

QNAP

Discover the

TS-2888X

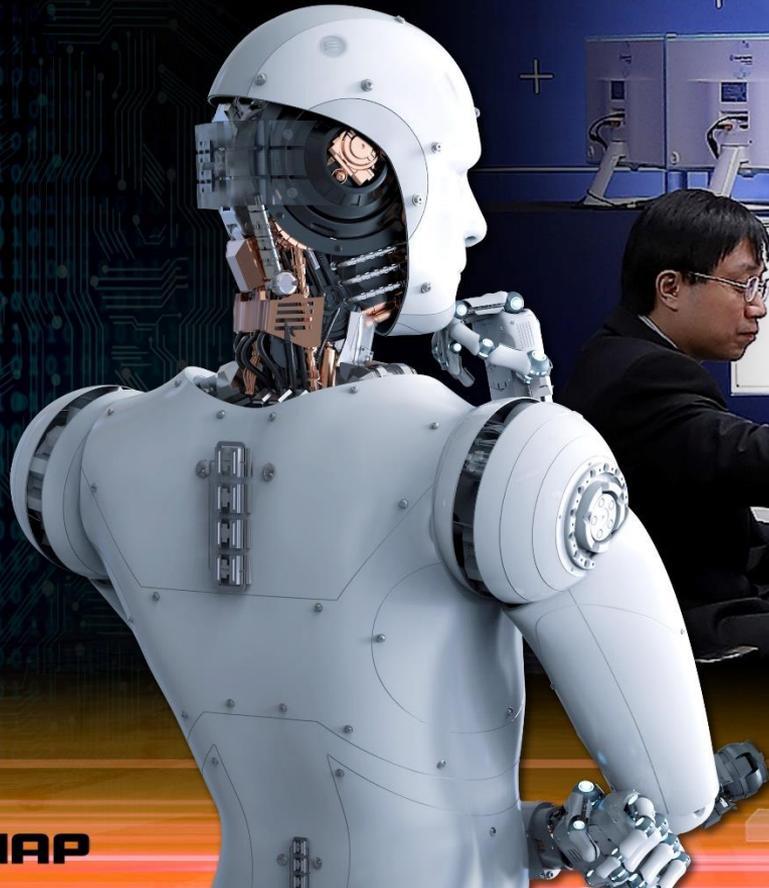
A business NAS for machine learning and AI development



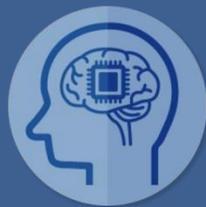
Intel Xeon W Processor
Up to **18 cores**
Turbo Boost
update to **4.5 GHz**



The story begins with AlphaGo



AI, Machine Learning and Deep Learning...



Artificial Intelligence (AI)

Intelligence demonstrated by machines



Machine Learning (ML)

Finding functioning principles through past data and experience, reaching AI ultimately.



Deep Learning (DL)

The technology that realizes machine learning. (neural network, CNN, etc.)

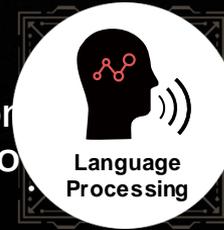
Applications of AI



- Driver-assistance system
- Emergency Alert
- Autonomous Vehicles



- Capacity boost
- Error prevention
- Defect inspection



- Language translation
- Natural language processing
- Voice recognition



- Diagnosis in medical imaging
- Drug Discovery
- Treatment queries and suggestions



- Automatic inventory-picking
- Footfall analysis



- Customer retention
- Sales forecasting
- Risk assessment



- Face detection
- Suspicious object detection
- Fire/smoke detection

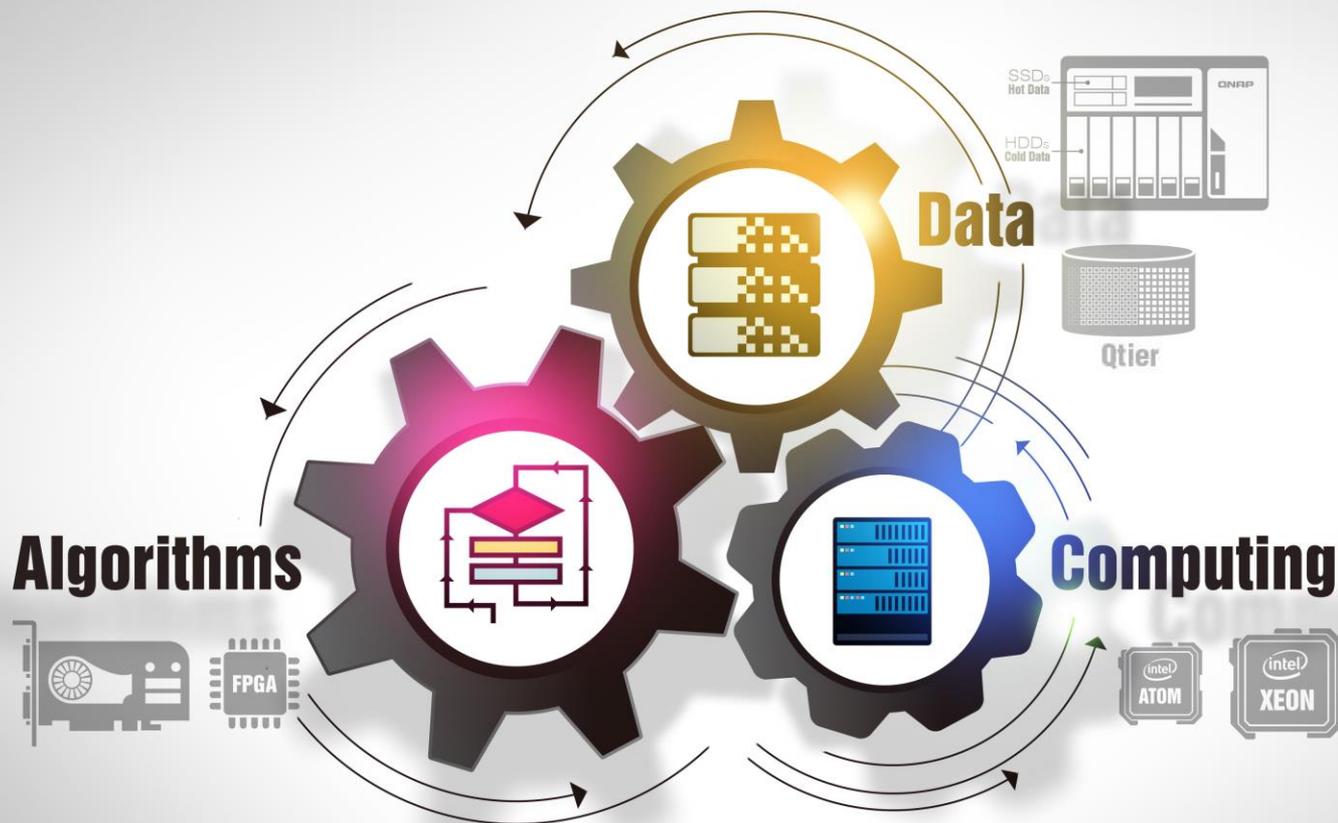


- DNA sequencing

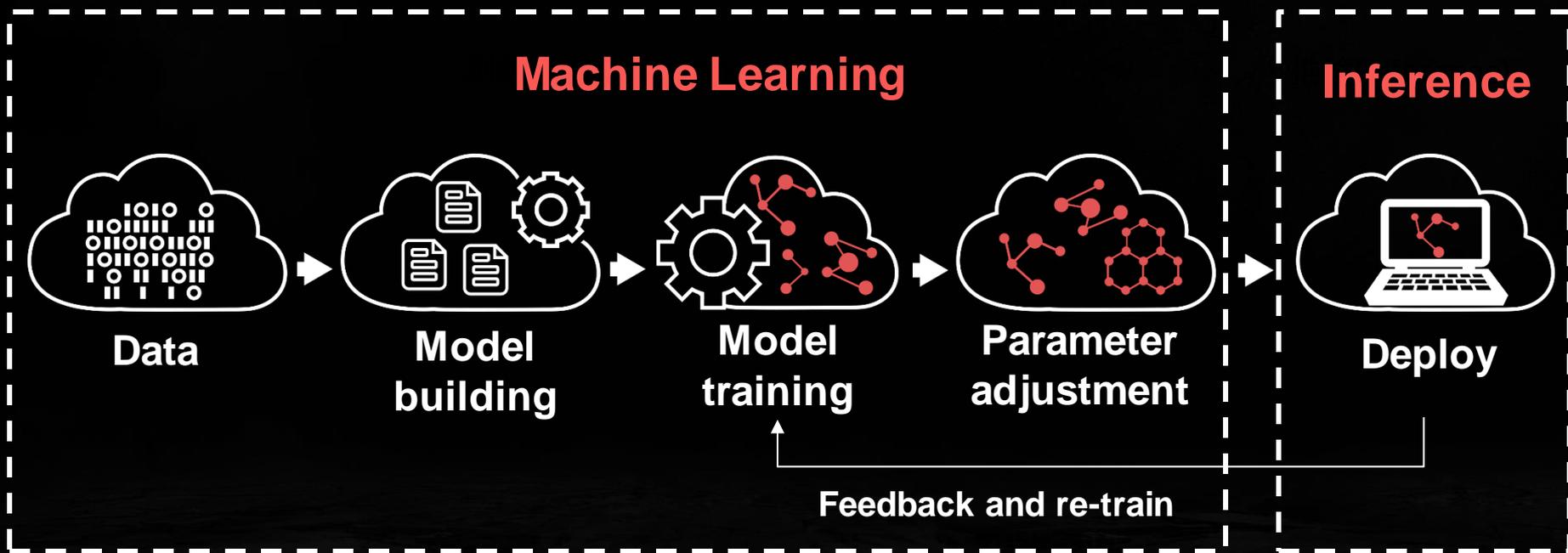


- Investment analysis
- Risk detection
- Credit review

3 Critical Factors in Deep Learning...



AI Process



The thorn in corporations' side...

