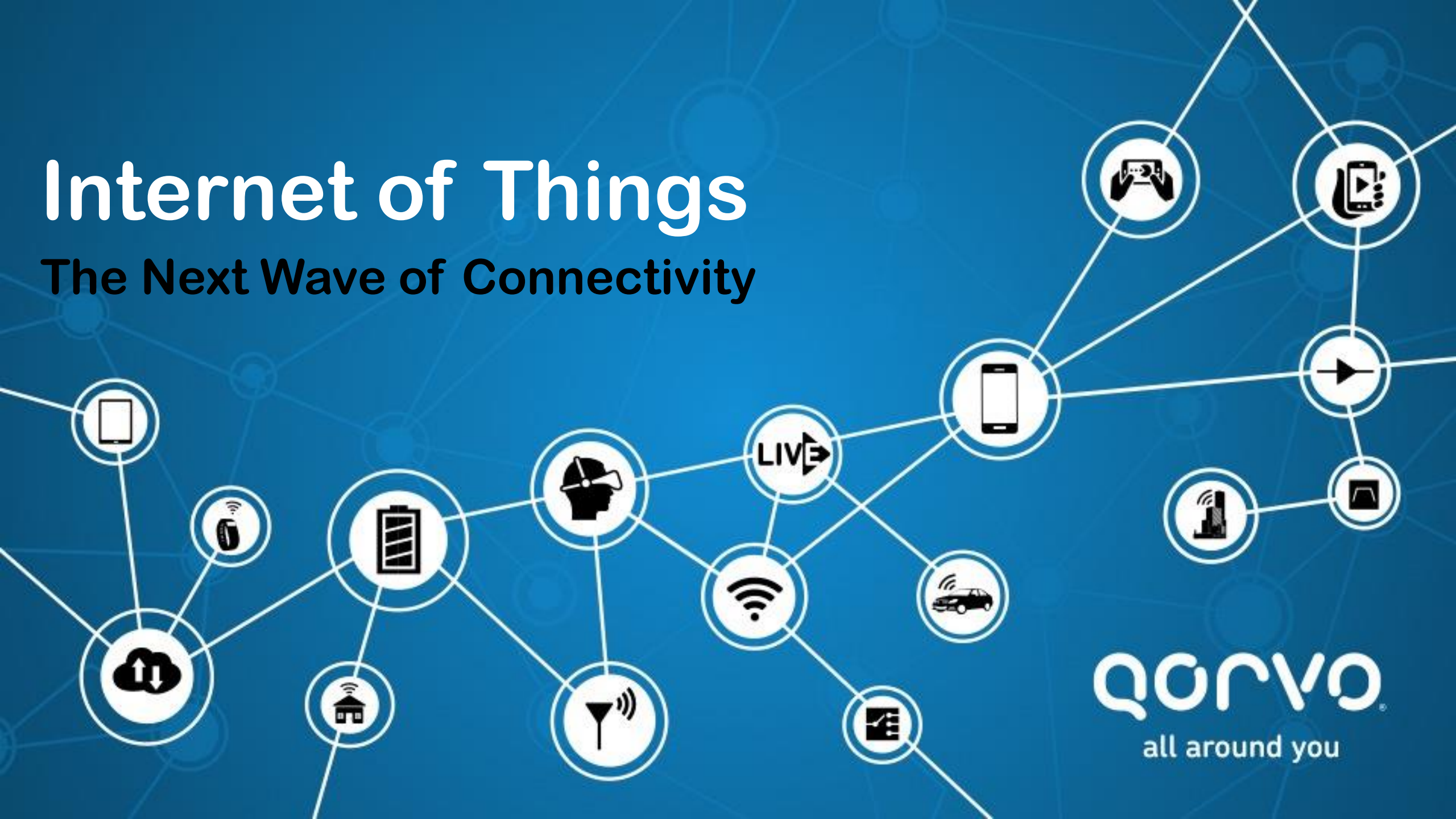


Internet of Things

The Next Wave of Connectivity

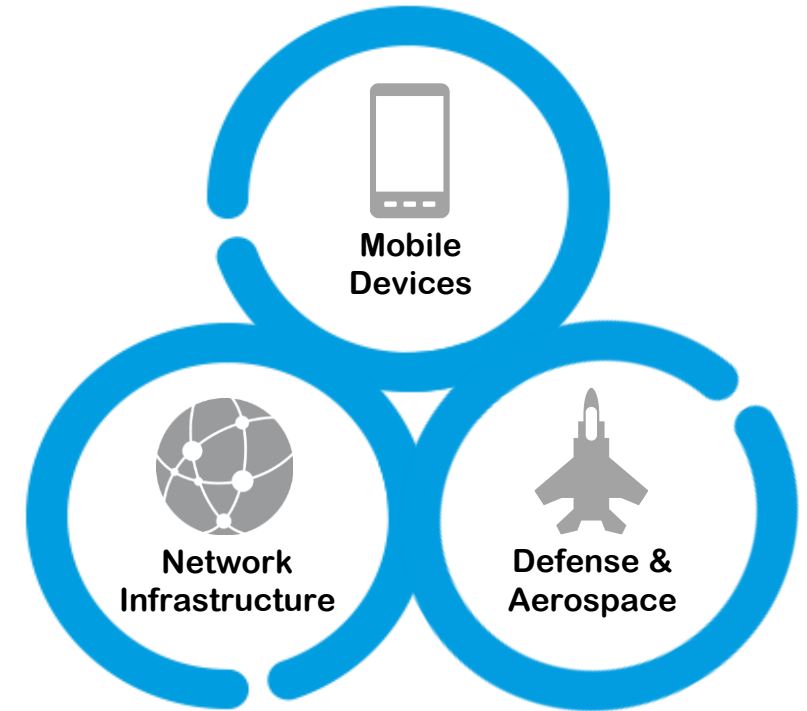


QORVO
all around you

We Are Qorvo®

Innovative RF solutions for everything that connects our world

- Qorvo, a diversified market leader in RF solutions, provides the industry's broadest portfolio of critical enabling technologies with expertise in mobile devices, complex infrastructure and global aerospace and defense applications
- Provides leading companies with core RF technologies, products and systems-level expertise to quickly solve most complex technical challenges
- +8,000 global employees
- 2017-May: trailing 12-month revenue is US\$3 billion
- An S&P 500 company – Nasdaq: QRVO



qorvo®

all around you



Qorvo Presence in China

Qorvo China

- 3,000+ employees
- Marketing/sales
- Technical support
- R&D
- Manufacturing



Enabling Wireless Communications

We design, develop and manufacture high-quality RF components that enable wireless communications

