Paving the way for sustainable AI

We enable and provide AI

May 2024

Infineon and you – driving the AI revolution

Our technologies and AI-models drive the development of energy-efficient, high-performance and reliable AI applications of the future – and thus for your successful market entry.

We power AI

Creating a more sustainable future by providing technologies to reduce power losses and cooling costs in greener data centers of the future.

We enable and provide AI

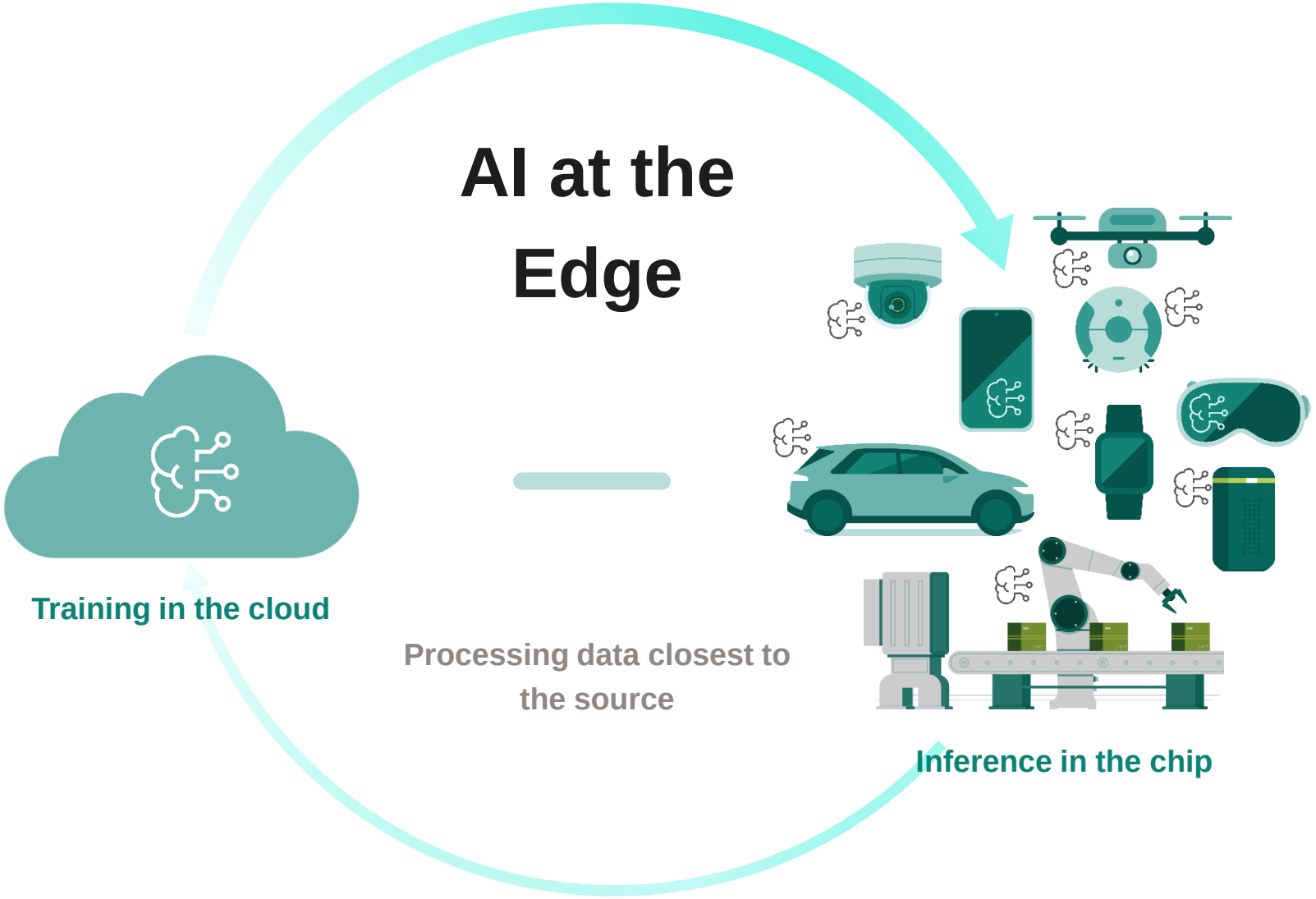
Supporting customer’s innovation with semiconductor solutions, software, and tools that help deliver AI innovation quickly, efficiently, and at scale.

We use AI

Moving forward for high-quality solutions by adopting AI across the organization for smarter products and more streamlined processes.

We enable and provide AI

Real-time requirements and the need for power-efficiency, security and privacy drives AI-processing at the edge



