Advanced Technologies & Intelligent Autonomous Systems in Alberta

Ken Brizel – CEO ACAMP

Who and What is ACAMP

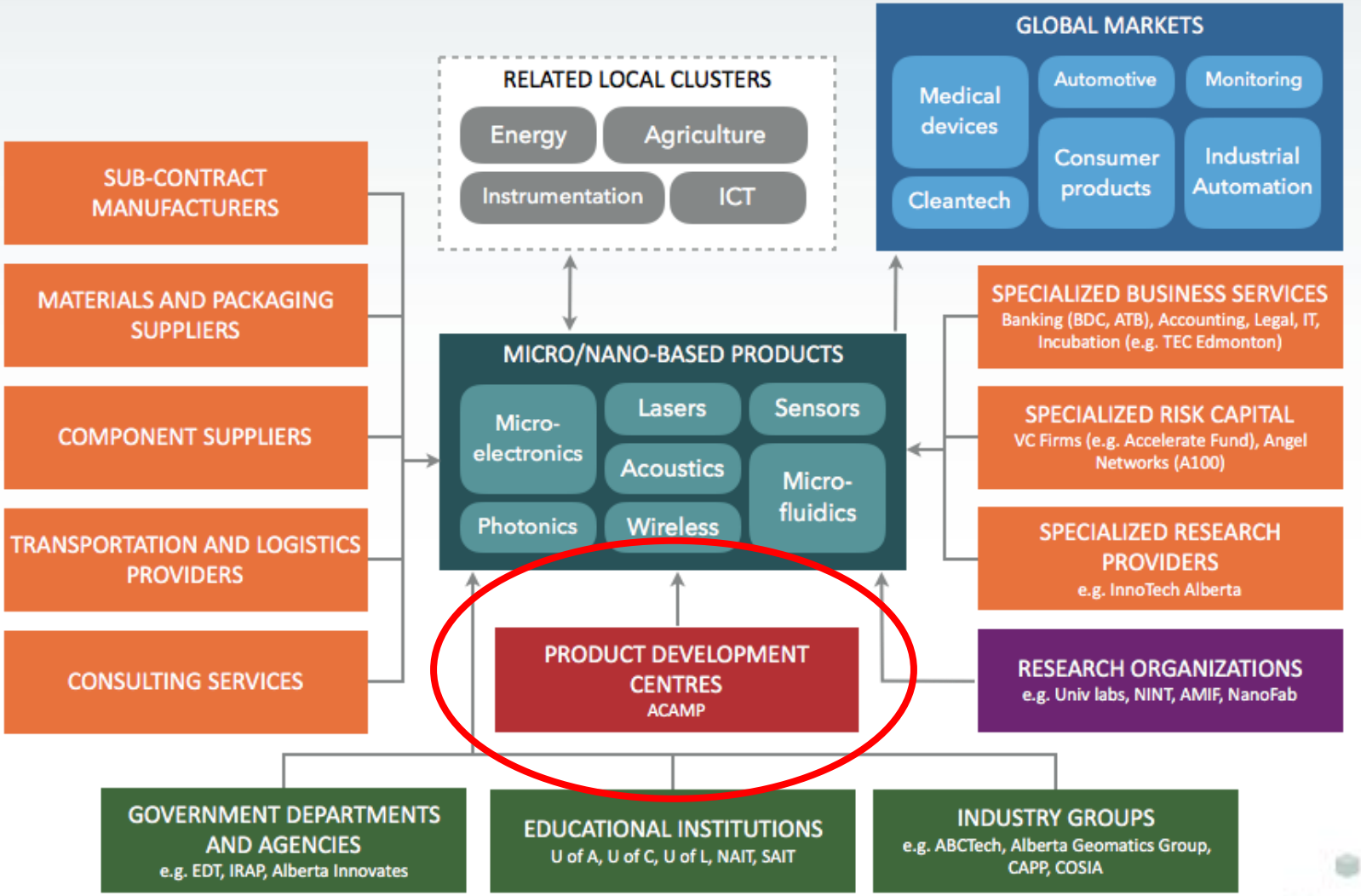
- ACAMP is a unique industry led product development centre supporting advanced technology commercialization
- From micro/nano sensors assembly to entire systems
- ACAMP is the only advanced technology product development group in Canada that provides support at each stage of product development process through to production TRL3 to TRL9
- Created AST Consortium in 2016 now at 50 Members
- ACAMP was established in 2007 and currently has 40 multidisciplinary engineers
- Presently supports over 400+ clients - www.acamp.ca

EDMONTON
1919 - 94th Street NW
3623 - 44 Avenue East Unit 101 EIA

CALGARY
Bay 1 - 1470 & Bay 3 -1480 28th Street NE

We focus on electronics hardware, firmware, sensors, and embedded systems. We are the only advanced technology product development group in Canada that provides a full range of support at each stage of the product development process.

Alberta's Technology EcoSystem



Taking Prototypes to Production

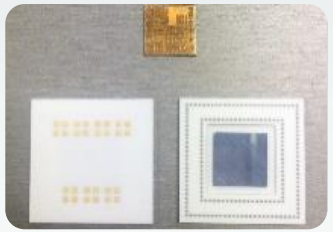
ACAMP is uniquely suited with

- Multi-Disciplinary Engineering
- Development & Manufacturing Equipment
- Industry experienced management team

SERVICES

- **Product development**
  - Design for manufacturing
  - Simulation
  - Prototyping and low-volume manufacturing
  - Testing and characterization
  - Technology scaling and transfer to high-volume manufacturing
- **Proof-of-concept** to **Commercialization**
- **Expertise** includes:
  - Electronic hardware and firmware
  - Sensors
  - Embedded systems
  - Optics, photonics & spectroscopy
  - Simulation
  - Microfluidics
  - Autonomous systems

