M2M & The Internet of Things

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Bi-Directional Communication:

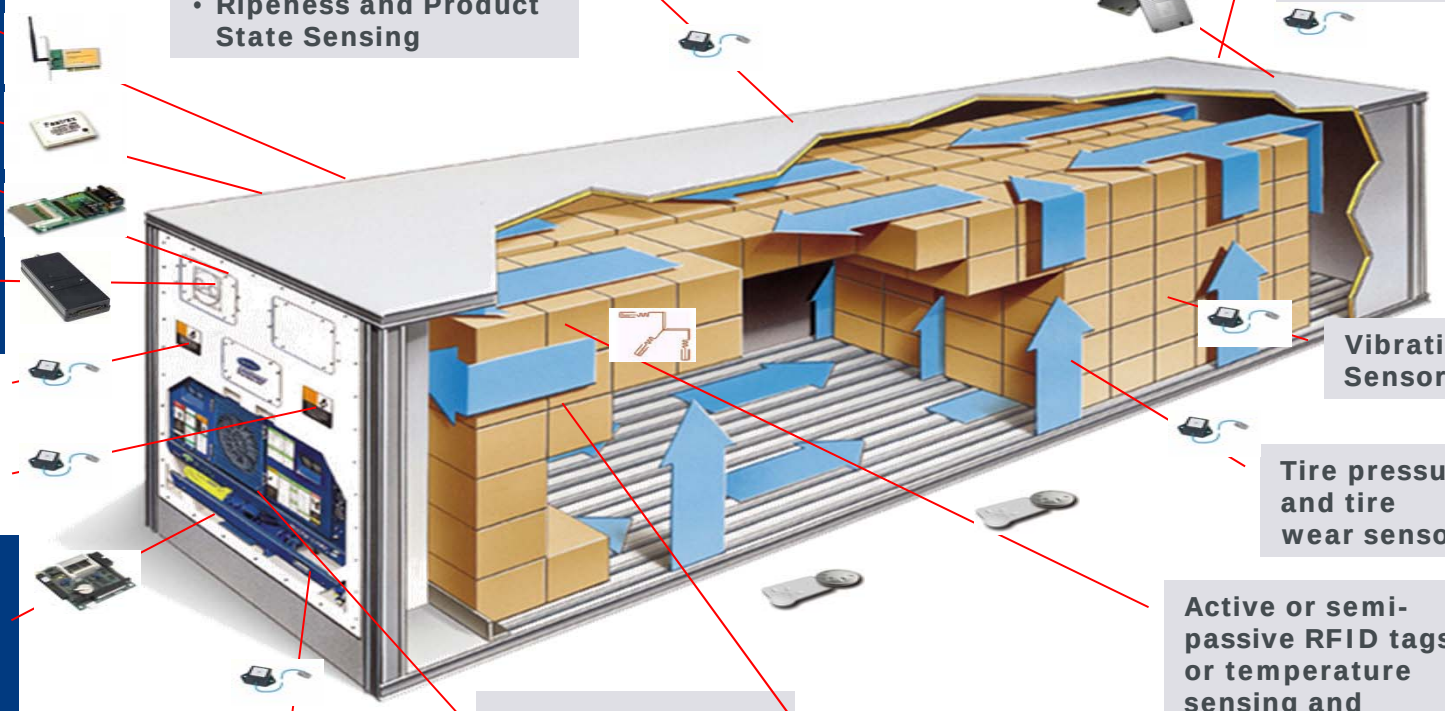
- Global Positioning Receiver (GPS)
- WIFI Radio
- Quad Band Cellular Transceiver
- Satellite Transceiver

CO2 and O2 Sensors

Load Sensor and Stowaway Sensor

Intelligence:

- Remotely adaptable business rules and edge intelligence
- Sense and Respond Control Network