Key benefits of Edge AI

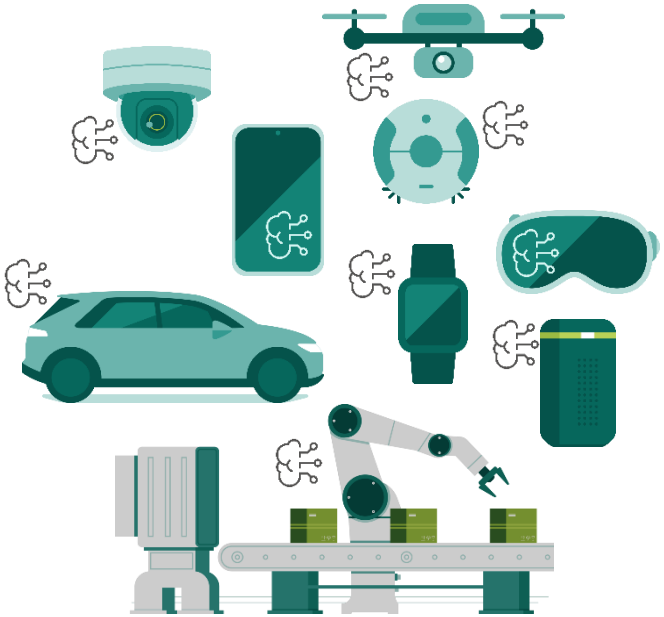
Low latency and real-time response

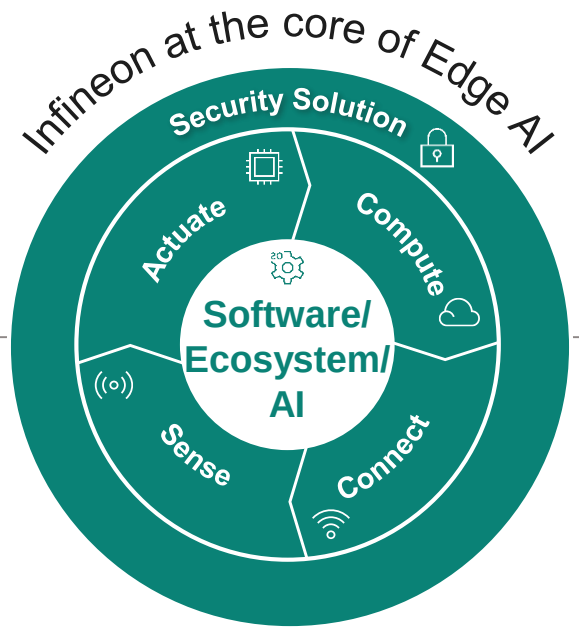
Higher power efficiency

Improved security and data privacy

Reduced cost

We provide & enable a wide range of technology-solutions for your AI solutions – for every level of AI knowledge





Digital world

Infineon at the core of Edge AI: Infineon's complementary set of AI-specific products and solutions, an end-to-end ML platform as well as an extensive application knowledge and a broad network of experienced AI partners allows you to get your AI application to market quickly – without having to be a proven AI expert.

Infineon offers end-to-end technology solutions for your AI market entry

Digital Services and AI solution platforms

INDUSTRIAL ANALYTICS

Hybrid AI-based services

In-field Power Analytics

e.g. RUL*

XENSIV™ sensor solutions

e.g. Sleep quality service

And others…

AI-models for a wide variety of applications

imagimob
An Infineon Technologies Company

Ready Models

- Baby cry detection
- Siren detection
- Surface detection
- Wearing detection (for headphones, helmets, etc.)
- Coughing detection
- Alarm detection
- Yelling & commotion detection
- ...
- Snoring detection
- Gesture detection
- Arc Fault Circuit Interrupters

End-to-end software solutions for easy training & deployment

TensorFlow

Keras

ONNX

imagimob
An Infineon Technologies Company

Imagimob Studio

ModusToolbox™

AI partner ecosystem:

SYNOPSYS®

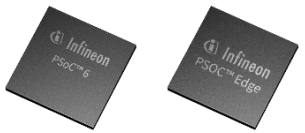
DesignWare ARC
MetaWare Toolkit

EKHONO AI

SensiML™

The right hardware for your Edge AI model

MCUs:



PSOC™

AURIX™

TRAVEO™

XMC™

XENSIV™ smart sensors portfolio for automotive, industrial and consumer

*Remaining useful life

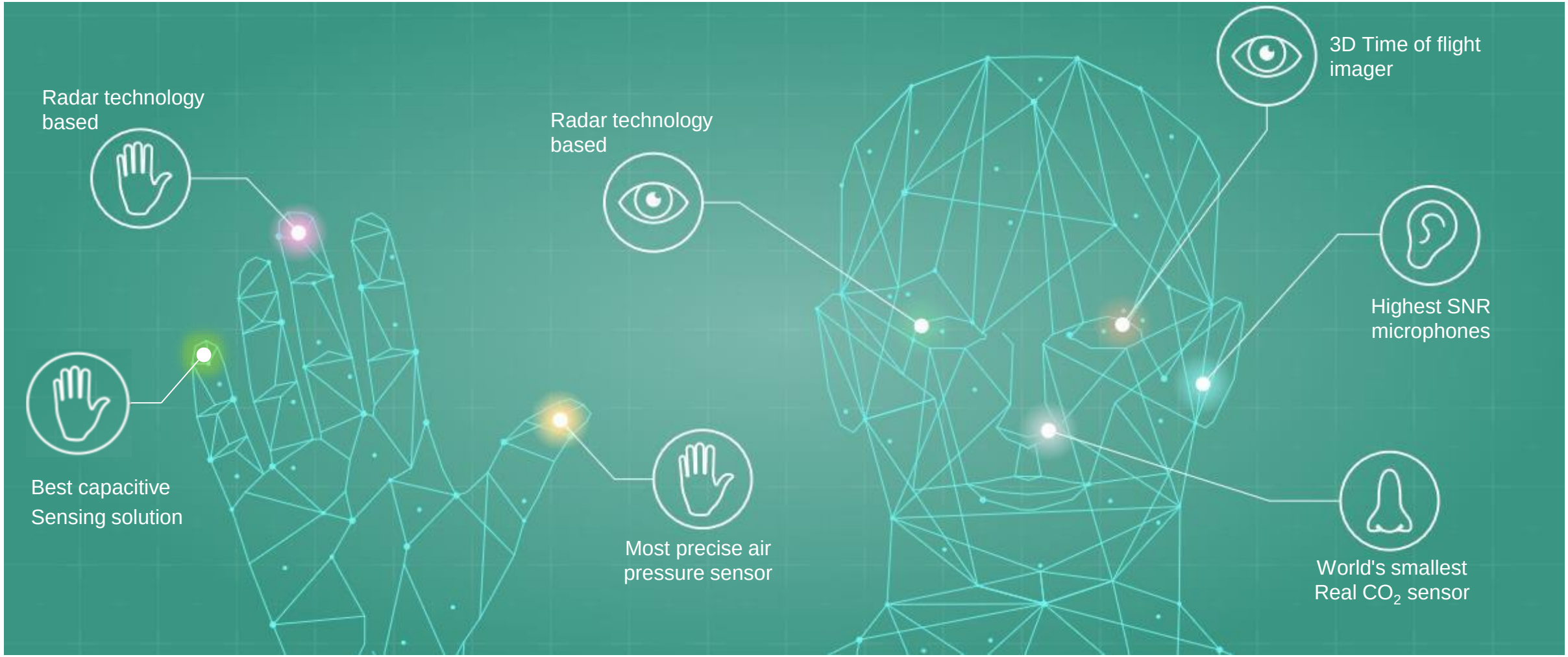
Imagimob Studio helps you take your Edge AI ideas to production quickly and easily

