



Health / Wellness

From the Sensor to the Cloud

Sensors Expo

Steven Dean | Analog & Sensors Marketing

JUN . 25 . 2014



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Agenda

- **Freescale Intro**
- **Market Trends & Fun Facts**
 - Macro economic
 - Healthcare delivery
 - IoT
- **Freescale Solutions Supporting Trends**
 - Application Use cases, WaRP, HHHRP, OneBox
- **Discussion**



A *Global Leader* in Microcontrollers and Digital Networking Processors

>50 Year Legacy
>5,500 Engineers
>6,000 Patent Families
#2 Merchant Auto MEMS

Five Core Product Groups

Microcontrollers

Digital Networking

Automotive MCU

Analog & Sensors

RF

Four Primary Markets

Automotive 

Networking 

Industrial 

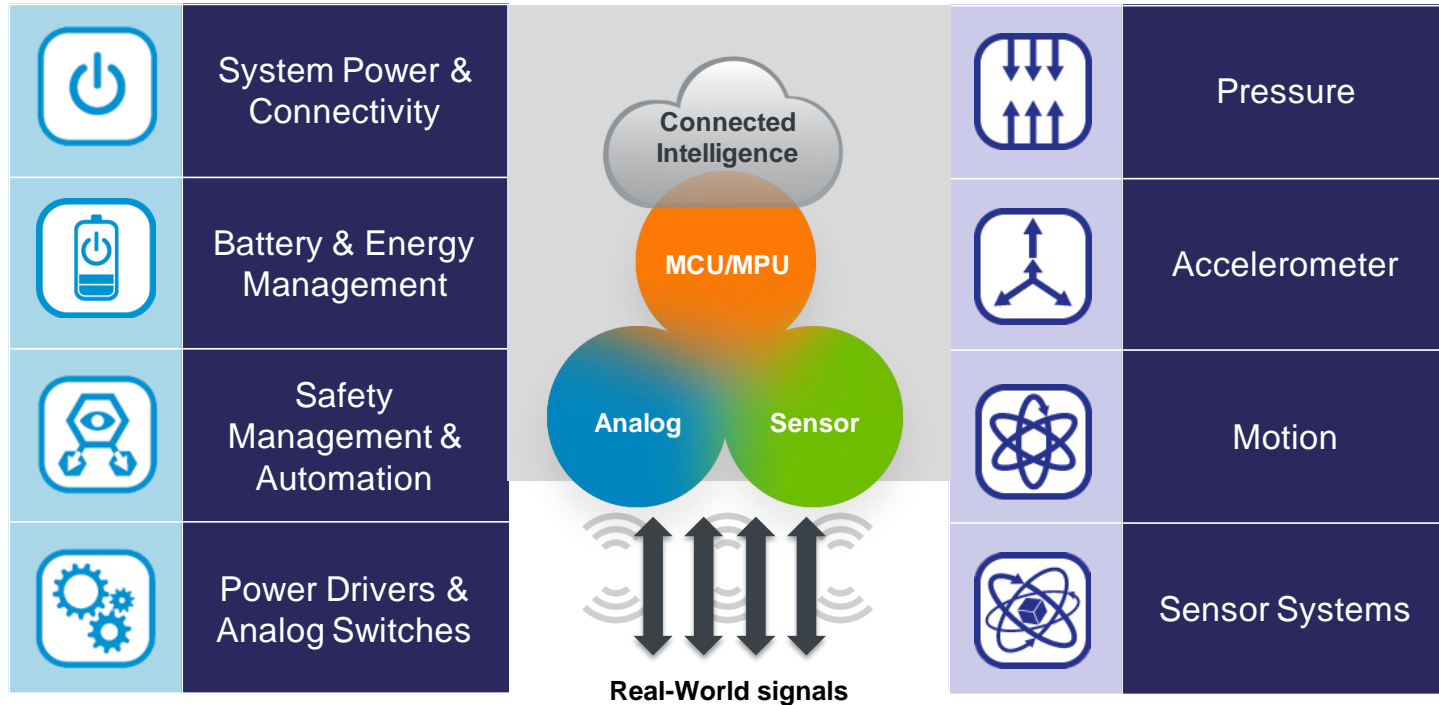
Consumer 



Real-World Signals to Connected Intelligence

Robust, reliable and high-performance solutions

- Sensors for contextual and environmental intelligence
- Complement with mixed-signal, power analog system ICs
- MCU partnership to deliver complete embedded system solutions



Sensor Portfolio



Pressure

Automotive, industrial, medical and **consumer** absolute and differential sensors
Flow, comfort management, HVAC, medical, engine control



Accelerometer

Consumer and industrial low-g sensors and tilt sensors
Automotive medium- and high-g crash sensors
Vehicle stability, airbag, vibration monitor, tilt alignment



Magnetometer

Consumer and industrial magnetic field sensor and 3D compass
Orientation alignment, proximity detection, magnetic switch



Gyroscope

Consumer and industrial angular rate sensors and 6/9-DOF IMU
Automotive roll sensor and IMU
Stabilization, motion and gesture HMI, inertial navigation, gaming



Sensing systems

Consumer and industrial MCU and sensor integrated platforms
Automotive tire pressure monitoring system
Smart sensors, pedometer, anti-tamper, fault prognostication

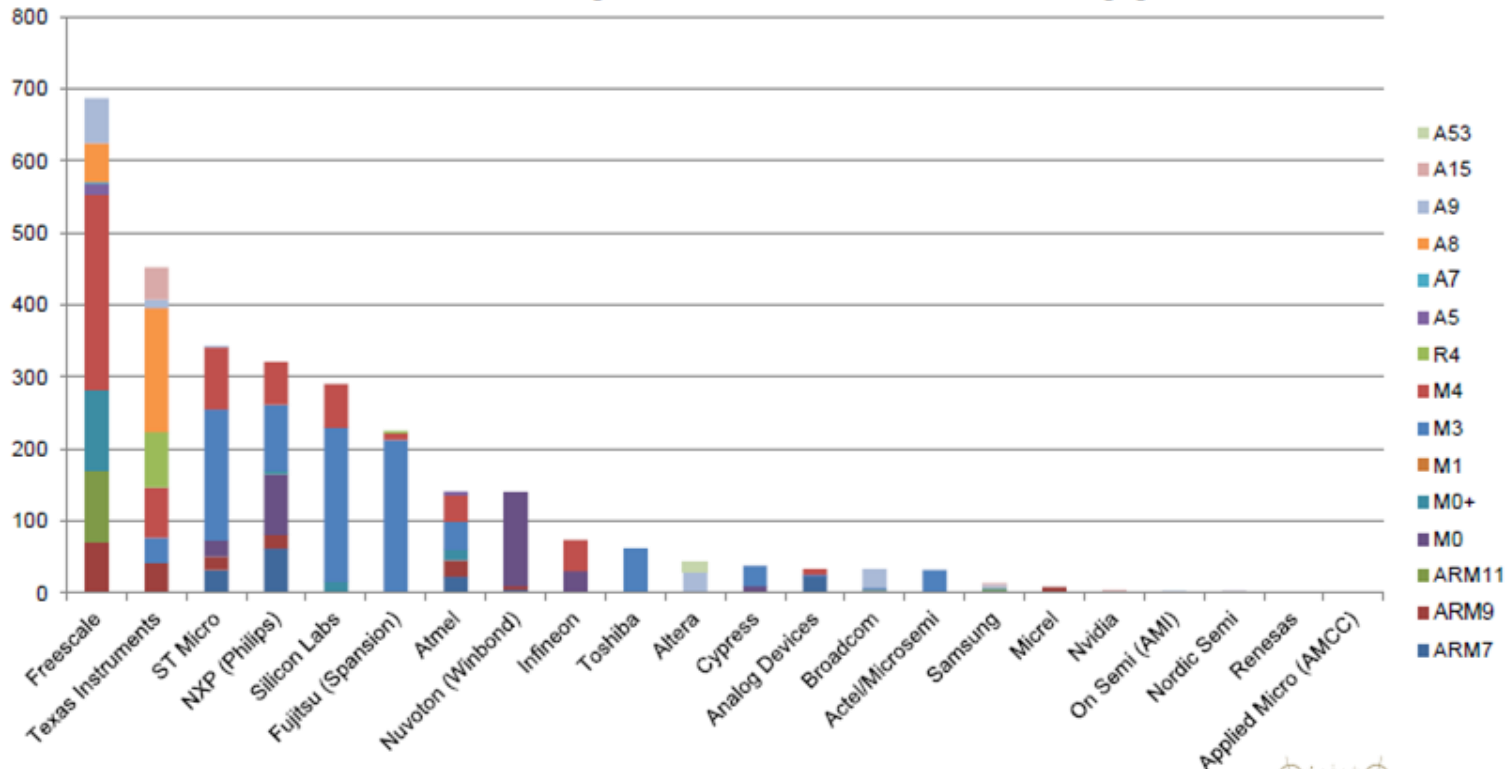


ARM SOC Portfolio's

How to Choose an ARM® Core Supplier



Who is the Most Comprehensive ARM® Supplier? **



**Number of active product SKUs listed on website as of November 2013



Freescale's Product Longevity Program

- Certain markets require long-term product support
- Freescale has a longstanding track record of providing long-term production support for our products
- Freescale has introduced a formal product longevity program for the market segments we serve
 - **For the automotive and medical segments, Freescale will make a broad range of solutions available for a minimum of 15 years**
 - Life cycles begin at the time of launch
- A list of participating products is available at:
www.freescale.com/productlongevity

Product Longevity



Freescale Semiconductor provides a product longevity program for the market segments we serve. For the automotive and medical segments, Freescale will make a broad range of devices available for a minimum period of 15 years. For all other market segments in which Freescale participates, Freescale will make a broad range of devices available for a minimum period of 10 years.

