SEVENTEENTH ANNUAL
BiTS
TM
Burn-in & Test Strategies Workshop
March 6 - 9, 2016
Hilton Phoenix / Mesa Hotel
Mesa, Arizona
Archive- Session 1
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Session 1

Ila Pal
Session Chair

BiTS Workshop 2016 Schedule

Frontiers Day

Monday March 7 - 10:30 am

Marketplace Report & Thing One, Thing Two, and Test Them We Do

"Marketplace Report"

Ira Feldman - Feldman Engineering Corp.

"How Internet Of Things Will Change Back End Processing"

Mike Frazier & Laurie Wright - Xcerra Corporation

"Serialized Programming Solutions for IoT Secure Elements"

Robert Howell - Exatron

"Internet of Things Testing Challenges"

Anthony Lum - Advantest

HOW INTERNET OF THINGS WILL CHANGE BACK END PROCESSING

Mike Frazier
Laurie Wright
Xcerra Corporation

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Agenda

- Technology requirements and business challenges of the Internet of Things market
- How IoT is changing back end processing
  - Handling
  - Test
- Summary key technologies and capabilities for an Internet of Things test cell

IOT Overview

- IOT Markets
  - Fitness and Wellness
  - Healthcare
  - Home and Office
  - Automotive
  - City
- Attributes
  - Smart (stand alone)
  - Low Power
  - Connected
  - Secure

The Connected World

Billions	Millions	Thousands
IOT End Node	Aggregation	Processing

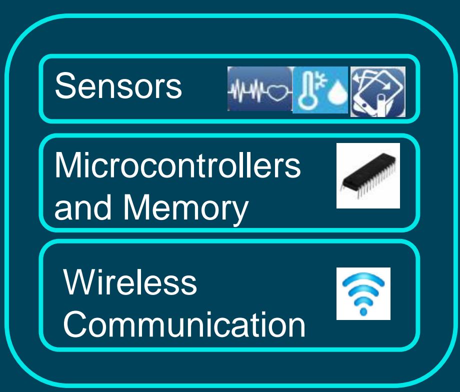
The "Thing" that senses our world

Transfers data from the end device to the cloud

Data crunching and services using captured information

Internet of Things End Nodes

- Sensors
  - Enable us to connect our physical world to technology
  - Many different sensors need physical stimulus
- Processing capability
  - Microcontroller have ultra-low power requirements, precision mixed signal integration, integrated memory in a small and inexpensive package
- Wireless communication
  - Transfer data to the cloud or smart device
  - Secure and low-power
  - Multiple standards competing in the market



Industry Challenges of IoT Market

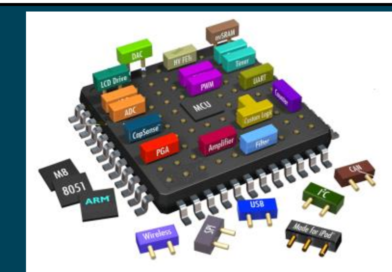
- Evolving industry
  - New applications development as standards emerge
  - High mix of devices with range of volumes behind each device
  - Fast development time
- Technology integration and packaging
  - Integration of different process technologies in a small packages
  - Sensor integration
- Cost pressures
  - Falling ASP for sensors, microcontrollers and radio

IOT Effects on Device Test

- Must meet technical requirements of the diverse IoT market
  - Digital, mixed signal, RF, embedded memory, power/automotive
  - Transaction based test patterns (protocol aware) test methodology
  - High quality test
- Highly scalable and reconfigurable tester
  - Address high mix of IoT devices
  - Ability for customization