- **State-of-the art, end-to-end ML development platform:** Collect & annotate data directly from your target hardware. Create, train, evaluate & deploy great ML models fast.
- **Own your own data:** Data is only used by Imagimob to train your models. Data is stored offline on your machine.
- **Not locked into the Ecosystem:** Build a custom model, or bring your own to optimize for the edge, and deploy on the hardware of your choice.
- **AutoML functionality**: Auto-generates high performance AI models optimized for speed and low footprint.
- **Visualization is king**: No more "black box": Follow your machine learning model creation journey with our Graph UX.

- Imagimob Studio supports all INFINEON Microcontrollers (PSoC™, AURIX™, TRAVEO™, XMC™)
- Imagimob in cooperation with INFINEON can develop customer specific AI-Models

Our intuitive sensors are enabling Edge AI – Giving things the human sense

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

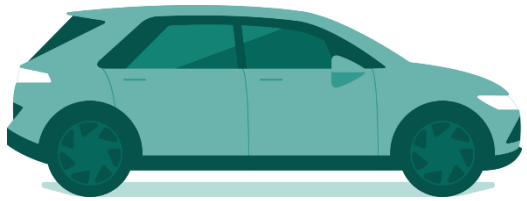


Our advanced technological solutions address a wide range of Edge AI applications

AI in IOT & Consumer

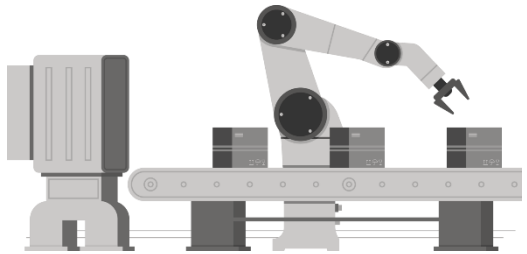
Democratizing AI by bringing the computational power of AI algorithms **closer to the source data** with **smarter** and **greener** devices for **intuitive real-time** interaction.

AI in Automotive



Ushering in a new era of connected and autonomous vehicles with **reliable**, **safe**, and **secure** systems for **real-time safety critical applications**.

Industrial AI



Creating self-learning systems for greater **productivity**, **quality**, and **efficiency** and supporting the adoption of sensor-based **predictive maintenance** models.

AI solutions for IoT & consumer applications

Infineon provides a comprehensive end-to-end embedded AI solution

In-house AI Software

imagimob
An Infineon Technologies Company

Development & AI Ecosystem

ModusToolbox™ Software

SensiML

Cyberon
Leading Speech Solution Provider

Micr.ai

PSoC™ 6 or PSOC™ Edge Microcontroller

Infineon sensors

Connectivity
& security solutions

PSoC™ 6 AI Evaluation Kit is Infineon's HW Platform for Edge AI. It Enables the full ML to embedded SW journey with endless possibilities for customers.

Launching 06/24

Easy to use & low-cost

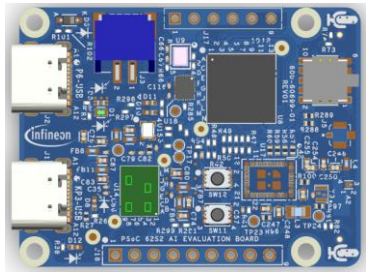
Evaluation board with efficient form factor for easy prototyping

Easy creation of ML models

Sensor fusion-, ML-, acoustic-, time series- and radar models

Connect easily & continuously improve models

Wired & wirelessly



CY8CKIT-062S2-AI

Fast time to market at minimal development cost

Direct launch for PSoC™ 6 & AURIX™

End-to-end

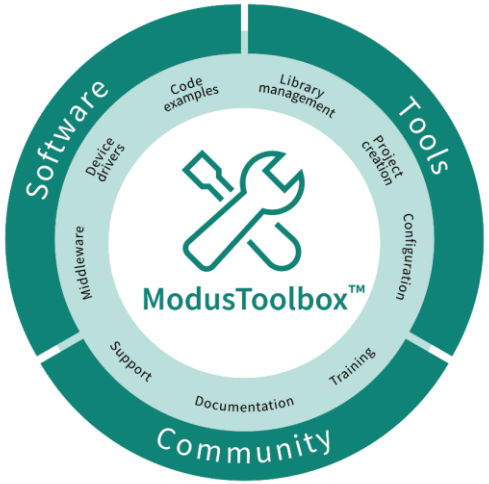
Collect data, create, train, evaluate & deploy your ML models fast

