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LOC-204: Optimize IIoT with Wireless Asset Monitoring

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dracula technologies

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Today’s speakers

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Dracula Technologies

Outline

- **Industrial IoT opportunities – Silicon Labs**
- **The what and why of energy harvesting — e-peas Semiconductors**
- **Lighting up energy harvesting — Dracula Technologies**
- **Hardware Demo – Energy Harvesting in Asset Monitoring**
- **Conclusions**
- **Audience Q&A**

Industrial IoT opportunities

Silicon Labs

Industrial IoT

CONNECTED LOGISTICS

Real time positioning and monitoring of cargo shipment

INDUSTRIAL ASSET MONITORING

Real time monitoring of machinery and equipment

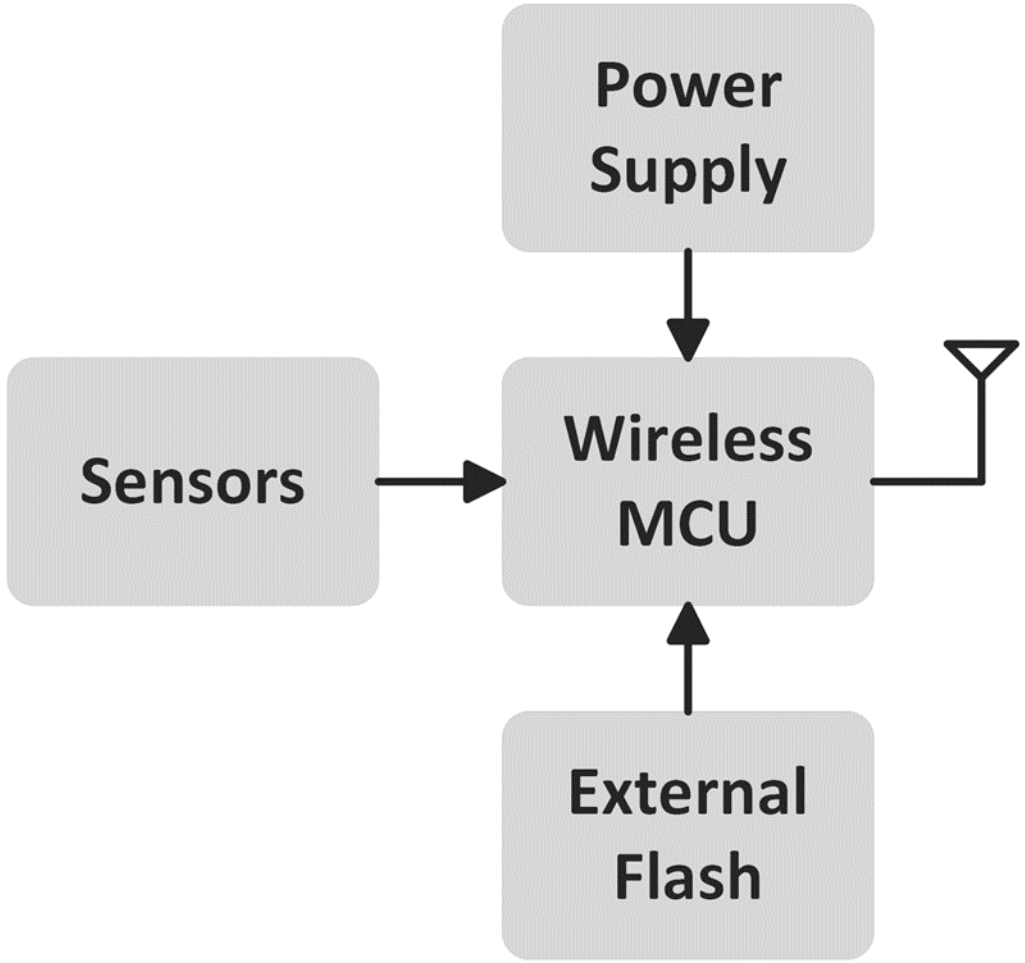
Connected logistics

- Key care abouts
  - Vehicle Telematics
  - Cargo sensing
  - Driver Monitoring
- Regulatory compliance and airline certification required in some use-cases

Industrial asset monitoring

- **Key care abouts**
  - **Connectivity**
  - **Power Supply**
  - **Security**
- **Total Cost of Ownership (TCO) and ease of commissioning are critical factors**

