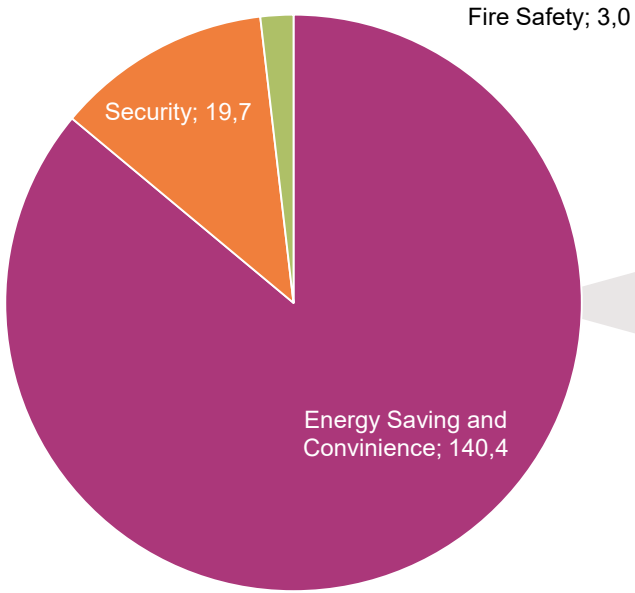
Infineon's sensor solutions for air conditioners

March 2022

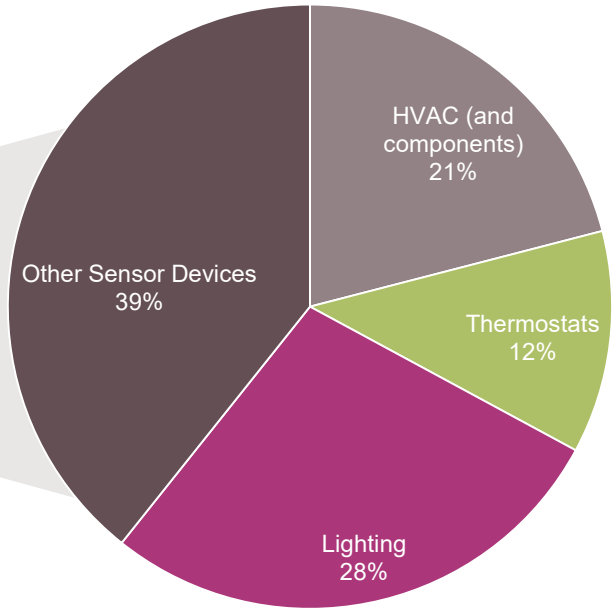
Smartification trends – dominated by Energy domain and Convenience

Growth in building market primarily **driven by energy conservation and occupant experience domain**

Commercial building automation equipment market in 2025 (in M units)



Unit shipments of equipment related to energy saving and convenience in 2025 (in M units)



Source: ABI 2020

Demand based controlled buildings is a strong lever for energy, CO_2 and opex reduction

In EU, buildings are responsible for about **40% of the EU's energy consumption**, and **36% of greenhouse gas** emissions from energy[2]

Table: Classes of building control from BS EN 15232

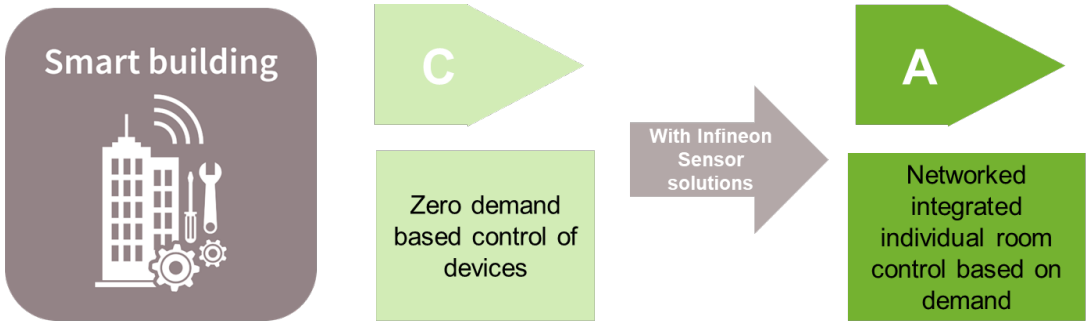
A
- Integrated individual room control
- Demand control of heating, cooling and ventilation
- Scheduled/preventive maintenance
- Energy consumption monitoring

B
- Integrated individual room control with preset or manual intervention
- No automatic demand control
- Energy monitoring

C
- Basic individual room control using thermostat
- No demand control
- No energy monitoring

