

Clarification for MTN Group

Hybrid Cloud Service Provider RFP

-Common Infrastructure



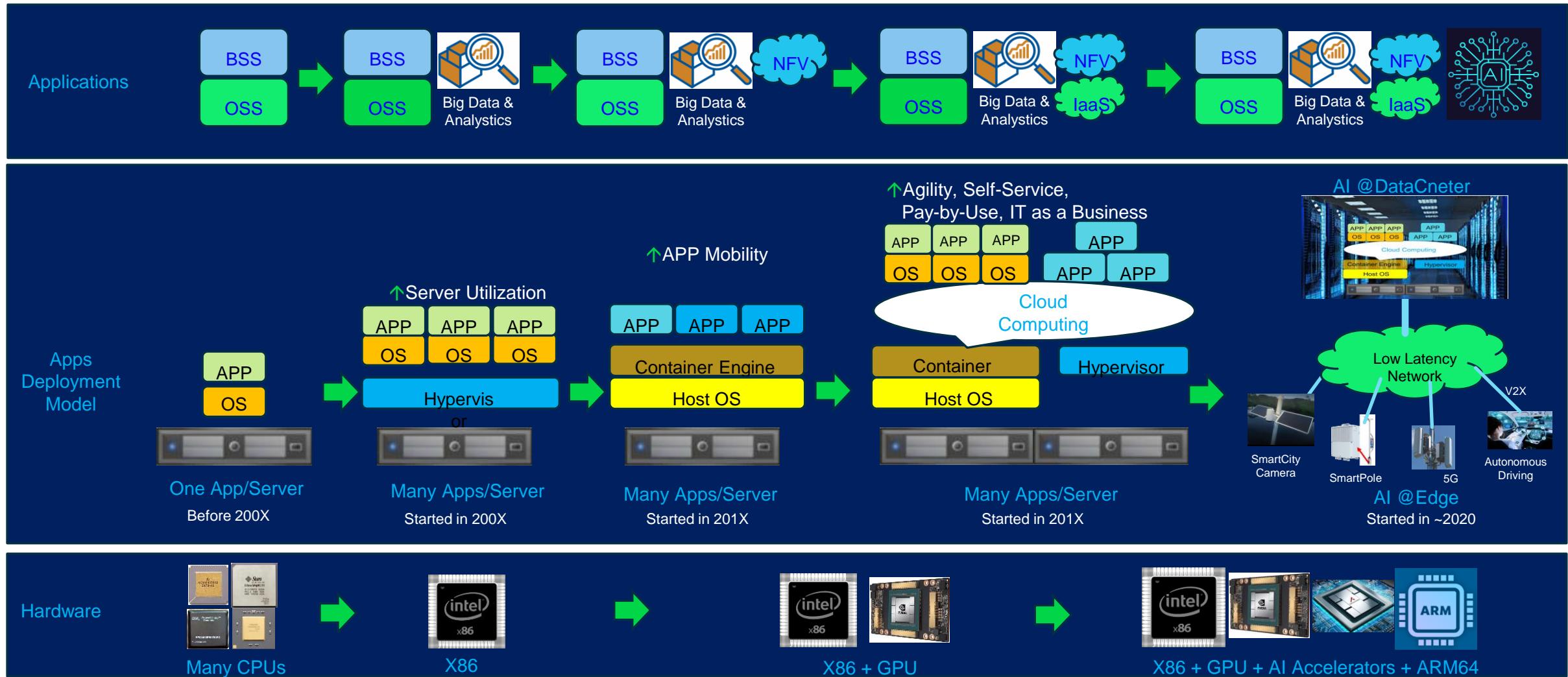
Speaker Briefing:

改为自己的PROFILE

Agenda

- Project Scope and Huawei Understandings
- Core Network and OSS on Cloud
- Cloud MEC Solution
- SDN
- **Common Infrastructure**

Telco Computing Evolution: Cloud, 5G, AI, Intelligent Edge



Huawei “Big Plane” for Building Future-Oriented ICT Infrastructure

1 Cloud, 2 Wings, 2 Engines, plus Open Ecosystem

Open ecosystem

Open hardware | Open-Source software | Partner enablement



Intelligent Computing

General purpose | AI | Edge

Data Storage and Intelligent Vision

Data storage | Intelligent vision | Intelligent collaboration

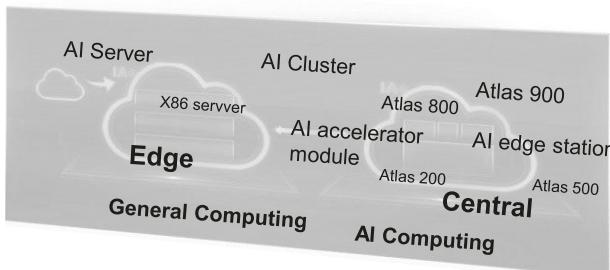


General Computing X86

AI Computing Ascend + GPU

Workloads-driven Diversified Computing

X86 + Kunpeng + Ascend



Data-driven Unified Data Infra.

