NEOUSYS
TECHNOLOGY

IP67 Waterproof Extreme-rugged Embedded Computer and GPU Computer

For Extremely Harsh Environment Applications

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When A Traditional IPC Reaches Its Limits?

With edge AI deployment becoming more popular in recent years, embedded systems deployed at the edge are usually positioned in hazardous environments that we once avoid putting laborers in. They can be hazardous environments such as high chemical content, chemical by-product concentration or atmospheric conditions (corrosion, humidity, salinity, dust, etc.) that may cause significant harm immediately or in the near future.

Recognizing the niche market, specifically the structural integrity of current embedded systems that limit their deployments into extreme-harsh conditions, Neousys created the extreme-rugged series, the SEMIL.

Aiming to resolve the environmental or climatic factors, Neousys Technology SEMIL computers are a class above traditional rugged-embedded computers. They seek to address some basic but overlooked and yet hard to achieve designs that are ideal for applications such as:

- Factory Automation (food & beverage, chemical, recycling, etc)
- Military
- Maritime
- Environmental Monitoring
- Medical
- Industrial Vehicle
- Transportation
- Railway

EN 50155 MIL-STD 810G

Evolution Through Innovation
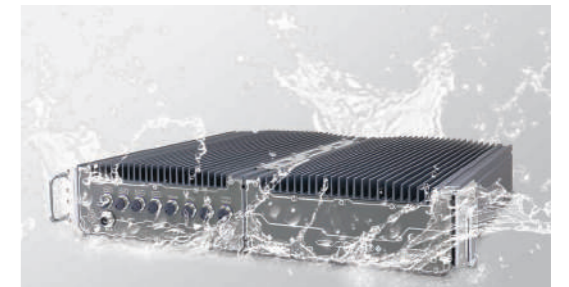
IP67 Rating

IP67 waterproof capability is achieved via specialized molded o-rings and enclosed in stainless steel and aluminum chassis for corrosion resistance
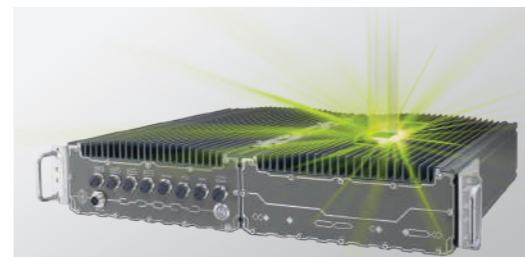
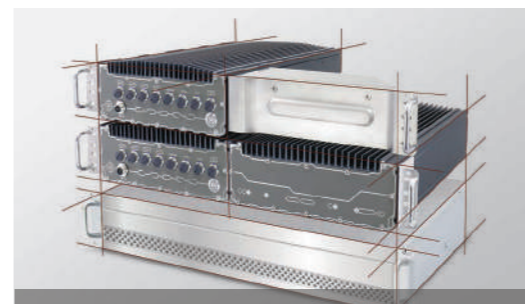### True Wide-temp Fanless with GPU

Patent No. I697759

NVIDIA RTX A2000/ Tesla T4/ Quadro P2200 can operate up to 62°C ambient without GPU throttling

M12 Connectivity

The M12 connectivity features COTS availability and is a cost-effective solution while maintaining robustness

