

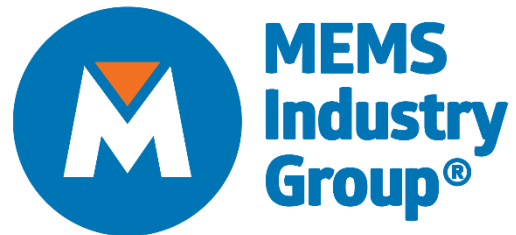
# Harnessing the Benefits of IOT Together

**MEMS Engineer Forum 2015**

**April 20-21**

**Yoshio Sekiguchi**

**MEMS Industry Group**

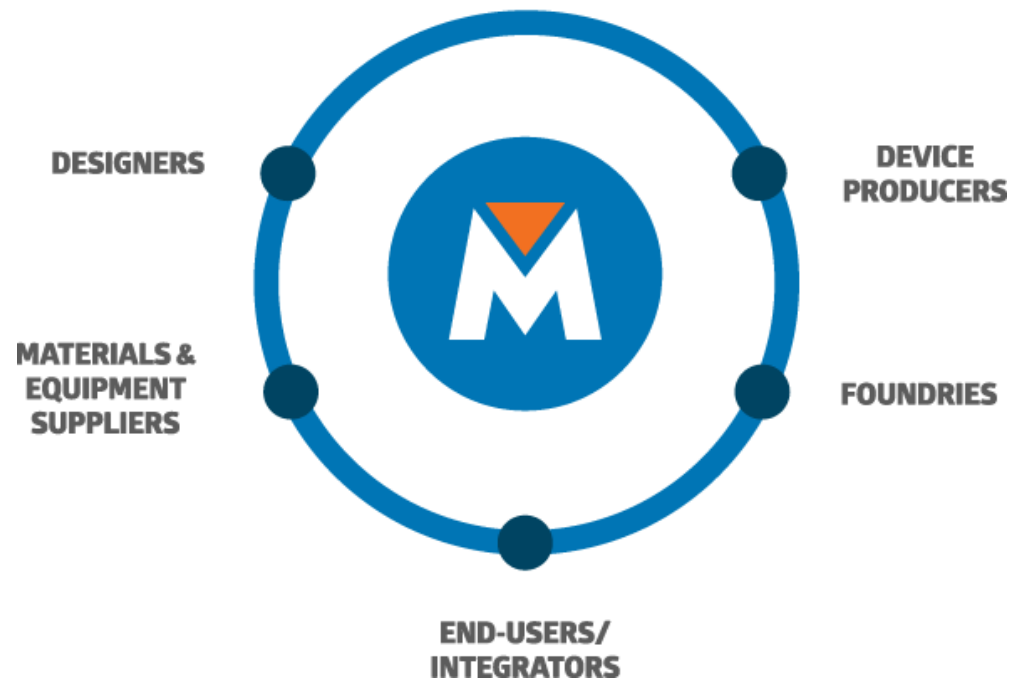


# Agenda



- Established in 2001, MEMS Industry Group (MIG) is a trade association advancing MEMS and sensors across global markets.
- Connects and champions the MEMS and sensors supply chain in established and emerging markets
- Enables the commercialization of MEMS and sensors – helping overcome technology and manufacturing hurdles
- 180+ member companies and partners

## Connecting the MEMS & Sensors Supply Chain



# As a member of MIG, you will...



**Connect** – MIG is the premiere place to meet MEMS and sensor companies across the entire supply chain



**Influence** – Drive solutions to business and technical issues common to MEMS and sensors



**Learn** – Discover the latest trends, discuss hot topics, get educated, hear fresh ideas

# Members

CAMBRIDGE CMOS SENSORS



DYNA IMAGE



OMRON



MEMS Industry Group

Audience



DYNALLOY



MERIT SENSOR



ACUTRONIC

AKUSTIKA



EMPOWER MATERIALS

knowles

micralyne



OXFORD INSTRUMENTS

SPTS



Audience



Energizer Personal Care

hillcrestlabs.



MICREL



life.augmented

a:etris BROADCOM

EPSON EXCEED YOUR VISION

Honeywell

ko so

microGen



SUSS MicroTec

TELEDYNE DALSA

AKrion systems

BK BROOKS KUSHMAN



Lam RESEARCH



UBOTIC

TEXAS INSTRUMENTS



BULLEN ULTRASONICS, INC.