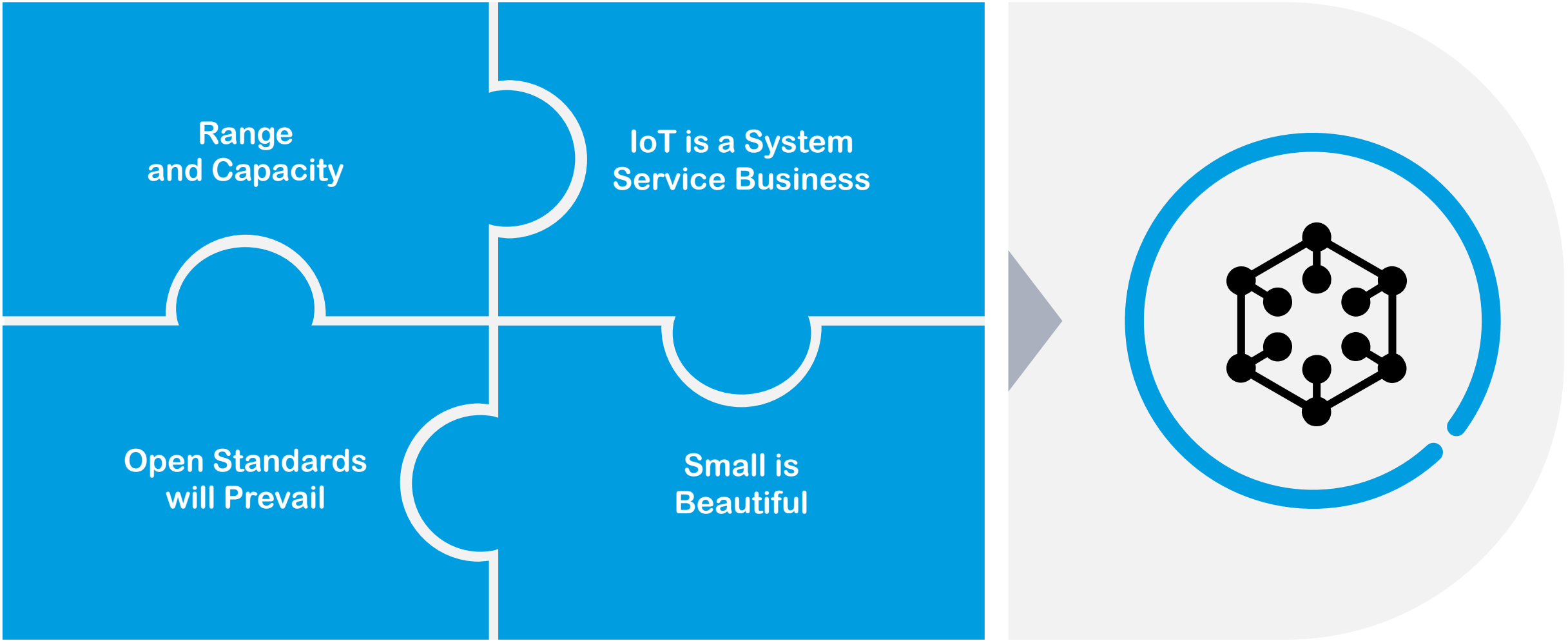


We're in billions of devices all around you – helping to enable the modern connected world