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

RFID Reader / Content Verification

Door open / door closed sensor

Vibration Sensor

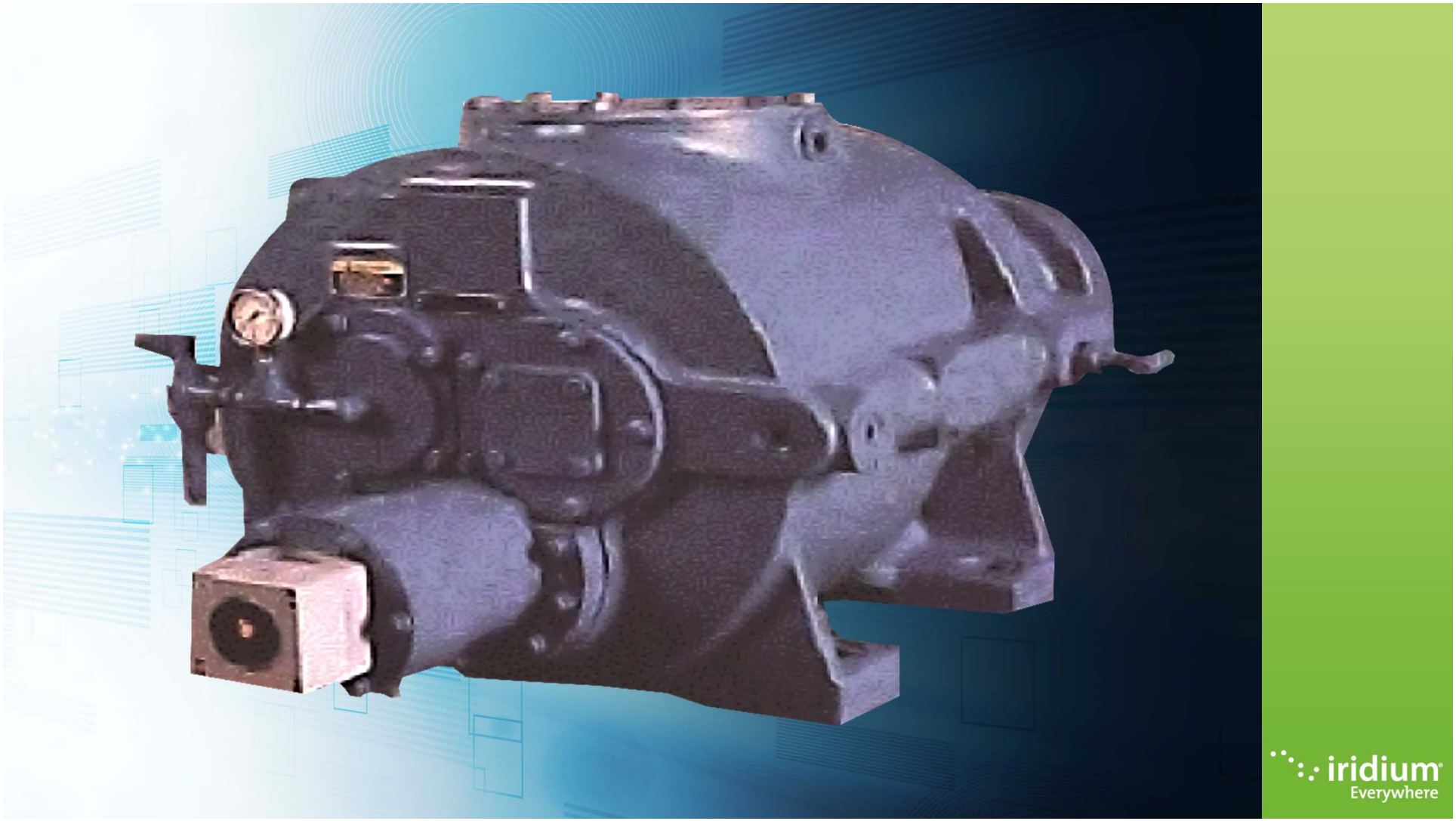
Tire pressure and tire wear sensor

Active or semi-passive RFID tags or temperature sensing and logging motes to track and monitor case / pallet temperature

Passive RFID tags for inventory and replenishment

Integrated multi-zone pallet / item level temperature control unit

Fuel Level Sensor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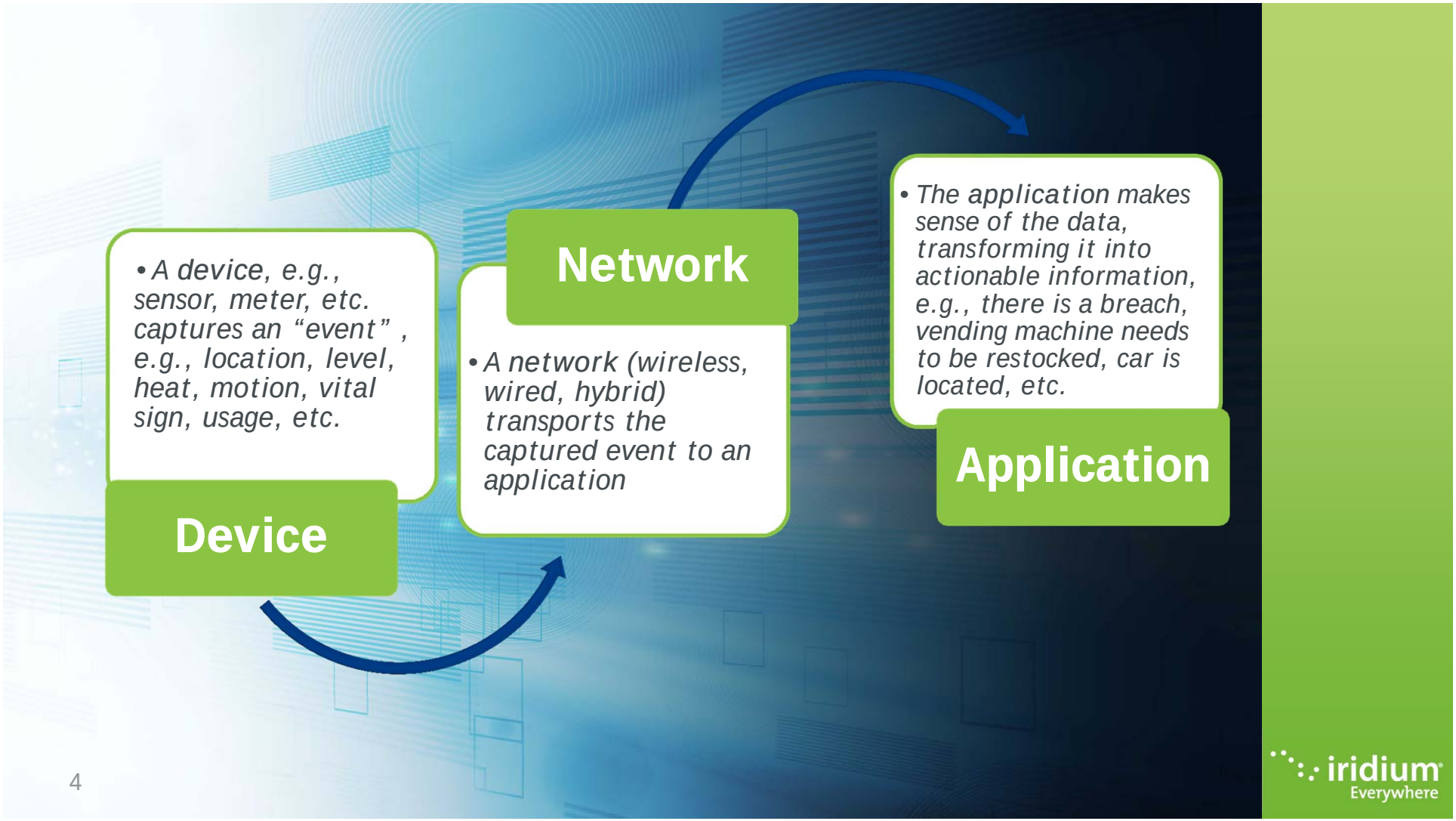

