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Rugged Virtualization Supercomputer

Product Specifications - Technology Procurement Guide

- Design for reliability under demanding MIL-STD-810G Thermal, Shock, Vibration, Humidity/EMI/EMC conditions
- Ultra-high performance Intel®Xeon® D-2796NT (2.0GHz, 20Cores, 40Threads)
- Up to 512GB DDR4 ECC RDIMM
- Dual removable solid-state disk
- Hardware secure erase
- 18-36V DC-in power supply
- MIL-STD-810, MIL-STD-1275, MIL-STD-461



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AV800-D27

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THOR11-D27

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Harnessing information and data as new source of powerful weapon has become crucial nowadays. And real-time reaction is vital. That's why 7StarLake Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) solutions emphasize on ultra-high performance system integration. We focus on the capabilities to control - because control lead to dominance.

AV800-D27 & THORII-D27 are equipped with Ultra-High Performance Intel® Xeon® D-2796NT CPU. In a scenario where virtual machine is integrated with C4ISR system, the 20-core processor allows the CPU resources be reallocated to one or more virtual machines. For instance, 4 cores are assigned to one virtual machine would mean the user now has maximum four different operating systems running on the same physical computer at the same time.

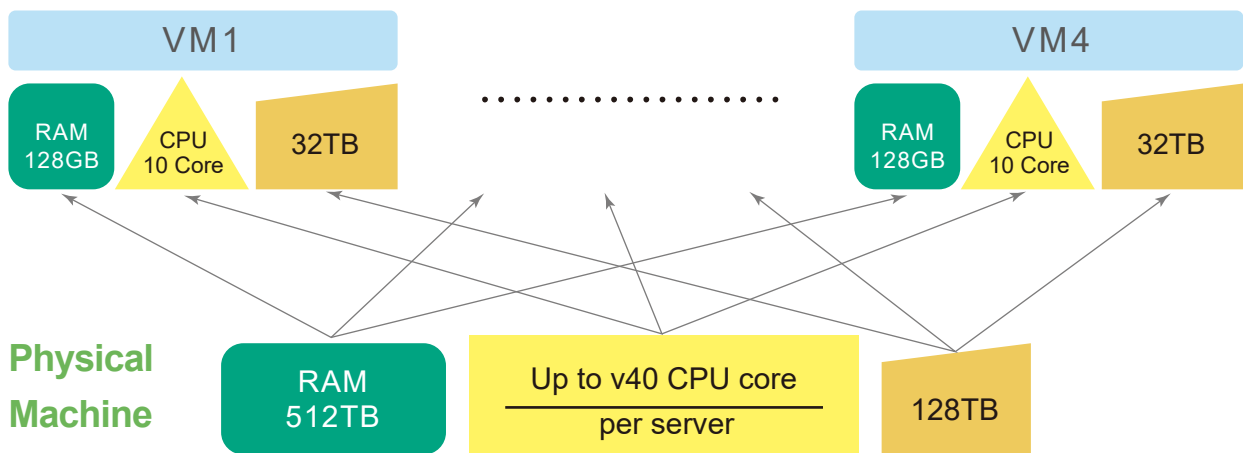
In this way, IT operators will no longer be disturbed by numerous interfaces, monitors and humongous servers. Various and complex system connecting one another should work coordinately, interpreting the received data and representing the commander's order. All data and assets can be managed from one location. Ideal hardware utilization, expansion potentials and high efficiency operation are further guaranteed. In battlefield reality, where one second difference defines success and failure, the application of virtualization machine has become indispensable.

Introduction

Our aim is to enhance tactical, operational, and strategic performance through synergy. To achieve this, information and data flowing through multiple systems must be received by the commander promptly and accurately, just as they are disseminated.

Virtual Machine Application

The increasing adoption of Virtual Machine technology by organizations and enterprises isn't solely driven by the reduction of physical hardware and the expansion potentials it offers. Indeed, both authorities and private sectors are turning to virtual machines because they provide users with numerous options for running operating systems in constrained environments. Essentially, the utilization of virtual machines effectively saves costs and achieves ultra-high efficiency.



Take **AV800-D27 & THORII-D27** for example, the CPU resources of their 20-core Ultra-High Performance Intel® Xeon® D-2796NT processor can be allocated to one or more virtual machines. Various operating systems can thus run at the same time, without having to adopt extra physical hardware and server. Meanwhile, all data and assets can be managed from one location. It achieves an ideal hardware utilization and lead to unlimited expansion potentials, which undoubtedly are the keys to mission success.



