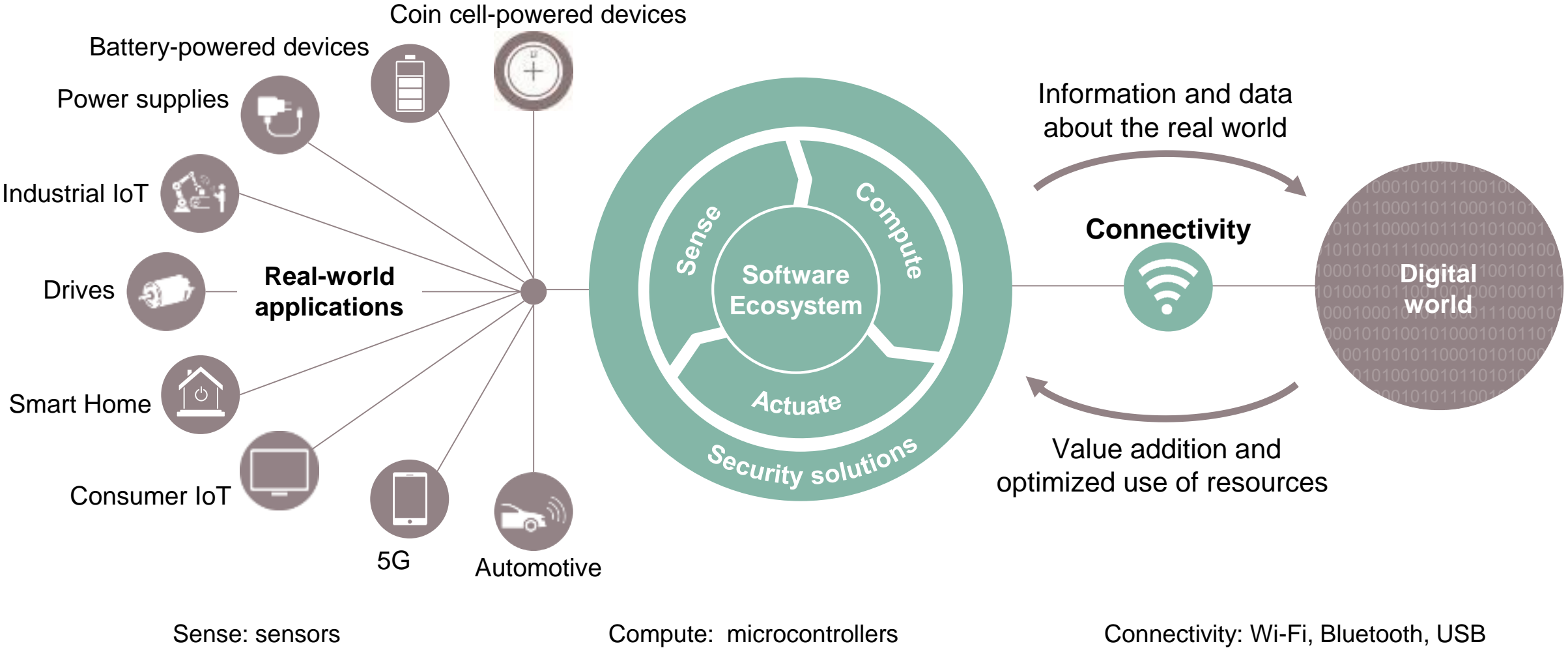# Connected Sensor Kit –
Sense, Compute, Connect