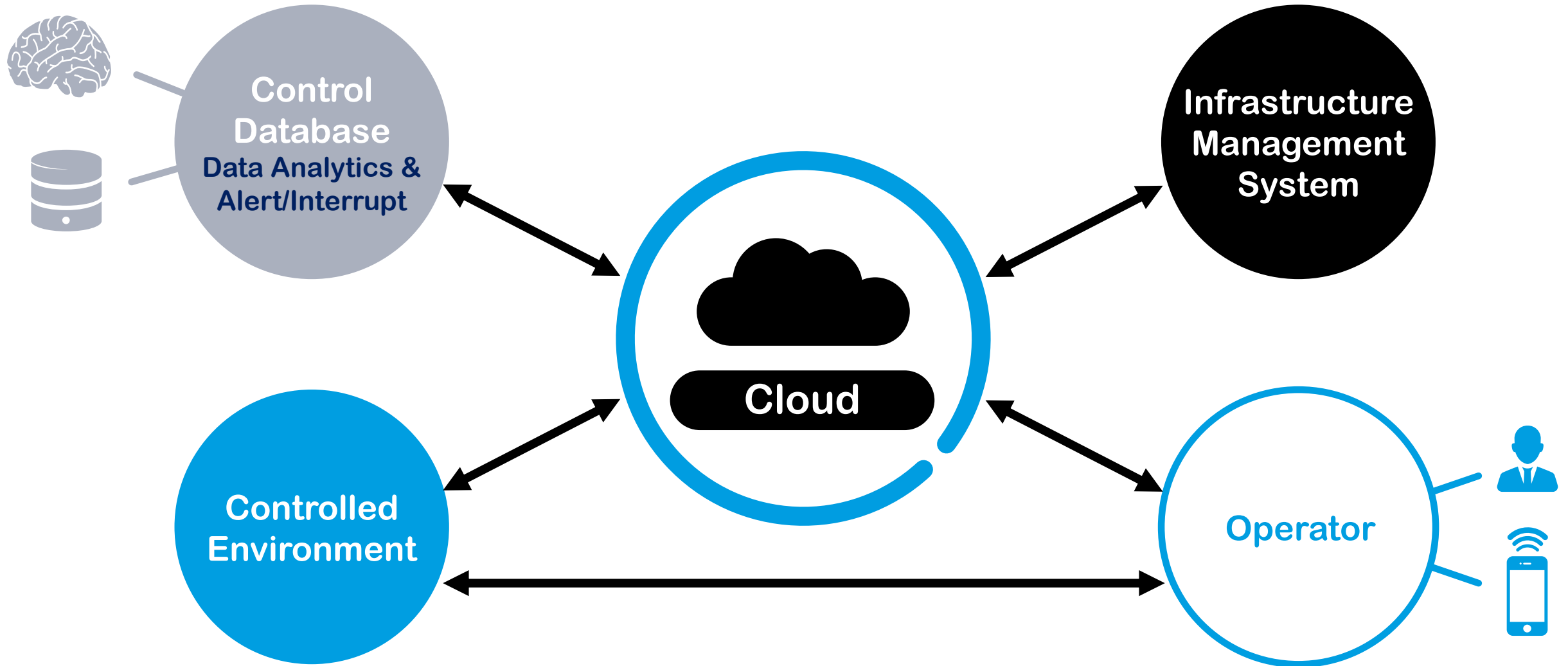


Qorvo Expertise To Develop Solutions

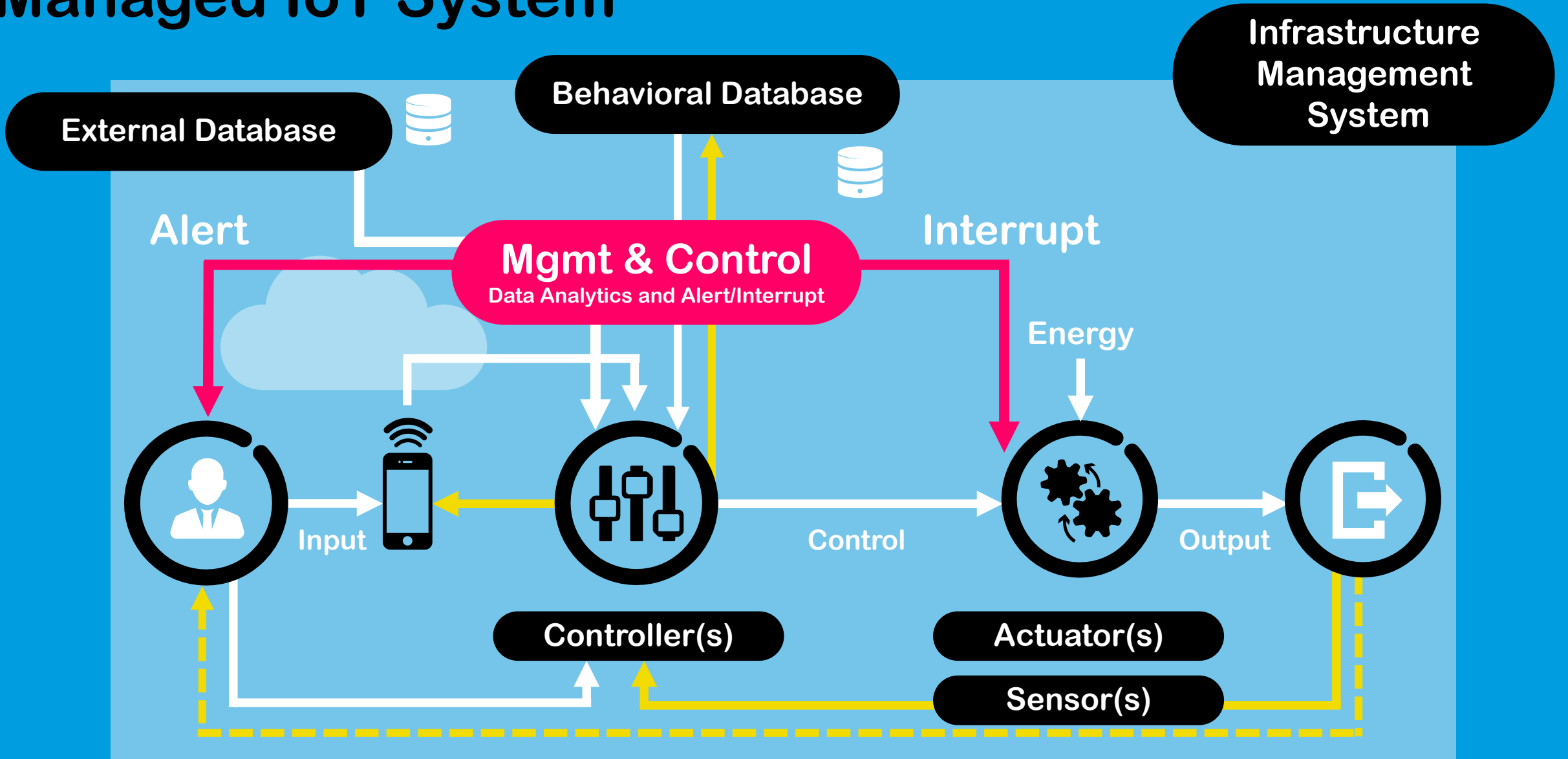
New Markets require New Understandings



IoT Template



Managed IoT System



Qorvo Partner Solution for Seniors

Differentiators

- Small and non-intrusive sensors
- Full home coverage
- Long battery life – ultra-low energy consumption (no need to change batteries)
- No need to wear bracelet or wristband
- Enable friends and relatives to provide care even from a distance to the seniors
- Increase the efficiency of “neighbourhood nurses”, community centres
- Available to consumers or (local) government at low price

1

Privacy

No cameras, only authorized users can access

2

Installation

Easy to deploy, up to 5 years standby time

3

User Experience

Unobtrusive sensors, small and discrete

4

Algorithm-Based

Algorithm based on cloud computing and smart learning

5

Targeted

Developed for elderly people living alone



Qorvo's ZigBee Products – Uniquely Differentiated

Ultra-low power

- ULP RF/MCU architecture, including power manager, scheduler
- Eliminates need for battery replacement: increases reliability, reduces cost
- Extremely low energy usage: sensors, end nodes are maintenance free

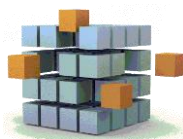


- Antenna diversity enables highly reliable communication
- Lower packet retransmission rates result in lower energy usage
- Full home coverage, comparable to Wi-Fi

Superior reliable range

Interference robustness

- Wi-Fi/Bluetooth interference rejection: 1,000x times (30dB) better than competing solutions
- Unique indoor radio signal stability



- Multi-radio (BLE/15.4), multi-channel RF technology
- Multi-protocol for multiple independent and concurrent networks
- HW MAC allows easy integration into hosted devices

