Product Spec Sheet
Part Number AIR2301

Modern Compute Meets Legacy Systems

Deepwave's Cognitive Algorithm Deployment System (CADS)

The Cognitive Algorithm Deployment System (CADS) is a compact-PCI GPU computing card designed to enable real-time execution of neural networks and cognitive algorithms while simultaneously recording wide-band data. CADS addresses the challenges of deploying modern AI capabilities in legacy systems by providing a high-performance solution optimized for seamless integration of cutting-edge technology.

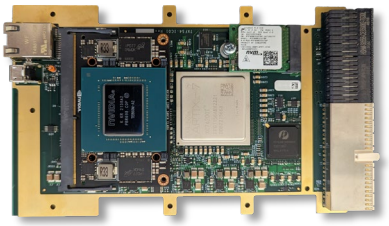
Cognitive AI algorithms, essential for handling complex and dynamic data environments, often require advanced computing resources that traditional systems lack. CADS overcomes this limitation by utilizing the latest heterogeneous computing technologies, enabling compatibility with industry-standard, open-source machine learning frameworks such as PyTorch, TensorFlow and Docker.

To streamline development, CADS includes the Cognitive Application Virtual Environment (CAVE), a digital twin that mirrors the CADS software environment. Built on Docker containerization, CAVE allows developers to create, test, and refine algorithms on any computer, ensuring that the exact software environment can be deployed directly onto the CADS hardware without modification.

Key features of CADS with CAVE include:

- Real-time processing for neural networks and cognitive algorithms.
- Wide-band data recording playback to support analysis and training.
- Open-source compatibility with leading AI frameworks.
- Seamless development workflow via the CAVE digital twin.

CADS delivers a comprehensive solution for integrating AI and cognitive processing capabilities into existing and legacy systems, enabling efficient upgrades and unlocking new possibilities in industries requiring precision and performance.



Modern Compute With Modern Software

Key Features

→ **Integrate with cPCI systems**

→ **Onboard heterogeneous edge compute with 21 TOPS**
- NVIDIA Xavier NX GPU
- Xilinx FPGA
- 6-Core ARM
- 8-GB memory

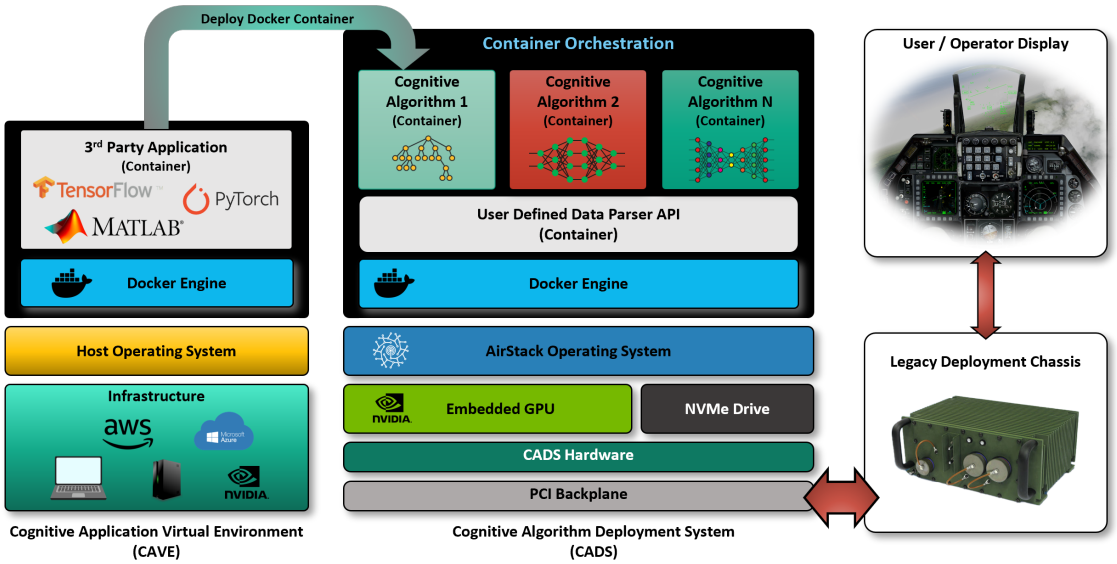
→ **Deepwave's patented low-latency DMA technology**