Ivan Karan, Application Marketing IoT & Sensor Solutions
26 October 2022
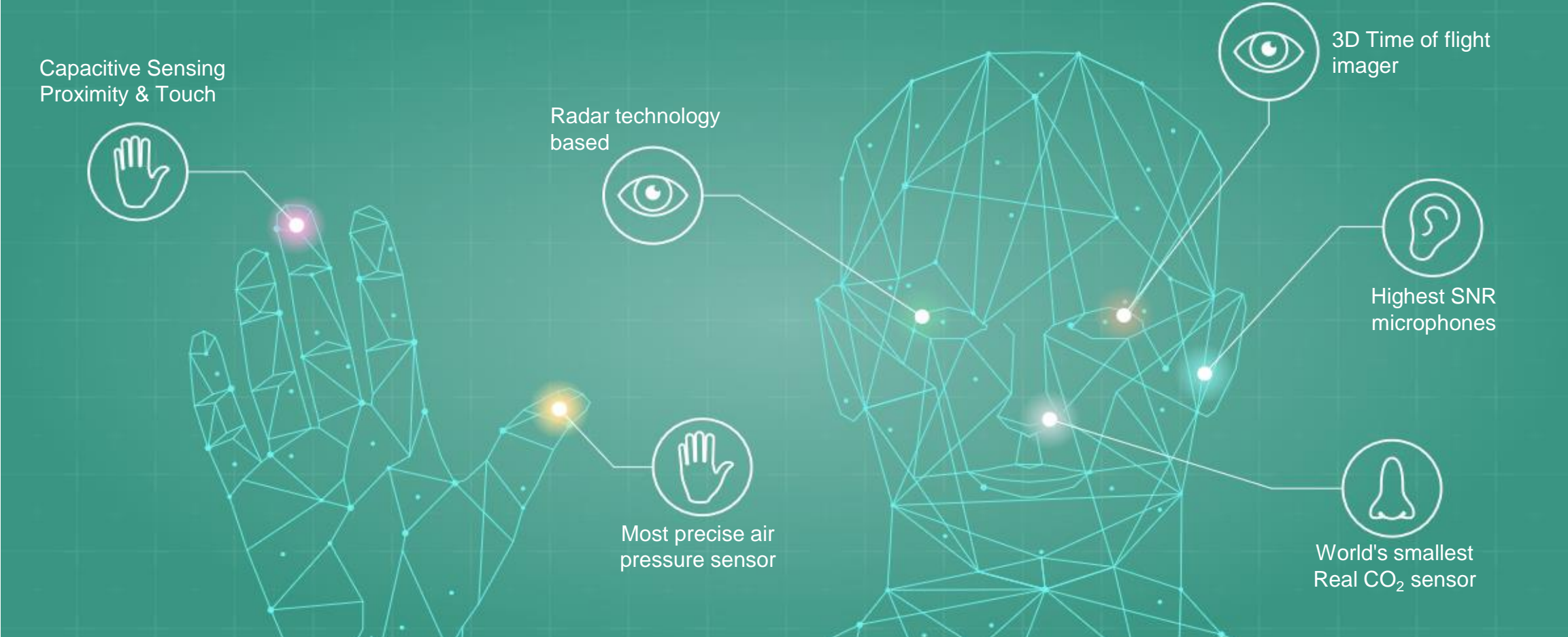
Infineon links the real and the digital world

Coin cell-powered devices

Battery-powered devices

Power supplies

Industrial IoT

Drives

Real-world applications

Smart Home

Consumer IoT

5G

Automotive

Sense · **Compute**

Software Ecosystem

Actuate

Security solutions

Information and data about the real world

Connectivity

Digital world

Value addition and optimized use of resources

Sense: sensors

Compute: microcontrollers

Connectivity: Wi-Fi, Bluetooth, USB

Intuitive sensors – human senses to make lifes easier

Infineon **XENSIV™ sensors** are exceptionally precise thanks to industry-leading technologies. They are the perfect fit for various customer applications in automotive, industrial and consumer markets.

Capacitive Sensing
Proximity & Touch

Radar technology
based

3D Time of flight
imager

Highest SNR
microphones

Most precise air
pressure sensor

World's smallest
Real CO_2 sensor

Smart sensing challenges – Infineon's solution

Customer's challenges		Infineon solution CSK XENSIV™
Integrate new sensors to the application: **Hard to start…**	>	**Easy to use** – Out of the box software: Examples and codes available
Sensors, MCUs, connectivity, security: **Many topics to consider…**		**Optimized** reference design: Cost, size, performance