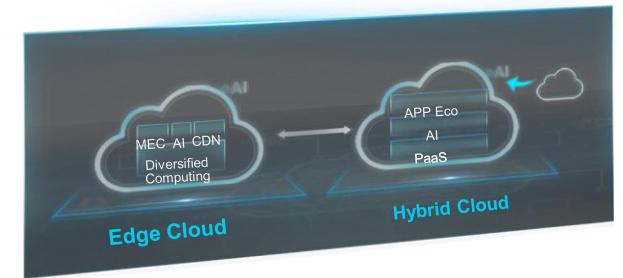
All Flash + Hybrid +Distributed storage



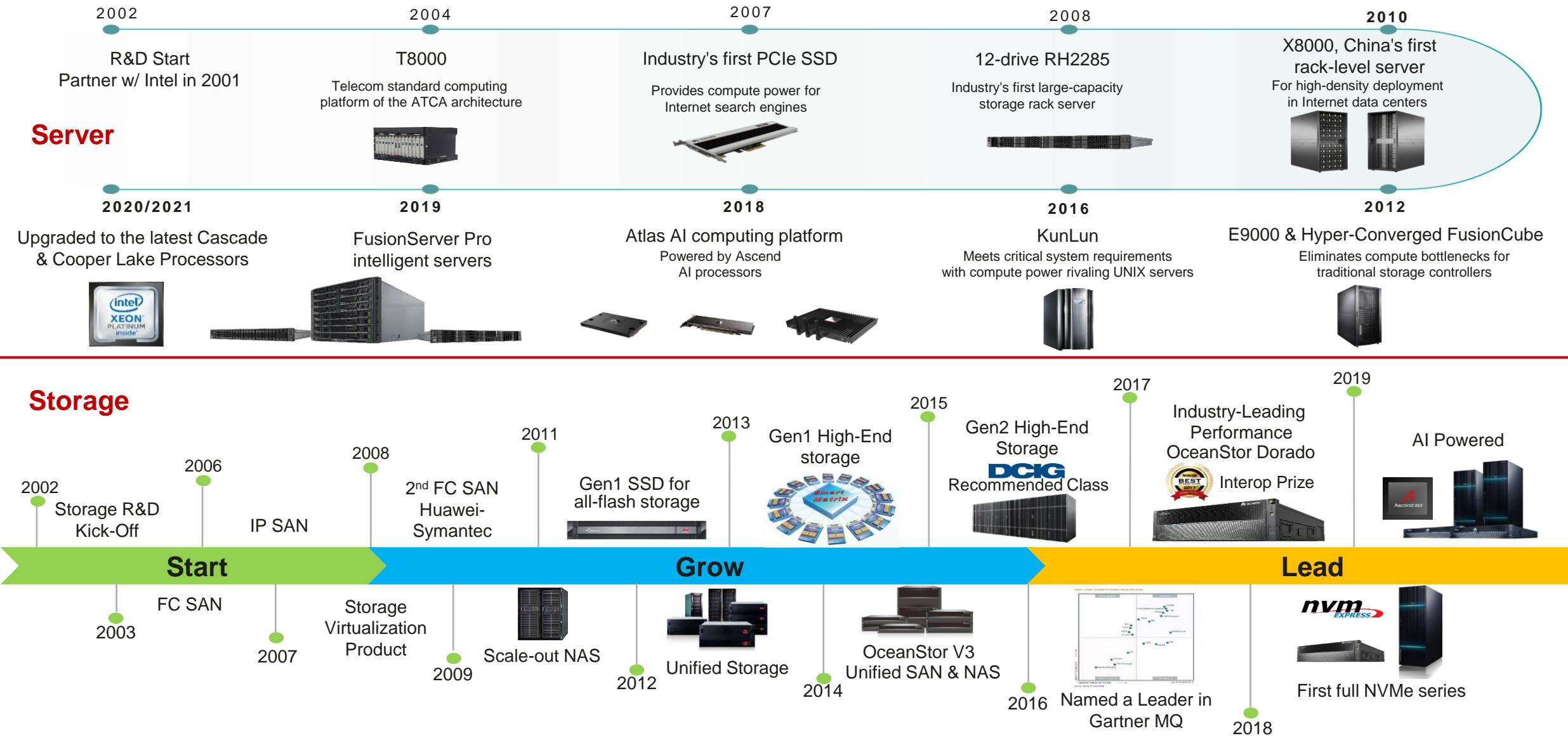
Best-Suited IT Architecture

Service-driven Cloud-AI Alignment

5G + Cloud + AI



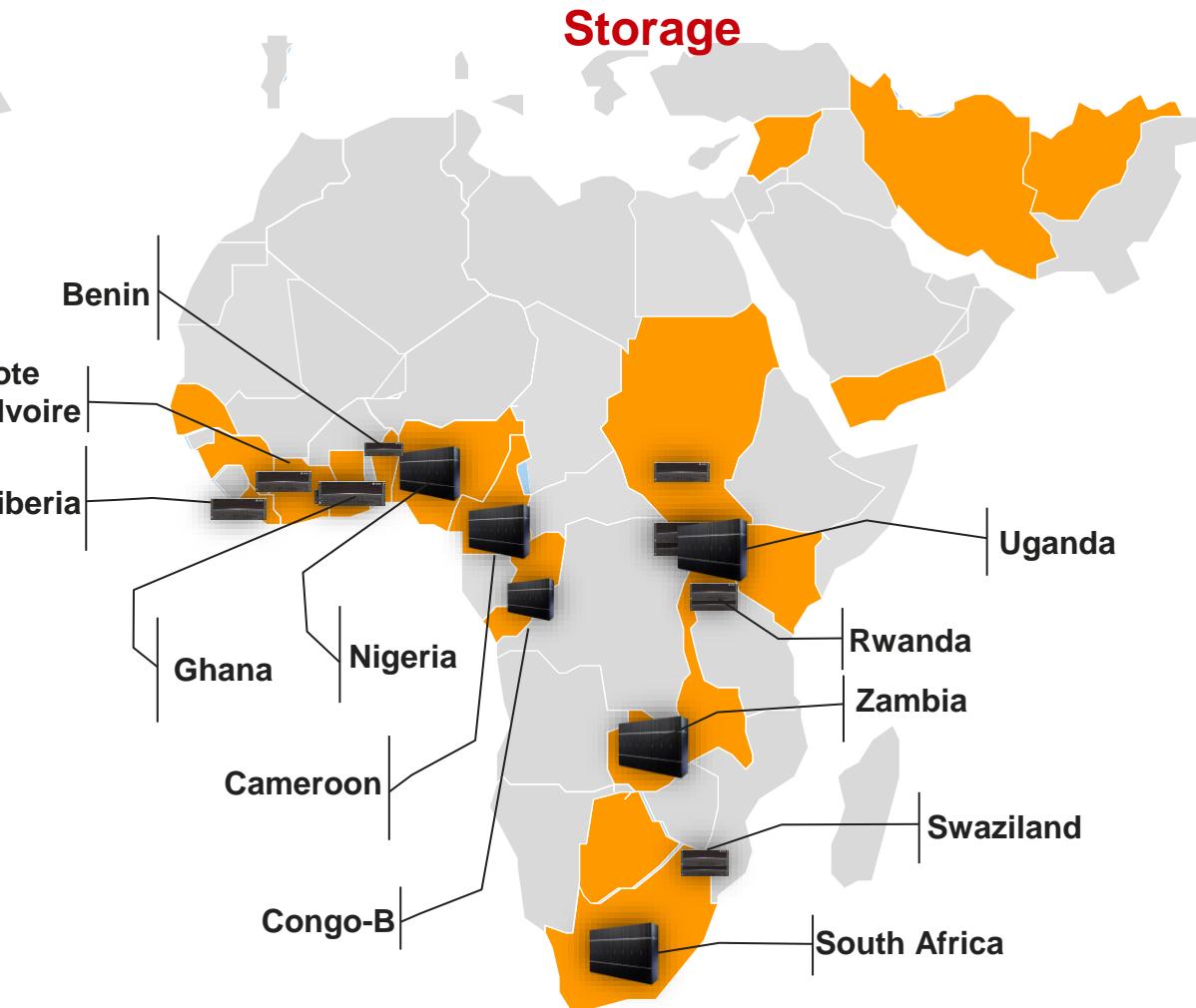
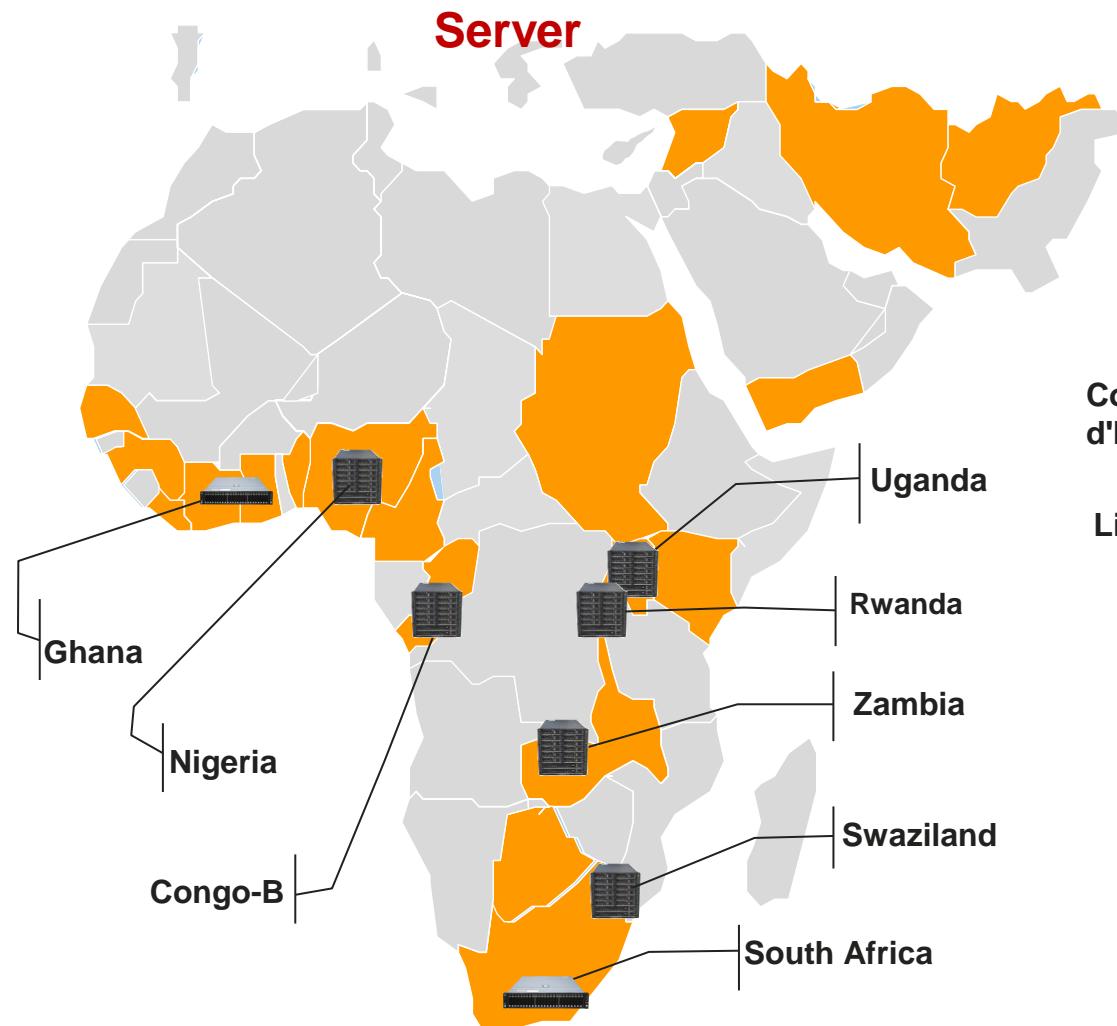
20-Year Continuous Innovations for Industry Leading Infrastructure



Huawei Servers Powering Global Tier-1 Telcos & Other Industries



Huawei Servers & Storages Serving Various Systems of MTN OPCOs



Applications Powered

VAS Service: VAS Cloud, Voice mail

BSS & OSS: Billing, CRM, MV-OSS, CEM

Core Network: vEPC, VMSE, vIMS, vSBC

ITSS: Email, DNS cache, DMS, VDI, REMEDY, Load Runner, DMS, Reporting, Domain Controller, Audit Tracker, File Server

Understanding of the RFP Common Infrastructure Requirements

Understanding of
RFP

Huawei Servers
Overview

Hardware Platform

Hardware Features

High Performance

Operation
Management

Innovations

Open Ecosystem

Roadmap

Key Technical Requirements

- Standardize to support both IT and CT Workloads
- Future-Oriented and Long-Term Evolution to support Telco 5G and Digital Business
- Open and Flexible to support MTN Cloud Transformation
- High Reliability & Scalability to support explosive data growth

Scopes

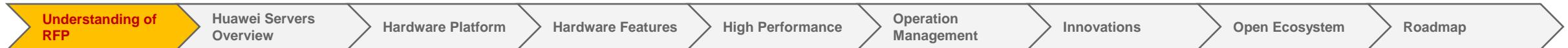
Rack-Mount Servers

Description	Entry Server1	Entry Server2	Entry Server3	Mid Server1	Mid Server2	Mid Server3	High Server1	High Server2	High Server3
CPU (cores)	2x12	2x16	2x20	2x16	2x20	2x24	4x16	8x24	8x26
RAM	4x 32GB	8x 32GB	8x 32GB	16x 32GB	12x 32GB	16x 32GB	32x 32GB	12x 128GB	12x 128GB
HDD SATA 6G	4x 4TB	4x 4TB	6x 4TB	20x 4TB	6x 4TB	6x 4TB	20x 4TB	24x 4TB	24x 4TB
SSD SATA 6G	2x 240GB	2x 240GB	2x 240GB	2x 960GB	2x 960GB	2x 960GB	2x 3.84TB	2x 3.84TB	2x 3.84TB
(HDD/SSD Slots)	4x3.5"+2x2.5"	4x3.5"+2x2.5"	6x3.5"+2x2.5"	20x3.5"+2x2.5"	6x3.5"+2x2.5"	6x3.5"+2x2.5"	20x3.5"+2x2.5"	24x3.5"+22.5"	24x3.5"+2x2.5"

Server Form-Factor	1U Server	1U Server	2U Server	2U Server	2U Server
NIC Configuration	3x(2x25GE)	1x (4x1GE)	2x(2x25GE)	2x(2x100GE)	1x(4x1GE)

✓ Huawei X86 Servers could meet or exceed ALL Your RFP's Requirements

Understanding of the RFP Common Infrastructure Requirements



Key Technical Requirements

- **Standardize to support both IT and CT Workloads**
- **Future-Oriented and Long-Term Evolution** to support Telco 5G and Digital Business
- **Open and Flexible** to support MTN Cloud Transformation
- **High Reliability & Scalability** to support explosive data growth

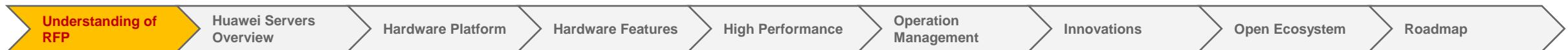
Scopes

Storage Systems

Description	Entry level1	Mid Tier1	Mid Tier2	File & Object Platform	High End
Traditional	15k RPM SAS SFF, SATA 6G SFF	15k RPM SAS SFF, SATA 6G SFF	15k RPM SAS SFF, SATA 6G SFF	NFS, SMB, FTP, iSCSI; HTTP; Cloud	15k RPM SAS SFF, SATA 6G SFF
All Flash	Native All Flash Architecture	Native All Flash Architecture	Native All Flash Architecture	The same as above	Native All Flash Architecture
Combination (50/50) Split	100%	100%	100%	100%	100%
Effective Capacity	200TB	400TB	600TB	600TB	600TB
Main Use	Cloud Storage			Unstructured Data & Archiving	Hot Storage

✓ Huawei OceanStor Storage Systems could meet or exceed ALL Your RFP's Requirements

Understanding of the RFP Common Infrastructure Requirements



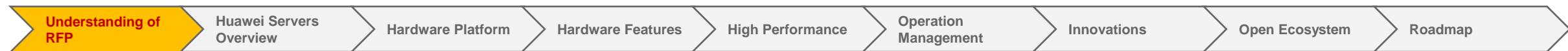
Based on our understanding of MTN's RFP, and its key drivers:

- Support **smoothly scale** with current MTN Hardware;
- Uses standard components for **flexible replacement** and **capacity expansion**;
- Support **different network adapters** capacity connectivity;
- **High-availability** requirements;
- Complies with related **standard protocols** and industry standards;
- Deliver best in class **energy and cooling** efficiency;
- Support the migration to flexible, agile and on-demand networks through the support of optimum **automation based on open APIs**;
- **Optimize the economics** to build a cost-effective infrastructure to support **profitable network growth**;
- Support the **Edge computing** solutions for Edge computing scenario;
- **Openness** to software, OS and hypervisor OS;
- Rich **AI, Cloud, Container NFV and SDN** experience, bringing value to MTN.

Huawei common infrastructure offers the following key advantages:

- Support **smoothly scale** with current MTN Hardware;
- Uses standard components for **flexible replacement** and **capacity expansion**;
- **High-availability** hardware design and software features;
- Support **rich network adapters** capacity connectivity;
- Complies with related **standard protocols** and industry standards;
- Deliver **best in class energy and cooling** efficiency;
- Support the migration to flexible, agile and on-demand networks through the support of optimum **automation based on open APIs**;
- **Optimize the economics** to build a cost-effective infrastructure to support **profitable network growth**;
- Huawei own R&D **Edge Computing** solution combining Huawei FusionServer and Atlas AI components, data will be processed at the remote side before transporting to data centers;
- **Openness** to industry mainstream **software, OS and Hypervisor OS**;
- **Future-oriented AI, Cloud, Container, NFV and SDN** experience in Telco industry.

Understanding the RFP: 100% Fully Compliant to ALL RFP-SOWs



SOC No.	Description	Compliance	Notes
1	The common infrastructure platform must be able to manage on-premise hardware resources for the consumption of on-premise IT and core network workloads	YES	1. Huawei servers & storages have been powering IT & Core network workloads extensively by 83% Global Tier1 Telcos
2	The Solution should incorporate the existing hardware resources where possible, or strategy should be mentioned on how best to service the business case around already invested hardware through re-use or buy-back options.	YES	1. Huawei Cloud is Supporting servers from other vendors
3	The x86 hardware is the preferred on-premise common infrastructure platform for both IT and network workloads. The bidder must be able to cater for 64-bit x86 dual/quad-socket multi-core high performance server microprocessors introduced which can offer the highest performance and high scalability with up to 4-way multiprocessing.	YES	1. 1288H V5 in 1RU for Dual-Socket; 2. 2288H V5 in 2RU for Dual-Socket; 3. 2488H V5/V6 in 2RU for Quad-Socket; 4. 9008H V5 in 8RU for max 8-socket. 5. All Huawei servers demo industry-leading performance
4	The CPU core must support vector instruction set for integer and floating-point (SSE: 128-bit integer, AVX1:128-bit integer, AVX2: 256-bit integer).	YES	1. Provided by Intel Xeon CPUs & Skylake CPUs & after support all these features; Huawei V5 servers use Skylake/Cascade, and V6 uses Cooper / Ice Lake CPUs
5	The server CPU and Memory configuration will be certified to run both IT and Core network workloads (VNF)	YES	1. Huawei servers have been serving 83% Global Tier 1 Telcos for both IT & Core Network VNF workloads
6	Please refer to table in section 6.1 for compliance to Server configurations	YES	1. Huawei V5/V6 Servers meet or exceed the requirements
7	Please refer to table in section 6.2 for compliance to Storage configurations	YES	1. Huawei OceanStor Storage meet or exceed the requirements
8	Network adapters will have the capability to route I/O traffic directly to L3 cache, reducing unnecessary trips to system memory, providing more throughput while further reducing power consumption and I/O latency as per the IT and core network workload requirements	YES	1. This feature is provided by Intel CPUs starting from Sandy Bridge (Xeon V2) and Huawei servers naturally support
9	The bidder shall ensure the platform can run on the following network configuration i.e., connectivity (Network interface) capacity requirements , refer to section 6.3 in RFP Document	YES	1. Huawei Servers & Storage supports All Required Network Types and Speeds.