- Existing equipment with insufficient performance
- Limited budget
- Confidential information not suitable for public cloud training
- Painful environment deployment
- Enormous storage needed to save raw data
- Different management approaches for model training
- Secure and complete disaster recovery solutions required (with backup, data sharing, Internet setting, etc.)



TS-2888X: QNAP AI NAS

Deep Learning Models

Image classification

AlexNet, VGG16, GoogLeNet, ResNet, MobileNet, etc.

Object Detection

SSD, Yolo v1/v2/v3, R-FCN, RCNN, Faster RCNN, etc.

Image Segmentation

SegNet, U-Net, FCN, DeepLab v1/v2, etc.

Face Recognition

MTCNN, DeepFace, Facenet, etc.

Video Classification

RNN, LSTM, etc.

Voice Recognition

DeepVoice, WaveNet, etc.

Framework

Caffe
Caffe2
CNTK
MXNet
Neon
PyTorch
TensorFlow

...

The all-in-one AI solution for computing and storage

Training

Intel® MKL/ NVIDIA® CUDA/ OpenCL

Inference

CoreML (iOS)/ OpenVINO/ TensorFlow Lite (Android) / TensorRT (Nvidia)

Container Station

NVIDIA Driver (via App Center)

IGD Driver

QTS 4.3.5

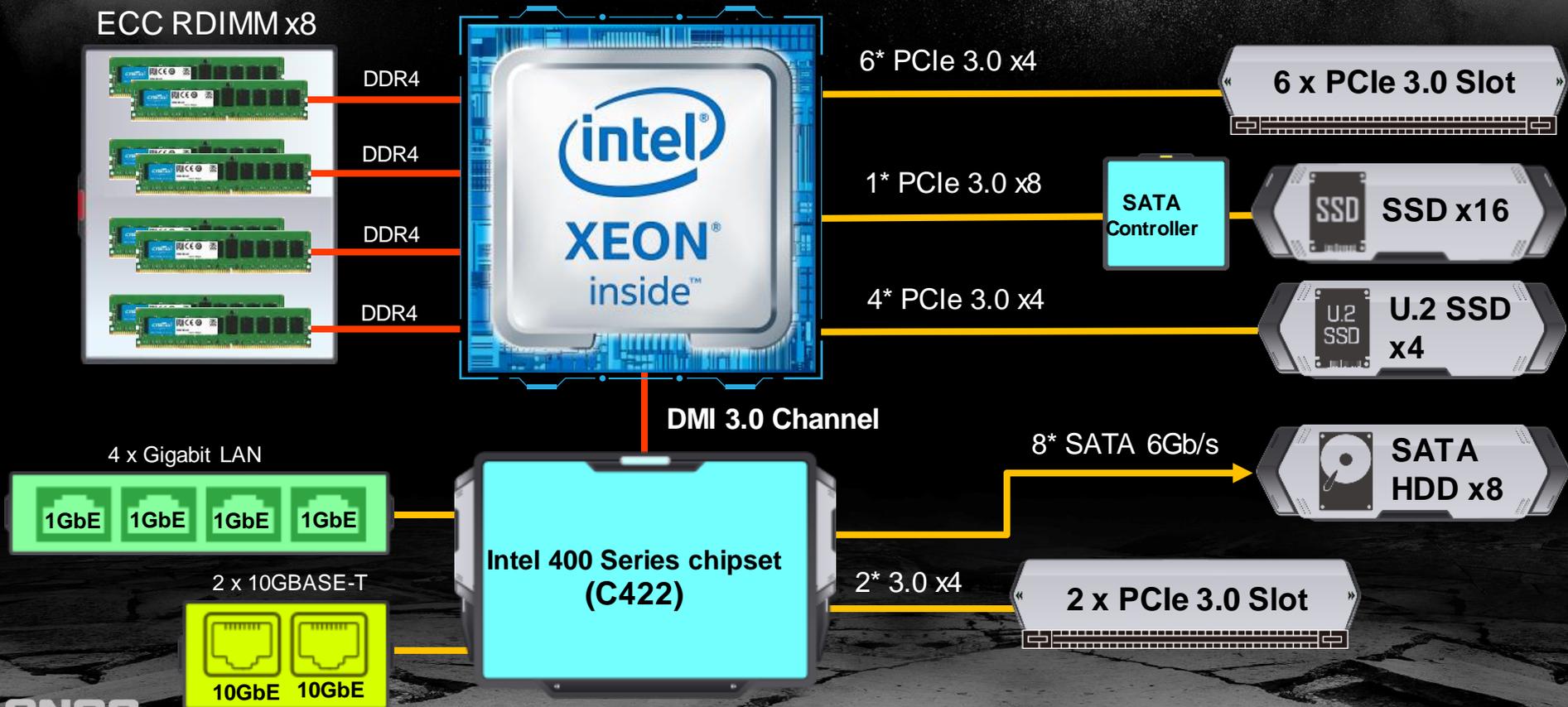


Intel Xeon W Processors

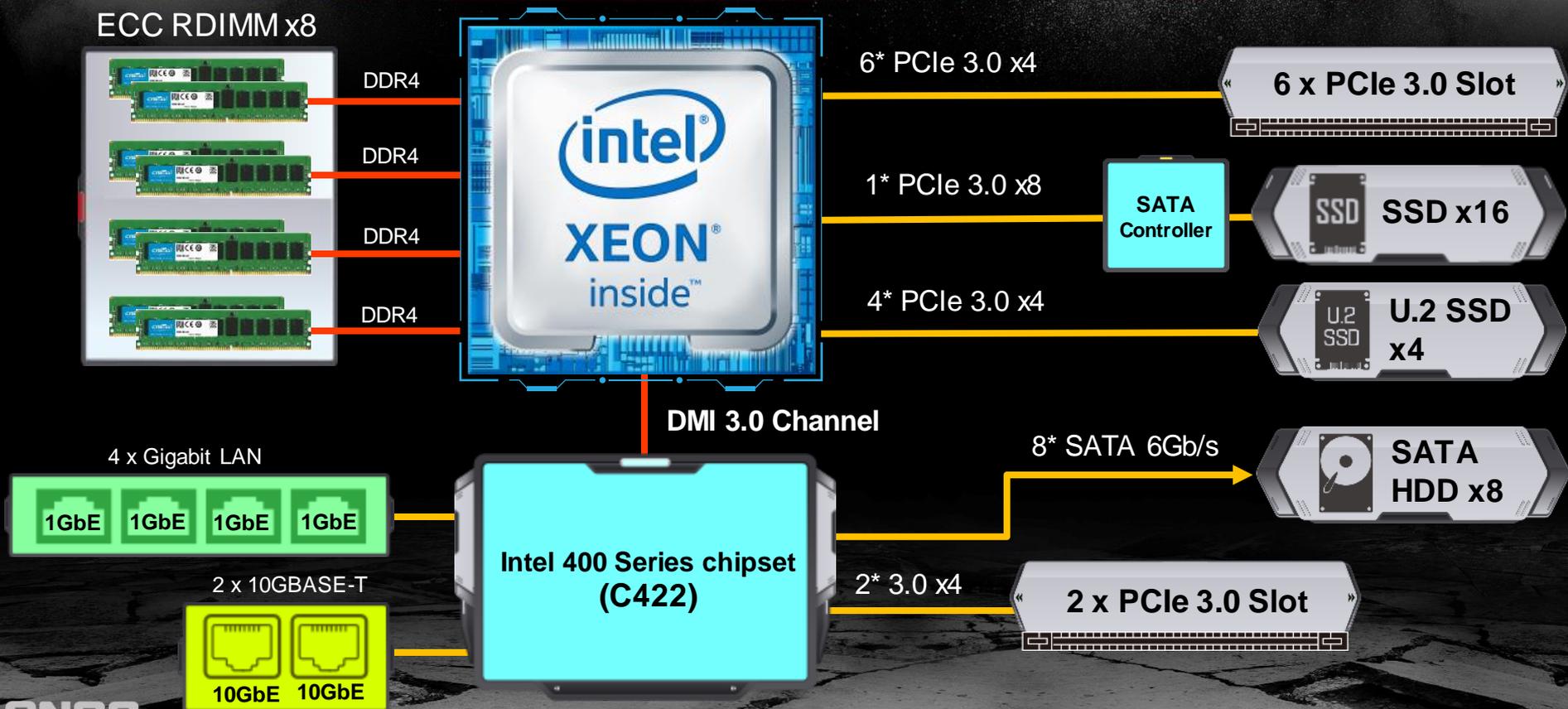
Up to **18 cores** and **36 threads** with up to **4.5 GHz** Intel® Turbo Boost Technology 2.0 frequency, combined with up to **512 GB** DDR4 ECC RDIMM 2666 MHz memory support delivering rapid workload loading and processing.