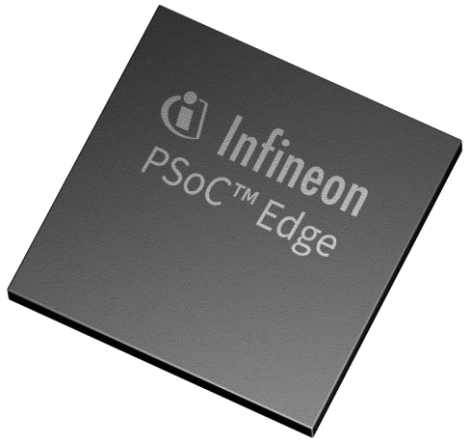
The best of Hardware, Software & ML

Solution approach with PSoC™ 6, QSPI Flash & multi-sensor input: radar, microphone, pressure & 6-axis motion sensor

Customized Machine Learning on PSoC™ Edge with Imagimob Studio and ModusToolbox™

With the seamless integration of **Imagimob Studio** and **ModusToolbox™** companies can build and deploy robust machine learning models. When paired with **PSoC™ Edge**, companies can optimize power consumption and improve efficiency while adding intelligence to products.





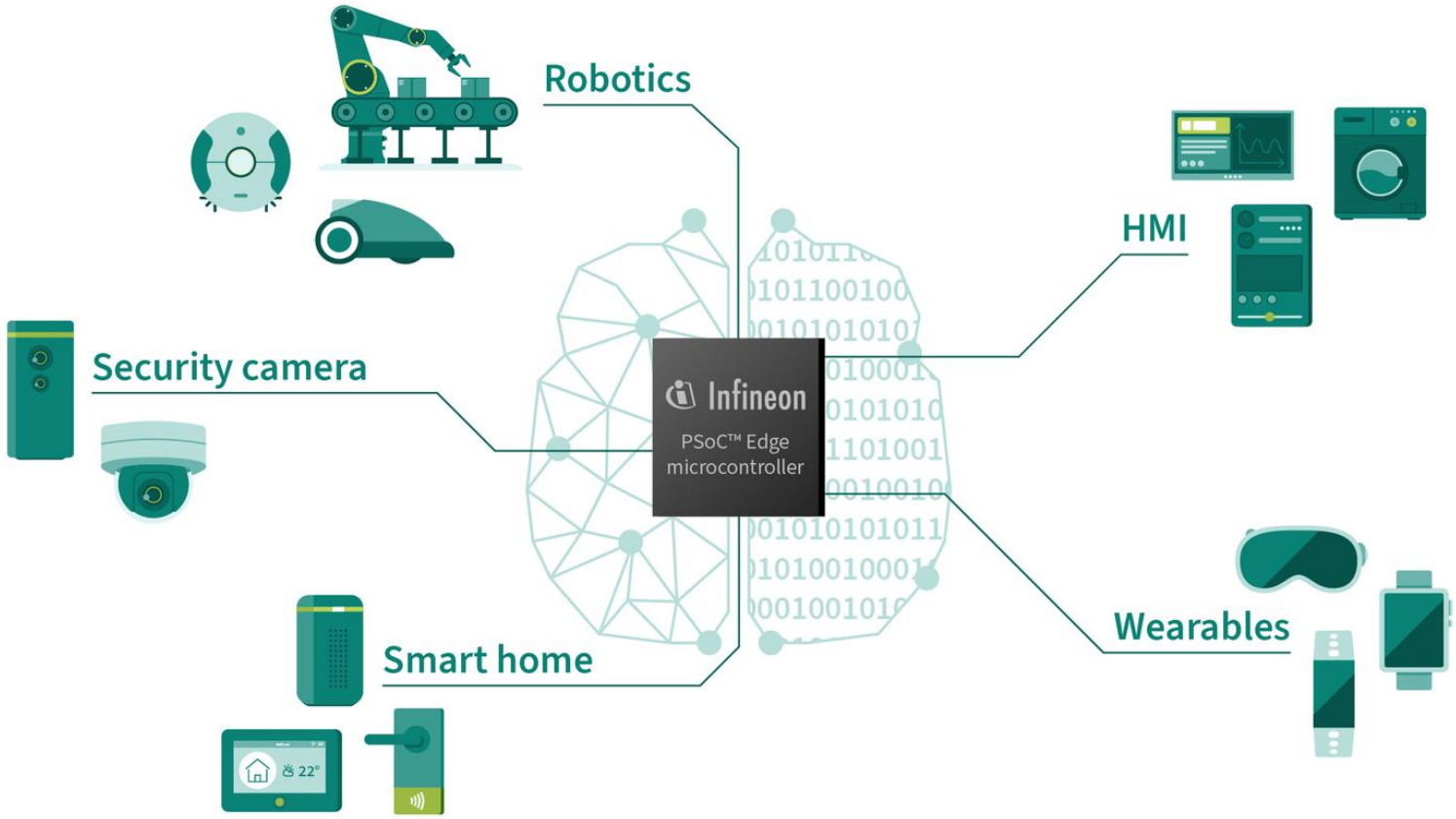
Imagimob Studio, Infineon's platform for machine learning development, makes it easier to create Edge AI models

ModusToolbox™ Software is a modern, extensible development ecosystem

PSoC™ Edge is the next generation Machine Learning-enhanced sensing, low power, secured, and advanced HMI high-performance microcontroller family

Next-generation PSOC™ Edge portfolio: Infineon PSOC™ Edge E81, E83 and E84 MCUs

PSoC™ Edge – Enables a new generation of responsive machine learning devices



Fully integrated system-on-chip (SoC) devices supported with comprehensive system design tools and software.