D
- No automation
- No automatic demand control
- No energy monitoring

For complete definition refer to standard EN 15232

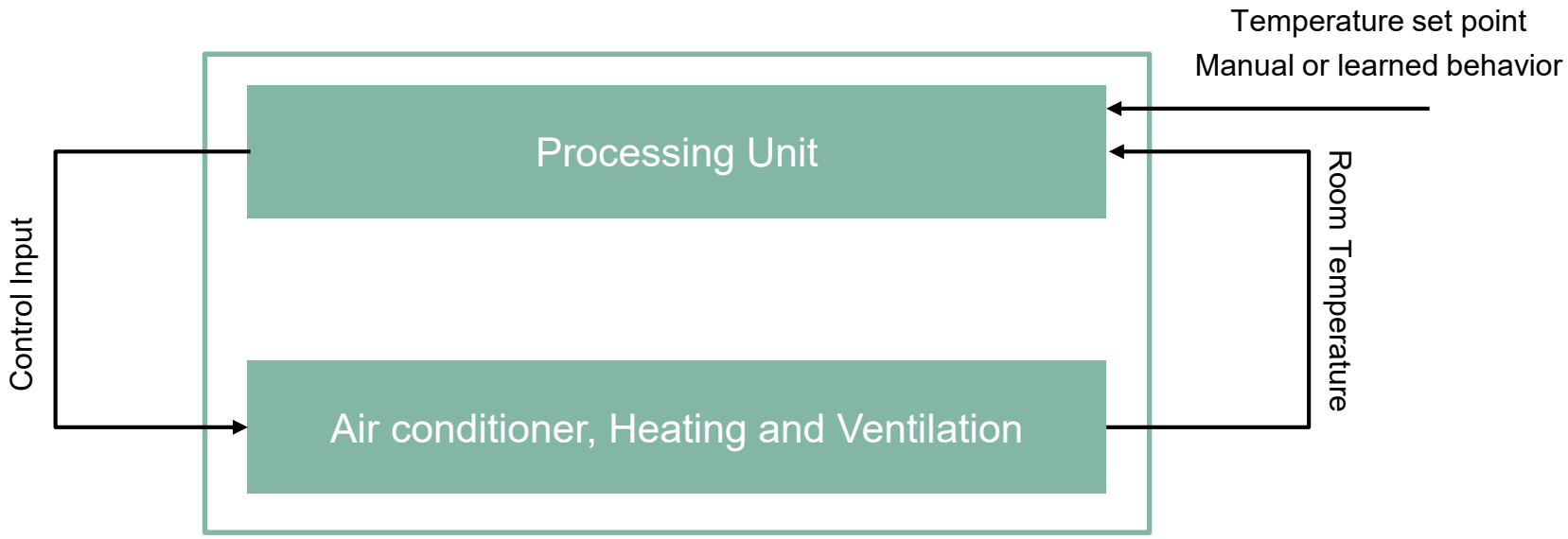


In Germany alone, about 22 million tons of CO_2 saving potential through demand based heating & cooling room control [3]

Sources:

[2] - https://ec.europa.eu/commission/presscorner/detail/en/ip_20_1835 [3]- Infineon calculation using BS EN 15232

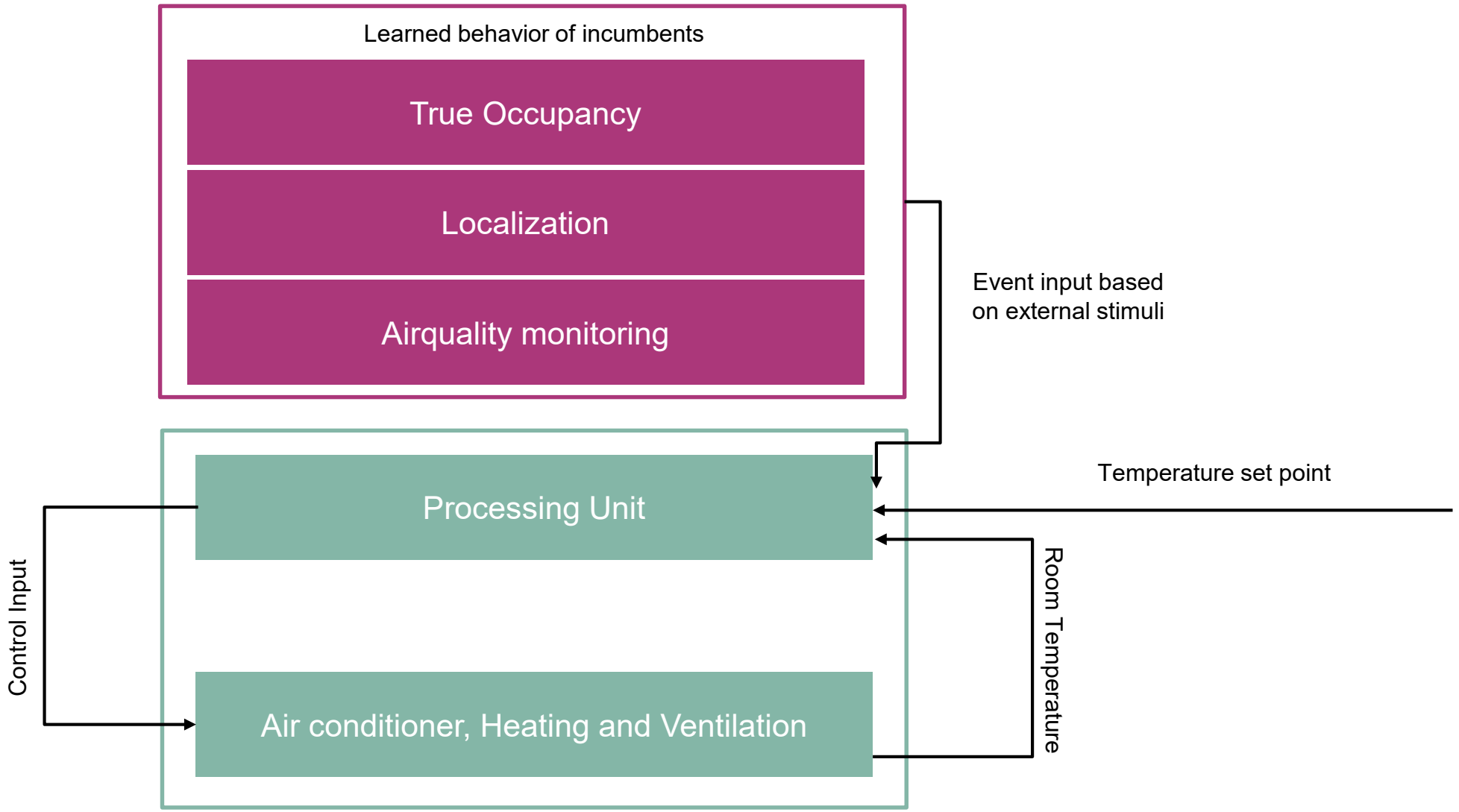
Most cooling, heating and ventilation systems in buildings/houses have manual inputs