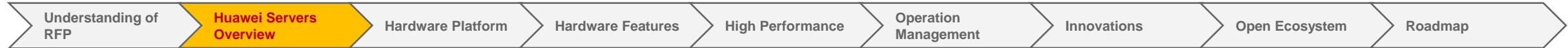
✓ For technical part, there are total **9** SOWs, and Huawei fully compliant for all the SOW items.

Huawei Cloud Support Server Re-use

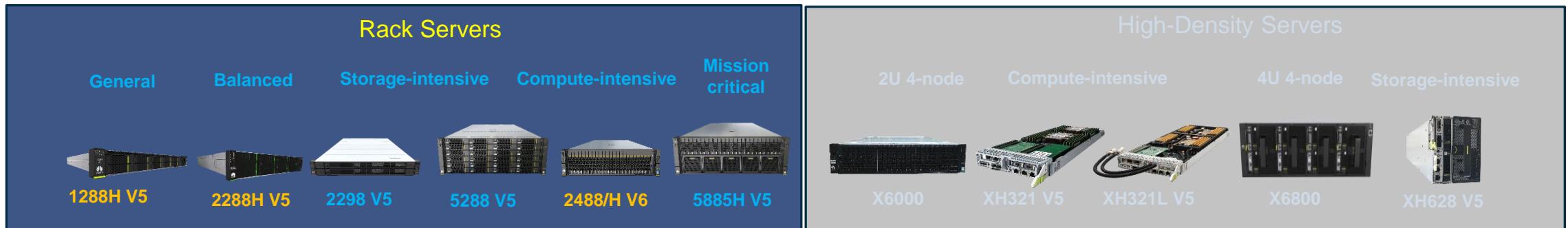
Huawei Cloud based on X86 server, and support total 20 server models, both from Huawei, HPE, Dell, H3C and Inspur.
Below as reference.

Compute node	huawei	2288H V5	Size: 2 U CPU: 2 x Intel Skylake-SP Xeon Gold 6151-18Core (with heatsink) Memory: 20 x 32GB RDIMM-32GB-288pin-0.68ns Hard disk: 2 x 600GB SAS HDD, 8 x 1.6TB NVME RAID: 3408 RAID NIC: 8 x 25GE Power: 900 W
Compute node	huawei	2288X V5	Size: 2 U CPU: 2 x Intel Xeon Gold 6278C (2.6GHz/26-core/35.75MB/185W) Memory: 16 x 32GB RDIMM-32GB-288pin-0.68ns Hard disk: 1 x 480 GB SATA SSD, 4 x 1.6 TB NVME NIC: 8 x 25GE Power: 900 W
Compute node	huawei	5288 V5	Size: 4 U CPU: 2 x Intel Xeon Gold 6278C (2.6GHz/26-core/35.75MB/185W) Memory: 12 x 32GB RDIMM-32GB-288pin-0.68ns Hard disk: 2 x 480GB SATA SSD, 36 x 4TB SATA HDD RAID: 3408 RAID NIC: 8 x 25GE Power: 900 W
Compute node	HPE	DL380 Gen10	Size: 2 U CPU: Intel Xeon Gold 6248 (2.5GHz/20-Core/27.5MB/150W) Memory: 12 x 16 GB RDIMMs, 32 GB, 2933 MT/s Hard disk: 1 x SSD-480GB-SATA 6Gb/s RAID: 3408 RAID/RAID-LSI-9460-8i(2G) NIC: 4 x 10GE onboard + 2 x 10GE 82599 dual-port NIC Power: 800 W
Compute node	DELL	PowerEdge R740	Size: 2 U CPU: Intel Xeon Gold 6248 (2.5GHz/20-Core/27.5MB/150W) Memory: 12 x 16 GB RDIMMs, 32 GB, 2933 MT/s Hard disk: 1 x 480 GB SSD SATA 6 Gbit/s 2.5-inch hot swap RAID: 3408 RAID/RAID-LSI-9460-8i(2G) NIC: 4 x 10GE onboard + 2 x 10GE 82599 dual-port NIC Power: 750W
Compute node	H3C	UniServer R4900 G3	Size: 2 U CPU: Intel Xeon Gold 6248 (2.5GHz/20-Core/27.5MB/150W) Memory: 12 x 16 GB RDIMMs, 32 GB, 2933 MT/s Hard disk: 1 x SSD-480GB-SATA 6Gb/s RAID: 3408 RAID/RAID-LSI-9460-8i(2G) NIC: 2 x 10GE onboard + 2 x 10GE 82599 dual-port NIC Power: 800 W
Compute node	Inspur	NF5280M5	Size: 2 U CPU: 2 x Intel Xeon Gold 6248 (2.5GHz/20-Core/27.5MB/150W) Memory: 12 x 16 GB RDIMMs, 32 GB, 2933 MT/s Hard disk: 1 x SSD-480GB-SATA 6Gb/s RAID: 3408 RAID/RAID-LSI-9460-8i(2G) NIC: 4 x 10GE onboard + 2 x 10GE 82599 dual-port NIC Power: 2 x 800 W

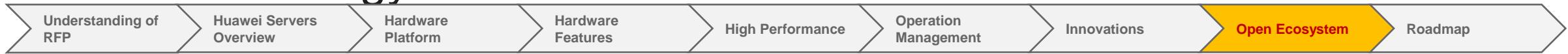
FusionServer Pro Intelligent Servers



- ✓ Rich Product Portfolio to meet your needs for different application scenarios:
 - Balanced, Computing or Storage Intensive, Air or Liquid Cooling, Rack or Blade, etc.
- ✓ Full series upgraded to the latest Intel Cascade Lake Refresh / Cooper processor, synchronous to Intel CPU Release Schedule

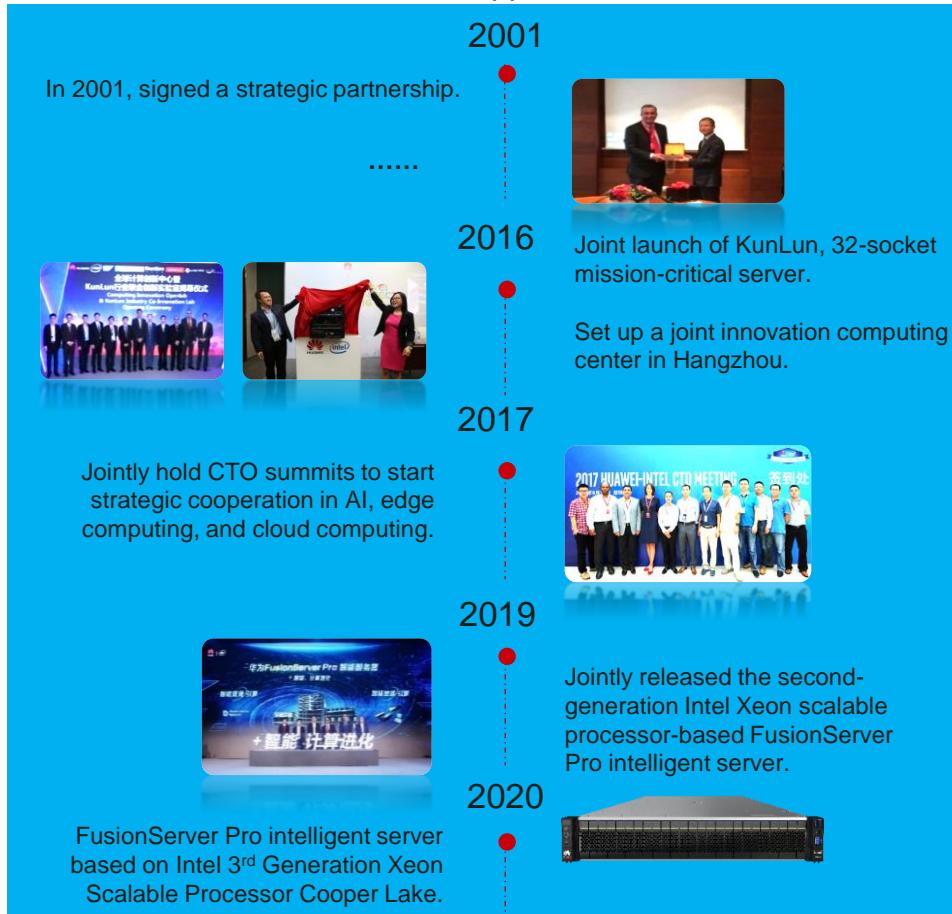


Strategic Partnership with Intel, Continuously Providing the Latest Technology and Products

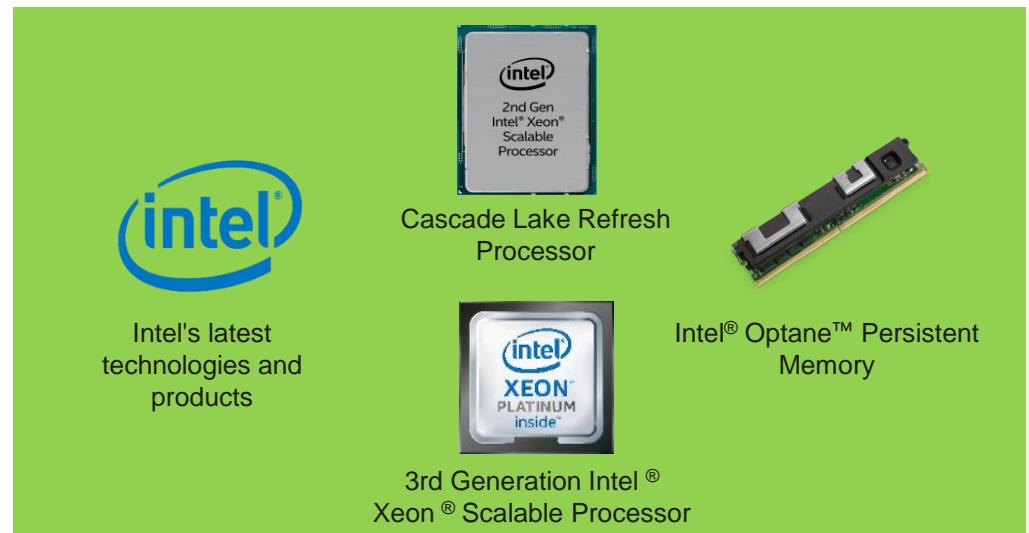
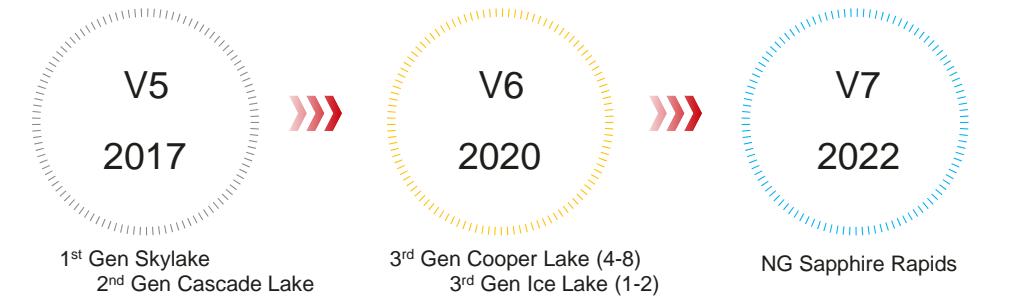


20-Year Partnership

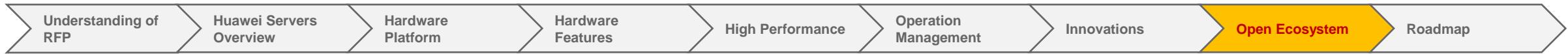
Total **5M+** Units Shipped from 2012 to 2020



Synchronous to Intel Processor Release Schedule



VMware Continues Compatibility Certification & Technical Support



- ✓ Partners such as **VMware**, **SUSE** and **Ubuntu** will continue to work with Huawei to provide compatibility certification and technical support for **FusionServer Pro** servers.