2U Half-rack/ 19" Rackmount

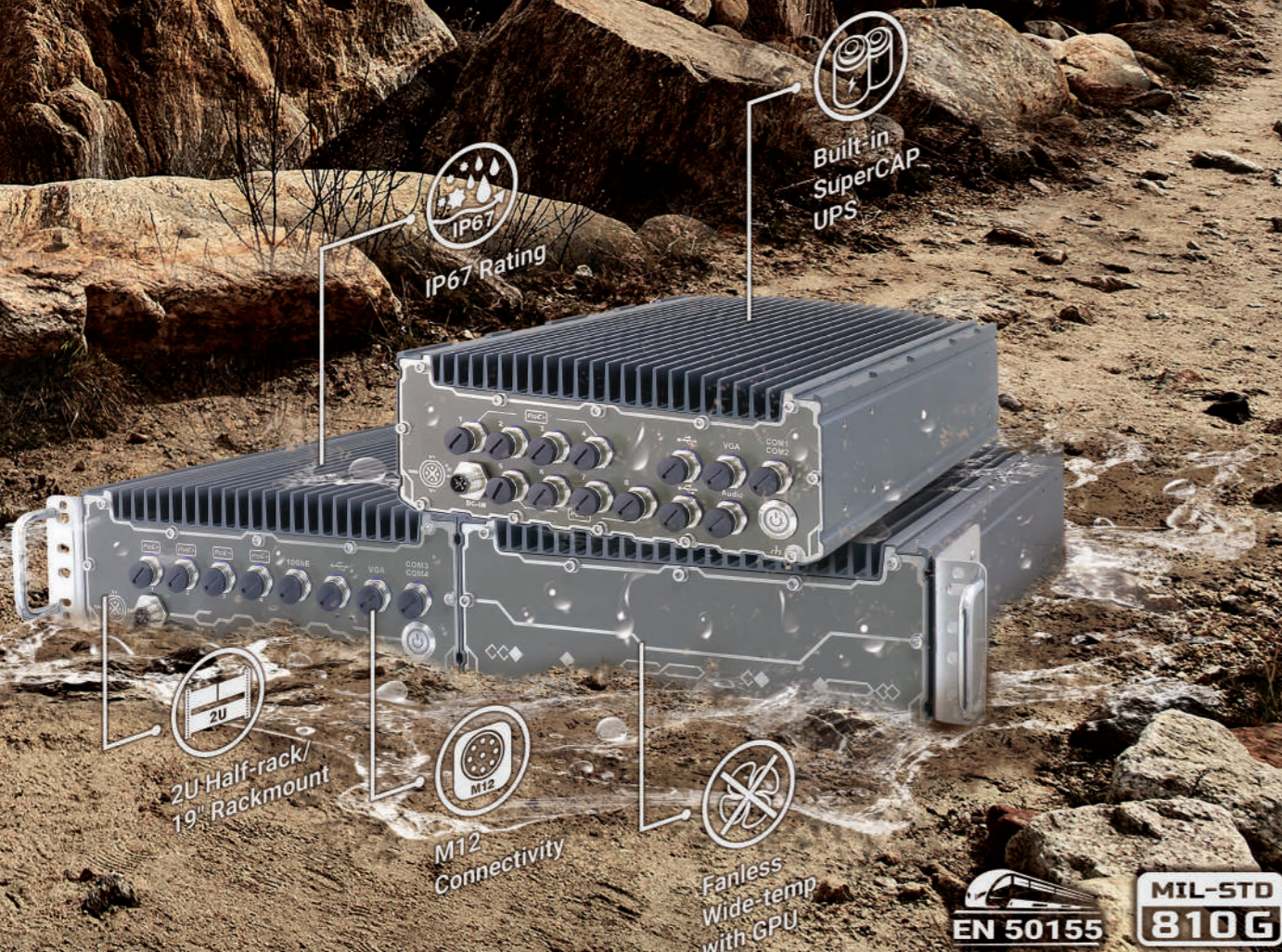Available in standard form factors with unique brackets for flexible rack or wall-mount deployment
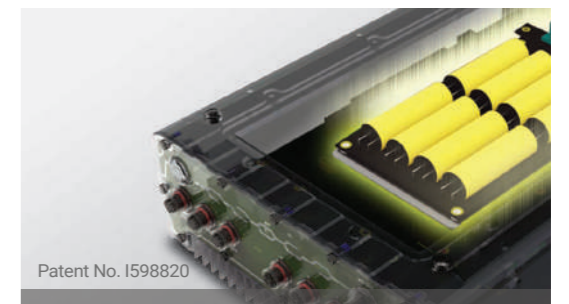
Built-in SuperCAP UPS

Patent No. I598820

Patented SuperCAP UPS effectively prevents data loss while featuring greater reliability and longevity over traditional battery UPS

SEMIL-1700GC Series

IP67 Waterproof GPU Computer Supporting NVIDIA® RTX A2000/ Tesla T4/ Quadro P2200

- IP67 waterproof with NVIDIA® RTX A2000/ Tesla T4/ Quadro P2200
- IIntel® Xeon® E or 9th/ 8th-Gen Core™ CPU
- Patented waterproof 2U 19" chassis for rack or wall-mount*
- Non-throttling GPU performance up to 62°C ambient
- M12 connector (X-coded PoE+, A-coded VGA/ USB/ COM)
- 8 to 48V DC input with built-in ignition power control

*Patent No. I697759

EN 50155 | MIL-STD 810G | NVIDIA TESLA | NVIDIA QUADRO

SEMIL-1700 Series

Half-rack IP67 Waterproof Computer

- IP67 waterproof with SuperCAP UPS
- Intel® Xeon® E or 9th/ 8th-Gen Core™ CPU
- -40°C to 70°C fanless operation
- 2U 19" half-rack chassis for rack or wall-mount
- M12 connector (X-coded PoE+, A-coded VGA/ USB/ COM)
- 8 to 48V DC input with built-in ignition power control

*Patent No. I598820

EN 50155 | MIL-STD 810G

SEMIL-1300GC Series

Wide-temp Fanless GPU Computer Supporting NVIDIA® RTX A2000/ Tesla T4/ Quadro P2200

- NVIDIA® RTX A2000/ Tesla T4/ Quadro P2200 fanless operation
- Intel® Xeon® E or 9th/ 8th-Gen Core™ CPU
- Patented waterproof 2U 19" chassis for rack or wall-mount*
- Non-throttling GPU performance up to 62°C ambient
- M12 connector (X-coded PoE+, A-coded VGA/ USB/ COM)
- 1x DisplayPort and 3x USB 3.1 Gen1
- 8 to 48V wide-range DC input with built-in ignition power control

*Patent No. I697759

EN 50155 | MIL-STD 810G | NVIDIA TESLA | NVIDIA QUADRO

SEMIL-1300 Series
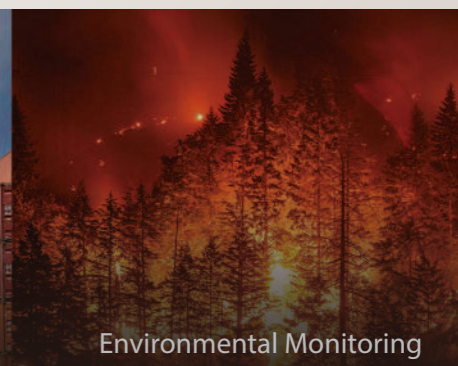
Half-rack Rugged Fanless Computer

- -40°C to 70°C fanless operation with SuperCAP UPS
- Intel® Xeon® E or 9th/ 8th-Gen Core™ CPU
- 2U 19" half-rack chassis for rack or wall-mount
- M12 connector (X-coded PoE+, A-coded VGA/ USB/ COM)
- 1x DisplayPort and 3x USB 3.1 Gen1
- 8 to 48V DC input with built-in ignition power control

*Patent No. I598820

EN 50155 | MIL-STD 810G

Central diagram

IP67 Rating

Waterproof with NVIDIA GPU · Waterproof with Optional SuperCAP UPS · Fanless with NVIDIA GPU · Wide-temp · Fanless with Optional SuperCAP UPS

SEMIL™

With a variety features and configurations to choose from, such as IP rating, GPU support and SuperCAP UPS, one can choose the ideal SEMIL for extreme and robust edge deployments beyond traditional industrial applications.