Virtual machines offer more than just cost savings on hardware and energy expenses. Nowadays, enterprises are also leveraging their secure virtual environments. Unlike physical servers, damage to a virtual machine doesn't affect the physical server, ensuring quick disaster recovery. Furthermore, when operating systems run in a virtual environment, the license key required by the virtual OS matches that of the hard drive ID. This makes virtual machines an ideal option for system testing and software licensing. While fulfilling these functions, virtual machines also ensure forward compatibility and support for legacy operating systems. The robust capabilities of virtual machines make them an unparalleled choice for significant data computing tasks.

MIL-STD-1275/461

Power Supply with Voltage Transient Protections

SK711, the power board adopted by AV800-D27 & THOR11-D27, supports input range from 18V to 36V. Possessing military standard filter for EMI avoidance, SK711 guarantees a stability of voltage and electric current under system operation. It is especially suitable for application in military or other harsh environment.

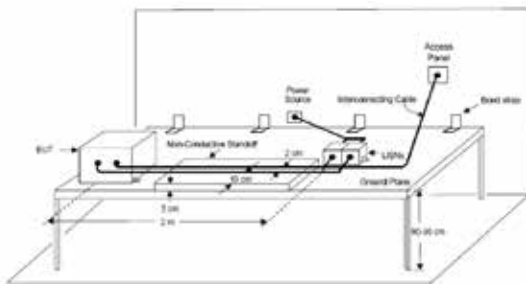


SK711

Furthermore, with parallel design, two SK711 combining can generate double power of 300W, supporting prominent system performance. Compliant with MIL-STD 1275/461, DO-160F and extended operating temperature from -40 to 85°C, SK711 performs as an ideal converter module for severe environmental usage.

Its GAIA Hi-Rel DC/DC CONVERTER also provides Undervoltage Lockout (UVLO), Output Over Current Protection (OCP), Output Overvoltage Protection (OVP) and Over Temperature Protection (OTP) to made stability and safety. They module is compliant with MIL-STD-461 C/D/E/F Standards.

Test Configuration

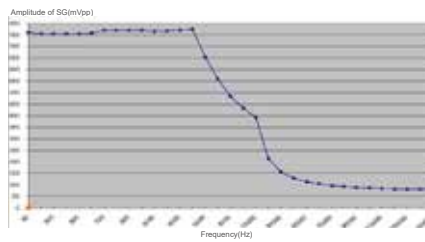


MIL-STD-461

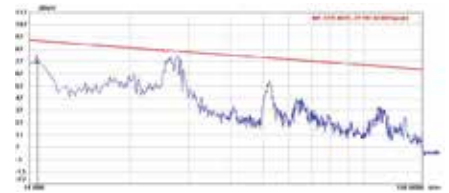
MIL-STD-461 is a military standard that establishes the control of electromagnetic interference (EMI) emissions and susceptibility characteristics of electronic, electrical & electromechanical equipment and subsystems for military equipment.

EMI, or Electromagnetic Interference, refers to any unwanted signals or "noise" emitted by electronic devices. Maintaining control over EMI is paramount in military applications, as uncontrolled emissions could lead to detection by enemy forces, potentially resulting in significant losses. Designing a product to meet stringent requirements demands engineers with comprehensive expertise in both electrical and mechanical design. This ensures the prevention of unintended generation, propagation, and reception of electromagnetic energy, which could otherwise lead to adverse effects such as physical damage to operational equipment.