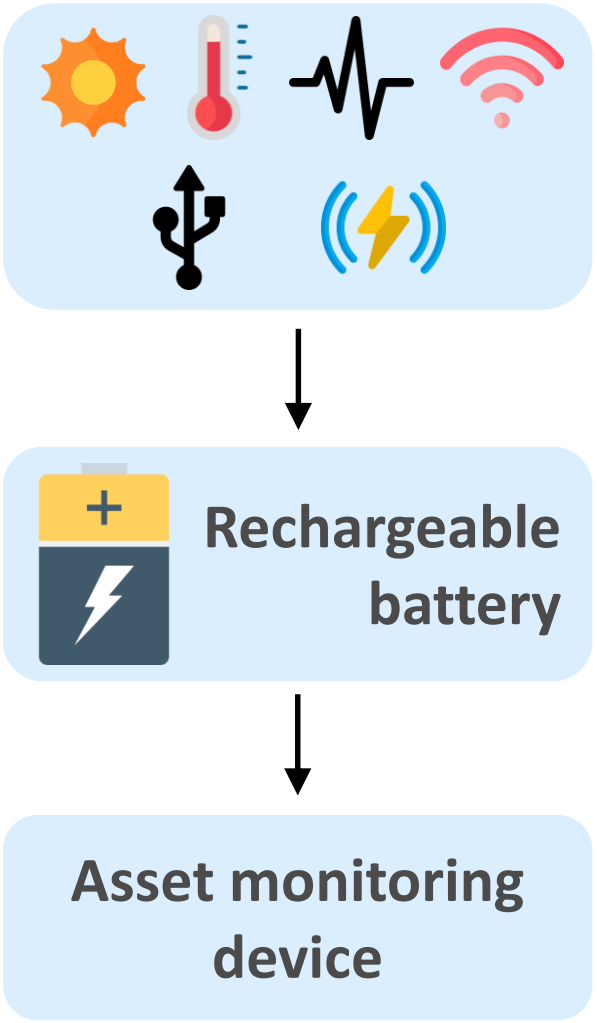
Asset monitoring – Block diagram



- **Power Supply**
  - Non-rechargeable battery
  - Rechargeable battery
- **Sensors**
  - UV and ALS
  - rHT
  - IMU
  - Pressure etc.
- **Wireless**
  - BLE
  - Wirepas
  - NB-IoT
  - Wi-Fi etc.

Asset monitoring + Energy harvesting

Recharging options



- **Factors affecting battery life:**
  - Measurement and transmission interval
  - Using multiple sensors
  - GPS and cellular connection
- **Optimization techniques**
  - Leverage MCU energy modes
  - Utilize battery life monitoring tool
  - Dynamic update rate for stationary and moving asset
- **Advantages of energy harvesting**
  - Prolong battery life
  - Reduce TCO
  - Minimize Waste

The what and why of energy harvesting

e-peas Semiconductors

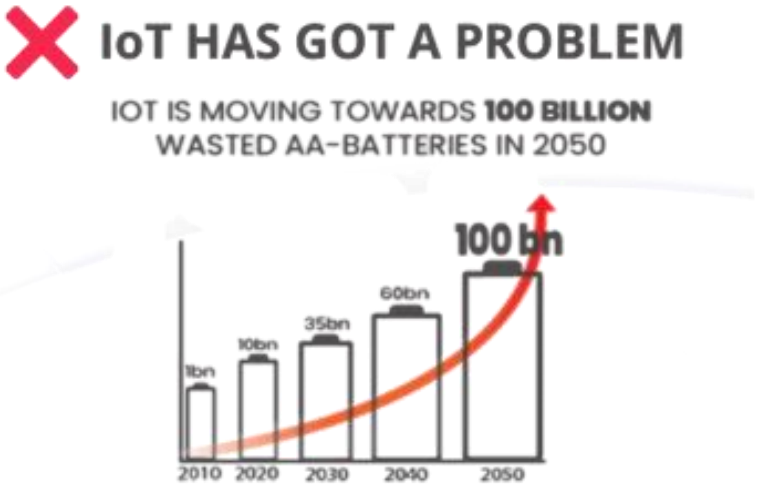
Energy Harvesting

IoT devices are deployed in volume to senses, measure, monitor, track…

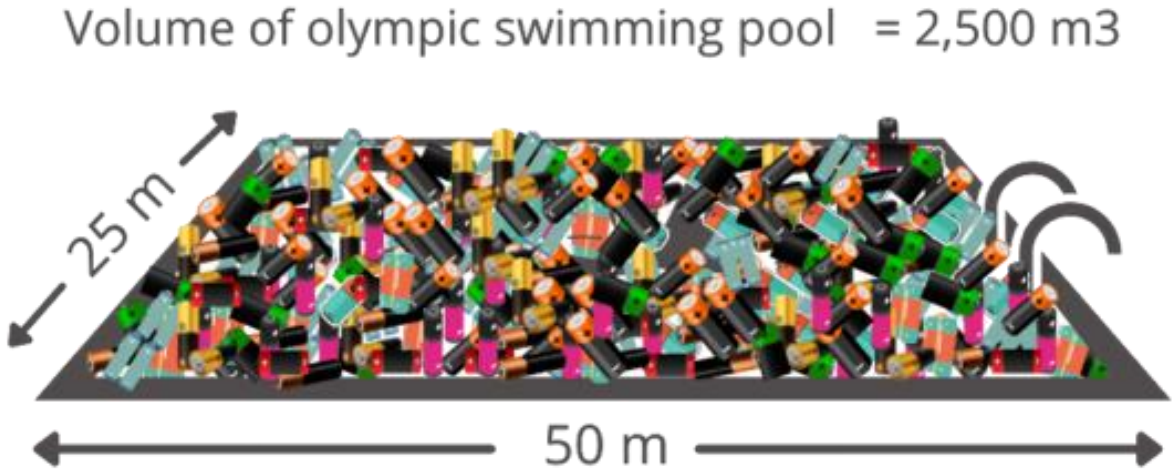
Battery replacement causes maintenance headaches to end users and industries

Energy Harvesting offers you a solution to those problems and removes the maintenance cost and issues.