Block Diagram



Block Diagram



Hyperconverged AI NAS

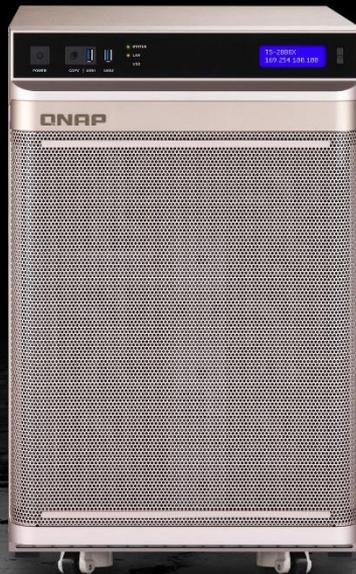
Computing in your storage

- Reduce the performance bottleneck due to network
- Provide low latency, high speed data flow.

Computing Zone(Left side)



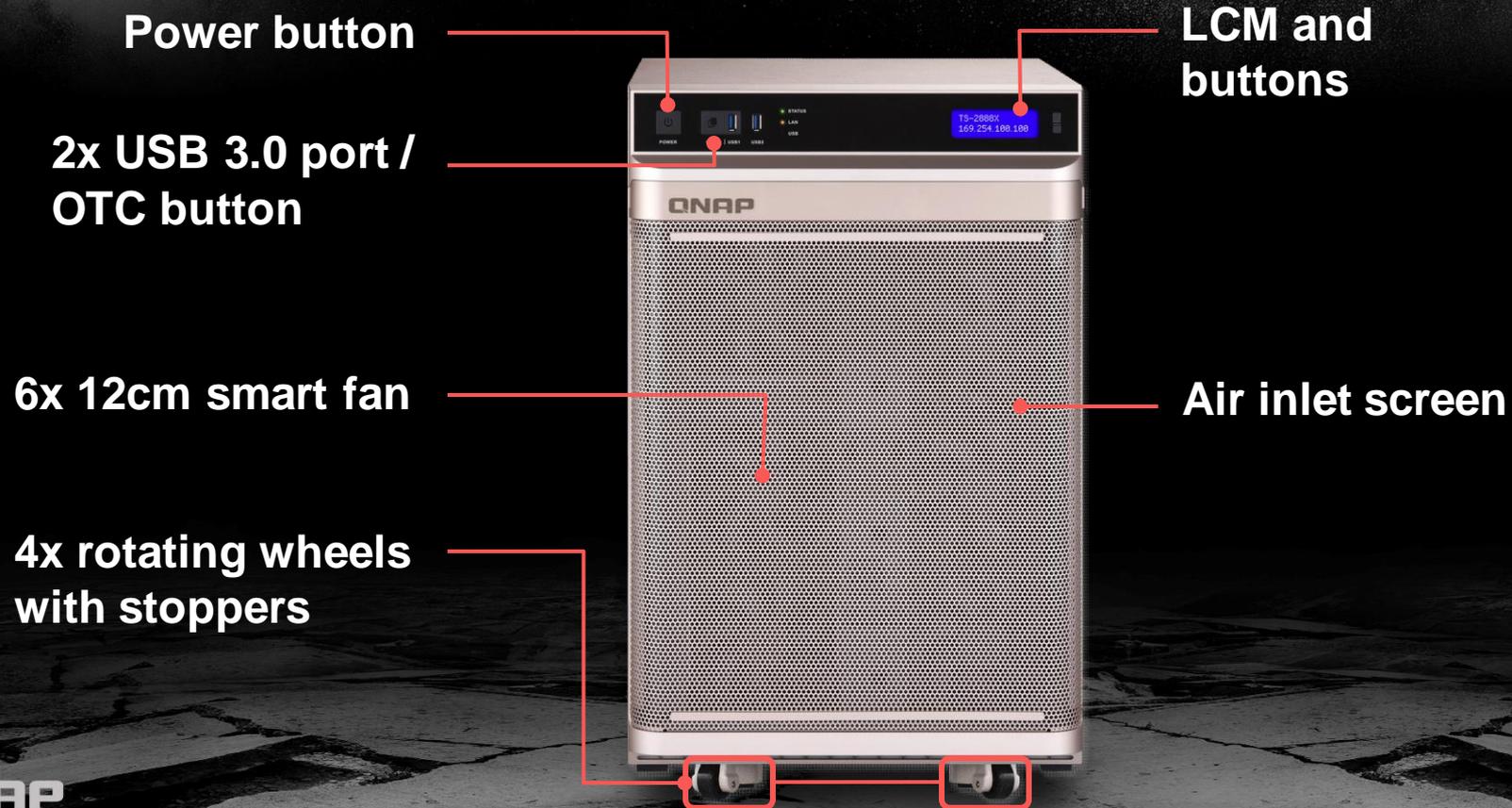
Front side



Storage Zone(Right side)



