

BrainChip

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brainchip

Essential AI



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The Future is Now

AI enabled sensors fusing experience



Mercedes-Benz
Media Newsroom USA

Neuromorphic computing
– a car that thinks like you



Another key efficiency feature of the VISION EQXX that takes its cue from nature is the way it thinks. It uses an innovative form of information processing called **neuromorphic computing**. The hardware runs spiking neural networks. Information is coded in discrete spikes and energy is only consumed when a spike occurs, which reduces energy consumption by orders of magnitude. **Working with California-based artificial intelligence experts BrainChip, Mercedes-Benz engineers developed systems based on BrainChip's Akida hardware and software.** The example in the VISION EQXX is the "Hey Mercedes" key-word detection. **Structured along neuromorphic principles, it is five to ten times more efficient than conventional voice control.**

Although neuromorphic computing is still in its infancy, systems like these will be available on the market in just a few years. When applied on scale throughout a vehicle, they have the potential to **radically reduce the energy needed to run the latest AI technologies.**



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Automotive

- * Keyword spotting
- * Visual Authentication
- * Voice Authentication
- * Tactile, vibration, diagnostics...

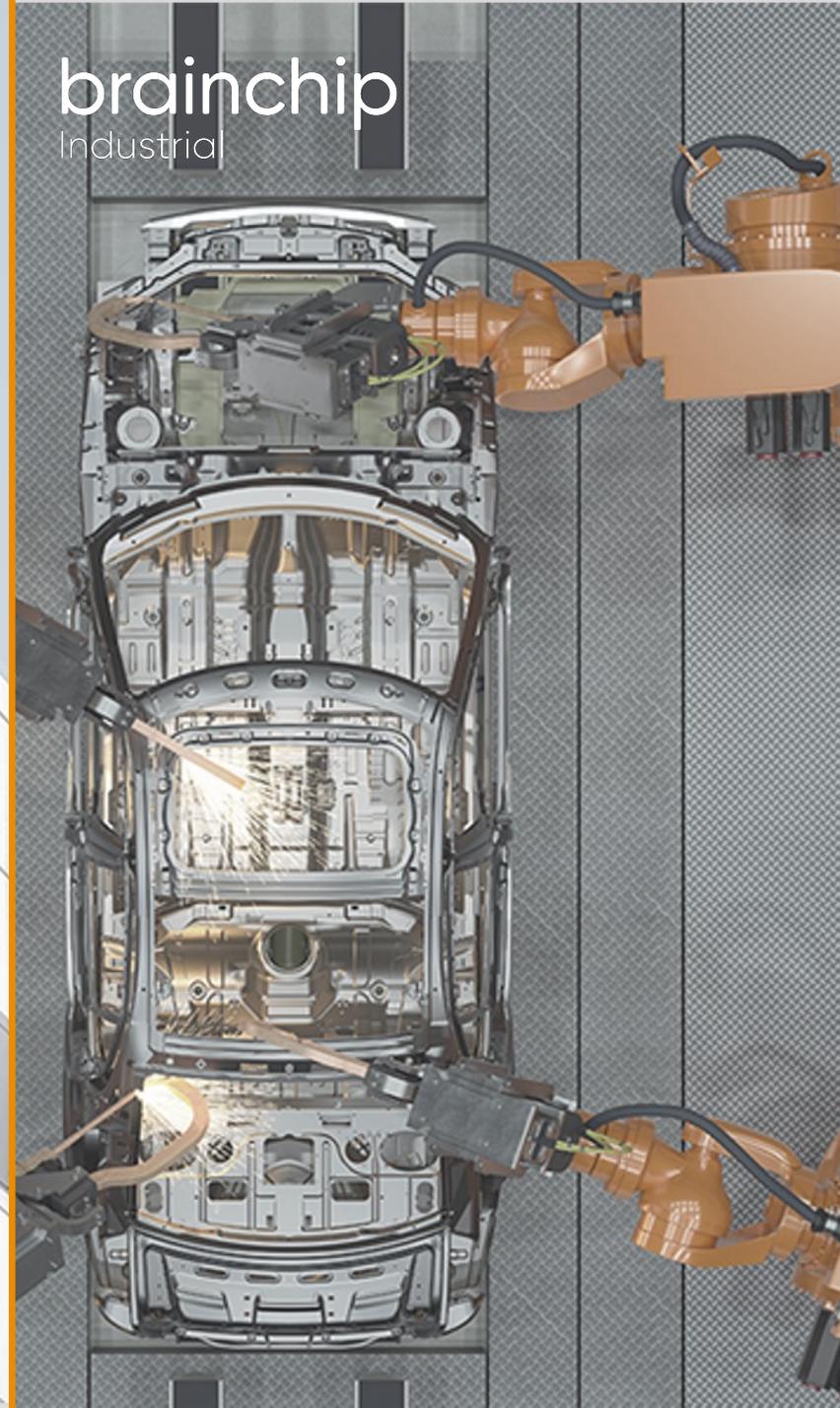
brainchip
Automotive



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Home



brainchip
Industrial



BrainChip Profile

Our technology brings commonsense to the processing of sensor data, freeing machines to do more with less. Accurately. Elegantly. Meaningfully. We call this Essential AI.

Essential is optimizing compute. Maximizing performance. Minimizing power. In the real world. And in real time.

- * 15 years of AI architecture research
- * Worldwide leader in edge AI on-chip processing and learning.
- * First to commercialize neuromorphic IP platform and reference chip.
- * Centers of engineering excellence in US, Australia, France and India.
- * Highly differentiated, and patent protected IP platform with high margin licensing and royalties business model.

Trusted By:



Mercedes-Benz

Profiled In:



Traded On:



Edge AI Device Market Outlook

A shift to a ubiquitous AI Edge...

Implications

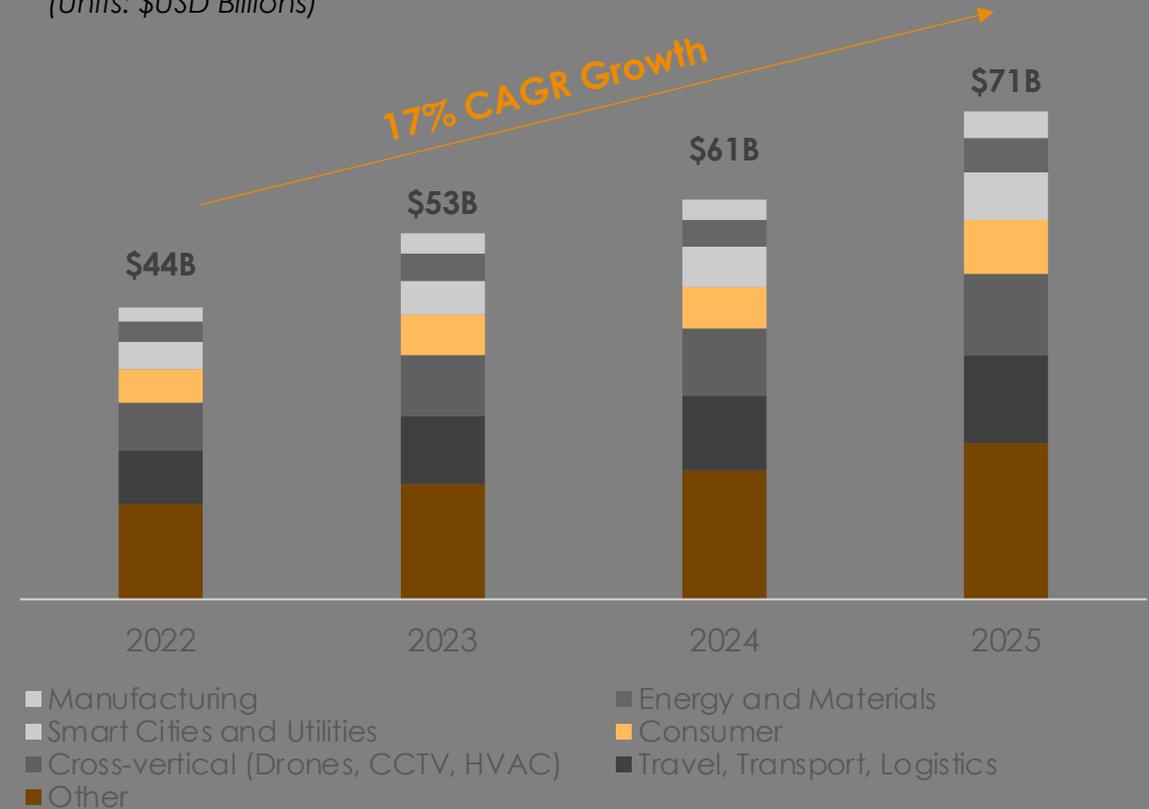
- * More capability
- * More data
- * More compute
- * More bandwidth