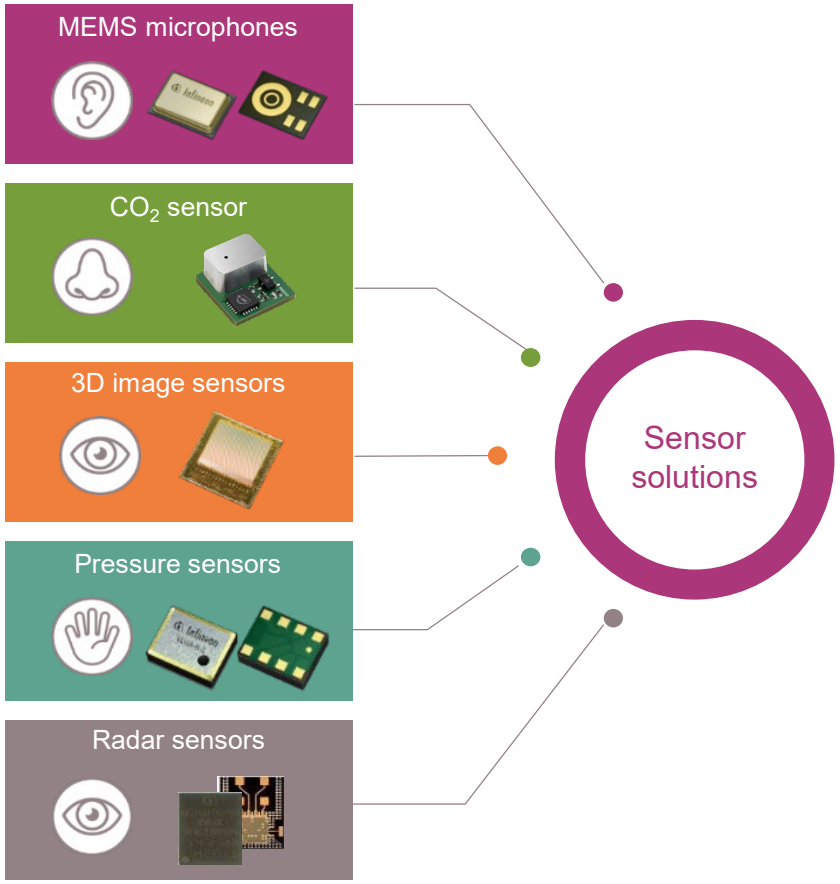
Manual control of parameters leads to

1. **Energy wastage**
2. **Decreased device lifetime**
3. **User inconvinience**

Adaptive and intuitive control can save improve energy efficiency



Infineon sensor solutions enabling energy efficiency, safety and convenience



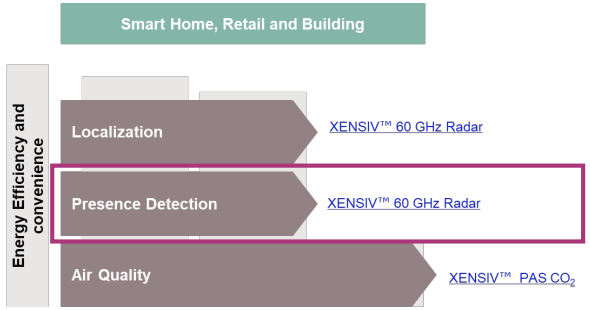
Infineon consumer sensors

Smart Home, Retail and Building

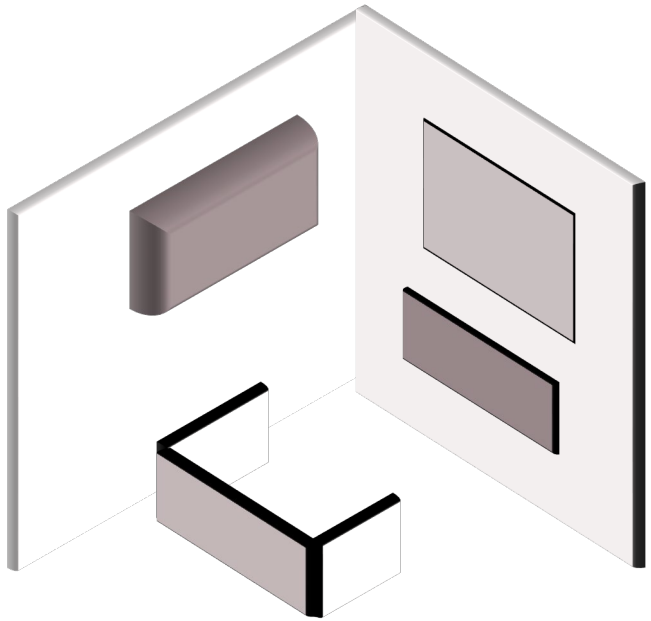
Energy Efficiency and convenience

Localization	XENSIV™ 60 GHz Radar
Presence Detection	XENSIV™ 60 GHz Radar
Air Quality	XENSIV™ PAS CO2

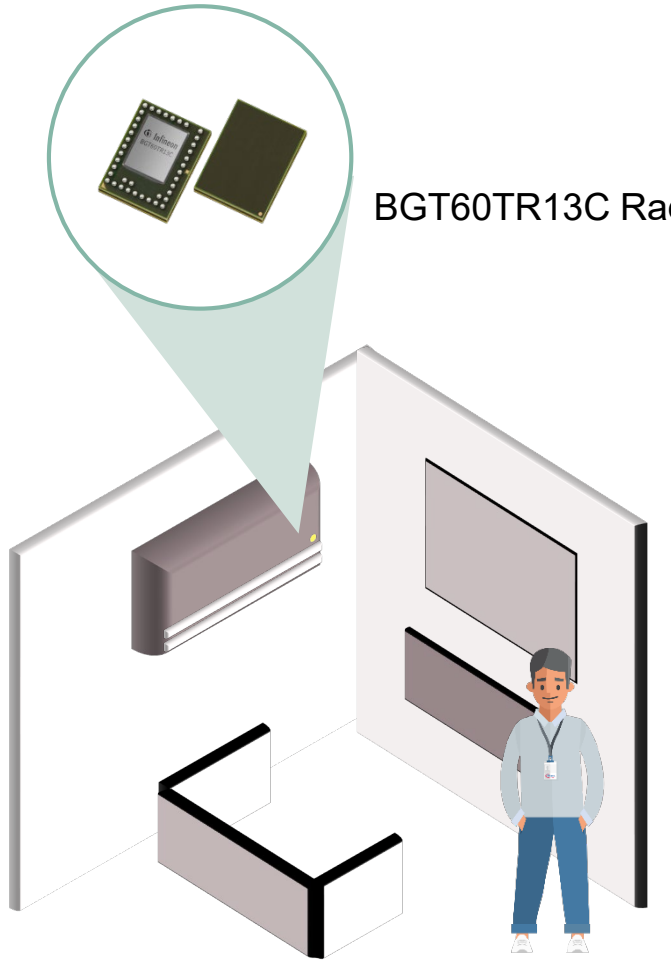
True occupancy with Infineon presence detection