Battery waste



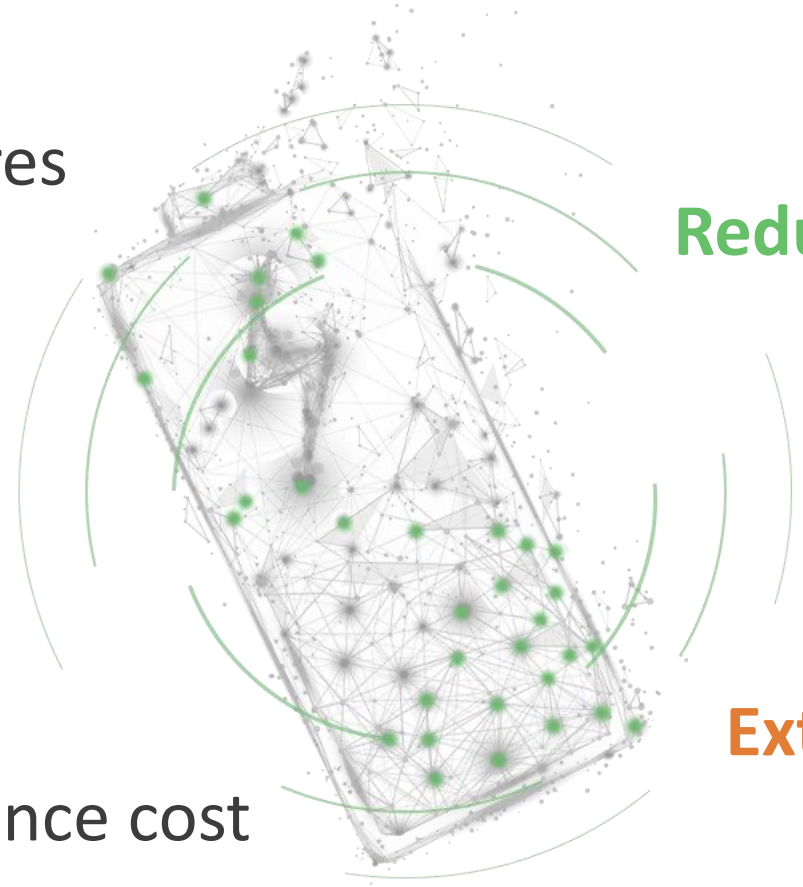
The number of IoT devices worldwide is projected to reach over 100 billion by 2050



The volume of the batteries needed to facilitate this growth is roughly equivalent to 300 olympic size swimming pools