Life cycles for participating Freescale products will begin at the time of product launch and will include the standard Freescale end-of-life notification policy (one-year notice for placement of final orders and an additional year until the last ship date). Freescale will manage the program through our own factories, outside foundries and other manufacturing resources. If it becomes necessary to transfer the production of a participating product to an alternate manufacturing facility, Freescale will re-qualify that product. These actions demonstrate our intention to provide supply stability to our customers.

[Product Longevity Program Device List](#)



Freescale's Value to the Healthcare Market

Freescale is a trusted provider of high-quality technical solutions that enable the development of breakthrough health care systems

Trusted Partner

Freescale is on your team, delivering innovative products with long lives and the quality you expect from a leader



History of Innovation

Long Product Lives

Quality

Service

Healthcare Technology Leadership

Freescale is committed to the **Healthcare device marketplace** and has put together the technical infrastructure to provide the highest level of support in the IC industry



Medical Center of Excellence

Continua Alliance

FDA Class I, II, and III

Solutions & eco systems

Product Portfolio

Freescale has one of the largest and most diverse IC portfolios in the industry, giving customers access to nearly all the necessary components for designing breakthrough health care systems



MCUs and MPUs

Sensors (Medical Grade)

Analog

Wireless



Healthcare Center of Excellence

The Facts

- Operating out of Tokyo Japan, Dr. Jose Fernandez Villaseñor leads Freescale's Medical Center of Excellence
- Practicing Surgeon, EE, and Medical Product Manager
- Author, Blogger, speaks 8 languages
- Blog: Freescale Medical by Design

▶ TABLE OF CONTENTS

Dr. José Fernández Villaseñor

Freescale Semiconductor
Interview with Dr. José Fernández Villaseñor - Medical Product Manager

4

Telemonitoring Solutions to Prevent Chronic Degenerative Disease Complications

BY DR. JOSÉ FERNÁNDEZ VILLASEÑOR

How Telehealth Monitoring Systems help health care providers adequately monitor patients with chronic degenerative illnesses.

9

TABLE OF CONTENTS



<http://s.eeweb.com/pulse/eeweb-pulse-2012-36.pdf>



Market Trends and Current Events



Megatrends Shaping Our Future

Going **Green**



Health & **Safety**




**Connected
Intelligence**



Medtronic in the news

Medtronic to buy Covidien for \$42.9 billion, rebase in Ireland

 **REUTERS** By Susan Kelly and Greg Roumeliotis
1 hour ago



By Susan Kelly and Greg Roumeliotis

(Reuters) - U.S. medical device maker Medtronic Inc said on Sunday it had agreed to buy Covidien Plc for \$42.9 billion in cash and stock and move its executive base to Ireland in the latest transaction aiming for lower corporate tax rates abroad.

While the deal will allow Medtronic to reduce its overall global tax burden, the Minneapolis-based company said it was driven by a complementary strategy with Covidien on medical technology rather than tax considerations



Medtronic Chairman and Chief Executive Officer speaks at the Reuters Health Summit in May ...

Financial Guidance
Health

Multiple of 4x
revenues

29% Premium



Body Worn “Wearable” Cardiac Monitoring Solution

Jun 9, 2014, 2:19pm CDT | UPDATED: Jun 10, 2014, 10:36am CDT

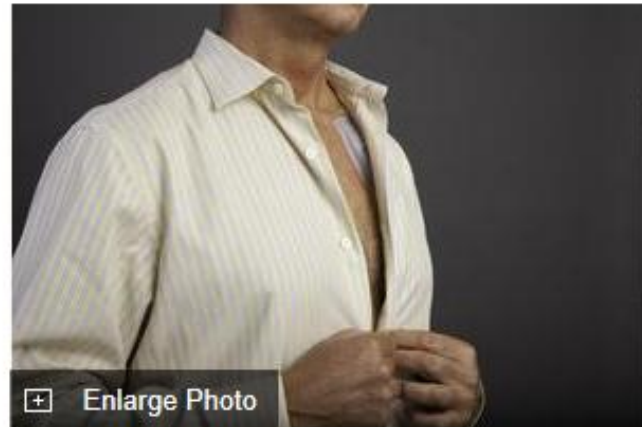
Medtronic confirms it will buy Twin Cities startup Corventis



Katharine Grayson
Staff reporter-
Minneapolis / St. Paul Business Journal
[Email](#) | [Twitter](#) | [Google+](#)

Medical-device maker [Medtronic Inc.](#) confirmed it will buy [Corventis Inc.](#), a St. Paul-based maker of wireless health-monitoring patches.

MobiHealthNews reported last month that Medtronic was negotiating a deal to buy Corventis. Fridley-based Medtronic declined to comment at the time, but said at a June 5 investor conference that the acquisition will close this month.



[Enlarge Photo](#)

Corventis

A patient wearing Corventis' Nuvant health-monitoring patch.

Telehealth Gets Shot in the Arm

MEDCITY
News

What's Next In Medical Innovation

Hot Topics: Telemedicine



TELEMEDICINE: A TOPIC SPONSORED BY AMERICAN TELEMEDICINE ASSOCIATION

Cleveland Clinic partners with HealthSpot to expand the reach of its doctors

May 20, 2014 4:37 pm by Deanna Pogorelc | 0 Comments

Share This Story



Telemedicine company HealthSpot and Cleveland Clinic are launching a joint venture intending to use telehealth technologies to reach more patients.

"Together we will be researching the vast amount of new point-of-care technology and developing new ways to integrate that into our solution," said HealthSpot CEO Steve Cashman in a statement.

The telemedicine kiosk is a **free-standing 8'x5' station** staffed by an attendant. Inside, it's equipped with a high-definition videoconferencing system and interactive digital medical devices including a scale, a blood pressure cuff, a thermometer, an otoscope, a stethoscope and a pulse oximeter.



Social Networking Service Meets Stealth Activity Monitor

mobi health news April 28, 2014

Subscribe NOW

Open question: Why did Facebook buy Moves?

By [Brian Dolan](#)

Last Thursday's big news was that **Facebook had acquired fitness tracking company ProtoGeo**, maker of the popular passive tracking app, Moves, for an undisclosed sum. Both companies said that the paid app Moves would remain a separate offering — for the foreseeable future, at least — and that the ProtoGeo team would also help work on Facebook's other products and develop new ones.



It's well-documented that Facebook is relatively acquisition-shy, especially when compared to companies like Google or Microsoft. While Facebook relied on so-called "acqui-hires" early on to build out its ranks, in the past year or two it has focused more on multi-billion dollar technology buys like Instagram and Oculus Rift. Facebook confirmed **the obvious for the Wall Street Journal**: The ProtoGeo deal was not a multi-billion dollar deal.