IP67 & Extreme-rugged for Various Deployments

Industrial Vehicle | Military Defense | Factory Automation | Maritime | Environmental Monitoring
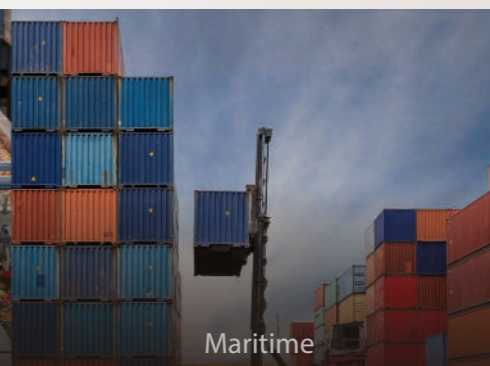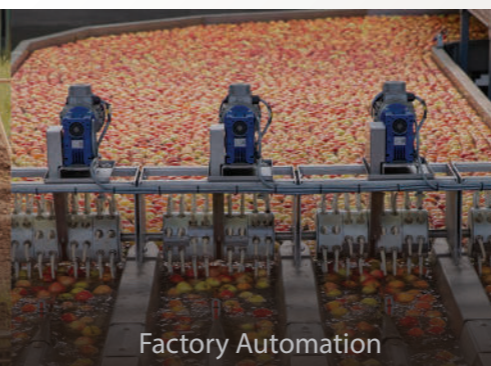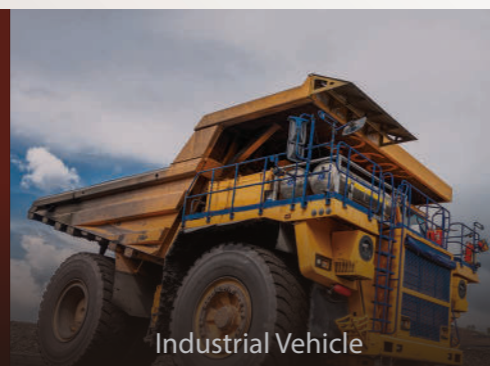
Autonomous Mining Truck and Remote Monitoring

Rail Transport Driver Assistance System

Overview

Mining vehicles play an important role in today's mining operations in terms of productivity and efficiency. Fast forward to today, the application of edge AI technology allows for autonomous mining vehicles and its effects are threefold: **(1) Safety,** t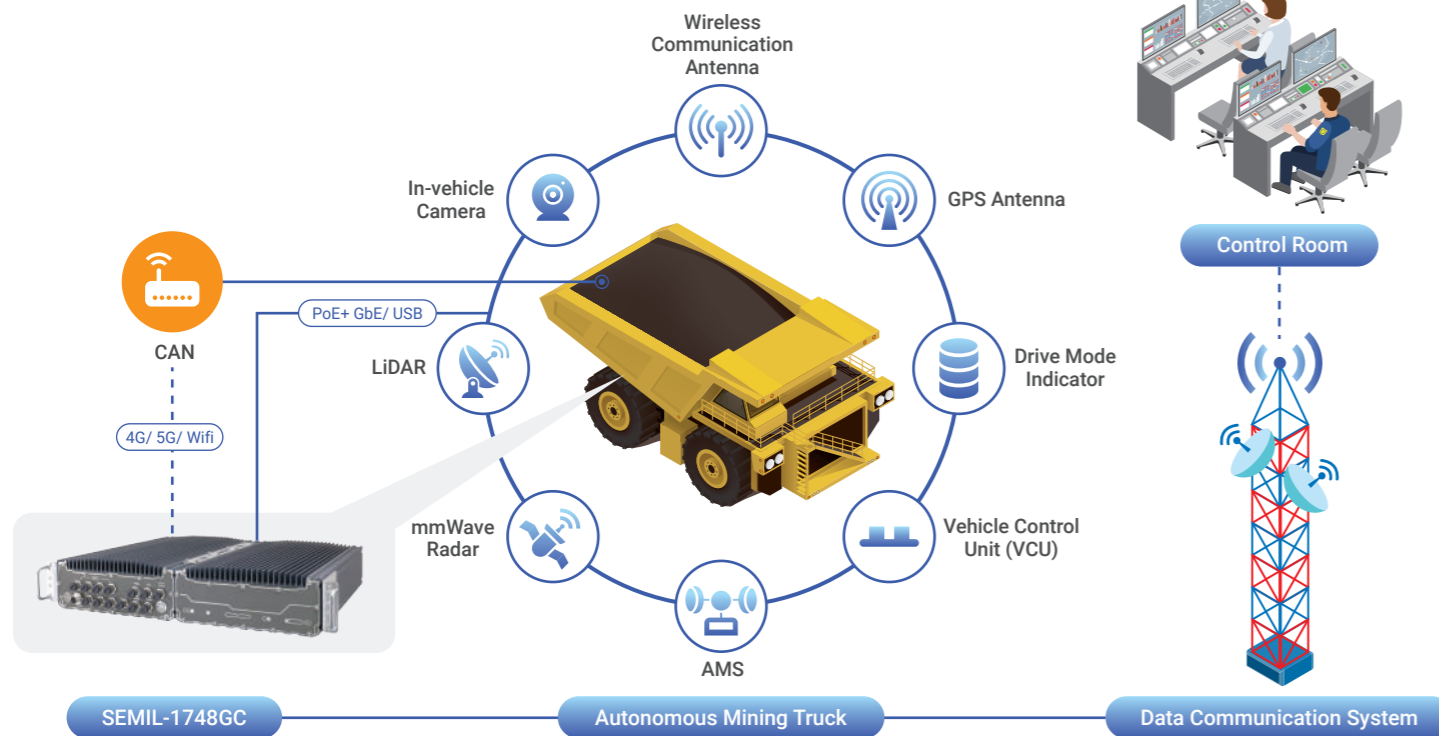o remove human error from the equation; **(2) Reduce operation cost,** whether it is maintenance or labor cost; and **(3) Increase efficiency** by introducing autonomous machines that can work 24/ 7 that does not fatigue. Also, putting workers out of harm's way and into a control room where one can still oversee all the tasks he would otherwise perform while operating the truck in person.