Advanced multi-radio/channel/protocol

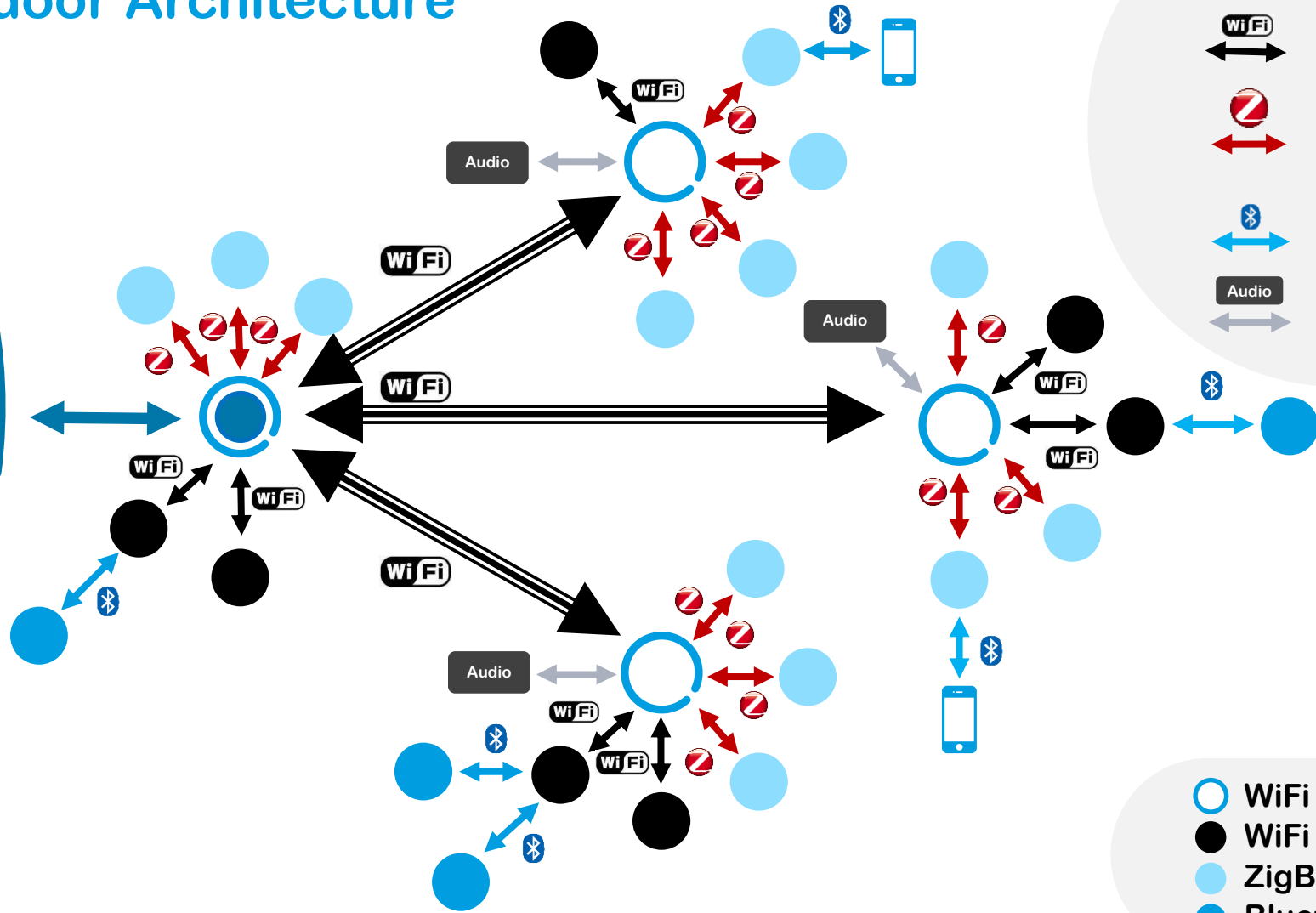
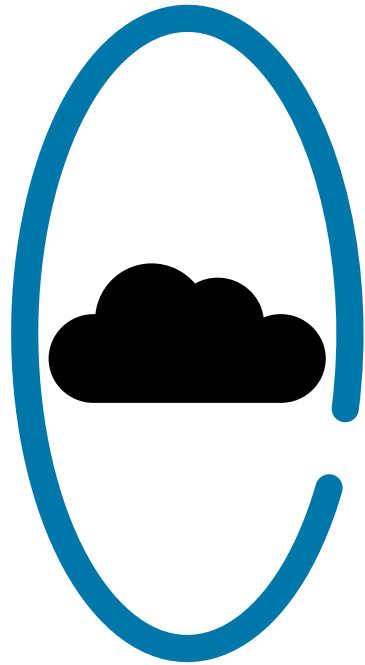
Low integration cost






- High level of on-board component integration
- Runs on single layer PCB (compared to 4-layer practice)
- Lowest cost solution with potential savings of up to ~25% on BoM




One Pod per Room

Wireless Indoor Architecture



-  WiFi, interconnectivity back-bone
-  WiFi, high-speed connectivity
-  ZigBee, low-power networking
-  Bluetooth, wearables connectivity
-  Audio interfacings

-  WiFi distributed infrastructure
-  WiFi end-devices (phones, PC's, TV's...)
-  ZigBee sentrollers
-  Bluetooth wearables



Wireless Connectivity Success Stories



- To introduce new services, reduce churn and increase ARPU
- To drive competitiveness and stay ahead of the technology curve
- To reduce service calls/support cost



- To become a major player in IoT security (home, building and industrial)
- To find a leading-edge technology supplier with worldwide ecosystem and access to MSOs

Solutions offered by Qorvo

- Delivery of multi-stack chips to the supply chain of Comcast (STB/GW)
- Hybrid IR/RF chips for remote controls enabling a ZigBee RC business model
- Embedding Bosch in the Qorvo ecosystem and allowing them access to the MSO universe
- Complete system solution offering by Qorvo in terms of hardware/software and RF design

Testimonials

“We are moving to support ZigBee RF4CE standards-based remote controls and set-tops because they improve the user experience for navigating all our services in the home while allowing us to make the transition to RF technology in a very cost effective way”

*Ted Grauch, Ex-Vice President,
Video Premise Equipment*

“Smart home services like remote control of doors, thermostats and lighting, all centrally monitored and controlled by the set-top box/gateway, are very enticing for cable and service operators. These new services will provide both increased customer loyalty as well as additional revenues. We are happy to join forces with Qorvo because their silicon guarantees robust and reliable interference-free communication of our high end sensors throughout the whole home”

*Peter Ribinski, Board Member,
Bosch Security Systems*



Wireless Connectivity Success Stories – China



创意感动生活
The Creative Life



- To become a major international player in a the Assisted Living space
- To partner with a technology/system provider with a complete end-to-end solution
- To leverage Qorvo's contacts in the world of the MSO's
- To become the top brand in smart home
- Focus on home care with intelligent hardware + intimate service + big data operations as the core

Solutions offered by Qorvo

- Ecosystem with low cost product providers to put together a competitive solution
- Best in class in range and low power
- Ecosystem including gateway and sensors with low cost product providers to put together a competitive solution
- Best in class in range and low power

Testimonials

ZTE Health strives to provide smart home solutions and services that go beyond our customers' expectations. The Senior Lifestyle application will allow elderly people to stay at home for 5 to 10 years longer, which means huge savings for families as well as for the governments on investments in nursing homes. ZTE Health wants to offer its customers and their family the highest possible quality of life and contribute to a harmonious community."

