

KiiGen™

Industrial Edge Intelligence Platform

Marketing Team Product Guide

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"The Universal Bridge for Industrial Intelligence"

AI-Powered · FPGA Deterministic · Multi-Protocol · Zero CAPEX Retrofit

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1. Product Overview

KiiGen is a modular edge-AI platform developed by Logiicdev GmbH that acts as a universal intelligence bridge for industrial environments. It connects fragmented legacy machines and heterogeneous protocols into a single, deterministic orchestration layer — without requiring equipment replacement — enabling manufacturers to unlock Industry 4.0 and Industry 5.0 capabilities on existing infrastructure.

KiiGen is peer-reviewed and published at IEEE ETFA 2025, validating its engineering rigour. Its technology stack combines FPGA-based deterministic networking, a 16 TOPS edge AI engine, OPC UA / Asset Administration Shell (AAS) digital twin modelling, and multi-protocol bridging into one compact, field-deployable device.

The 30-Second Pitch

KiiGen retrofits AI intelligence into any factory floor — bridging PROFINET, EtherCAT, Modbus, CAN, MQTT, and more into one deterministic, AI-driven edge node. No rip-and-replace. Zero CAPEX modernisation.

Four Technology Pillars

Multi-Protocol AI Bridge Unifies PROFINET, EtherCAT, Modbus, CAN, PROFIBUS, MQTT & DDS into a single deterministic edge layer via FPGA logic.	16 TOPS Edge AI Engine On-device inference: CNN, LSTM, RL, SLM — computer vision, time-series forecasting, reinforcement learning, no cloud needed.	Digital Twin & OPC UA / AAS Asset Administration Shell models create structured digital twins with lifecycle management across multi-generational equipment.
Deterministic Networking ≤1ms TSN, DetNet, Layer-2 bridging ensure predictable packet handling for time-critical industrial control loops.	Zero CAPEX Retrofit Transforms legacy machines into intelligent systems without full equipment replacement, protecting capital investment.	Industrial-Grade Security TPM 2.0 secure boot, authenticated firmware, encrypted communication, and data sovereignty via edge-only processing.

How KiiGen Works — System Flow

KiiGen sits between your legacy machines and your digital infrastructure as an intelligent orchestration node:

Architecture Layer	What Happens	Technology Used
Layer 1 — Ingest	PLCs, sensors, CNC machines,	PROFINET, EtherCAT, Modbus,

	AMRs, and legacy equipment feed data via any industrial protocol	CAN, MQTT, DDS
Layer 2 — Bridge	FPGA-based universal protocol bridge harmonizes all signals into a deterministic edge layer with AAS modeling	TSN / DetNet, ≤1ms latency, AAS, OPC UA
Layer 3 — Intelligence	16 TOPS edge AI engine runs inference: predictive maintenance, vision inspection, RL optimization, process control	CNN, LSTM, RL, SLM — fully on-device
Layer 4 — Deliver	Insights pushed to dashboards, PLC systems, enterprise databases, cloud platforms, and automated alert systems	IPC, PCIe/Ethernet, Cloud, SCADA/MES

2. Key Features & Industrial Use Cases

This section equips the marketing team with the technical depth and real-world context needed to engage engineering buyers, plant managers, and digital transformation leads.

2.1 Technical Specifications

Parameter	Specification
Edge AI Performance	2-40 TOPS on-device inference engine (user selectable)
AI Model Types	CNN (vision), LSTM (time-series), RL (optimization), SLM (language)
Network Latency	≤ 1 ms via TSN, DetNet & Layer-2 bridging
Supported Protocols	PROFINET, EtherCAT, Modbus, CAN, PROFIBUS, MQTT, DDS, AMQP, OPC UA
Digital Twin Standard	Asset Administration Shell (AAS) with OPC UA integration
Cybersecurity	TPM 2.0 secure boot, authenticated firmware, encrypted communications
Networking Stack	TSN, DetNet, software-defined networking, QoS scheduling
OS & Frameworks	Linux-based OS; TensorFlow Lite, PyTorch Mobile, Docker, MQTT
Proprietary Technologies	Real-time protocol translation engine, custom HDL deterministic packet logic
Research Validation	Published IEEE ETFA 2025 — DOI:0.1109/ETFA65518.2025.11205755
Data Governance	All datasets anonymized; processed under international industrial standards

2.2 Industrial Use Cases

KiiGen's deterministic edge architecture delivers measurable operational impact across four proven industry domains, all without infrastructure replacement.

