PUZZLE-IN005

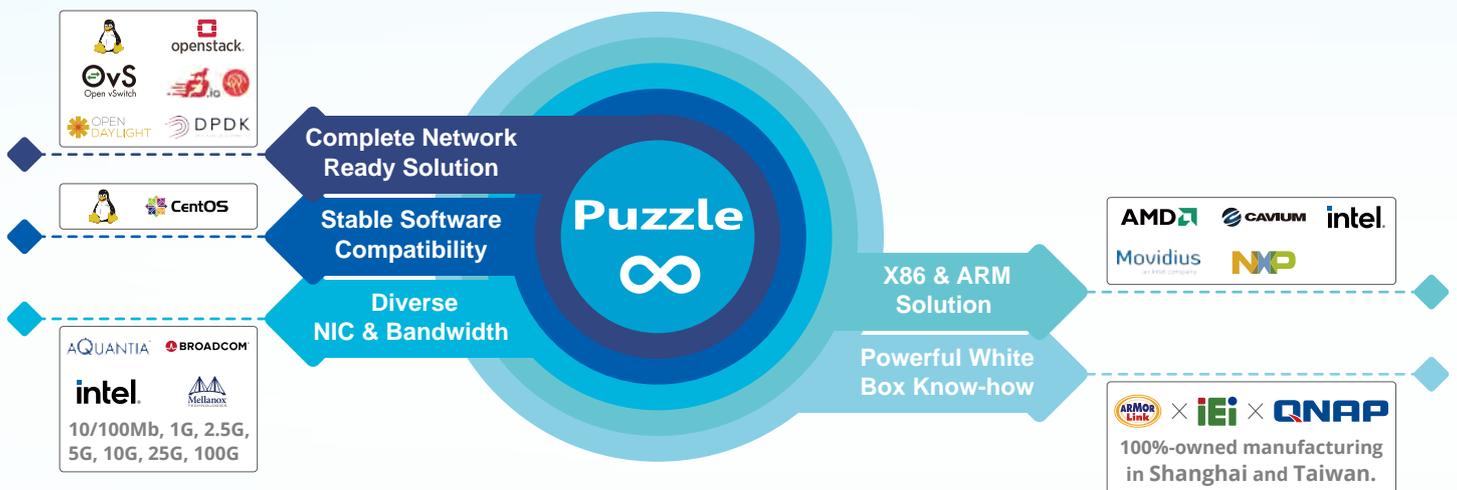## IEI PUZZLE with Intel® Solution

5G

www.ieiworld.com

Why PUZZLE Series?

Redefining and Maximizing Network Scalability

The next gen. network appliance, the PUZZLE series, is an uCPE solution consisting of software virtual network functions running on a standard operating system hosted on an open server.

Universal CPE (uCPE) is one of the most compelling use cases of Network Function Virtualization (NFV). Virtualization is the process of creating a software-based, or virtual, representation of something, such as virtual applications, servers, storage and networks. Network functions virtualization or NFV is a network architecture concept.

The IEI PUZZLE system can provide an open universal customer premises equipment (uCPE) solution that offers realtime software-defined wide-area network (SD-WAN) services that support both x86 and ARM architectures with any additional virtual network functions (VNF) services.

openstack
OvS
Open vSwitch
.io
OPEN DAYLIGHT
DPDK

CentOS

AQUANTIA
BROADCOM
intel
Mellanox
10/100Mb, 1G, 2.5G, 5G, 10G, 25G, 100G

Complete Network Ready Solution

Stable Software Compatibility

Diverse NIC & Bandwidth

Puzzle ∞

X86 & ARM Solution

Powerful White Box Know-how

AMD
CAVIUM
intel
Movidius
NXP

ARMOR Link × iEi × QNAP
100%-owned manufacturing in Shanghai and Taiwan.

5G Solution

IEI's PUZZLE series network appliance is developed to meet the low latency and quality of service (QoS) requirements in 5G network. The PUZZLE series allows private companies/organizations to utilize the Virtual Evolved Packet Core (vEPC) framework by deploying Mobile Edge Computing (MEC) and Open Radio Access Network (O-RAN) architecture with network function virtualization (NFV) to replace traditional proprietary hardware equipment.

In order to meet 5G speed, point-to-point latency and service quality, network operators need to upgrade the entire front-end to back-end process. IEI's PUZZLE series can provide solutions for today's IoT that expands massively; it can boost cellular operations, IoT security and network challenges, and drive the Internet future to the edge.