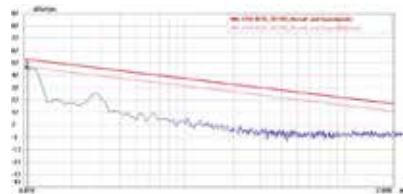
CS101



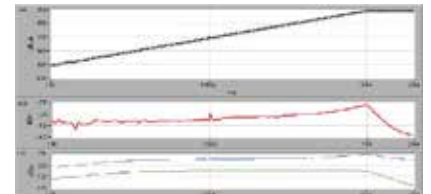
CS102



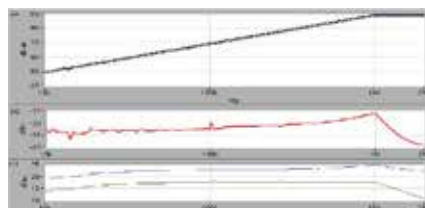
RE102



CS114

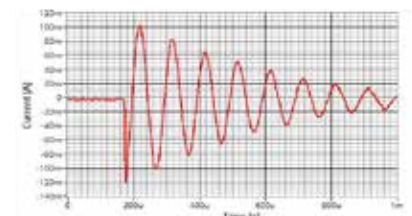


CS115

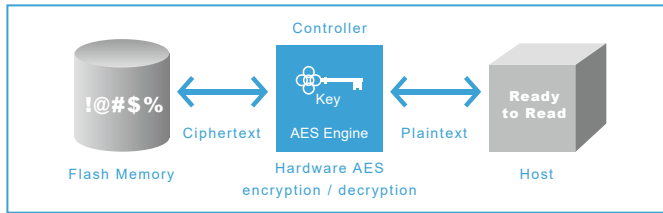


Peak Current Limit [A]: 5.0
Charging Voltage [%]: 56.4
Peak Current, Cpeak [A]: 5.1
Rise-time, tr [s]: 1.52n
Fall-time, tf [s]: 1.30n
Duration, td [s]: 30.45n

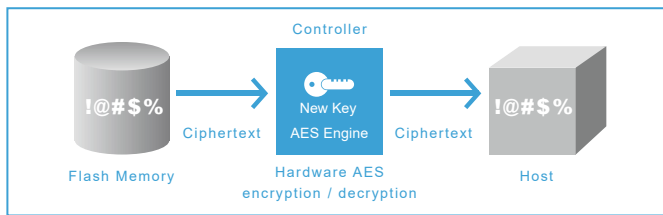
CS116



Hardware Secure Erase - AES Encryption



INSTANT ERASE



In urgent scenarios where immediate data erasure is required, a Secure Erase Button becomes essential. Instant Erase, a specific feature tailored for Self-Encryption Drives (SED), provides a faster method compared to Quick Erase, rendering all written data invalid promptly. The encryption and decryption processes are managed by an AES key along the pathway; once this AES key is substituted with a new one, the data becomes unintelligible.



- 1 Open the Protection cap
- 2 Press button for destroyed SSD AES key
- 3 Data/partition becomes unrecognizable

The Advanced Encryption Standard (AES) is one of the block cipher specification adopted by U.S. government. AES is enhanced and approved by the U.S. National Security Agency (NSA), and is now used worldwide.

High speed and low RAM requirements

The kind of cryptographic module can encrypt and decrypt rapidly on software and hardware with relatively less memory, thus is easier to practice and implement.

Unbreakable Encryption Algorithms

The larger size of key adopted, the more possible keys there are. Take 256-bit encryption for instance, it generates 2^{256} possible keys, taking more years than the age of the universe (13.8 billion years) for hackers to break through.

Perfectly Secure Environment

AES Key is generated randomly through various rounds of algorithms. Each round consists of several processing steps, even the supplier and the user cannot access to the cypher. To date, AES encryption has never been broken in a way its predecessor DES (Data Encryption Standard) was way back in 1999.

Taking into consideration the strength, versatility, and speed of the cipher, AES Encryption is undoubtedly the best encryption program out there. To guard top-secret information, given the current state of technology, governments and the military select, and only use the AES Encryption.

NVMe U.2 Conduction Cooled Pack

A Quantum Leap in Speed : NVMe Gen 4.0 x 4

In the world of NVMe interface architecture, a direct connection to the CPU is established through the PCIe interface, allowing for efficient memory-like access as data transactions exclusively follow the PCIe bus protocol. The Super High-Performance **Gen 4.0x4 NVMe** drive stands out with an impressive read/write speed of **7,880 MB** per second, disrupting the conventional use of hard drives in SATA and SAS.



Rugged Conduction Cooled Pack

With increased speed and performance comes a higher generation of heat which causing higher chance of malfunction. In environments where active cooling is impractical, conventional removable SSD cages struggle to cope with the elevated heat levels, particularly from ultra-high capacity NVMe U.2 SSDs (up to 32TB per pack). Enter the 7StarLake NVMe U.2 **Conduction Cooled Pack**—a game-changer. Each U.2 SSD is equipped with its own standalone, and anti-corrosive aluminum cooling pack. This innovative solution efficiently redirects heat flow through thermal pads and heat-spreader. The distinctive and high-efficiency modular design of the 7StarLake solution distinguishes it from traditional storage alternatives, ensuring exceptional thermal solution even in the face of the intense heat generated by demanding processing tasks.



Resilient Against Extreme Pressures

In conjunction with its exceptional thermal management system, the **ultra-compact Conduction Cooled Pack** by 7StarLake boasts a carefully crafted enclosure meticulously tailored to accommodate U.2 SSD dimensions. This precise design ensures that U.2 SSDs remain impervious to vibrations and shocks, enhancing their durability across various scenarios including airborne missions, naval operations, or ground deployments. The precision-engineered enclosure provides an additional safeguard, fortifying the resilience and longevity of the U.2 SSDs even in the harshest and most challenging environments.