Based on the high-performance Arm® Cortex-M55.

Quick move from concept to product.

Fast time-to-market for IoT and consumer applications.

Security is key in the context of AI and in our portfolio

Security is crucial for Edge AI + **Security is part of our DNA** › **New PSOC™ EDGE E8X product family**

- Multiple points of attack
- Critical IP
- Sensitive data

- Designed to meet highest certification level provided in the Platform Security Architecture (PSA) PSA L4 iSE
- Integrated secure enclave to support boot-time and run-time security services
- Isolation of security protection and AI acceleration computation

Our solutions help you make the most from our sensors.
Making sleep measurable with the XENSIV™ Sleep Quality Service

XENSIV™ Sleep Quality Service

Key analytics

Sleep Attributes: *Distinguishing between sleep and wakefulness*	Sleep Stages: *Detecting and monitoring different sleep stages*	Respiratory Factor: *Detects breathing events by analyzing relative changes in breathing intensity*
• Total sleep time • Sleep efficiency • Time to sleep • No. of awakes	• Absence • Presence /awake • Sleep • REM • NREM	• Breathing rate • Breathing patterns • No. of respirational anomalies

XENSIV™ Sleep Quality Service

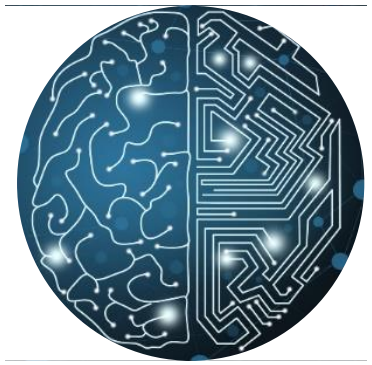
Product details

- **Embedded Sensor:** IFX **60GHz Radar** for precise sensing
- **Compute and Connect:** IFX **PSoC™** and **Wifi+BT module** for edge compute and cloud connectivity
- **Cloud AI:** Globally accessible, near real-time analytics
- **OEM Data Ownership:** Secure, exclusive consumer data control and anonymized user data for on-boarding (BirthYear, Timezone, Gender)
- **Sleep Analytics API:** Instant access to sleep and other SQS insights

Embedded AI solutions for Automotive

AURIX™ TC4x Parallel Processing Unit (PPU) enables affordable artificial intelligence use cases for Automotive

Artificial Intelligence & Neural Networks



Optimize Automotive Use Cases

› Cost Reduction
› Innovation
› Improve Performance
› Accelerate Time to Market

Automotive AI Use Cases

Domain/Zone Control

› Modelling
› Model Predictive Control
› IDPS & other security methods

ADAS

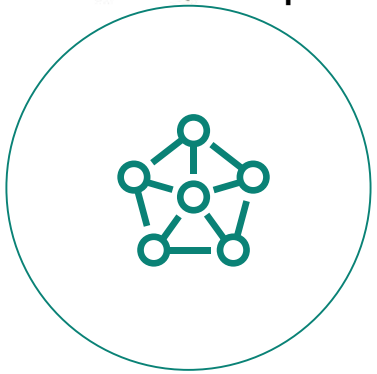
› Object classification
› Advanced Radar Signal Processing
› Sensor Fusion

xEV Applications

› Predictive Control
› Virtual Sensing
› Advance State of Health (SoH) and State of Charge (SoC) algorithms

PPU accelerator

SIMD vector DSP Co-processor



› Data processing of linear algrebra (e.g. matrix operations) and signal processing (e.g. filtering, convolutions)
› Ultra fast control loop implementation
› Implemented in low-latency cluster with mixed signal peripherals

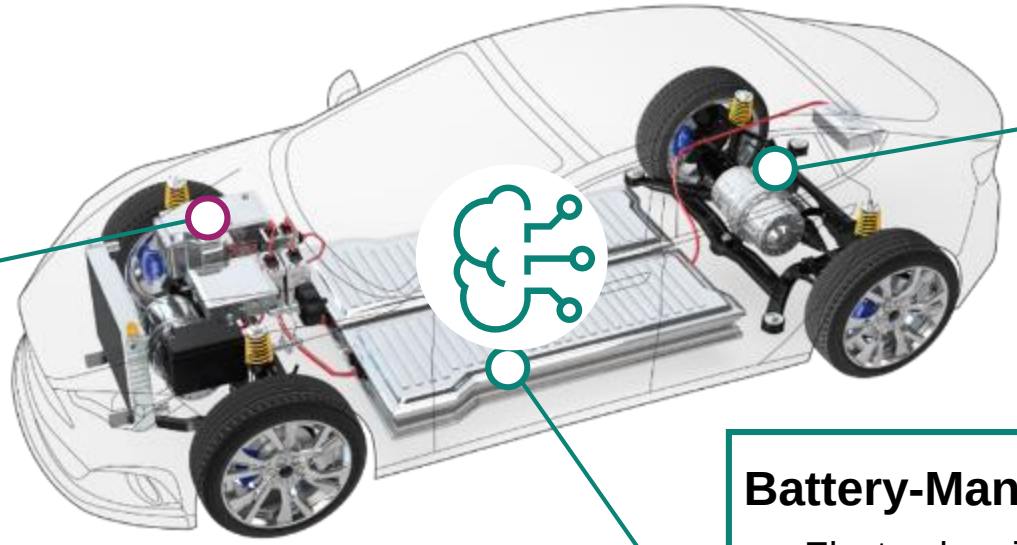
For instance, AURIX™ TC4x PPU empowers the e-Drivetrain of the future for best-in-class system efficiency and cost-innovation

