER™

(Placed inside truck cab: Monitoring: Sensors-RSSI data via RFID, GPS and GPRS Communications)

**ZONER™ Tags**  
(Sensors-RFID INSIDE Container monitoring temperature-humidity on-and-of the products)

**ZONER™**  
Badge for Personnel

When container is "closed", RELAYER receives Lower RSSI & Temperature-humidity Sensors conditions from ZONER tags inside the container

**NORMAL**



Status: CLOSE

When container is "open", RELAYER receives Higher RSSI & Temperature-humidity Sensors changes and report exceptions from ZONER tags inside

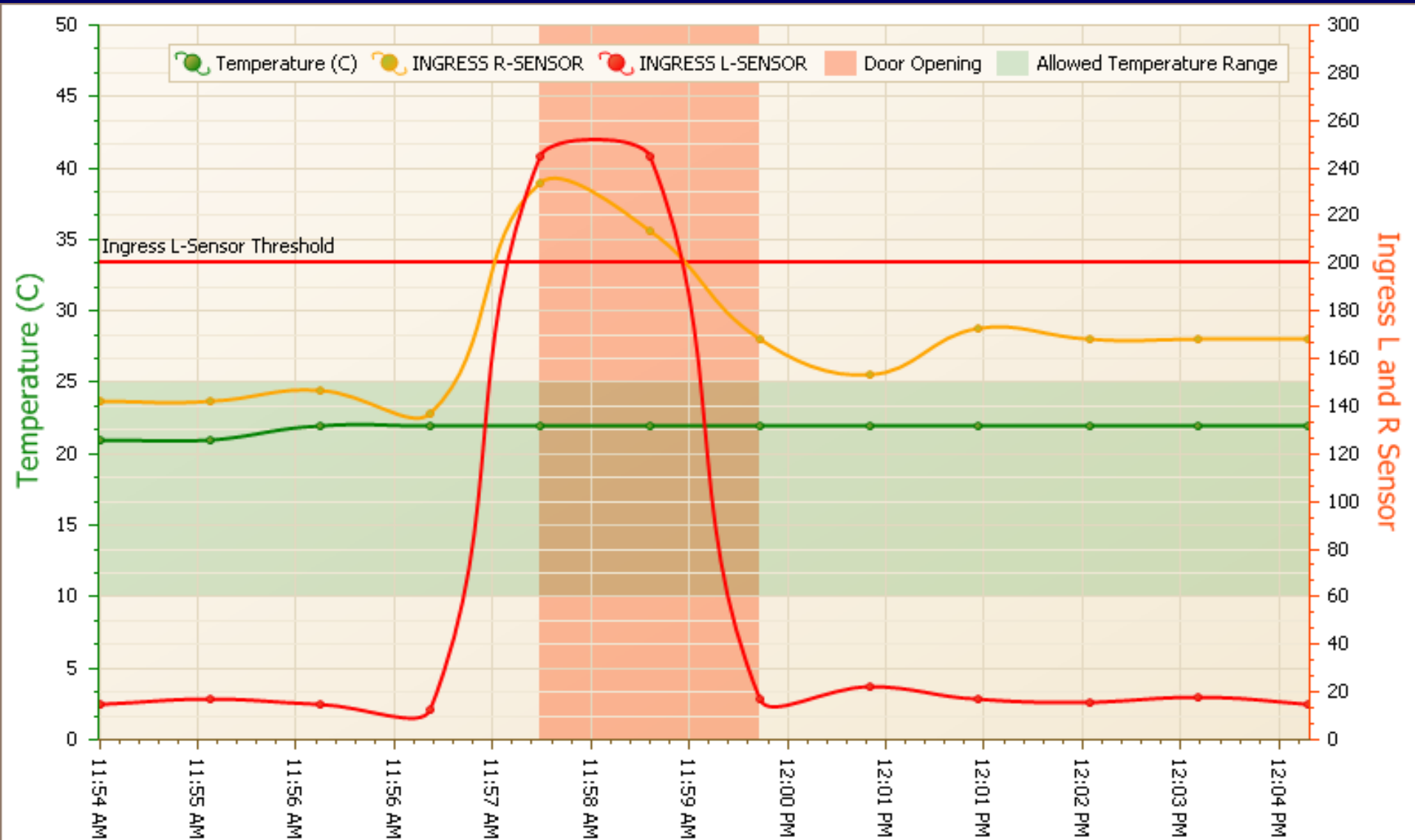
**EXCEPTION**



Status: OPEN

Monitoring Temperature ON the Products for Real-Time Alert from End-to-End

# Multiple Sensors of Multiple ZONER Tags (at least two each) & Multiple Data Reading (at least 3 sets) Eliminated the Dreaded False Positives During Harsh Container Shipping and Transportation





## RELAYER™

(Placed inside truck cab:  
Monitoring: Sensors-RSSI  
data via RFID, GPS and  
GPRS Communications)

## RELAYER™

Mounted every 300 ft  
apart inside the  
warehouse monitoring:  
Temperature-Humidity  
of Product-Produce  
Directed Mounted with  
ZONER tag-Sensor  
along with its locations  
deduced from its RSSI