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Use Conditions

Outdoor Location

Indoor Location

Special Use Conditions

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Multiple Network Options

- Satellite
- CDMA
- GSM
- Wi-Fi
- Zigbee

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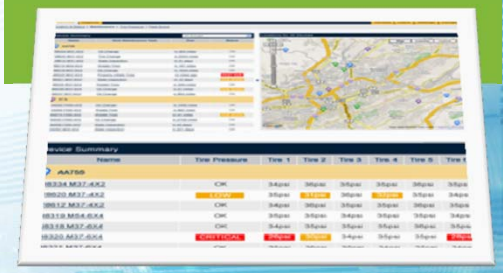
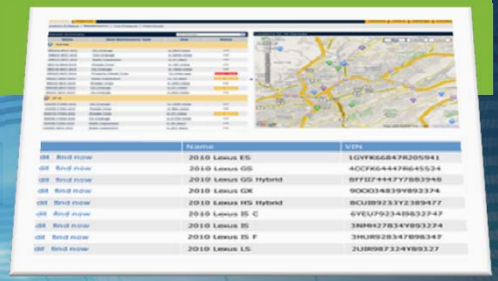
Line of Business Applications

Tire Pressure Monitoring

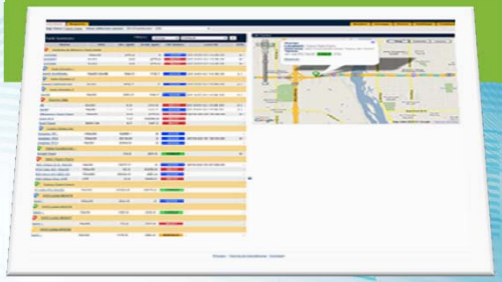


Vehicle Inventory Management



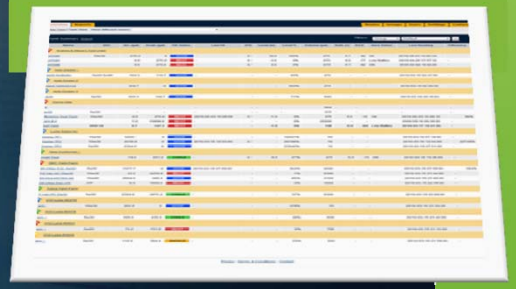
Driver Analytics

Tank Level Monitoring



Document Management

Fixed Asset Monitoring



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Device & Platform Management