TS-2888X Front View

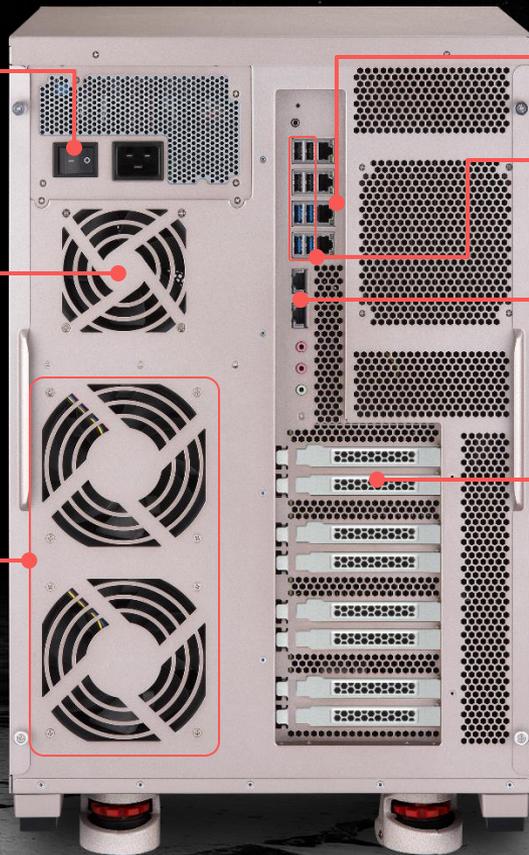


Rear View

2,000 Watt PSU
switch and
connector

Cooling fan for
power

2x 12 cm
Cooling fan for
storage zone



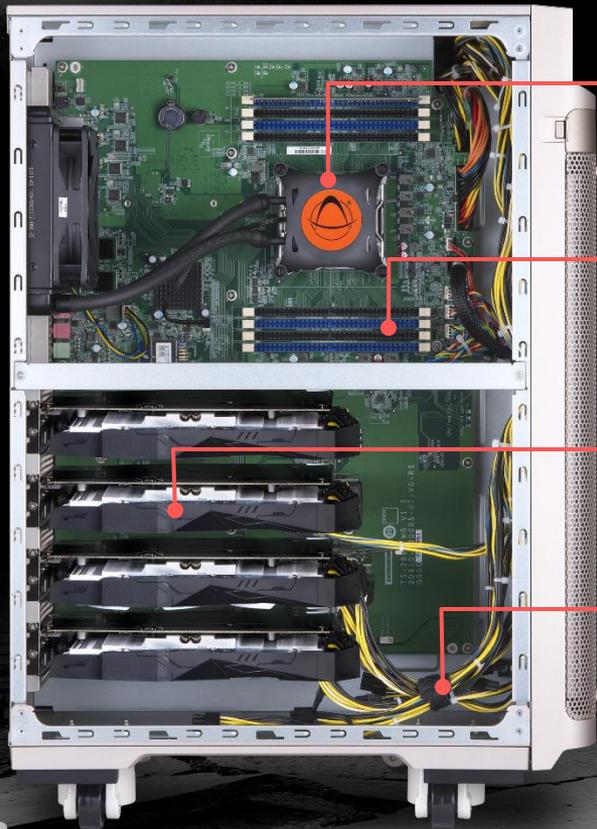
4x 1 GbE LAN port

4x USB 3.0 + 4x USB 2.0

2x 10GBASE-T LAN port

8x PCIe 3.0 slot

Exceptional Computing Capability



Intel Xeon W Multi-core Processor

**8x DDR4-2666 ECC RDIMM slot · max
up to 512GB**

8 x PCIe Slot, up to 4 GPU adapters

8 x PCIe power connector

ASETEK CPU Liquid Cooling System

Unparalleled Cooling Performance for 140W Xeon



ASETEK
DATA CENTER LIQUID COOLING

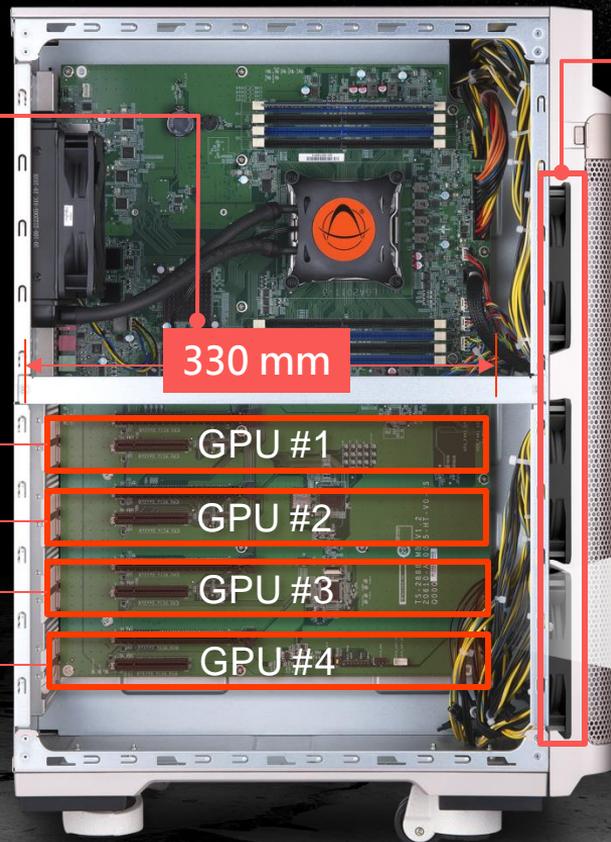
Supports up to 4 GPU Cards

Max depth 330mm

- Fit for GPU cards in the market
- Max. 330x140x55mm

Widen gaps between slots

- Avoid interference
- Better heat dissipation



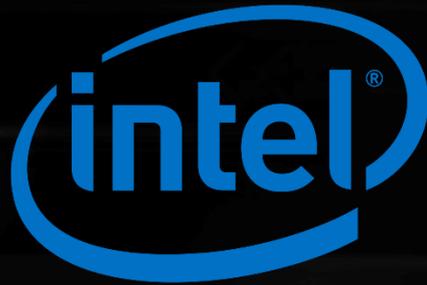
3x 12 cm cooling fan

- Front-to-back airflow for CPU and GPU cards
- 12cm quiet cooling fans

8x 6+2 pin PCIe power connector



Supports Mainstream Acceleration Card



Massive high performance storage

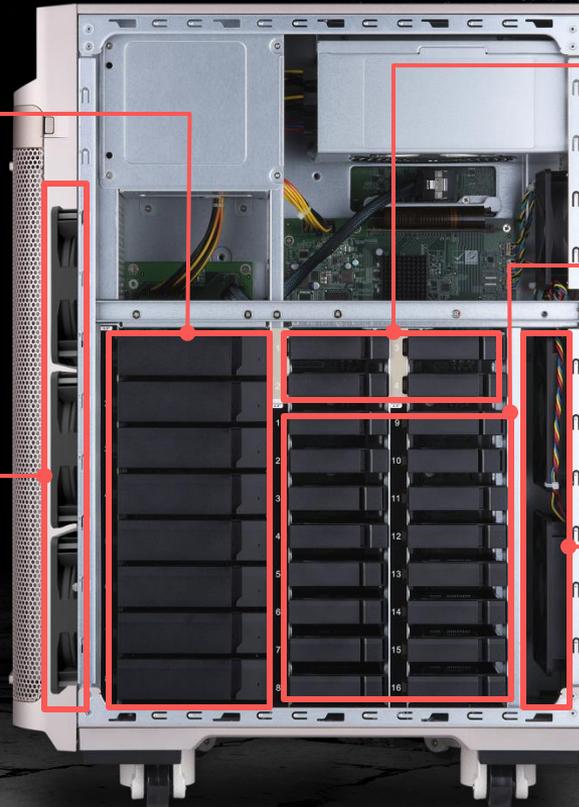
8x 3.5"/2.5" SATA
6Gb/s HDD ports

3x 12 cm
cooling fans

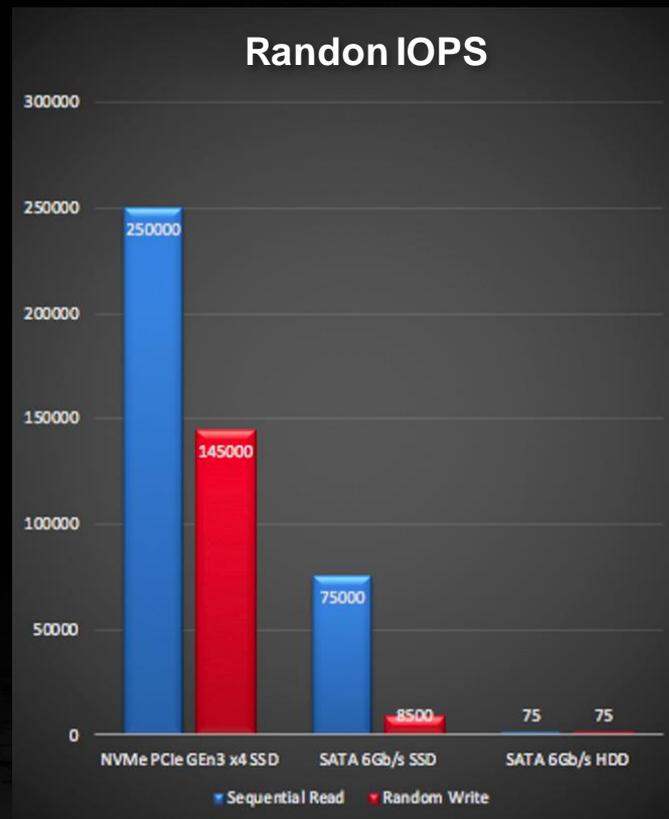
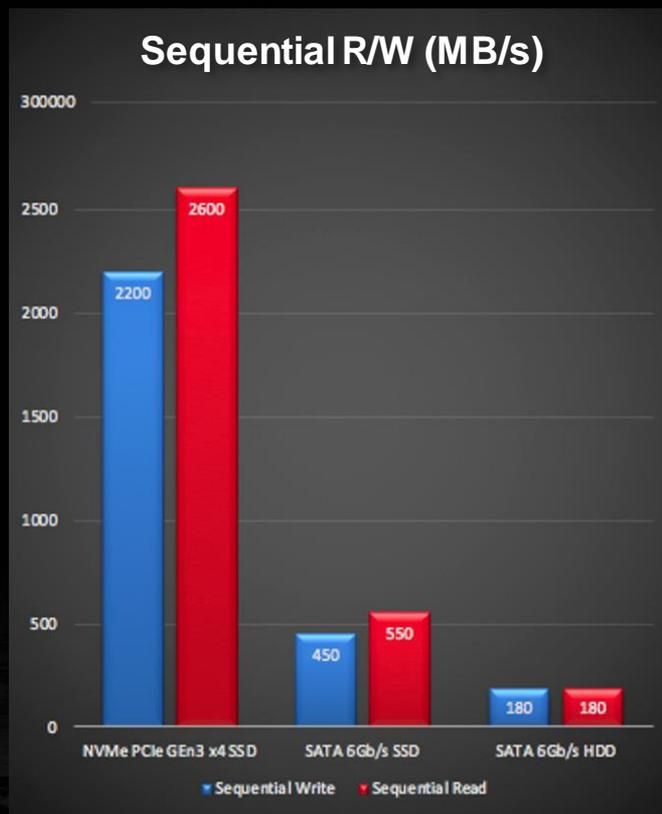
4x 2.5" U.2 SSD ports
- PCIe 3.0 x4 per port

16x 2.5" SATA 6Gb/s
SSD ports

2x 12 cm cooling fans



PCIe 3.0 x4 U.2 NVMe SSD



QDC U.2 to M.2 Drive Converter

Coming soon!