APPLICATIONS



Isolators

Opto-Gas Sensor

Telecom Laser

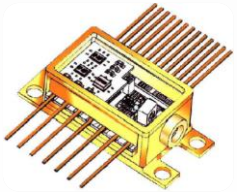
Pathogen Detection

Electronics Firmware

Optical MEMS

Micro-fluidic Embossing

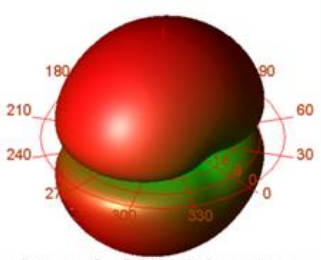
Micro Optic Assembly



DNA Analysis

Embedded Systems

Laser Failure Analysis



Antenna far-field radiation pattern

Test & Characterize

Simulation

Spectro-scopy

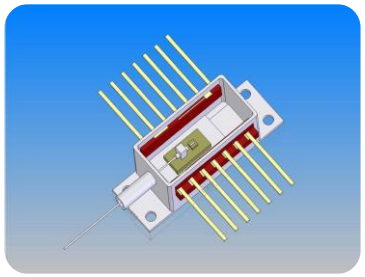
LTCC Manufacture

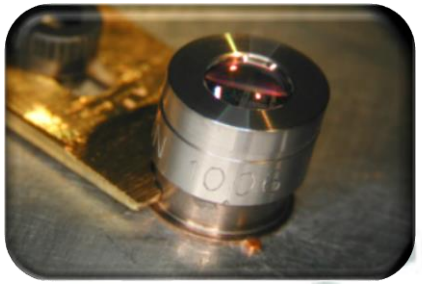
Modulators

Harsh Environment Testing

Burn in Test

MEMS Testing

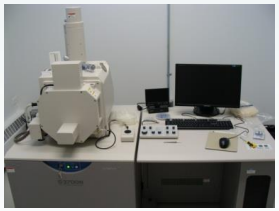




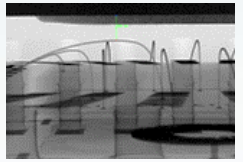
EQUIPMENT & SOFTWARE

400+ pieces of specialized equipment, tools and software

Electronics Packaging, Assembly, Design & Test

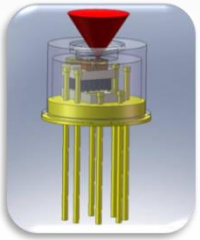


Inspection & Failure Analysis

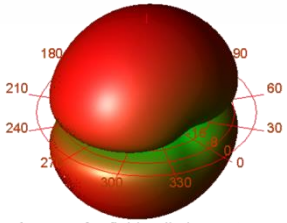


Inertial System Testing

Optics & Photonics



Simulation & Modelling



Antenna far-field radiation pattern

Low Temp. Cofired Ceramic (LTCC) electronics packaging

Reliability Testing

Microfluidics

10 Year Highlights

Note: ACAMP results from 10yr survey Dec 2018

AST Consortium
Advanced Systems for Transportation

Vision

AST consortium will be a world leader in its ability to accelerate the delivery of autonomous systems into transportation by bringing together requirements with world class experienced personnel

Mission

Accelerate AST products to market by investing in and supporting the development of autonomous systems through hardware, firmware and software expertise along with testing and characterizing the developed products.

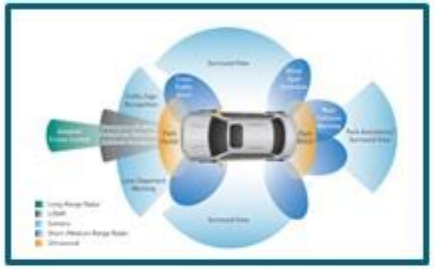
Objectives

1. Facilitate informative, multi-directional communication between industry, government and applied research.
2. Identify and invest in opportunities to commercialize new AST products and services both locally and internationally.
3. Support the eco-system and grow the economy in Alberta around advanced systems for transportation

Technology Requirements for Intelligent Autonomous Systems

Security and Safety

Perception



Radar

Lidar

Camera

GPS

IMU

Ultrasonic

Mapping

Comprehension

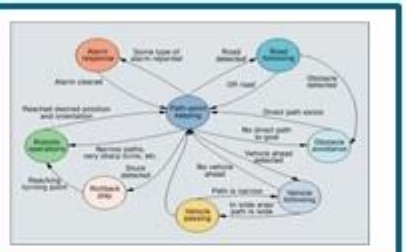
Sensor Fusion

Machine Learning & Artificial Intelligence

Human Machine Interface

Robotics

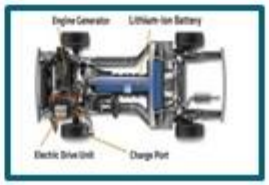
Projection



Steering

Braking

Transmission/ Drive



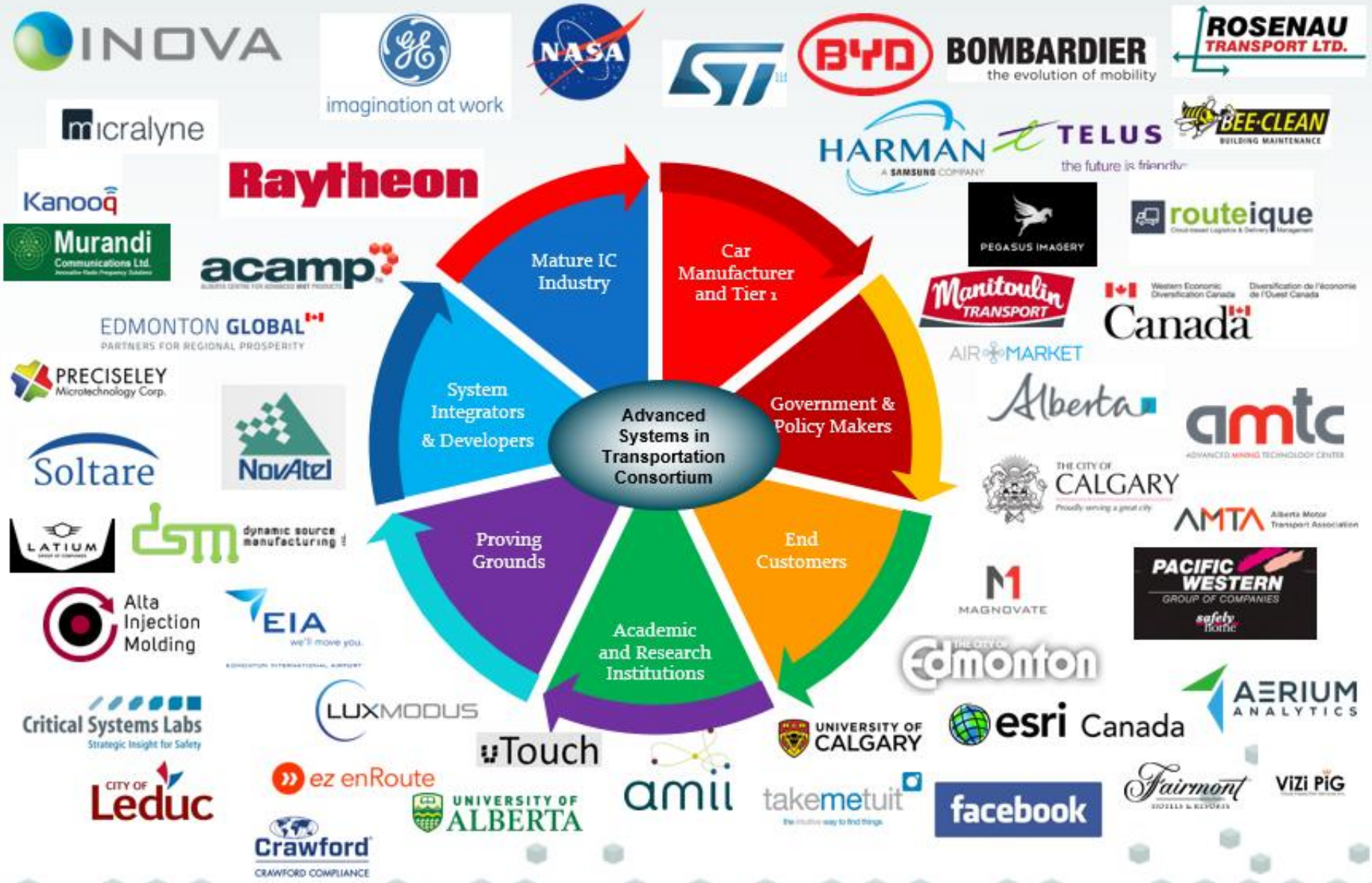
Communication

Cellular

Satellite

Wireless

AST Consortium Members



Project Example: Security ATV

- ACAMP has developed a platform autonomous security patrol system for Edmonton International Airport.