Requirements

- Dustproof, waterproof systems that can withstand high-pressure water wash-downs, and able to operate in mining temperature environments that can reach over 50°C
- Rugged industrial reliability with machine vision, AI inference processing power for autonomous functions
- Communication between onsite and central command room for the data from cameras, LiDAR, sensors, Radar, GPS network, checkpoints, etc. and remote operation
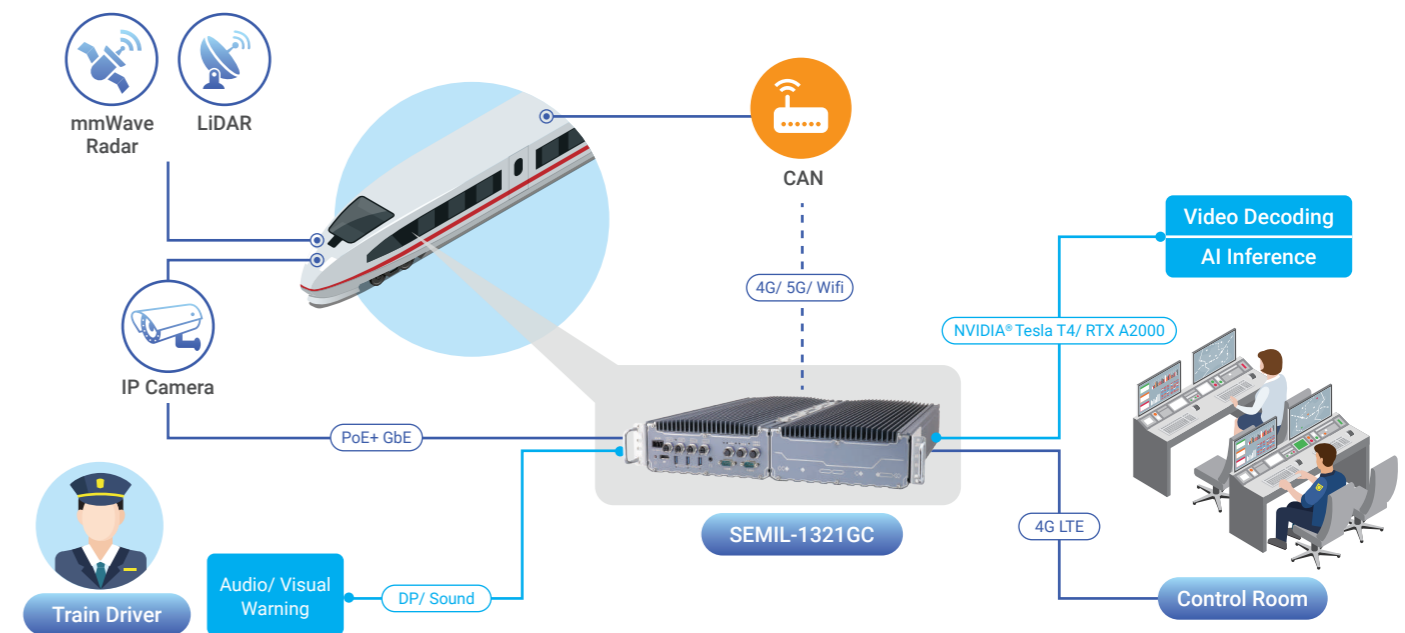- Autonomous mining fleet management and predictive maintenance capability

Overview

Safety and efficiency is vital to rolling stock operations. Whether it is cargo or passengers onboard, the growing numbers reflects a direct increase in risks and costs. This also called for the need to automate trains with matured technologies. A train's driver assistance system can achieve: **(1) Assist the train driver,** reduces stress on the driver while supporting and complementing the driver **(2) Prevent accidents,** especially when entering stations/ platforms, ensuring there are no people/ objects on the train track; **(3) Reduce energy consumption,** optimize traveling speeds through machine learning to minimize carbon emissions.