TC4x PPU is enabling

Power-Conversion

- Combining control and communication functions and reducing number of system MCUs from up to 7 to 1

clear cost-down path and further efficiency increase



HV Traction Inverter

- Motor Position Sensing
- Health Observing
- Temperature Estimation
- Model Predictive Control

best-in-class system efficiency and cost-innovation

Battery-Management

- Electrochemical models
- Hybrid ML accelerated models
- Artificial intelligence

optimized Charging, extended vehicle range and battery life

Up to **12x**

TriCore performance, eg. for AI-applications based on 256 bit PPU

Infineon provides a comprehensive end-to-end embedded AI solution with automotive qualified hardware and software

End-to-end solution stack for Automotive AI

In-house AI Software

imagimob
An Infineon Technologies Company

AI Partner ecosystem

SYNOPSYS® EKHONO AI

ASIL-D qualified AURIX™ Microcontroller

Automotive qualified sensors

Power management solutions

Connectivity & security solutions

Industrial AI solutions

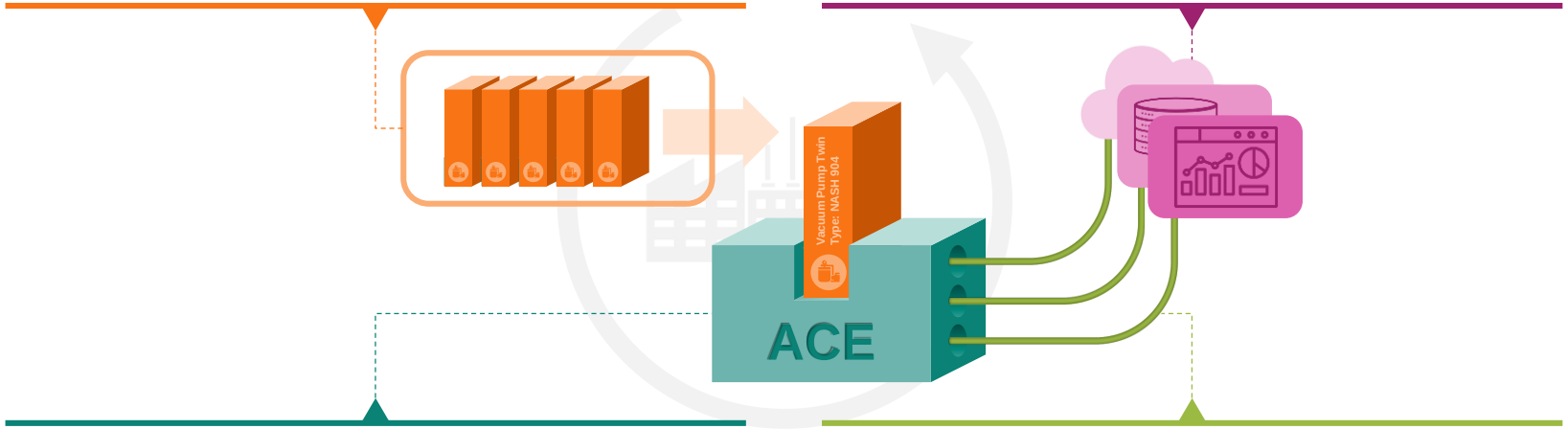
IAX provides digital representations of physical assets, housed in a docker with standardized interfaces to customer applications

1. Digital Twin / Digital Twin Library

- Database of digital replicas for industrial equipment
- Physics-based models reflecting real-world properties of the corresponding asset for high accuracy and efficiency
- Simulation of asset condition to predict failures, optimizing lifespan & energy use

4. Customer Applications

- Customer applications (e.g. Building Management Systems) can seamlessly integrate data from deployed ACE
- IAX offers complementary applications like interactive dashboards and mobile apps that can be customized to specific front-end use cases



2. Analytics Core Element (ACE)

- Acts as pre-processing brain of the Digital Twin
- Stored on a PLC on site and compares sensor input data with model data
- Runs essential real-time analytics tasks, identifying anomalies and reports product status via APIs to Customer Applications

