eVPU - Embedded Vision Processing Unit

Powerful computing platform for image processing and analysis

UP TO 32x 4K CAMERAS

100Top/s - 100Gb/s data stream - 100w

NEXVISION
OPTRONIC DESIGN

www.nexvision.fr

A POWERFUL EMBEDDED CALCULATOR *FOR SITUATIONAL AWARENESS*

Tank/train/bus/trucks/UGV
Unmanned Ground Vehicle

Autonomous tractor
Smart Farming

RPAS/UAV
Unmanned Aerial Vehicle
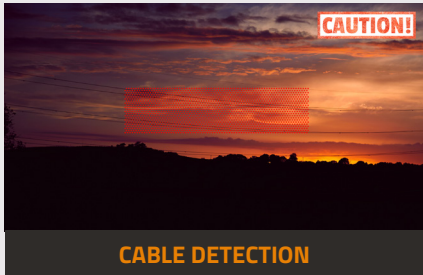
AUV
Autonomous Underwater Vehicle
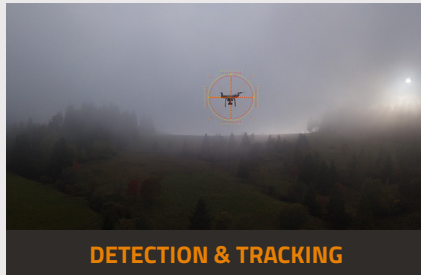
USV
Unmanned Surface Vessel

Aircraft/VTOL
Vertical Take off & Landing

EVS/EFVS (Enhanced Vision System/ Enhanced Flight Vision System)
For vehicle, autonomous or not, in extreme conditions [#DVE - Degraded Visual Environment]
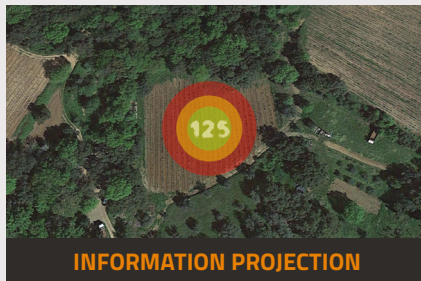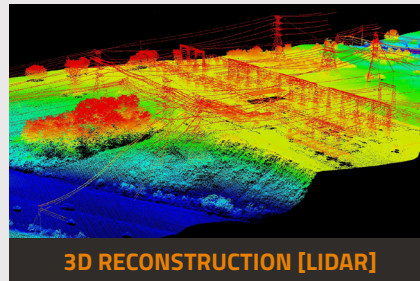
CAUTION!

CABLE DETECTION

DETECTION & TRACKING

THREAT IDENTIFICATION

PATH PLANNING

SEARCH & RESCUE

INFORMATION PROJECTION

125

3D RECONSTRUCTION [LIDAR]

MAPPING

Image analysis through embedded GPU + Neuronal network (object detection & tracking, deep learning)