U.2 port



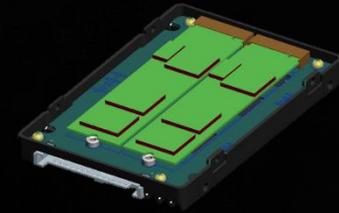
QDC-U2M2P

Specifications

Dimension : 100.2 x 69.85 x 15mm (2.5" HDD)

Controller : Asmedia 2812X
RAID: N/A

U.2 interface: PCIe Gen3 x4
M.2 interface: 1 x PCIe Gen3
x4 M.2 port, 2280



QDC-U22M2PR

Specifications

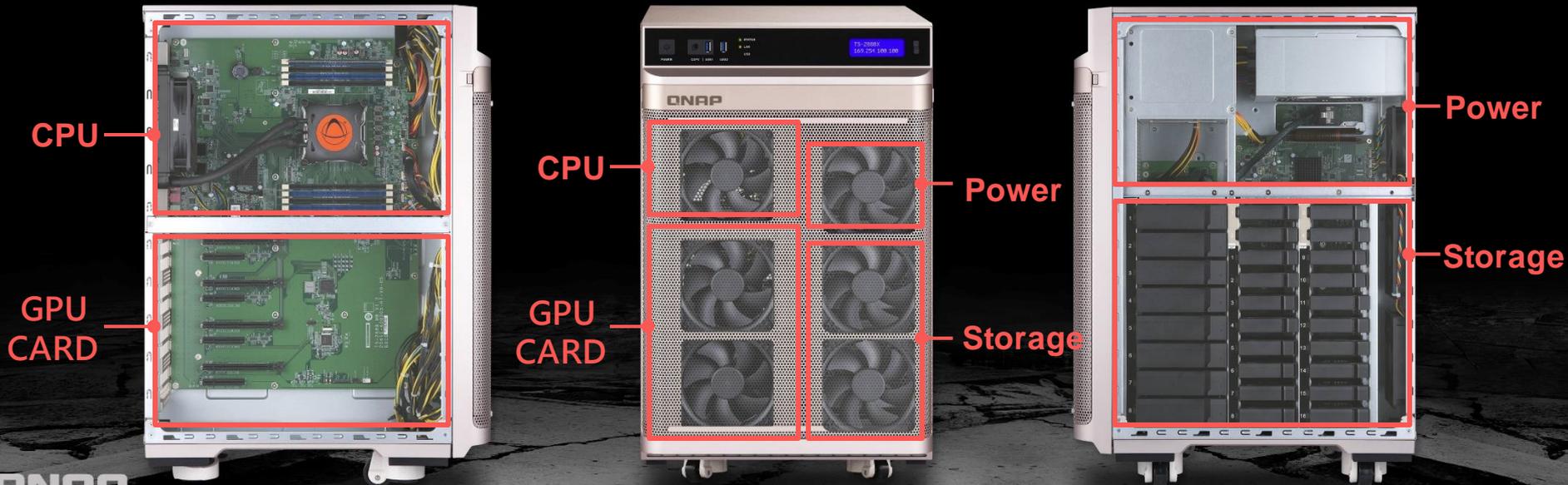
Dimension : 100.2 x 69.85 x 15mm (2.5" HDD)

Controller : Marvell NevoX
RAID: **Hardware RAID 0,**

RAID1
U.2 interface: PCIe Gen3 x4
M.2 interface: 2 x PCIe Gen3
x4 M.2 port, 2280

Compartmentalized Smart Cooling

- Separately detects temperatures in different zones to dynamically control fan speed for quieter operations.

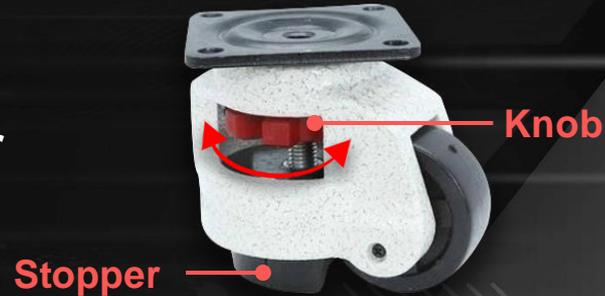


Rotating Wheels for Moving Around



- Shipped with 4 rotating wheels
- Support up to 100 Kg dynamic load

- Rubber stopper



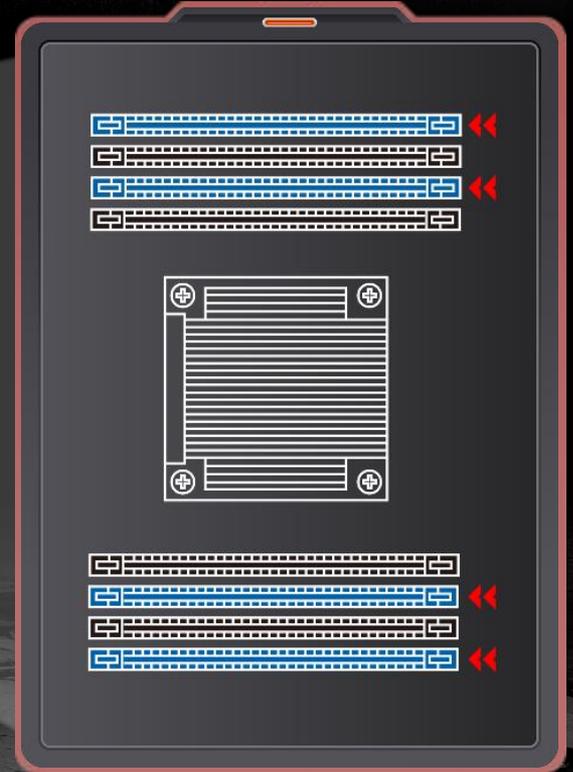
4-Channel DDR4 2666 Memory

- Up to 512 GB
- Installing memory in 4 or 8 to take advantage of 4-channel



4 modules

Install in blue slots



Memory Accessories

Ordering P/N

Specification

RAM-8GDR4ECK0-RD-2666

DDR type: DDR4(288PIN) ECC RDIMM
Capacity: 8 GB
Manufacturer: Kingston
Frequency: DDR4-2666
Manufacturer P/N: KSM26RS8/8MEI

RAM-16GDR4ECK0-RD-2666

DDR type: DDR4(288PIN) ECC RDIMM
Capacity: 16 GB
Manufacturer: Kingston
Frequency: DDR4-2666
Manufacturer P/N: KSM26RS4/16MEI

RAM-32GDR4ECK0-RD-2666

DDR type: DDR4(288PIN) ECC RDIMM
Capacity: 32 GB
Manufacturer: Kingston
Frequency: DDR4-2666
Manufacturer P/N: KSM26RD4/32MEI

RAM-64GDR4ECS0-LR-2666

DDR type: DDR4(288PIN) ECC LRDIMM
Capacity: 64 GB
Manufacturer: Kingston
Frequency: DDR4-2666
Manufacturer P/N: M386A8K40BM2-CTD



LRDIMM & RDIMM cannot be used at the same time.

Choose Your AI NAS

TS-2888X-W2123-32G

Xeon® W-2123 4-core/8-thread 3.6GHz processor (Turbo 3.9 GHz)
32 GB DDR4 ECC RDIMM (4 x 8 GB)

TS-2888X-W2133-64G

Xeon® W-2133 6-core/12-thread 3.6GHz processor (Turbo 3.9 GHz)
64 GB DDR4 ECC RDIMM (4 x 16 GB)

TS-2888X-W2145-128G (BTO)

Xeon® W-2145 8-core/16-thread 3.7GHz processor (Turbo 4.5 GHz)
128 GB DDR4 ECC RDIMM (4 x 32 GB)

TS-2888X-W2195-512G (BTO)

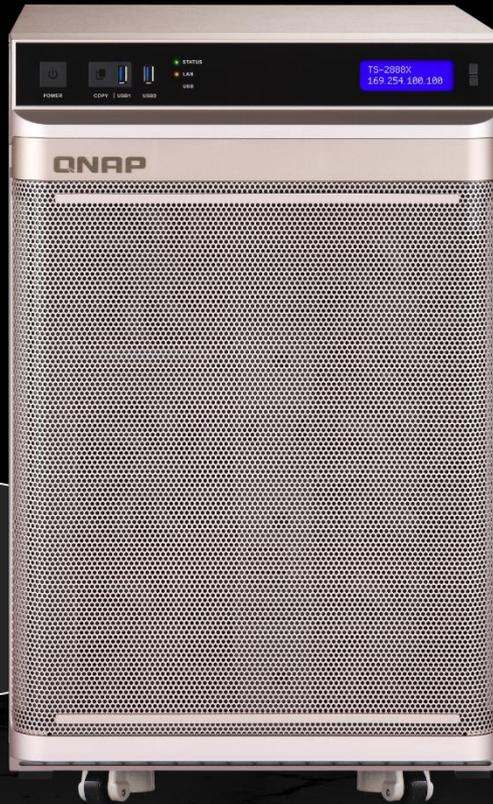
Xeon® W-2195 18-core/36-thread 2.3GHz processor (Turbo 4.3 GHz)
512 GB DDR4 ECC RDIMM (8 x 64 GB)



Customized AI NAS

128 GB, 256 GB and 512 GB for each SKUs

CTO SKUs have longer lead time



Build your development platform

AI with **QTS**

The logo for 'AI' is rendered in large, white, bold letters. The letter 'A' contains a small, blue and white globe with a network of white lines overlaid on it. The letter 'I' is replaced by a white silhouette of a human head in profile, facing left. The word 'with' is written in a smaller, white, lowercase sans-serif font between the 'AI' and 'QTS'.