IEI's Network Appliance Series for 5G Solution

- Network maintainability
- Coverage of wireless communication
- Reducing capital expenditure
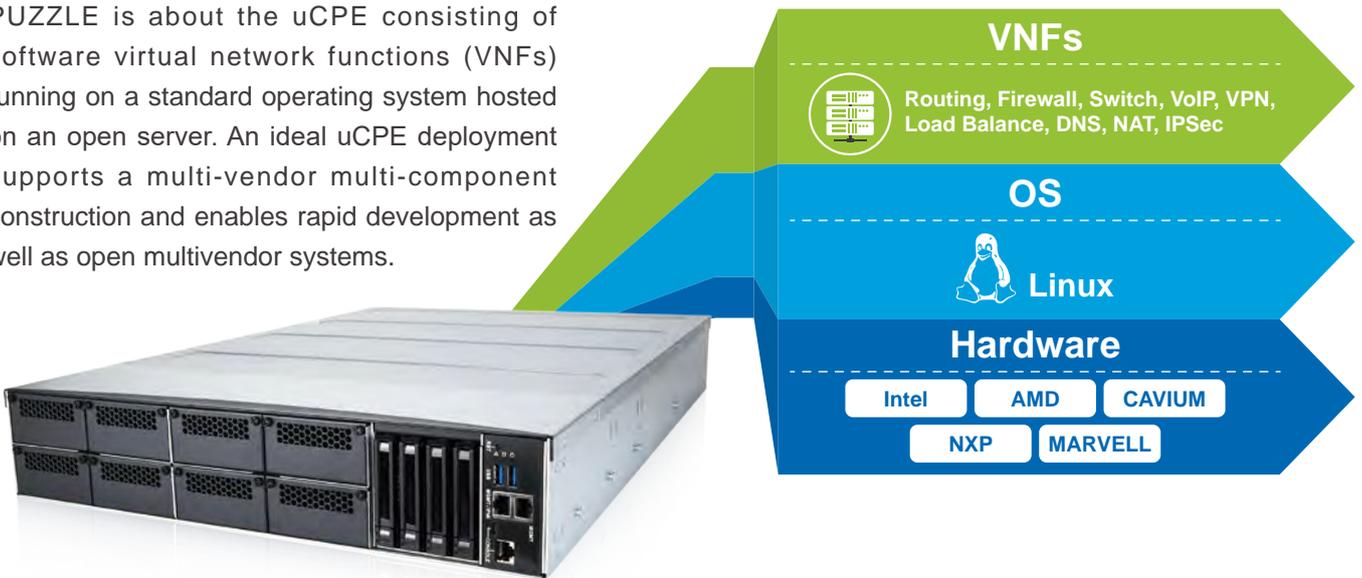- Throughput, and high scalability
- Trustworthy
- Security

PUZZLE Series Technology

Virtualization is the process of creating a software-based, or virtual, representation of something, such as virtual applications, servers, storage and networks. Network functions virtualization or NFV is a network architecture concept that uses the technologies of IT virtualization to virtualize entire classes of network node functions into building blocks that may connect, or chain together, to create communication services.

PUZZLE Series Ecosystem

PUZZLE is about the uCPE consisting of software virtual network functions (VNFs) running on a standard operating system hosted on an open server. An ideal uCPE deployment supports a multi-vendor multi-component construction and enables rapid development as well as open multivendor systems.

VNFs

Routing, Firewall, Switch, VoIP, VPN, Load Balance, DNS, NAT, IPSec

OS

Linux

Hardware

Intel   AMD   CAVIUM

NXP   MARVELL

3rd Gen Intel® Xeon Scalable Processor (Ice Lake)

Optimized for an outstanding HPC and AI experience

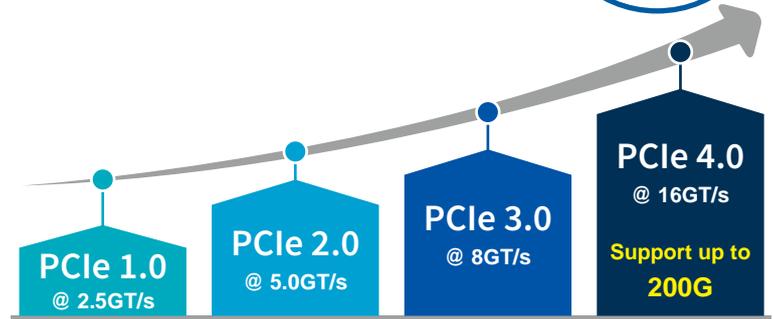**intel.**

XEON®

PLATINUM

Higher memory bandwidth: 8 DDR4 channels & 320MT/s

Better performance per core via new architecture

Faster I/O with PCIe Gen4

Supporting exascale storage with up to 6TB memory / socket and Intel® Optane™ PMem

Security Innovations Intel® SGX & coypto acceleration

Ice Lake-SP, Intel's first server processor with 10nm technology, and its companion Whitley 2-socket server platform increase the number of DDR4 memory channels from six to eight per CPU and introduce PCI Express Gen4. The platform supports up to 6TB per socket using Intel Optane persistent memory technology.

PCI Express 4.0

- Higher performance storage (next generation NVME) with double the speed of PCIe 3.0

- Faster Ethernet capability to eliminate throughput bottlenecks for data intensive applications (100/200G NIC cards)

- FPGA/GPU accelerators to support emerging machine learning and deep learning workloads with uncompromised PCIe 4.0 bandwidth and lowest latency

PCI EXPRESS 4.0

PCIe 1.0
@ 2.5GT/s

PCIe 2.0
@ 5.0GT/s

PCIe 3.0
@ 8GT/s

PCIe 4.0
@ 16GT/s
Support up to
200G

Intel® QuickAssist Technology

Intel® QuickAssist Technology integrates hardware acceleration of compute intensive workloads.

Such as Bulk Cryptography, Public Key Exchange & Compression on Intel® Architecture Platforms.