Swappable CMOS Battery

In general, replacing the battery in a rugged solution can be complex and may compromise the original water and dust resistance function. However, the AV800-D27 addresses this issue with its easy-to-swap battery tray, enabling users to replace it directly. Simply pull the tray out fully from the computer to access the coin-cell battery. Replace it with a new CR2032 battery, push the tray back into the computer, lock the screw, and the replacement process is complete.





AV800-D27

developed in collaboration with a leading global defense system integrator, is a resilient virtualization supercomputer tailored to meet the rigorous demands of C4ISR land systems. It boasts exceptional quality both internally and externally.

During combat operations, this computer is directly integrated into the interior of tanks. Its sturdy casing effectively mitigates sudden impacts from extreme shock, vibrations, and bumps encountered on the field. The AV800-D27 exemplifies genuine ruggedness by withstanding dust intrusion, accidental contact, and water exposure, thanks to its IP65 compliant sealed compact chassis and the utilization of Souriau D38999 connectors.

Almighty Ruggedness

D38999 connectors provide unparalleled performance and reliability for applications in severe environments. This family of cylindrical connectors is specifically engineered to endure extreme temperatures (-65 to 200° C), intense vibrations, and corrosive fluids. Compliant with key mil-spec standards (MIL-DTL-38999 series III, EN3645, BACC63, CECC), these connectors meet the most stringent requirements in harsh environmental conditions.