- Detects presence of static and moving people (sleeping, reading or typing)
- Distance information of the closest person
- Smart power on/off and active stand-by
- Room occupancy for demand based air conditioner systems

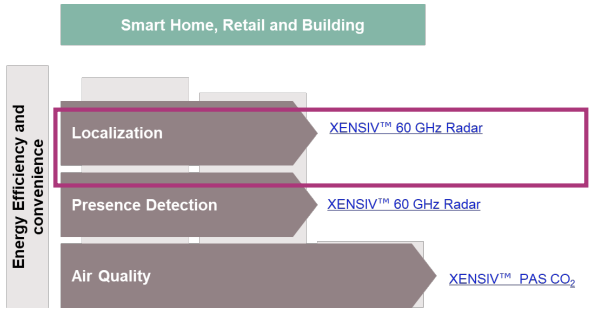


AC off when no one is present in the room

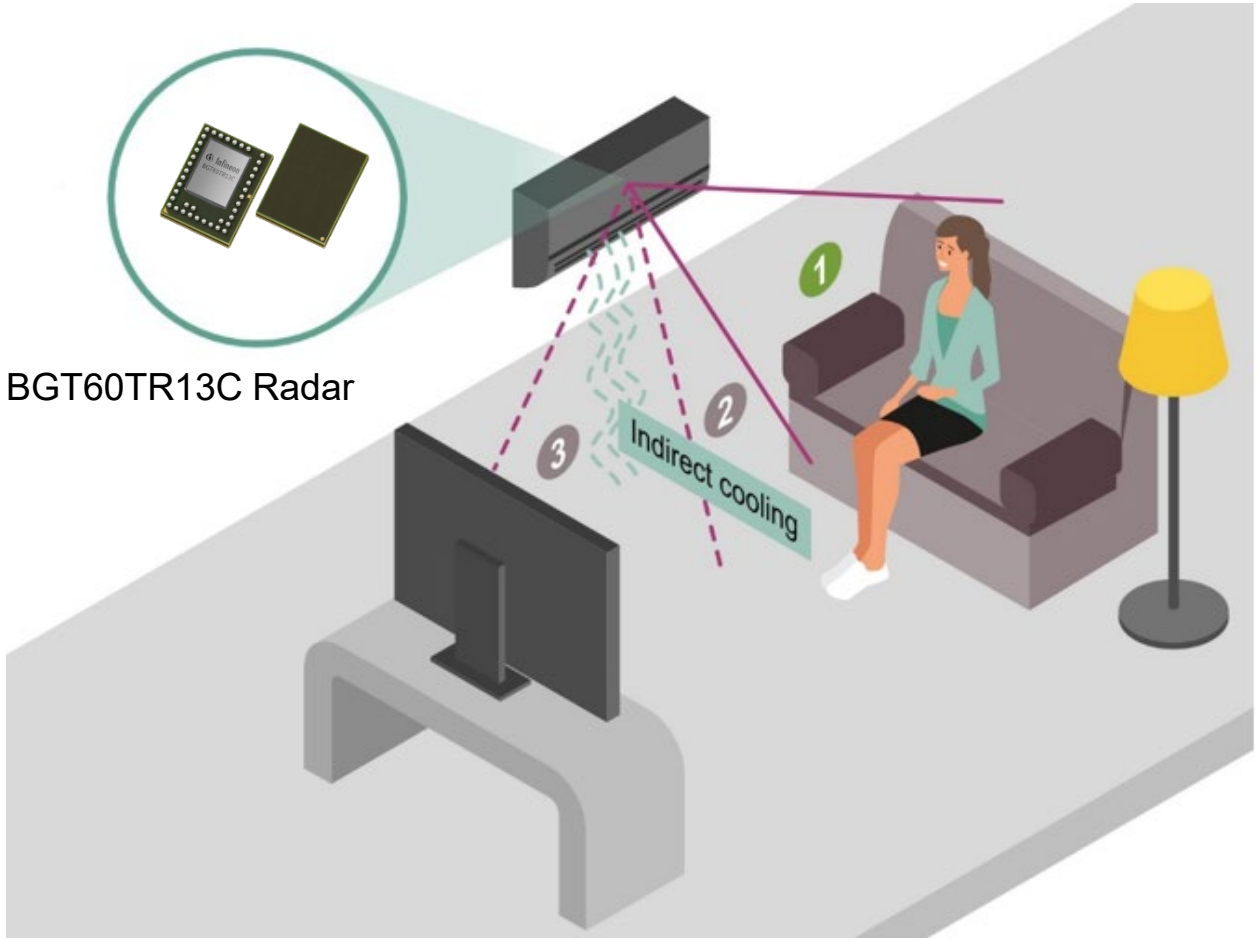


AC ON when presence is detected

Localize* the incumbent to create targeted air flow profile

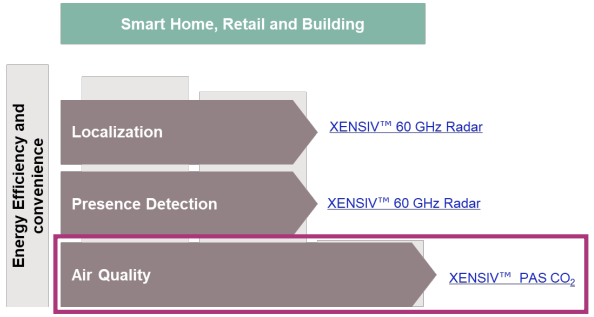


- Range and angle for nearest person
- Presence detection in segments

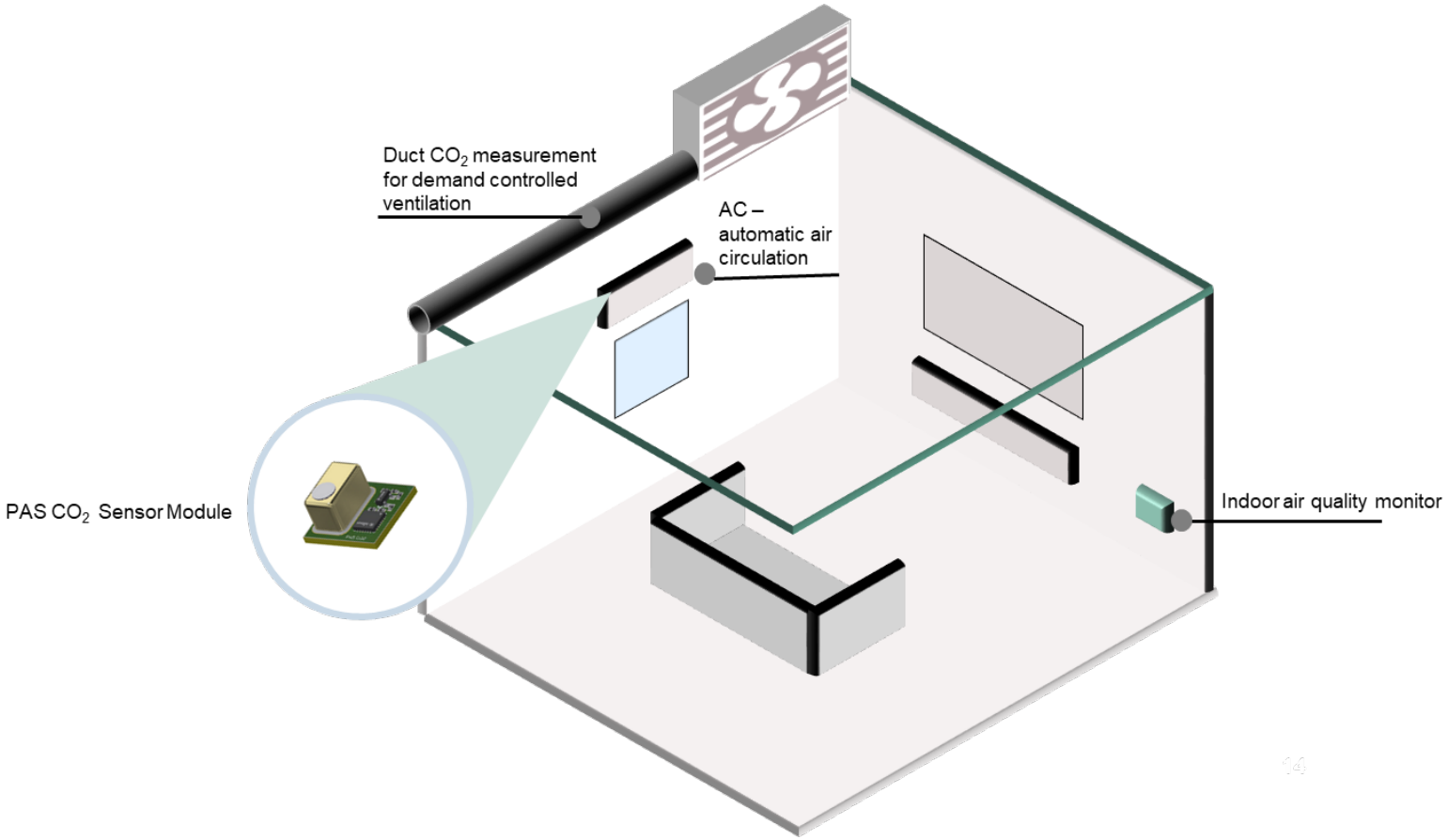


*in roadmap

Monitoring the air quality with PAS CO2 in smart homes



- Accurate CO_2 measure with no drift
- Small form factor
- Demand based ventilation systems
- Germs and Covid prevention



Flexible to integrated – Sensor solution options from Infineon for improving energy efficiency and convinience in airconditioners

Sensor Evaluation & Use Case Dev on PC/Rpi (RDK)

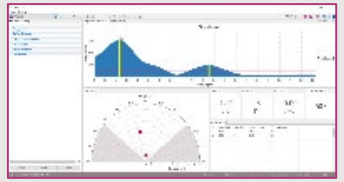