Integrated Accelerator & PCH

Intel® QuickAssist Technology

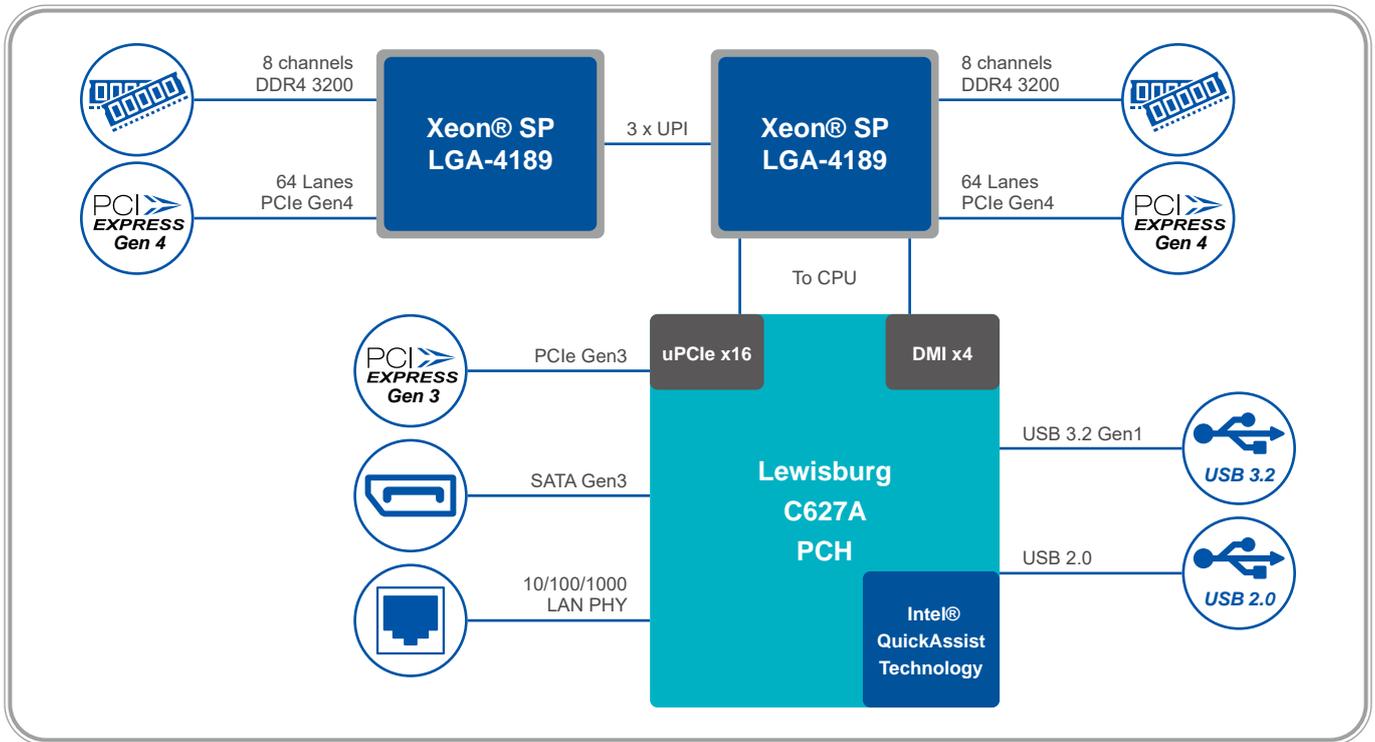**Crypto**

Compression

High Speed I/O

- Intel's 3rd Generation Technology

- Sub Gb/s to 100 Gb/s Rates

- Networking, Storage, Big Data, Cloud, Datacenter, and HPC Applications Receive High Performance Execution of:
  » Cryptographic Ciphers
  » Authentication
  » Public Key Exchange & Key Protection
  » Compression/Decompression

- Enables Standard Server & Cloud Platforms to Offer Ubiquitous Security and Compression/Decompression

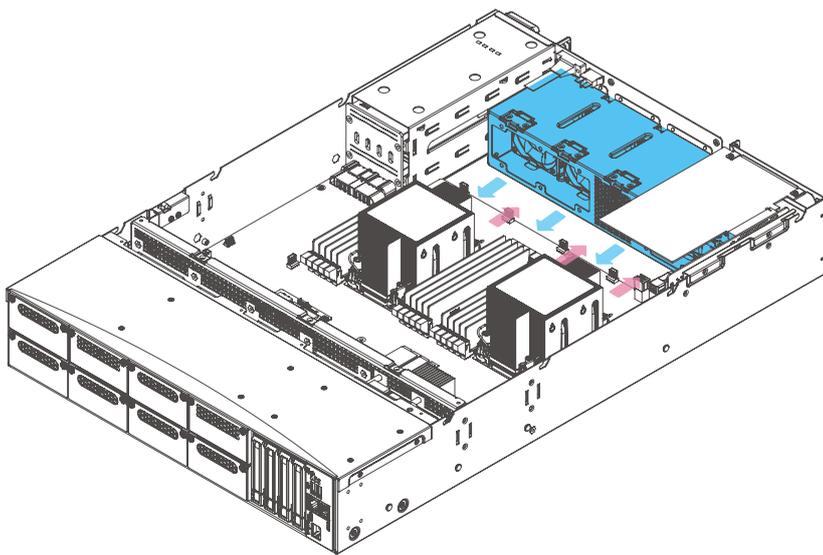- Provides a Converged Platform Architecture for Cloud, Networking, Storage & Big Data