SOURIAU®



Amphenol®

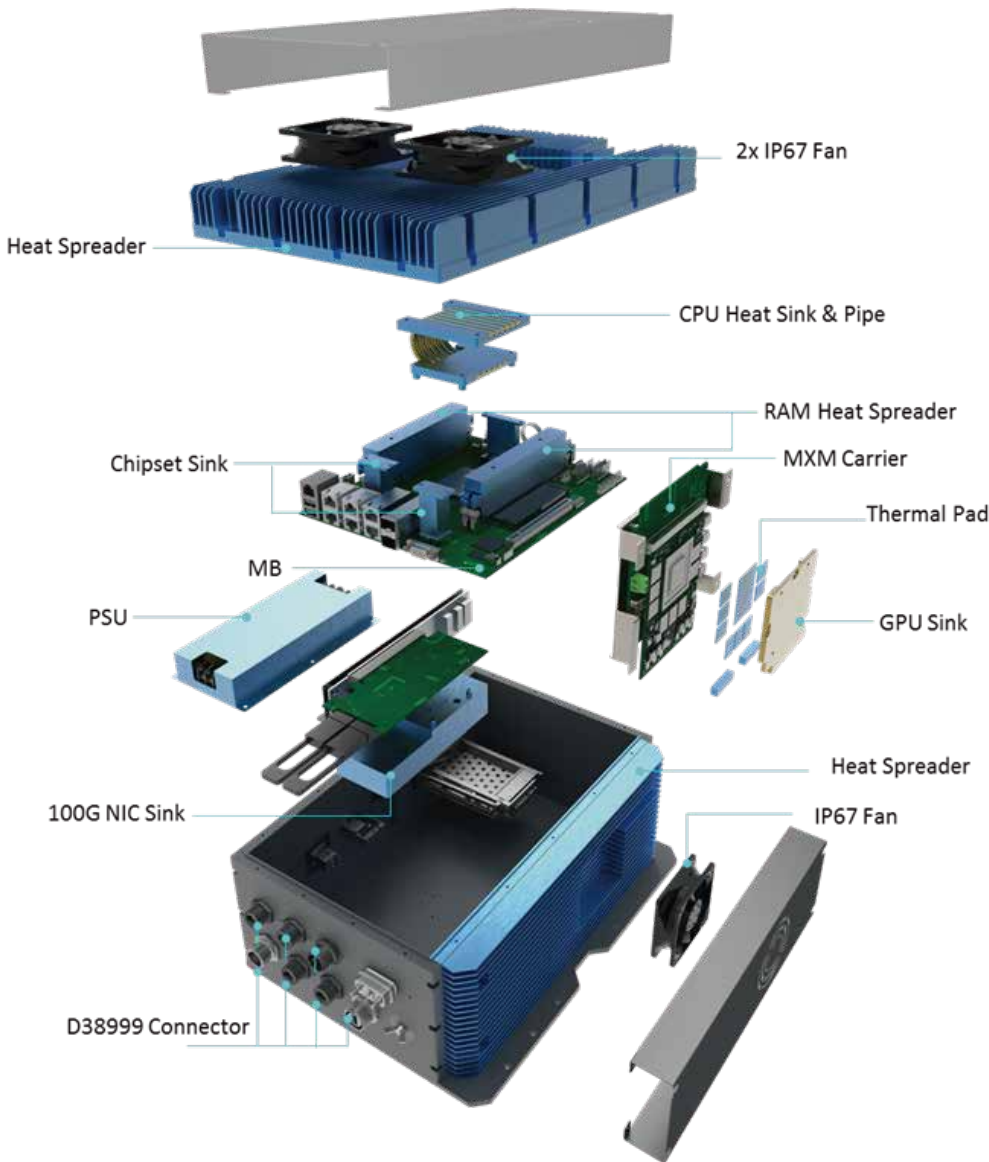


AV800-D27 Specification

System	
CPU	Intel® Xeon® Processor D-2796NT (Frequency 2.0GHz, Turbo Boost Frequency up to 3.1GHz), 20-Core, 40 Thread Support, 24MB Smart Cache. Build-in Turbo Boost Technology 2.0, VPro and Hyper-Threading
Memory type	256GB RDIMM ECC DDR4-2933 / 512G LRDIMM DDR4-2933 in 4 DIMM Slot
GPU	
Graphics Processor	NVidia® RTX A4500 5888 CUDA Cores PCIe Gen4.0 x16
Storage	
HDD/SSD	2x NVMe PCIe GEN 4.0 x 4 Hardware Secure Erase (AES) by option
Front I/O	
X1	DC-IN connector
X2	1x USB3.0 Amphenol USB3FTV7AZNF 312 connector
X3	1x 1GBase-T TV07RW-13-98S connector
X4	1x 1GBase-T TV07RW-13-98S connector
X5	1x 10GBase-T M20 RJ45 CAT6A connector
X6	1x 10GBase-T M20 RJ45 CAT6A connector
X7	2x 100G Fiber Ethernet Amphenol FSI MPOFTV70ZNN
VGA	D-sub 15 connector with waterproof cap
Side I/O	
SSD Tray	2 x Dual 2.5" HDD/SSD Easy Swap Tray
Power Button	1x Power Button with LED backlight
Power Requirement	
Power Input	MIL-STD-461 EMI power supply, 18V~36V DC-IN (300W)
Application, Operating System	
Application	Commercial and Military Platforms Requiring Compliance to MIL-STD-810G. Embedded Computing, Process Control, Intelligent Automation and manufacturing applications where Harsh Temperature, Shock, Vibration, Altitude, Dust and EMI Conditions. Used in all aspects of the military
Operating System (UEFI BOOT Support)	Windows 10 64bit Enterprise, Windows 10 64bit Pro Workstations, Windows 10 IoT 64bit Enterprise, Windows 11 64bit Enterprise, Windows 11 64bit Pro Workstations, Windows 11 IoT 64bit Enterprise, Windows Server 2019 64bit, Windows Server 2022 64bit, RHEL 8.3 64bit, RHEL 8.4 64bit, CentOS 8.3 64bit, CentOS 8.4 64bit, Oracle 8.3 64bit, Oracle 8.4 64bit, SLES 12 SP5 64bit, SLES 15 SP3 64bit, Ubuntu 20.04.3 64bit Server, Ubuntu 21.10 64bit Server, FreeBSD 12.1, VMWare ESXi 7.0u3 x64
Physical	
Dimension (WxDxH)	405 x 316 x 195 mm
Weight	10Kg
Chassis	Aluminum Alloy, Corrosion Resistant.
Finish	Anodic aluminum oxide (Color Iron gray)
Cooling	Natural Passive Convection / Conduction. No Moving Parts

Patented Thermal Architecture

7StarLake guarantees reliable and supreme solutions for industrial and military applications. All of our selected components are of authentic industrial grade, and have verified their stability and durability through a series of Wide-range Temperature tests.