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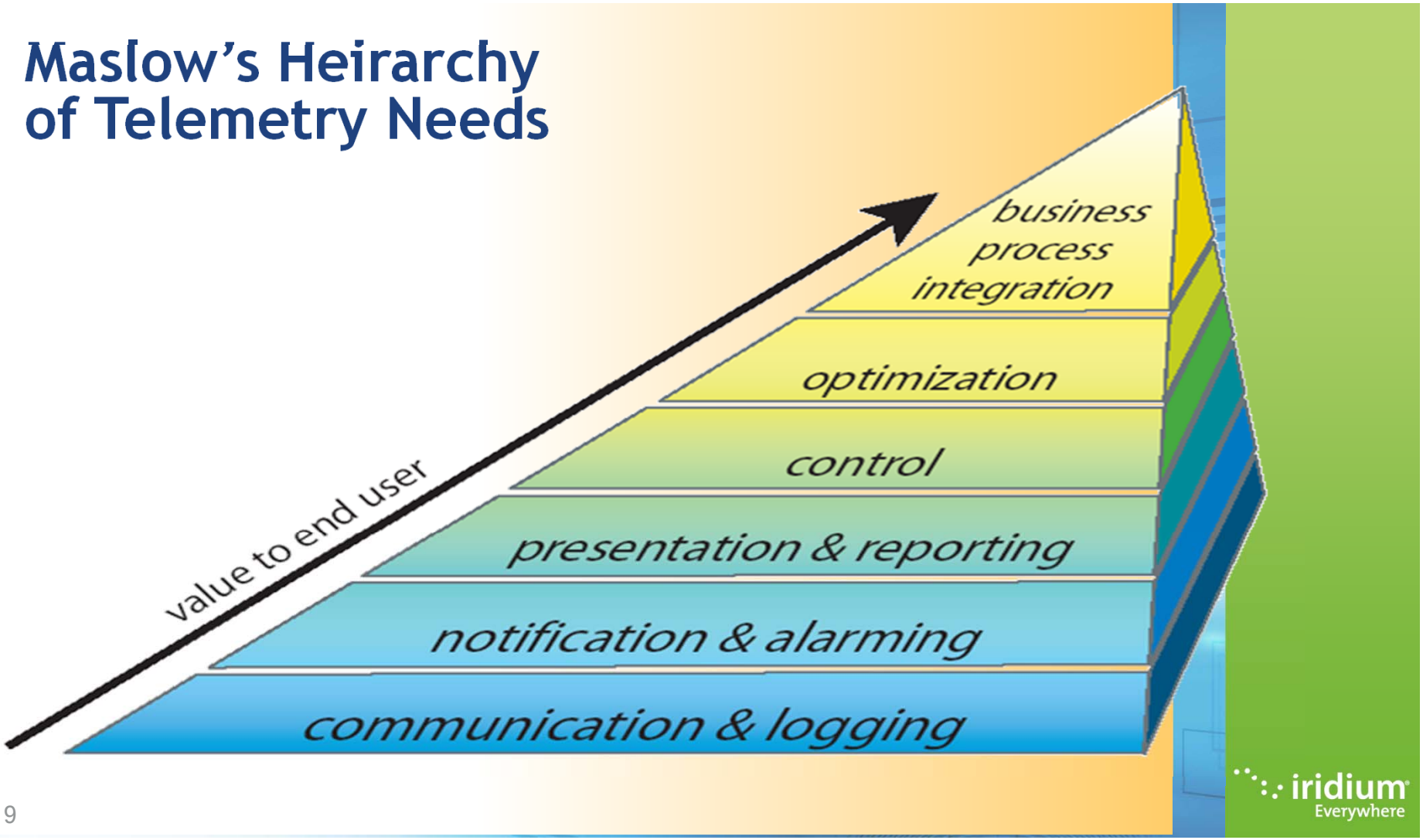
Maslow's Heirarchy of Telemetry Needs



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Process

- **Prototyping**: Use existing platform for understanding the use cases and technical requirements
- **Pilot:** Modify platform design to meet the use cases. Deploy limited yet meaningful quantities in actual business environment.
- **Production:** Manufacture large scale quantities which can be deployed, monitored and maintained in actual business environment.

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Location Based Services: Asset Tracking

- Track Equipment, Trailers, Containers
  - Satellite & Cellular Devices – Global coverage, cost effective messaging
  - Slap & Map – Simple install, out of the box and tracking in minutes
  - Long Life Batteries – Deliver years of service, field replaceable
  - Motion Detection – "Moving" status when an asset is in motion, track more frequently
  - Powerful, Intuitive Application – Web based, configurable

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Asset Tracking Deployment Model

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Asset Tracking Deployment Drivers

- **Loss Reduction** – Automated asset location monitoring, increase reporting frequency in motion
- **CapEx Reduction** – Do more with available assets, reducing the need to purchase more
- **Labor Savings** – Reduce the number of employees needed to manually track down/count assets
- **Asset Utilization** – Assets that are not being used can quickly be located and put back to work

Use Case

Asset Recovery: install tracking device on valuable mobile assets to identify when they move and help recover the asset when stolen or lost.

Asset Tracking: install tracking device on mobile distributed assets to help in movement and utilization.

Location Based Services: Service Fleet Tracking

- Reseller Branded – Numerex is the technology partner, not the user-brand
- Satellite & Cellular Devices – See all your vehicles and assets in one central location
- Employee & Asset Safety – Panic Alert and Vehicle Disable capable – optional features
- Simple Web-Based Portal – Icon based interface and intuitive layout
- Alarms & Notifications – Geofence, speed, idle, stop, off-line, panic and others
- Bi-lingual – English or Spanish language and English or Metric Units

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Service Fleet Tracking Deployment Model

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Service Fleet Tracking Deployment Drivers

- **Cost Reduction** – Reduce cost due to fewer accidents, less gas usage, less vehicle wear and tear.
- **Revenue Increase** – Better service time windows help increase customer service, jobs per day and revenue.
- **Risk Reduction** – Reduce risk of lawsuits due to bad drivers.
- **Policy Compliance** – Facilitate reward programs such as bonuses/raises.

Use Case

Service fleet owners install device in company vehicles to capture driver data and help them **better run their business**.