Requirements

- Machine vision and inference capability for object detection models such as railroad objects, traffic signs, switch positions, and pedestrians
- Connect to multiple IP cameras for multiple field-of-view angles
- GPU unit to perform real-time video decoding, plus inference capability for multiple AI models
- Connect to other sensors such as mmWave radar and LiDAR to collaborate with camera input in case of poor weather conditions such as fog, rain, or snow

Wireless Communication Antenna · In-vehicle Camera · GPS Antenna · Control Room · CAN · PoE+ GbE/ USB · LiDAR · Drive Mode Indicator · 4G/ 5G/ Wifi · mmWave Radar · Vehicle Control Unit (VCU) · AMS · SEMIL-1748GC · Autonomous Mining Truck · Data Communication System

mmWave Radar · LiDAR · CAN · Video Decoding · AI Inference · 4G/ 5G/ Wifi · NVIDIA® Tesla T4/ RTX A2000 · IP Camera · PoE+ GbE · SEMIL-1321GC · 4G LTE · Control Room · Train Driver · Audio/ Visual Warning · DP/ Sound

Solution

- Extreme-rugged systems with dust and IP67 waterproof capability for 24/7 field operation from -25°C to 70°C environments
- Thermal design for NVIDIA RTX A2000, Tesla T4 or Quadro P2200 for maximum GPU performance in high-temperature environments
- Rich I/O connectivity, including 802.3at Gigabit PoE+, VGA, USB, COM ports with robust M12 connectors in shock and vibration conditions
- Optional CAN bus for data signals collecting, processing and communication. 4G/5G/Wifi for communication between trucks and control room

Solution

- Support NVIDIA RTX A2000 or Tesla T4 GPU for AI inference applications and video decoding
- Support 802.3at Gigabit Power over Ethernet (PoE+) with secured M12 connectors for multiple IP cameras
- CAN bus to connect mmWave Radars sensors
- 8 to 48V range DC input for train deployments and patented SuperCAP UPS to counteract against unforeseen power interruptions

Automation and Autonomous Agriculture Tractor

Overview

Farming improved greatly with the invention and development of heavy equipment to aid farmers in covering more area and doing more in less time. However increasing productivity for farmers today means they require **(1) The need for skilled farmworkers** for agricultural knowledge and to operate heavy equipment; **(2) Farmworker safety,** according to National Agricultural Safety Database, approximately 33% of farmworkers suffer non-fatal injuries every year, one of the most predominant causes of farmworker death or serious injury involves a vehicle (tractor, heavy machine, etc.); **(3) Lowering cost and increasing productivity**, costs including labor, seeds, soil and machine, which holds the most potential for overall productivity gain.

Requirements

- Systems that can be deployed in dusty fields, constant shock conditions, and in rain or shine
- Achieve agriculture tractors autonomy and fleet management for one worker to control multiple tractor deployments to the field
- The ability to control and monitor the farming vehicle fleet in real-time
- Predictive maintenance for minimum tractor operation downtime

360° View of The Tractor's Surroundings

Camera

LiDAR

Radar

GPS

Agriculture Tractor

SEMIL-1748GC

Remote Control

Customization to Suit Field Type

Tractor Fleet Management

Scalability

Farmworker

Solution

- Extreme-rugged systems with dust and IP67 waterproof capability for 24/7 field operation from -25°C to 70°C outdoor environments
- Connect with cameras, sensors, Lidars, GPS on the tractors to offer a 360° view of the tractor's surroundings for farmers remote operation
- Collect data from sensors on vehicles to achieve predictive maintenance
- 8 to 48V DC input with built-in ignition power control for vehicles
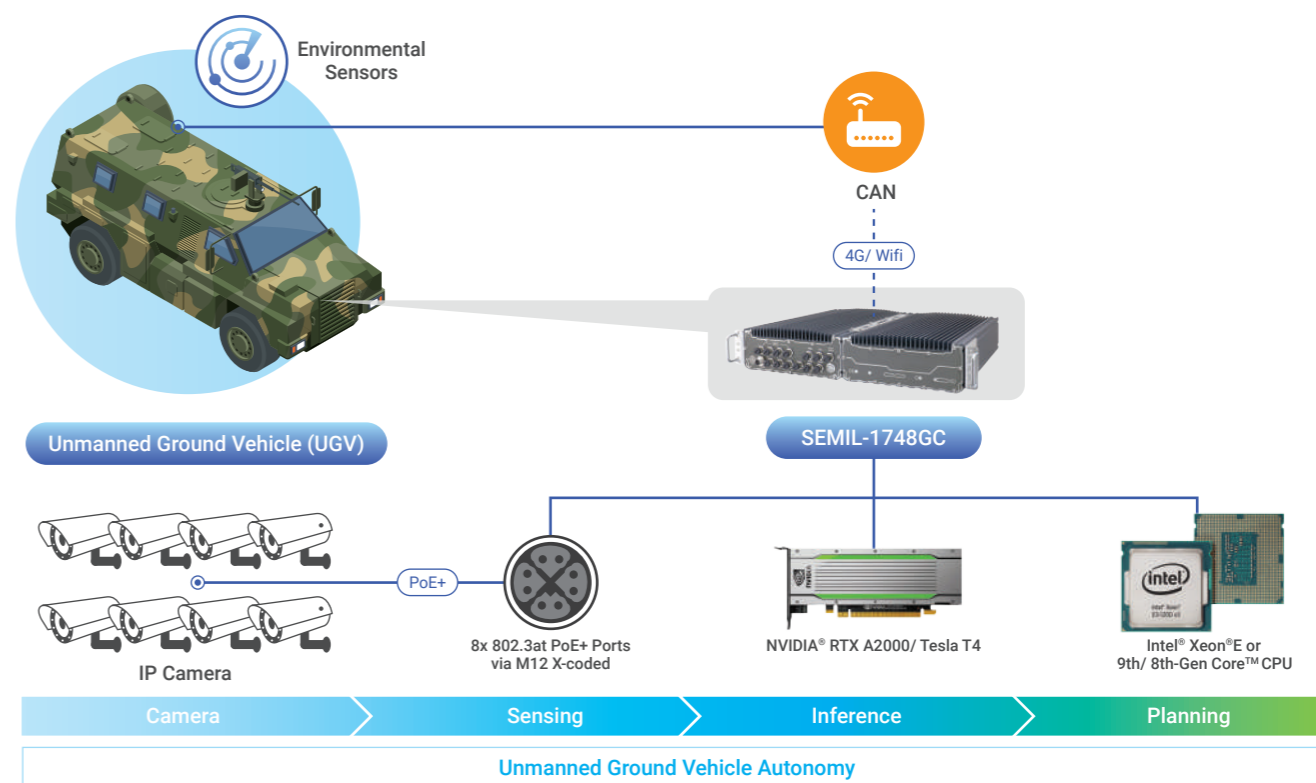
Unmanned Ground Vehicle