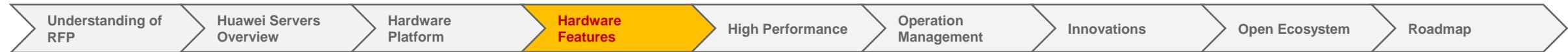
On May 23, 2020, VMware announced that Huawei FusionServer Pro 2288H V5 and other servers have passed the latest VMware vSphere 7.0 compatibility certification.

*VMware vSphere, vSAN, and vCenter will continue to provide compatibility certification and technical support for Huawei FusionServer Pro servers.

The latest 2488H V6 (Copper Lake) has been certified

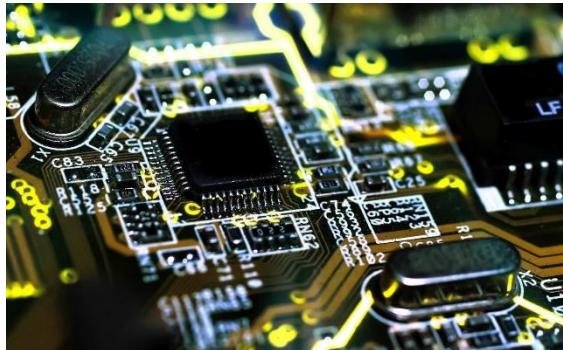
Huawei Technologies Co., Ltd.	2488 V5	Intel Xeon Platinum 8200 (Cascade-Lake-SP) Series	ESXi	⊕	7.0 U1	7.0	6.7 U3	6.7 U2
Huawei Technologies Co., Ltd.	2488H V5	Intel Xeon Gold 6100/5100, Silver 4100, Bronze 3100 (Skylake-SP) Series	ESXi	⊕	7.0 U1	7.0	6.7 U3	6.7 U2
Huawei Technologies Co., Ltd.	2488H V5	Intel Xeon Gold 6200/5200 (Cascade-Lake-SP/Refresh) Series	ESXi	⊕	7.0 U1	7.0	6.7 U3	6.7 U2
Huawei Technologies Co., Ltd.	2488H V5	Intel Xeon Platinum 8100 (Skylake-SP) Series	ESXi	⊕	7.0 U1	7.0	6.7 U3	6.7 U2
Huawei Technologies Co., Ltd.	2488H V5	Intel Xeon Platinum 8200 (Cascade-Lake-SP) Series	ESXi	⊕	7.0 U1	7.0	6.7 U3	6.7 U2
Huawei Technologies Co., Ltd.	2488H V6	Intel Xeon Gold 6300/5300 (Cooper-Lake-SP) Series	ESXi	⊕	7.0 U1			
Huawei Technologies Co., Ltd.	2488H V6	Intel Xeon Platinum 8300 (Cooper-Lake-SP) Series	ESXi	⊕	7.0 U1			
Huawei Technologies Co., Ltd.	5288 V5	Intel Xeon Gold 6100/5100, Silver 4100, Bronze 3100 (Skylake-SP) Series	ESXi	⊕	7.0 U1	7.0	6.7 U3	6.7 U2
Huawei Technologies Co., Ltd.	5288 V5	Intel Xeon Gold 6200/5200 (Cascade-Lake-SP/Refresh) Series	ESXi	⊕	7.0 U1	7.0	6.7 U3	6.7 U2
Huawei Technologies Co., Ltd.	5288 V5	Intel Xeon Platinum 8100 (Skylake-SP) Series	ESXi	⊕	7.0 U1	7.0	6.7 U3	6.7 U2
Huawei Technologies Co., Ltd.	5288 V5	Intel Xeon Platinum 8200 (Cascade-Lake-SP) Series	ESXi	⊕	7.0 U1	7.0	6.7 U3	6.7 U2
Huawei Technologies Co., Ltd.	5288 V5	Intel Xeon Silver 4200, Bronze 3200 (Cascade-Lake-SP/Refresh) Series	ESXi	⊕	7.0 U1	7.0	6.7 U3	6.7 U2
Huawei Technologies Co., Ltd.	5288X V5	Intel Xeon Gold 6200/5200 (Cascade-Lake-SP) Series	ESXi	⊕	7.0 U1	7.0	6.7 U3	6.7 U2

30+ Years of High-quality Experience, 15% Fewer Failures than Industry Peers



Over 30 years of hardware design, development, and manufacturing capabilities coupled with complete product R&D and test processes to maximize server reliability, reduce downtime and data loss, and enhance device maintainability

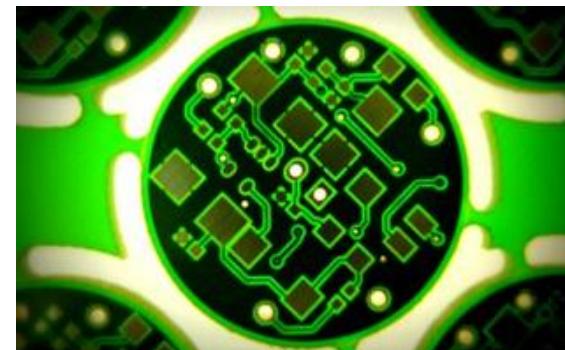
Component Selection and Process Technique



High Reliability Design



Strict Test and Certification



Enhanced O&M Features



Hard Disk Failure rate

40% ↓

Source: Per Internal Testing & O&M Data Collections

Working Temperature

45°C

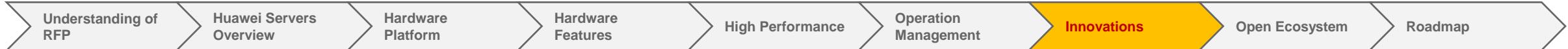
Source: Internal Lab Tested for most products

Machine Failure rate

15% ↓

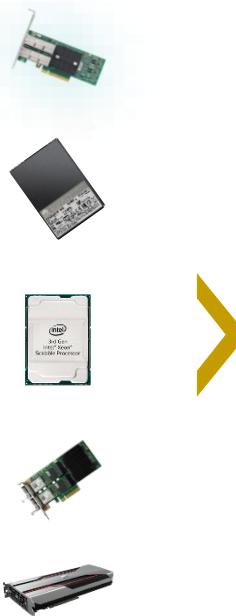
Source: Per a Large Customer Statistics

The Most Powerful E2E AI Computing Platform



FusionServer Pro
intelligent server

Intelligent NIC IN200/IN300
Intelligent SSD ES3000
Intel® Xeon® Scalable processor
BSST M.2 SSD
AI accelerator card



Network acceleration **releases 15% CPU resources**

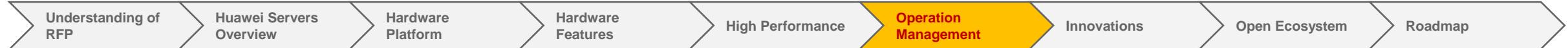
Storage acceleration **improves data read/write IOPS by 66%**

Computing acceleration **improves system performance by 15%**

Boot acceleration **improves system boot by 3x**

Heterogeneous acceleration **improves AI computing power by 33%**

Entire-Lifecycle Management Enabling Intelligently O&M



O&M efficiency up by 30%



Intelligent maintenance



Intelligent upgrade



Intelligent energy saving



Intelligent deployment



Intelligent discovery

AI-enabled fault warning and diagnosis

Automatic version matching, unattended upgrade

Energy saving at 3 levels: single-node, cabinet, and data center

Pipeline-style deployment

Server model, configuration, inventorying, and retirement

7–30 days earlier prediction of risks

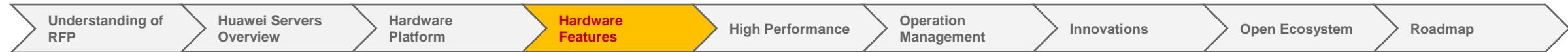
O&M time per 100 servers reduced from 1 week to hours

15% better energy efficiency

10x deployment efficiency

Automatic inventorying in seconds, with 100% accuracy

Embedded Security Features



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2

Management Software Security Design

2.1 Account Security

The server onboard management software iBMC supports management interfaces such as CLI, SNMP, Web, IPMI, and Redfish, and provides unified user management functions. A maximum of 16 users can be added, modified, or deleted.

Account security includes: password complexity check, historical password disabling, password validity period, minimum password validity period, anti-brute force cracking, manual account lockout, and online user logout.

Password complexity check: The complexity of the password configured by the user is checked to prevent the user from setting a simple password. The password must meet the following complexity requirements:

- Contains 8 to 20 characters.
- Contains at least one space or the following special characters: `~!@#\$%^&* () -_=+|[{};:","<>/`
- Contains at least two of the following combinations: lowercase letters a-z, uppercase letters A-Z, and digits 0-9.
- Cannot be the same as a user name or the user name in reverse order.
- Contains at least two characters different from the old password.

History password disabling: You can set the number of historical passwords that can be retained. The new password cannot be the same as the history passwords.

- Huawei iBMC supports **15 kinds of security**, including Account Security, Authentication Management, Authorization Management, Certificate Management, Session Management, Security Protocol, Data Protection, Access Policy, Key Management, System Hardening, Log Audit, Trusted Boot, Secure Boot, BIOS Firmware Security, Security Tool Scanning and End-to-End Assurance.
- Huawei FusionServer supports hardware level security, provides **TPM 2.0 for data encryption**.



Security White Paper

Optimized DIMM Configuration Varies Generation by Generation

- ✓ Intel SSE, AVX, AVX2 & AVX-512 SIMD Instruction Extensions Deliver High Performance for a lot of Applications
- ✓ Balanced Memory Configuration w/ the same DIMM on every Channel is Crucial to Application Performance
- ✓ Huawei X86 Servers Support all Intel Xeon CPUs & Memory Configurations, Exceed or Meet your RFP's SSE/AVX & Memory Requirements

1. DDIO – NIC/IO to place data to L3/LLC Cache directly;
2. CPUs w/ AVX-512 Support AVX2(-256b) & AVX(-128b)
3. CPUs w/ AVX also Support SSE,SSE2,SSE3, SSE4.1,SSE4.2
4. Intel DL Boost: AVX-512-VNNI, AVX-512-BF16 & AMX(in Sapphire Rapids)