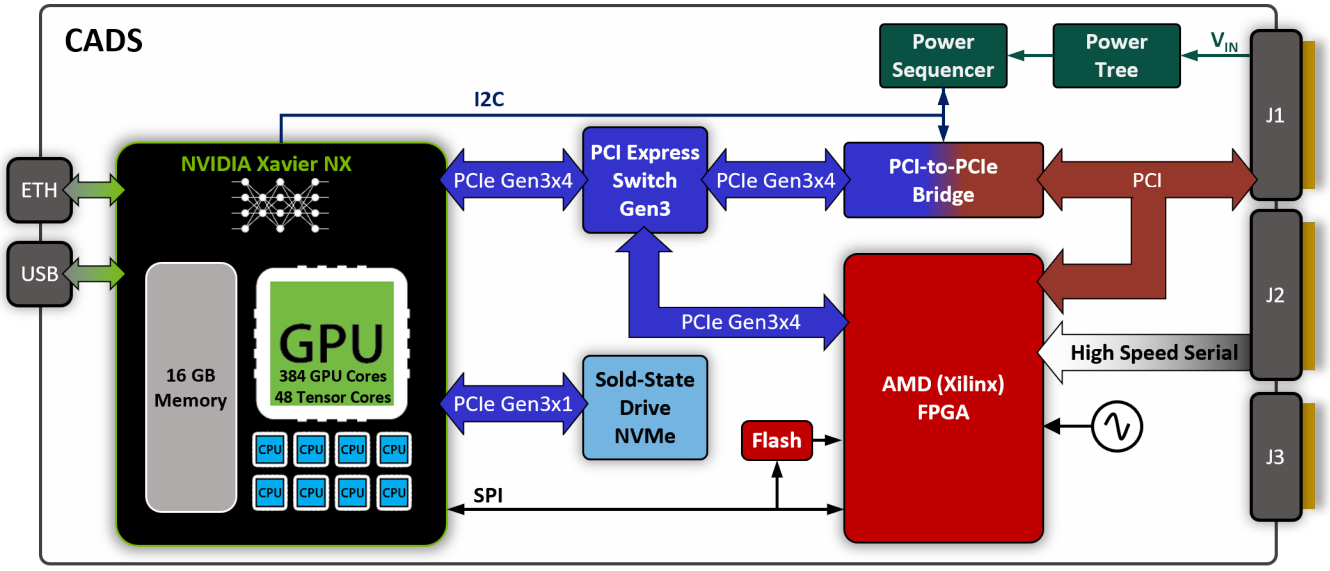
→ **High-speed recording of I/Q data**

→ **3rd party algorithm support**

→ **All applications run in containerized environment:**
- Fast deployment
- Flexible resource sharing
- Better security

→ **A practical digital twin**
- Container that is exact replica of CADS API
- Windows, Mac, or Linux
- Code in digital twin, deploy same container on CADS





Software Development on CADS

The CADS hardware is accompanied by Deepwave's AirStack operating system (OS) and firmware to provide a modern API for the most common machine learning and signal processing workflows. The OS allows for deployment of built-in and 3rd party containerized applications. The baseline container is provided to developers as the CAVE digital twin and their applications can be benchmarked using COTS GPU developer kits or the CADS hardware itself.

CADS has an open-architecture approach to application development and deployment and supports *any* 3rd party algorithm. It includes a data recording containerized application for recording streaming data.

Integrate Your Cognitive Model:

- → **Download CAVE digital twin**
- → **Build baseline Docker container**
- → **Install your required packages**
- → **Integrate your cognitive model**
- → **Install resulting Docker container to CADS hardware for deployment**

Specifications and Features

Processors / Compute Interfaces	
AI Performance	21 TOPS
GPU	384-core NVIDIA Volta GPU
→ Tensor Cores	48
→ DL Accelerators	2 x NVDLA Engines
CPU	6-core ARM v8
Shared Memory	8 GB DDR4 (59.7 GB/s)
FPGA	Xilinix Artix 7 200-T
Solid State Disks	16 GB (OS), 512 GB (Apps/Data)

Environmental / Mechanical	
Cooling	Rugged conduction-cooled
Form Factor	3U CompactPCI, VITA 30.1
Operating Temp	-40 to +85°C
Conformal Coating	Urethane 1A33
Altitude (max)	70,000 ft (21 km)
Shock	15G sinusoidal
Power (max)	35 Watts
Power Modes	Low | Medium | High

Software Support	
Operating System	AirStack (Linux, Ubuntu-based)
Digital Twin	Docker Container for 3rd party app testing
CUDA	NVIDIA CUDA Toolkit 11+
API	C, C++, Rust, and Python
Machine Learning Inference	cuDNN, PyTorch, TensorFlow, TensorRT, ONNX Runtime, MATLAB (via GPU Coder)
Package management	Anaconda, PIP, apt
Containerization	Docker
Reporting	Telegraf

I/O Interfaces	
Backplane	PICMG 2.0, R3.0 (cPCI)
→ PCI	33 MHz, 32 bit
→ I/Q data	2.5 Gbps
→ Synchronization	GPS 1PPS
Front Panel	1 Gbps Ethernet, USB 2.0

Security	
SSD Encryption	Hardware-based AES-256

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