Compare to previous gen. CPU

Family Branding	Cascade Lake-SP	Ice Lake-SP
Process Node	14nm++	10nm+
Platform Name	Intel Purley	Intel Whitley
Socket	LGA 3647	LGA 4189
Max Core Count	Up To 28	Up To 38
Max Thread Count	Up To 56	Up To 76
Memory Support	6-Channel DDR4-2933	8-Channel DDR4-3200
	R-DIMM / LR-DIMM	R-DIMM / LR-DIMM
PCIe Gen Support	PCIe 3.0 (48 Lanes)	PCIe 4.0 (64 Lanes)
TDP Range	Up to 205W	Up To 270W
3D Xpoint Optane DIMM	Apache Pass	Barlow Pass

Puzzle ∞

PUZZLE-IN005 2U Intel® Ice-Lake

Block diagram showing:

- 8 channels DDR4 3200 → Xeon® SP LGA-4189
- 64 Lanes PCIe Gen4 (PCI EXPRESS Gen 4) → Xeon® SP LGA-4189
- 3 x UPI between the two Xeon® SP LGA-4189
- Xeon® SP LGA-4189 → 8 channels DDR4 3200
- Xeon® SP LGA-4189 → 64 Lanes PCIe Gen4 (PCI EXPRESS Gen 4)
- To CPU
- PCI EXPRESS Gen 3 — PCIe Gen3 → uPCIe x16
- DMI x4
- SATA Gen3
- 10/100/1000 LAN PHY
- Lewisburg C627A PCH
- USB 3.2 Gen1 → USB 3.2
- USB 2.0 → USB 2.0
- Intel® QuickAssist Technology

Smart Fan Operation

Users can define CPU fan and system fan speed and temperature profile in the BIOS menu. When the system is in idle or running less demanding tasks, smart fan is able to bring down the level of noise produced by rotating fans. The adjustable settings allow the PUZZLE series run with less noise while extending the fan's lifespan, enhancing system stability and durability.
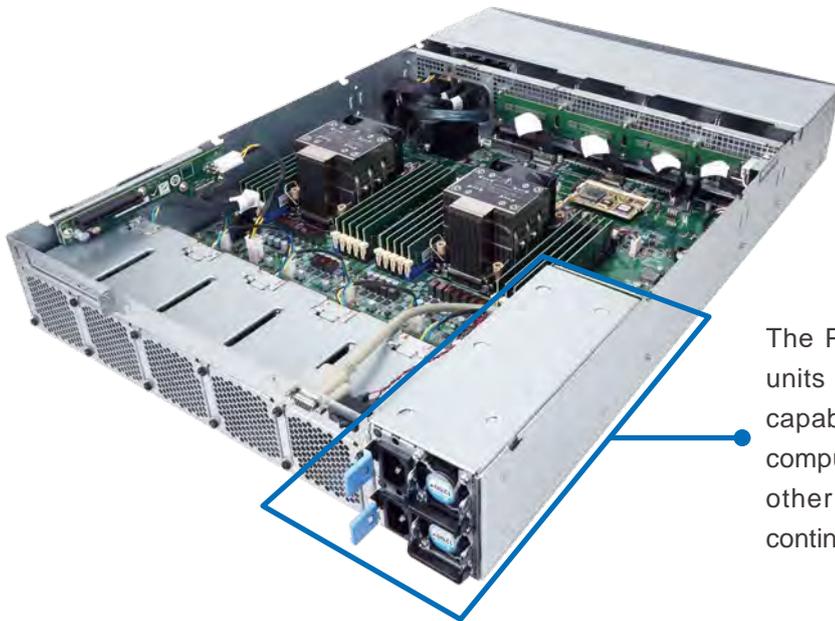
PUZZLE Series

With fan speed and temperature trigger settings set, the fan speed can change seamlessly according to temperature readings.

Traditional System

Traditional system fan operation is detected by system's ON (fan at full speed) and OFF statuses.

Fan Speed (PWM%)

- PUZZLE Series
- Traditional System

T1°C   T2°C   Temperature
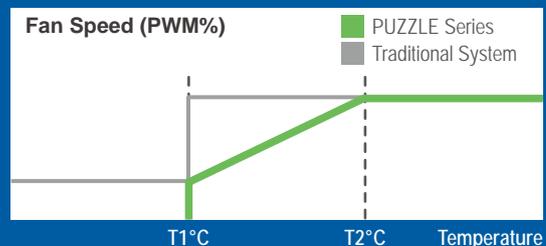
Redundant Power Supply

The PUZZLE-IN005 contains two 1200W power units for redundancy. Each power supply unit is capable of powering the entire computer so the computer runs with only one unit. If one fails, the other power supply starts running to maintain continuous operation.

One PCIe x8 Expansion Slot

Standard PCIe Slots

➤ PUZZLE-IN005 support one PCIe x8 slot.

➤ Support full height, 200mm length Standard PCIe card.

- **AI Accelerating Card:** VPU, GPU card…etc.
- **High Speed:** 10GbE card, Fiber card
- **I/O Card:** Serial port card, USB card, LAN card…etc.
- **Wireless Card:** WiFi card, mobile wireless card…etc.
- **Storage Card:** SAS, RAID card

P/N	QNAP QM2-2P-384 QM2-2P-344	IEI GPOE-4P-R10 GPOE-2P-R10	IEI Mustang-V100-MX8	GP GPU	GT1030
Description	Dual M.2 PCIe SSD expansion card	2-port/4-port PoE card	VPU card	Inferencing accelerator card	GPU card
Form Factor/Interface	Low-Profile PCIe 3.0 x8	Low-Profile PCIe x1	Low-Profile PCIe 2.0 x4	Low-Profile PCIe Gen3 x16	Low-Profile PCIe Gen3 x4