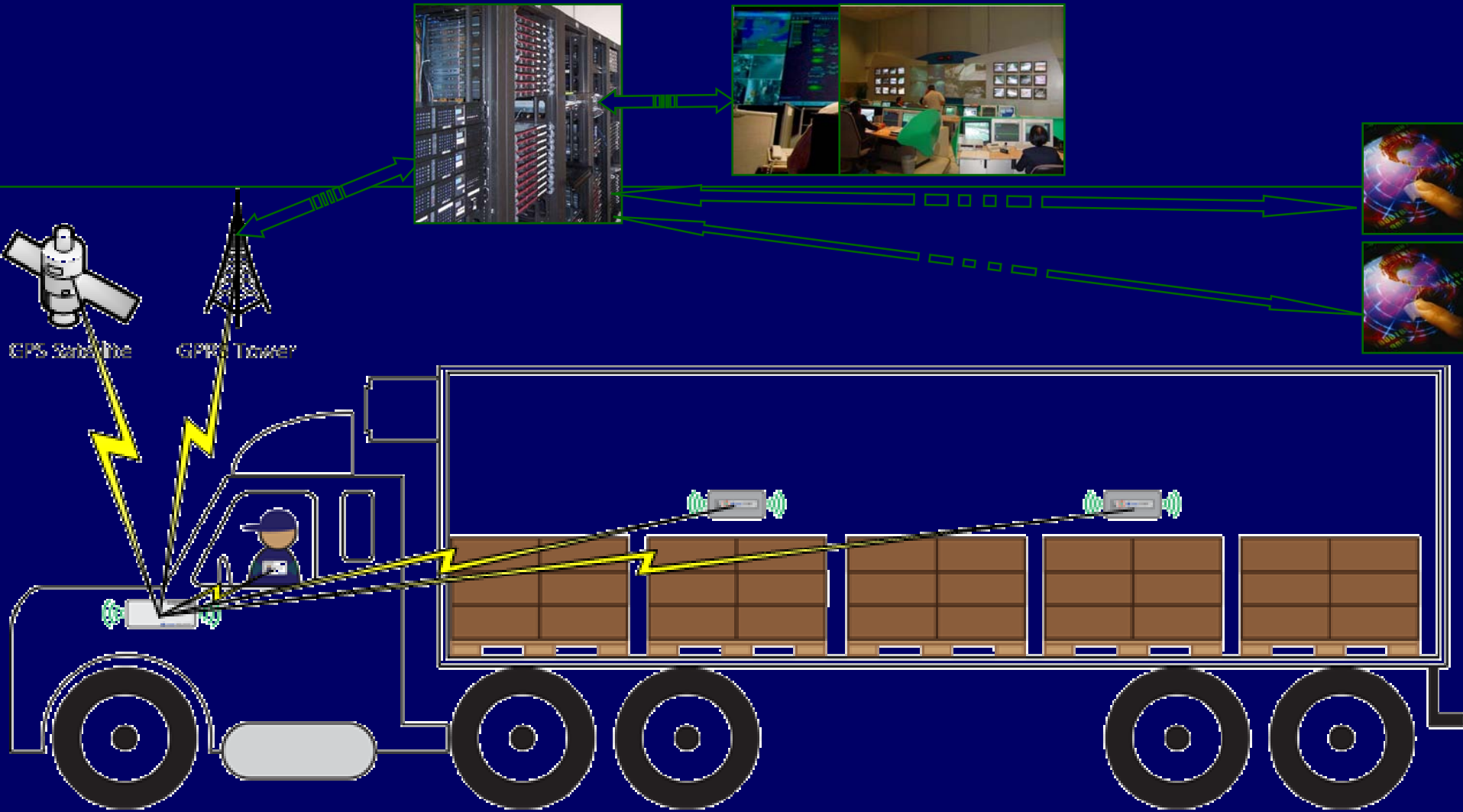
**ZONER™ Tags** Temperature-  
Humidity-Shock Sensors Embedded  
RFID Mounted ON Product-Produce  
to Achieve “End-to-End” Documentation  
that is Verifiable

**ZONER™  
Badge for  
Personnel**



# AVANTE Verifiable End-to-End Cold Chain Safety & Security Monitoring Services:

1. GPRS and/or Satellite as primary communications during wide-area transit
2. RFID network for Cold Chain Storage and Processing Plants