Distributed AI

- * AI at the edge
- * Close to sensor
- * Sensor fusion
- * Send "information" not data

Edge Based Devices Requiring AI - \$70B by 2025

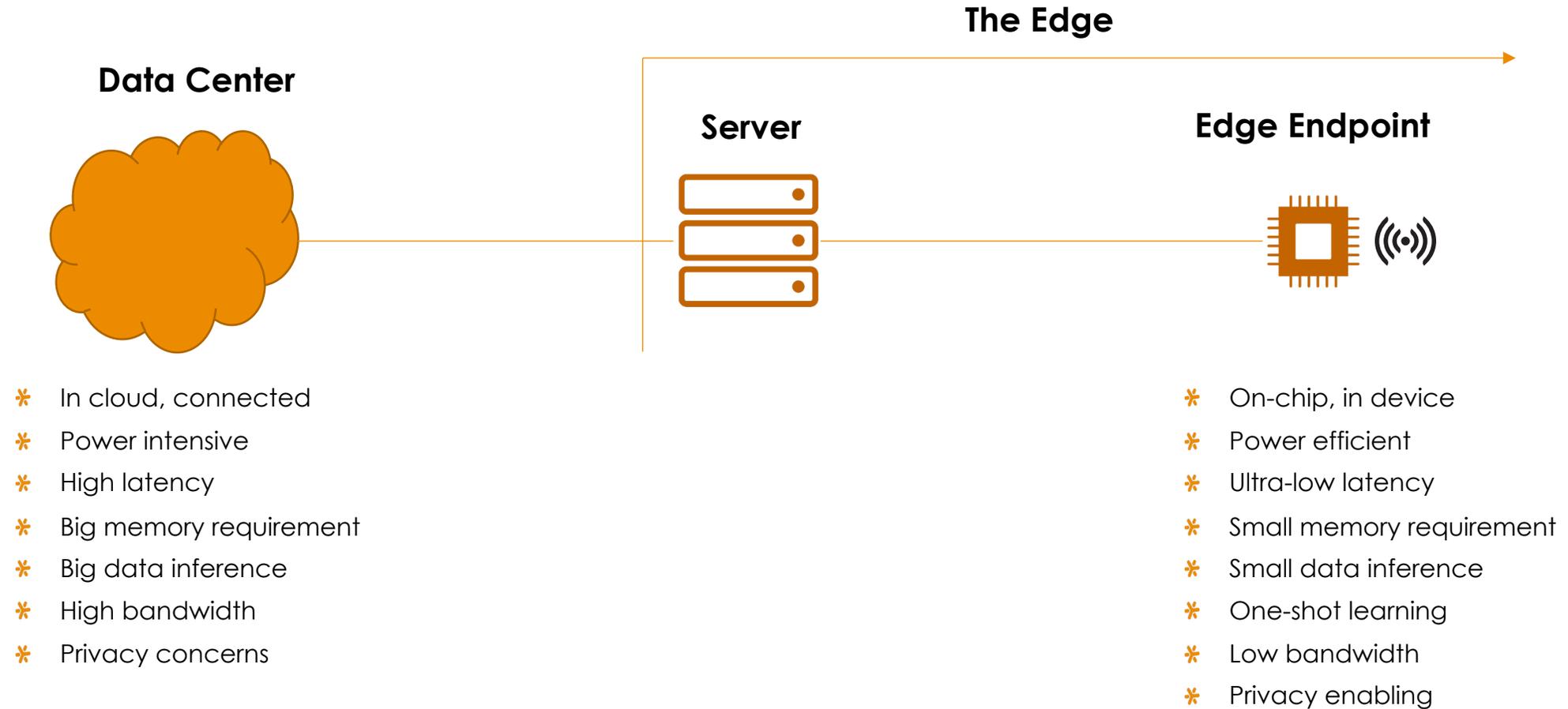
(Units: \$USD Billions)