Tank Monitoring Solution Overview

- Monitor liquid level in fixed and mobile tanks
- Oil/Gas, liquid storage, propane, waste water, and other markets
- Provides near real-time visibility of fill levels
- Alerts when a set threshold is crossed (low, high, potential leak)
- Intrinsically Safe (Class 1, Div 1) rating
- Near global coverage, even outside of cellular network maps

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Tank Monitoring Deployment Model

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Tank Monitoring Deployment Drivers

- **Risk Reduction** – Alerting of a potential leak minimizes asset loss, environmental impact and regulatory issues.
- **Labor Savings** – Automated level polling and reporting reduces the number of resources for monitoring and servicing.
- **Transportation Efficiency** – Actionable data that reduces truck rolls, gas expense and wear and tear. Only fill/empty when needed.

Use Case

Business owners reduce truck rolls and risk of leaks by automated monitoring and alarming of liquid tank levels.

Supply Chain

- Tracking containers and products (shipped in the containers) in the open supply chain
- Monitor location (outdoor and inside buildings)
- Provide visibility and alert customers when location or storage duration has been crossed
- Tangible return on investment for customers in Manufacturing, Waste Management, Food and Oil & Gas industries.

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Key Supply Chain Challenges

Where are all our containers at any given time?	Could tracking our containers deliver significant cost reductions?	Can we tell if/when specific containers are being used?
What is the utilization rate of our containers?	Can we find containers which are indoors by using Cell-derived locations?	Can we find specific container types by using tracking?
How can we avoid costs spikes caused by RUSH shipments?	Can we get a firm handle on available container inventory at any time?	Can we cut down on the number of containers that are permanently lost?
How can we better allocate costs of container use?	What is the ratio of “Days in Transit” vs. “Days in Use” for our containers?	Is it possible to reduce our expense to buy new containers?

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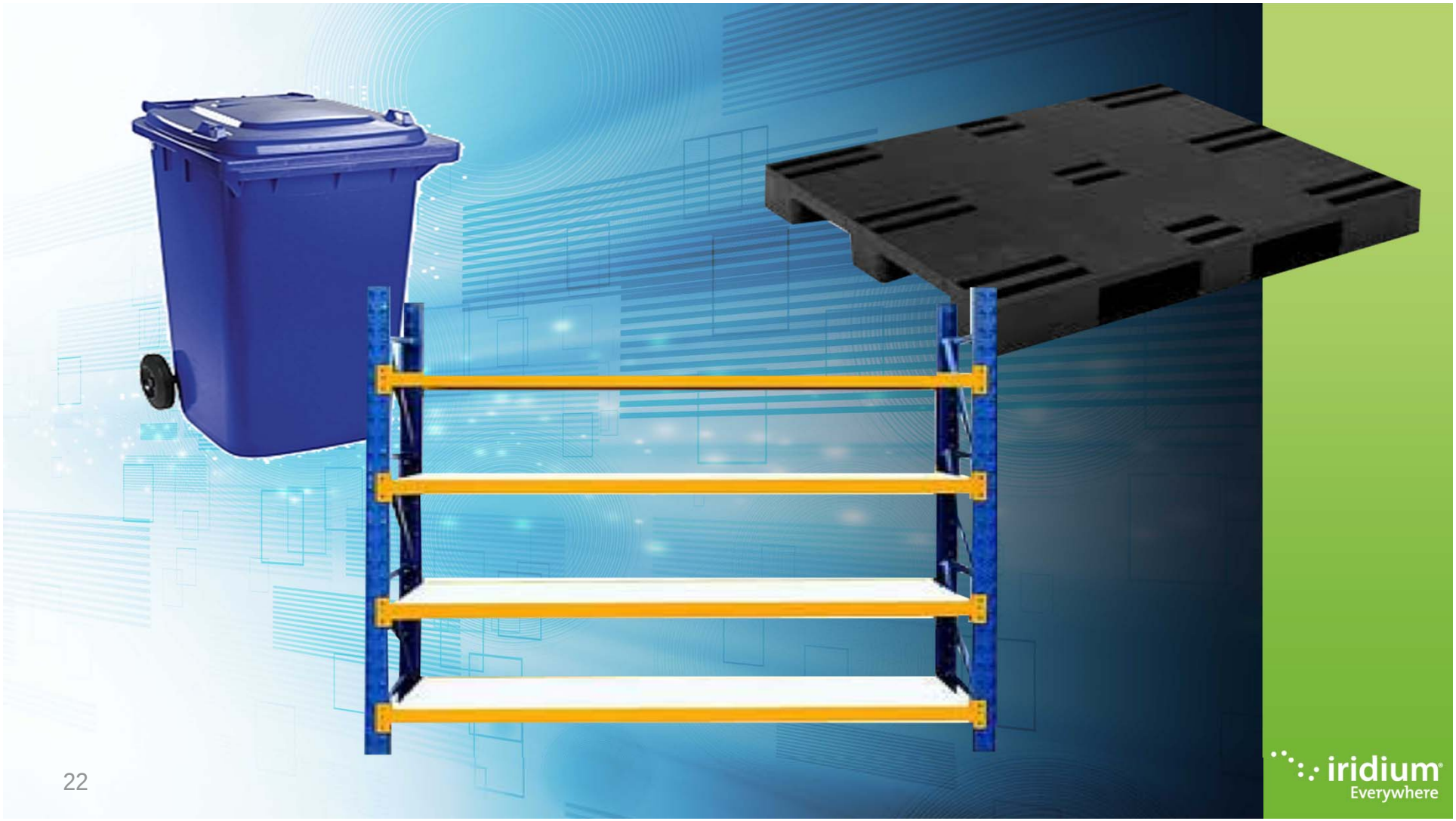