Use Case 1 — Smart Distribution & Logistics

Multi-protocol synchronisation of AMRs, conveyors, and RFID systems eliminates vendor fragmentation across mixed-brand distribution centres. Real-time edge orchestration via KiiGen prevents congestion and improves overall flow efficiency. Predictive monitoring reduces mechanical downtime and enables safe human-robot collaboration — a key requirement under EU machinery safety directives.

Key Outcomes

- Single protocol bridge for AMRs, conveyors, RFID — regardless of vendor
- Real-time congestion prevention through deterministic TSN/DetNet networking
- Predictive alerts before mechanical failures occur, reducing unplanned stoppages

- Safe human-robot collaboration enabled by sub-millisecond response times

Use Case 2 — CNC Machining & Inline Quality Control

Real-time 3D vision inspection via the 16 TOPS AI engine ensures zero-defect production on CNC and precision machining lines. The ≤ 1 ms deterministic communication backbone enables true closed-loop control between sensors, the KiiGen edge node, and machine PLCs. AI-driven optimisation continuously extends tool life and improves dimensional accuracy — reducing scrap rates and improving OEE.

Key Outcomes

- Zero-defect production via real-time AI-powered 3D vision inspection
- Closed-loop control with ≤ 1 ms response between CNC machines and PLCs
- Automated defect detection, parameter control, dashboards & alerts
- Longer tool life and better dimensional accuracy through RL optimisation

Use Case 3 — Healthcare & Critical Infrastructure

KiiGen's secure orchestration node integrates ICU monitors, ventilators, and oxygen systems using DDS/MQTT/AMQP protocol harmonisation with AAS modelling. Predictive analytics ensure 24/7 system stability without any cloud dependency — critical for data sovereignty in medical environments. Deterministic networking eliminates latency risk in life-critical operations, while built-in TPM 2.0 security ensures patient data protection.

Key Outcomes

- Unified integration of ICU monitors, ventilators, and oxygen systems
- 24/7 uptime through on-device predictive analytics — no cloud dependency
- Critical alert escalation with deterministic ≤ 1 ms processing
- TPM 2.0 security and data sovereignty for medical compliance requirements

Use Case 4 — Sustainable Textiles & Apparel

KiiGen enables legacy loom machines and yarn sensors to participate in AI-driven quality and efficiency programmes through Modbus RTU integration and federated learning. Computer vision achieves 99% yarn-break detection accuracy. Reinforcement learning increases production throughput by up to 40%. Sensor-driven analytics automatically generate ESG and CBAM compliance reports — reducing administrative burden while supporting sustainability goals.

Key Outcomes

- 99% yarn-break detection accuracy via computer vision AI
- Up to 40% throughput increase through reinforcement learning optimisation

- Automated ESG and CBAM compliance reporting from production sensor data
- Federated learning preserves data privacy across multi-site operations

3. Market Positioning & Sales Messaging

3.1 Target Customer Segments

Customer Segment	Primary Need	KiiGen's Winning Feature
Industrial Manufacturers (General)	Legacy machine connectivity, OEE improvement, predictive maintenance	Multi-protocol bridge + 16 TOPS AI + zero CAPEX
Logistics & Distribution Centres	AMR/conveyor/RFID unification, congestion prevention, safe HRC	Deterministic TSN networking + multi-vendor sync
Precision Manufacturing & CNC	Inline quality control, closed-loop control, tool life extension	16 TOPS vision AI + ≤1 ms deterministic control
Healthcare & Critical Infrastructure	Medical device integration, 24/7 stability, data sovereignty	Secure edge node + no cloud + TPM 2.0
Textiles, Apparel & Sustainability	Vision QC, throughput optimisation, ESG/CBAM compliance	Computer vision + RL + federated learning
System Integrators & OEM Partners	Platform for customer digital transformation projects	Modular architecture + open-source stack + AAS/OPC UA
Defence & Sovereign Industries	On-device processing, no cloud dependency, secure comms	Edge-only AI + TPM 2.0 + data sovereignty

3.2 Competitive Differentiation

KiiGen occupies a unique position where deterministic industrial hardware meets embedded AI and open-standard digital twin architecture. No competitor combines all three in a single field-deployable, retrofit-ready device.