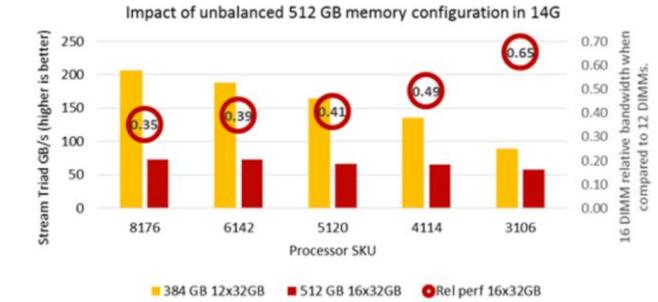
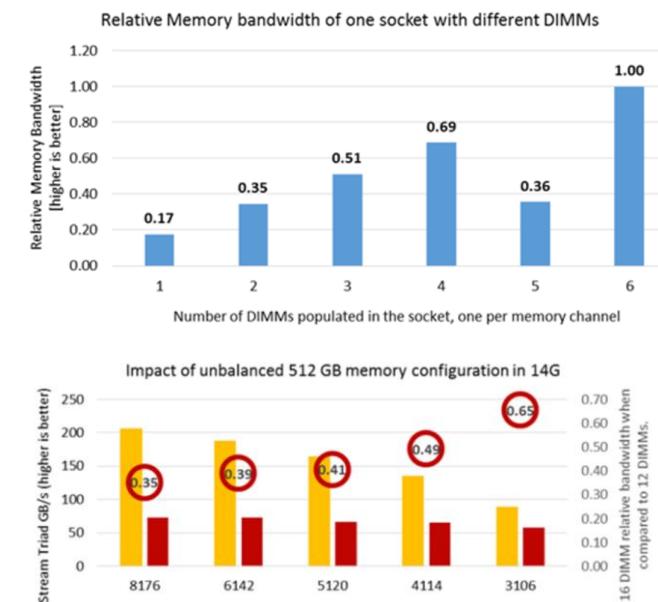
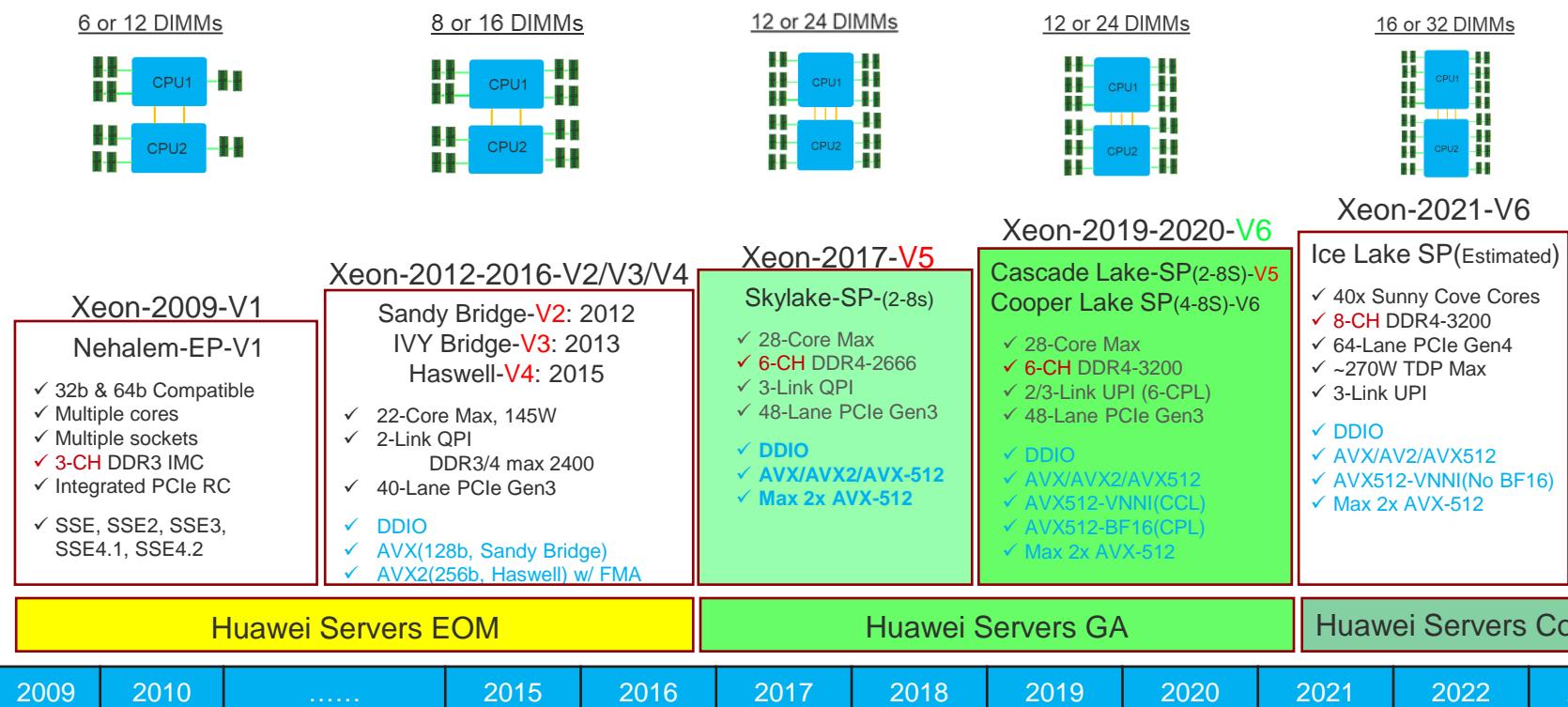


Image source & credit: DellEMC White Paper "Skylake Memory Study", Author Joseph Stanfield etc., 2018

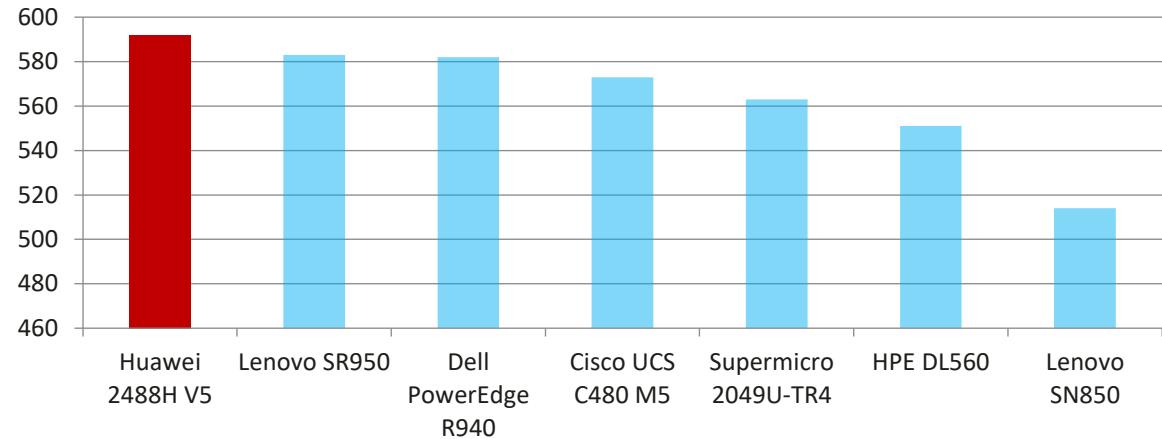
The CPU core support vector instruction set for integer and floating-point



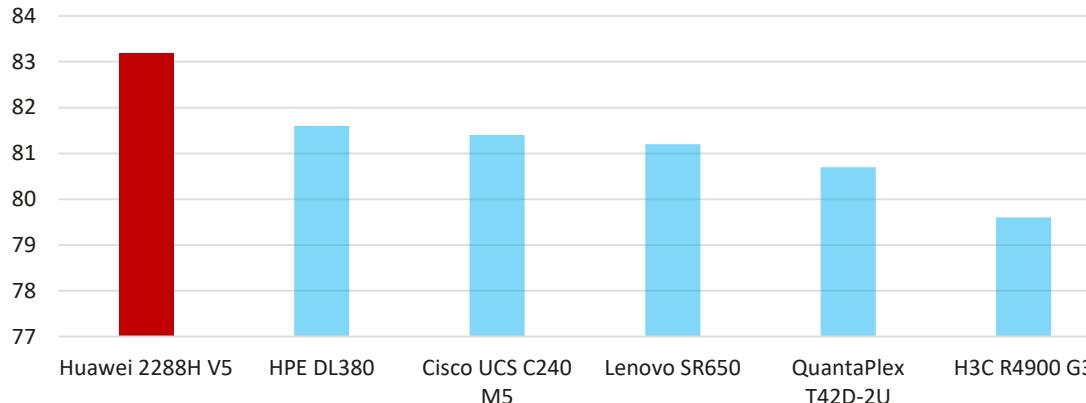
1288H V5 SPECint_base2006 Test Result



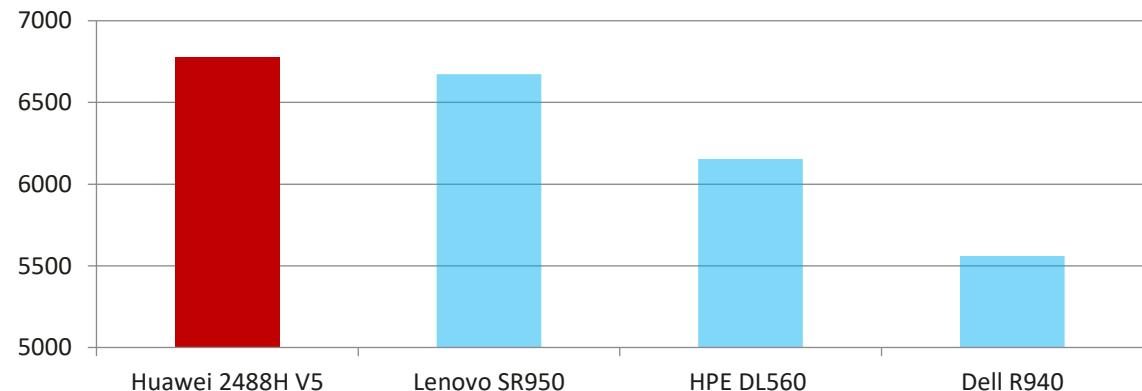
2488H V5 SPECrate2017_int_base Test Result



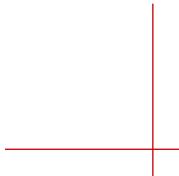
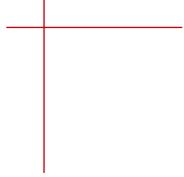
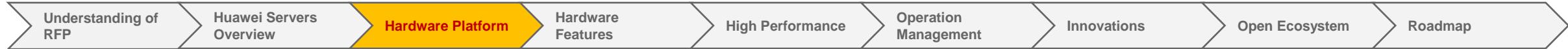
2288H V5 SPECint_base2006 Test Result



2488H V5 SAP B4H Benchmark Test Result



Rack Server: FusionServer Pro 1288H V5



- Virtualization and cloud computing
- Virtual desktop interface (VDI)
- SDS

High reliability

- Carrier-class component specifications and **100% derating design**
- **Redundancy design:** PSU modules in 1+1 mode, fan modules in N+1 mode, and memory module sparing/mirroring
- **99.99% availability**
- **15% fewer failures** than the industry average

Ultimate performance

- 2 x 2nd Gen Intel® Xeon® Scalable processors, up to 28 cores **and TDP 205 W per CPU**
- **24 DDR4 DIMMs**, up to 2933 MT/s; total memory capacity up to 3 TB on a single server
- **No. 1 in SPECint®_base2006** performance test
- **No. 1 in SPECpower ssj2008** Benchmark energy efficiency test

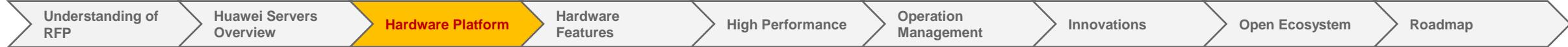
Unique value

- **FDM:** The patented Fault Diagnosis & Management (FDM) technology provides the fault locating **accuracy up to 93%** and predicts a **fault 7 to 30 days before it occurs**, reducing OPEX
- **DEMT:** The patented Dynamic Energy Management Technology (DEMT) **reduces energy consumption by 15%** without compromising services
- **BSST:** Boot Speedup Storage Technology (BSST), 2 M.2 SSDs as high-speed OS boot drives, **industry-unique hot plug** and hardware RAID

Innovative design

- **2 x 10GE/GE and 2 x GE LOM ports**, reducing CAPEX
- **Flexible NICs** for higher networking capabilities, support 3*2*25GE;

Rack Server: FusionServer Pro 2288H V5



- Virtualization and cloud computing
- Virtual desktop interface (VDI)
- SDS
- HPC
- Big data and hyper-convergence
- Entry-level in-memory database (SAP HANA)
- AI inference or training

High reliability

- Carrier-class component specifications and **100% derating design**
- Redundancy design: PSU modules in 1+1 mode, fan modules in N+1 mode, and memory module sparing/mirroring
- **99.99% availability**
- **15% fewer failures** than the industry average