Energy Harvesting

Add features



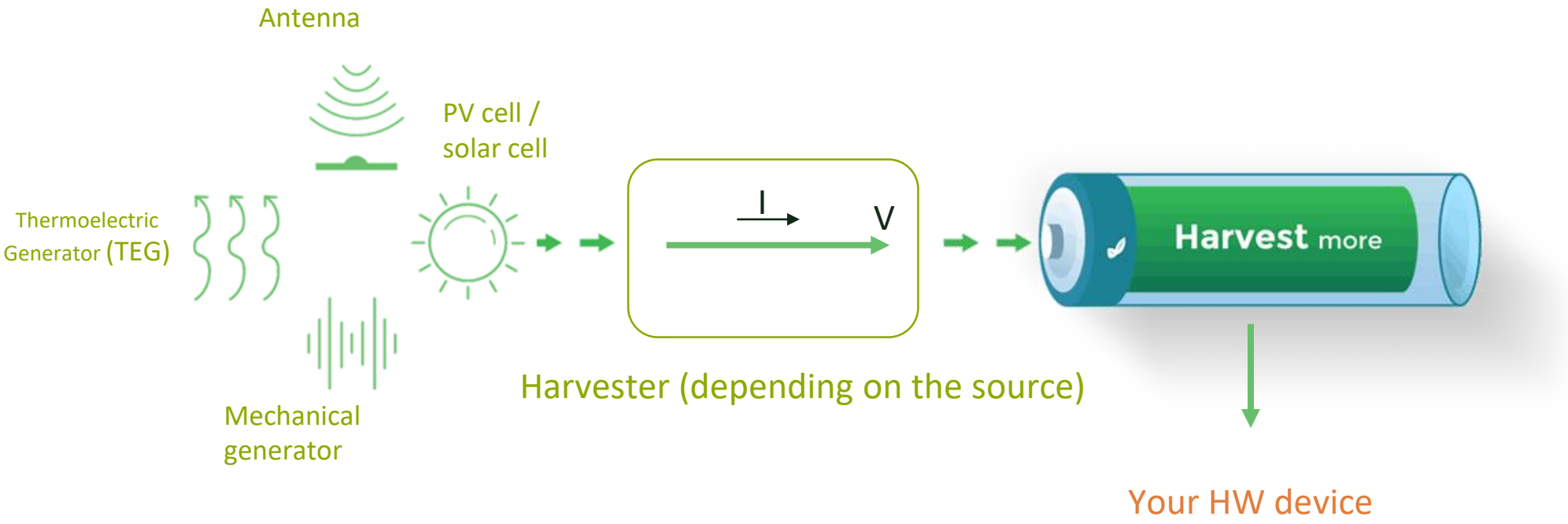
Reduce storage volume

Extend lifetime

Remove maintenance cost

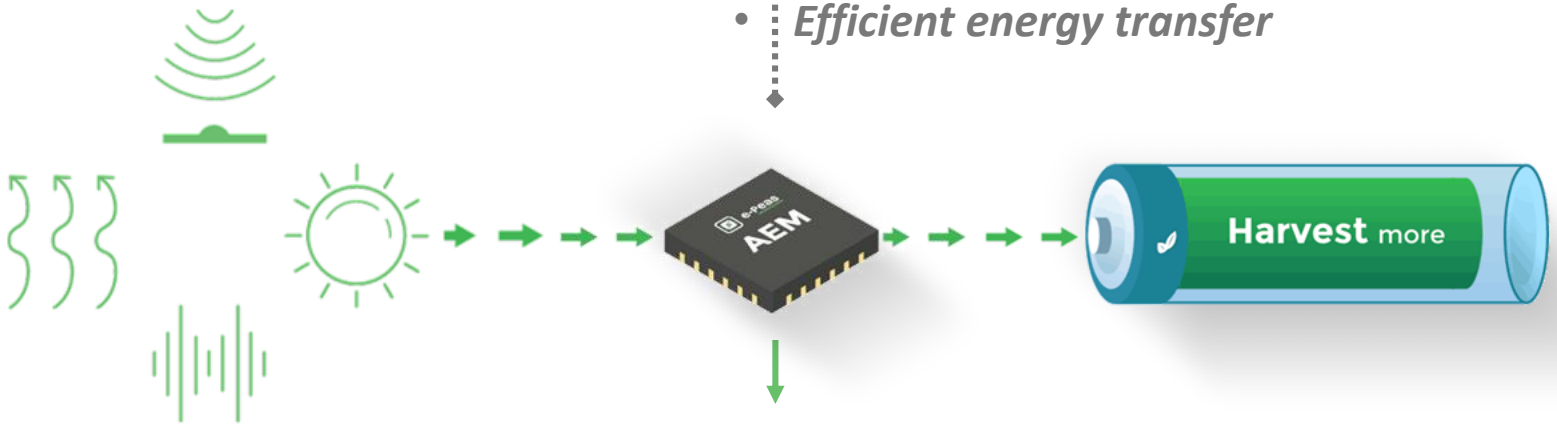
What Is Energy Harvesting?

First, you need **a harvester** to transform the energy into electrical power and a **storage element** to store the energy for a later use.



Energy Harvesting requires an **AEM (Ambient Energy Manager)**

- *Extracting the **maximum power** from the harvester*
- ***Starting** from 0 V nodes = coldstart*
- ***Efficient energy transfer***



Your hardware device

Ambient Energy Manager

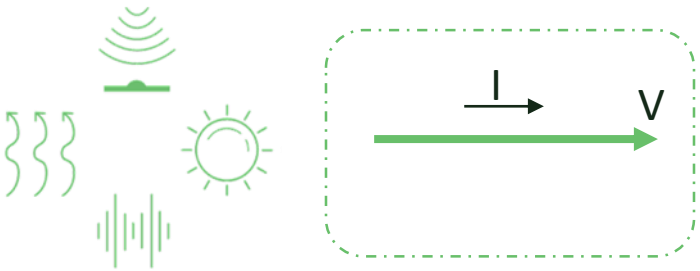
Why Do I Need Something in Between the Harvester and the Storage Element?

- To extract the **maximum power** from the harvester
- To **enable starting** from low voltage (< 0.5 V) and low power (µW)
- To **protect** your storage element
- To directly **supply** your application

These functions are integrated in the **AEM** - **A**mbient **E**nergy **M**anager.

Key Features

The **A**mbient **E**nergy **M**anager – **AEM** – handles the **MPP tracking**, the **cold start** and the **storage element protection** and provides **2 regulated outputs**.