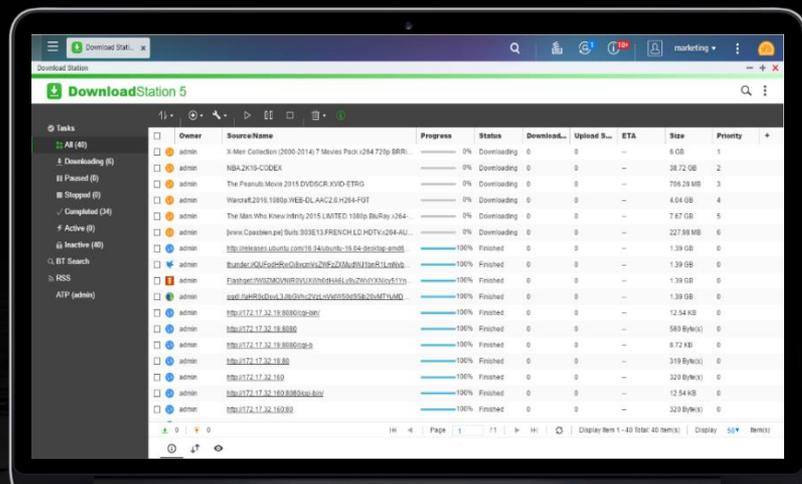
The ready-to-use AI environment - QuAI

Ready-to-use GPU driver and Container Station enable users to easily and quickly construct containers such as Caffe, TensorFlow, MXNet, and pytorch with GUI in QTS.



Your data download companion – Download Station

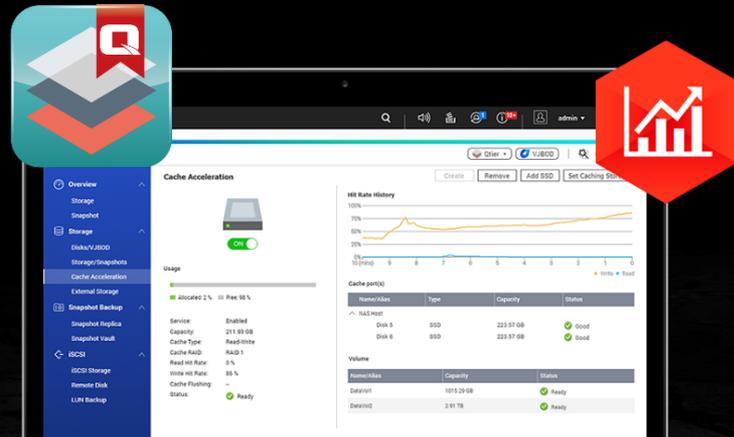
Download Station helps to download massive training data quickly and easily. For example, more than 9 million images are in OpenImage v4 data sets (20 TB complete sets and 60 GB for competition purposes in 2018), and you can now create download tasks in Download Station to get them all done automatically and on a scheduled basis.



Caution: Do not download any unauthorized data.

Strike a Balance Between Performance and Storage – SSD Cache / Qtier

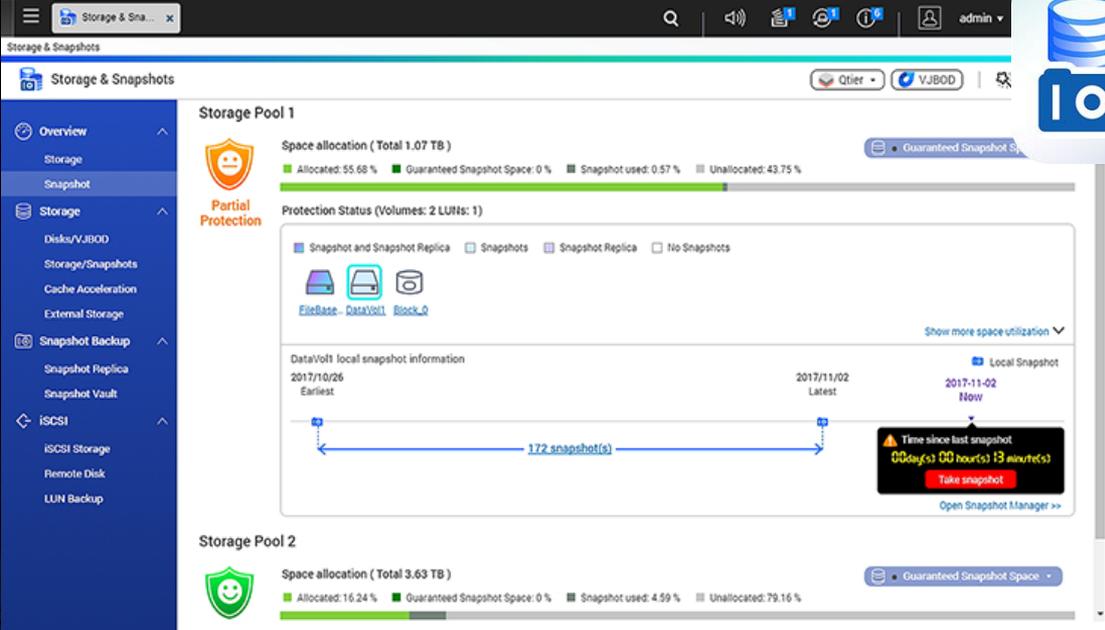
Even with the best GPU card at hand, the bottleneck for model training tends to be determined by IOPS because the training data comprises of a great number of small data sets (usually more than 10 TB). With SSD Cache and Qtier, you can relish the speed of SSD and the capacity of HDD simultaneously.



QNAP Snapshots

Keep the training data/model of every moment, at any time.

Record the state of your system at any moment with snapshots. You may keep track of the state of your system/data at any time, and mitigate disastrous losses of trained data/model.



The screenshot displays the QNAP Storage & Snapshots management interface. The left sidebar shows navigation options: Overview, Storage, Snapshot, Storage Pool 1, Storage Pool 2, Cache Acceleration, External Storage, Snapshot Backup, Snapshot Replica, Snapshot Vault, iSCSI, iSCSI Storage, Remote Disk, and LUN Backup. The main content area is divided into two sections for Storage Pool 1 and Storage Pool 2.

Storage Pool 1:

- Space allocation (Total 1.07 TB): Allocated: 55.68%, Guaranteed Snapshot Space: 0%, Snapshot used: 0.57%, Unallocated: 43.75%
- Protection Status (Volumes: 2 LUNs: 1): Partial Protection
- Options: Snapshot and Snapshot Replica, Snapshots, Snapshot Replica, No Snapshots
- Storage types: FileBase, DataVault, Block0
- DataVault local snapshot information: 2017/10/26 Earliest, 2017/11/02 Latest, 2017-11-02 Now
- Timeline: 172 snapshot(s)
- Warning: Time since last snapshot 00 day(s) 00 hour(s) 13 minute(s). Take snapshot button.