Porting use case to embedded platform

Use case evaluation on embeded platform

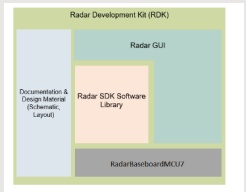
Value added development on MCU (eg.integration of VUI skills)

Final testing of use case and Integratíon components (sensor+ MUC) /**module** in AC

Radar Demo Board + RDK and PAS CO2 Mini Eval Kit

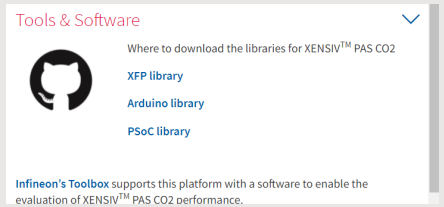


XENSIV™ BGT60TR13C Demo Kit with RDK



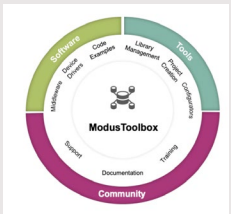
RDK in Infineon Developeer Center with complete kit, documentation

XENSIV™ PAS CO2 Mini Eval Board



Connected Sensor Kit

Rapid IoT Connect SoM (PSoC 62 + WIFi/BLE)+ XENSIV™ BGT60TR13C Radar+PAS CO2+ DPS368 Pressure Sensor
Visualization in sensor cloud



- ✓ Presence Detection
- ✓ Localization*
- ✓ PAS CO2 monitoring

Application example code in ModusToolbox™

ModusToolbox™ PSoC Software ecosystem

Radar SoM (**via partners – Arrow and NISD)**

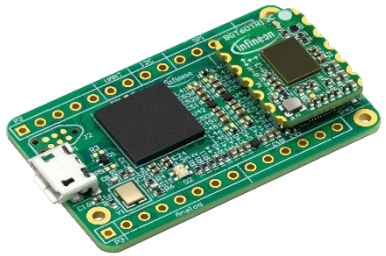
- ✓ Presence Detection
- ✓ Localization*