- The system will :
  - ✓Operate autonomously over long range
  - ✓Conduct routine patrols of the perimeter
  - ✓Detect security threats & intruders
  - ✓Identify wildlife versus humans
  - ✓Send pictures and video feeds
  - ✓Report back to Security

Project Example:
Animal detection and Neural Network

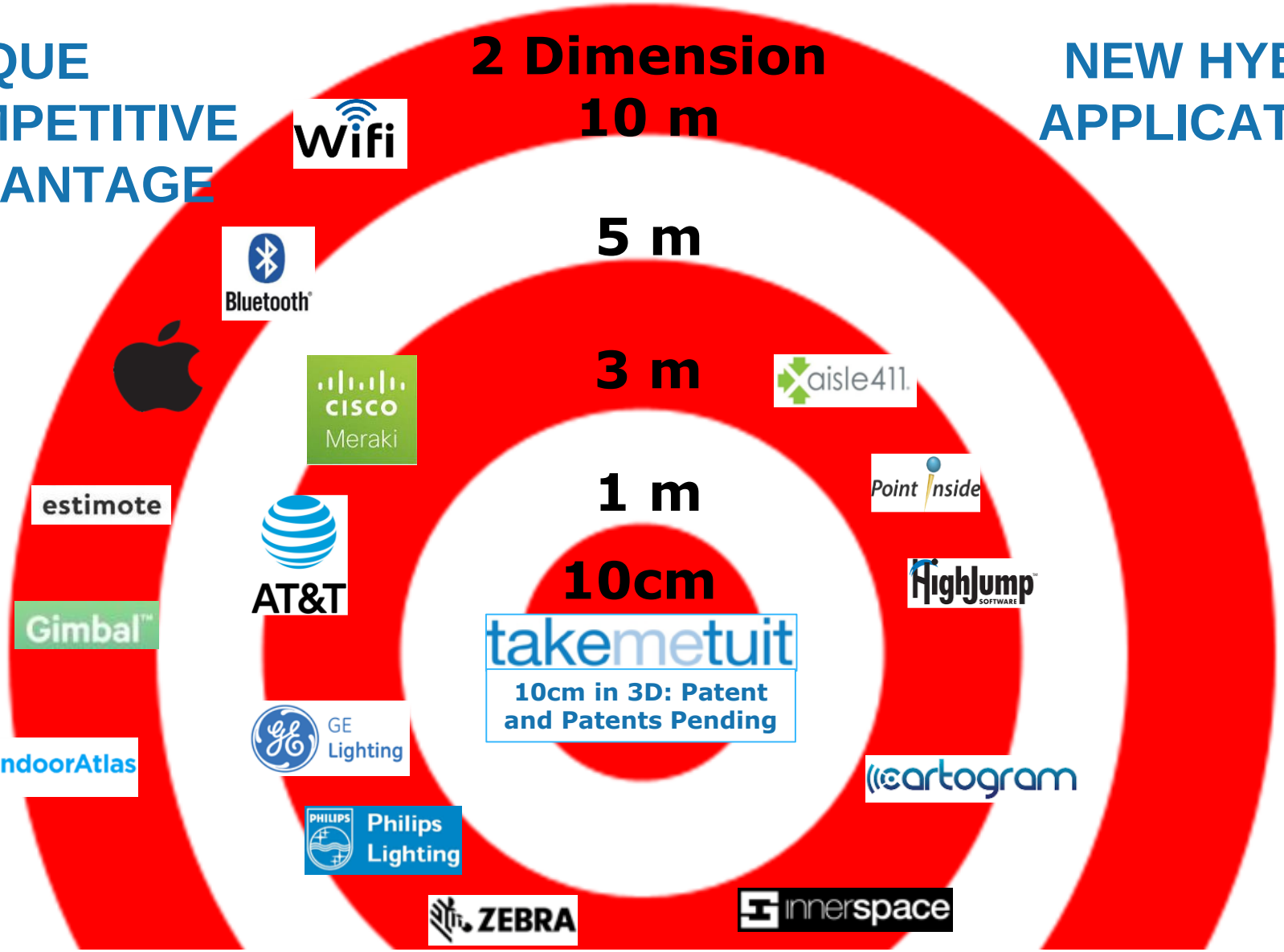
- Animal Detection Project
- Neural Network detection
- Canadian Wild's
  - ✓Mule Deer
  - ✓Elk
  - ✓Caribou
  - ✓Black Bears
  - ✓Grizzly Bears
  - ✓Wolves
  - ✓Coyotes

takemetuit

World's Most Accurate Indoor GPS for Smartphones

Stores. Warehouses. Malls. Airports.
Vehicles. Parking. Apps + Navigation.

UNIQUE COMPETITIVE ADVANTAGE



NEW HYBRID APPLICATIONS

takemetuit
the intuitive way to find things

MARKET NEEDS We Solve & Monetize

Market	Need & Value Proposition
1. Acquire, keep, grow retail shoppers	Save them real time and money = permissions - Capture ALL shopper journey details - Shopper last mile to purchase conversion - AI and big data for smart experience, smart marketing
2. Retailers	Employee productivity, re-capture 23% sales
3. Warehousing	WMS for 10-40k sq ft warehouses
4. Airports & Malls	Navigation to needs, revenue, efficiency
5. Autonomous Vehicles	Navigation in parking garages & denied spaces
6. Mobile	New revenue streams, differentiation
7. GPS/GNSS	New revenue streams, differentiation
8. Global System Integrators	New revenues = Co-market to their clients

Takemetuit Indoor Positioning System - 2D & 3D

Receiver

- Smart device
- No chips/tags
- Time of arrival, TDOA
- Navigation engine
- 3D mapping
- API’s

Scalable Transmitters

Amplifier and Synchronisation

Server to generate encoded signals

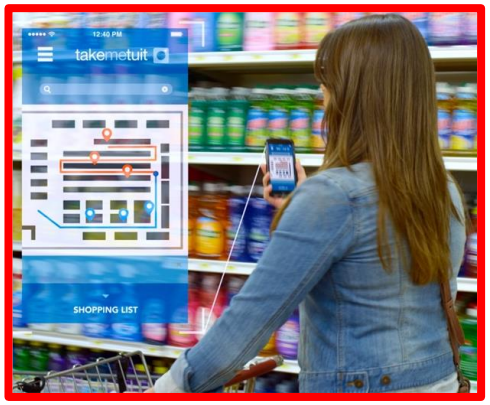
takemetuit
the intuitive way to find things

Mainstream Design Concepts

- Goal
  - A reliable and accurate user experience in indoor positioning for mass adoption
  - Use standard smart devices without any extra chips or cost
- First indoor platform capable of adapting proven GPS concepts
  - Real-time latitude, longitude, and height – seamless GPS/GNSS tool compatibility
  - Trilateration – every 1/3 of a second – user position comparable to high accuracy GNSS receivers (~$5000+)
  - Patent and pending CDMA and FDMA hybrid – for precise TOA/TDOA
  - Measure & adjust for incoming Doppler
  - Indoor multipath mitigation
  - User position augmented by standard smartphone sensors (accelerometer, gyroscope, magnetometer, barometer)
- Utilize proven smart phone performance techniques