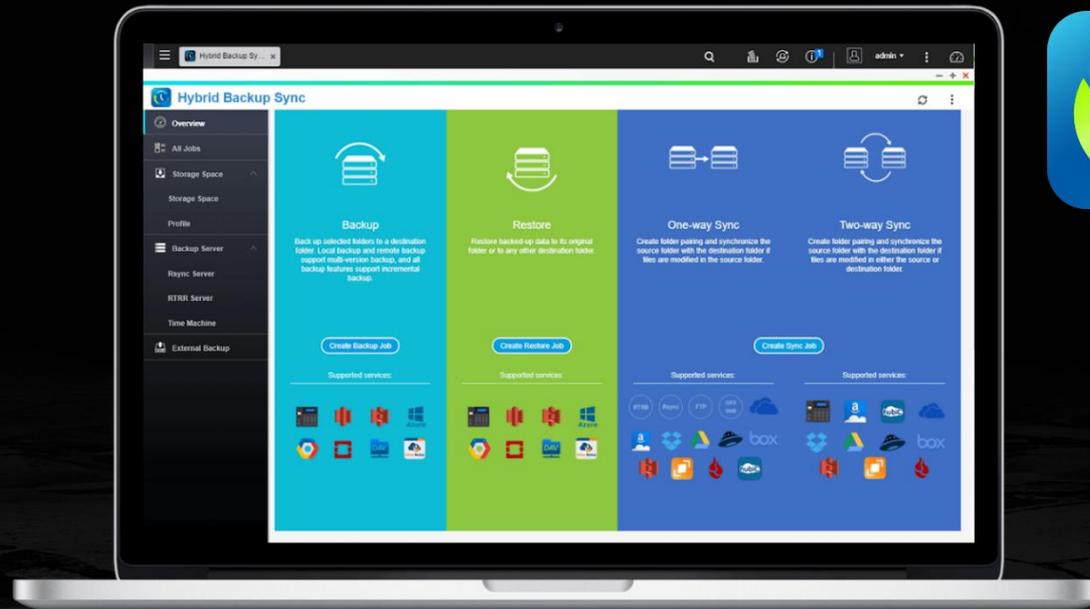
Storage Pool 2:

- Space allocation (Total 3.63 TB): Allocated: 16.24%, Guaranteed Snapshot Space: 0%, Snapshot used: 4.59%, Unallocated: 79.16%
- Status: Happy

An icon in the top right corner shows a database cylinder and a camera, symbolizing data backup and snapshots.

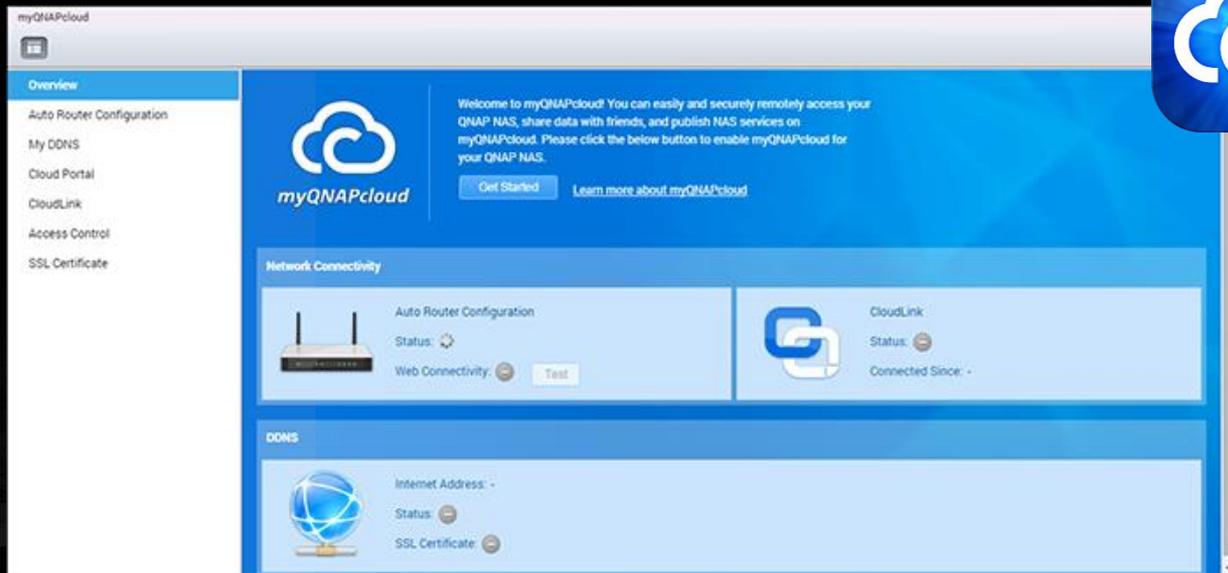
Data Backup/Synchronization– Hybrid Backup Sync

To synchronize trained data in different computers, files, or remote servers, simply arrange the scheduled tasks with Hybrid Backup Sync in one single click!



MyQNAPCloud – Connect to your AI NAS anytime

Whatever you do, wherever you go, keep in touch with your NAS and attend to the states of your data training/backup through myQNAPcloud.



The screenshot displays the myQNAPcloud web interface. On the left is a navigation menu with the following items: Overview, Auto Router Configuration, My DDNS, Cloud Portal, CloudLink, Access Control, and SSL Certificate. The main content area is titled "myQNAPcloud" and features a welcome message: "Welcome to myQNAPcloud! You can easily and securely remotely access your QNAP NAS, share data with friends, and publish NAS services on myQNAPcloud. Please click the below button to enable myQNAPcloud for your QNAP NAS." Below the message are two buttons: "Get Started" and "Learn more about myQNAPcloud".

The interface is divided into sections for "Network Connectivity" and "DDNS".

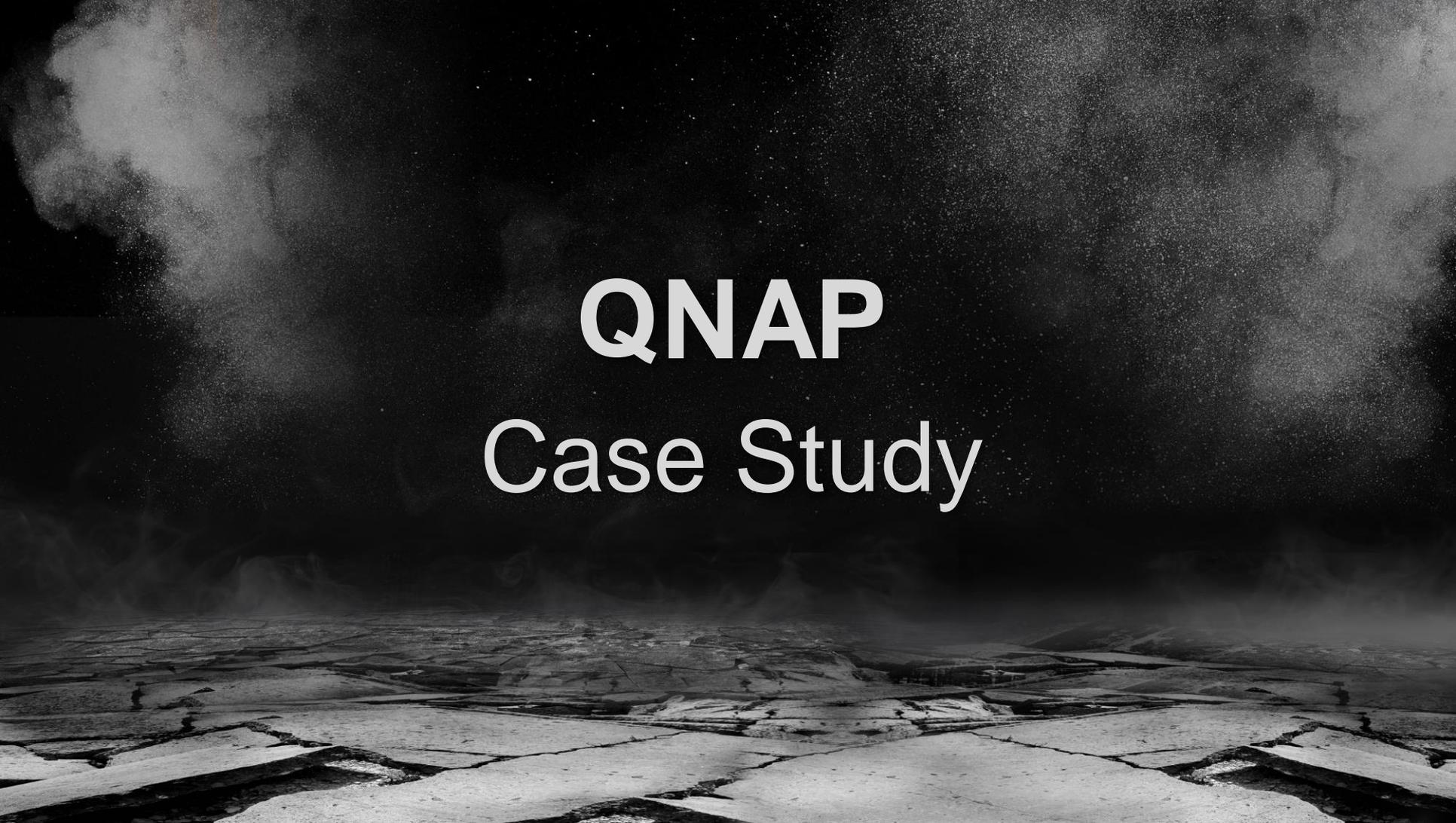
Network Connectivity

- Auto Router Configuration:** Includes a router icon, a "Status" indicator with a refresh icon, and a "Web Connectivity" section with a "Test" button.
- CloudLink:** Includes a CloudLink icon, a "Status" indicator with a refresh icon, and a "Connected Since" field.