Overview

The integration of AI is bringing more autonomy to military applications, particularly in unmanned machines and robots. One of them is unmanned ground vehicles (UGVs) that can function with little to no human intervention in the battlefield or hazardous zone, to **(1) Undertake multi-purpose tasks,** such as information gathering, load-carrying or terrain reconnaissance; **(2) Enhancing performance and efficiency** with autonomy functions, and **(3) Ensure the safety of soldiers,** minimizing the need for deployment into hazardous zones.

Requirements

- AI processing power for vehicle autonomy functions
- Conquer environmental challenges such as electrical power source, wide operating temperature, shock and vibration, etc.
- Collect data from environmental sensors
- Optimized SWaP provides less weight, less power consumption, and smaller form factor

Environmental Sensors

CAN

4G/ Wifi

Unmanned Ground Vehicle (UGV)

SEMIL-1748GC

IP Camera

PoE+

8x 802.3at PoE+ Ports via M12 X-coded

NVIDIA® RTX A2000/ Tesla T4

Intel® Xeon®E or 9th/ 8th-Gen Core™ CPU

Camera → Sensing → Inference → Planning

Unmanned Ground Vehicle Autonomy

Solution

- IP67 rugged GPU fanless computer support NVIDIA RTX A2000, Tesla T4 GPU for AI applications
- Available in half-rack or rackmount form factors with unique brackets for flexible rack or wall-mount deployment
- Commercially available off-the-shelf M12 connectors for robust I/O connections
- Ruggedized mechanism design for -25°C to 70°C fanless operation and MIL-STD-810G certified