He Shiyou, President of ZTE Health & Executive Director of the Board of ZTE Corp.

TCL provides on services around living environment, safety management, spiritual entertainment, health care and other aspects of the core features.

TCL focuses on multidirectional services including intelligent control for comfortability at home, / on-site services / health management / emergency relief / entertainment and other aspects of services.

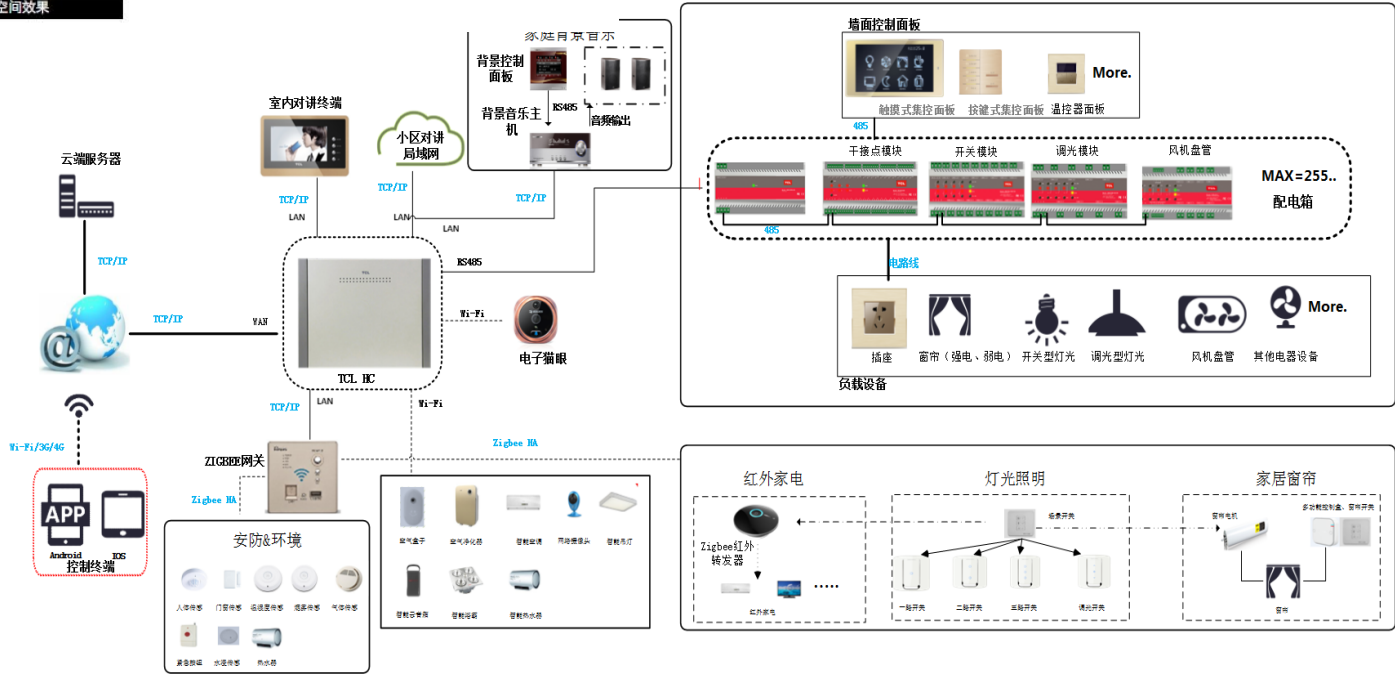
Sun Xiaoli, CTO and Assistant General Manager of TCL Smart Home Technologies Ltd.



TCL Using Qorvo ZigBee Solution

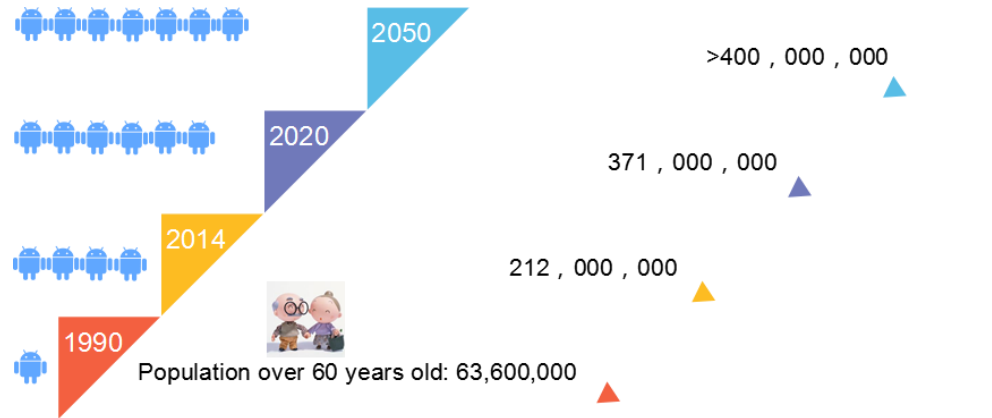


产品展示区“整体”空间效果

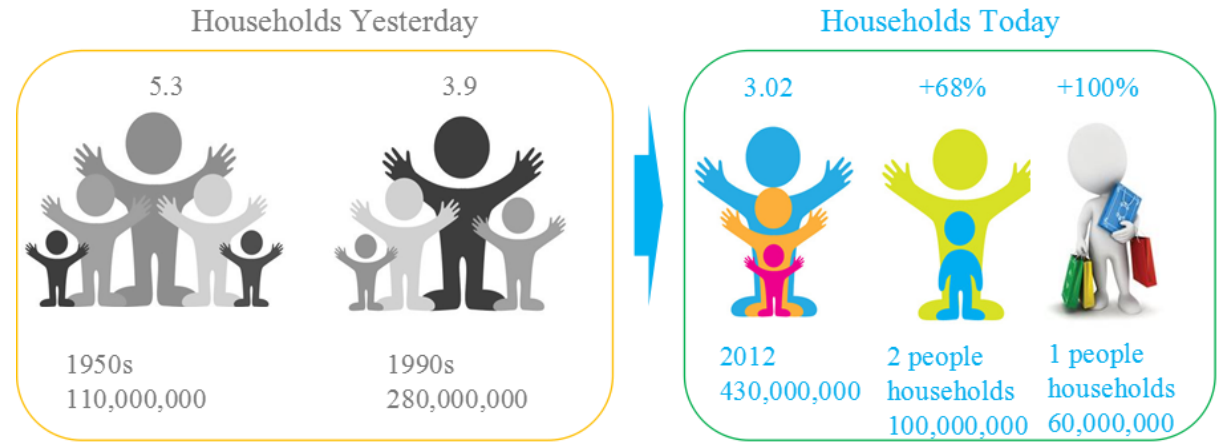


China Senior Situation

Fundamental Problems require Fundamental Solutions



Source: Ministry of Civil Affairs



Source: China Family Development Report 2015

- Dec 31st 2014, elderly people in China increased to **>200M - 15%** of total population
- Mar 2015, the total capacity of nursing home is around 5 million - can cover only **<3%** of the elderly population
- One couple will take care of 4 elderly people even if they are not living together
- **50% - 100 million** elderly are NOT living with their children – **10%** are living alone
- **The gap of pension requires a smart and economic solution as well as a dedicated service provider**