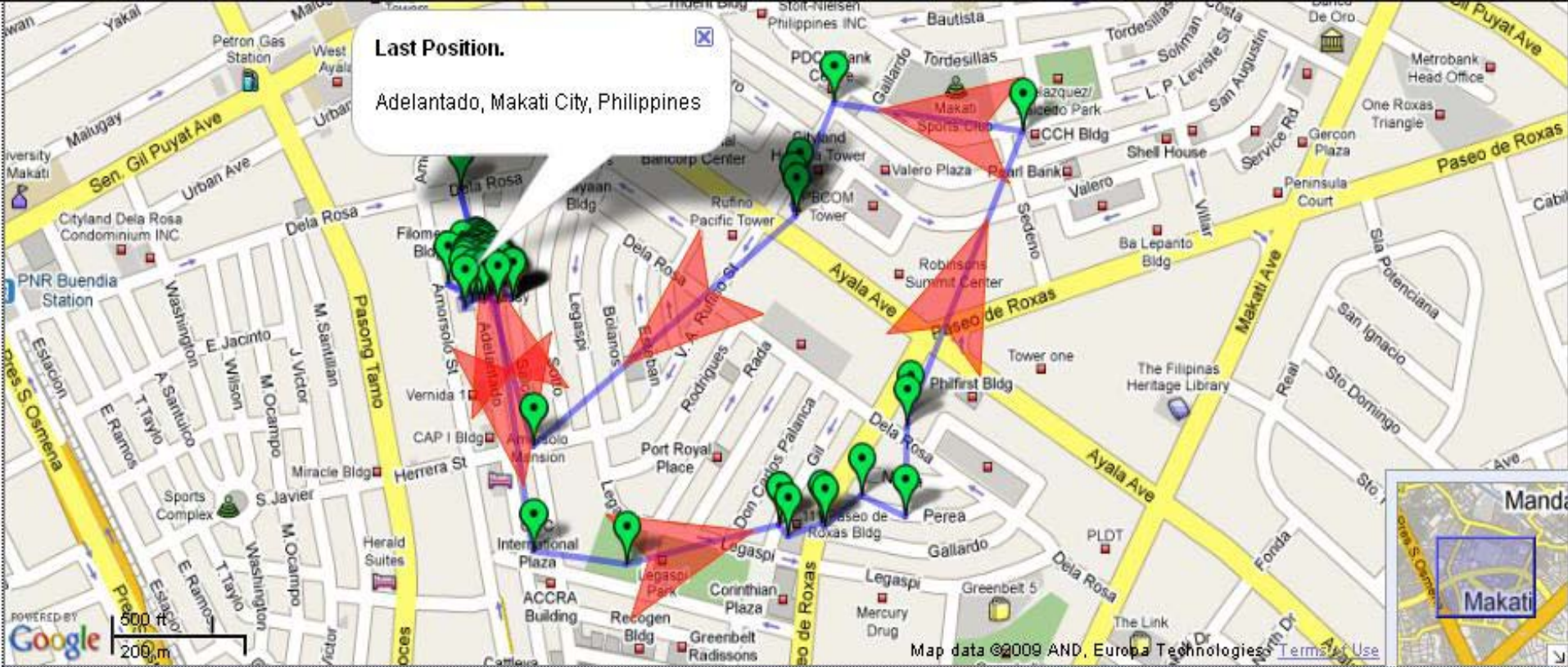


# AVANTE Verifiable End-to-End Cold Chain Safety & Security Monitoring Services:

1. GPRS and/or Satellite as primary communications during wide-area transit
2. RFID network for Cold Chain Storage and Processing Plants

The screenshot displays a web application interface for tracking. On the left, there is a sidebar with two sections: 'Operations' and 'Device List'. The 'Operations' section shows a message 'Load data successfully.' and two buttons: 'Get Data' and 'Map It'. The 'Device List' section prompts the user to 'Please select the device that you want to track.' and lists three devices: 'Avante Truck 1' (selected with a checked checkbox), 'Avante Truck 2' (unchecked), and 'Avante Truck 3' (unchecked). The main area of the page is a map of the United States. A pop-up window is displayed over the map, showing the following information: 'Device: Avante Truck 1', 'Time: 11/8/2007 10:01:07 PM', 'Latitude: 33.76283', 'Longitude: -84.38458', and 'Status: Door opened'. The map includes various city names and state boundaries. At the bottom of the browser window, the taskbar shows the 'start' button, the 'Avante Secure Inter...' application, and the 'map1 - Paint' application. The system clock indicates '6:51 PM'.





### Data

All data between 7/6/2009 12:00:00 AM and 7/7/2009 11:59:00 PM

	Time	Longitude	Latitude	Relayer Status	Tag Status	Importance	Ack.	Ack. By	Ack. Time	
<a href="#">Select</a>	7/7/2009 11:13:24 AM	121.015266	14.557251	Normal.	Normal.	Low	False			<a href="#">Ack.</a>
<a href="#">Select</a>	7/7/2009 11:13:24 AM	121.015266	14.557251	Normal.	Normal.	Low	False			<a href="#">Ack.</a>