SEMIL Extreme-rugged Platforms

IP67 Rating

	SEMIL-1744GC/ SEMIL-1724GC	SEMIL-1748GC/ SEMIL-1728GC	SEMIL-1704/ SEMIL-1714J	SEMIL-1708/ SEMIL-1718J
Model Name				
Chassis				
Dimensions (W x D x H)	440 x 310 x 86.5 mm	440 x 310 x 86.5 mm	220 x 310 x 86.5 mm	220 x 310 x 86.5 mm
Weight	12 kg	12.2 kg	5.8 kg (SEMIL-1704) 6 kg (SEMIL-1714J)	5.8 kg (SEMIL-1708) 6 kg (SEMIL-1718J)
Chassis Construction	Aluminum alloy with stainless steel /waterproof	Aluminum alloy with stainless steel /waterproof	Aluminum alloy with stainless steel	Aluminum alloy with stainless steel
IP Rating	IP67	IP67	IP67	IP67
System				
Processor	Intel® Xeon® E-2176G/ E-2278GE/ E-2278GEL Intel® Core™ i7-9700E/ i7-9700TE/ i7-8700/ i7-8700T Intel® Core™ i5-9500E/ i5-9500TE/ i5-8500/ i5-8500T Intel® Core™ i3-9100E/ i3-9100TE/ i3-8100/ i3-8100T	Intel® Xeon® E-2176G/ E-2278GE/ E-2278GEL Intel® Core™ i7-9700E/ i7-9700TE/ i7-8700/ i7-8700T Intel® Core™ i5-9500E/ i5-9500TE/ i5-8500/ i5-8500T Intel® Core™ i3-9100E/ i3-9100TE/ i3-8100/ i3-8100T	Intel® Xeon® E-2176G/ E-2278GE/ E-2278GEL Intel® Core™ i7-9700E/ i7-9700TE/ i7-8700/ i7-8700T Intel® Core™ i5-9500E/ i5-9500TE/ i5-8500/ i5-8500T Intel® Core™ i3-9100E/ i3-9100TE/ i3-8100/ i3-8100T	Intel® Xeon® E-2176G/ E-2278GE/ E-2278GEL Intel® Core™ i7-9700E/ i7-9700TE/ i7-8700/ i7-8700T Intel® Core™ i5-9500E/ i5-9500TE/ i5-8500/ i5-8500T Intel® Core™ i3-9100E/ i3-9100TE/ i3-8100/ i3-8100T
Acceleration GPU	NVIDIA® RTX A2000 (SEMIL-1724GC-A2K) NVIDIA® Tesla T4 (SEMIL-1744GC) NVIDIA® Quadro P2200 (SEMIL-1724GC)	NVIDIA® RTX A2000 (SEMIL-1728GC-A2K) NVIDIA® Tesla T4 (SEMIL-1748GC) NVIDIA® Quadro P2200 (SEMIL-1728GC)	-	-
Chipset	Intel® C246	Intel® C246	Intel® C246	Intel® C246
Graphics	Intel® UHD Graphics 630	Intel® UHD Graphics 630	Intel® UHD Graphics 630	Intel® UHD Graphics 630
Memory	Up to 64 GB DDR4-2666/ 2400	Up to 64 GB DDR4-2666/ 2400	Up to 64 GB DDR4-2666/ 2400	Up to 64 GB DDR4-2666/ 2400
I/O Interface				
PoE	1x IEEE 802.3at (25.5W) by Intel I219 (M12 X-coded) 3x IEEE 802.3at (25.5W) by Intel I210 (M12 X-coded)	1x IEEE 802.3at (25.5W) by Intel I219 (M12 X-coded) 7x IEEE 802.3at (25.5W) by Intel I210 (M12 X-coded)	1x IEEE 802.3at (25.5W) by Intel I219 (M12 X-coded) 3x IEEE 802.3at (25.5W) by Intel I210 (M12 X-coded)	1x IEEE 802.3at (25.5W) by Intel I219 (M12 X-coded) 7x IEEE 802.3at (25.5W) by Intel I210 (M12 X-coded)
10GbE Port	Optional 1x 10G port (M12 X-coded)	Optional 1x 10G port (M12 X-coded)	Optional 1x 10G port (M12 X-coded)	Optional 1x 10G port (M12 X-coded)
Video Port	1x VGA (M12 A-coded)	1x VGA (M12 A-coded)	1x VGA (M12 A-coded)	1x VGA (M12 A-coded)
Serial Port	2x RS-232 ports (M12 A-coded)	2x RS-232 ports (M12 A-coded)	2x RS-232 ports (M12 A-coded)	2x RS-232 ports (M12 A-coded)
USB 2.0	2x USB 2.0 (M12 A-coded) 1x USB 2.0 (internal)	4x USB 2.0 (M12 A-coded) 1x USB 2.0 (internal)	2x USB 2.0 (M12 A-coded) 1x USB 2.0 (internal)	4x USB 2.0 (M12 A-coded) 1x USB 2.0 (internal)
USB 3.1	-	-	-	-
Audio	-	1x Mic-in and speaker-out (M12 A-coded)	-	1x Mic-in and speaker-out (M12 A-coded)
Digital I/O	-	-	-	-
Storage Interface				
SATA HDD	2	2	2	2
mSATA	2	2	2	2
M.2 (M-key)	1	1	1	1
Mini PCI-E	2 (mux with mSATA)	4 (2x mux with mSATA)	2 (mux with mSATA)	4 (2x mux with mSATA)
Expansion Bus				
M.2 (B-key/ E-Key)	-	-	-	-
SIM	2	2	2	2
PCI/PCI Express	1x PCIe with NVIDIA® Tesla T4 pre-installed (SEMIL-1744GC) 1x PCIe with NVIDIA® RTX A2000/ Quadro P2200 pre-installed (SEMIL-1724GC-A2K/ SEMIL-1724GC)	1x PCIe with NVIDIA® Tesla T4 pre-installed (SEMIL-1748GC) 1x PCIe with NVIDIA® RTX A2000/ Quadro P2200 pre-installed (SEMIL-1728GC-A2K/ SEMIL-1728GC)	PB-2500J pre-installed (SEMIL-1714J)	PB-2500J pre-installed (SEMIL-1718J)
Power Supply				
DC Input	8 to 48V DC (M12 S-coded)	8 to 48V DC (M12 S-coded)	8 to 48V DC (M12 S-coded)	8 to 48V DC (M12 S-coded)
Ignition Control	Built-in	Built-in	Built-in	Built-in
Environmental				
Operating Temperature	with 35W CPU -25°C~ 70°C with >= 65W CPU -25°C~70°C (configured as 35W TDP mode) -25°C~50°C (configured as 65W TDP mode)	with 35W CPU -25°C~ 70°C with >= 65W CPU -25°C~70°C (configured as 35W TDP mode) -25°C~50°C (configured as 65W TDP mode)	with 35W CPU -40°C~ 70°C with >= 65W CPU -40°C~70°C (configured as 35W TDP mode) -40°C~ 50°C (configured as 65W TDP mode)	with 35W CPU -40°C~ 70°C with >= 65W CPU -40°C~70°C (configured as 35W TDP mode) -40°C~ 50°C (configured as 65W TDP mode)
Certification	EN 50155, CE/ FCC, MIL-STD-810G	EN 50155, CE/ FCC, MIL-STD-810G	EN 50155, CE/ FCC, MIL-STD-810G	EN 50155, CE/ FCC, MIL-STD-810G