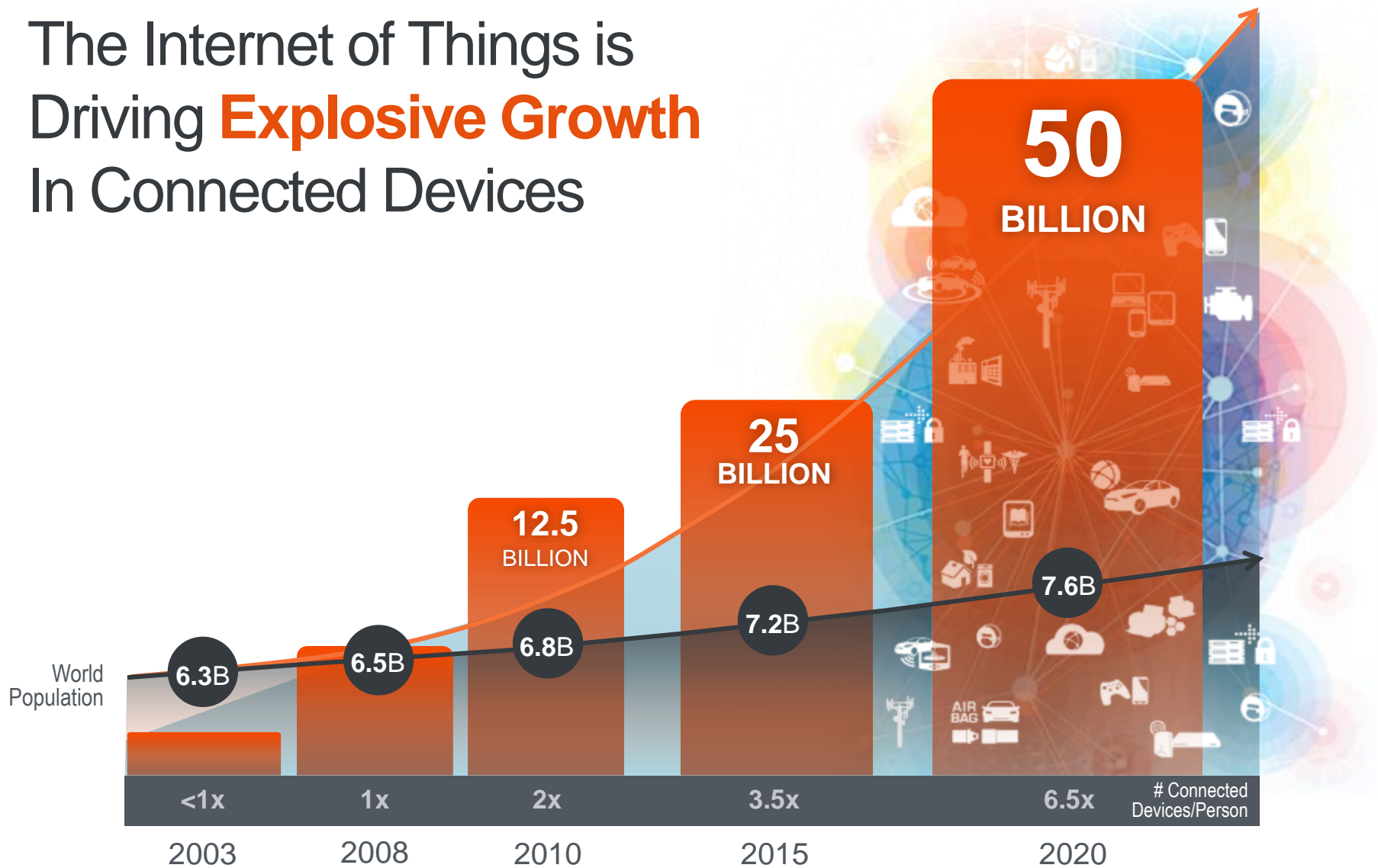
So was the Facebook-Moves deal yet another acqui-hire for the social networking company? Whether Moves remains in Facebook's growing suite of mobile app offerings will help answer that down the road, but ProtoGeo did announce that the Moves app will not "commingle" data with Facebook's platform. Facebook announced that the ProtoGeo team will help it develop other products. Sounds a bit

Top Headlines

- [Open question: Why did Facebook buy Moves?](#)
- [Hearst Health acquires care transition software maker CareInSync](#)
- [Voluntis raises \\$29M to bring diabetes app to US](#)
- [RunKeeper adds goal coaching, hikes premium pricing](#)
- [In-Depth: Revisiting Topol's Top Ten Digital Health Targets](#)