Qorvo Assisted Living System

Solution - Helping Seniors Live Independently at Home



Slim sensors



Suitable for all homes



Data is translated to secure app that identifies and alerts



Resident: better quality of life



Caregiver: peace of mind, less stress

- Easy to install and use: 5 sensors + 1 gateway
- Alerts on irregular behavior & potential danger
- Detects long-term behavioral trends – analyses sleeping, eating, walking patterns
- Peace of mind for both seniors and care givers
- New revenue for operators, insurance companies



Why, What and How

- 15 years of research to support elderly in their independence via smart monitoring
- Resulting in quality of life for the elderly, cost effective care and less stress for informal care
- We all want to grow old in our own home, in our neighborhood with our friends and if that's not possible in a respectful environment.
- Create a safer environment at home. Offer preventive healthcare advice. Alert the elderly and their contact person (private and/or professional) when really needed
- Offer a modular system of sensors and other devices generating data 24/7 from which detect medically certified profiles while respecting privacy (no cameras).
- The profiles target at safety, prevention and emergencies



Prevention is key

- **25%** of elderly receiving care are malnourished
- In **47%** of fall incidents the alarm button is out of reach
- **200,000** elderly have one social interaction each month (Europe)
- **2 weeks** on average before UTI is diagnosed at Alzheimer patients
- **3 times a night** elderly wake up when nurses check if they are in bed
- By knowing better, you can provide better care. Smart lifestyle monitoring detects (early stage), prevents and makes some procedures obsolete



Prevention

- **Malnourishment:** reduction of kitchen activity is an indication of a change in eating habits
- **Fall incidents:**
 - Reduction in gait speed is an indicator for increased risk of falling
 - Suspicious inactivity alert does not require pressing a button and covers 100% indoors
- **Social isolation:** Trends of time spend outside and number of visits indicate social isolation
- **UTI:** Increase in toilet visits indicates UTI
- **Bed checks:** Monitoring 24/7, physical checks no longer necessary



Main functionalities of Qorvo HomeCare

- **Alarms**

- Alarm button
- Fall detection
- Wander detection
- Did not arrive home at night
- Did not get out of bed in the morning

- **Trends**

- Sleep pattern
- Gait speed
- Activity in the house
- Time spend outside
- Toilet visits
- Kitchen activity

- **Preventive care alerts**

- Risk of falling
- Malnourishment
- Dehydration
- UTI
- Social isolation
- Kitchen activity



Qorvo Home Care

- **Apartment Set**
 - 1x Gateway
 - 3x PIR sensor
 - 2x door sensor
 - Cables and batteries



- **House Set**
 - 1x Gateway
 - 5x PIR sensor
 - 3x door sensor
 - Cables and batteries