## AVANTE Verifiable End-to-End Cold Chain Safety & Security Monitoring Services:

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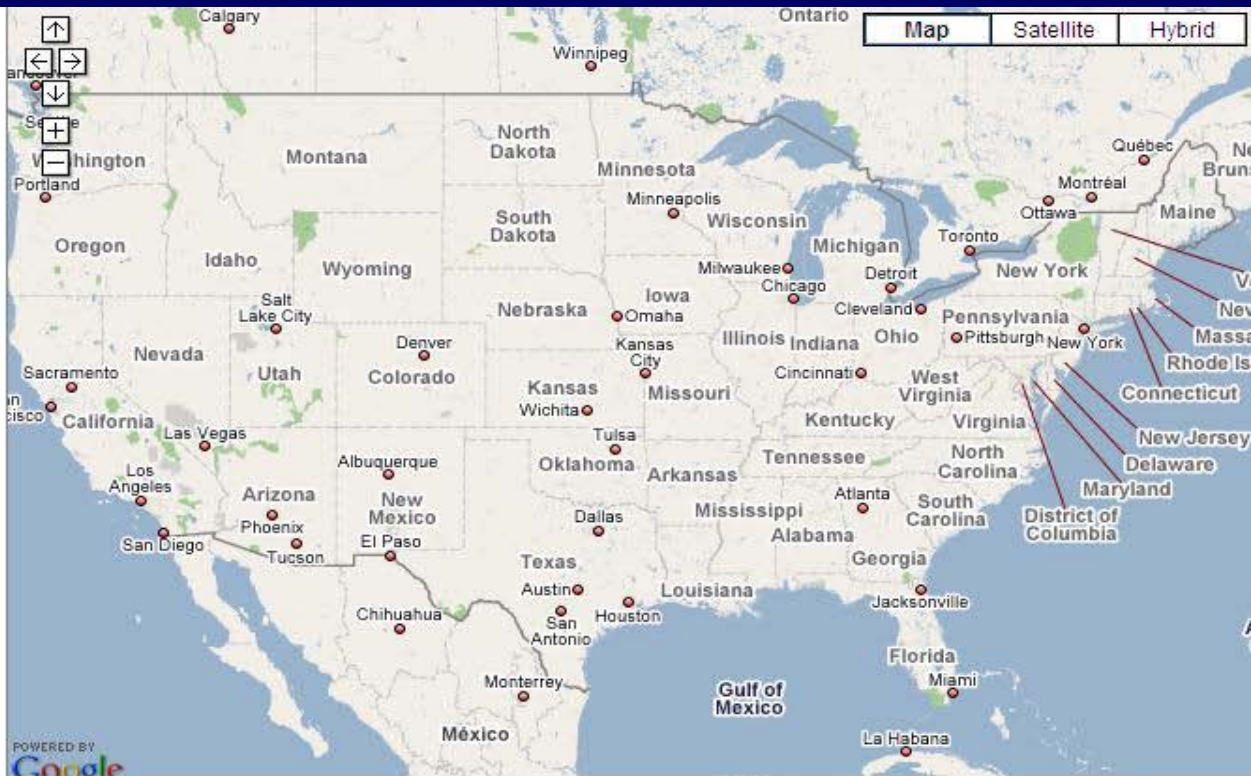
# Easy to Use & Integrate Web-Based System that can be Role-Based Accessed from Anywhere

**Log In**

User Name:

Password:

☐ Remember me next time.



Done

start

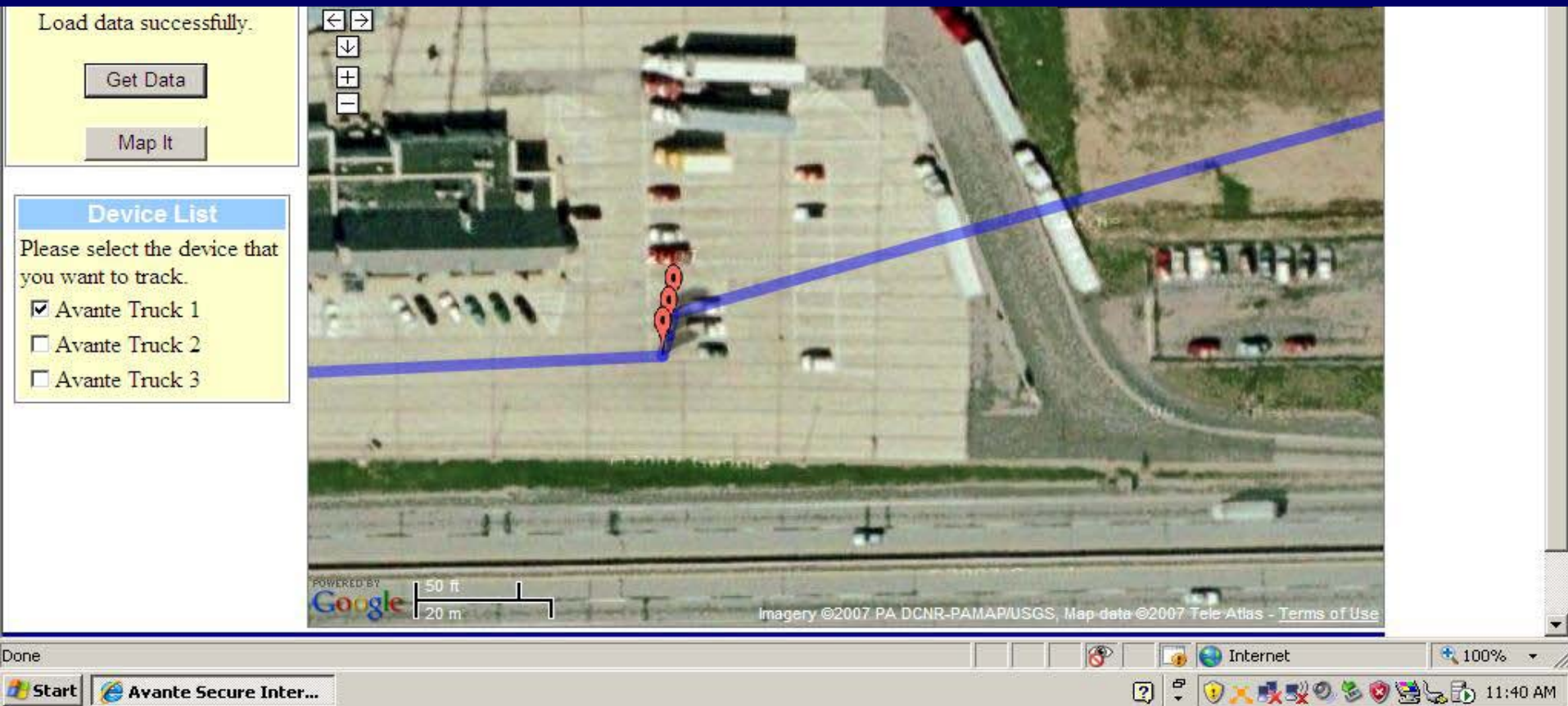
Avante Secure Inter...