Low SWaP-C

Size : 300x220x109 mm
weight : 5.5kg

300mm

220mm

109mm

NVIDIA.
Jetson AGX Xavier™

XILINX®
Ultrascale+ FPGA

ARM. POWERED

samtec

PCI EXPRESS

H.265 HEVC

HDMI™

HI-SPEED CERTIFIED USB
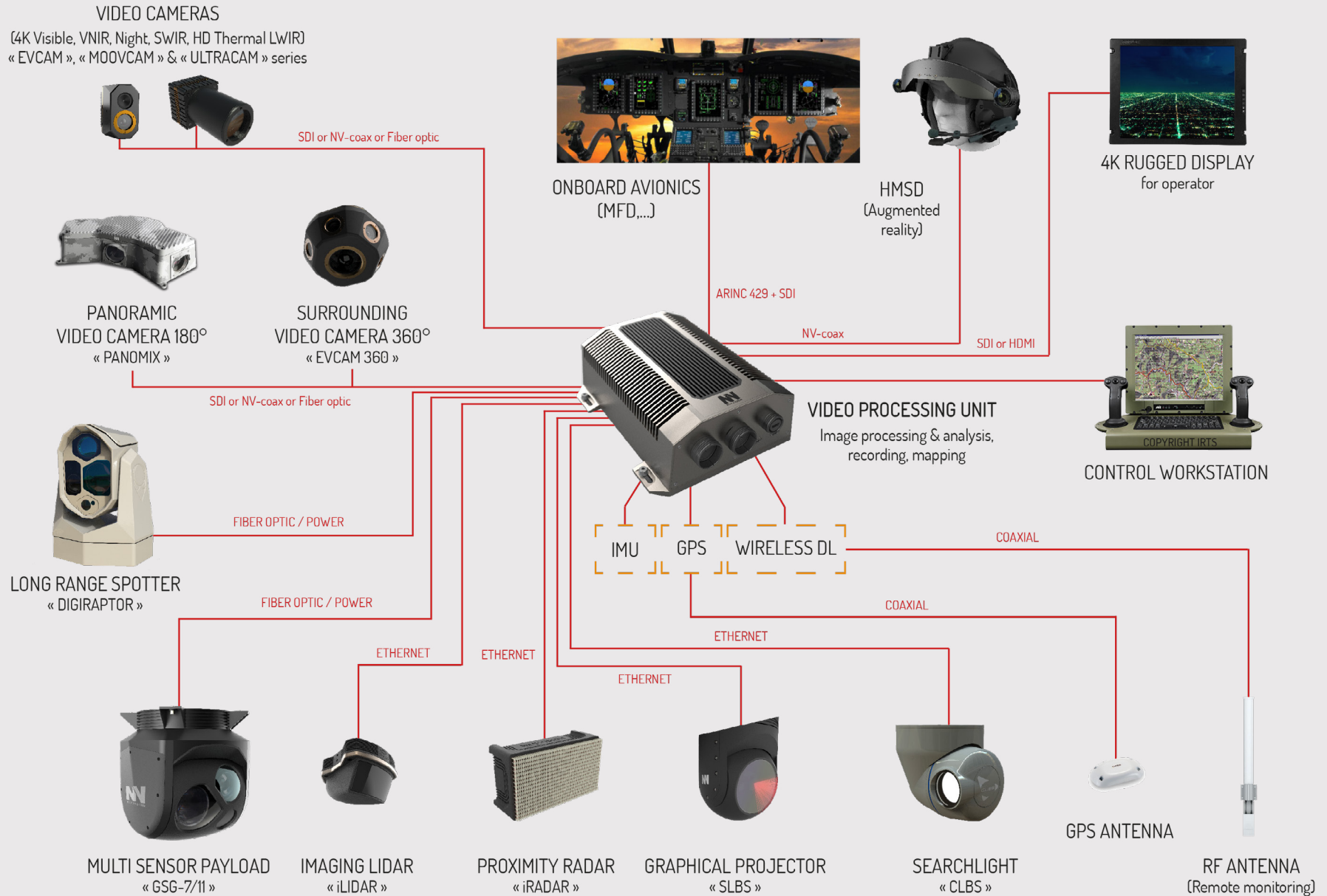
MIL-STD
810 - 1275B

RTCA
DO160
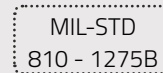
COMPATIBLE WITH ALL NEXVISION' SENSORS & ALL DEVICES OF THE MARKET :
Video camera in Visible, Infrared night vision (VNIR, SWIR, thermal MWIR/LWIR) or Active 3D LiDaR/RaDaR

Perfect for data fusion, image processing and analysis (detection, tracking...)

VIDEO CAMERAS
(4K Visible, VNIR, Night, SWIR, HD Thermal LWIR)
« EVCAM », « MOOVCAM » & « ULTRACAM » series

SDI or NV-coax or Fiber optic

ONBOARD AVIONICS
(MFD,...)

HMSD
(Augmented reality)

4K RUGGED DISPLAY
for operator

PANORAMIC
VIDEO CAMERA 180°
« PANOMIX »

SURROUNDING
VIDEO CAMERA 360°
« EVCAM 360 »

ARINC 429 + SDI

NV-coax

SDI or HDMI

SDI or NV-coax or Fiber optic

VIDEO PROCESSING UNIT
Image processing & analysis,
recording, mapping

CONTROL WORKSTATION

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FIBER OPTIC / POWER

IMU   GPS   WIRELESS DL

COAXIAL

LONG RANGE SPOTTER
« DIGIRAPTOR »

FIBER OPTIC / POWER

COAXIAL

ETHERNET

ETHERNET

ETHERNET

ETHERNET

MULTI SENSOR PAYLOAD
« GSG-7/11 »

IMAGING LIDAR
« iLIDAR »

PROXIMITY RADAR
« iRADAR »

GRAPHICAL PROJECTOR
« SLBS »

SEARCHLIGHT
« CLBS »

GPS ANTENNA

RF ANTENNA
(Remote monitoring)

NEXVISION
OPTRONIC DESIGN

Front-End Image Co-processor (FPGA)
- 650k logic elements
- 22 Mb SRAM
- 3x 1GB DDR4 @2666 Mb/s (42.66Gb/s)
- 512 Mb NOR Data Flash

System on Chip GPU modules

Up to 3x onboard parallel NVIDIA® Jetson AGX Xavier™ Module. Each SoC has the following performance :