Sources: McKinsey, IDC, Management

What is Edge AI?

From Cloud to Edge



Why Neuromorphic Computing

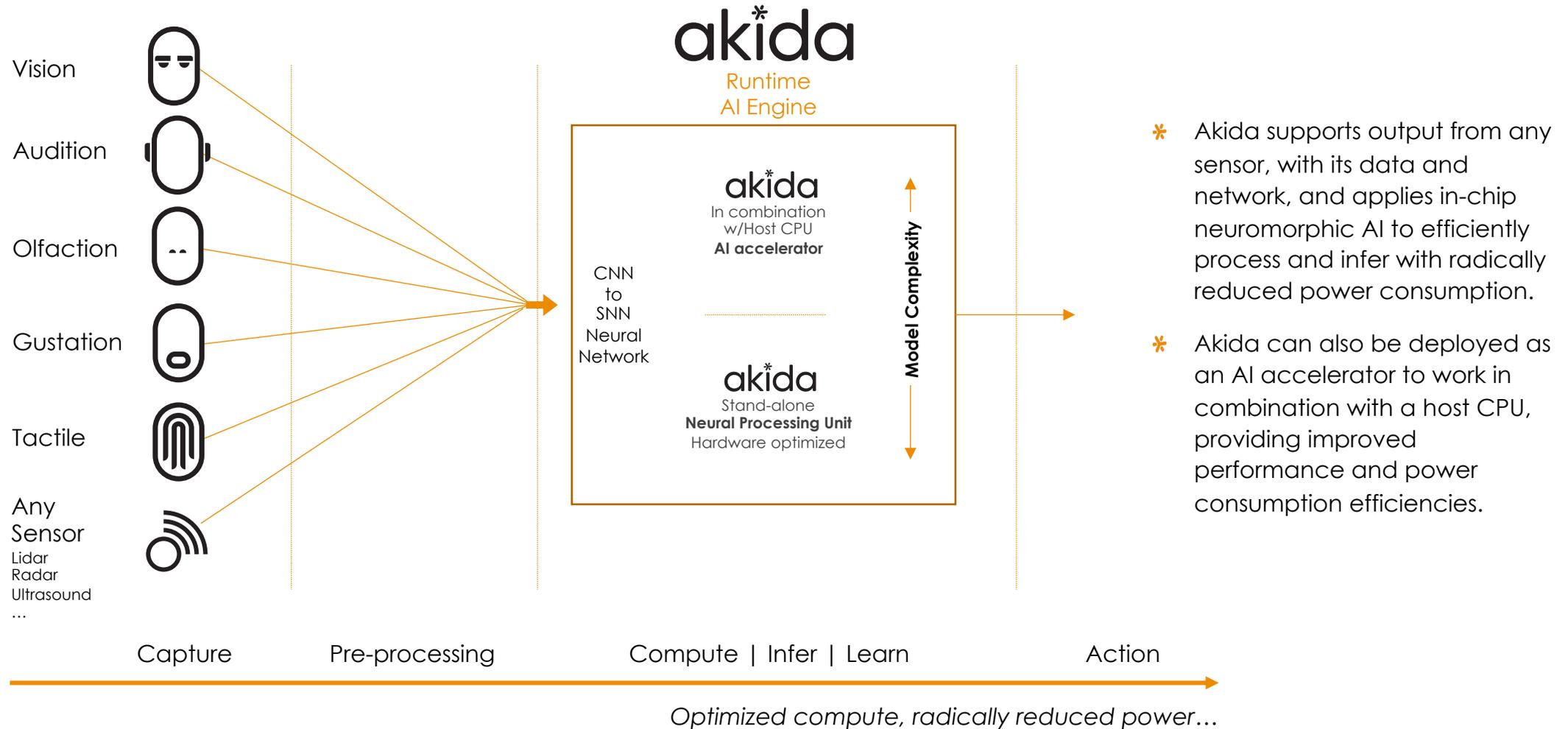
Akida is the world's first commercial neuromorphic processor.