Internet

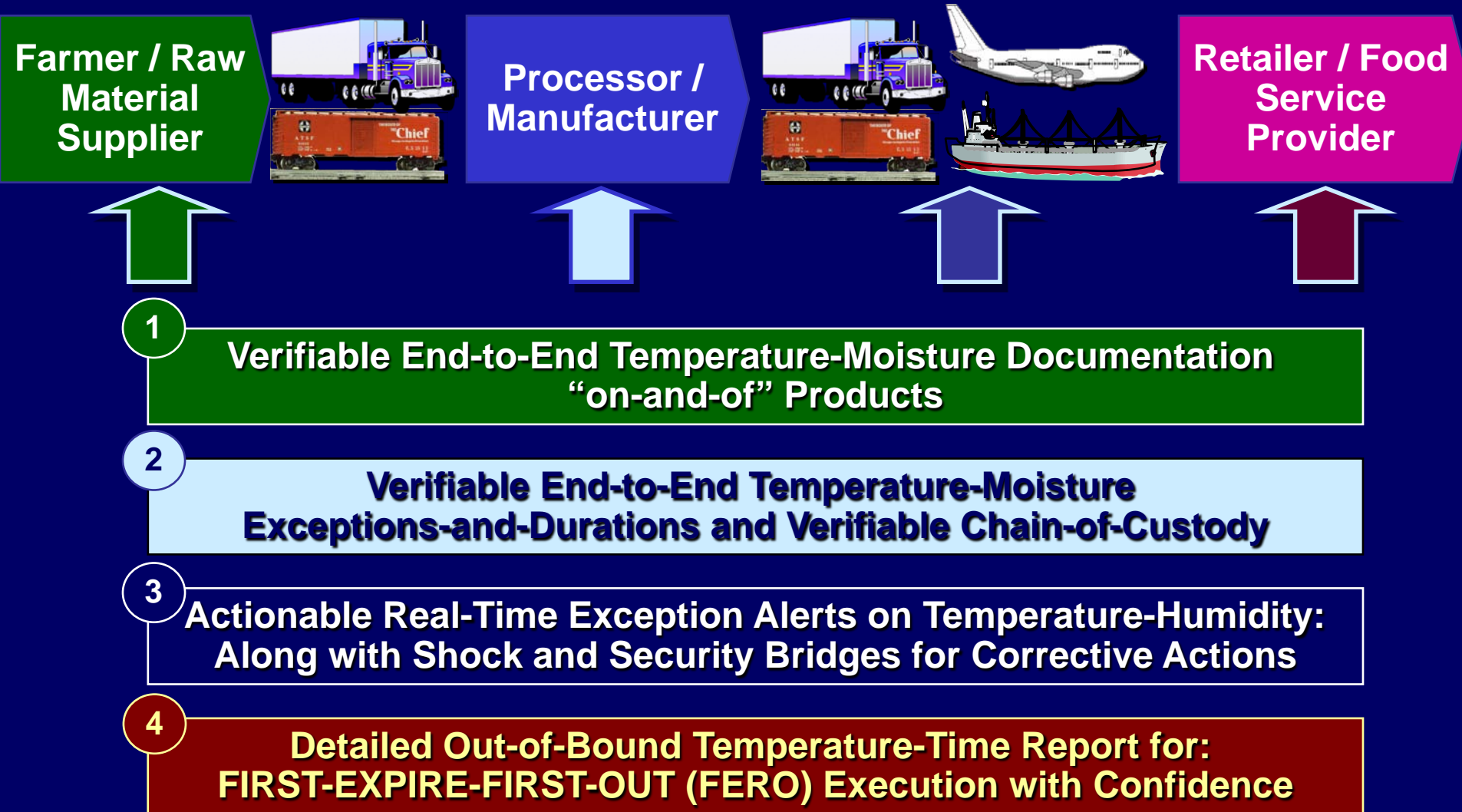
100%

6:46 PM

# Google Earth Shows the Area When Temperature and/or Humidity Exceeded the Limits, Doors are Open, High Shock, etc.



# Verifiable End-to-End Cold Chain Safety & Security Monitoring Services





# *“Verifiable End-to-End Cold Chain Safety & Security Monitoring”*

- 1. Costs of Implementing?*
- 2. Who will be willing to pay for them?*

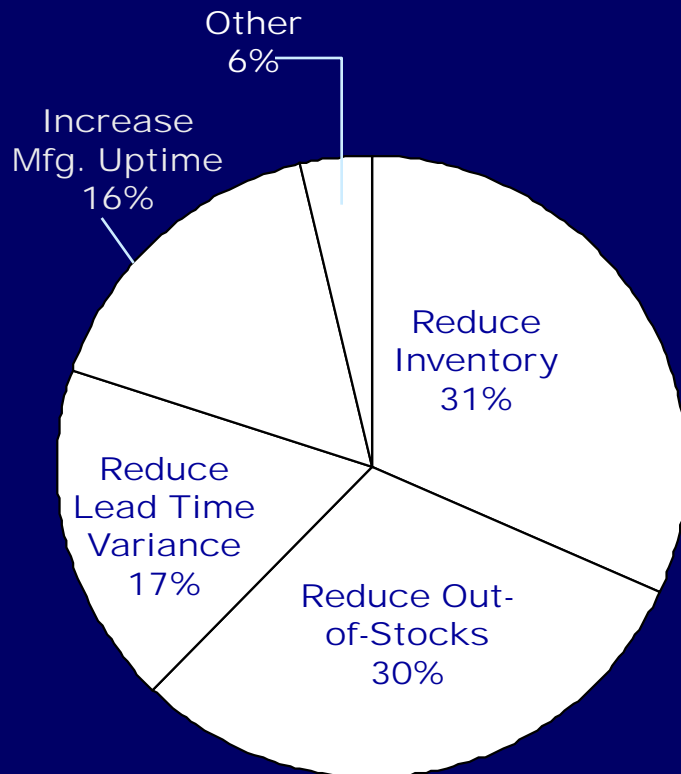


# Verifiable End-to-End Cold Chain Safety & Security Monitoring

	Consumer	Gov't	Retailer	Manufacturer
FOOD SAFETY				
LESS WASTE & SPOILAGE				
HIGHER EFFICIENCY				

**Everyone Wins!!!**

**“Supply chain executives estimated the total average benefit derived from supply chain visibility per container is approximately \$1,150<sup>(1)</sup>” : Yet very few “buy in”.**



## Key Findings

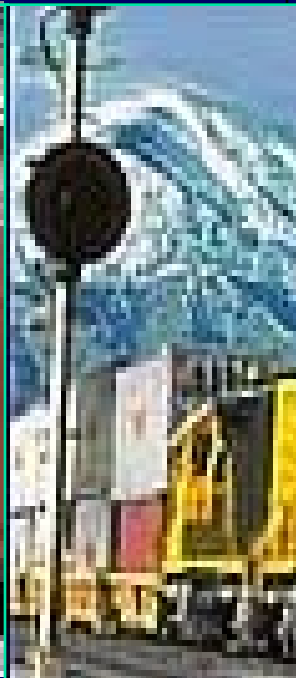
1. Approximately 94% of the total benefit derived from the resulting savings
  - Reduced inventory carrying costs
  - Reduced out-of-stocks
  - Reduced lead time variance
  - Increased manufacturing uptime
  - Total “value”: US \$1,081
  - *However, most aspects already achieved with existing logistics management*
2. increasing security (2%), preventing lost containers (1%), Reducing labor and fees (3%), and reducing insurance costs (0%) combined for 6% of the total benefit: US \$69 (6%)