3. APIs

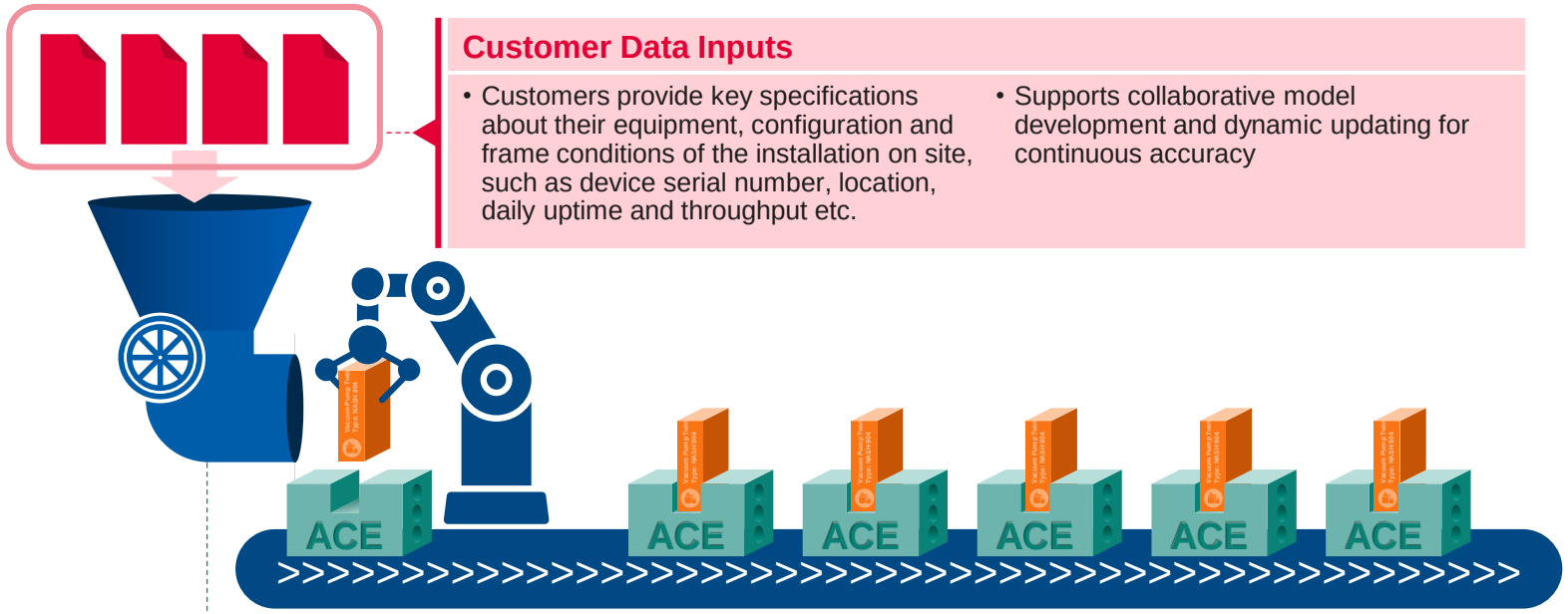
- Standardized interfaces for seamless integration of Digital Twin Model and ACE into customer applications, enhancing functionality
- Promotes ecosystem growth through third-party application development

INDUSTRIAL ANALYTICS

Value Proposition to Our Customers

- Highly accurate and reliable physics-based models tailored to specific equipment and components
- Precise analytics providing event notifications, alerts and status reports in real-time.
- Ease of implementation thanks to standardized interfaces to common customer applications

In the future, ACE Forge will mostly automate creating digital twins with ACE dockers that are compatible with customer infrastructure



Customer Data Inputs

- Customers provide key specifications about their equipment, configuration and frame conditions of the installation on site, such as device serial number, location, daily uptime and throughput etc.
- Supports collaborative model development and dynamic updating for continuous accuracy

ACE Forge

- Automates Digital Twin creation, streamlining model development with less time and expertise needed
- Simplifies model access with an easy upload-and-receive interface, making advanced analytics more accessible
- Employs AI and machine learning to refine Digital Twins for precise physical asset representation, enhancing accuracy as more data is collected

INDUSTRIAL ANALYTICS

Value Proposition to Our Customers

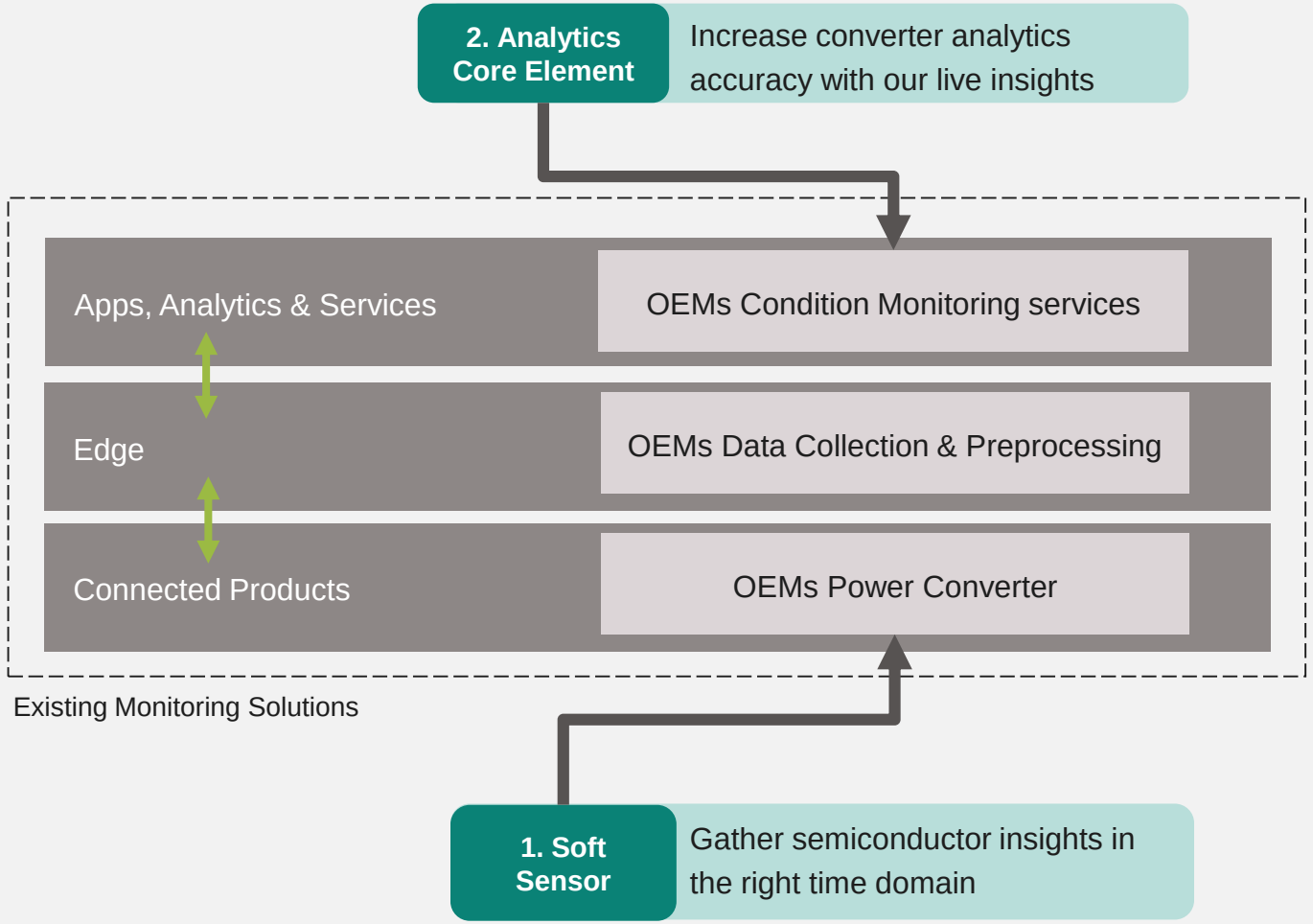
- Simple data entry thanks to user-friendly interface and menu navigation as well as plausibility check
- Immediate assessment of potential savings and immediate cost estimate
- Fast and automated model development through the use of generative AI solutions