FCC certifiable, size and cost optimzed

*in roadmap

Radar Developement Kit – Get started with Radar Evaluation and Use case developement on PC

Step 1: Sensor Evaluation and Development

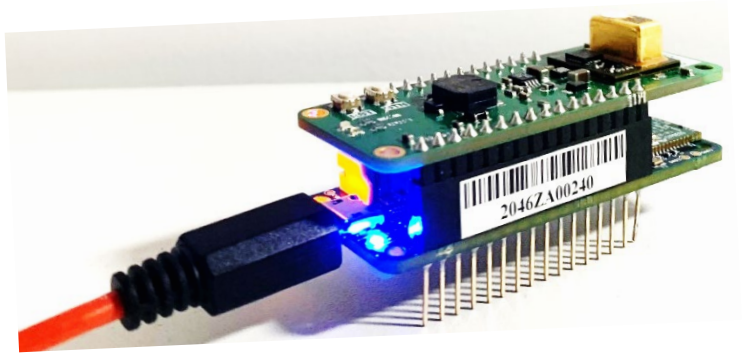


Radar Demo Board for Evaluation and Developement

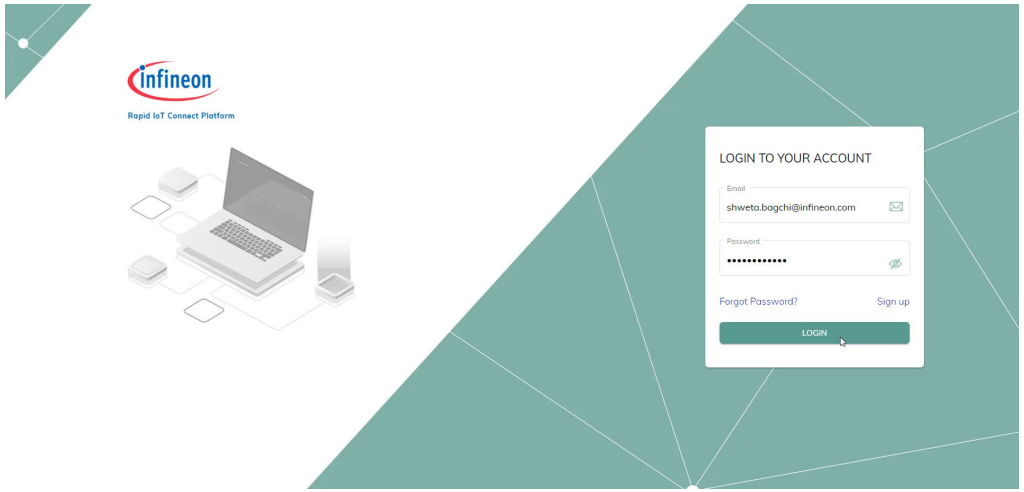
Step 2: Integration

Connected Sensor Kit – From Evaluation to Integration in easy steps

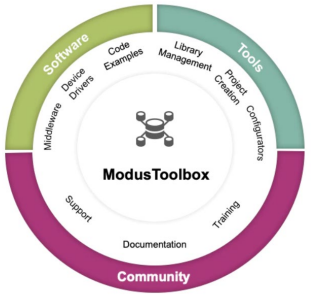
Step 1: Evaluation



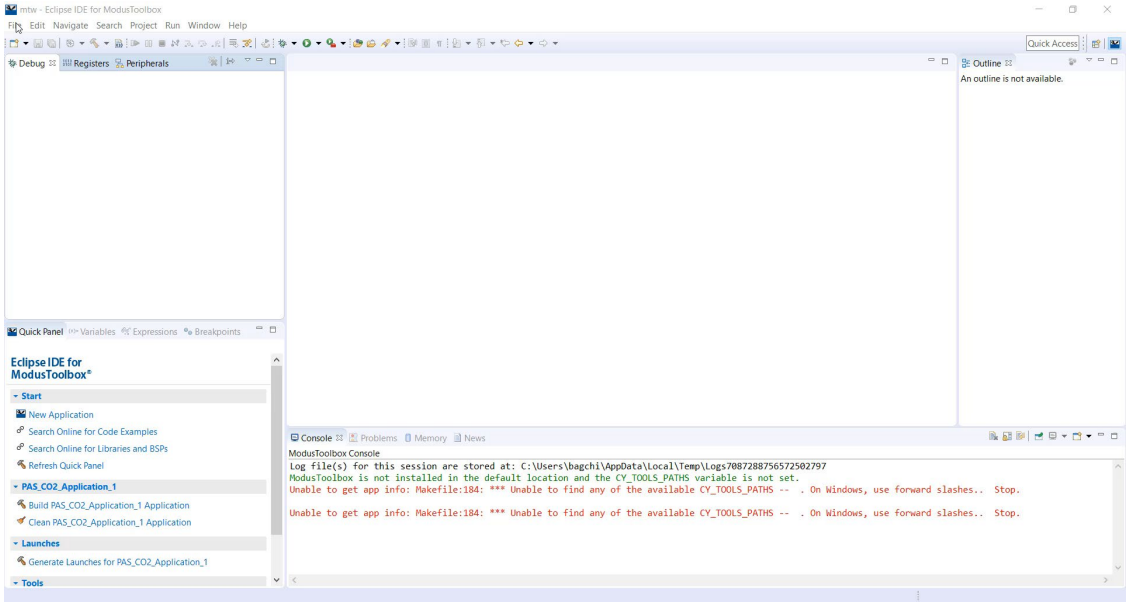
Power up Connect the Rapid IoT Connect Developer Kit + PAS CO2 wing via USB



Step 2: Development



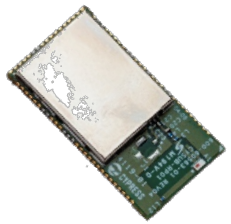
[Download ModusToolbox](#)
And get started with vlue added developement on PSoC™ 6 MCU