Competitor Approach	KiiGen Advantage
Industrial IoT Gateways	KiiGen adds 16 TOPS on-device AI inference — gateways only collect and forward data
Cloud AI Analytics Platforms	KiiGen processes at the edge — no cloud latency, no data sovereignty risk, works offline
Traditional PLC/SCADA Upgrades	KiiGen retrofits without rip-and-replace — zero CAPEX, no production stoppage during install
Single-Protocol Bridges	KiiGen unifies 8+ protocols simultaneously in one deterministic layer — not one-at-a-time
Custom In-House Solutions	KiiGen is peer-reviewed, production-ready, and actively supported by Logiicdev R&D
Generic Edge Computers	KiiGen includes proprietary HDL deterministic packet logic and

	AAS/OPC UA digital twin stack
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3.3 Core Marketing Messages

Message 1 — Zero CAPEX Modernisation

- KiiGen retrofits AI intelligence into existing machines — no equipment replacement needed
- Customers protect their capital investment while gaining full Industry 4.0/5.0 capability
- Best for: plant managers, CFOs, procurement teams focused on ROI and budget justification

Message 2 — The Universal Industrial Bridge

- One device unifies PROFINET, EtherCAT, Modbus, CAN, PROFIBUS, MQTT, DDS, and OPC UA
- Eliminates vendor lock-in and protocol silos across mixed-brand factory floors
- Best for: IT/OT convergence teams, system integrators, multi-vendor industrial environments

Message 3 — AI at the Edge, Data Stays On-Site

- 16 TOPS on-device inference — predictive maintenance, computer vision, RL optimisation
- No cloud dependency means zero latency risk, full data sovereignty, and offline capability
- Best for: defence, healthcare, sovereign industry customers, GDPR-sensitive environments

Message 4 — Science-Backed, Production-Ready

- Peer-reviewed and published at IEEE ETFA 2025 — the only edge AI bridge with this validation
- Research heritage from CEA-List (France) collaboration; commercially supported by Logiicdev GmbH
- Best for: enterprise procurement, tender processes, academic and government procurement

3.4 Common Questions & Recommended Answers

Question	Recommended Answer
What makes KiiGen different from a standard IoT gateway?	KiiGen combines FPGA-based deterministic networking, 16 TOPS on-device AI, and OPC UA/AAS digital twin in one device. Standard gateways only collect and forward data — KiiGen reasons about it in real time.

Does KiiGen require replacing existing machines?	No. KiiGen is designed specifically for zero-CAPEX retrofit. It connects to existing machines via their native protocols without any modification.
Does the AI require cloud connectivity?	No. All AI inference runs on the device. KiiGen works fully offline, preserving data sovereignty and eliminating cloud latency.
Which protocols does KiiGen support?	PROFINET, EtherCAT, Modbus, CAN, PROFIBUS, MQTT, DDS, AMQP, and OPC UA — simultaneously bridged into a single deterministic layer.
What is the latency guarantee?	≤ 1 ms for time-critical control loops, ensured by FPGA-based TSN/DetNet networking with Layer-2 bridging.
Is KiiGen validated scientifically?	Yes. KiiGen is published and peer-reviewed at IEEE ETFA 2025 (DOI: 10.1109/ETFA65518.2025.11205755), originating from CEA-List and Logiicdev joint research.
What industries is KiiGen designed for?	Manufacturing, logistics, CNC/precision machining, healthcare, textiles, energy, defence, and any environment with legacy industrial machines.

Start the Conversation with KiiGen

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