Eight Network Module Expansion Slots
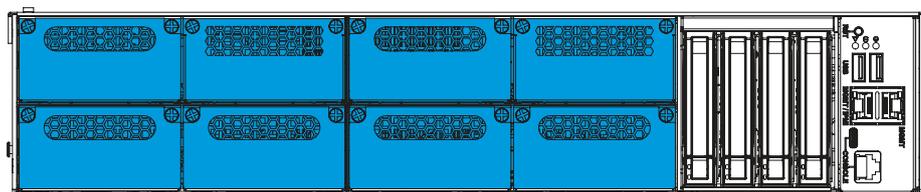
Install the IEI PuIM networking module into the slot of the PUZZLE series. All slots support 8 lanes of PCIe gen4 signal from CPU (one PCIe x8 or two PCIe x4)

CPU — One PCIe x8 or Two PCIe x4

PCIe Configuration
x8
x4 x4

A32 A19
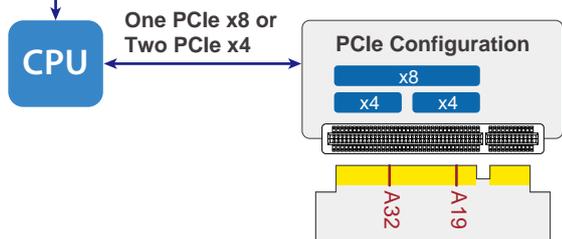
A19	A32	PCIe Config.
0	1	2x4
1	0	1x8

	PuIM-100G2SF-E810	PuIM-25G2SF/T-MLX	PuIM-10G2SF/T-X710	PuIM-10G4SF/T-XL710
Chipset	Intel® E810	Mellanox ConnectX-4	Intel® X710	Intel® XL710
Bypass	No	No	No	No
Host Interface	PCIe 4.0 x8	PCIe 3.0 x8	PCIe 3.0 x8	PCIe 3.0 x8
LAN Interface	QSFP28	SFP+	SFP+	SFP+
Speed	1GbE / 10GbE / 25GbE / 50GbE / 100GbE	1GbE / 10GbE / 25GbE	1GbE/10GbE	1GbE/10GbE
LAN Port Number	2	2	2	4
Storage Temp.	-20°C ~ 75°C (-4°F ~ 167°F)			
Operating Temp.	0°C ~ 40°C (32°F ~ 104°F)			
Humidity	5% ~ 90% RH, non-condensing			
Dimensions (mm)	165.50 (L) x 77.8 (W) x 44.2 (H)			
Certification	CE / FCC / RoHS	CE / FCC / RoHS	RoHS	CE / FCC / RoHS

	PuIM-10G4SF/T-XL710-BP	PuIM-10G4SF/T-MLX	PuIM-1G4SF/T-I350	PuIM-1G8SF/T-I350
Chipset	Intel® XL710	Mellanox ConnectX-4	Intel® I350-AM4	Intel® I350-AM4
Bypass	Yes, two pairs	No	No	No
Host Interface	PCIe 3.0 x8	2 PCIe 3.0 x4	2 PCIe 2.0 x4	2 PCIe 2.0 x4
LAN Interface	SFP+	SFP+	SFP	SFP
Speed	1GbE/10GbE	1GbE/10GbE	GbE	GbE
LAN Port Number	4	4	4	8
Storage Temp.	-20°C ~ 75°C (-4°F ~ 167°F)			
Operating Temp.	0°C ~ 40°C (32°F ~ 104°F)			
Humidity	5% ~ 90% RH, non-condensing			
Dimensions (mm)	165.50 (L) x 77.8 (W) x 44.2 (H)			
Certification	RoHS	CE / FCC / RoHS	RoHS	RoHS

|	PuIM-1G4T/T-I350	PuIM-1G4T/T-I350-BP	PuIM-1G8T/T-I350	PuIM-1G8T/T-I350-BP
Chipset	Intel® I350-AM4	Intel® I350-AM4	Intel® I350-AM4	Intel® I350-AM4
Bypass	No	Yes, two pairs	No	Yes, four pairs
Host Interface	2 PCIe 2.0 x4	2 PCIe 2.0 x4	2 PCIe 2.0 x4	2 PCIe 2.0 x4
LAN Interface	RJ45	RJ45	RJ45	RJ45
Speed	GbE	GbE	GbE	GbE
LAN Port Number	4	4	8	8
Storage Temp.	-20°C ~ 75°C (-4°F ~ 167°F)			
Operating Temp.	0°C ~ 40°C (32°F ~ 104°F)			
Humidity	5% ~ 90% RH, non-condensing			
Dimensions (mm)	165.50 (L) x 77.8 (W) x 44.2 (H)			
Certification	CE / FCC / RoHS	CE / FCC / RoHS	CE / FCC / RoHS	CE / FCC / RoHS

PUZZLE-IN005

Support Various Expansion Card

1200W Redundant Power Supply ●

Hot-swappable redundant power supply to ensure maximum system uptime.