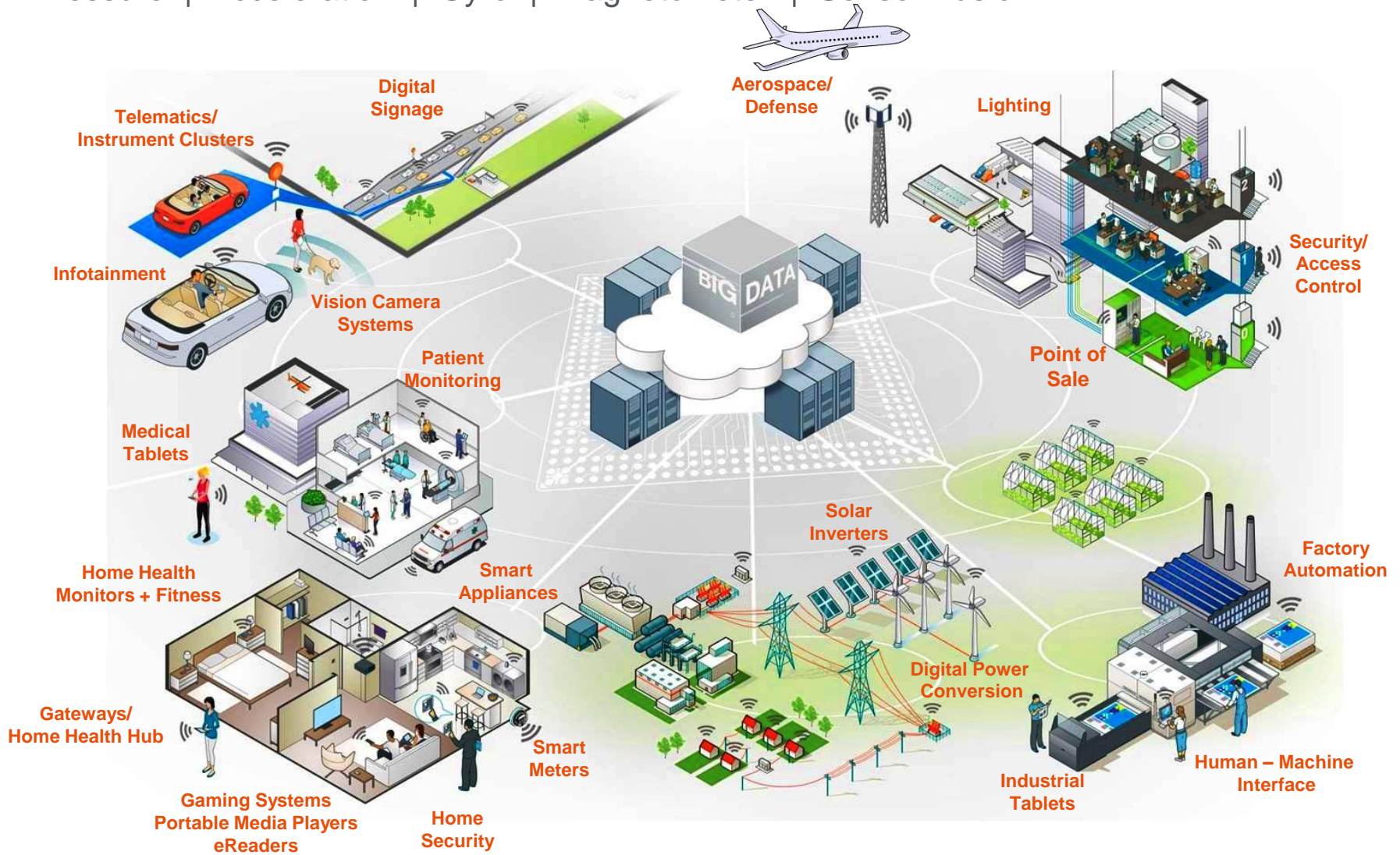


The Internet of Things is Driving **Explosive Growth** In Connected Devices



Edge Nodes – Sensing The Internet of Things

Pressure | Acceleration | Gyro | Magnetometer | Sensor Fusion



Edge Nodes – Sensing The Internet of Things

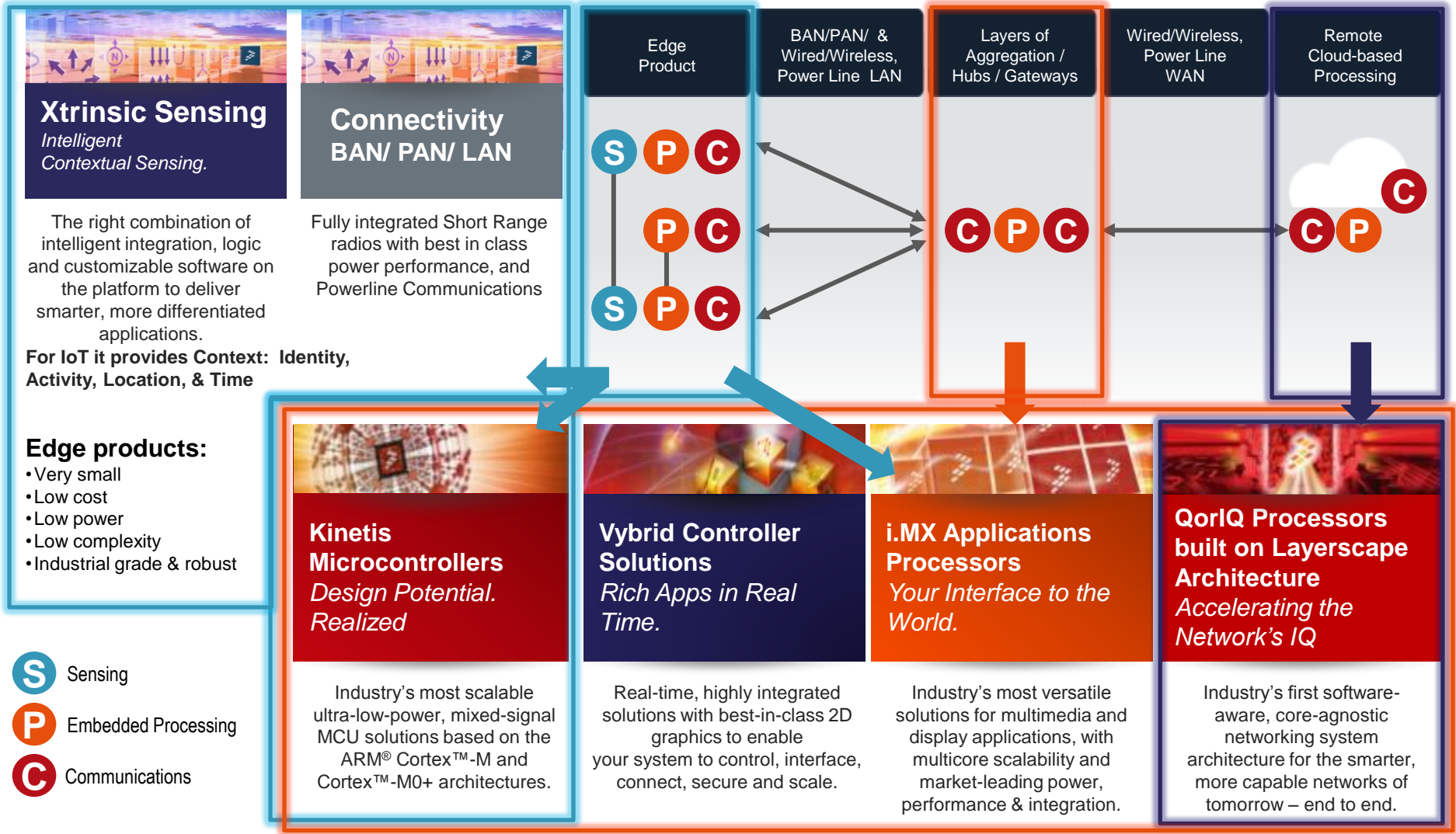
Pressure | Acceleration | Gyro | Magnetometer | Sensor Fusion



“SMART” Is Everywhere!



Freescale IoT Offerings



Scalable Industry Standard Solutions, Software and Development Ecosystem

Market Survey Question





Eyeglasses Chosen As Top Medical Device



Posted in Design Services by Brian Buntz on April 15, 2014



Eyeglasses are the top medical device of all time, according to a survey of Qmed readers, which to date has received 739 votes. At the time of writing, eyeglasses had received about a quarter of all of the votes.

The Vision Council of America estimates **that 64% of U.S. adults** use glasses regularly. Glasses are also one of the oldest medical devices.

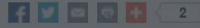
The idea of using a lens to magnify text is thought to date to the first century AD.

Reading stones (made from sand converted to glass) were one of the most widely used applications of lenses until the debut of **wearable eyeglasses** in **approximately 1284** by Salvino D'Armato.





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SO WHAT?

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The Survey Says

Trending today? WEARABLES

Google




CNET > Mobile > Intel grabs smartwatch maker -- report

Intel grabs smartwatch maker -- report

Intel has reportedly purchased smartwatch maker Basis Science to become part of the firm's arsenal in the wearable device industry.

by **Charlie Osborne** / March 4, 2014 7:46 AM PST / Updated: March 4, 2014 8:05 AM PST

[o](#) / [f](#) / [t](#) / [in](#) / [g+](#) / more+ presented by T-Mobile



Market Trends

mobihealthnews Cellular Connected Devices Integrated Alere™ Con

News About Advertise Research

Augmedix gets \$3.2 million to bring Google Glass to doctors

By: Brian Dolan | Mar 24, 2014

Tags: [Augmedix](#) | [clinical documentation](#) | [DCM](#) | [dictation](#) | [digital health venture capital](#) | [Emergence Capital](#) | [Google Glass MD](#) | [Google Glass medical](#) | [Google Glass physicians](#) | [Great Oaks Venture Capital](#) | [mobile health venture capital](#) | [patient satisfaction](#) |

San Francisco-based Augmedix, which has developed a Google Glass clinical documentation offering for physicians raised \$3.2 million last week in a round led by DCM and Emergence Capital Partners. Other investors included Great Oaks Venture Capital, Rock Health's LPs (Kleiner Perkins, Mohr Davidow Ventures, and Aberdare), and various angels. Emergence had previously invested in Doximity and Welltok, while Great Oaks is also an investor in Healthtap.



Freescale and OrCam Transform the Lives of the Visually Impaired



OrCam eyeglass-mounted device for the visually impaired uses processing power from i.MX 6Quad processor, paired with the added power management provided by the PF0100 power management IC (PMIC).

Challenge

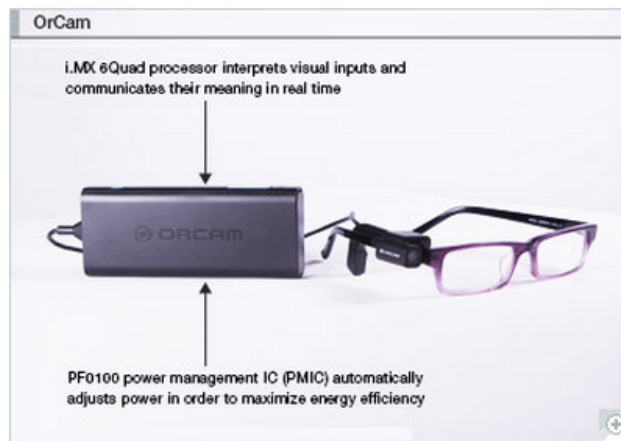
Create a portable solution for the visually impaired that allows them to access activities that most people take for granted but which pose tremendous challenges for them – riding the bus, shopping for groceries, reading the newspaper.

Solution

The OrCam solution employs sophisticated visual computing algorithms run by Freescale's high performance and energy efficient i.MX 6Quad processor to interpret visual inputs and communicate their meaning in real time to the person wearing the technology.

Benefit

For people whose visual impairments prevent them from easily interacting with the world around them, OrCam offers a wearable, affordable intuitive solution.



"Freescale's i.MX 6Quad processors delivered the processing power we needed in a small form factor and with all-day battery life – unmatched by anyone else. On top of that, our close relationship with Freescale gave us early access to the SW, tools, samples and state of the art support allowing us to achieve our clear mission: To use advanced computer vision to help the visually impaired and blind."

– Yonatan Wexler, VP of R&D at OrCam

Featured Video



[OrCam Featuring i.MX 6Quad Applications Processor \(04:34 min\)](#) OrCam is a novel assistance device for the visually impaired and the blind. This video shows how it works and how it can aid the user in daily life.

Read More

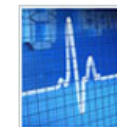


[Freescale and OrCam \(pdf\)](#)
Read the complete case study

Featured Products

[i.MX 6Quad applications processor](#)
[Linux Board Support Package \(BSP\) for i.MX applications processors](#)
[PF0100 power management IC \(PMIC\)](#)

Connect With Us



[Medical by Design Blog](#)
by Freescale's medical experts

[i.MX Community](#)
Share ideas, design tips and meet other i.MX fans

Market Trends

mobihealthnews Cellular Connected Devices Integrated S Alere™ Conn

News About Advertise Research

Report: Apple adds sleep scientist to iWatch team, seeks exercise physiologist

By: Brian Dolan | Feb 6, 2014 [Tweet](#) 40 [Share](#) 6 [Share](#) 9

Tags: [Apple iWatch](#) | [Apple sleep app](#) | [Basis Band](#) | [CES 2014](#) | [iWatch sleep tracking](#) | [Masimo](#) | [Proteus Digital Health](#) | [Withings](#) | [Zeo](#) |

Apple has added yet another person working in digital health to its iWatch team, **according to a report in 9to5Mac**. The company recently hired Roy J.E.M. Raymann from Philips Research, where he led various sleep-related studies. Raymann was a senior scientist at Philips Research who founded the Philips Sleep Experience Laboratory, a non-clinical sleep research lab. He also led projects related to sleep and activity monitoring as part of Philips' Consumer Lifestyle Sleep Research Program and Philips' Brain, Body, and Behavior group.