ESS

invenios

inex

Plasma-Therm

silex MICROSYSTEMS

tronics

Amkor Technology

CrucialTec

Expertech

imt

Ling Star Technology



silex

ULVAC

ANALOG DEVICES

C2MI



FAIRCHILD SEMICONDUCTOR



Maradin

mCube



VIT

APPLIED MATERIALS

Fraunhofer ENAS

罕王微电子 HANKING ELECTRONICS

htc

maxim integrated

lenovo



SmallTech Consulting

wi Spry

APPLIED M S T

Fraunhofer IPMS

IntelliSense

LG Life's Good

lenovo

lenovo



SmallTech Consulting

wi Spry



ClassOne EQUIPMENT

infineon

IIC

Micron

micronit MICROFLUIDICS

NOVATI TECHNOLOGIES, INC.

SunEdison

SMART

Commercialization Center for Microsystems at Lehigh University Community College

XAAR

ASE GROUP

DRAPER LABORATORY

FRT

freescal

Micronit

THE NEDLOH GROUP

camLine

SONY

SPEC SENSORS

vesper

WAFER

apm

SMS-SERVICE

FRT

InvenSense

MEMSTAFF

NIST QUALCOMM

SolMateS

unisem

VIRTUALBEAM

ARM

COVENTOR



NovAtel

NXP

Qualtré

SITRI

SPT

VALENCELL

FAB MEMS FOUNDRY EXPERTS

COTO TECHNOLOGY

DeIFMEMS

GORE Creative Technologies Worldwide



brewer science

OKMETIC

OEN GROUP

Soft MEMS

Omni

ZMDI

# Partners



## Association Partners



## Event Partners



## Market Analyst Partners



## University Partners



## Media Partners



## Marketing Consultant Partner

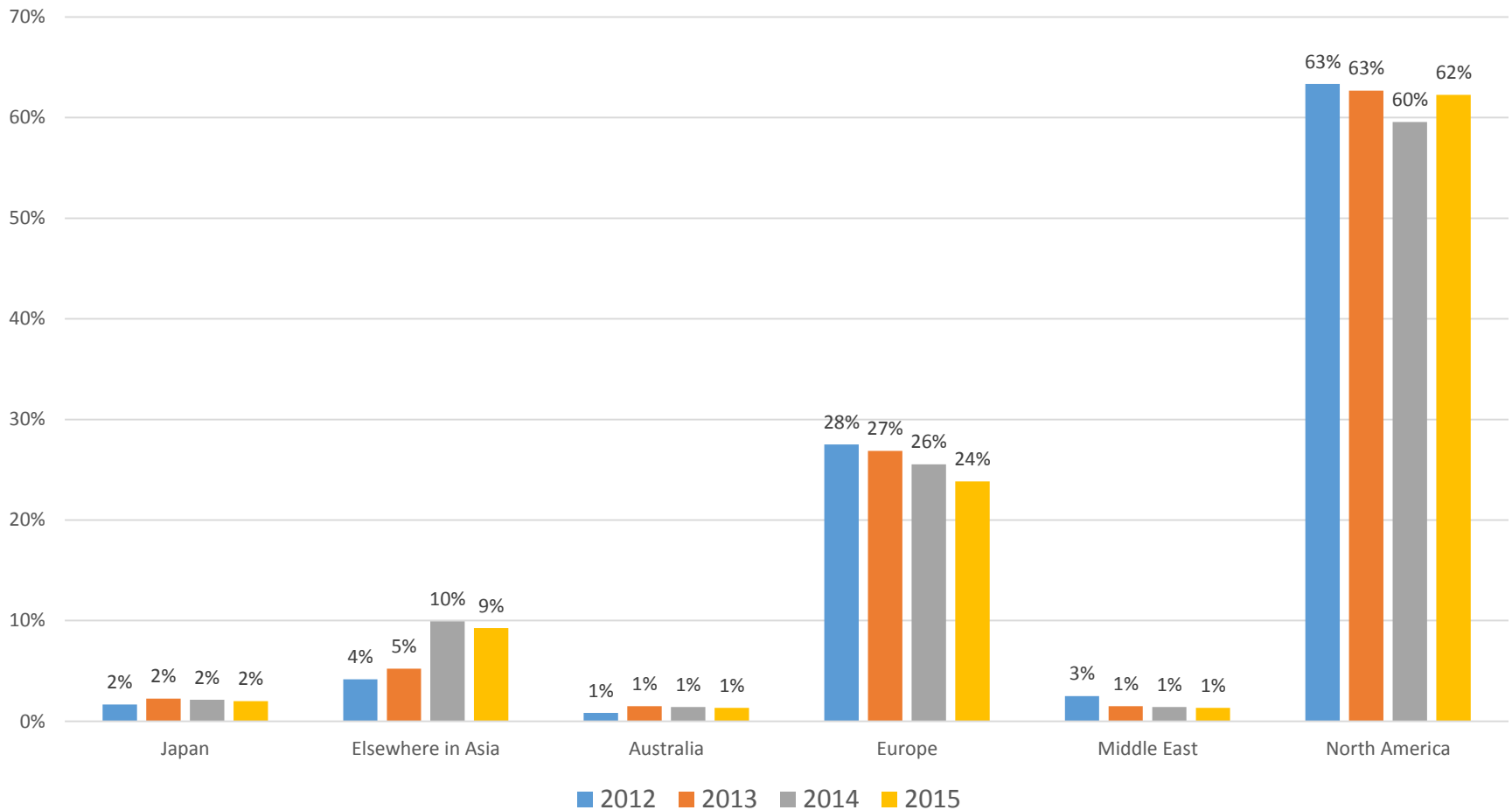


For a complete list of members and partners, please visit [www.memsindustrygroup.org](http://www.memsindustrygroup.org).

# Members by Region



## Members by Region 2012-2015



# Join MIG in 2015 at these MIG Events



**MEMS Technical  
Congress®**