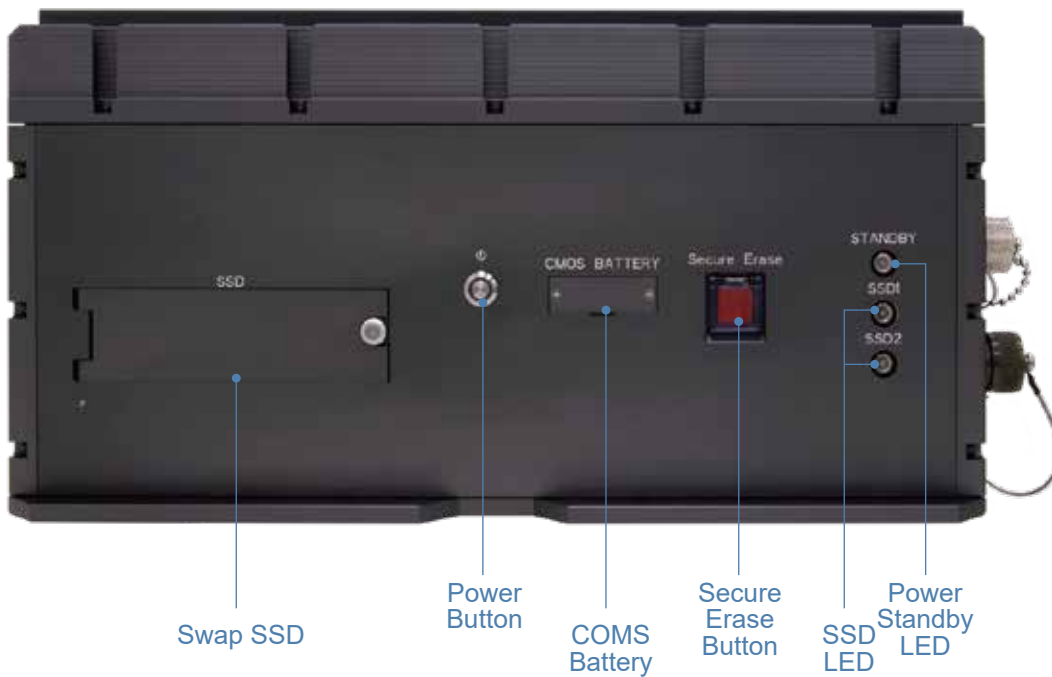
Aluminum Upper Cover

7StarLake's unique high thermal conductivity enclosure is designed with high and low fin plus wave line, creating adequate airflow and increasing the surface area in contact with the cooling medium up to 30-40%.

Exclusive Aluminum Heat Spreader for 512GB RDIMM

RAM generates intense heat while the server is operating in high speed. The aluminum heat spreader touches the RAM and the upper cover directly, efficiently dissipate heat from the heat source to the external enclosure.

AV800-D27 Appearance



AV800-D27 Environmental Testing

Environmental Condition

Operating Temperature -20 to 55°C

Storage Temperature -40 to 85°C

MIL-STD-810 Test

- Method 507.5, Procedure II (Temperature & Humidity)
- Method 516.6 Shock-Procedure V Non-Operating (Mechanical Shock)
- Method 516.6 Shock-Procedure I Operating (Mechanical Shock)
- Method 514.6 Vibration Category 24/Non-Operating (Category 20 & 24, Vibration)
- Method 514.6 Vibration Category 20/Operating (Category 20 & 24, Vibration)
- Method 501.5, Procedure I (Storage/High Temperature)
- Method 501.5, Procedure II (Operation/High Temperature)
- Method 502.5, Procedure I (Storage/Low Temperature)
- Method 502.5, Procedure II (Operation/Low Temperature)
- Method 503.5, Procedure I (Temperature shock)

Reliability

No Moving Parts; Passive Cooling.
Designed & Manufactured using ISO 9001/2000 Certified Quality Program.

MIL-STD-461G Test

- CE102 10KHz-10Mhz
- CS101 30Hz-150KHz
- CS114 10KHz to 200MHz, curves 3&4
- CS115 bulk cable injection, impulse excitation
- CS116 damped sinusoidal transients, cables and power leads, 10KHz to 100MHz
- RE102 10KHz-18GHz
- RS103 2Mhz to 18GHz, 50V/m

EN61000-4-2

EN 61000-4-2: Air discharge: 8 kV, Contact discharge: 6kV
EN 61000-4-4: Signal and DC-Net: 1 Kv
EN 61000-4-5: Leads vs. ground potential 1kV, Signal und DC-Net: 0.5
EN 55022, Class A
EN 61000-4-3: 10V/m