Survey Question #2



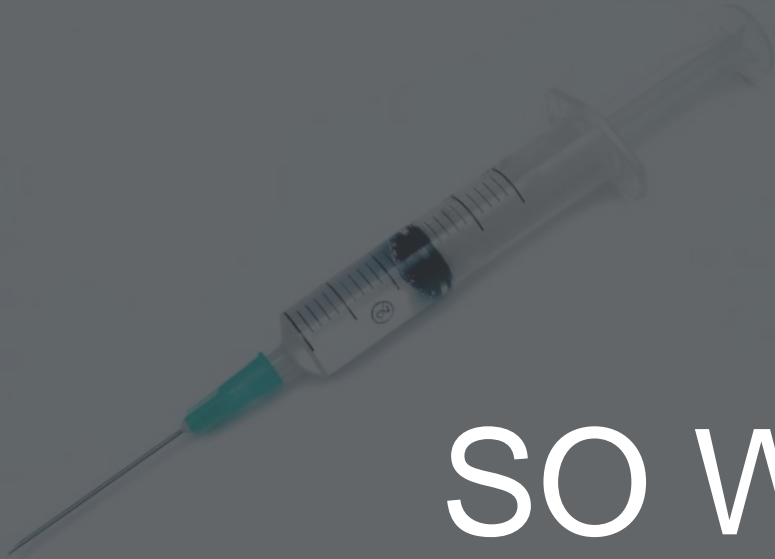


An early hypodermic syringe kit. (Courtesy American Association for the History of Nursing)

The Hypodermic Needle

RUNNER UP

The [hypodermic needle](#) came in second position in our poll, snagging 20% of all votes. Invented much later than eyeglasses, the hypodermic needle is among the most widely used medical devices, and is manufactured in the billions each year. As we explain in a post on the subject, the hypodermic needle has “probably been responsible for saving more lives and alleviating more suffering than any other piece of medical technology.”



SO WHAT?

An early hypodermic syringe kit. (Courtesy American Association for the History of Nursing)

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Customer Use Case – Drug Delivery

- **Metering dose is an issue**
 - Pressure Sensors
 - Kinetis MCUs
- **Pens ...**



Insulet OmniPod

Powered by the Freescale i.MX Series MPU and Wireless 8-bit MCU



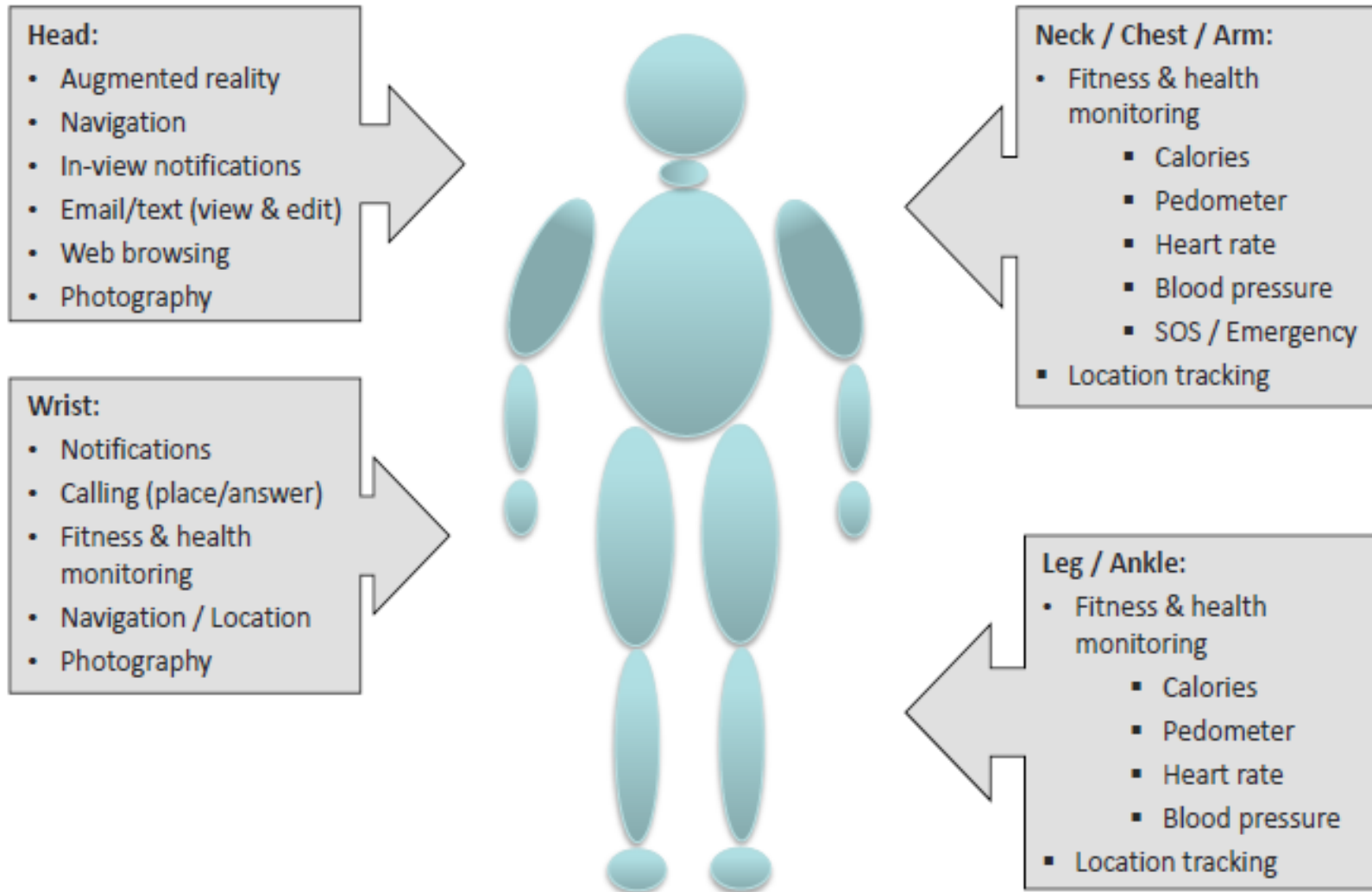
Enablement: Wearables

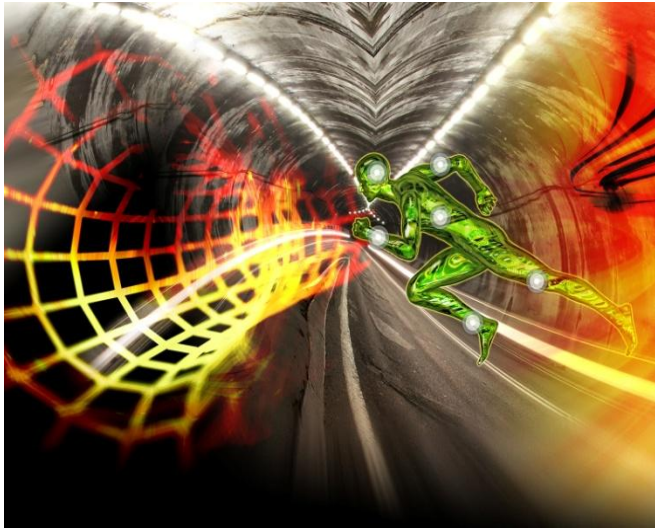


Wearable Market: Segmentation

Vertical	Categories
<p>Fitness & Wellness</p>	<p>Sports & Heart Rate Monitors Pedometers, Activity Monitors Smart Sport Glasses Smart Clothing Sleep Monitors Emotional Measurements</p>
<p>Healthcare & Medical</p>	<p>CGM (Continuous Glucose Monitoring) ECG Monitoring Pulse Oximetry Blood Pressure Monitors Drug Delivery (Insulin Pumps) Wearable Patches (ECG, HRM, SpO2)</p>
<p>Infotainment</p>	<p>Smart Watches Augmented Reality Headsets Smart Glasses Wearable Imaging Devices</p>
<p>Industrial & Military</p>	<p>Hand-worn Terminals Augmented Reality Headsets Smart Clothing</p>

Wearable Market: Diverse Usage Models





WaRP

Wearable Reference Platform

WearAble Reference Platform

Enabled by Freescale

Speeds and eases development for creating wearable devices by **addressing key technology challenges** which frees developers to focus on creating differentiated features