THE PROBLEM: Retail's Blind Spot – The 87% of Sales In-Store

Supply Chain



In Store Shopping

Point of Sale/Analytics

eCommerce

TAKEMETUIT VALUE PROPOSITION

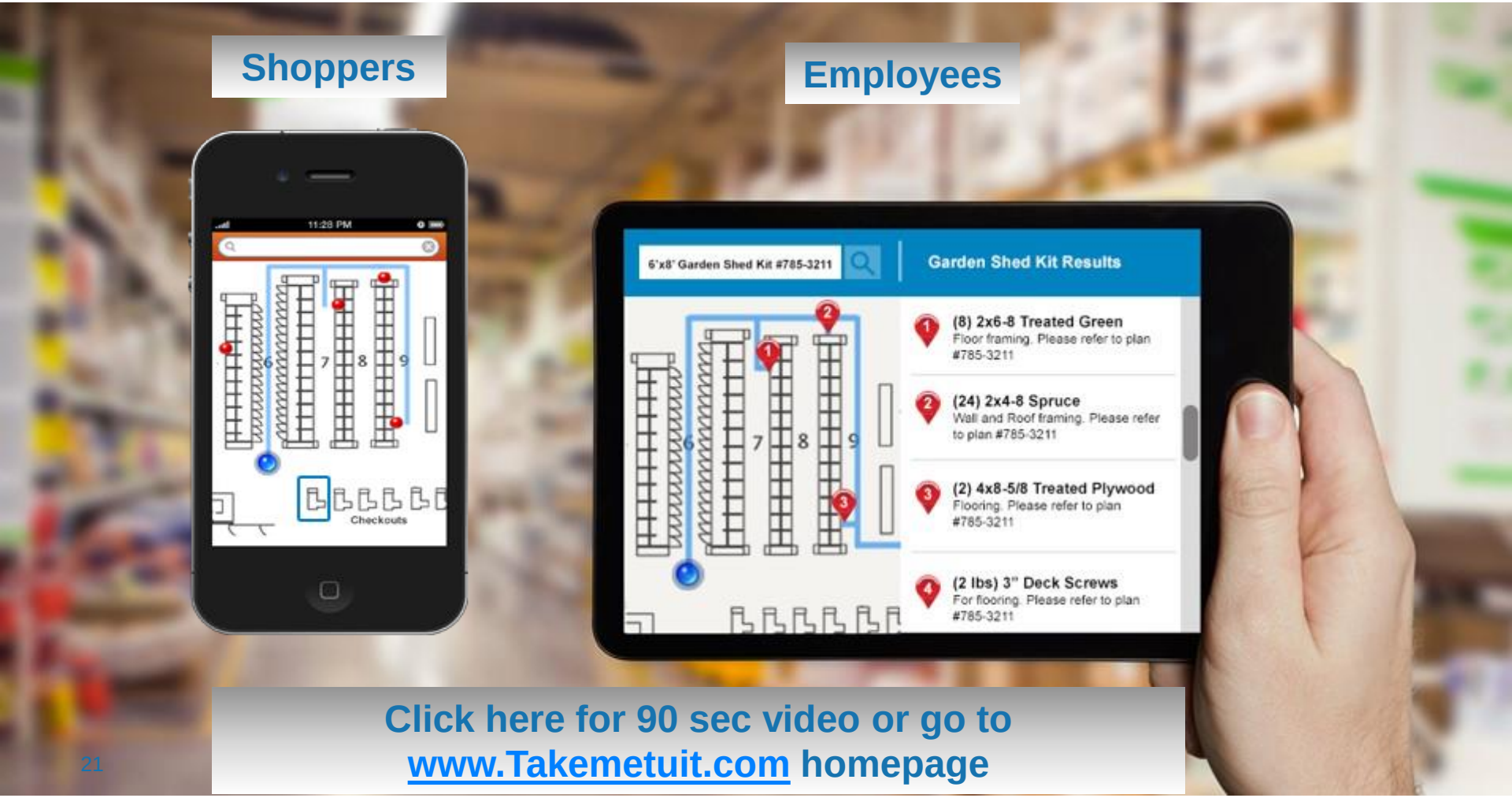
- **23%** of sales lost from unfound items
- Save **5-10%** employee time
- **90%** Shopper Adoption
- Shopper Data for AI & Preferences

takemetuit
the intuitive way to find things

SOLUTION: INDOOR POSITIONING ON ANY SMART DEVICE

Accuracy: 10 cm in 3D

Validated by: IBM, University of Calgary, MediaMarkt Saturn, WRLD



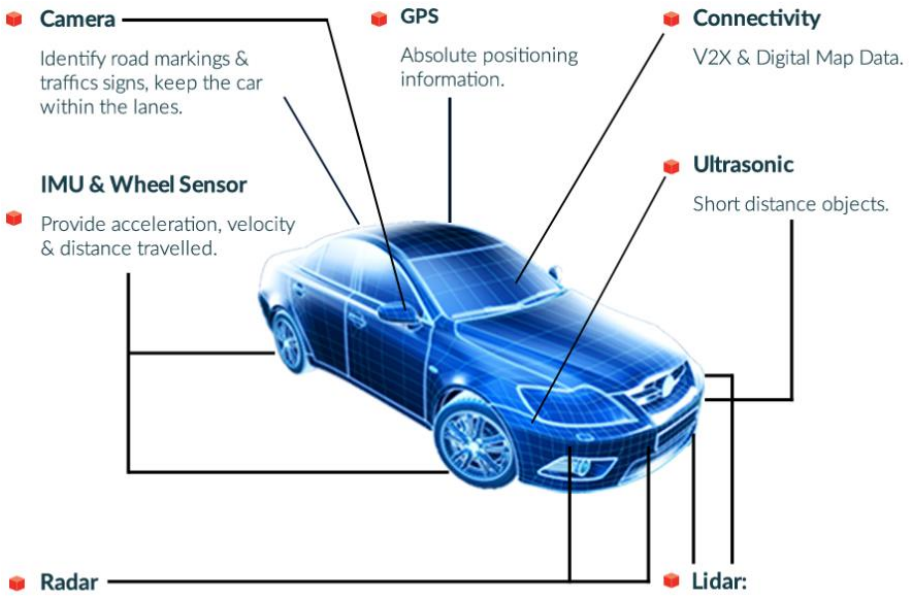
Click here for 90 sec video or go to www.Takemetuit.com homepage

takemetuit
the intuitive way to find things

CURRENT PILOT AND DISCUSSIONS

VEHICLE APPLICATIONS

- Parking garages
- Seamless outdoor to indoor GPS



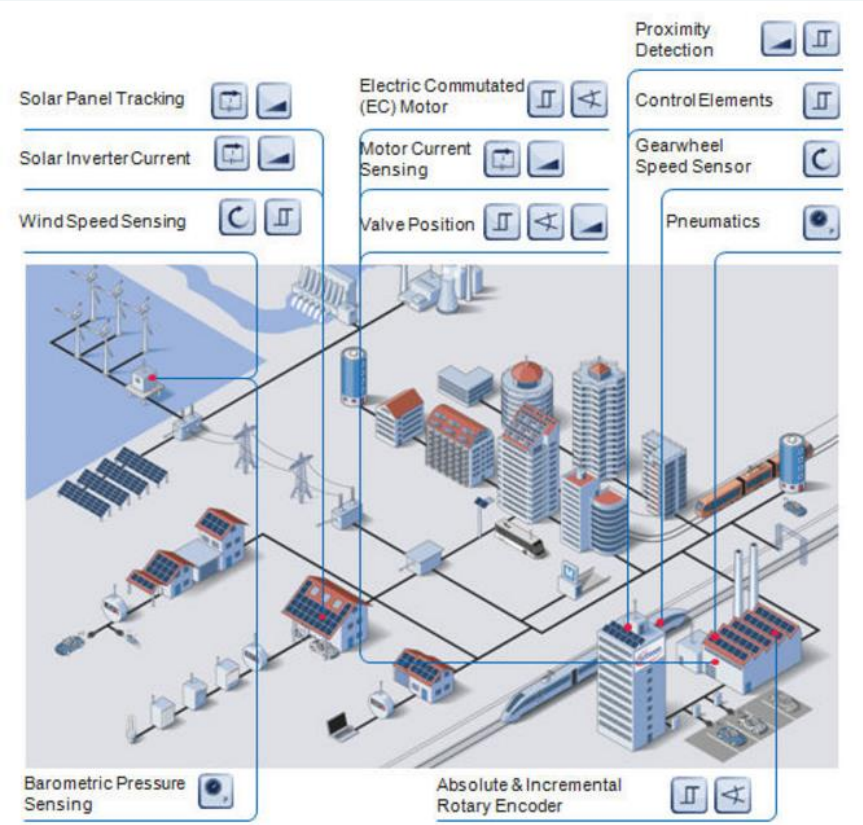
takemetuit
the intuitive way to find things