May 6-7, 2015 | Boston, MA  
Hilton Back Bay Hotel

<http://memstechcongress.memsindustrygroup.org/>



**MEMS Industry Group®  
Conference Asia**

MEMS Industry Group Conference Asia  
September 2015 | Shanghai, China  
Web site Coming Soon!



**MEMS Executive  
Congress® us**

MEMS Executive Congress® US  
November 4-6, 2015 | Napa, CA

<http://us2015.memscongress.com/>



**MEMS Technical  
Congress®**

March 2016 | Munich, Germany  
Save the date!



# Join MIG in 2015 at our Partner Events



## sensors expo & conference

Pre-Conference Symposium & Exhibit  
June 9-11, 2015 | Long Beach, CA



Conference Session  
June 21-25, 2015 | Anchorage, AK

## SEMICON<sup>®</sup> West2015

Member Event  
July 14-16, 2015 | San Francisco, CA

# Opportunities and Challenges



**but...**



# How BIG will it really be?



## EVERYTHING WILL BE CONNECTED

Billions of wirelessly interconnected devices will communicate directly



Smart Homes  
Autonomous vehicles  
Agriculture  
Machine to Machine  
Smart Buildings  
Augmented Reality  
Smartphones  
mHealth  
Printed Electronics  
IOT

Drones  
Consumer Electronics  
Tablets  
Smart Cities  
IOE  
Wearable  
Automotive  
Environmental  
Flexible Electronics  
Gaming Consoles

\*Infographic courtesy of Jabil

## CONNECTED THROUGH SENSORS

One of the biggest drivers of the IOT is the increasing number of low-cost sensors available for many different kinds of functionality