20 x R-DIMM/LR-DIMM DDR4 ●

4+1 Hot-swappable System Fan ●

Standard PCIe Slots ●
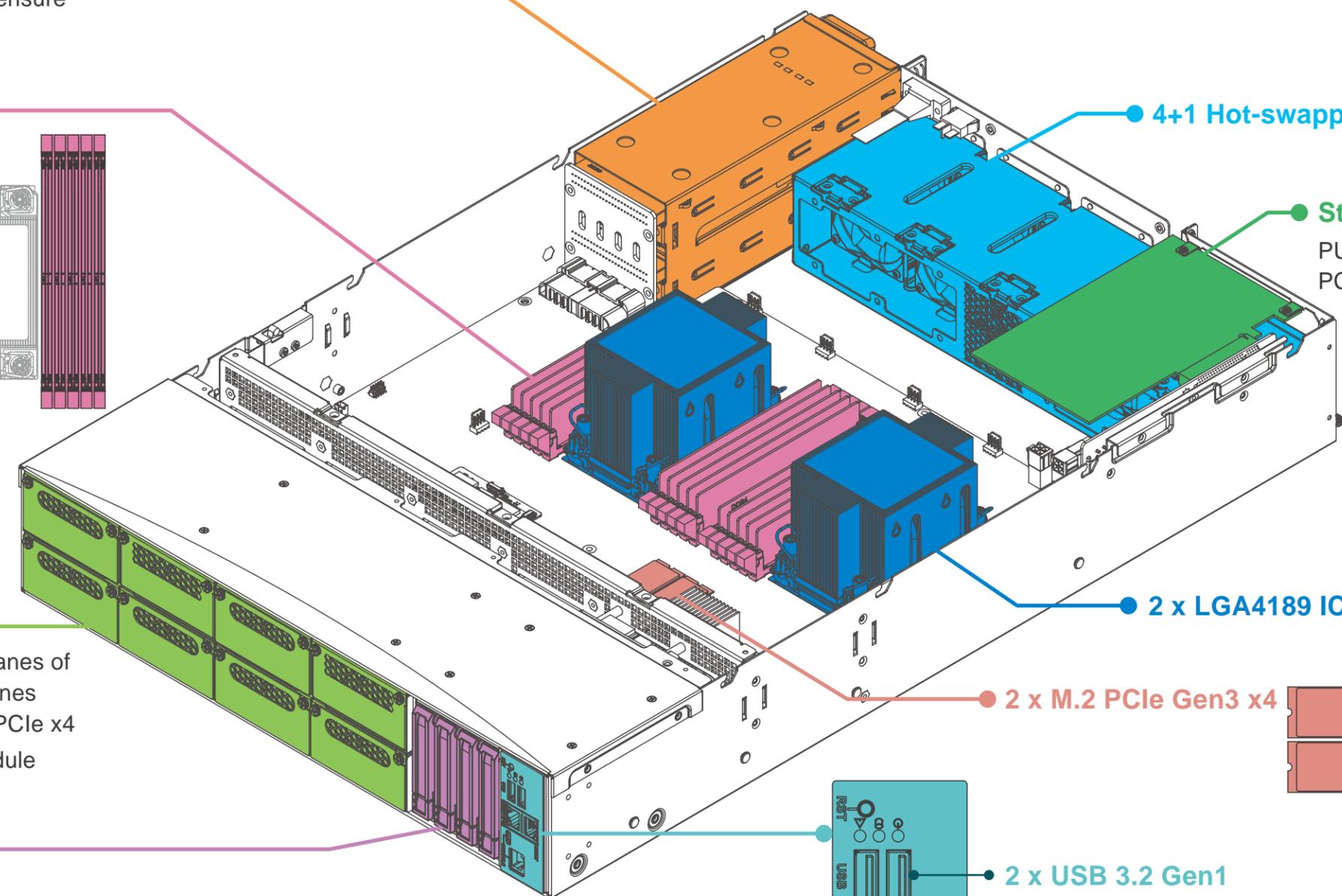
PUZZLE-IN005 support one PCIe Gen4 x8 FHHL PCIe card
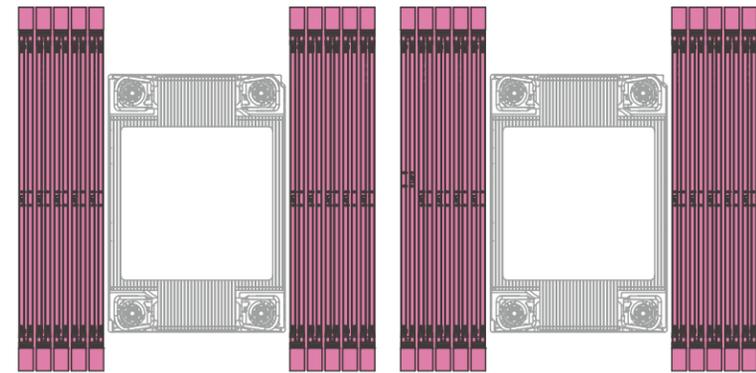
IEI PulM Network Module Slot ●

- IEI PulM Network Module slot support 8 lanes of PCIe Gen4 signal form CPU. The PCIe lanes could be configured to one PCIe x8, two PCIe x4
- Support smart NIC via PulM Network Module

2 x LGA4189 ICE Lake-SP CPU ●

2 x M.2 PCIe Gen3 x4 ●

Four 2.5" SSD/HDD Bays ●

- Support U.2 nVMe & SATA
- Support intel VROC
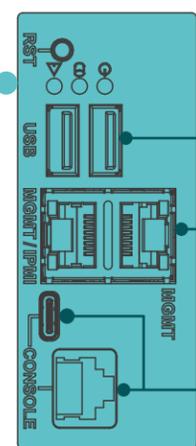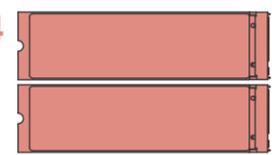
2 x USB 3.2 Gen1 ●