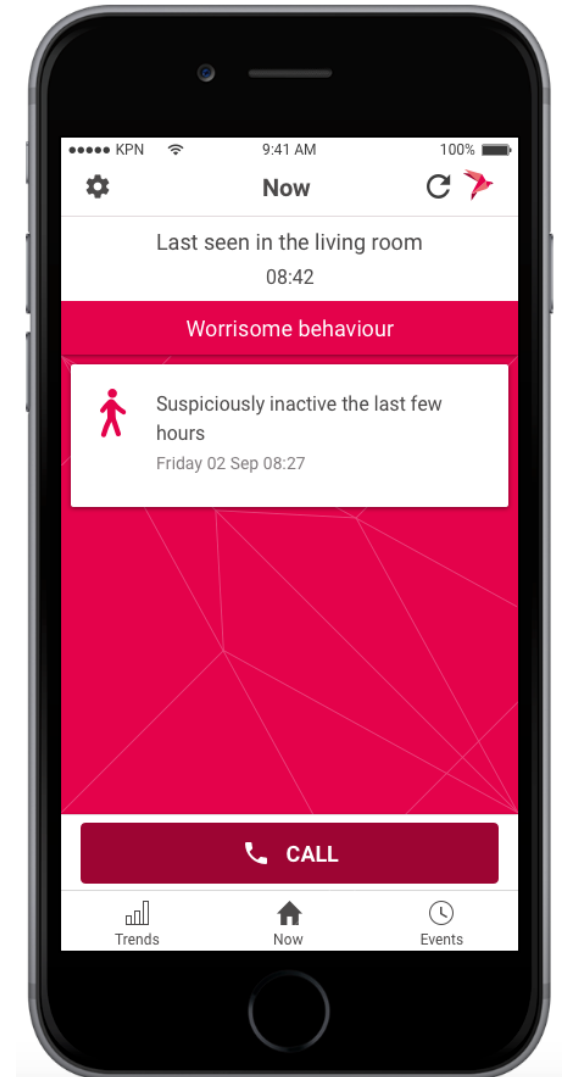
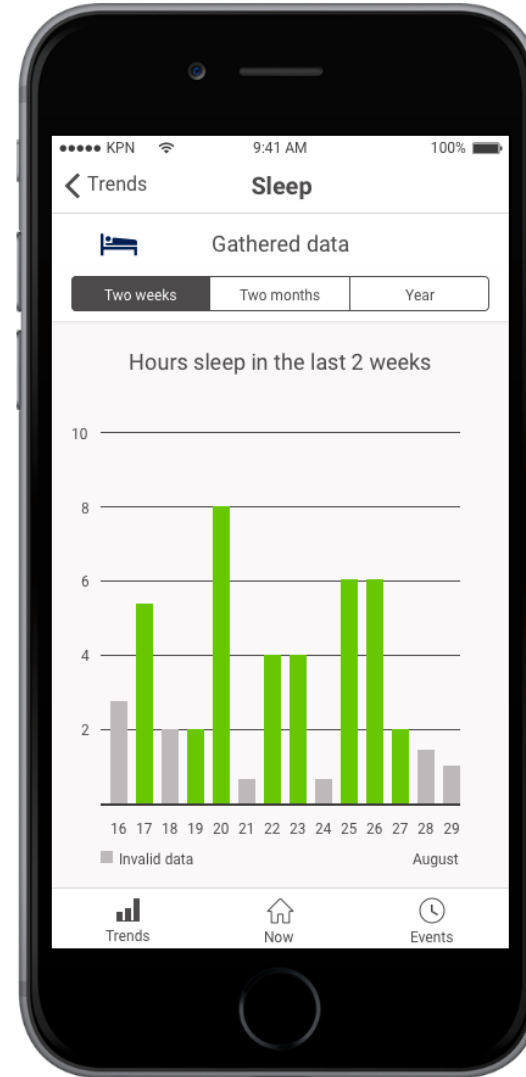
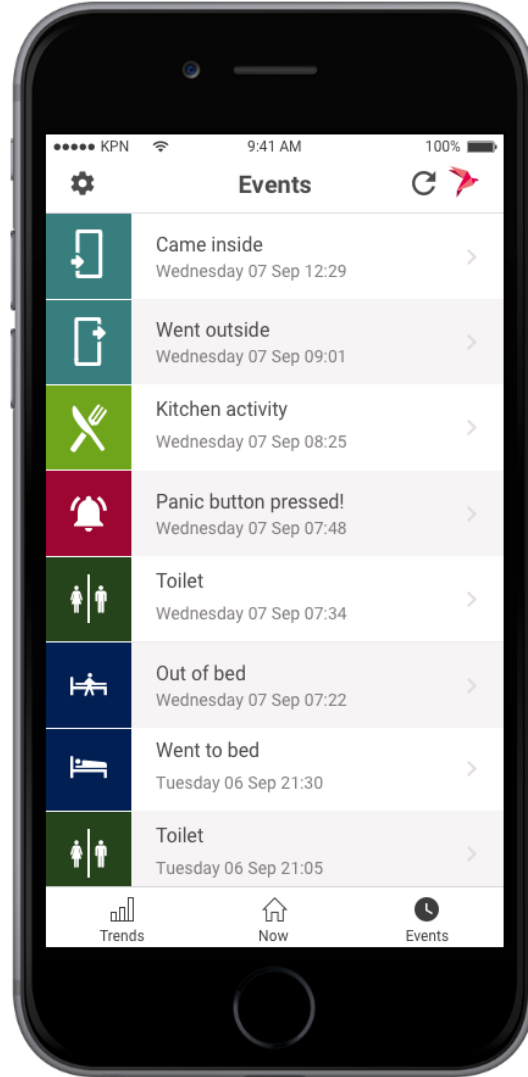
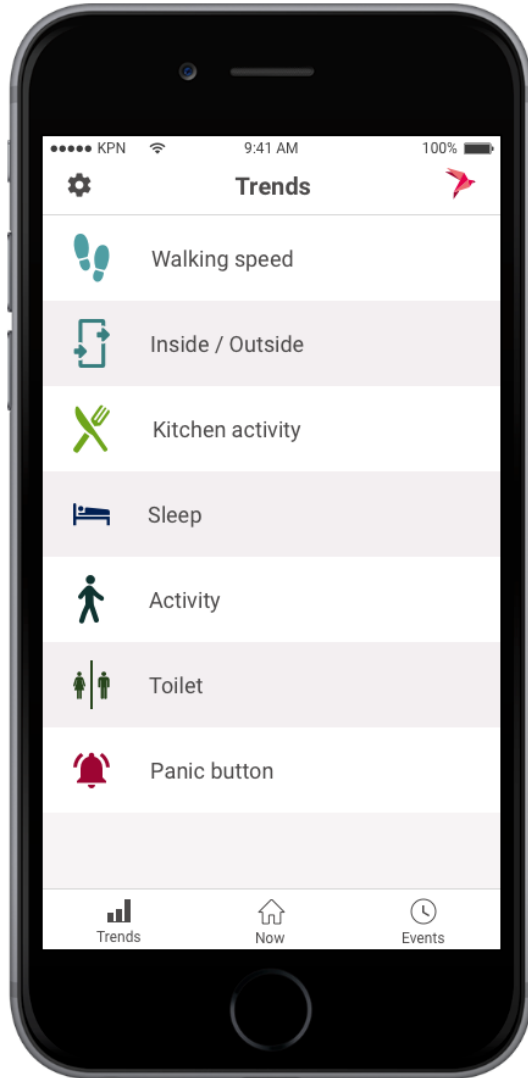


Self-install (30min)

- Preconfigured set (gateway and all sensors are already paired)
- Adding single sensors possible to adapt to local situation
- Qorvo Zigbee protocol ensures coverage in houses



Apps



HomeCare Case Manager Tool

(Multiple client interface for professional care)

sensara CASE MANAGER IREKADMIN@MYSENSARA.COM

SECTOR 1 RESIDENTS (5) EVENTS Notifications All GRAPHS 2 Weeks 2 Months Year

SECTOR	Name	Room	Status
SECTOR 1	Thijs		●
SECTOR 1	Marja		●
SECTOR 10	Louis		●
SECTOR 2	Jan v V		●
SECTOR 2	Evelyn		●
SECTOR 3			
SECTOR 4			
SECTOR 5			
SECTOR 6			
SECTOR 7			
SECTOR 8			
SECTOR 9			
SECTOR NAME 1			
SECTOR			

Event	Time
Went inside	14:36
Went outside	14:35
Toilet visit	13:48
Toilet visit	12:34
Time getting asleep on this day strongly deviates from last week's average	12:01
At the door	10:01
Went inside	09:12
Went outside	09:11
Toilet visit	07:56
At the door	07:10
At the door	07:04
Toilet visit	06:52
At the door	06:39
Out of bed	06:38
Went to bed	02:54
At the door	02:45

Daily activities

Sleep

Date	Hours
11 We	2.5
12 Th	3.2
13 Fr	0
14 Sa	0
15 Su	4.5
16 Mo	5.5
17 Tu	0
18 We	0
19 Th	5.2
20 Fr	6.5
21 Sa	7.5
22 Su	3.2
23 Mo	5.0
24 Tu	0

Walking speed

Date	Speed
11 We	0.5
12 Th	0.4
13 Fr	0.6
14 Sa	0
15 Su	0.3
16 Mo	0.8
17 Tu	0.2
18 We	0.1
19 Th	0.1
20 Fr	0.1
21 Sa	0.3
22 Su	0.5
23 Mo	0.2
24 Tu	0.2