MPP Tracking feature

Cold start:
3 µW
380 mV

Global Leakage: 400 nA

HVOUT LVOUT

Your HW device

STORAGE ELEMENT PROTECTION:
Overcharge
Overdischarge

AEM - Ambient Energy Manager Family

Products for each **energy source**

Photovoltaic

Thermal

AC Sources

Vibration

RF

Lighting up energy harvesting

Dracula Technologies

Energy harvesting has the potential to solve these hardware issues, providing greater reliability and operational lifetimes in wireless sensor networks.

Dracula Technologies relies on organic photovoltaic

Our Mission

Using ambient light to power the next generation of indoor devices using inkjet printed technology :
LAYER® (=Light As Your Energetic Response).

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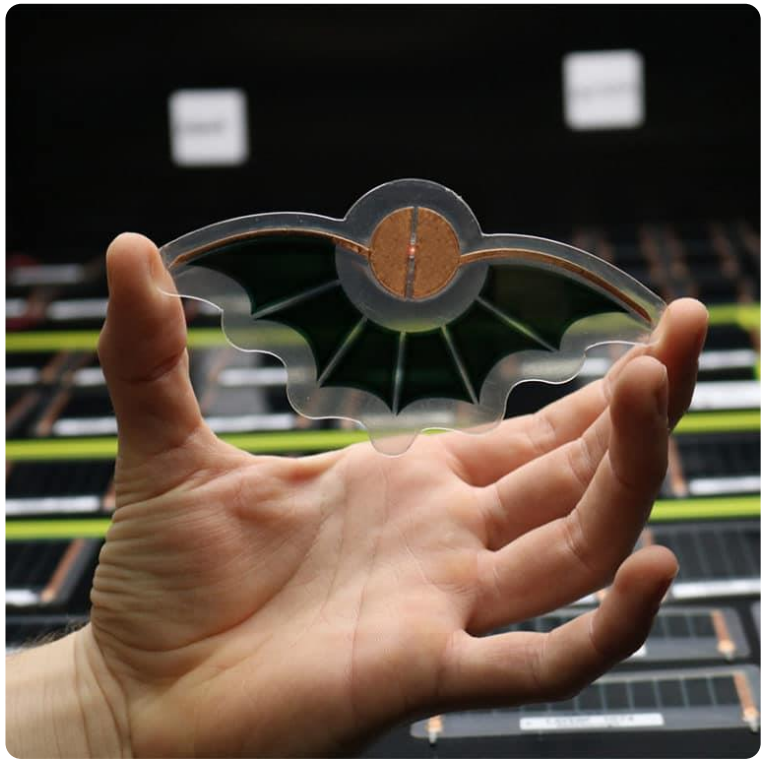
Dracula Technologies



LAYER® for Light As Your Energetic Response

Energy from Ambient Light

35 µW/cm2 under 1000 lux

GreenTech

0,35 years energy payback time
10,7 g C02-eq/kWH

Adaptable & Customizable

Reduce your TCO

https://www.dracula-technologies.com

LAYER® Demokit Datasheet

Standard Organic Photovoltaïc Modules (OPV)

6 Interconnected Cells in Series

Demokit #6 performances between 50 - 1000 lux

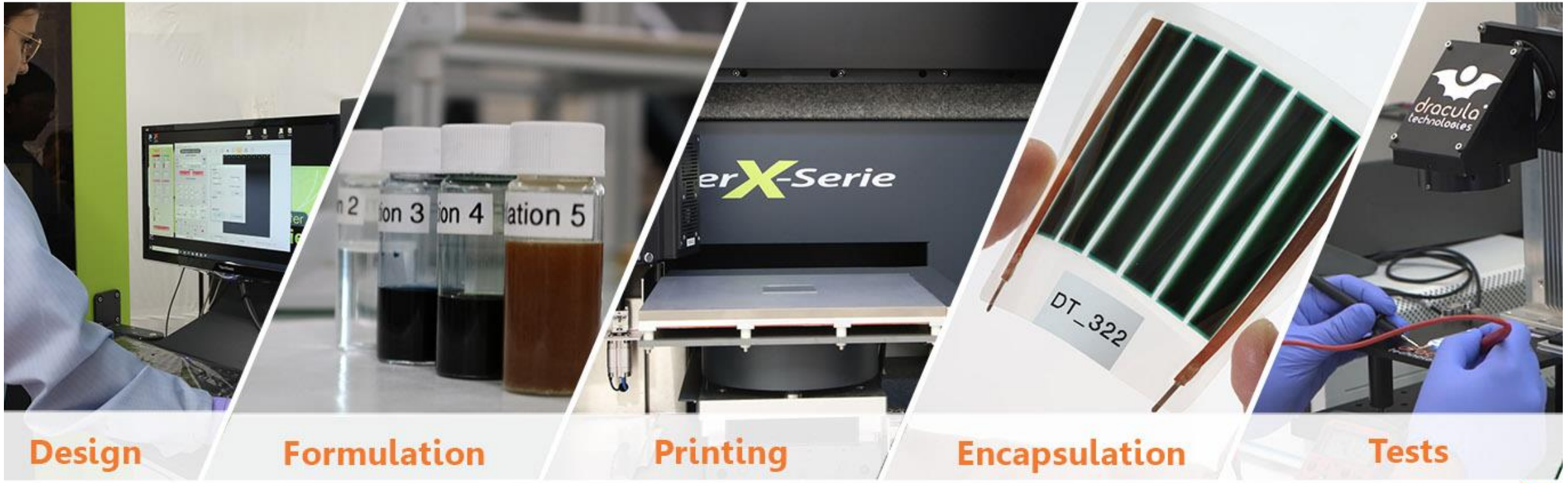
Illumination (lux)	Voc(V)	Isc(µA)	Vmax(V)	Imax(µA)	Pmax(µW)
50	3 - 3.2	13 - 15	2.35 - 2.45	10 - 11	23 - 27
100	3.25 - 3.3	30 - 35	2.55 - 2.65	24 - 27	61 - 72
200	3.4 - 3.5	55 - 65	2.7 - 2.75	45 - 55	121 - 151
300	3.55 - 3.6	75 - 85	2.80 - 2.85	65 - 75	182 - 214
400	3.6 - 3.65	100 - 110	2.85 - 2.9	85 - 95	242 - 275
500	3.65 - 3.68	130 - 140	2.9 - 2.95	105 - 115	294 - 328
1000	3.7 - 3.8	245 - 255	2.95 - 3	200 - 210	570 - 609