To Share Data With Other Devices That Will Soon Be

- Embeddable
- Implantable
- Micro and nano scale

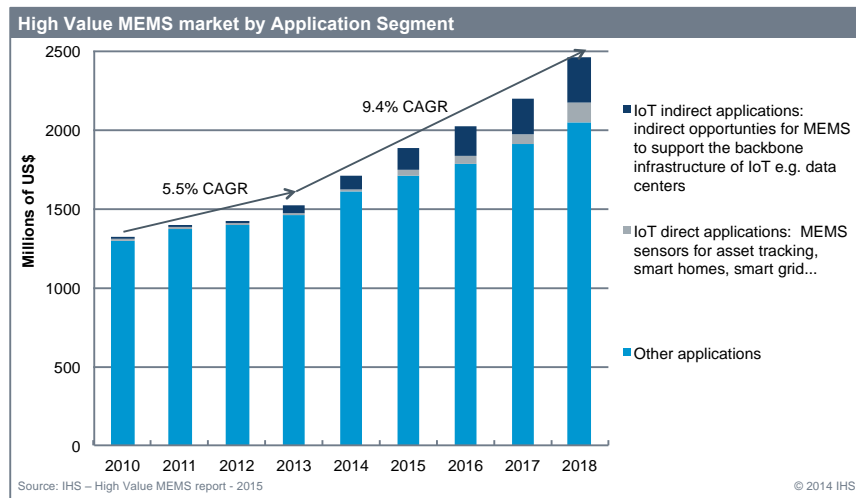


To Manage, Connect, Control & Measure Things We Care About

# The MEMS and sensor value is gaining momentum in IOT



## Internet of Things Begins to Impact High Value MEMS

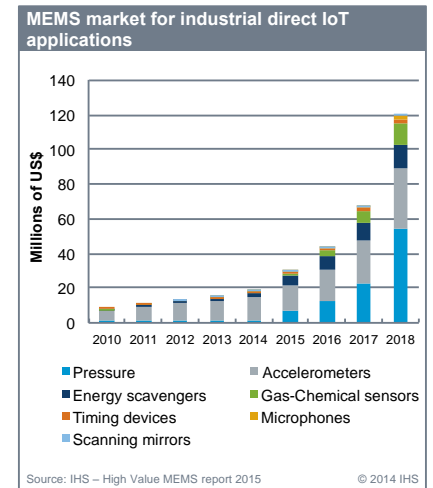


Source: IHS – High Value MEMS report 2015

## MEMS and Sensors are the front end of the IoT Growth

### IoT Direct Applications: \$120 Million in 2018 up from \$16 Million in 2013; CAGR = 45%

- First IoT applications start to generate volumes for sensors
- Cow telemetry monitoring systems.
- Microphones in smart homes and street lights
- Black box (driven by insurance companies) goods tracking is much larger than previously anticipated.
- Top volume opportunity for accelerometers and pressure sensors
- Top revenue for wireless implanted pressures



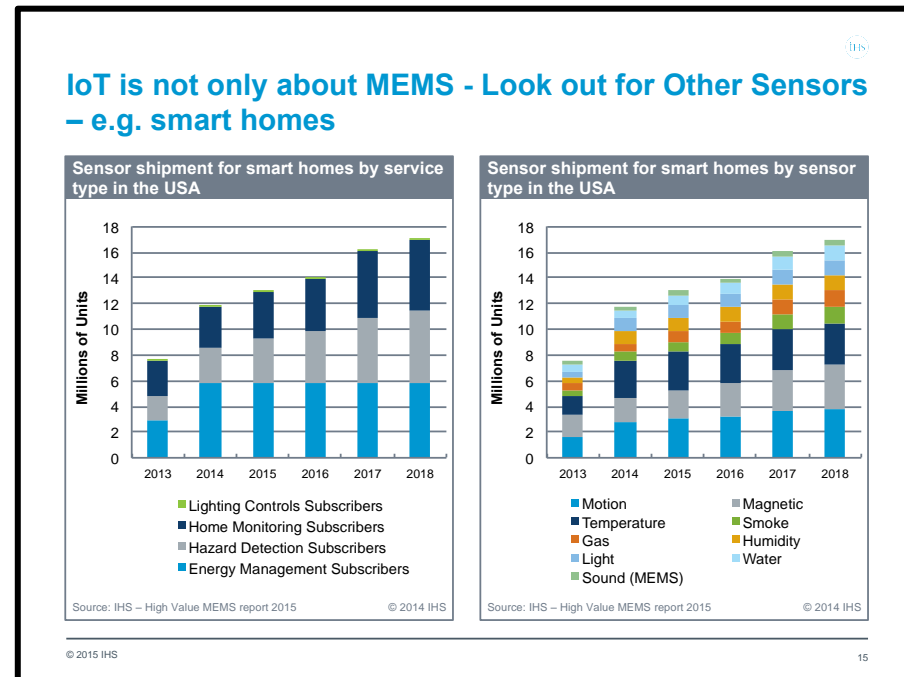
**Smart Cities, Buildings, Homes, Vehicles and Agriculture are starting to generate interesting volumes now**

Source: IHS – High Value MEMS report 2015

# MEMS and Sensor Suppliers are chasing the IOT Wave now



- Opportunities for large and smaller MEMS sensors companies with low-cost, low-power sensors to participate in medical, industrial and infrastructure type applications
- Opportunities for companies offering bundles: sensor + connectivity IC + microcontroller.
- Opportunities for the “long tail” of the sensor suppliers
- But, remember, most of the money is to be made not in the hardware, but in the data analytics



Source: IHS – High Value MEMS report 2015

# What Stands in the Way?

## Consumer MEMS challenges

(Source: Status of the MEMS Industry 2014, Yole Développement, August 2014)