1 x MGMT port ●
1 x IPMI LAN

2 x Console ●

Puzzle ∞

PUZZLE–IN005

2U Rackmount Network Appliance support dual Intel® ice-lake CPU

Features

- Dual Intel® Ice lake Xeon® Scalable processors (up to 185W)
- 20 x DDR4 R-DIMM / LR-DIMM memory
- 8 network module with PCIe gen4 x8 signal
- Intel® Quick-Assist Technology
- 4 x U.2(PCIe x4) 2.5" SSD compatible with SATA
- 1+1 1200W CRPS redundant power supply
- 4+1 hot swappable system fans

Specifications

		PUZZLE-IN005
Platform	**Form Factor**	2U
	CPU	Intel® Ice-Lake LGA-4189 Xeon® Scalable Processor
	Chipset	C627A
Memory	**Memory Technology**	DDR4 3200MHz ECC RDIMM / LRDIMM
	Memory Capacity	Memory up to:1280GB (20 x 64GB)
	Memory Socket	20 x 288-pin DIMM
Network and Security	**Network Acceleration and Security Function**	• Intel® AES New Instructions • Intel® QuickAssist Technology (Intel® QAT) • Intel® Virtualization Technology (Intel® VT) • Intel® Trusted Execution Technology (Intel® TXT)
	TPM	1 x TPM 2.0 Pin header
IPMI	**IPMI Sulotion**	1 x iRIS-2400 module
Networking	**Ethernet IC**	1 GbE NIC: Intel® i210-AT with NCSI support 1 GbE NIC: Intel® i219
	Ethernet Port	2 x 1GbE RJ45 ports (1 x IPMI Lan)
	Network Module Slot	8 x Networking Module Slot
Expansion Slot	**PCIe Slot**	1 x PCIe Gen4 x8 (FHHL) slot (single width)
	PCIe Mini Card Slot	N/A
	M.2	2 x M.2 M key 2280 Support PCIe Gen3 x4 nVMe
Storage	**Storage**	4 x U.2 SSD drive bay compatible to SATA
	eMMC	N/A
	SD Card	N/A
External I/O	**VGA**	1 x VGA port
	USB	2 x USB 3.1 Gen 1 (5Gb/s) Type-A ports
	Console	1 x RJ45 1 x USB Type-C
Internal I/O	**HDMI**	N/A
	USB	1 x USB 2.0 pin header
Power and Mechanical	**Power Switch**	1 x Power Switch
	Reset Button	1 x Reset Button
	Power Input	100 V ~ 240 V
	Type/Watt	Redundant Power 1200W, 90V~264V AC
	Processor Cooling	2 x Active CPU Cooler
	System Cooling	5 x Cooling Fans with Smart Fan
	Antenna Hole	N/A
Physical and Environmental	**Storage Temperature**	-20°C ~ 75°C (-4°F ~ 167°F)
	Operating Temperature	0°C ~ 40°C (32°F ~ 104°F)
	Operating Humidity	Relative humidity: 5% ~ 90% non-condensing
	Dimensions (W x L x H) (mm)	438 x 650 x 88 mm
	Weight	23kg
OS and Certifications	**Certification**	CE / FCC / RoHS
	Operating System	Linux 18.04 (CentOS, Red Hat, Ubuntu, etc.) Windows server 2019
Indicators	**LCM**	N/A
	LED	1 x Power LED, 1 x Storage LED, 1 x Alert LED

Ordering Information

| Part No.	Description
PUZZLE-IN005-R-R10*	2U Rackmount Network Appliance support dual Intel® ice-lake-SP CPU, twenty DDR4 R-DIMM/LR-DIMM slots, and two 1GbE (one support BMC control), eight PuIM, one PCIe expansion, Redundant Power, without cooler, RoHS

* A CPU heatsink must be purchased separately

Packing List

|	
1 x USB to RJ45 console cable	Rack mounting ears
2 x Power cord	Screws for rack mounting ears
Flat head screws (for 2.5" HDD)	

Options

Item	Part No.	Description
Slide rail	RAIL-A03-57	Kingslide Rail kit for TS-EC2480U-RP, maximum load 90 kg
USB to console cable	32013-004000-100-RS	Round cable; LAN CABLE; FTDI console cable; 2; 1800MM; (A)USB A TYPE 4P MALE+PCB:FTDI_FT232RL; (B)RJ-45 8P8C; RoHS
CPU cooler	19100-000287-00-RS	Cooler module/Heat Pipe; HEATSINK:113*78*64mm, FAN:60*60*15mm; Standard; 00; TSM-002007-HS3; Aluminum plate+FIN Buckle+Heat Pipe*5; +Grease:TC5888+6025FAN+FAN cover+LGA4189*4; Nidec; H60T12BHA7-57T07; CCL; RoHS