The above table shows standard performances mesured by imanp

Luminosity	Best Performance	Standard performance
AM1.5* (+/- 100 000lux)	13,2%	10,2%
1000 lux	26%	22-24%

* Exactly 100 mW/cm² equivalent to 100 000 lux

LAYER® Process

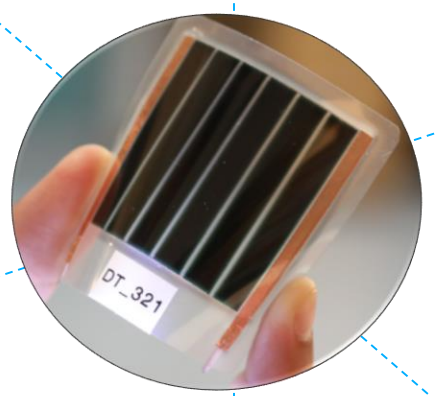


Active materials — Conductive ink

Characterization

- Materials & Ink
- Substrates
- Printed layers
- Cells & Modules

Targeted market



- Tracking
  - Asset geolocalisation
  - Shipping monitoring
- Smart home
  - Home automation
  - Ambiance control
  - Remote control
- Smart building
  - Security and surveillance
  - Energy management
- Smart cards
  - Access badge
  - Connected credit cards
- Industrial IoT
  - Air pollution detection
  - Security and surveillance
  - Workers safety
- Healthcare
  - Integrated portable sensor
  - Beacons
  - Bike/Motorbike active helmet

Reduce by 4 times your Total Cost of Ownership (TCO)

↘80%
Battery Maintenance

>10
Years Lifetime

Autonomous sensor powered by LAYER®.
Provide temperature and humidity information

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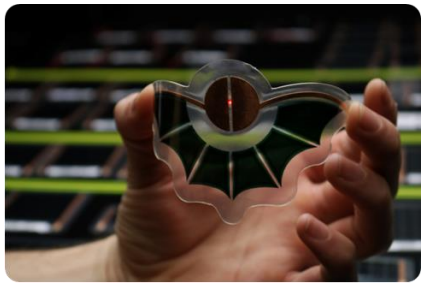
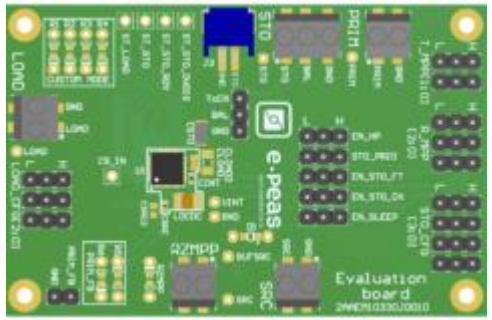
Hardware Demo