Connected Sensor Kit – From Evaluation to Integration in easy steps

Step 3: Integration

XENSIV™ PAS CO2

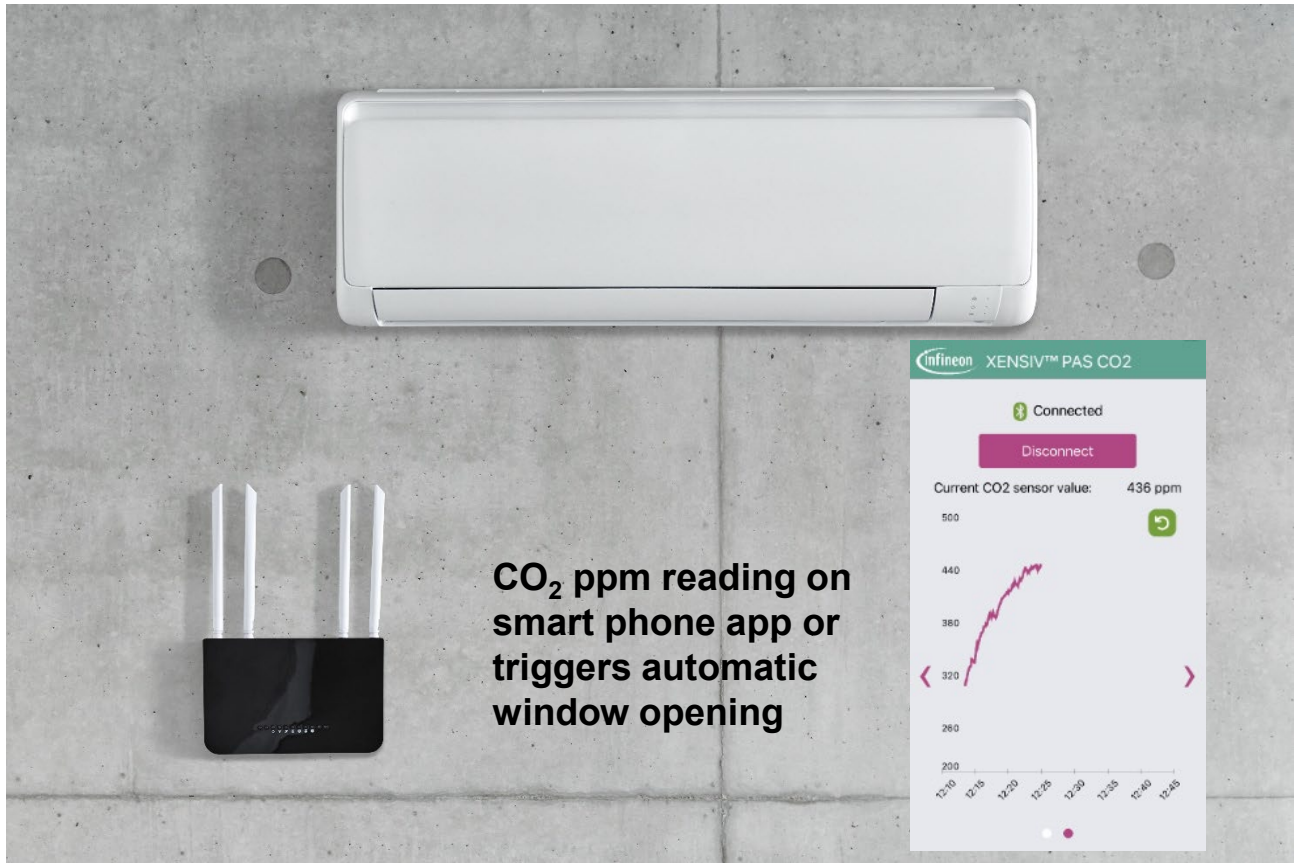


Rapid IoT Connect SoM

=

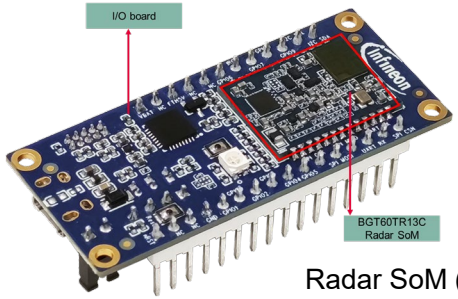
AIROC™ WiFi/BLE Combo

PSoC™ 62 MCU



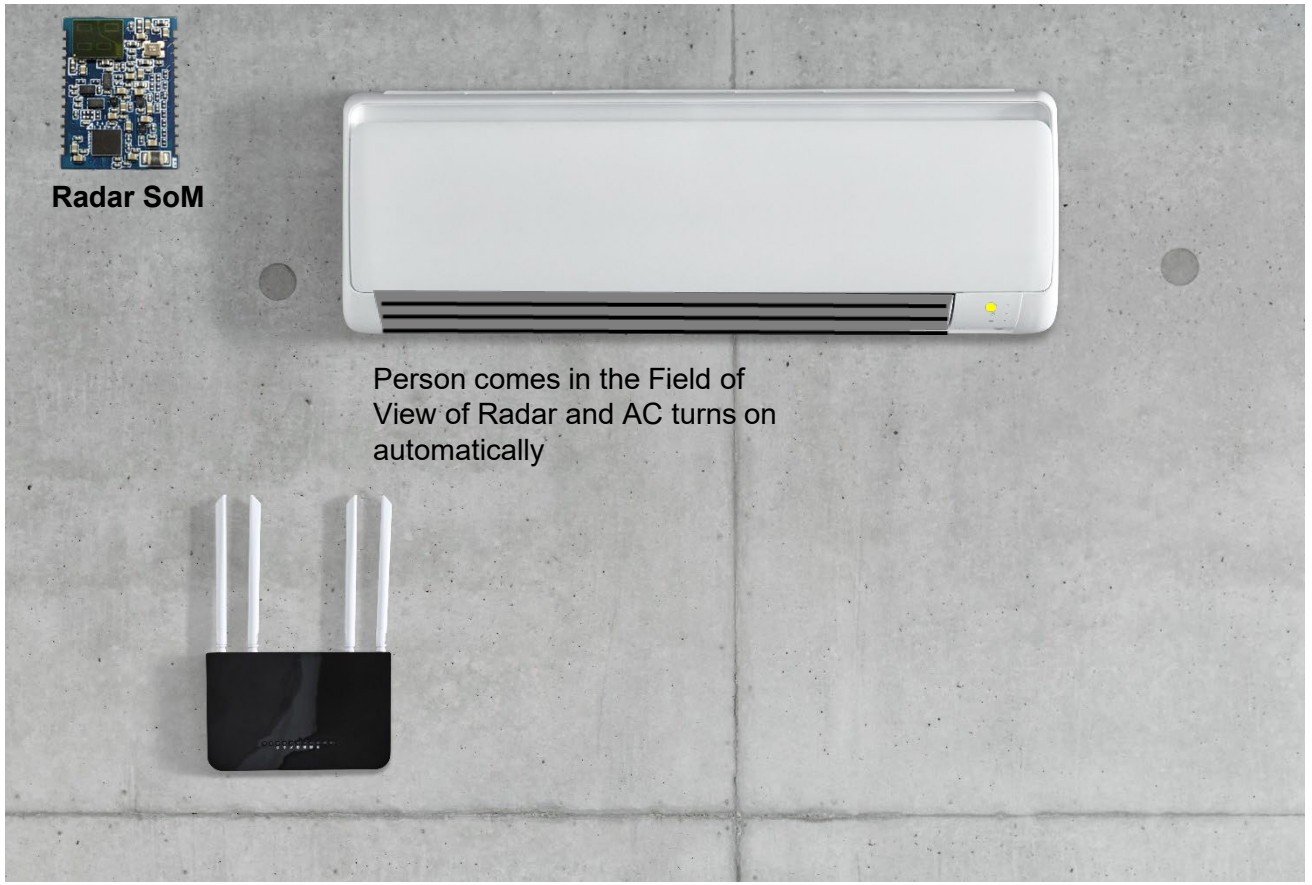
Radar SoM (w/ I/O Board) via partners – Cost and Size optimzed module