Available
July
2014

Open source design files
Open source version of Android

Connectivity

Usability

Maximizing Battery Life

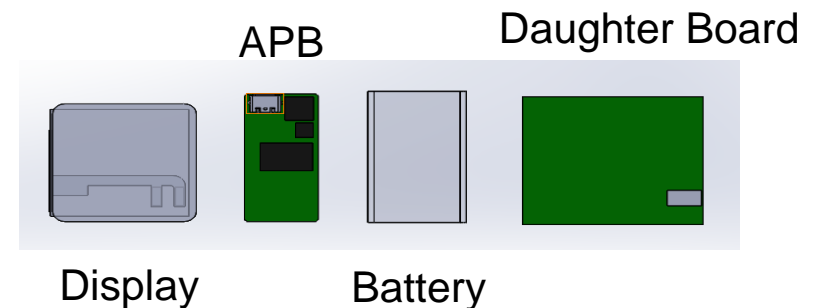
Miniaturization

WaRPboard.org



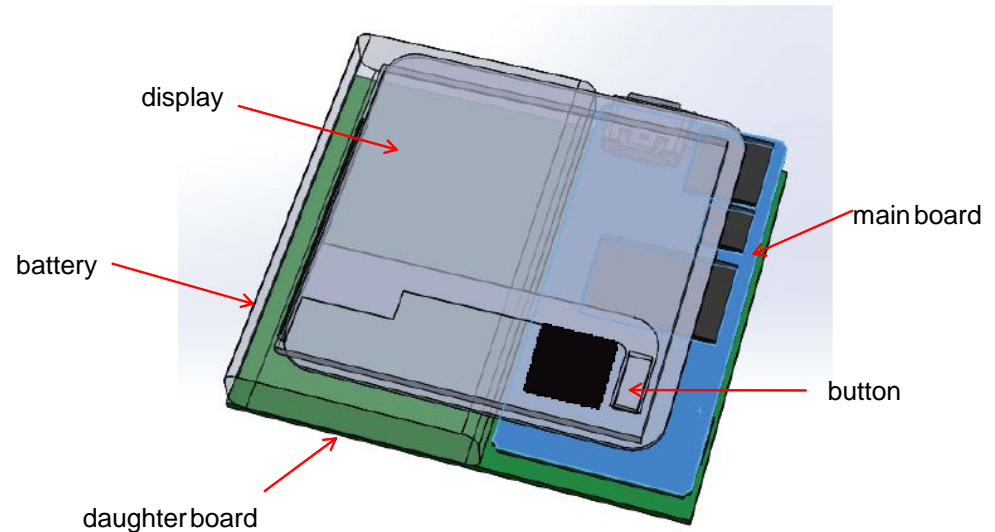
Hardware Overview

- **Main board (APB) based on i.MX 6SoloLite applications processor, runs Android and provides:**
 - Bluetooth and Wi-fi 802.11
 - Power Management - Integrated Lipo charger
 - 6-axis Accelerometer and Mag sensor
 - Supports LCD and E-ink display
 - Micro USB OTG for host USB and device power / battery charging
 - Daughter board expansion interface
- **User replaceable Daughter Board for expansion, based on Freescale Kinetis L Series**
 - Pedometer functionality with Freescale's MMA9553L sensor
 - Wireless charging
 - User interface buttons



Application Examples

- Time, chrono, lap time, alarms
- Smart music player with audio streaming via BT to headset
- Photo and video player
- Wi-Fi connectivity
- Compass
- Free fall detection
- Pedometer / activity monitor
 - Step counter (pedometer)
 - Motion detection (walking, running)
 - Distance traveled
 - Calories
- ECG & Heart Rate
- Wake up on motion
- Charging over USB
- Wireless charging



Wearables: Summary

- More than just smart watches
- Growing market covering multiple vertical segments
- Freescale, Kynetics and Revolution Robotics are building a scalable, modular, and open source reference platform that will evolve with market and enable innovation.
- The possibilities are almost endless!
- Available July 2014 via warpboard.org

WaRP

Wearable Reference Platform

Open source design files
Open source version of Android

WaRPboard.org



Enablement: AFE Reference Platforms



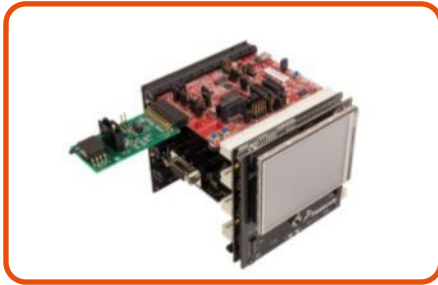
Healthcare AFE Reference Platform

- **Gain Valuable**
 - Healthcare Expertise
 - Proven leader
 - Medical Center of Excellence
 - Leadership in Continua Health Alliance
 - Strong partner ecosystem
- **Speed Time to Market**
 - Accelerate development time
 - Comprehensive design platform
 - Kinetis K53 MCU
 - Online, on-demand resources
- **Lower Development Costs**
 - Reduce system cost, board size and complexity
 - Scalability and analog measurement engine
 - Tower System
 - 15 years assured supply

Speed development time for portable medical devices with a complete hardware platform, schematics and software



Healthcare AFE Plug-In Boards



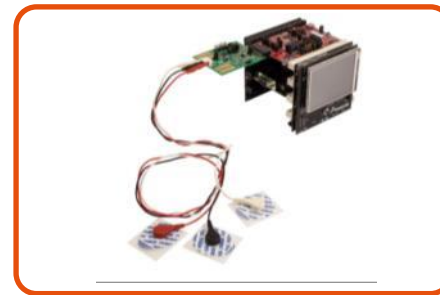
MED-BPM

- Blood pressure monitors
- Isolation circuitry for an air pump and escape valve, designed for 3–3.3 V



MED-STETH

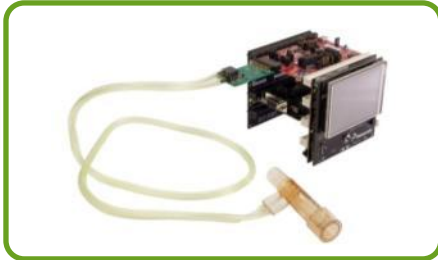
- Digital stethoscopes, fetal heart rate monitors
- Based on ultrasonic waves



MED-EKG

- EKG, heart rate monitoring
- Scalable

Cardio-vascular



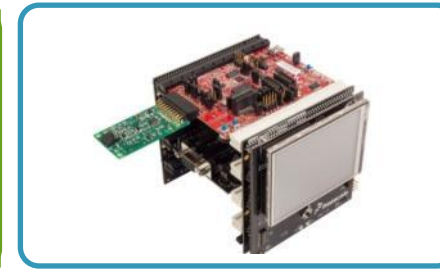
MED-SPI

- Spirometer solution
- Differential pressure sensor that facilitates the measurement of air flow and allows calculation of lung capacity measurement



MED-SP02

- Pulse oximetry solution requiring an SpO2 or beats per minute determination using non invasive procedures
- Reduced in size



MED-GLU

- Single-board glucometer solution
- Reduced in size
- Together with Tower System, a complete solution including serial communications and LCD screens

Metabolic

Enablement IoT



IoT Is More Than M2M

The Internet of Things (IoT) is about Machine to Entity (M2E):

- **Machine to Machine:**
 - Automatic diagnostics for cars: Automatic information collection from your car's engine management system and sending real-time alerts to drivers or service centers
- **Machine to Infrastructure:**
 - Automatic bridge monitoring: Sensing and monitoring the structural integrity of a bridge in case of flooding
- **Machine to Human:**
 - Automatic health monitoring for people: Implant monitoring services or disease management via implantable electronics
- **Machine to Nature/Environment:**
 - Early detection of earthquakes: Distributed sensors to detect early tremors in specific places

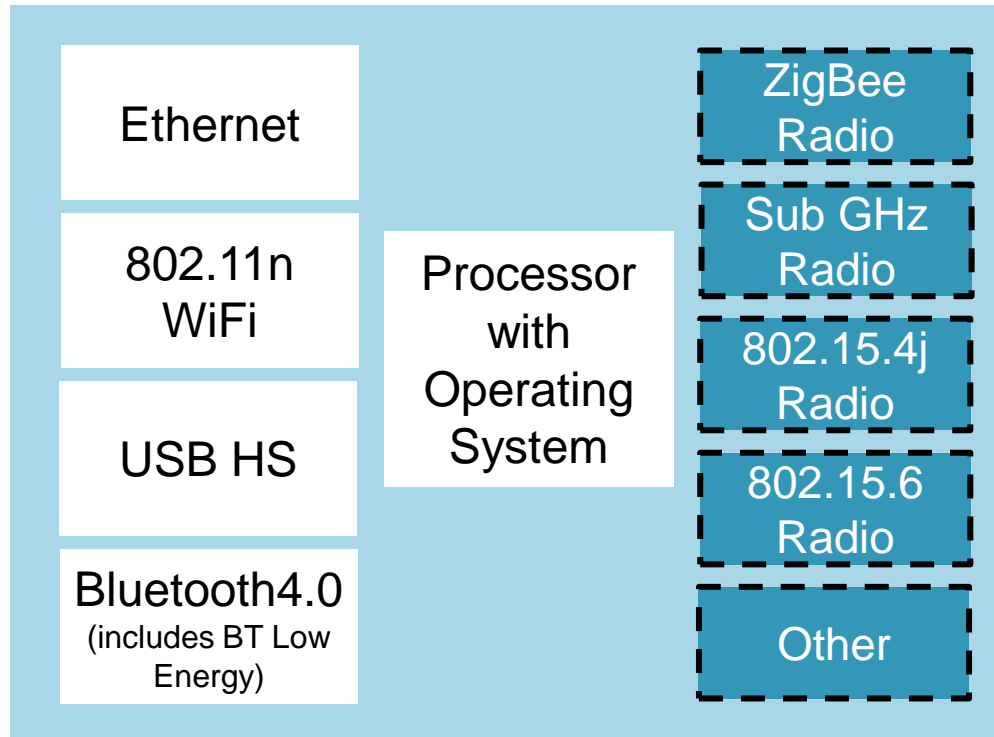


Machine to Machine (M2M) refers to technologies that allow both wireless and wired systems to communicate with other devices of the same ability



One-Box: What is It?