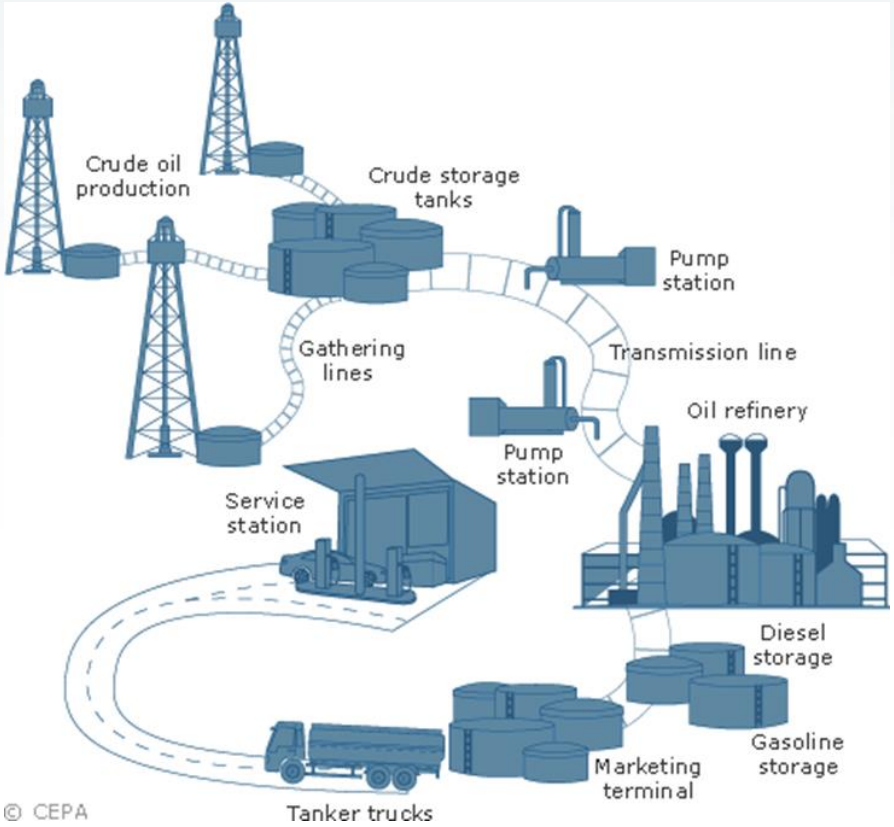
Advanced Technologies & Market Application Areas

- Industrial & Energy
- Drone Technologies
- Agriculture & Forestry
- Health & Medical
- Automotive
- Smart Homes
- Wearable Technologies
- Cellular
- The future of everything being connected !!

Industrial & Energy

The future of industrial & energy requires better quality of service, monitoring systems and reduced cost





Drone Technologies

The future of drone systems is

Complete commercial suitability, fully compliant safety and regulatory standards-based design, platform and payload interchangeability, automated safety modes, enhanced intelligent piloting models and full autonomy, full airspace awareness, auto action (takeoff, land, and mission execution)

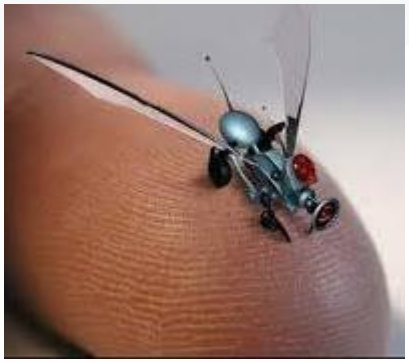
Autonomous flight

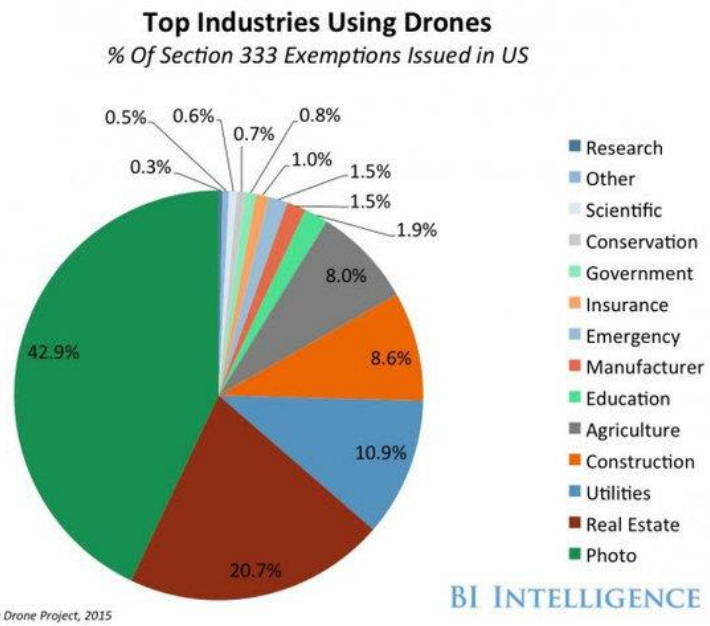
Battery performance

Detect-and-avoid technologies

Location technologies

Integrated air-traffic-management (ATM)





Source: FAA, The Verge Drone Project, 2015

Light weight - Lidar, Radar, Camera's, GPS, Wireless, Advanced Battery Tech.