It mimics the brain to analyze only essential sensor inputs at the point of acquisition with unparalleled performance and efficiency.

- * Modeled after the way a human brain learns and processes information
- * Only processes information when an event takes place
- * Can learn new data after detecting it in “one shot”
- * A neuromorphic chip performs AI very efficiently on the device at a very low power
- * Low power equals low heat, requiring no colling

From Sensor to Inference

Performance and efficiency

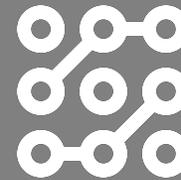


BrainChip Akida Differentiation

BrainChip's Akida™ IP is like no other...

- * Distributed computation and event-based action delivers unparalleled performance and efficiency.
 - Ultra-low latency
 - Runs multiple networks simultaneously
 - Performs one-shot learning
 - Remarkably power efficient
 - Cloud independent
 - Flexible and quick to deploy
 - Privacy and security protected

akida



Distributed Computation

Each NPU has dedicated compute and memory, reducing data movement



Event-based Processing

NPUs perform computationally on events (non-zero values)



Event-Based Communication

Send events over mesh network without host CPU intermediation.



Event-Based Learning

On-Chip learning algorithm.

Akida Neuromorphic Processor – Reference Chip

akida
AKD1000

Data Input Interfaces

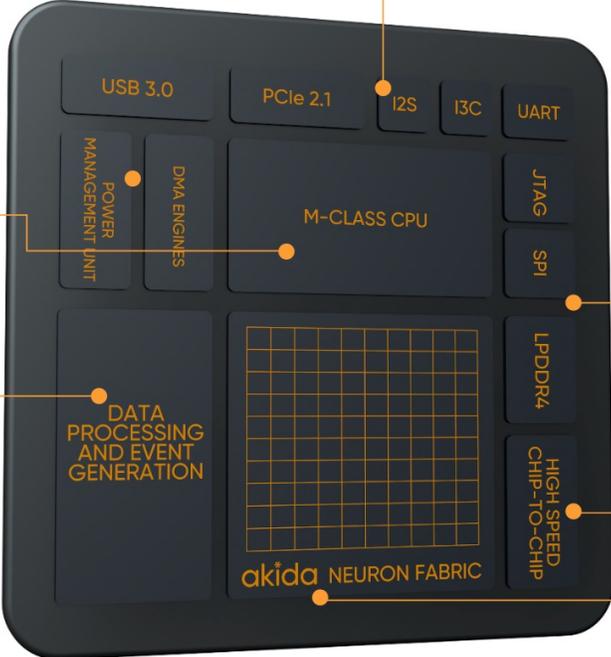
- * PCI Express 2.1 x2 Lane Endpoint
- * USB 3.0 Endpoint
- * I3S, I2C, UART, JTAG

On-Chip Processor

- * M-Class CPU with FPU & DSP
- * System Management
- * Akida Configuration

Data Processing

- * Pixel-Event Converter
- * SW Data-Event Encoder
- * Any multivariable digital data
- * Sound, pressure, temp., others