Knowing better, is caring better

Advantages for the elderly

- Ability to live in your own house while feeling safe
- Increase in quality of life due to prevention based on medically verified profiles instead of curing
- Tailored care package to meet the personal needs in the specific environment
- Informal and professional care have information to discuss the relevant health issues
- Stress relieved of the informal care because of the 24/7 watchful eye
- Improved relationship with the children, no need for same questions to elderly everyday to determine well-being
- Overall result: Spend your days in your trusted environment



Knowing better, is caring better

Advantages informal care

- Reassurance all is well where ever you are 24/7
- Alerts only when help is needed
(Competitor analysis: 2 real alerts per month vs 30 alerts per month)
- Early detection of possible health issues and the option to intervene at an early stage
- No obligatory calls to check-up, instead talking like mother and daughter again
- Sharing of the care responsibility between informal care close by and at a distance (sharing alert response)
- Overall result: less stress, less impact on own family, less strain on own health



Knowing better, is caring better

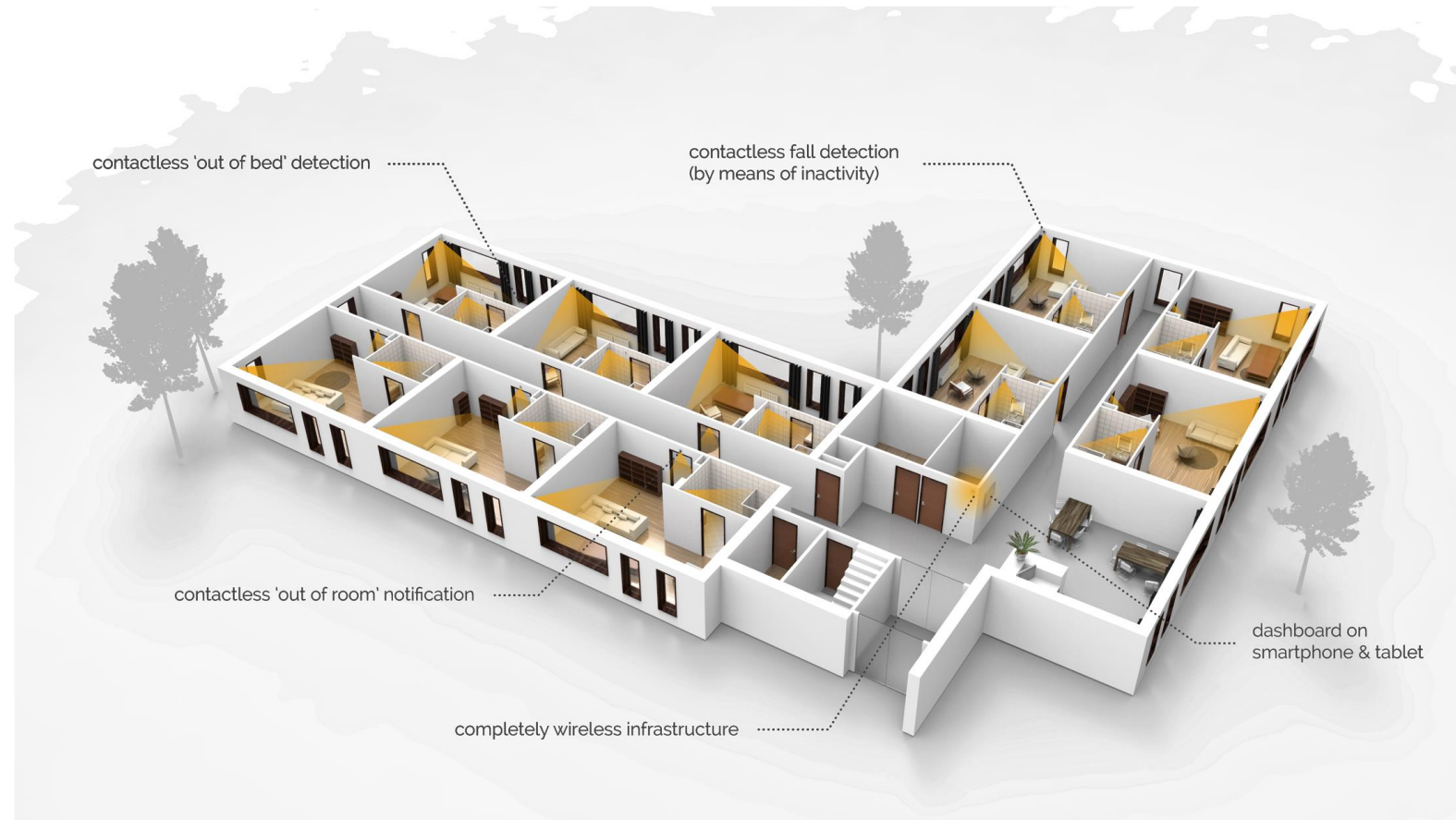
Advantages professional care

- **Early detection of health issues**
 - Change in eating behaviour; Prevention of malnutrition
 - Change in gait speed; Indication of increased fall risk, option to train in day-care
 - Change in toilet trend; Higher could be UTI or flue. Lower could be dehydration
 - Change in day/night rhythm; prevention of complete change of day/night rhythm
 - Change in visitors and time spend outside; could be an indication of social isolation
- **Early detection supported by graphs and event data to use in conversation with informal care on solution**
- **Ability to address the important issues with the elderly instead of asking and guessing what the issues are**
- **Closer collaboration with informal care**
- **Data to support conversation / diagnoses of physician**
- **Overall result: Increased quality of care and hour / cost reduction**



Intelligence & Privacy

- **Intelligent** - Self learning, no input required from user
- **Reliable** - Almost no false alarms or missed situations
- **Contactless & wireless** - Nothing on the body, no cables
- **Proven technology** - Thoroughly tested in the past 15 years
- **User friendly** - Intuitive human centred design, fast acceptance
- **Privacy friendly** - No camera's, individual profile setting
- **Flexible** - Individual profile setting
- **Scalable** - Multiple location on one system



IoT for Dummies

But you are Experts now!

- Published by Wiley and co-written by Cees Links, Father of Wi-Fi and GM of Qorvo's Wireless Connectivity business unit
- 2 volumes
 - Vol 1 - What is the IoT
 - Vol 2 - IoT Applications
- Download eBooks www.qorvo.com/iot-for-dummies
- Chinese version: <http://cn.qorvo.com/design-hub/ebooks/internet-of-things-for-dummies>



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