Ultimate performance

- 2 x 2nd Gen Intel® Xeon® Scalable processors, up to 28 cores **and TDP 205 W per CPU**
- **24 DDR4 DIMMs**, up to 2933 MT/s; a maximum of 12 Optane™ Persistent Memory (PMem), up to 2666 MT/s; total memory capacity up to 7.5 TB on a single server
- **No. 1 in SPECint®_base2006** performance test
- **No. 1 in SPECpower ssj2008** Benchmark energy efficiency test

Unique value

- **FDM**: The patented Fault Diagnosis & Management (FDM) technology provides the fault locating **accuracy up to 93%** and predicts a **fault 7 to 30 days before it occurs**, reducing OPEX
- **DEMT**: The patented Dynamic Energy Management Technology (DEMT) **reduces energy consumption by 15%** without compromising services
- **BSST**: Boot Speedup Storage Technology (BSST), 2 M.2 SSDs as high-speed OS boot drives, **industry-unique hot plug** and hardware RAID

Innovative design

- **2 x 10GE/GE and 2 x GE LOM** ports, reducing CAPEX
- **Flexible NICs** for higher networking capabilities, support 2*2*25GE; 2*2*100GE;
- **20 x 3.5" or 31 x 2.5"** drives for industry-leading storage capability
- **28 NVMe SSDs** for optimal service experience
- 7 Atlas 300 inference cards/NVIDIA Tesla T4 GPUs for AI inference
- 2 NVIDIA Tesla V100 cards for AI training

Rack Server: FusionServer Pro 2488H V5



- Virtualization
- Cloud computing
- HPC
- Database
- In-memory database (SAP HANA)
- AI inference

High reliability

- Carrier-class component specifications and **100% derating design**
- **Redundancy design**: PSU modules in 1+1 mode, fan modules in N+1 mode, and memory module sparing/mirroring
- **65 RAS features**
- **99.99% availability**
- **15% fewer failures** than the industry average

Ultimate performance

- 4 x 2nd Gen Intel® Xeon® Scalable processors, up to 28 cores and **TDP 205 W per CPU**
- **48 DDR4 DIMMs**, up to 2933 MT/s; a maximum of 24 Optane™ Persistent Memory (PMem), up to 2666 MT/s; total memory capacity up to 15 TB on a single server
- **No.1 in SPECrate2017_int_base/SPECvirt_sc** 2013 benchmark/SAP B4H benchmark tests
- **Full mesh CPU architecture design**, improving performance by 14.9%

Unique value

- **FDM**: The patented Fault Diagnosis & Management (FDM) technology provides the fault locating **accuracy up to 93%** and predicts a **fault 7 to 30 days before it occurs**, reducing OPEX
- **DEMT**: The patented Dynamic Energy Management Technology (DEMT) **reduces energy consumption by 15%** without compromising services
- **BSST**: Boot Speedup Storage Technology (BSST), 2 M.2 SSDs as high-speed OS boot drives, **industry-unique hot plug** and hardware RAID

Innovative design

- **2 x 10GE/GE and 2 x GE LOM ports**, reducing CAPEX
- **Flexible NICs** for higher networking capabilities
- **25 x 2.5" drives**, providing the industry's largest storage capacity
- 3 NVIDIA Tesla T4 GPUs for image and video inference and analytics
- Up to **11 PCIe 3.0 slots**, the most in the industry for diverse applications

2488H V6: Stable and Reliable Mission Critical Server



- Virtualization
- Cloud computing
- High-performance computing (HPC)
- Database
- In-memory database (SAP HANA)
- AI inference and training

- ✓ 4S+48-DIMM in 2RU w/ Intel latest Xeon CPUs for Ultimate Computing Performance
- ✓ 25x2.5" HDDs or NVMe SSDs for high performance storage
- ✓ For Computing Applications Requiring 4-Socket & Large Memory in 2RU Space

High reliability

- Carrier-class component specifications and 100% derating design
- Redundancy design: PSUs in 1+1 mode, fan modules in N+1 mode, and memory module sparing/mirroring
- 69 RAS features
- 99.999% availability
- 15% fewer failures than the industry average

Ultimate performance

- 4 x 3rd Gen Intel® Xeon® Scalable processors (Cooper Lake), up to 28 cores and **TDP 250 W per CPU**
- 48 DDR4 DIMMs, up to 3,200 MT/s; 24 Intel® Optane™ persistent memory (Optane™ PMem) modules (200 series), up to 2,666 MT/s; total memory capacity of a single server up to 18 TB
- 2 x 300 W high-performance dual-width GPU accelerator cards, providing powerful computing for AI inference and training

Unique value

- **FDM:** The patented Fault Diagnosis & Management (FDM) technology provides the fault locating accuracy up to 93% and predicts a fault 7 to 30 days before it occurs, reducing the OPEX
- **DEMT:** The patented Dynamic Energy Management Technology (DEMT) reduces energy consumption by 15% without compromising services
- **BSST:** The Boot Speedup Storage Technology (BSST) uses 2 M.2 SSDs as high-speed OS boot drives, supporting the hardware RAID and the industry-unique hot plug for M.2 SSDs

Innovative design

- 2 FHFL dual-width GPU AI accelerator cards, such as Tesla V100
- 4 HHHL single-width GPU AI accelerator cards, such as Tesla T4
- 11 PCIe 3.0 slots, including one dedicated PCIe slot for the OCP 3.0 NIC (hot-swappable)
- 25 x 2.5" SAS/SATA drives, up to 24 NVMe SSDs¹
- Access to iBMC using Type-C, enabling agile O&M

¹ The configuration of 24 NVMe SSDs is estimated to be released in Q4 2020.

8S Server - 9008 V5



High reliability

- **Carrier-class** component specifications and **100% derating design**
- **Redundancy design:** PSU modules in 1+1 mode, fan modules in N+1 mode, and memory module sparing/mirroring
- **99.99% availability**
- **15% fewer failures** than the industry average

Ultimate performance

- 2/4/6/8 Xeon Skylake Lake Scalable Processors, up to 28 cores/processor, **TDP max 205 W**
- **96 DDR4 DIMMs**, up to 2933 MT/s; 48 channels
- Up to **40pcs NVMe or 48pcs SAS/SATA HDD/SSD**

Unique value

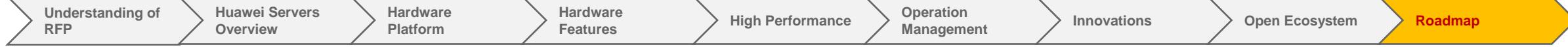
- **FDM:** The patented Fault Diagnosis & Management (FDM) technology provides the fault locating **accuracy up to 93%** and predicts a **fault 7 to 30 days before it occurs**, reducing OPEX
- **DEMT:** The patented Dynamic Energy Management Technology (DEMT) **reduces energy consumption by 15%** without compromising services
- **BSST:** Boot Speedup Storage Technology (BSST), 2 M.2 SSDs as high-speed OS boot drives, **industry-unique hot plug** and hardware RAID

Innovative design

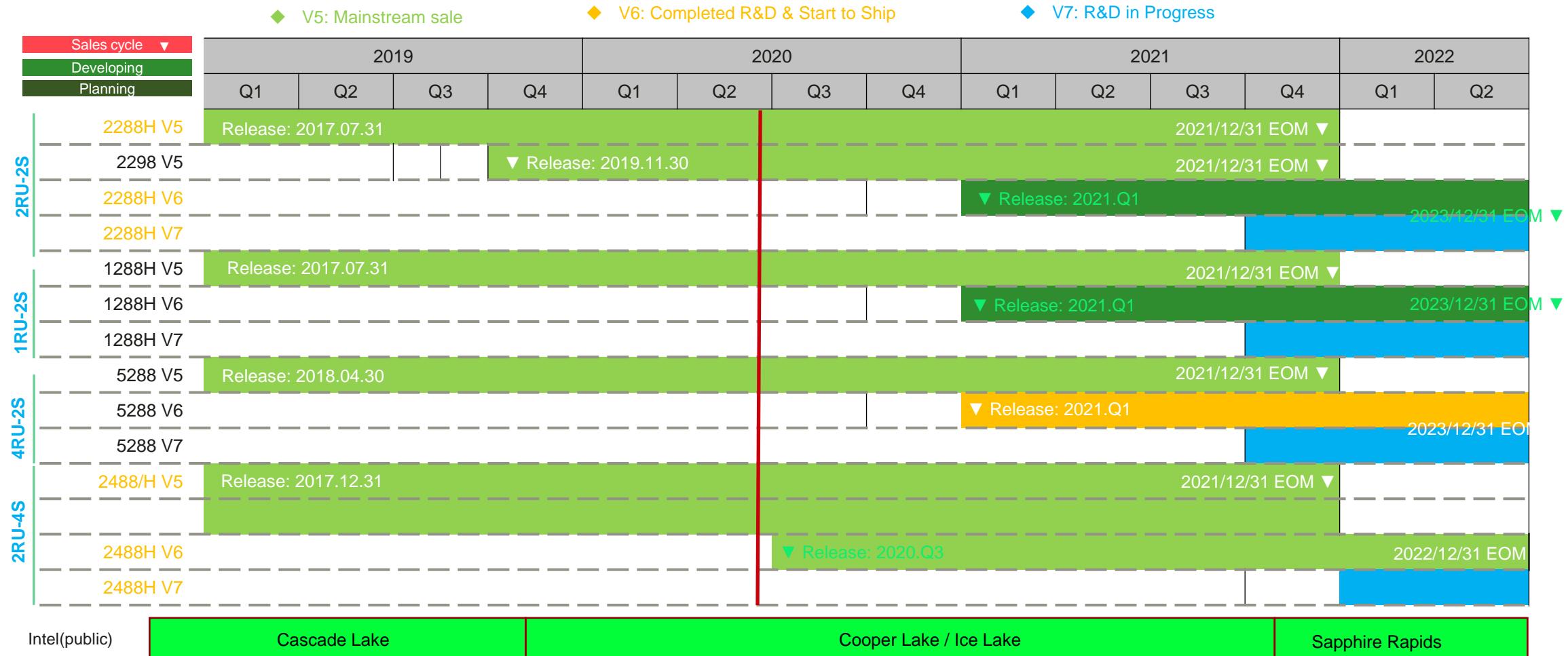
- **2*10GE optical + 2*GE RJ45 ports**, reducing CAPEX
- 4 x 2.5" SSDs, or SAS/SATA hard drives;
- Support 2 M.2 storage, **hot-plug**

Continuous Roadmap Synchronous to Intel Release Schedule

Server Storage Service



✓ Huawei FusionServer Pro X86 Servers Synchronous to Intel Processor Release Schedule