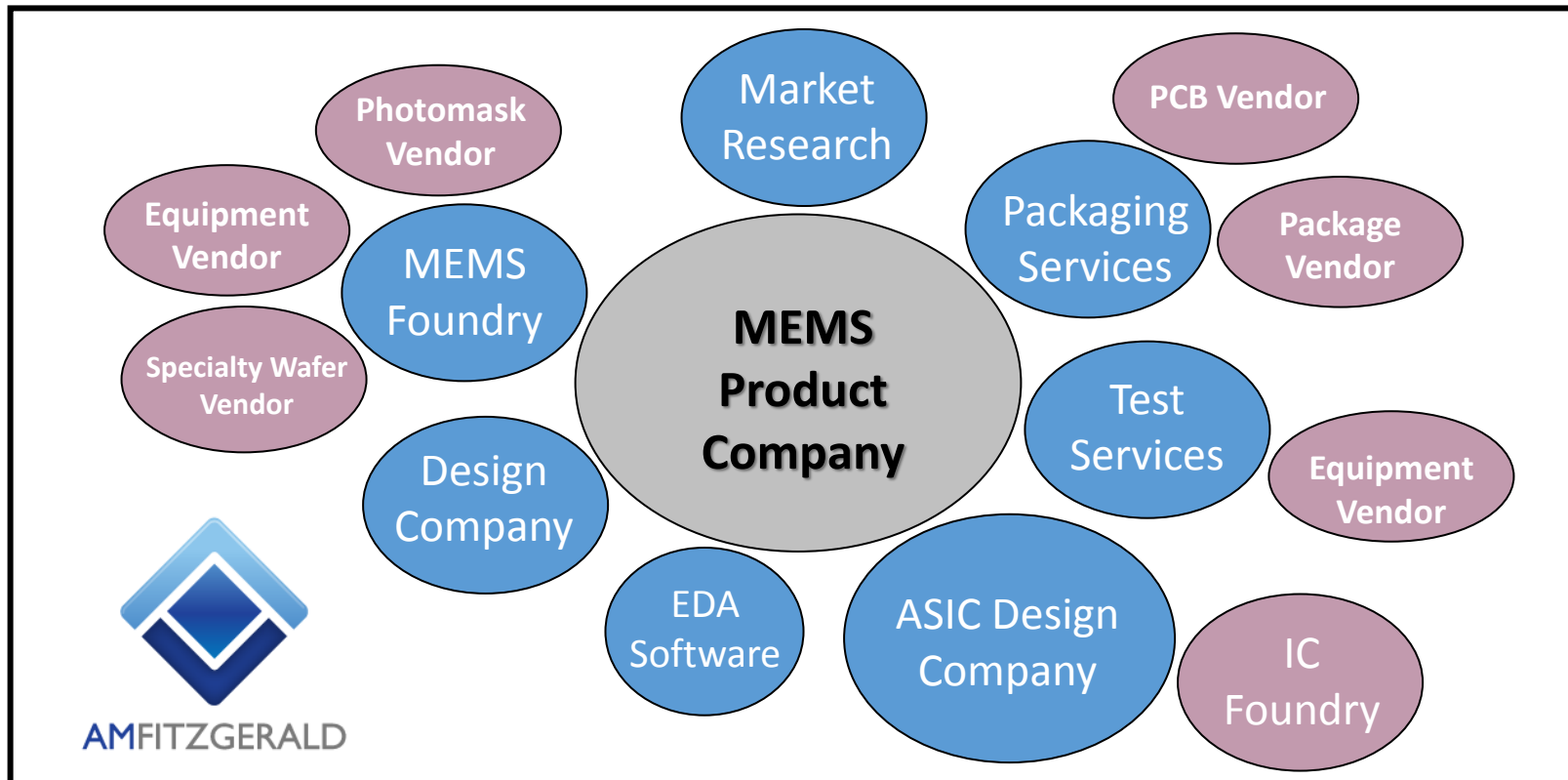


**No shortage of business and technology challenges across the supply chain**

**Is the MEMS and sensors industry positioned to effectively address these and other challenges such as standards, security, interoperability, power?**

# Are We Really Working Together?

- The MEMS ecosystem has many elements that need to work together
- This is more true today as we scale into higher volume CE and IOT markets
- The MEMS Ecosystem also needs to work with adjacent ecosystems
- Is the Japan MEMS industry ready to scale for the new wave of growth?



# Sensor, Data and Ecosystem Fusion is Key to the Future



Improvements coming in hardware with higher integration, lower power, smaller footprint, etc...

Algorithms and backend data analytics can further help with power, interoperability and security challenges

Processing needs to be distributed across the sensors, the sensor hub, the application processor, the Fog and the Cloud for the most efficiency

Value is in the total end-to-end solution

The MEMS and sensor ecosystem needs to comprehend these challenges but also work with adjacent ecosystems such as semiconductors, flexible electronics and advanced packaging



# MIG is Here to Help



- Partnerships And Collaboration
- Working Groups
- Business and Technical Events
- New Sensor I/O Definition
- Educational Webinars
- Accelerated Innovation Community

# Interested?



Great opportunities are ahead

Challenges are being addressed

Ecosystem collaboration needed

MIG and MEF can help identify and solve challenges together in Japan



# Thank you!



[www.memsindustrygroup.org](http://www.memsindustrygroup.org)

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