Technologies for T&T Solutions

Hardware and Software overview for track and trace, monitoring and data acquisition

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Summary

• Track and trace technologies overview

• Track and trace case histories
Components of a T&T Solution

A track and trace solution needs at least the followings features:

- Automatic Identification
- Geographic Localization
- Communication
- Software

And, preferably, the following features:

- Environmental Monitoring
- Local Intelligence
Automatic Identification

RFID

Barcodes

Combined RFID and Barcode
Geographic Localization

• **Check-points**: discrete position localization (via RFID for example)

• **Location-based services**: use GSM cells or WiFi AP for example

• **GPS, Galileo or similar systems**: for global positioning

• **Ultra Wide Band (UWB) systems**: for local RTLS (indoor/outdoor)
Communication

- **WiFi**: local area communication
- **ZigBee, Bluetooth and other PAN technologies**: proximity communication
- **GSM/GPRS/UMTS**: wide area communication
- **Satellite**: global communication
Software

- Web portals
- Web services
- Databases
- GIS Service
Environmental Monitoring

- **Sensors**: temperature, humidity, shock, vibrations, pollution …

- **Weather services**: automatic re-routing

- **Traffic monitoring services**: automatic re-routing
Local Intellignece

- Embedded CPUs
- Smartphones
- Mobile agents
Container Total Control

- BI-Directional Communication:
  - Global Positioning Receiver (GPS)
  - WiFi Radio
  - Quad Band Cellular Transceiver
  - Satellite Transceiver

- Artificial Nose
  - Contraband Sensing
  - Ripeness and Product State Sensing

- RFID Reader/Content Verification
- Door open/door closed sensor
- Vibration Sensor
- Tire pressure and tire wear sensor

- CO2 and O2 Sensors
- Load Sensor and Stowaway Sensor
- Intelligence:
  - Remotely adaptable business rules and edge intelligence
  - Sense and Respond Control Network
- Fuel Level Sensor
- Integrated multi-zone pallet/lam level temperature control unit
- Passive RFID tags for inventory and replenishment
- Semi-passive or powered RFID tags ("motes") to track, monitor and record case/pallet temperature

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A complete view
Case Histories: Driver + Trailer Tracking

- **Automatic Identification** with RFID UHF both for the driver and for the trailer
- **Communication** via the driver’s smartphone
- **Geographic localization** via the A-GPS embedded in the driver’s smartphone
- **Local intelligence** inside the smartphone
Case Histories – DHL (1) Smart Sensor

- Sensor enabled RFID tags: automatic identification and environmental monitoring in one device
- Localization using reads at checkpoints
- Web portal for data visualization and analysis
Case Histories – DHL (2) Smart Truck

- **Tour planning system** – dynamic planning of pick-up & delivery routes
- **Infrastructure Depot** – registration of outgoing shipments via RFID
- **Infrastructure Vehicle** – RFID controls the loading condition
- **On-board unit** – automatic navigation and sequencing stop list
- **Current traffic data** – respond to traffic blocks
- **Notification** – give customer a notice of pick-up via SMS
Zenatek Tracking System (ZTS):

- Container Tracking Device (CTD)
  - GPS localization
  - GSM communication
  - Sensors (temperature, door opening, …)
  - Optional UHF RFID identification with large memory (shipment list)
- Rugged enclosure

- Corporate Operating Centre
  - Secure web portal access
  - Access to full data in real-time
Web portal:

- List of all alarms
Case Histories – Zenatek (3)

Web Portal:

- Geographic localization with visualization of alarms related to position of the container.
- Detail of alarms vs. positions
Web Portal:

- Temperature history
- Acceptance range
- Evidence of out-of-range alarms