External Memory Interfaces

- * SPI FLASH for boot/storage
- * LPDDR4 Program/Weights

Multi-Chip Expansion

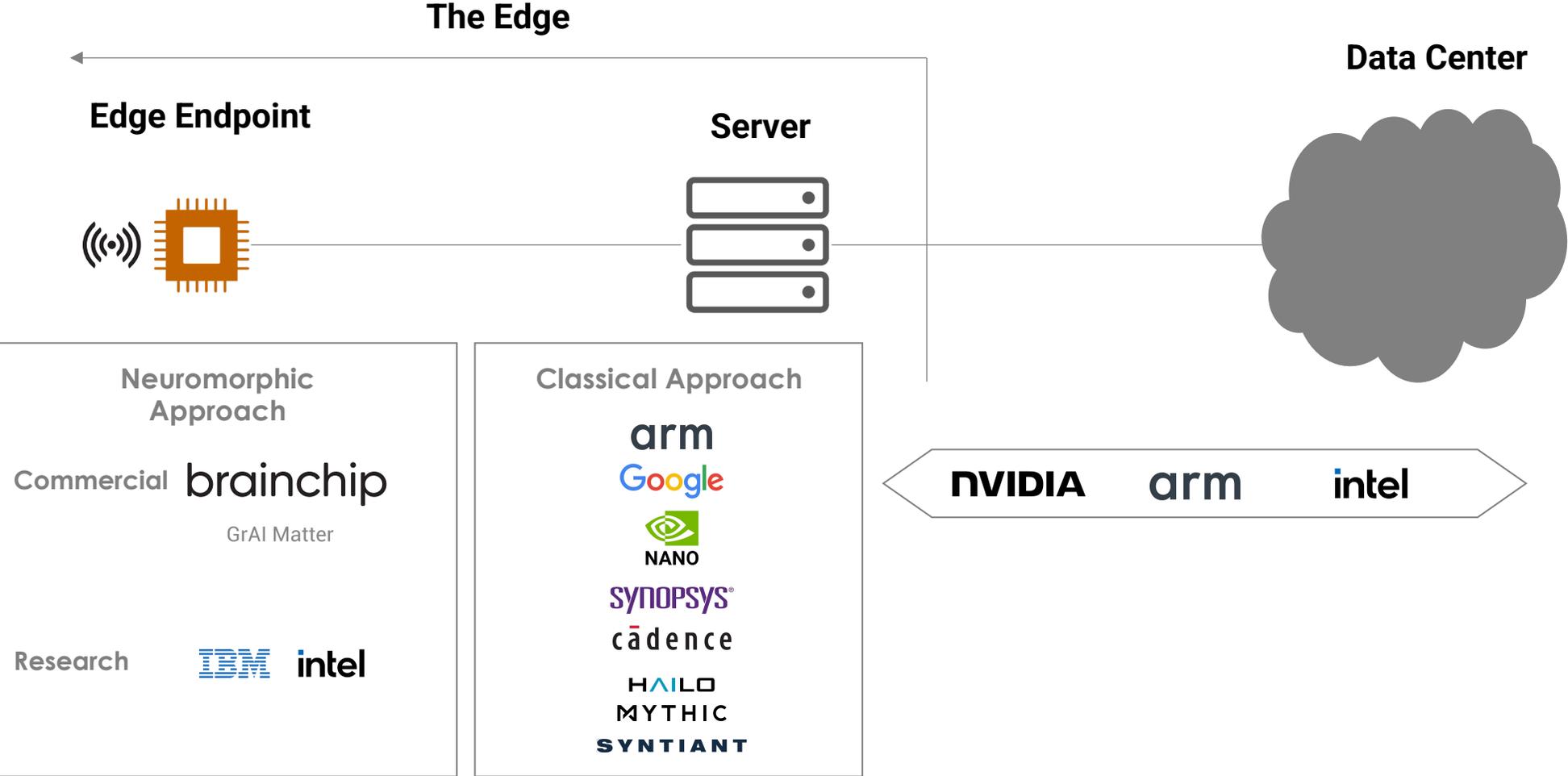
- * PCIe 2.1.2 lane root complex
- * Connects up to 64 devices

Flexible Akida Neuron Fabric

- * Implements 80 NPUs
- * All Digital logic with SRAM (8MB)
- * Also Available as Licensed IP Core
- * First Implementation: TCSM 28nm

Akida™ is the world's first neuromorphic processor.