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Pallet & Container Tracking Deployment Drivers

- **Loss Reduction** – Monitoring asset location and comparing to known locations.
- **Capital Expenditure Reduction** – Reduction in losses and better asset management leads to fewer purchases of new containers.
- **Labor Savings** – Knowing location automatically can reduce labor involvement in locating containers.
- **Transportation Savings** – By better managing containers stock and flow, fewer transportation trips will be needed.

Use Case

Loss Reduction and **Increase Asset Utilization** for **Leasing companies** and **manufacturing companies** that own these containers. Reduced **Labor involvement** and Transportation Costs via automatic location information.

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Bin Monitoring Deployment Drivers

- **Security and Chain of Custody** – Monitoring the bin location and tracking its movement over a period of time leads to secure custody.
- **Fill Level Monitoring** – The Bins are equipped with tracking devices which have level sensors. Level and location monitoring can help in determining when the container is full, so that it can be replaced.
- **Labor Savings** – Knowing location automatically can reduce labor involvement in locating containers.
- **Transportation Savings** – By better managing containers stock and flow, fewer transportation trips will be needed.

Use Case

Document Management, Oil & Gas and Waste Management companies can **monitor bin levels**. The bins are used by customers to discard material, and customers expect immediate replenishment when the bins fill up. In addition, **tracking devices help reduce losses**, both when the bins are full and when empty.

Solution Example: Bin Monitoring

- Track bins to monitor location and level across customer base
- Optimize truck rolls and lower costs, dynamic change routing
- Enhanced chain of custody
- Service verification at the customer, improved revenue realization

Opportunity Statement and Solution Assumptions

Opportunity Statement: Out Of Stock (OOS) presents an opportunity to increase revenue by $1B per annum

- Fixed, Portable and Scalable Solution
- Deployed with Minimal Infrastructure Capital
- Fast Time to Market
- Sensitive to Privacy Concerns
- Accessible via Enterprise and Mobile Apps

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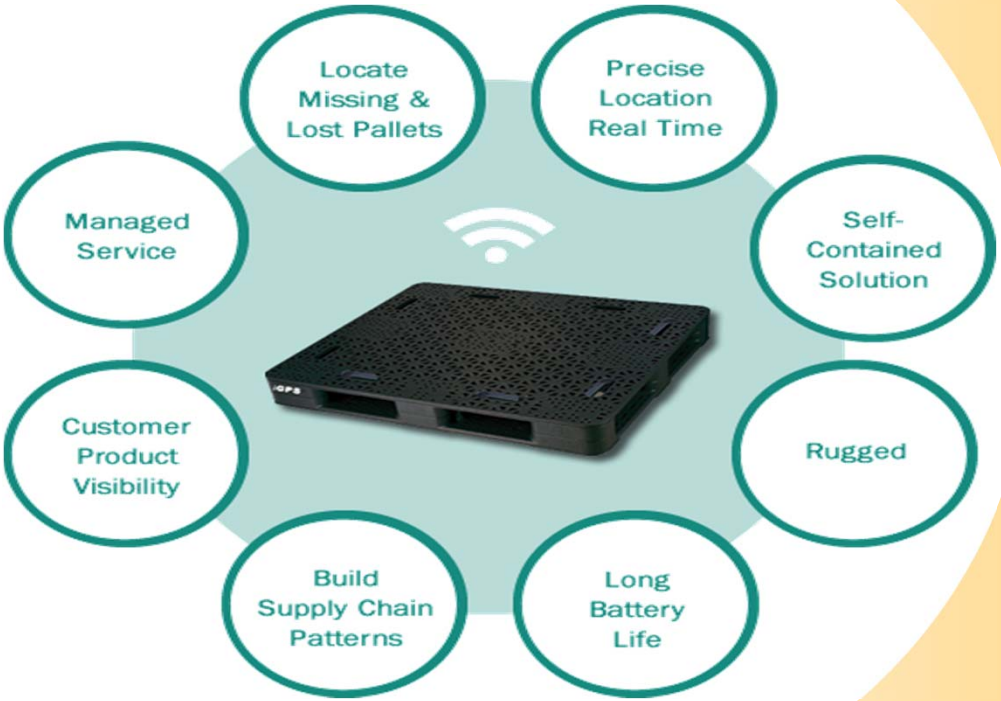
Case Study: iGPS Pallet Tracking



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Case Study: Recall Bin Tracking