  - *Cannot be achieved by visibility alone!*

Note: (1) Reducing insurance costs showed zero benefits or the benefits could not be provided, according to the interviewees

Source: A.T. Kearney Interviews; A.T. Kearney analysis

# Enabling End-to-End Supply Chain Security Services Covering Intrusion, Theft, and Loss to Pay for Itself

Transportation Method	% of Total	\$20B+ (US) to \$50B+ (Worldwide)
<b>Inland Truck Transport</b>	<b>87% (93%)</b>	<b>\$26.1 Billion</b> <i>(i.e. &gt; \$260/Trip for 100 million container trips)</i>
Marine Container Ship	8% (1%)	\$2.4 Billion
<b>Rail Cargo</b>	<b>4% (5%)</b>	\$1.2 Billion
Air Cargo	1%	\$300 Million



## Some figures

- Global transit losses. \$30 to \$50billion per year.
- Typically 2% to 8% income reduction for Fortune 500 companies.
- Probably 80% of cargo thefts are “made to order thefts”
- Threat rated “severe” in Brazil, Russia, South Africa, Indonesia, Nigeria and Malaysia.
- Cost of an effective terrorist attack using the supply chain as a vehicle is incalculable but would probably bankrupt some businesses in the chain.



**\$30 Billion for 200 million container trip worldwide = \$130/container trip**



# Importance of Benefits

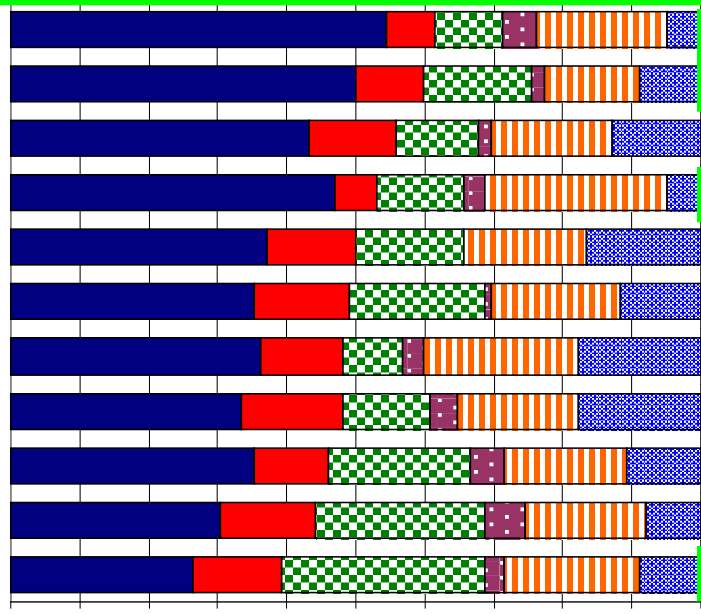
Average 50-70% agreed they are highly important