Demonstration Set up

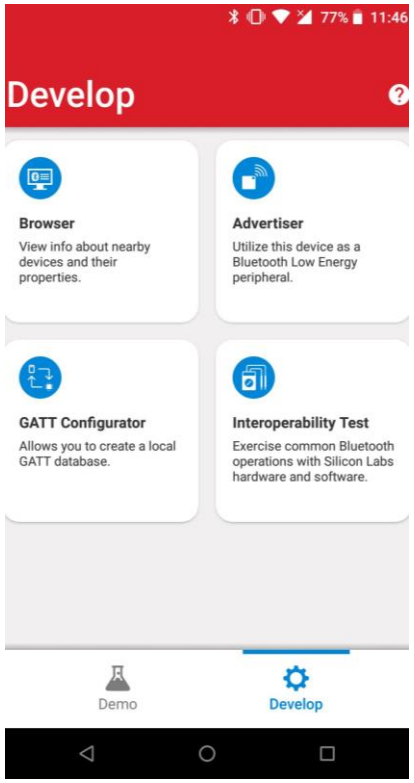


Dracula
OPV / PV cell



e-peas
AEM10330EVK

Silicon Labs
Thunderboard BG-22



Silicon Labs
EFR Connect App

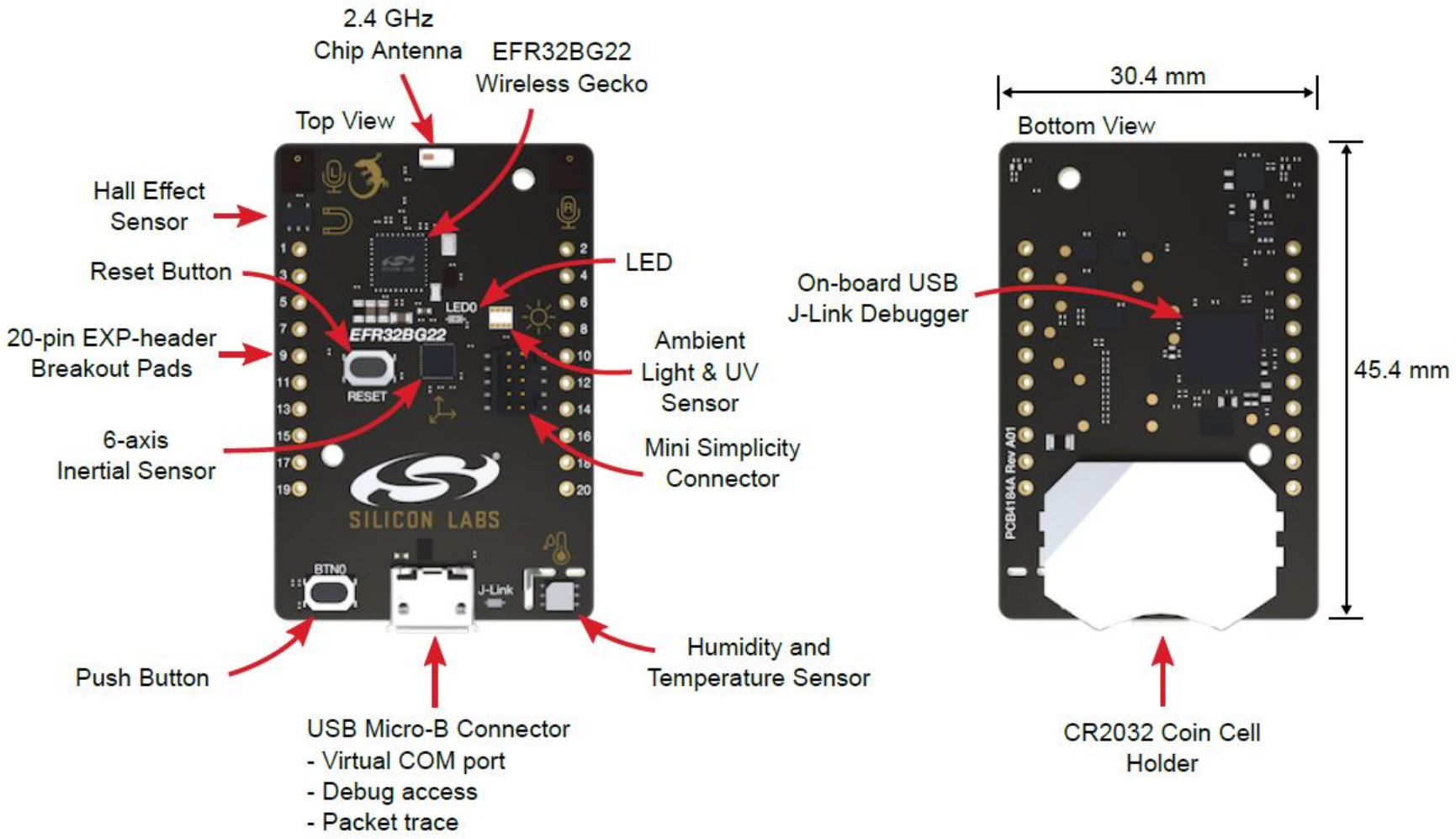
Thunderboard BG22

Thunderboard BG22 is a small form-factor, optimized development platform for adding Bluetooth connectivity to battery-powered IoT products.