In-field Power Analytics Service, enhancing Converter Monitoring Solutions with unprecedented insights about the power stage.

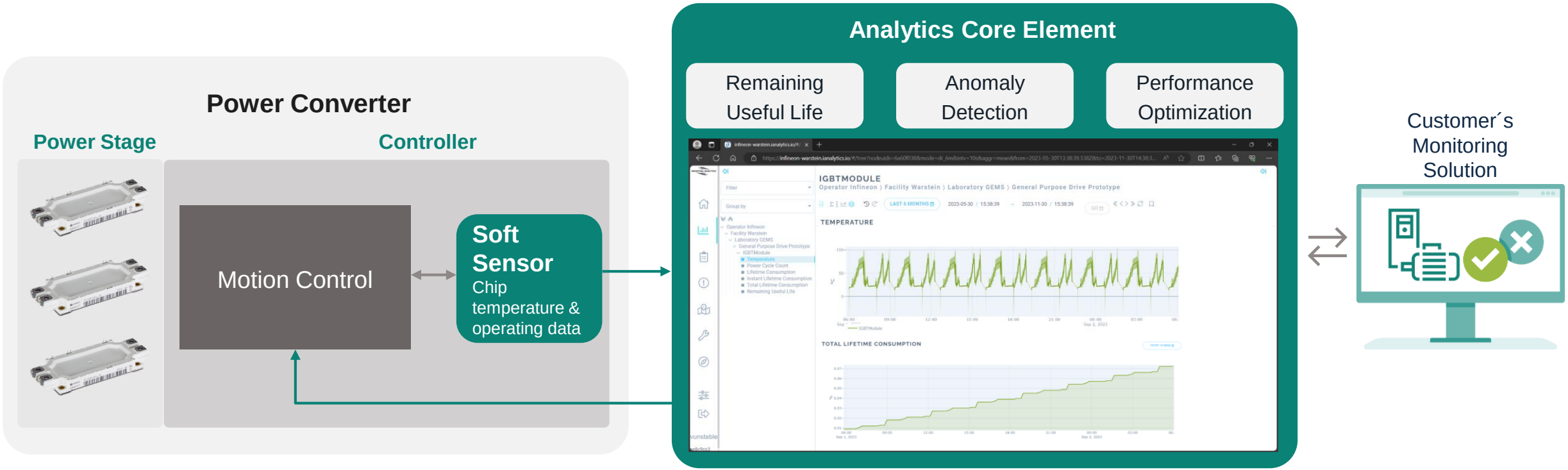
Existing monitoring solutions focus mostly on mechanical components. For this reason we have designed a service to help OEMs:

- **Minimize unexpected downtime due to Power Semiconductors failure**
- **Increase coverage of your monitoring solutions**
- **Optimize converter operation in real-time**

To do so, In-field Power Analytics Service has two main components:
1. Soft Sensor
2. Analytics Core Element



Enhancing converter´s digital journey: In-field power analytics service
Unprecedented Insights into the Power Stage



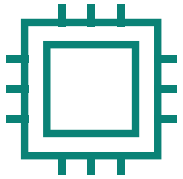
Infineon GIP
Power Electronics expertise

Industrial Analytics
SW and Analytics expertise

Modernize Industrial HVAC Equipment Anomaly Detection and Intelligence with AWS AI and tinyML at the Edge

Office buildings, industrial and manufacturing facilities, and commercial living spaces rely on modern, industrial HVAC systems to meet their respective heating and cooling needs. While the aim is to provide customer comfort in a climate-controlled environment, configuration complexities in modern equipment, as well as compatibility issues with legacy systems, can result in **costly failures and downtime**.

Monitoring the status, health, and working condition of industrial HVAC is key!



Infineon and **Klika Tech** provide a solution incorporating highly precise **XENSIV™ sensors**, **XMC™ microcontrollers**, and **OPTIGA™ Trust** family, sensors that will feed data into the **TinyML model** that can **detect anomalies in real time** enabling the system to transmit the identified anomaly information, along with relevant sensor data, to a cloud-based AI solution generator .


Infineon