CE

EN55032:2015 + A11:2020 Class A
CISPR32:2015. (Ed 2.0) +C1:2016
BS EN55032:2015 + A11:2020
EN IEC 61000-3-2: 2019 + A1: 2021
BS EN IEC 61000-3-2: 2019 + A1: 2021
EN 61000-3-3: 2013 + A1:2019 + A2:2021
BS EN 61000-3-3: 2013 + A1:2019 + A2:2021
EN 55035: 2017 + A11: 2020
BS EN 55035: 2017 + A11: 2020
IEC 61000-4-2: 2008; IEC 61000-4-3: 2020 (Ed. 4.0)
IEC 61000-4-4: 2020; IEC 61000-4-5: 2014 + A1: 2017
IEC 61000-4-6: 2013 + COR1: 2015; IEC 61000-4-8: 2009
IEC 61000-4-11:2020 + COR1: 2020 + COR2: 2022 (Ed. 3.0)



In reality, **THOR11-D27**, the 1U Rackmount Virtual computer, is placed in military transit rackmount. It is connected to various IT devices, including communication equipment, information extractor and data storage center. In order to run under high-speed and stable transmission, naturally, THOR11-D27 is equipped with dual 25GbE LAN, supporting the best parallel working system.



THOR11-D27

Dual 25G Ethernet for Virtual Machine

The Intel® Ethernet Connection Dual 25GbE SFP28 (SoC), Dual 10GBase T (Intel X550 AT2), Quad 1GBase T (Intel i350 AM4) networking Physical Layer (PHY) is designed for workstations, servers, and embedded systems with critical space and power constraints. The THOR11-D27 is equipped with Dual 25GbE SFP28 (SoC), Dual 10GBase T (Intel X550 AT2), Quad 1GBase T (Intel i350 AM4), enabling high-speed and stable transmission in systems.

Compared to typical 1GbE and 10GbE LAN setups, 25GbE LAN offers advantages in bandwidth, latency, scalability, reliability, and application performance. Additionally, 25GbE LAN supports Virtual Machine applications, a significant feature for parallel working systems. Virtual Machines allow multiple operating environments to run simultaneously on the same server, isolated from one another but accessible through the same server. This capability is particularly useful for limited space or portable control and command centers, enabling several tasks to be accomplished on a single server concurrently.

THOR11-D27 Specification

System

CPU	Intel IceLake-D SoC, High Core Count 4/8/16/20 Cores, up to 120W
Memory type	Up to 512GB LRDIMM/256GB RDIMM, 4CH DDR4 3200MHz in 4 Slots
Chipset	SoC
GPU	Nvidia RTX A2000 MXM or PEG RTX A4000

Storage

HDD/SSD	6x NVMe or SATA III SSD with Hot-swap tray
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Ethernet

Ethernet	Dual 25GbE SFP28 (SoC) Dual 10GBase-T (Intel X550-AT2) Quad 1GBase-T (Intel i350-AM4)
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RAID

RAID	Support RAID 0,1,5,10
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OS

OS	(UEFI BOOT Support) : Windows 10 64bit Enterprise, Windows 10 64bit Pro Workstations, Windows 10 IoT 64bit Enterprise, Windows 11 64bit Enterprise, Windows 11 64bit Pro Workstations, Windows 11 IoT 64bit Enterprise, Windows Server 2019 64bit, Windows Server 2022 64bit, RHEL 8.3 64bit, RHEL 8.4 64bit, CentOS 8.3 64bit, CentOS 8.4 64bit, Oracle 8.3 64bit, Oracle 8.4 64bit, SLES 12 SP5 64bit, SLES 15 SP3 64bit, Ubuntu 20.04.3 64bit Server, Ubuntu 21.10 64bit Server, FreeBSD 12.1, VMWare ESXi 7.0u3 x64
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Power

Power Requirement	AC 110/220V 500W Power Supply MIL-STD-461 EMI 18~36V 500W DC Power Supply
Dimension	410 x 400 x 44 mm (W x D x H)
Weight	Under 12kg

Front I/O

LED	1x HDD LED (Red) 1x Power on LED (Green)
SSD	6x Hot Swap SSD tray
Switch	1x Power On switch