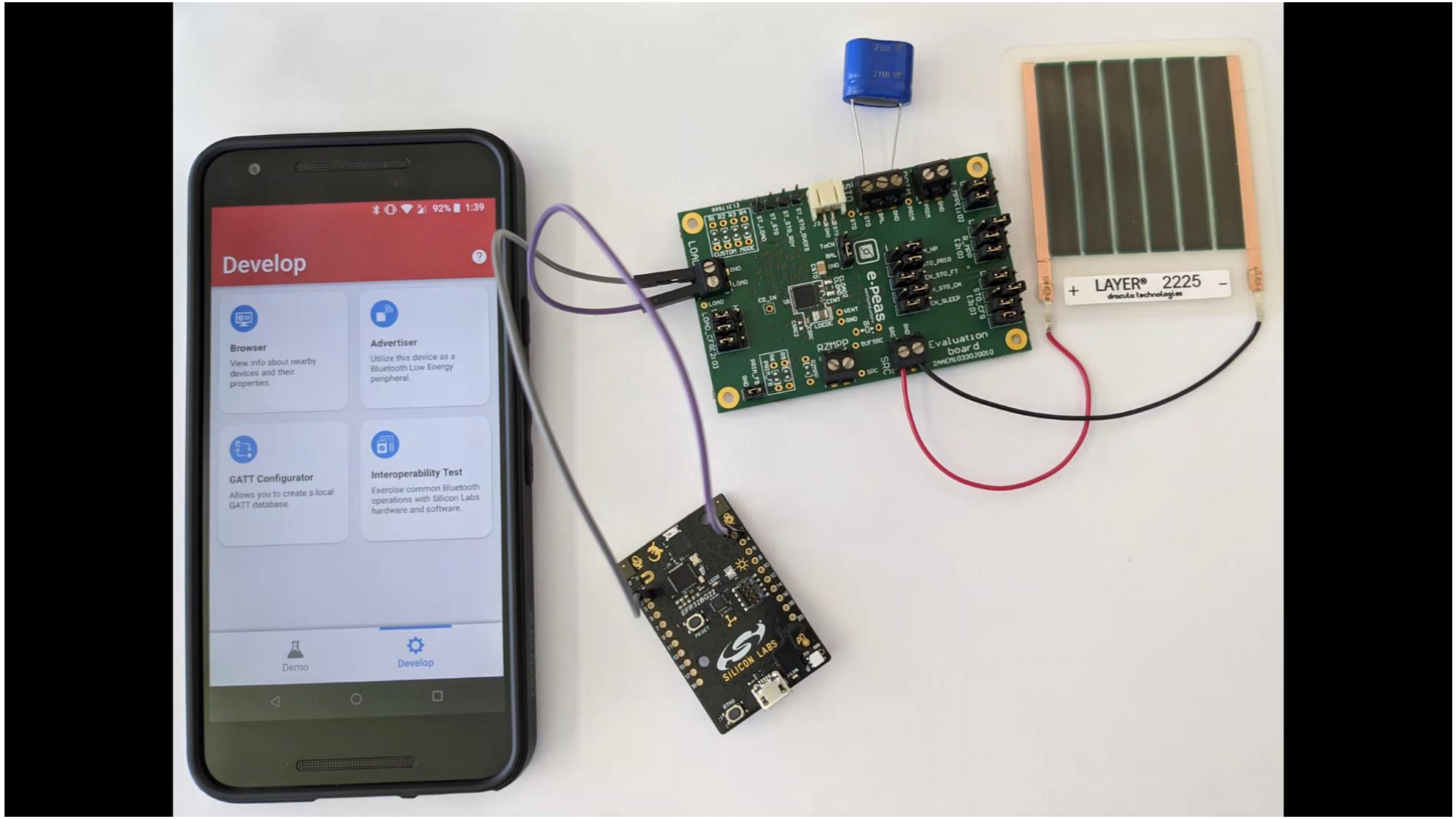
[SLTB010A EFR32BG22 Thunderboard Kit - Silicon Labs (silabs.com)]

Thunderboard BG22 - Overview

- **Asset monitoring device in our setup**
- **Wireless - BLE**
- **Supply: 3.3V**
- **Sensors**
  - Ambient Light and UV
  - Humidity and Temperature
  - Inertial
  - Hall Effect
- **Power Supply**
  - Coin cell
  - USB
  - Mini Simplicity Connector



Hardware Demo



Conclusions

Conclusion

- **Opportunities for IoT devices in connected logistics and industrial asset monitoring segments**
- **Energy Harvesting and Wireless technologies can reduce TCO**
- **Advancements in energy harvesting can eliminate batteries in IIoT devices**

Audience Q&A

Audience Q&A

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Links

AEM10330: https://e-peas.com/product/aem10330/

AEM10941: https://e-peas.com/product/aem10941/

Dracula Layer: https://dracula-technologies.com/layer/

Silicon Labs Thunderboard BG22: https://www.silabs.com/development-tools/thunderboard/thunderboard-bg22-kit

AVX supercap: https://be.farnell.com/2696625

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