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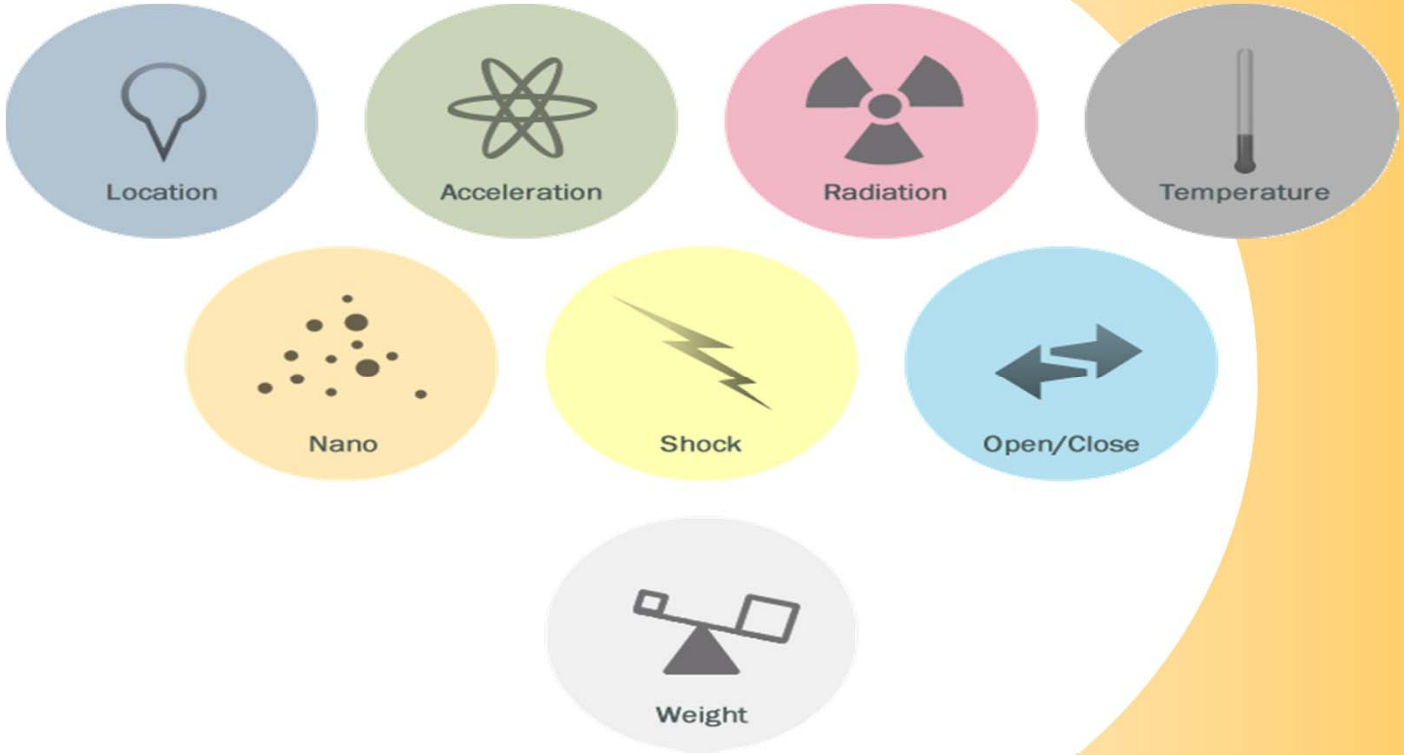
The future for sensors and location based tracking

- standards
- interoperability
- on-event pricing
- hybrid networks
- software-defined radios
- tweets from machines
- self-provisioning
- throw away
- energy harvesting
- adoption of social networking for machines concepts like crowdsourcing
- embedded everywhere
- on-demand usage
- very low-cost devices with radios

Sensors



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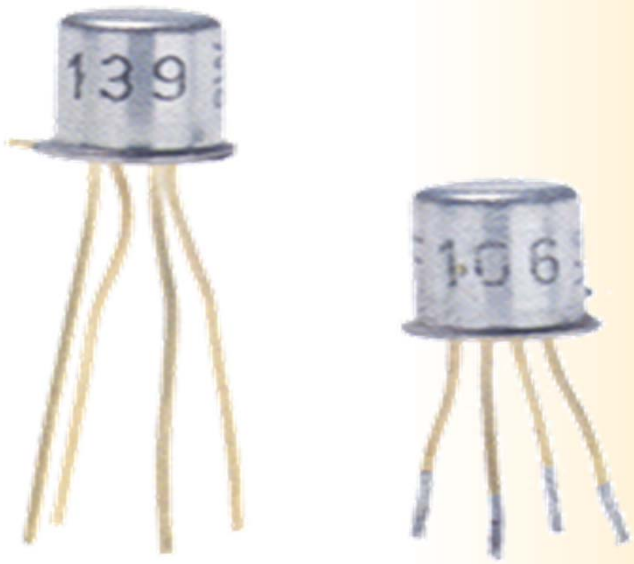
WiMax Zigbee UWB Mems Nano NDIR