Huawei Comprehensive Storage Solution Supporting All Scenarios

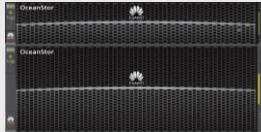


Solution

Data Protection Solution



Disaster recovery



Backup



Archiving

Data management



Device management

DeviceManager

Intelligent storage management platform



OceanStor DME



Intelligent O&M

eService

Intelligent storage

All-flash storage



OceanStor Dorado 18000 V6



OceanStor Dorado 8000 V6



OceanStor Dorado 6000 V6

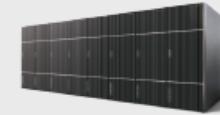


OceanStor Dorado 5000 V6



OceanStor Dorado 3000 V6

Hybrid flash storage



OceanStor 18500/18800 V5



OceanStor 5300/5500/5600/5800 V5



OceanStor 6800 V5



OceanStor 2200/2600 V5



OceanStor 100D



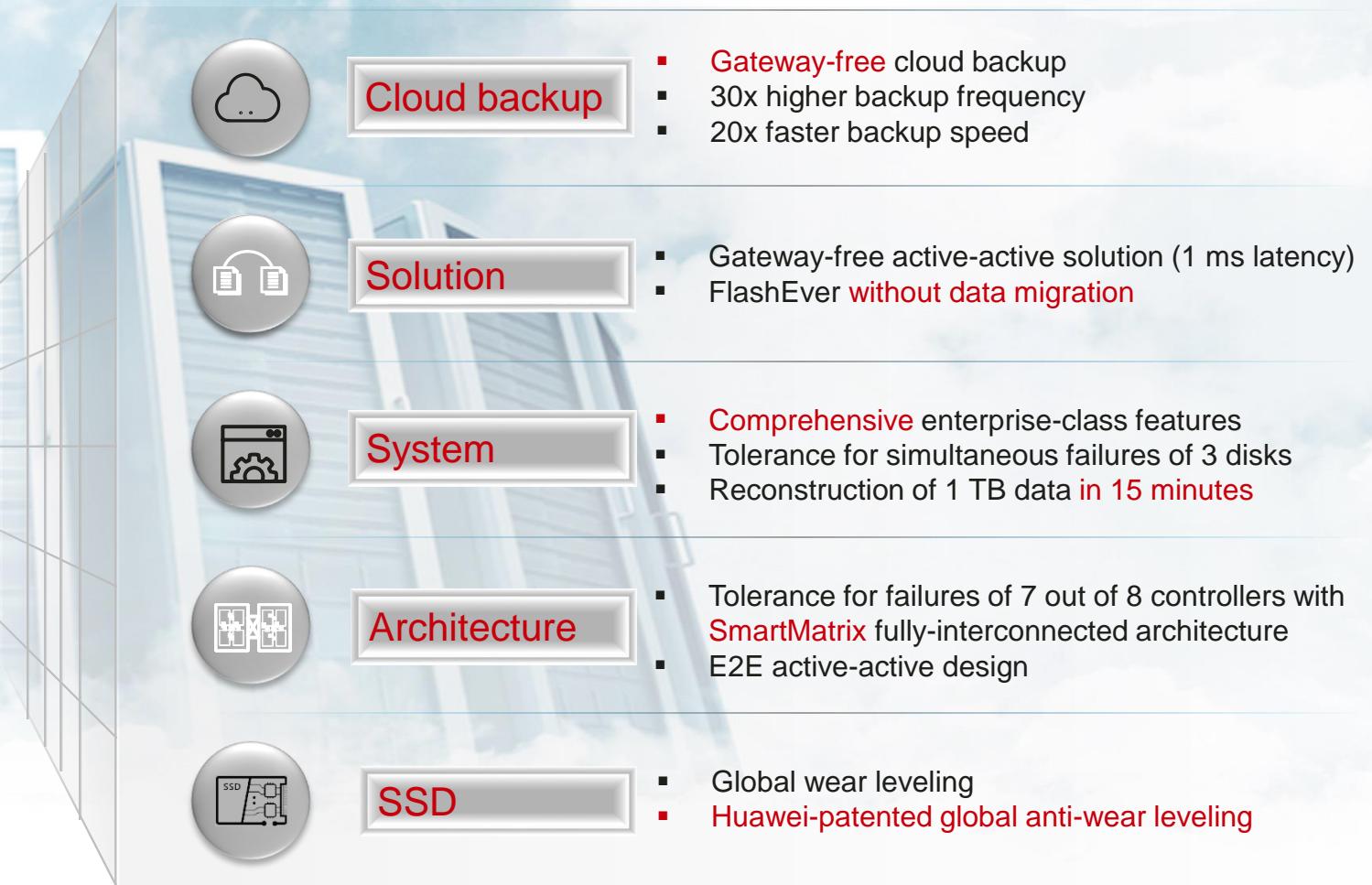
OceanStor 9000

Ever Solid: Five Layers for Extreme Reliability



99.9999%
system-level reliability

99.99999%
solution-level reliability



Industry-Leading Disk Reliability by 6 Core SSD Technologies



- SSD wear leveling and Huawei-patented anti-wear leveling
- LDPC + SmartFSP 3.0 for error correction granularity 10x superior to competitors
- Intra-disk DIF preventing silent data corruption
- Data inspection algorithm preventing data distortion
- Built-in dynamic RAID improving utilization
- RAID at the SSD and system levels

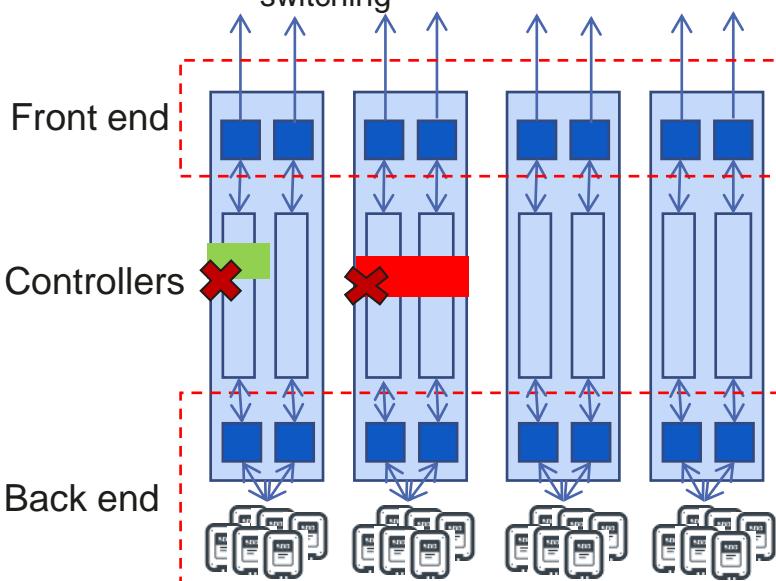
Architecture Reliability — Industry-Leading Service Continuity



Vendor X

2 controllers, scale-out

- I/O interface module connected to 1 controller
- Controller failure: front-end link switching

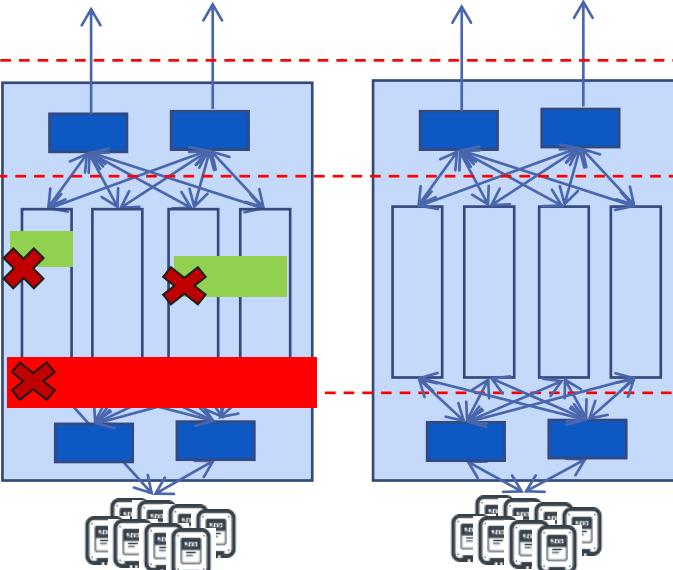


- SSD enclosure connected to 2 controllers (1 controller enclosure)
- 2-controller failure: service disruption

Vendor X

4 to 8 controllers, scale-out

- Interface module shared by controllers
- Controller failure: 0 front-end link switching

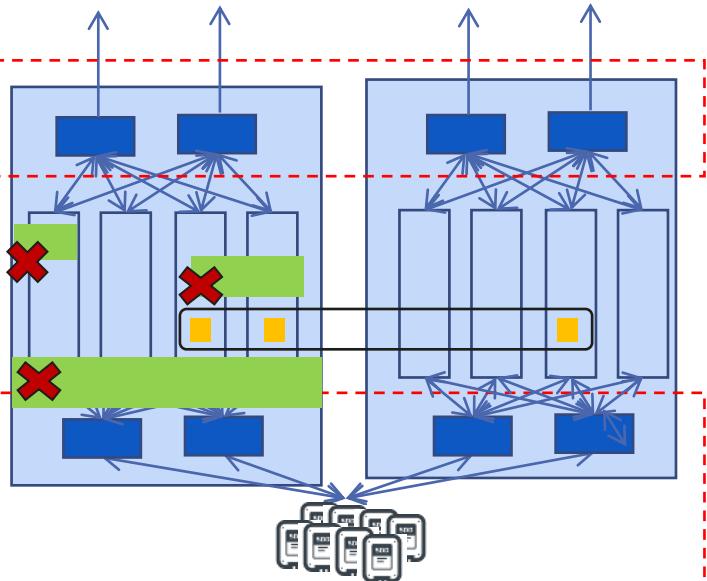


- SSD enclosure connected to 4 controllers (1 controller enclosure)
- 4-controller failure: service disruption

OceanStor Dorado

8 controllers, scale-out

- Interface module shared by controllers
- Controller failure: 0 front-end link switching, 0 impact on hosts



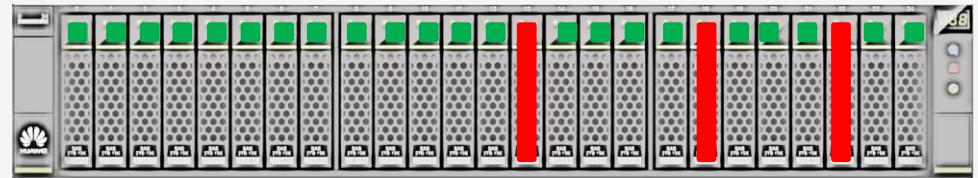
- Global cache: continuous mirroring, 3 copies across controller enclosures
- SSD enclosure connected to 8 controllers (2 controller enclosures)
- Up to 7-controller failure: 0 service disruption

System Reliability— RAID-TP Provides Customized Protection for SSDs



Large-capacity SSDs lead to double the capacity (up to 32 TB) and 5x to 10x the failure rate

Simultaneous 3-disk failure without service interruption



Reconstruction of 1 TB data

SSD failure toleration

Traditional RAID: up to 2 SSDs

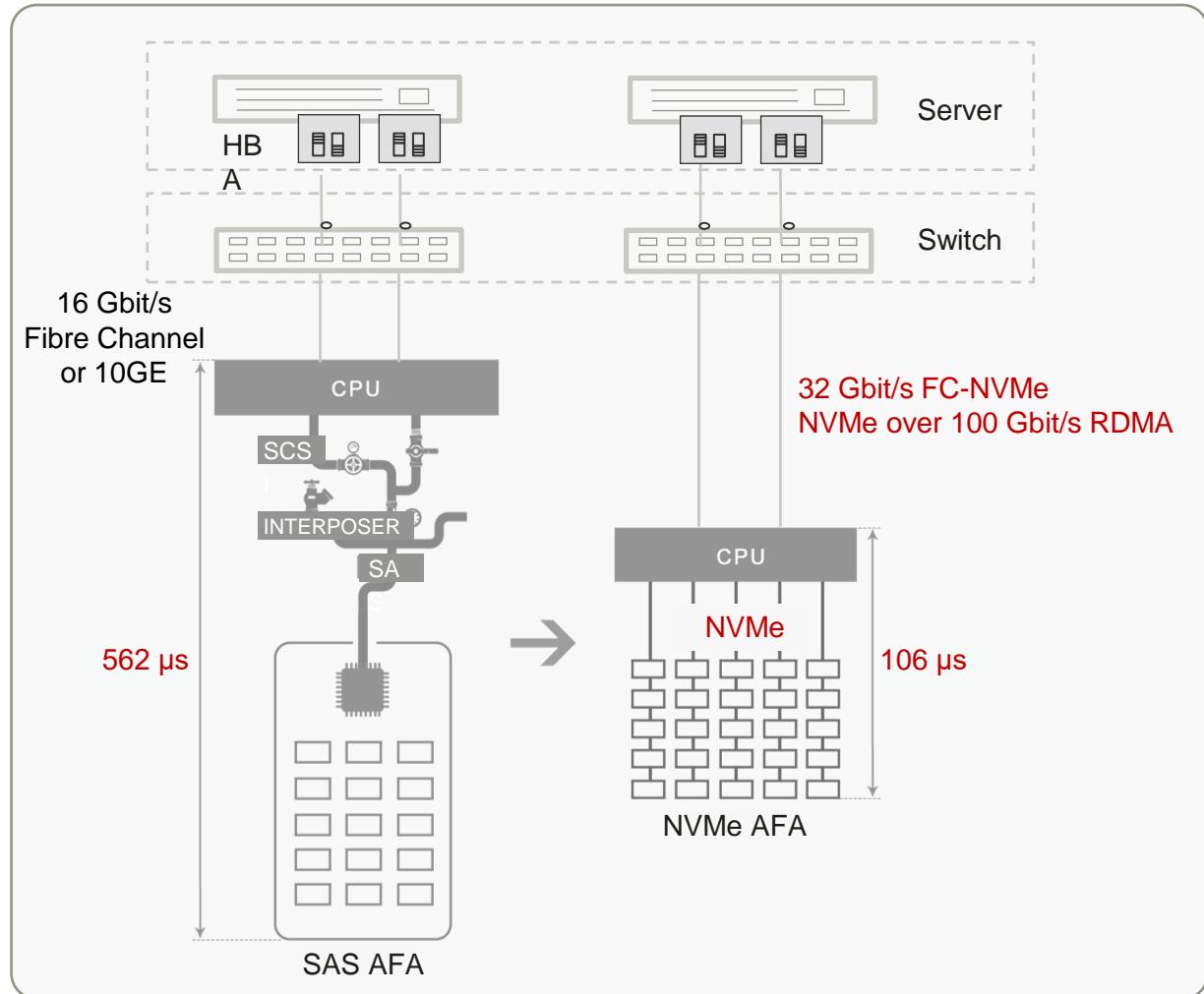
Huawei RAID-TP: simultaneous **3-SSD** failure