IO Interface
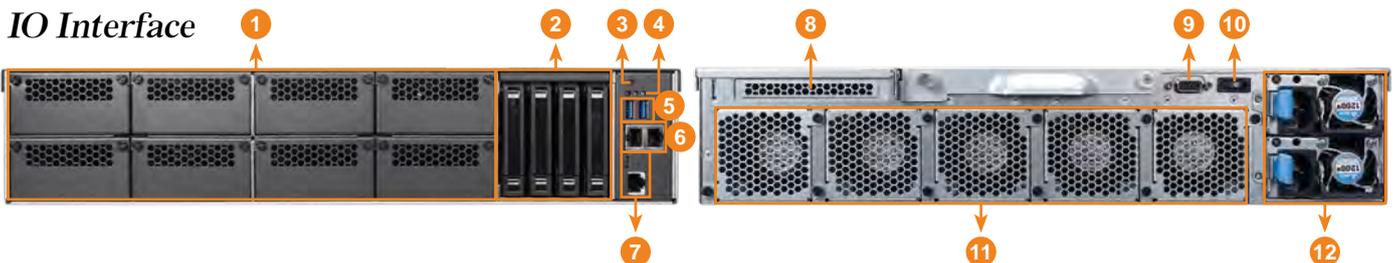
1. 8 x IEI Networking module slot
2. 4 x 2.5" drive bay
3. Reset button
4. Power status
   HDD status
   Alert LED
5. 2 x USB 3.2 Gen1
6. 1 x MGMT LAN
   1 x IPMI LAN
7. Console port
   1 x USB type C
   1 x RJ45
8. PCIe expansion slot
9. VGA port
10. Power switch
11. 5 x hot-swappable fan
12. Power inlet

Dimensions *(Unit: mm)*

650.80
368
92
92
67.50
22.20
442
88.50
438
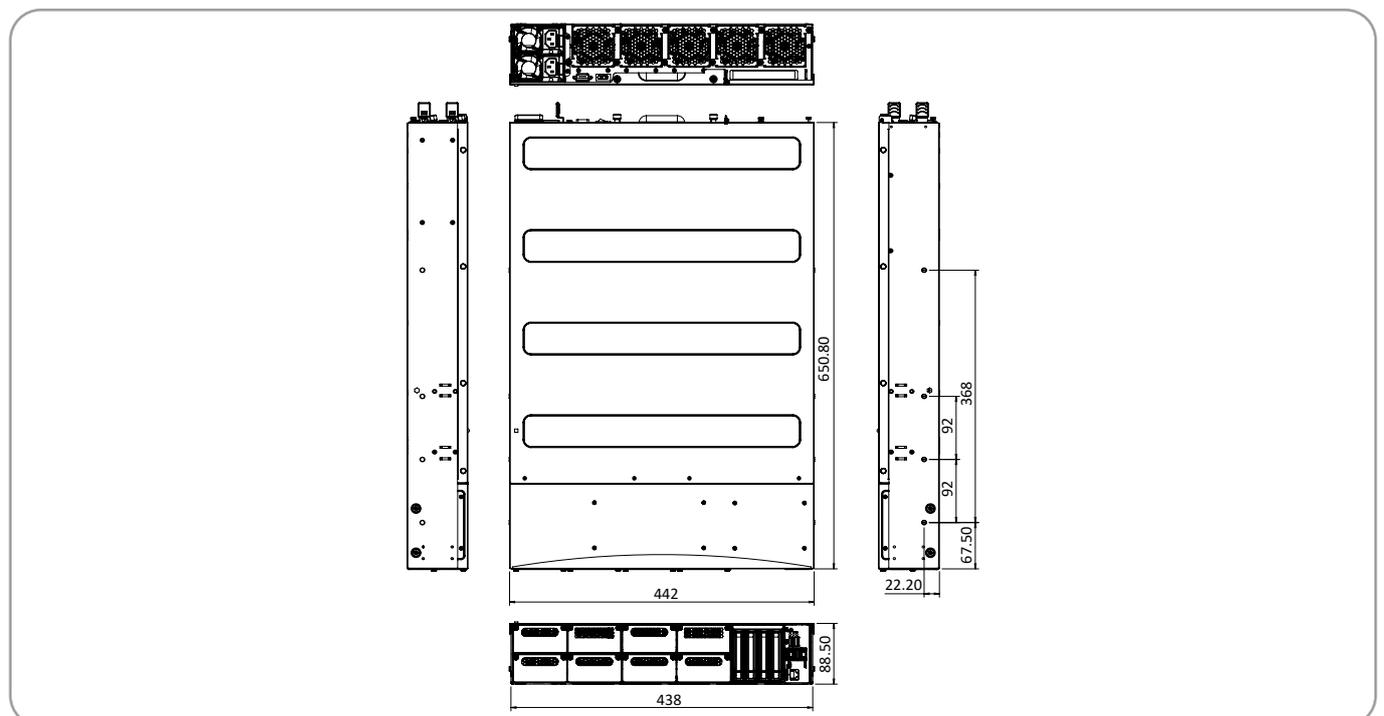
Specifications are subject to change without prior notice.

Headquarters
威強電工業電腦 **IEI Integration Corp.**
No. 29, Zhongxing Rd., Xizhi Dist., New Taipei City 221, Taiwan
TEL : +886-2-86916798 / +886-2-26902098 FAX : +886-2-66160028
sales@ieiworld.com   www.ieiworld.com

America
IEI Technology USA Corp.
138 University Parkway, Pomona, CA 91768
TEL : +1-909-595-2819   FAX : +1-909-595-2816
sales@usa.ieiworld.com   usa.ieiworld.com

China
威强电工业电脑 **IEI Integration (Shanghai) Corp.**
上海市闵行莘庄工业区申富路515号
515, Shen Fu Rd., Xin Zhuang Industrial Develop Zone, Shanghai, 201108, China
TEL:+86-21-3116-7799   FAX:+86-21-3462-7797
sales@ieiworld.com.cn   www.ieiworld.com.cn

2021.03