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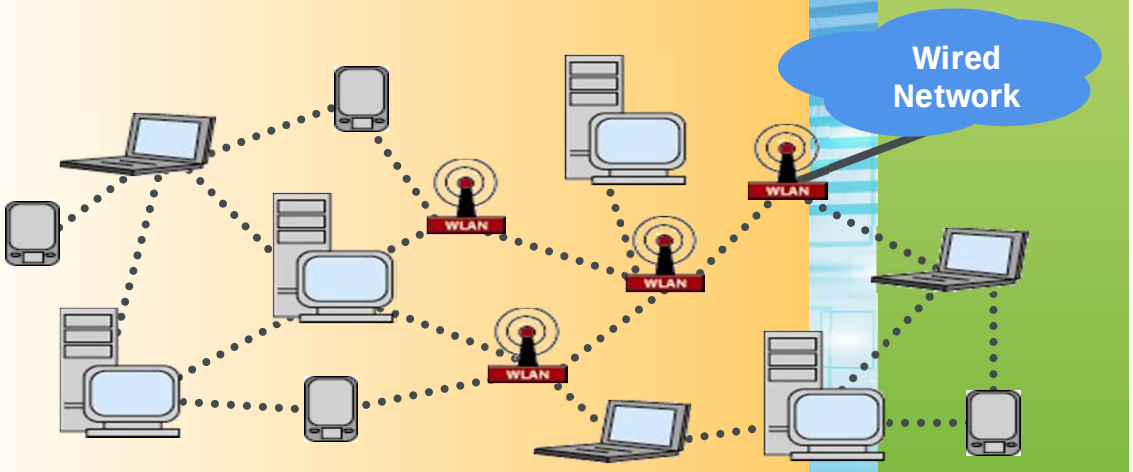
Future: Mesh Networks

Multi-hop Wireless Networking

- Devices route messages across multiple links
- Not simply access points and clients
- Any device with radio is potentially a router
- Could apply to home, access, industrial cases



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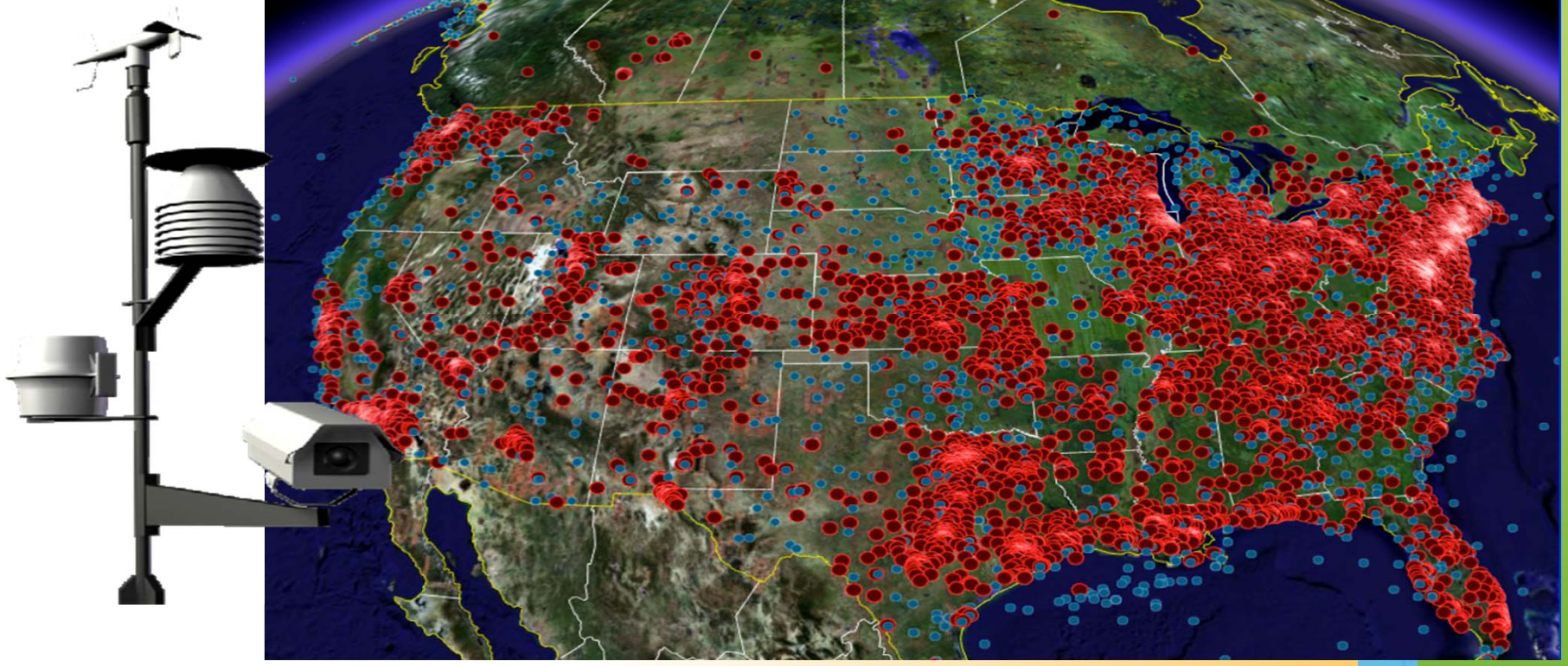

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The Future:

Big Data
Cloud Computing
Energy Harvesting
Sensors - Lab-on-a-Chip
Energy Harvesting
SW Defined/Cognitive Radios
Low Power
Mesh Short Range Radios
Swarm/Emergent Behaviors
Social M2M
Wisdom of the Crowds
M2M Microtransactions
High Speed Message systems
Unlicensed & White Space
Real-Virtuality

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Thank You!

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