Diamond_x

IOT Effects on Device Test

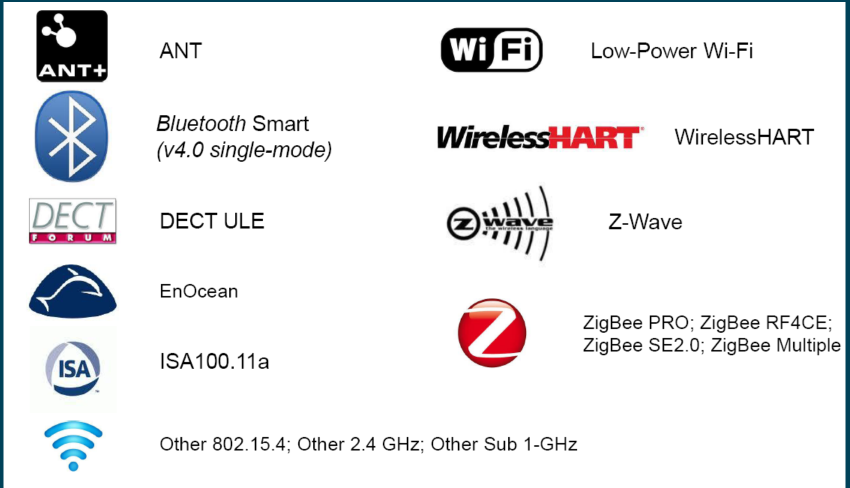


- Microcontroller
  - Instrumentation optimized for MCU testing
    - Protocol aware
      - "Talk" to device in it native language (SPI, JTAG, CAN/LIN….)
    - Site dependant data
      - Ability to efficiently write different data to many sites (MAC address, Calibration data…)
    - Concurrent Test
      - Test different features of device at same time (Memory, Scan/BIST, Analog)
  - Mixed-Signal
  - High accuracy and high speed ADC/DAC testing
    - 8 bit going to 12 to 16 bit or more

IOT Effects on Device Test

- Wireless connectivity
  - Multiple standards vying for adoption
  - Lower end RF is enough
    - Lowest power consumption will win
    - RF Test cost must be minimal

Nighthawk



IOT Effects on Device Test

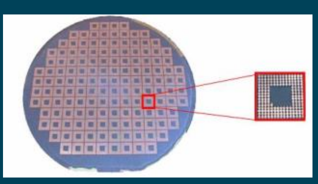
- Low Cost of Test
  - High Utilization
    - Re-configurable system to match device requirements
  - Ability to cost effectively test low multi-site/high mix through very high multi-site (>256 sites)
  - High multi-site efficiency
  - Low CAPEX and operating costs

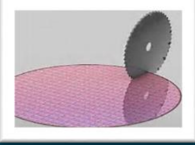
IOT Effects on Device Handling

More than just presenting device to the tester…

- Must provide physical stimulus to the sensor
  - Inertia, pressure, gas, temperature, light, sound, touch…
  - Integrated sensors (10DOF, environmental sensors) with demanding test challenges, minimize number test insertions
  - Higher performance (high SNR)
- Wide variety package types and small sizes
  - Increase WLCSP for low cost and small size
  - WLCSP, package, strip
  - Less than 1mm x 1mm
  - Fine pitch devices

InCarrier





Source: Gila Tool

IOT Effects on Device Handling

- High mix IoT devices and applications
  - Flexible
    - Reconfigurable and reusable for a wide product mix
    - Simple and fast change kit conversion
    - Equipment modularity for high test cell utilization
    - Tri-temperature for all markets
  - Adaptable
    - Cover all emerging new applications and sensors
- Faster time to high volume
  - Scalability from engineering to high volume production
  - Integrated and optimized test cell for highest performance

IOT Effects on Device Handling

- Cost Pressures
  - Focus on achieving lowest Cost of Test
    - Number of devices tested for 1 cent
  - Low operating costs (resources, floor space)
    - Minimize test cells and different platforms
  - High parallelism and high UPH
- Efficient high volume retest, re-programming or returned material (RMA) to minimize scrap or shelving of inventory
  - Changing customer demand
  - Tape and reel back into high volume test

Key Features for an IoT Test Cell

- Diverse technical capability
  - Flexible test solution that covers wide range of technology
  - Sensors, WLCSP, tri-temp, small devices…
- Efficient Test
  - Time to Market
  - Ability to scale volume
- Low Cost of Test

Xcerra Test Cell

Summary

- IoT will be a significant driver for semiconductor revenue over the next 5 years.
- The evolving IoT industry will drive change in the way we approach back end processing.
- Handling and test equipment will need to be flexible and adapt to the technical and business challenges of the dynamic IoT market.

MT2168 Tri-Temp

InStrip/InMEMS