Value beyond silicon

Use cases for radar sensors are versatile

Smart Home
Robust, Discreet, small

Door opening
Direction of travel to remove false opening

Security
Privacy protection, and increased accuracy

Lighting
Indoor, & outdoor. Resistant to harsh weather

Monitors & Laptops
Small, Hidden, sensitive

Home appliances
Activate displays based on presence around

Air conditioners
Track people to move the airflow away from them

Smart speaker
Eliminate keyword based activation

TV
Safe energy & OLED lifetime by turning off

Gaming & VR
Enhance gaming experience

Gesture control
Additional gesture package available

Material detection
Object recognition & classification

Service robots
Robust, small footprint, accurate

Robotics
Safety, accuracy and efficiency

Vital sensing
Breathing & heart rate measure-ment

Key benefits of radar sensing

Radar detects any motion

> Radar can detect even the smallest kind of motion including vital signs

> No need to wave in front of motion triggered lighting systems or similar devices

> **Radar feels presence!**

Radar detects through obstacles

> Radar waves penetrate all non-conductive materials

> Radar sensors can be hidden in the end product, allowing product design flexibility

> **Radar sensing is anonymous!**

> Radar can sense distance, velocity, breathing & heart rate, gestures, track people and much more!

> Radar performance parameters can be adjusted

> **Radar is versatile and flexible!**

> Radar works in sun, dark and all other lighting conditions

> Radar is robust to fog, dust and temperature

> Radar sensors do not require maintenance

> **Radar is environmentally resilient!**

Radar is powerful

Radar is robust

Choose the right radar system

24 GHz vs. 60 GHz

	24 GHz		60 GHz
Detection range	up to 100m		up to 10m
Range resolution			up to x28 related to 24 GHz
Integrated antennas	No		Yes
System size	~625 mm²		~125 mm²
Power consumption	<1mW possible		<1mW possible
Detection through obstacles	Good penetration		Limited penetration
Env. robustness	unsusceptible		vulnerable

- Regulatory aspect
- Physical aspect
- Product aspect

Doppler vs. FMCW

Doppler Radar

› Low power consumption

› Easy to understand & use

› Low signal processing required (On-chip processing available)

› Lower BOM cost solution

FMCW Radar

› High sensitivity

› High range resolution

› Providing range information

 − Stationary target detection

 − Enabling complex use cases

With radar addressable use cases:

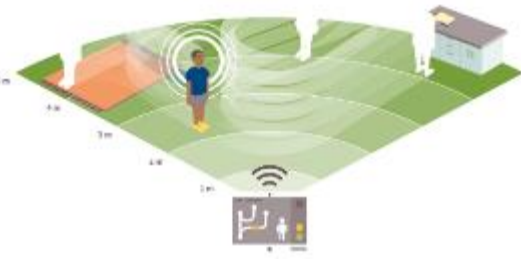Motion detection | Presence detection | Ranging cm | Segmentation | People tracking | Gestures | Material detection | Vital sensing

RADAR – Roadmap
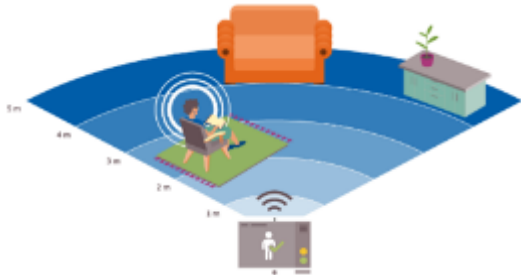
Presence
- › Detecting human presence from 1m to 15m
- › Detects micro and micro motion
- › Ability to detect direction of movement (angle-of-arrival)
- › Can calculate range and velocity of human target(s)

Location/Segmentation
- › Same as presence but can detect multiple target locations and segments them into zones
- › People counting

Tracking
- › Same as target location but can actively track multiple targets while moving
- › Can track multiple moving targets within specified range

Gesturing
- › Hand swipes and macro-motions
- › Enabler ("Jumpstart") package with latest SDK
- › Machine Learning and AI techniques needed for production-level reliability
- › External expertise required

XENSIV™ CO2 PAS sensor: best in class price/performance sensor in an exceptionally small size

Smart Home	Smart Appliances	Ventilation Control	Consumer Devices
+ Comfort	+ Energy saving	+ Productivity	+ Healthier life