Configurable “One-Box”

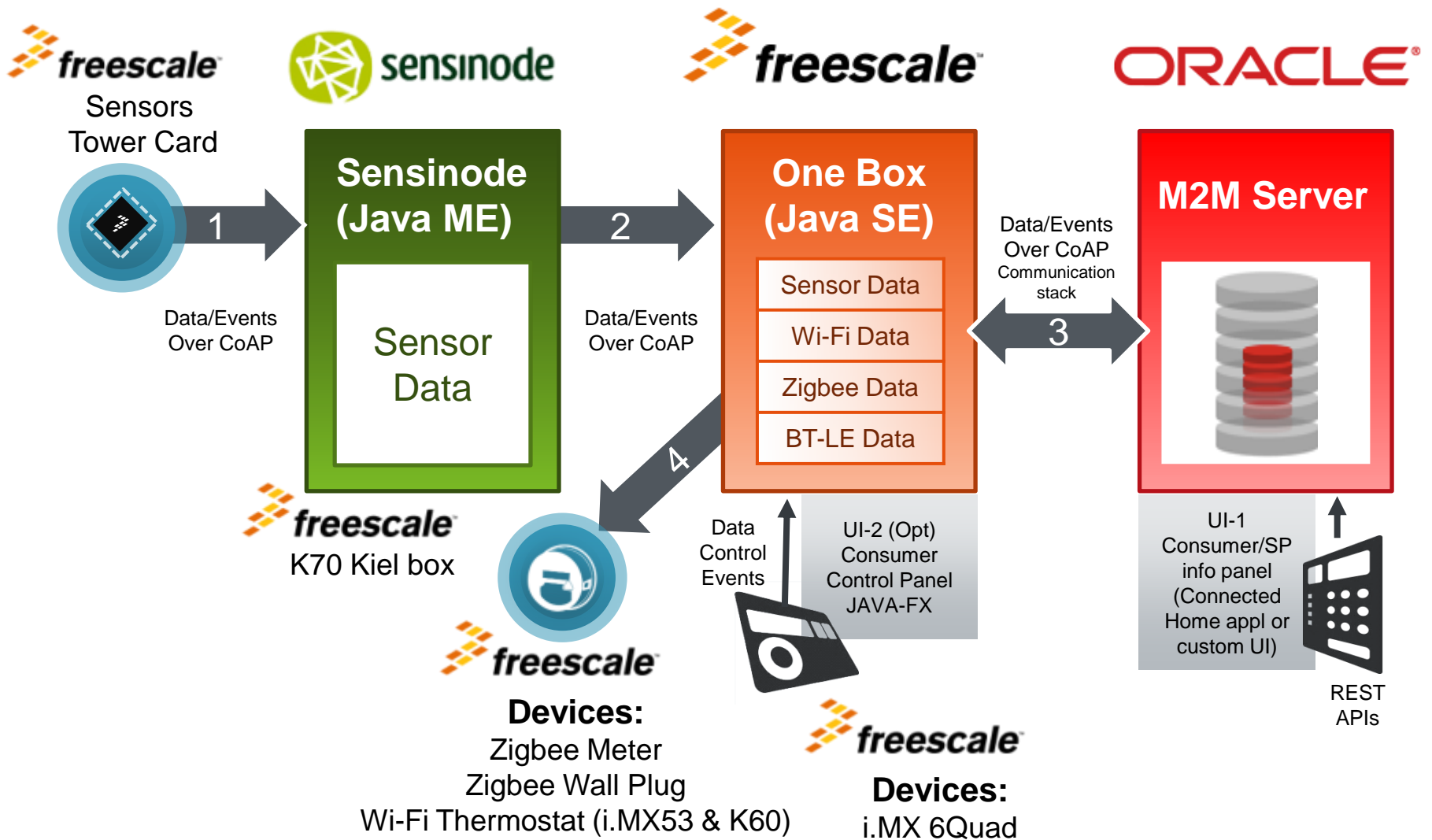


ORACLE®

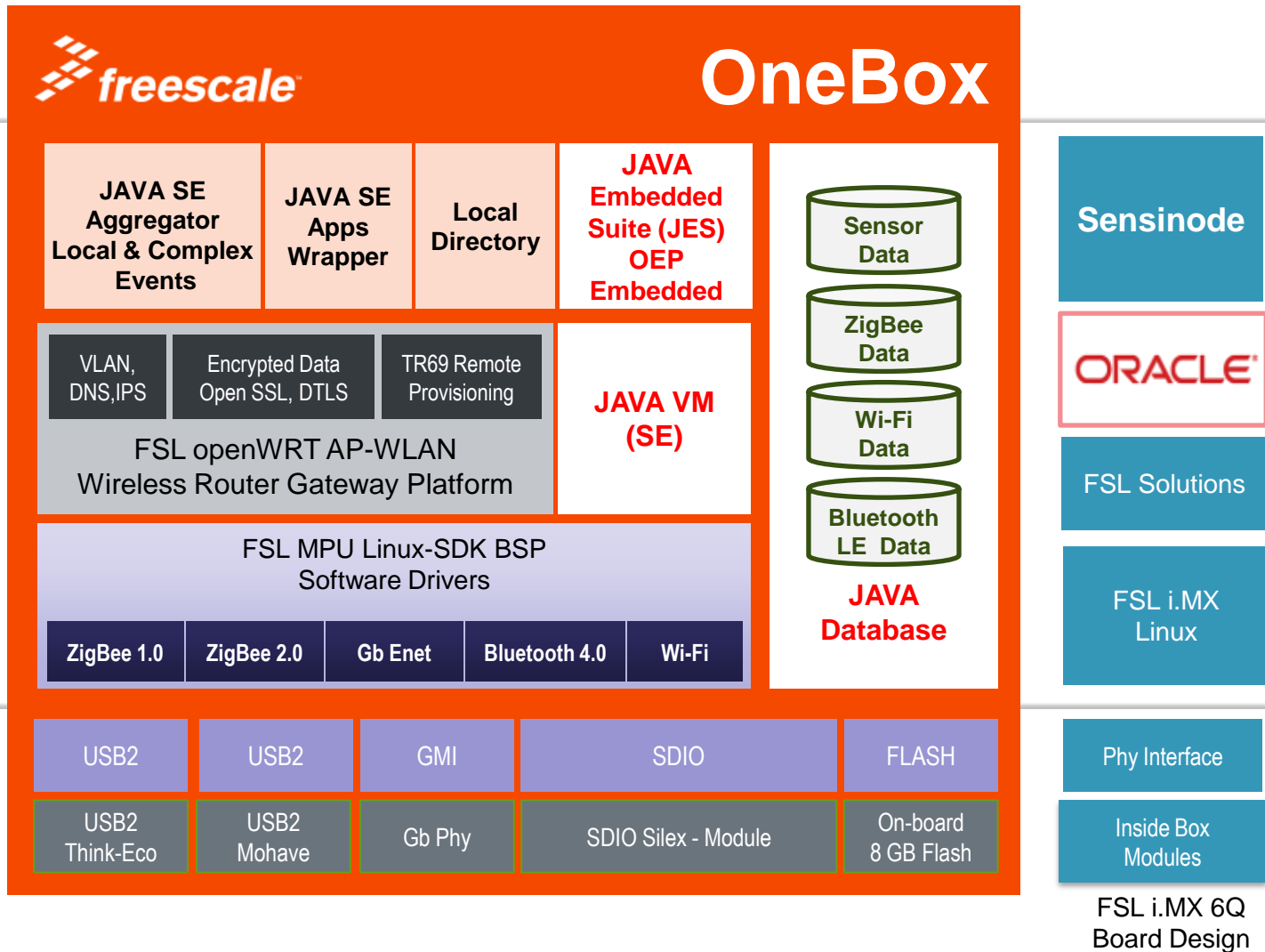
Optional Plug-In Modules

One-Box is a scalable gateway device using scalable i.MX or Kinetis SOC's and built with JAVA for Oracle big data services