DDNS

- Internet Address:** Includes a globe icon, an "Internet Address" field, a "Status" indicator with a refresh icon, and an "SSL Certificate" field with a refresh icon.



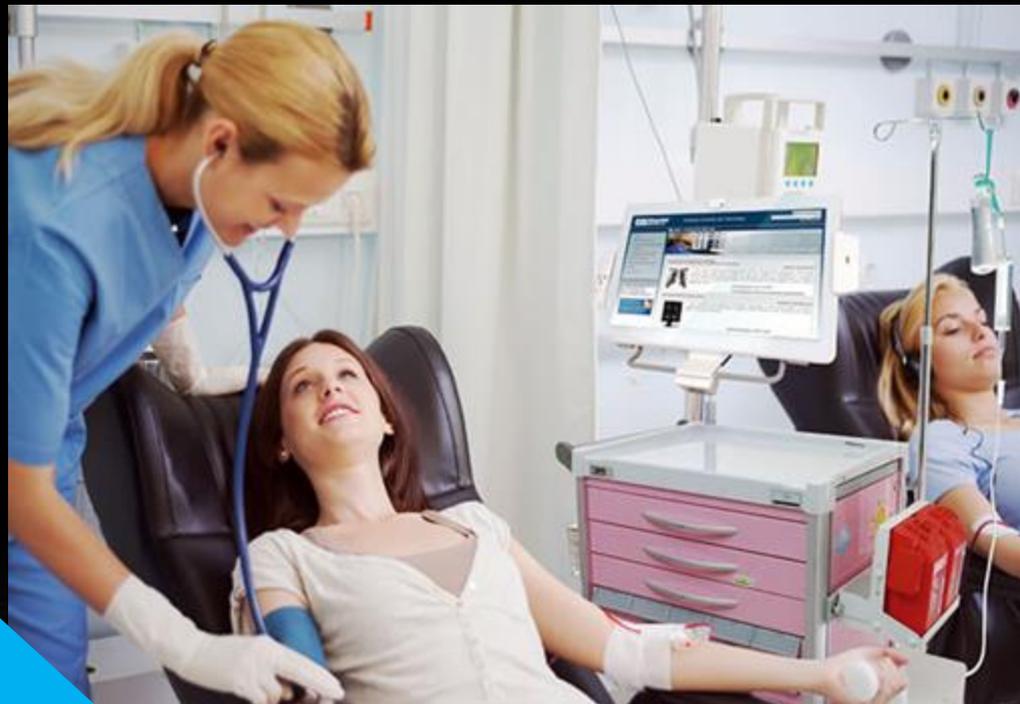
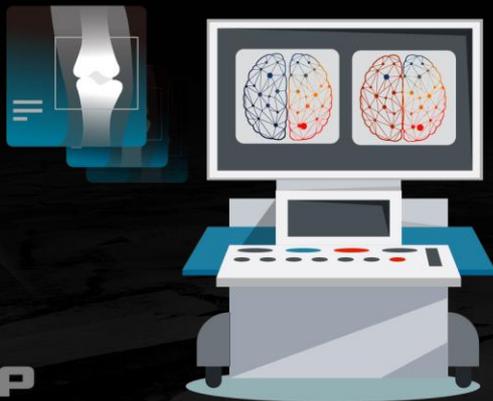


QNAP

Case Study

Health Care

- **Major Application**
Diagnosis assistance
- **Dataset Type**
Medical images (e.g. OCT, MRI, etc.)



Process

01

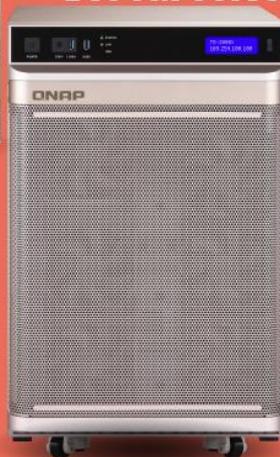


OCT Equipment

02



MediQpacs
DICOM Server



DNN Model
Training



03



Category:

- Normal
- Active Wet
- Drusen
- Inactive Wet



Inference Service

Case Study – Choroidal Neovascularization (CNV)

Are there any lesions?

Prepare the dataset

1. Define the disease categories.
2. Prepare 500 to 1,000+ labeled images for each category.
3. Start from public dataset.

Methodology

Using CNN (Convolution Neural Network) topology, for example, VGG16, GoogleNet, ResNet, etc.

Benchmark

ImageNet 1K:

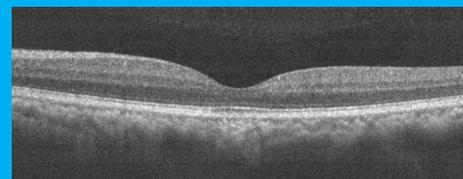
1. Top-1 Error Rate: 22.25%
2. Top-5 Error Rate: 6.42%

Training platform

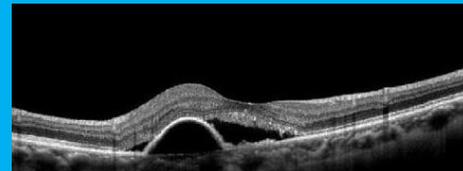
Normally you can have a trained model in few hours or few days when using Transfer Learning with latest GPU Card.

Inference platform

1. Using Intel CPU with Intel OpenVINO to have a acceptable throughput.
2. Consider GPU Card, AI Chip or FPGA card when high throughput is required.



Normal with 99.99% confidence



CNV (Active Wet) with 100.00% confidence

Case Study- Choroidal Neovascularization (CNV)

Where are they?

Prepare the dataset

1. Define the disease categories.
2. Prepare 500 to 1,000+ labeled images for each category.
3. Start from public dataset.

Methodology

Using object detection topology, for example, SSD, Yolo v1/v2/v3, R-FCN, RCNN, Faster RCNN, etc.

Benchmark

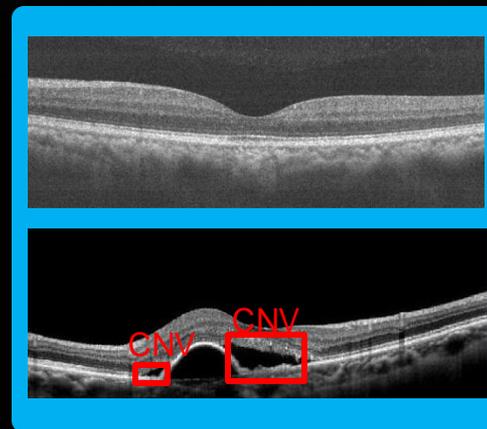
SSD300: 73.4mAP
YOLOv2 544x544: 76.8mAP

Training platform

Normally you can have a trained model in few hours or few days when using Transfer Learning with latest GPU Card.

Inference platform

1. Using Intel CPU with Intel OpenVINO to have a acceptable throughput.
2. Consider GPU Card, AI Chip or FPGA card when high throughput is required.



Case Study- Choroidal Neovascularization (CNV)

Can we mark them?

Prepare the dataset

1. Define the disease categories.
2. At least 500 to 1,000+ well segmented images for each category.
3. Start from public dataset.

Methodology

Using image segmentation topology, for example, SegNet, U-Net, FCN, DeepLab v1/v2, etc.

Benchmark

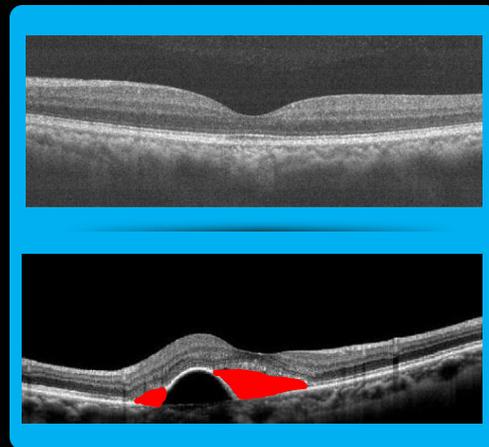
DeepLabv3+:
1.IoU Class: 82.1
2.IoU Category: 91.8

Training platform

1. Using multi GPU cards is recommended.
2. For those real large 3D+ images data, you can consider using Intel Xeon Scalable Processors.

Inference platform

Depend on model size and throughput requirements, the GPU card or Xeon Scalable Processor may required.



QNAP



TS-2888X

is your best choose!

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