Measure what matters with our disruptive CO_2 sensor based on photoacoustic spectroscopy (PAS)

Multiple benefits

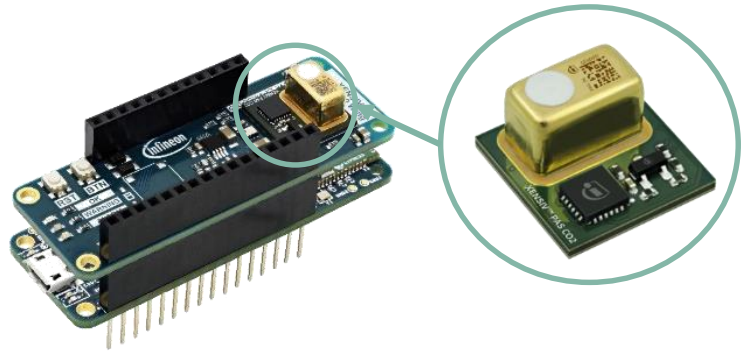High data quality

Plug & Play

Small form factor in SMD package

Infineon's quality and supply guarantee

Connected Sensor kit success story: Munich Security Conference 22

MSC

› **Use Case:** Monitoring the CO_2 level in MSC meeting rooms

› **Function:** Traffic light and cloud connection dashboard

Infineon inside

Connected Sensor Kit

› XENSIV™ PAS CO2 sensor (on Wing Board)

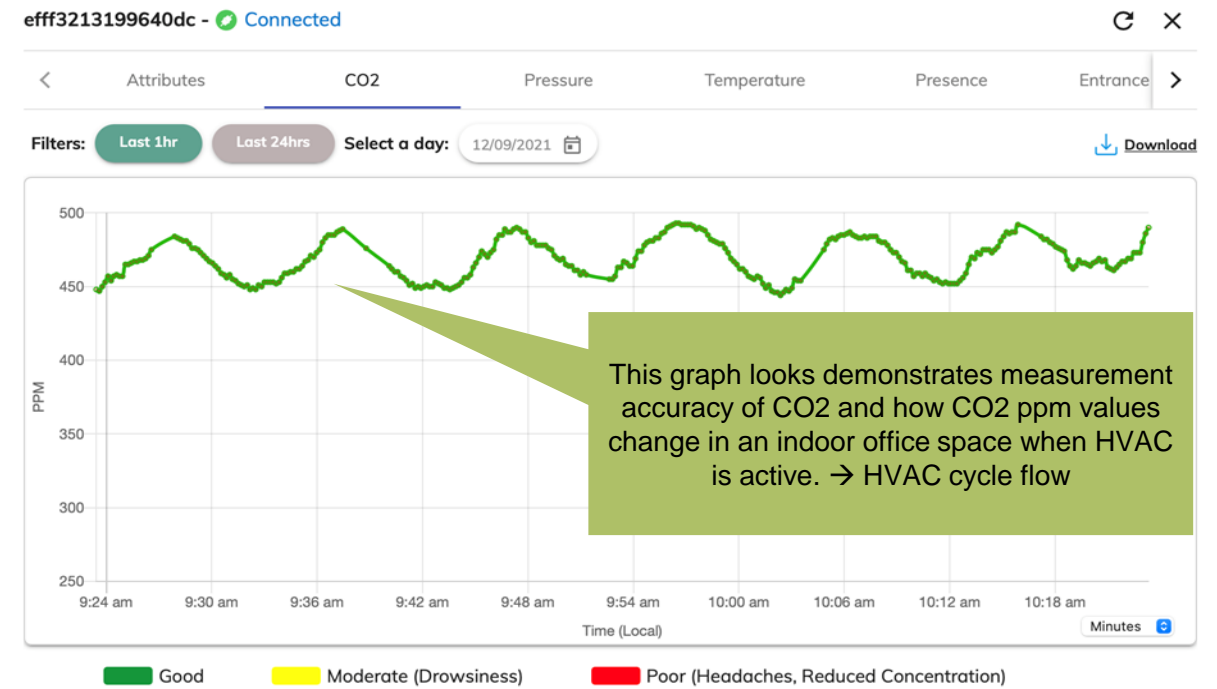› Cloud-ready SoM (on Rapid IoT Connect Dev Kit): CYSBSYS-RP01 (incl. PSoC™ 62 & CYW43012)