ARM TechCon Demo: Sensinode – OneBox – Oracle

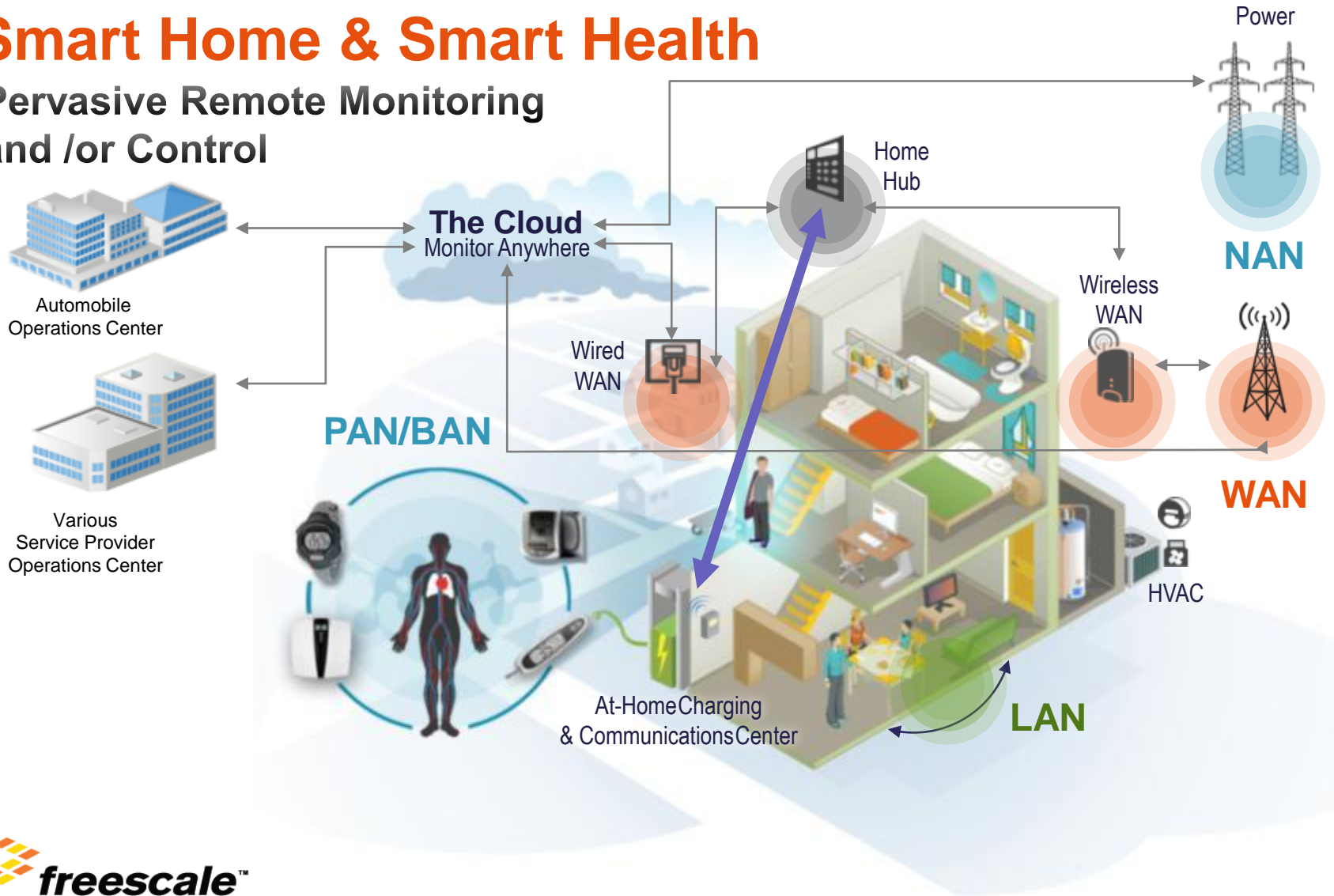


OneBox Software/Hardware (i.MX 6 Based)



Smart Home & Smart Health

Pervasive Remote Monitoring and /or Control



Home Health Hub Reference Platform

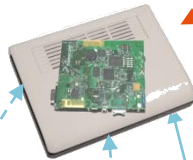
Health Care

Tablet with
Medical User
Interface (i.MX6)



Ethernet

Reference Platform
Gateway (i.MX28)



- Physician
- Social Networking
- Monitoring Center
- Loved Ones

HOME AUTOMATION

Expanding the
Reference
Platform

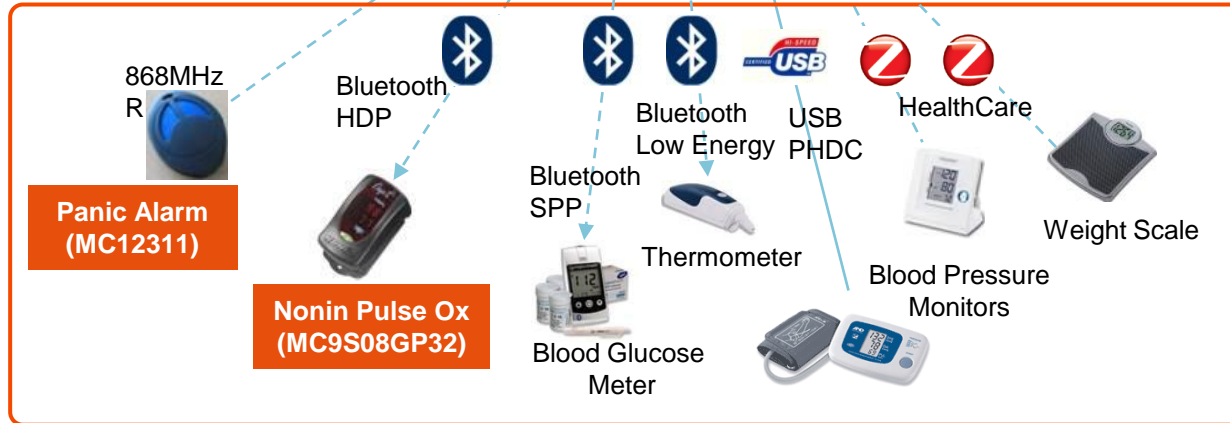


Smart Plugs
Smart Appliances
Safety/Security
Lighting Control
Local Display



- Wired connection
- - - Wireless connection
- Medical monitoring
- WWW connection

Telehealth



Home Health Hub Reference Platform

Health Care

Tablet with
Medical User
Interface (i.MX6)



- Physician
- Social Networking
- Monitoring Center
- Loved Ones

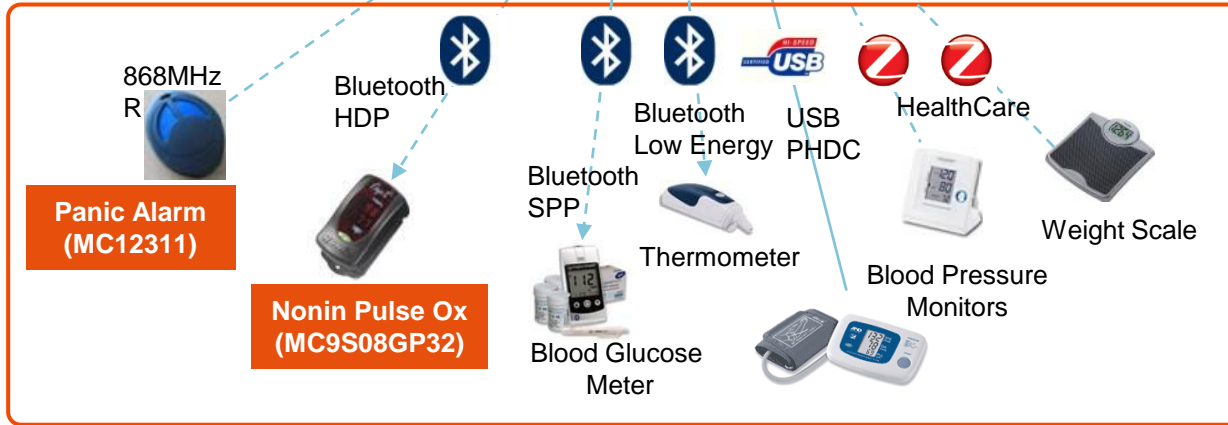
Reference Platform
Gateway (i.MX28)

HOME AUTOMATION

Expanding the
Reference
Platform

- WiFi Smart Plugs
- Smart Appliances
- Safety/Security
- Lighting Control
- Local Display

Telehealth



Orange is the new Black



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