CPU	CPU 8-core Carmel ARM v8.2 64-bit CPU, 8MB L2 + 4MB L3
GPU	GPU 512-core Volta GPU with 64 Tensor Cores 11 TFLOPS (FP16) 22 TOPS (INT8)
AI performance	32 TOPs DL Accelerator (2x) NVDLA Engines* | 5 TFLOPS (FP16), 10 TOPS (INT8)
Vision accelerator	7-way VLIW Vision Processor
Video capabilities	**Video Encode 2x1000MP/sec** 4x 4K @ 60 (HEVC) / 8x 4K @ 30 (HEVC) 16x 1080p @ 60 (HEVC) / 32x 1080p @ 30 (HEVC) **Video Decode 2x1500MP/sec** 2x 8K @ 30 (HEVC) / 6x 4K @ 60 (HEVC) 12x 4K @ 30 (HEVC) / 26x 1080p @ 60 (HEVC) 52x 1080p @ 30 (HEVC) / 30x 1080p @ 30 (H.264)
Embedded memory	32GB 256-Bit LPDDR4x | 136.5GB/s
Embedded storage	32GB eMMC 5.1
FPGA link	PCIe Gen 3 1x SoC with 8 lanes and 2x SoC with 4 lanes

VIDEO INPUTS

12x Digital (mix of the following type of links)

- **Optical fiber** (proprietary fiber optic protocol)
  > 16 Gb/s per lane [0 ; 70] °C
  > 10.3 Gb/s per lane [-40 ; +85] °C

- **SDI** 12G/6G/3G

- **NV-COAX** up to 16 Gbit/s Down Link + camera control Up Link + 20w power-over-coax

VIDEO OUTPUTS

Digital
- **12x SDI** 12G/6G/3G
- **1x HDMI** 4096x2160 at 60 Hz

Analog
- **2x Composite PAL/NTSC** (CVBS)
- Optional : **2x STANAG 3350** Class B

DATA LINK

USB
- **USB 3.1** type C connector

Ethernet
- **2x Ethernet Gigabit** Slot M12 (1000 BASE-T)
- 1x Ethernet Gigabit **switch**

Serial
- **4x RS485/422**
- Optional : **ARINC 429** 8x IN / 6x OUT (100 kb/s)

STORAGE

SSD
- **2x SSD NVMe** up to 10 TB

EEPROM
- 1x 2Mb EEPROM per SoC
- 1x 2Mb EEPROM for FPGA

OTHERS

Discrete I/O
- 4x protected I/O 28V

Temperature management
- Airflow cooling

MIL-STD 810G compliant
- Operating temperature Range : -20°C to 70°C
- Humidity : 10-90% non condensing

MIL-STD 1275B compliant

Voltage range	9-36 V$_{DC}$

Power consumption
• Light process
   > 1 SoC (40% Load)
   > Ambient temp : 25°C
	35W

• Typical application
   > 2 SoC (70% Load)
   > Ambient temp : 55°C
	75W

• Peak process
   > 3 SoC (100% Load)
   > Ambient temp : 70°C
	120W

IMAGE PROCESSING : NEXIP™

FPGA (Image Pre-Processing)
- Video enhancement and advanced video processing : Temporal noise filtering and contrast enhancement
- Multiple exposure blending provides realtime HDR for high details retention in low and over exposed area
- Multispectral band image sensor fusion (Visible, SWIR, Thermal IR)
- Feature point extraction, image stabilization, denoising

GPU (Image analysis and codec)
- Object detection, recognition, tracking
- Machine learning / AI / Pattern matching
- 3D perception / SLAM / 360° vision (stitching)
- Full framerate, 4K high quality video encoding

SOFTWARE DEVELOPMENT

Dedicated Embedded Linux BSP based on Buildroot, including:
- U-boot bootloader
- Custom Linux kernel based on NVIDIA sources
- Integration of NVidia Tegra specific frameworks: CUDA®, OpenCV, OpenGL TensorRT™, cuDNN, NVIDIA DIGITS™ Workflow, NVIDIA VisionWorks™, Camera Imaging, Video CODEC.
- Customizable failsafe update system (FPGA, Software)
- Embedded debugging and profiling tools: quadd, nvprof, cuda-gdb, gdb, LTTng

External debugging and profiling tools:
- Tegra system profiler, NVIDIA NSight

Specific drivers:
- FPGA: PCIe based, video acquisition, video display, Xilinx IPs (UART, SPI, I2C, XADC, ...), High Speed Inter SoCs communication channel, generic data transfer to/from SoC modules
- Arinc 429: network socket interface based, label filtering, high/low speed configuration, multi-channel support

Nexvision's Middleware:
- Video Analysis Framework
- Embedded Video Recording: H264, H265, MP4, MKV, AAC
- Video streaming: RTSP/RTCP/RTP, H264, H265, AAC

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OPTRONIC DESIGN