Cloud connection

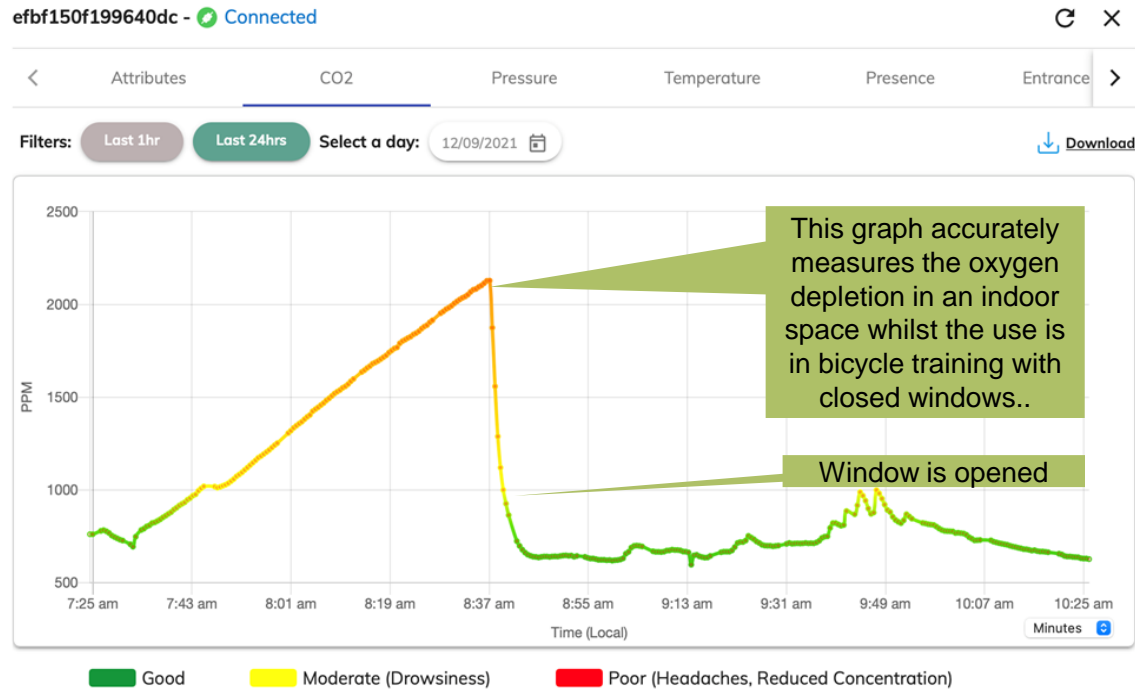› Dashboard view by Infineon partner eesy-innovation GmbH

XENSIV™ PAS CO2 for consistent monitoring of room air quality

Real-time measurement of CO_2 concentration during indoor cycling (left) and in home office (right)

Air quality measurements with CO_2 concentration levels can vary dramatically based on how people behave and are moving around a room. XENSIV™ PAS CO2 CSK measurements can be a directional indicator when multiple sensors are deployed in analyzing human activity/movement beyond the room air quality state, HVAC performance or a malfunctioning of equipment.

XENSIV™ Connected Sensor Kit at a glance

Connected Sensor Kit

+

Software ecosystem in ModusToolbox®

XENSIV™ BGT60TR13C GHz Radar + Pressure Wing Board

XENSIV™ PAS CO$_2$ + Pressure Wing Board*

CYSBSYSKIT-01- Feather Board

Features:

› Sense: XENSIV™ Radar, PAS CO2, Pressure Sensor

› Compute: Low power dual core PSoC™ 62 MCU

› Connect: Wi-Fi and Bluetooth®

› Secure: OPTIGA™ Trust M

› Complete software suite and sensing algorithms

Part of your life. Part of tomorrow.