for easy integration with FCC certiafiable use case Presence Detection

Step 1: Pre Developed Use Case Evaluation on PSoC™ 6



Radar SoM (BGT60TR13C Radar + PSoC 62 (MCU) + I/O Board

Step 2: Radar SoM integration



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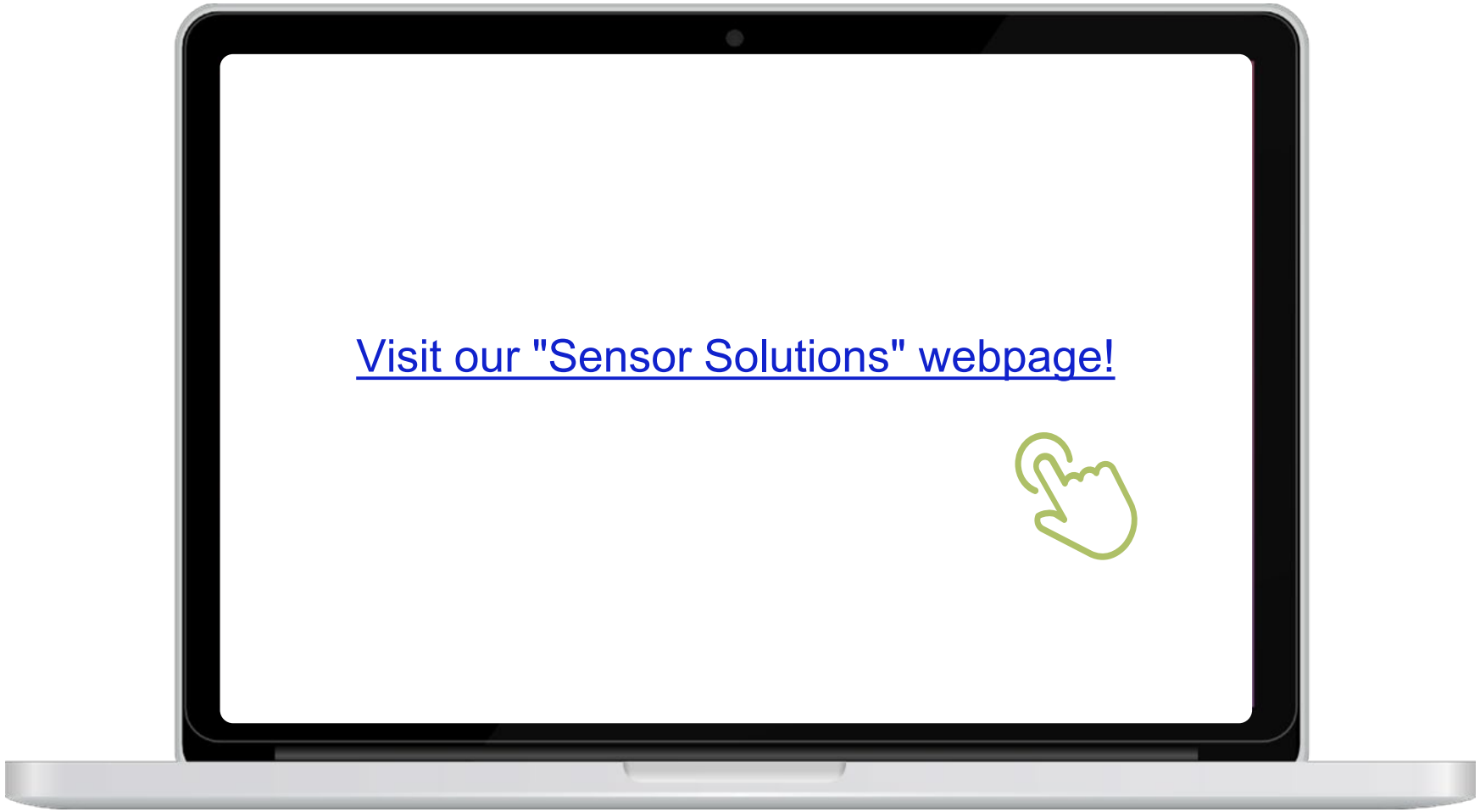

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