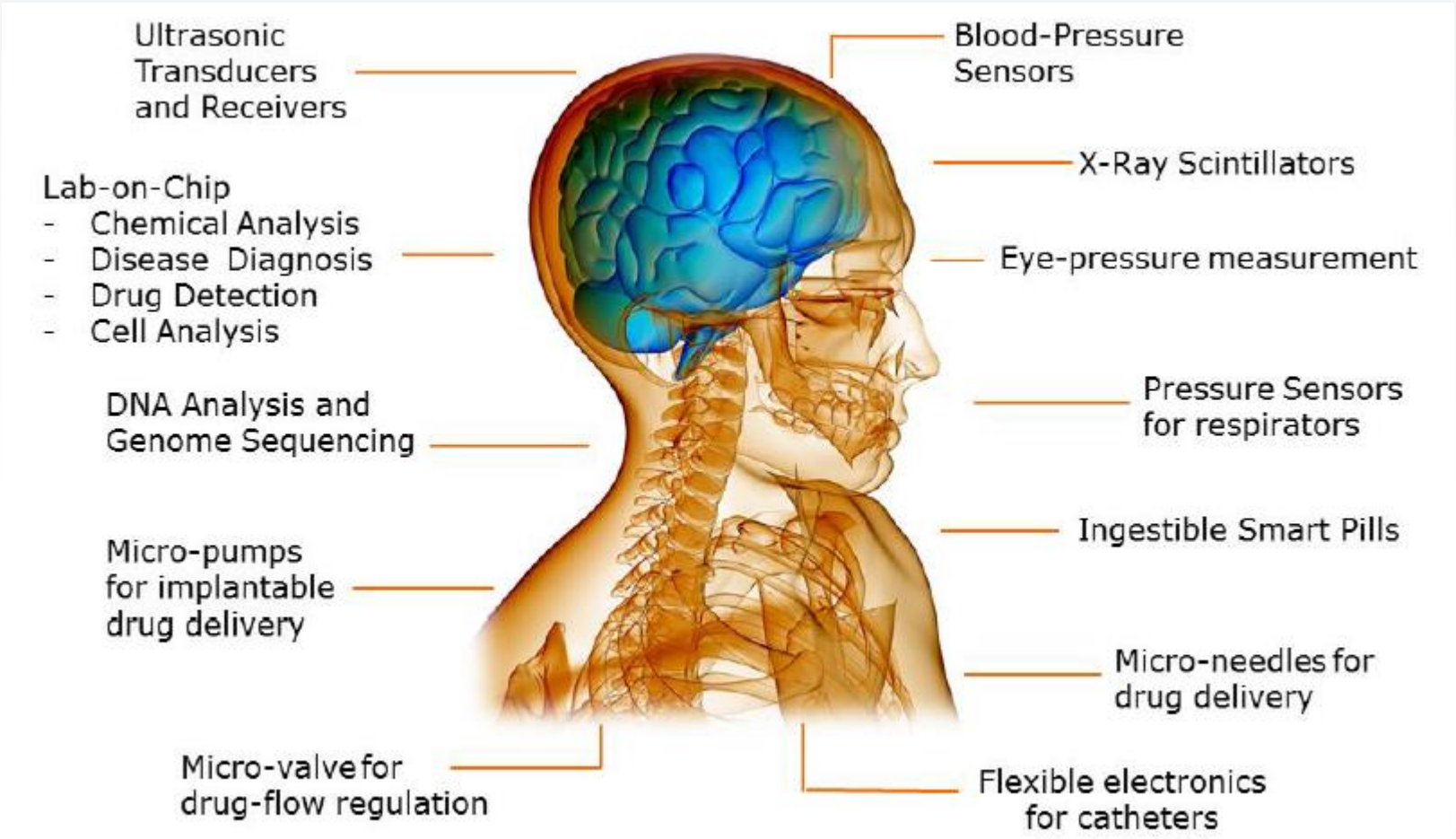
Agriculture & Forestry Technologies

The future of Agriculture & Forestry requires efficient harvesting, monitoring systems for issues and reduced cost

- Multi-Spectral Imaging
- Robotics
- Autonomous Systems
- Advanced Sensors
- Navigation
- Sensor Fusion

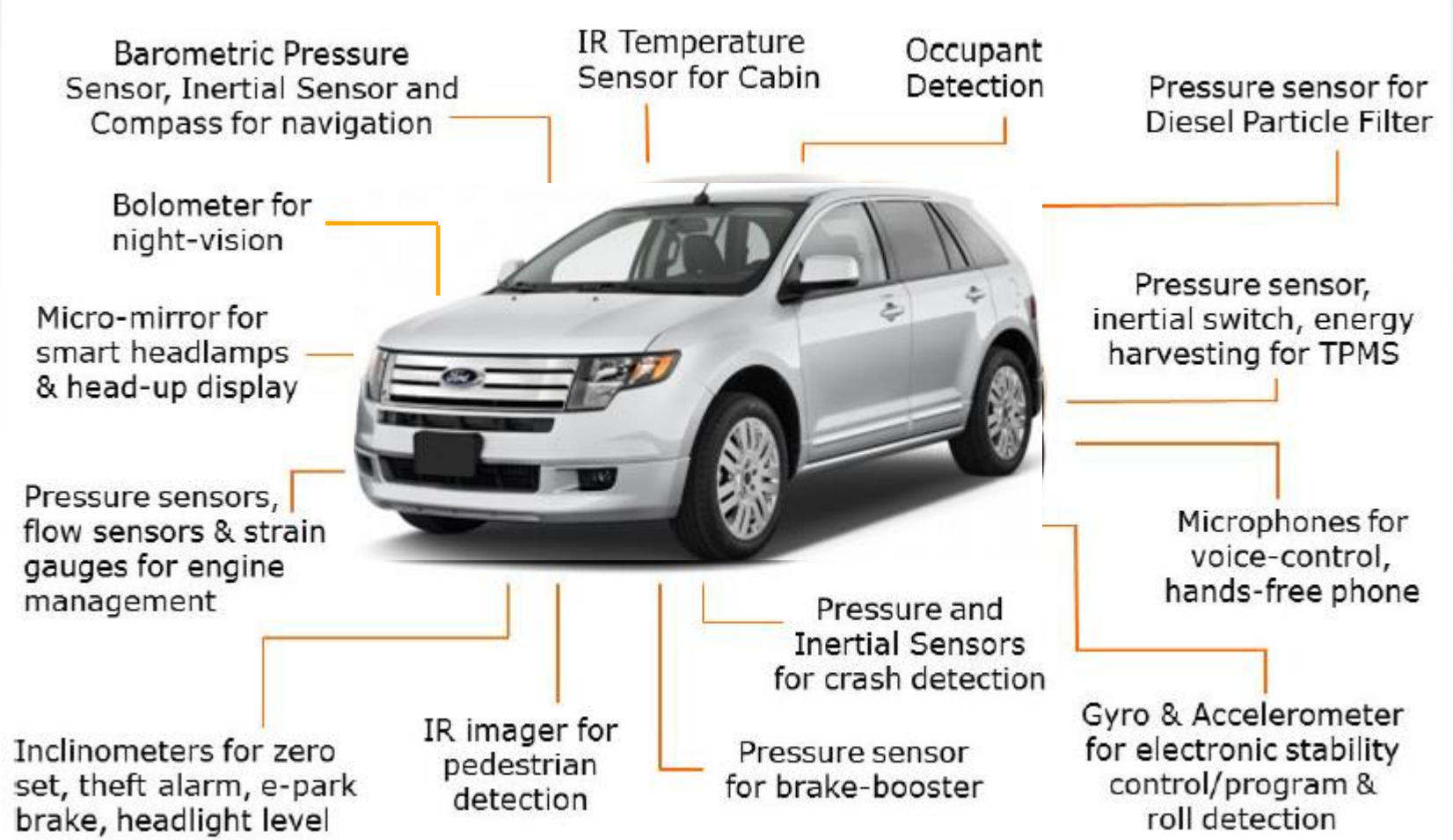
Health & Medical

The future of health & medical systems requires better quality of service for an aging population



