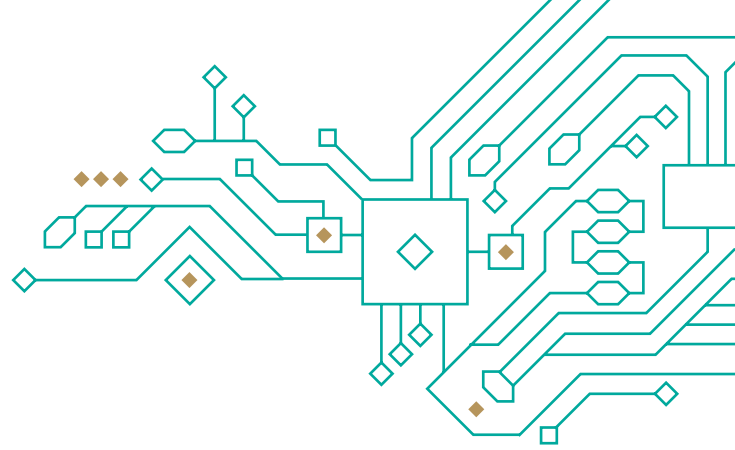




LEOPARD DPU



A new chapter in on-board data processing

ABOUT LEOPARD

Leopard is a CubeSat standard compliant Data Processing Unit which enables mission designers to apply Artificial Intelligence solutions in space. It was designed to support capturing, managing and processing of data in orbit. Leopard redefines the current approach to remote sensing. Now, instead of sending huge, unprocessed sets of data to ground stations, Leopard uses **Deep Neural Networks** to process data on-board and therefore only sends the most important and valuable insights to the ground. By reducing the time and cost of data transfer and processing, it enables you to focus on a rapid response to any detected phenomena.







Leopard is integrated with a powerful FPGA to accelerate execution of deep learning algorithms and has a throughput of up to **3 Tera Operations Per Second**. A number of hardware and software measures protect the computer against the influence of radiation.

With its extraordinary capabilities-to-size ratio (**less than 1U**), wide supply voltage range and universal interfaces, it is compatible with most CubeSats platforms. Its scalable and customisable architecture makes it possible to create larger and more powerful versions dedicated to bigger platforms as well.

Leopard is a part of **Smart Mission Ecosystem** – hardware, software and AI-powered algorithms designed to complete your mission.

APPLICATIONS

Leopard was designed to resolve problems when real-time data analysis is crucial.

 Image segmentation and object detection	 Signal quality enhancement
 Data compression and encryption	 Spacecraft autonomy
 Optical navigation	 And many more!

KEY ADVANTAGES

- 1 Huge processing power in a small form-factor**
 - Using powerful FPGAs to accelerate execution of deep learning algorithms.
- 2 Artificial Intelligence available on board**
 - Processing data directly in orbit using Deep Neural Networks.
 - Using the most popular ML libraries such as Cafe or TensorFlow.
- 3 Freedom, flexibility and security of the mission**
 - Implementing an open-source operating system (Linux).
 - Uploading multiple Neural Network models prior to the launch as well as during the mission.
 - Applying active techniques for radiation-induced errors mitigation.



TECHNICAL SPECIFICATION

PROCESSING CORES

- Zynq UltraScale+ MPSoC
ZU6EG | ZU9EG | ZU15EG
- ◆ Quad ARM Cortex-A53 CPU up to 1.5 GHz
 - ◆ Dual ARM Cortex-R5 in lock-step
 - ◆ FPGA for custom function implementation

MEMORY

- ◆ 4-16 GiB DDR4 providing with ECC
- ◆ 4-16 GiB SLC flash-based file system storage (EDAC)
- ◆ Up to 2x256 GiB SLC flash-based data storage

INTERFACES

- ◆ Interfaces: CAN, LVDS, SPI, RS422/485, UART, GTY and GTH transceivers
- ◆ Additional customisable interfaces upon request: SpaceWire, Ethernet
- ◆ LVDS/RS422 interfaces compatible with X/S-Band radios and CCSDS-compatible communication channel upon request

SPECIFICATIONS

- ◆ A radiation hardened Payload Controller
- ◆ Supply Voltage: 6.5 to 14 V (VBAT)
- ◆ Power Consumption: 7.5 W to 40 W – depending on workload and specified processing speed
- ◆ Computational Throughput for Neural Networks: up to 3 TOPS
- ◆ Thermal interface customisable for satellite architecture

SOFTWARE ECOSYSTEM

- ◆ 64-bit Linux
- ◆ Deep Learning Accelerator fed with Caffe or TensorFlow models
- ◆ Fully reconfigurable in orbit

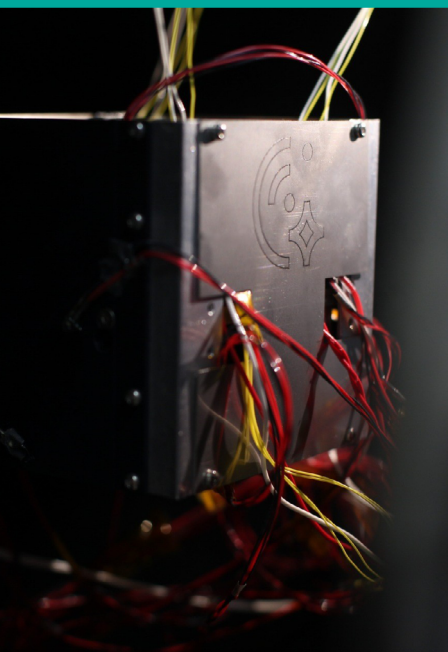
REDUNDANCY

- ◆ Possibility to introduce additional redundancy to each version

FORM-FACTOR

- ◆ CubeSat standard-compatible, < 1U

Leopard is **perfectly compatible with The Herd** – algorithms dedicated to Earth Observation which are responsible for on-board data processing and pre-processing.



INTUITION-1 MISSION CASE STUDY

Leopard will be utilized by the Intuition-1 satellite, coupled with a 150-band hyperspectral sensor to perform image segmentation and object detection. For the purpose of on-board data processing during the mission, we will use two high performance nodes for redundancy and parallel operation.

ABOUT US

KP Labs is a NewSpace company based in Poland. We deliver AI computers and software to bring autonomy into demanding space missions. We are a team of more than 50 space enthusiasts who do not think that the sky is the limit.

SOUNDS GOOD?

Contact us at sales@kplabs.pl to attain the benefits your organization deserves!

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