BrainChip is Leading the Way at the Edge

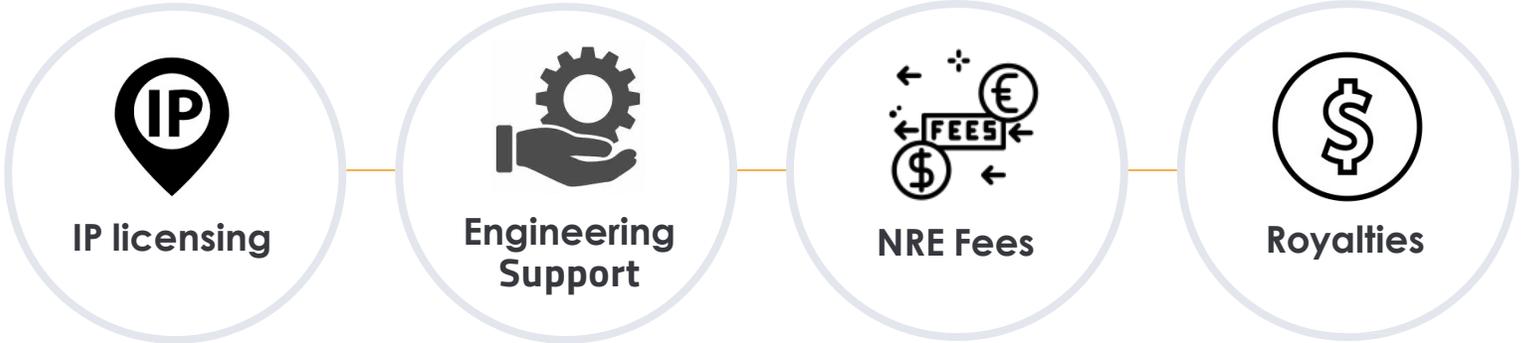


Competitive Analysis

	Micro to MW Power Use	Real-Time On-Chip Learning & Training	Standard ML Workflow	Stand-Alone Possible (No CPU Required)	On-Chip Convolution
BrainChip Akida™ AKD1000	✓	✓	✓	✓	✓
IBM TrueNorth	✓	✗	Learn Corel	✗	✗
Intel Loihi	✓	Programmable	Learn NEF	✗	✗
Google Coral TPU	2-5W	✗	✓	✗	✗
Deep Learning Accelerator (Nvidia, Others)	✗	✗	✓	✗	✗

BrainChip stands alone with the most performant, commercially available Edge AI solution.

Revenue Model



Revenue model includes IP licensing, support, and high-margin royalty streams

Market Traction

Early Adopters



Mercedes-Benz



Licensees



Most customers cannot be identified due to Non-Disclosure Agreements.

Investment Thesis

- * **Demand for AI enabled Edge and Internet of things (IOT)** devices forecasted to grow at double-digit annual growth rates for the foreseeable future.
- * Due to bandwidth, data security, latency and power constraints on edge devices, product **demand will shift from cloud-dependent AI devices to solutions where data is captured on the device.**
- * **Massive power consumption and emissions resulting from AI data centers** will force a shift in AI processing from traditional cloud data centers to processing on the device. Akida's cloud independence capabilities are uniquely suited to address these AI related infrastructure and sustainability issues.
- * The **Akida architecture is both scalable and flexible to and addresses the requirements for the vast and growing number of IoT and edge devices** in consumer and industrial applications.
- * **MetaTF software makes adoption easy**, automating conversion from traditional networks into immediately usable and efficient "spiking" networks.
- * **Marquee brands including Mercedes, Valeo, Vorago and NASA**, as well as commercial IP licenses with **Renesas** and **MegaChips**.
- * **Commercial availability** of semiconductor chips, IP, tools, and boards.
- * **Revenue model includes IP licensing, support, and high-margin royalty streams.**

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Thank You

Questions?