Automotive

The future of automotive systems is autonomous and connected vehicles

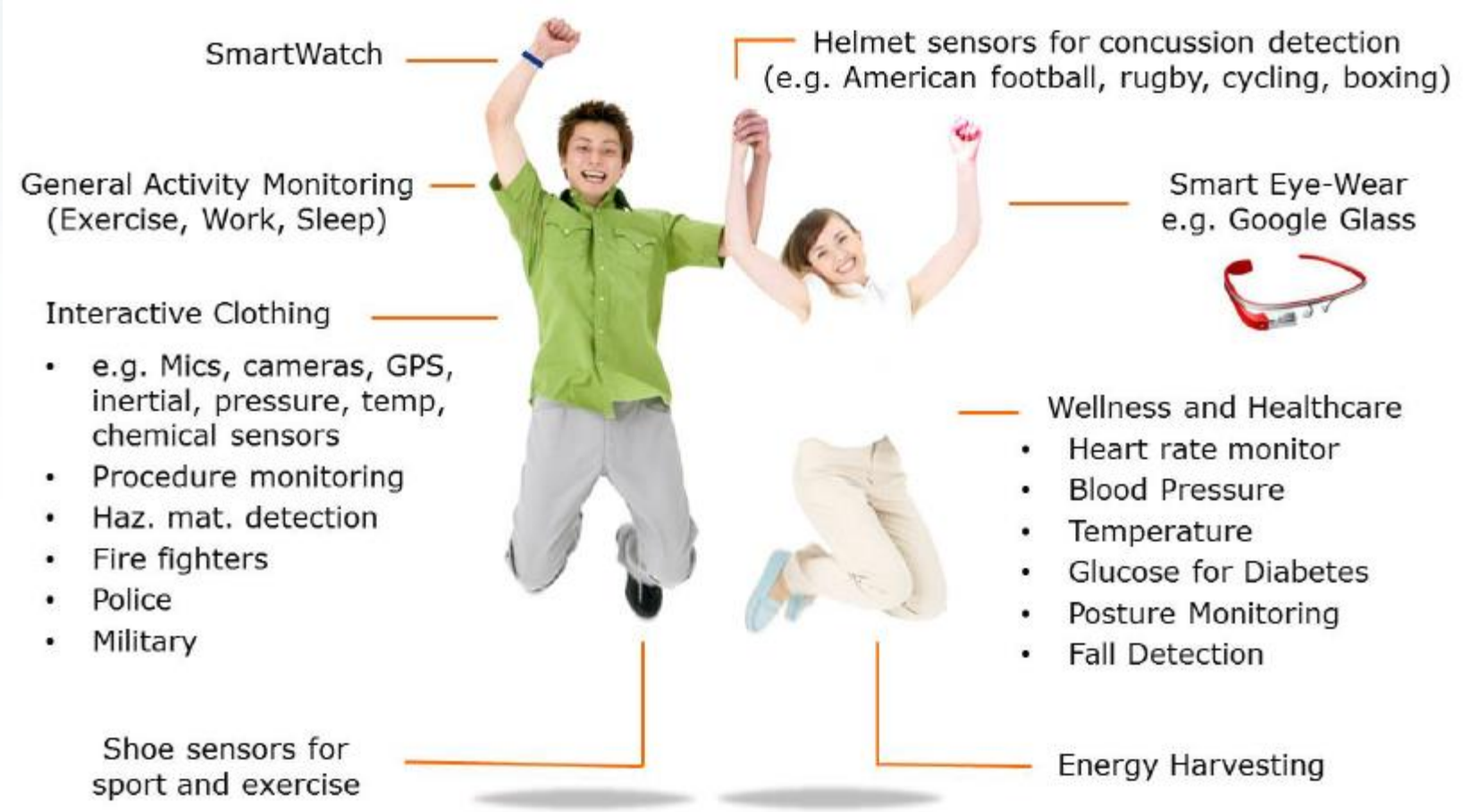


Smart Homes

The future of smart homes systems requires connecting and informing the occupants