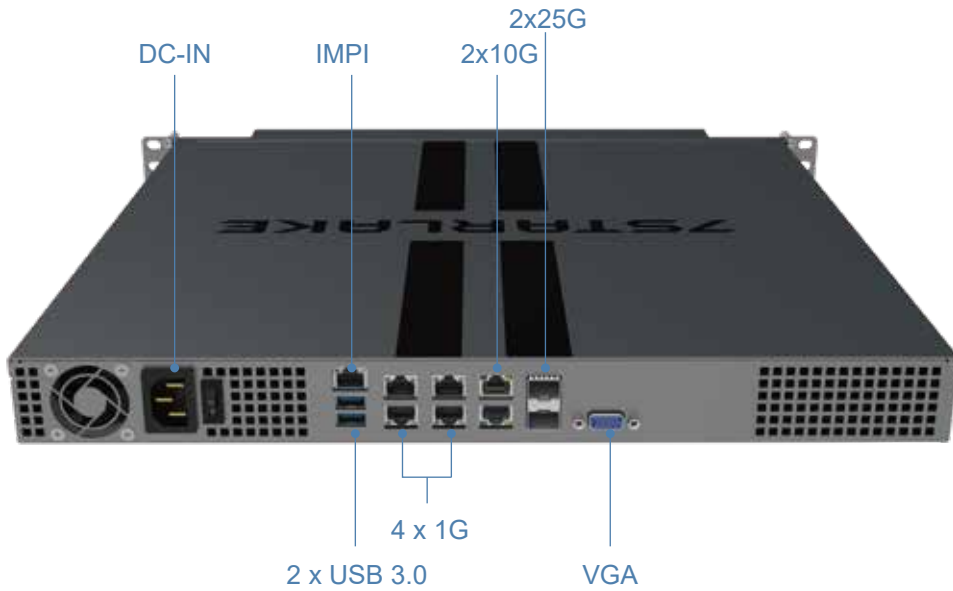
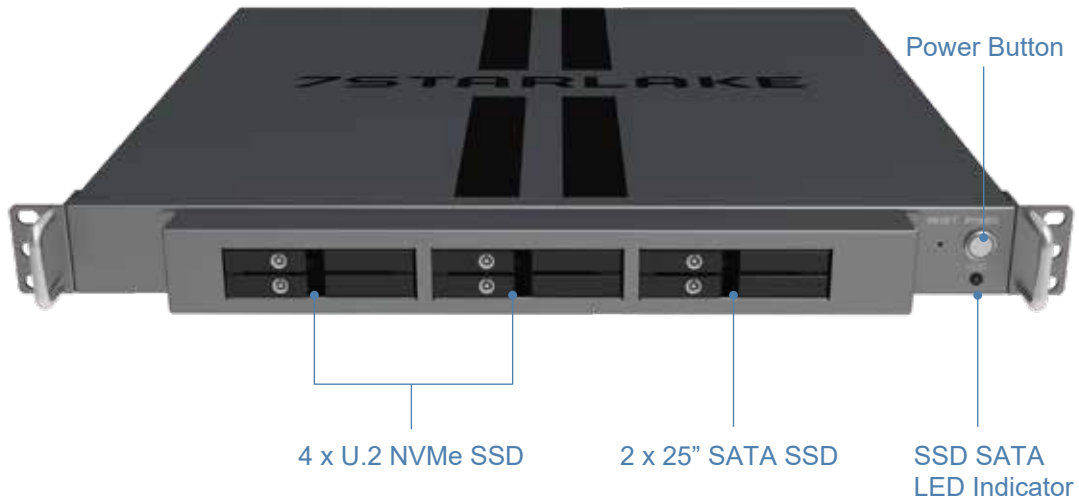
Rear I/O

Power Switch	1x AC Power switch (AC version)
AC-IN	1x AC-IN (IEC socket) (AC version)
DC-IN	1x 4P DC-IN Phoenix Jack (DC version)
IPMI	1x IPMI
USB	2x USB 3.0
LAN1, 2	2x 25GbE SFP28
LAN3, 4	2x 10G Base-T
LAN5, 6, 7, 8	4x 1G Base-T
Display	1x VGA

Environment

Operating Temp.	-20°C to 60°C
Storage Temp.	-40°C to 85°C
Relative Humidity	5% to 95%, non-condensing
RoHS	RoHS Compliant

THOR11-D27 Appearance



THOR11-D27 Environmental Testing

Environmental Condition

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CS115 bulk cable injection, impulse excitation

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 BS EN55032:2015 + A11:2020
 EN IEC 61000-3-2: 2019 + A1: 2021
 BS EN IEC 61000-3-2: 2019 + A1: 2021
 EN 61000-3-3: 2013 + A1:2019 + A2:2021
 BS EN 61000-3-3: 2013 + A1:2019 + A2:2021
 EN 55035: 2017 + A11: 2020
 BS EN 55035: 2017 + A11: 2020
 IEC 61000-4-2: 2008; IEC 61000-4-3: 2020 (Ed. 4.0)
 IEC 61000-4-4: 2020; IEC 61000-4-5: 2014 + A1: 2017
 IEC 61000-4-6: 2013 + COR1: 2015; IEC 61000-4-8: 2009
 IEC 61000-4-11:2020 + COR1: 2020 + COR2: 2022 (Ed. 3.0)