Very High High Medium Low Very Low Not applicable



- Improve company image and credibility
- Anti-smuggling
- Anti-theft
- Reduce supply chain vulnerability
- Improve supply chain performance

Average 60% agreed they are not so important or not applicable



- Anti-loss and damage
- Fast/stable/predictable border crossing process
- Quick recovery from direct disasters
- Anti-counterfeit
- Quick recovery from general disasters
- Better Customs regulations & processes compliance
- Preferential treatment in post-disaster situations
- Preferential treatment in alert situations
- Direct cost savings
- Indirect cost savings
- Reduction of insurance premiums

The most important benefits



The least important benefits

Companies reported achieving multiple benefits, although they had difficulties to quantify them



# AVANTE End-to-End Cold Chain Safety & Security Monitoring Services incorporating "End-to-End" Tracking & Monitoring with Real-Time Alert for temperature-humidity exceptions and intrusion into Container along with Personnel Association with all Operations <US\$1/Day

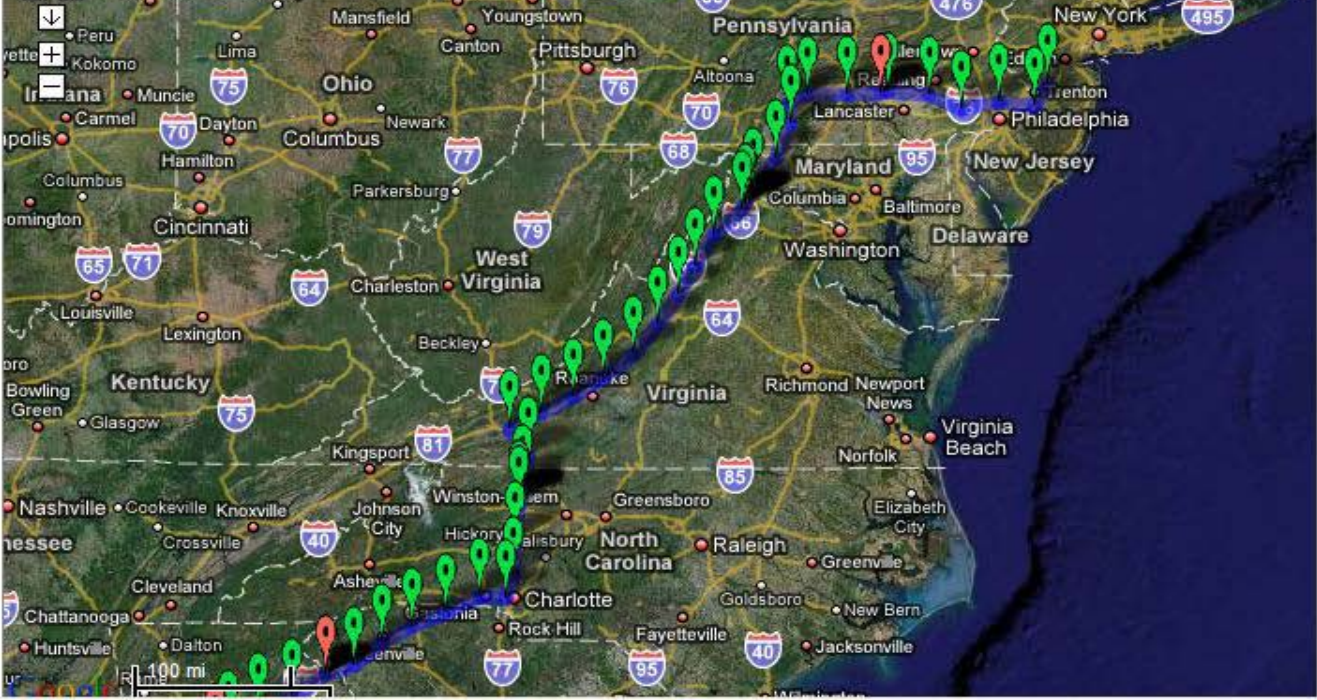
Get Data

Map It

**Device List**

Please select the device that you want to track.

☒ Avante Truck 1  
☐ Avante Truck 2  
☐ Avante Truck 3



The map displays a route starting in Pennsylvania, passing through Maryland, Virginia, and ending in North Carolina. Green pins indicate specific tracking points along the route. The interface includes a sidebar with controls for data retrieval and device selection, and a Windows taskbar at the bottom showing the Start button, open applications, and system clock.

DoneInternet100%startAvante Secure Inter...map4 - Paint6:55 PM

# U.S. Safety/Security Imperatives & Legal Requirements



1. *Good Manufacturing Processes ("GMP")*
2. *Hazard Analysis Critical Control Point ("HACCP")*
3. *Traceability*
4. *Transportation and cold-chain monitoring procedures*