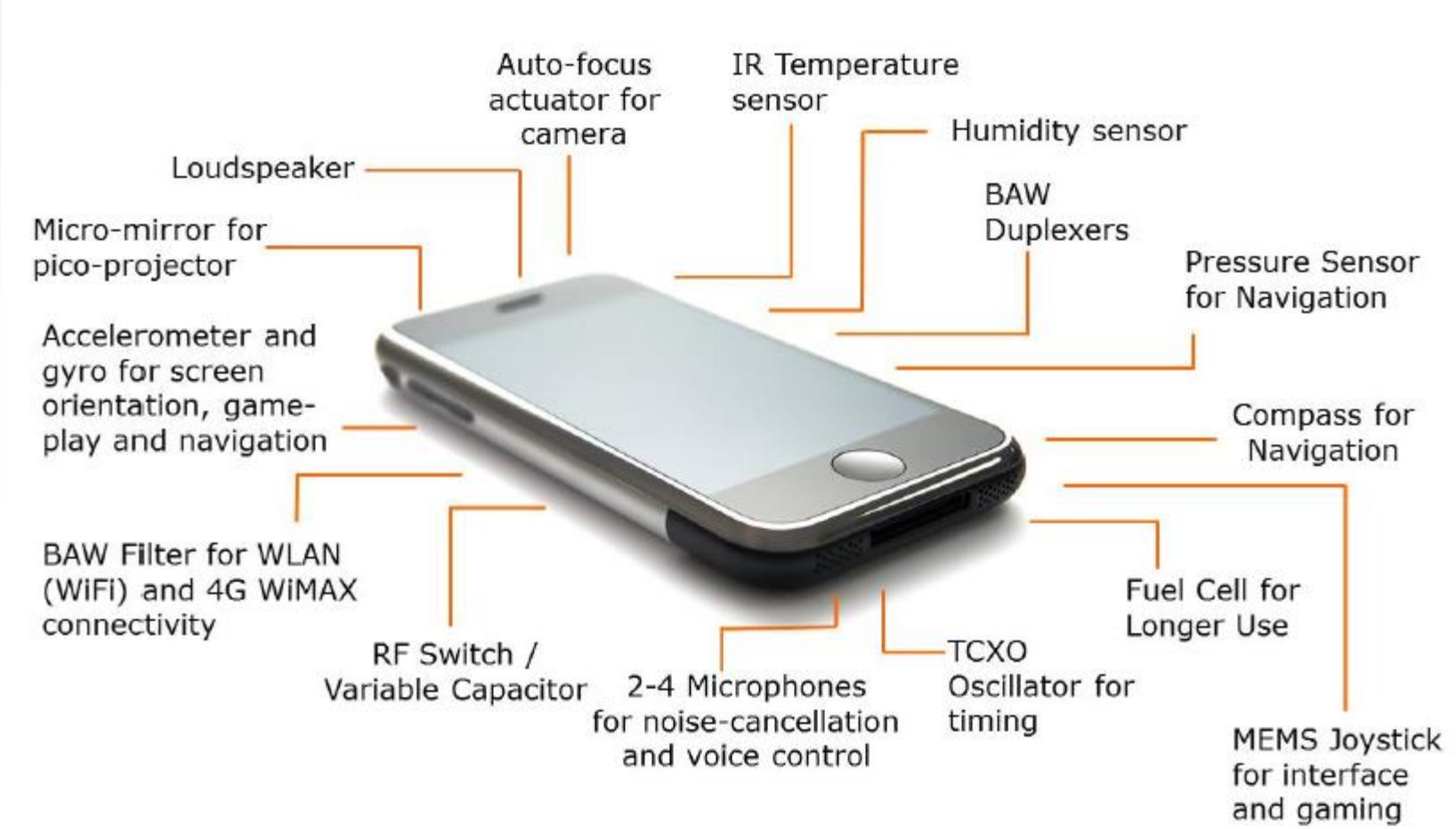
Wearable Technologies

The future of wearable systems is performance in an active life style



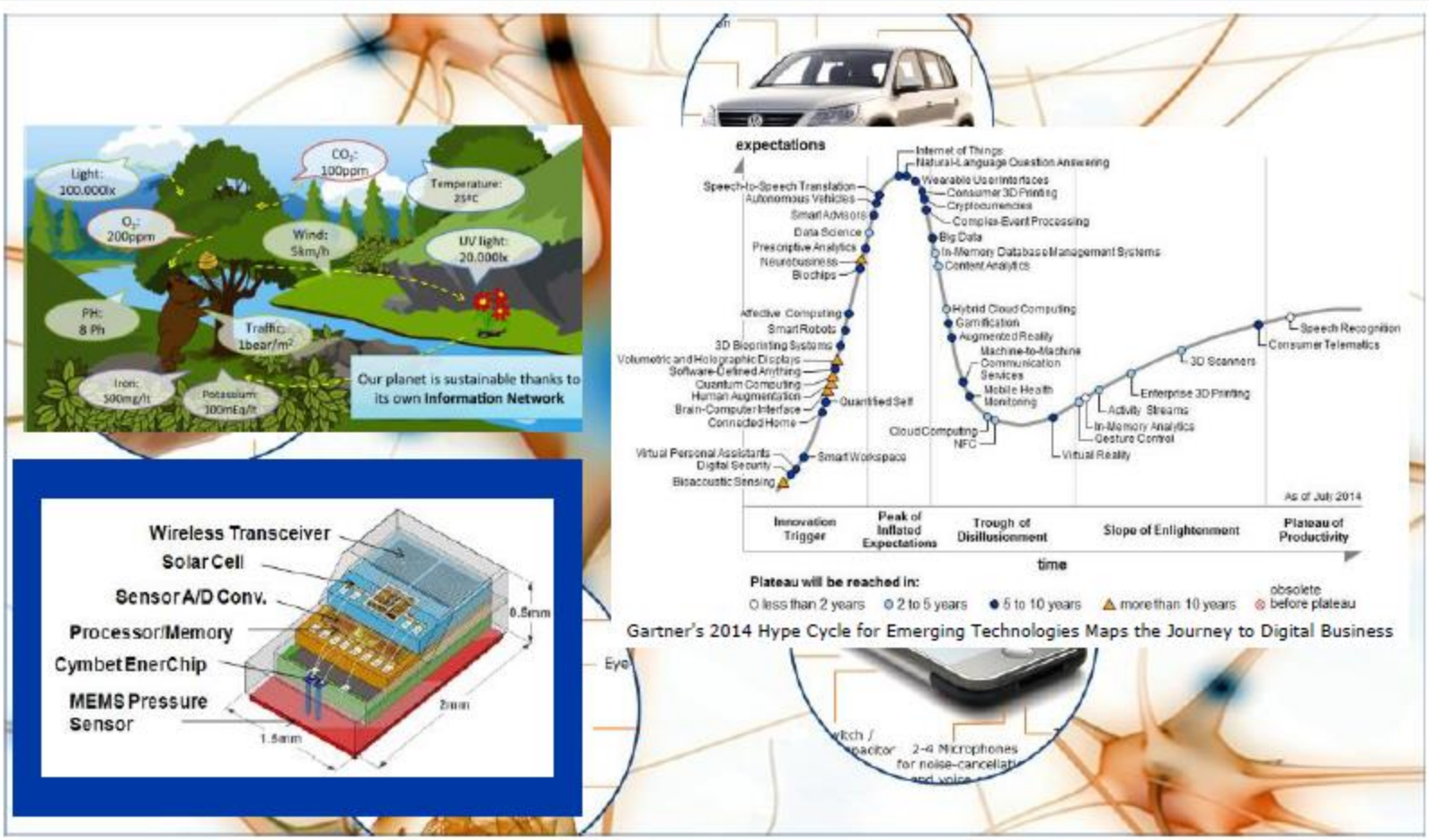
Cellular

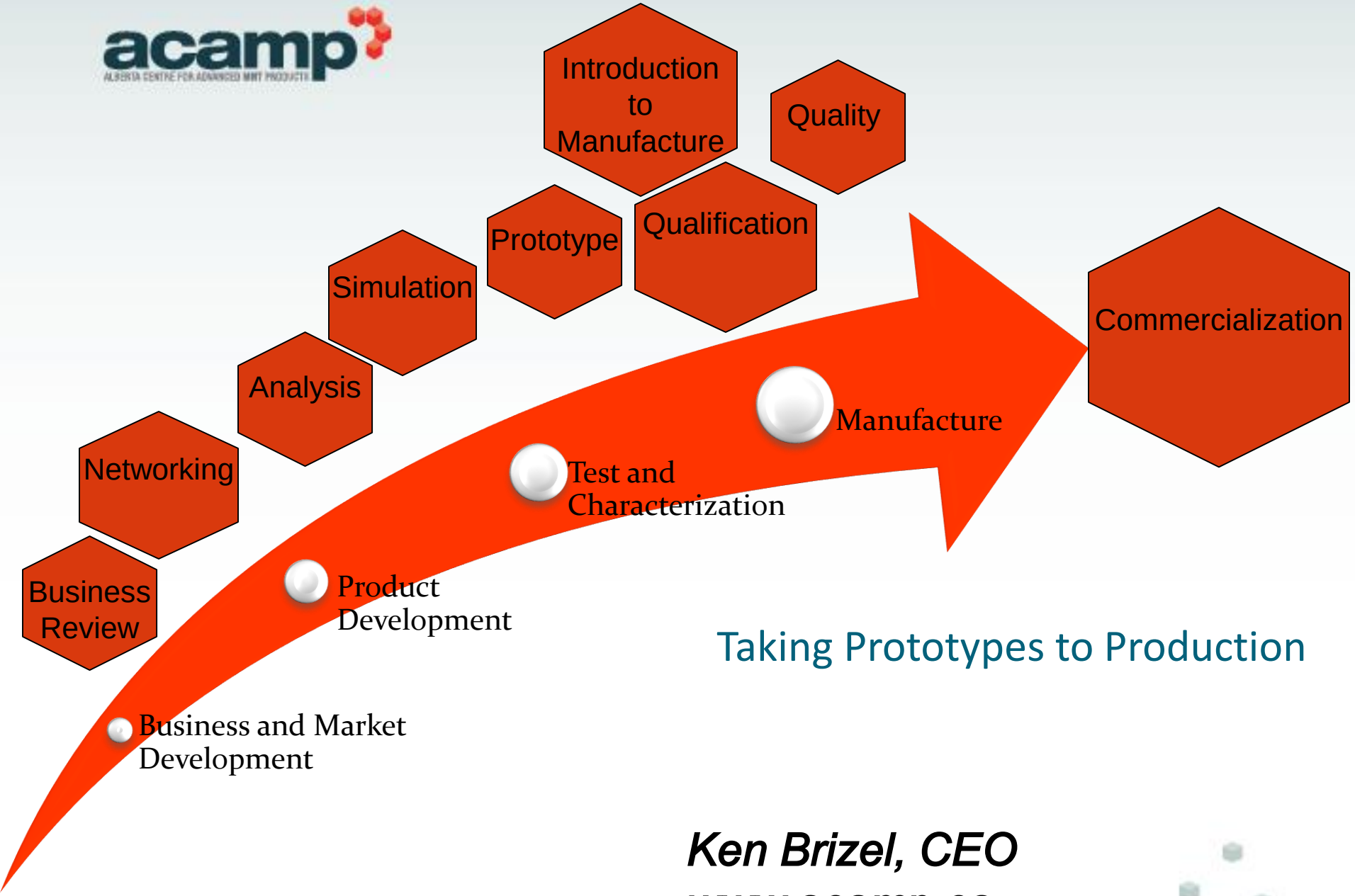
The future of cellular systems is high bandwidth, low latency, reducing cost and higher levels of integration



Everything being connected

In the future of everything is being connected !!!
The Internet of Things !





Taking Prototypes to Production

Ken Brizel, CEO
www.acamp.ca