Wide-temperature

	SEMIL-1341GC/ SEMIL-1321GC	SEMIL-1301	SEMIL-1311J
Model Name			
Chassis			
Dimensions (W x D x H)	440 x 310 x 86.5 mm	220 x 310 x 86.5 mm	220 x 310 x 86.5 mm
Weight	12 kg	5.8 kg	6 kg
Chassis Construction	Aluminum alloy with stainless steel	Aluminum alloy with stainless steel	Aluminum alloy with stainless steel
IP Rating	IP4X	IP4X	IP4X
System			
Processor	Intel® Xeon® E-2176G/ E-2278GE/ E-2278GEL Intel® Core™ i7-9700E/ i7-9700TE/ i7-8700/ i7-8700T Intel® Core™ i5-9500E/ i5-9500TE/ i5-8500/ i5-8500T Intel® Core™ i3-9100E/ i3-9100TE/ i3-8100/ i3-8100T	Intel® Xeon® E-2176G/ E-2278GE/ E-2278GEL Intel® Core™ i7-9700E/ i7-9700TE/ i7-8700/ i7-8700T Intel® Core™ i5-9500E/ i5-9500TE/ i5-8500/ i5-8500T Intel® Core™ i3-9100E/ i3-9100TE/ i3-8100/ i3-8100T	Intel® Xeon® E-2176G/ E-2278GE/ E-2278GEL Intel® Core™ i7-9700E/ i7-9700TE/ i7-8700/ i7-8700T Intel® Core™ i5-9500E/ i5-9500TE/ i5-8500/ i5-8500T Intel® Core™ i3-9100E/ i3-9100TE/ i3-8100/ i3-8100T
Acceleration GPU	NVIDIA® RTX A2000 (SEMIL-1321GC-A2K) NVIDIA® Tesla T4 (SEMIL-1341GC) NVIDIA® Quadro P2200 (SEMIL-1321GC)	-	-
Chipset	Intel® C246	Intel® C246	Intel® C246
Graphics	Intel® UHD Graphics 630	Intel® UHD Graphics 630	Intel® UHD Graphics 630
Memory	Up to 64 GB DDR4-2666/ 2400	Up to 64 GB DDR4-2666/ 2400	Up to 64 GB DDR4-2666/ 2400
I/O Interface			
PoE	1x IEEE 802.3at (25.5W) by Intel I219 (M12 X-coded) 3x IEEE 802.3at (25.5W) by Intel I210 (M12 X-coded)	1x IEEE 802.3at (25.5W) by Intel I219 (M12 X-coded) 3x IEEE 802.3at (25.5W) by Intel I210 (M12 X-coded)	1x IEEE 802.3at (25.5W) by Intel I219 (M12 X-coded) 3x IEEE 802.3at (25.5W) by Intel I210 (M12 X-coded)
10GbE Port	Optional 1x 10G port (M12 X-coded)	Optional 1x 10G port (M12 X-coded)	Optional 1x 10G port (M12 X-coded)
Video Port	1x VGA (M12 A-coded) 1x DisplayPort	1x VGA (M12 A-coded) 1x DisplayPort	1x VGA (M12 A-coded) 1x DisplayPort
Serial Port	2x RS-232 ports (M12 A-coded) 1x RS-232/422/485 1x RS-232	2x RS-232 ports (M12 A-coded) 1x RS-232/422/485 1x RS-232	2x RS-232 ports (M12 A-coded) 1x RS-232/422/485 1x RS-232
USB 2.0	2x USB 2.0 (M12 A-coded) 1x USB 2.0 (internal)	2x USB 2.0 (M12 A-coded) 1x USB 2.0 (internal)	2x USB 2.0 (M12 A-coded) 1x USB 2.0 (internal)
USB 3.1	3	3	3
Audio	1x Mic-in and speaker-out	1x Mic-in and speaker-out	1x Mic-in and speaker-out
Digital I/O	-	-	-
Storage Interface			
SATA HDD	2	2	2
mSATA	2	2	2
M.2 (M-key)	1	1	1
Mini PCI-E	2 (mux with mSATA)	2 (mux with mSATA)	2 (mux with mSATA)
Expansion Bus			
M.2 (B-key/ E-Key)	1x M.2 B-key 1x M.2 E-key	1x M.2 B-key 1x M.2 E-key	1x M.2 B-key 1x M.2 E-key
SIM	4	4	4
PCI/PCI Express	1x PCIe with NVIDIA® Tesla T4 pre-installed (SEMIL-1341GC) 1x PCIe with NVIDIA® RTX A2000/ Quadro P2200 pre-installed (SEMIL-1321GC-A2K/ SEMIL-1321GC)	-	PB-2500J pre-installed
Power Supply			
DC Input	8 to 48V DC	8 to 48V DC	8 to 48V DC
Ignition Control	Built-in	Built-in	Built-in
Environmental			
Operating Temperature	with 35W CPU -25°C~ 70°C with >= 65W CPU -25°C~70°C (configured as 35W TDP mode) -25°C~50°C (configured as 65W TDP mode)	with 35W CPU -40°C ~ 70°C with >= 65W CPU -40°C ~ 70°C (configured as 35W TDP mode) -40°C ~ 50°C (configured as 65W TDP mode)	with 35W CPU -40°C ~ 70°C with >= 65W CPU -40°C ~ 70°C (configured as 35W TDP mode) -40°C ~ 50°C (configured as 65W TDP mode)
Certification	EN 50155, CE/ FCC, MIL-STD-810G	EN 50155, CE/ FCC, MIL-STD-810G	EN 50155, CE/ FCC, MIL-STD-810G