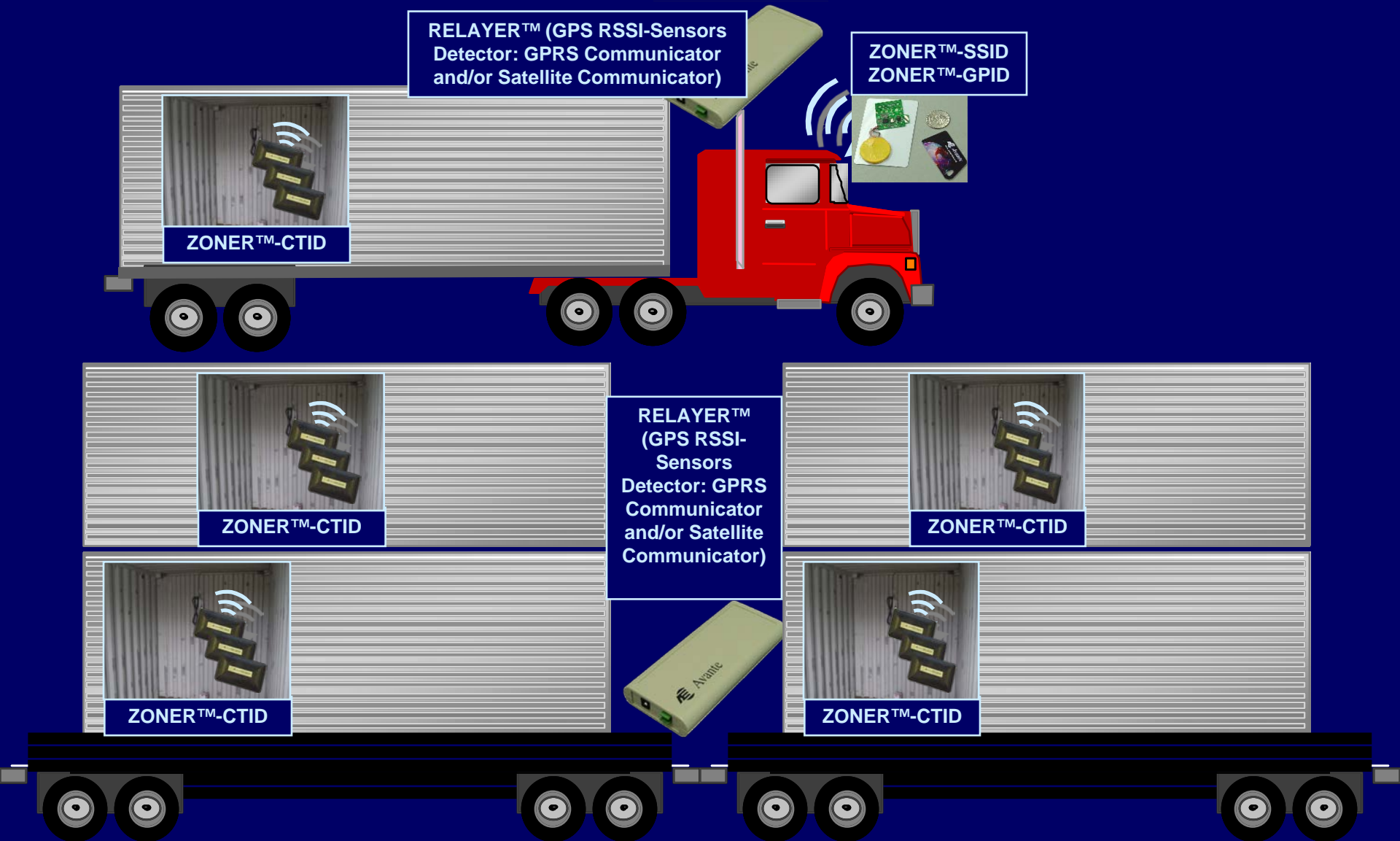
# U.S. Safety/Security Imperatives & Legal Requirements



1. The Farm Security & Rural Investment Act of 2002 (Pub. L. 107-171) requires AMS to issue COOL **guidelines for voluntary use** for beef (including veal), lamb, pork, fish, perishable agricultural commodities & peanuts
2. **Mandatory** COOL for Wild & Farm-raised Fish & Shellfish, 69 Fed. Reg. 77609 et seq (Dec. 28, 2004)(Requires retailers to notify customers of COO)
3. Recordkeeping: Requires documentation & chain of custody information

*AVANTE End-to-End Cold Chain Safety & Security Monitoring Services ensure compliances to:*

- 1. ISO 22000: Required Food Management System for any organization in the food chain
- 2. ISO 28000: Supply Chain Security Practices and Management





# ***THANK YOU!***

## ***AVANTE International Technology, Inc.***

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# AVANTE International Technology, Inc.

## Company History

■ AVANTE headquarters is located in the company owned complex in Princeton Junction, New Jersey with close to 52,000 square feet office and manufacturing facilities within a 16 acre site. In addition to the New Jersey headquarters, the company has offices in California, Hong Kong, China and the Philippines. AVANTE has approximately 80 employees world-wide. AIT/AVANTE is an ISO 9001:2000 quality management certified manufacturing company.

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## Corporate Headquarters in Princeton, New Jersey



## West Coast Office in Salinas, California



## End-to-end article, asset, personnel, supply chain, cold chain and container tracking and monitoring:

1. **US 7,342,497: "Object Monitoring Location, and Tracking System Employing RFID Devices"**
2. **US 7,423,535: "Object Monitoring Location, and Tracking Method Employing RFID Devices"**
3. **US 7,319,397: "RFID device for object monitoring, locating, and tracking"**
4. **US 7,513,425: "Article Tracking System and Method"**
5. **US 7,098,793: "Tracking System and Method Employing Plural Smart Tags"**
6. **US 7,036,729: "Article Tracking System and Method"**
7. **US 6,883,710: "Article Tracking System and Method"**
8. **US 11/749,976 (and other pending patents)**