Data reconstruction

Traditional RAID: 5 hours

RAID-TP: 1 TB of data within **15 minutes**

Ever Fast: E2E NVMe for All Storage Series



0.1 ms

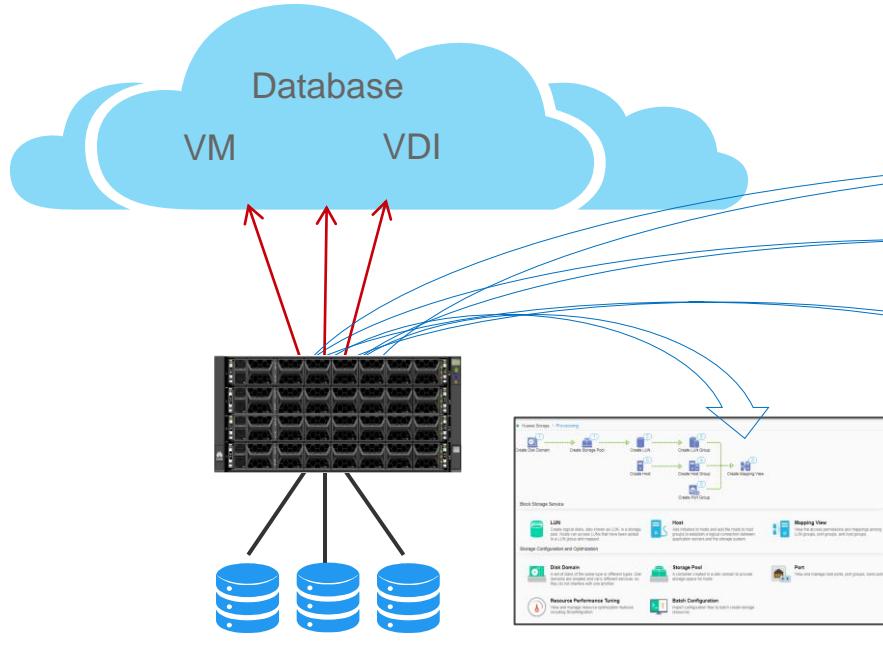
Test model: 7:3 read/write, 130 μs read latency, 50 μs write latency
 $\text{Time} = 130 \times 0.7 + 50 \times 0.3 = 106 \mu\text{s}$

Shorter path ➯ Wider channel ➯ Fewer interactions
 E2E ➯ Full series ➯ Every model ever fast

*Front-end NVMe over 100 Gbit/s RDMA will be available in the next version.

*Deployment of FC NVMe or NVMe over ROCE due to the maturity of ecosystem.

Device-Cloud Full Stack Management

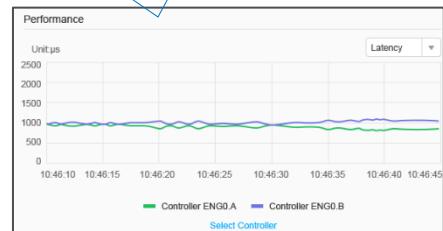
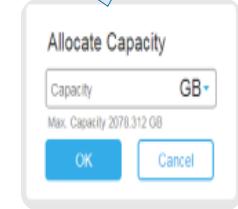


OceanStor Dorado V6 DeviceManager

- Web-based GUIs
- Step-by-step guide for FCAPS management

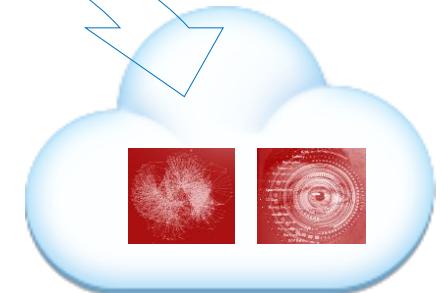
SmartConfig

- 3-step host configuration
 - Add a storage device.
 - Set the IP address.
 - Set the capacity.



DME

- Unified storage management
- Topology and data path analytics
- Long-term log and performance storage and analytics



eService

- Cloud-based remote AI services
- 24/7 monitoring
- 5-min service ticket creation
- All-round health check
- Regular performance analytics

Four Level Security Ensures System and Data Security



Storage Service Security

- Resource access control
- Resource access authentication and authorization
- Data encryption
- Data destruction

Storage Network Security

- Network isolation
- Transmission security

Storage System Security

- Storage OS security hardening
- Security patches
- Web security
- Secure boot and software integrity protection

Management Security

- Role-based access control
- User security policies
- Password security
- Authentication and authorization
- Log and alarm management

- **ITU-T X.805 telecom network security architecture based model**
- **Management Security**
 - ✓ Role-based access control
- **Storage Service Security**
 - ✓ Data at rest encryption
 - ✓ DoD standard data destruction
- **Storage Network Security**
 - ✓ Secure transmission protocols (SSH, SFTP, HTTPS, and SNMPv3)
- **Storage System Security**
 - ✓ The RSA 2048/4096 algorithm is used, which has the top security level in the industry

Four Level Security Ensures System and Data Security



Specification	2020		2021		2022		2023		2024		2025		2026	
	H1	Q2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2
Dorado All Flash	Dorado V6 6.0.0 Release:2019.12.31	Active-active architecture for all models, High-density hardware + interconnect I/O module								2024/12/31 EOM ▼	2025/12/31 EOM ▼			2026/12/31 EOM ▼
	Dorado V6 6.1.0 ▲ Release:2020.12.31	Integrated unified storage. High-performance NAS: 30% higher performance								2025/12/31 EOM ▼	2026/12/31 EOM ▼			2027/12/31 EOM ▼
	Dorado V6 6.1.2 ▲ Release:2021.12.31	Supports HDDs. The brand name changes to OceanStor V6								2026/12/31 EOM ▼	2027/12/31 EOM ▼			
	Dorado V7 ▲ Release:2022.12.31	Supports Flash Ever feature, Support S3 Object storage								2027/12/31 EOM ▼				
Converged Storage	OceanStor 5.7.6 Release:2019.12.31	Front-end interconnect I/O modules								2024/12/31 EOM ▼	2025/12/31 EOM ▼			2026/12/31 EOM ▼
	OceanStor 5.7.7 ▲ Release:2020.12.31	Supports NVMe enclosures with disk and controller integration								2025/12/31 EOM ▼	2026/12/31 EOM ▼			2027/12/31 EOM ▼
	OceanStor 6.0.0 ▲ Release:2021.12.31	Next-gen OceanStor series based on the Dorado V6 software platform, A-A architecture								2026/12/31 EOM ▼	2027/12/31 EOM ▼			
	OceanStor 6.x ▲ Release:2022.12.31	Consolidate into one architecture with Dorado.								2027/12/31 EOM ▼				

The roadmap is for reference only and may be adjusted according to market requirements.

Huawei Professional Service Team

Services at your hand



1	Shenzhen HQ	5	Stages	100+	Experts for consulting	200+	Value-added service partners
4	Regional COEs	8+	Service domains	26000+	Professional service teams	2000+	Partners
32	Regional technical support centers	10+	Expert groups	300+	Professional service supervisors	4	Training centers
140+	Cities covered	1	Service contract	300+	Spare parts center	1700+	Professional lecturers

Integration Enablement Service

Huawei Service Assurance During Lockdown

One-stop services



Professional service teams



Strategic service cooperation



Consultation

Design

Implementation

O&M

Improvement

Service Partner: IT CSP certification

Integration Enablement Service

Huawei Service Assurance During Lockdown

2020 CSP Certification Standards				
CSP Certification Requirements		3 Star	4 Star	5 Star
1. Basic Requirements	Registered as a partner of Huawei	●	●	●
	No major complaints from customers caused by poor service quality	●	●	●
2. Requirements for service sales personnel	Passing the HCS-Pre-sales-Service Solution certification	-	(1)	1
3. Service Specification Exam	Engineers Passing the Service Specification Exam	-	1	2
3. Requirements for project management personnel	PMP	-	(1)	(1)
5. Certification requirements for after-sales engineers	Enterprise IT (Storage, Cloud Computing), ECC (UC, CC, VC, IVS), Intelligent Computing	HCIA	2	1+1*
		HCIP	-	2
		HCIE	-	2
6. Service platform	Technical service organizations	●	●	●
	Technical Assistance Center (TAC)	5×8	7×24	7×24
	Customer Issues Escalation Process	●	●	●
	Company email account for receiving Huawei service requests and transferring materials and documents	●	●	●
	After-sales support labs	-	-	●
	Cyber security specialist (taking Huawei cyber security training and passing Huawei exams)	-	1	1
	On-site investigation reports (for the first certification application)	-	>=60	>=70
7. On-site investigations				

HCIA 183,HCIP 60,HCIE 4 In CSP

Region	Southern Africa	Northern Africa
5 Star	0	1
4 Star	11	3
3 Star	28	4
Total	39	8

Huawei IT Remote Delivery Mode with Video Conference during Lockdown

Integration Enablement Service

Huawei Service Assurance During Lockdown

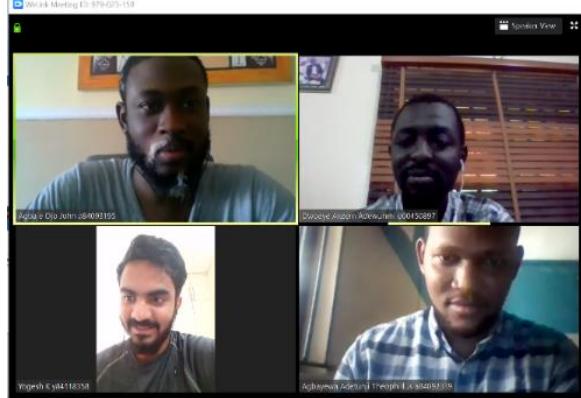
Morning session at 9:00 am, highlight the top key tasks/issues for the day.

Evening session provides status review and update top key tasks/issues that was discussed in the morning.

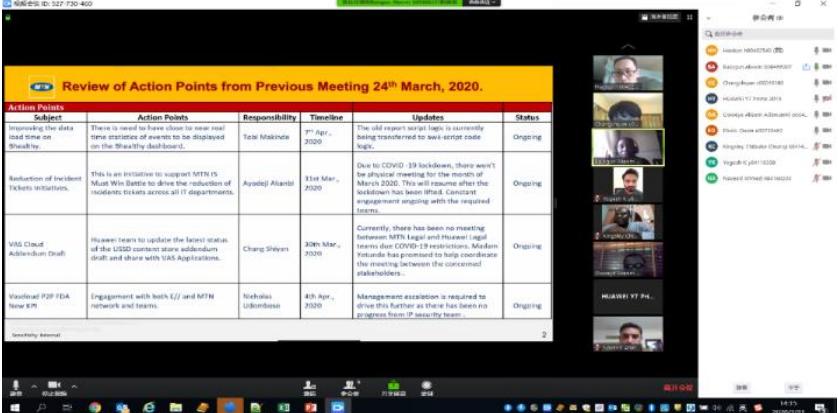
Technical team Leader Morning meeting 9AM



Huawei Staff Clocking in



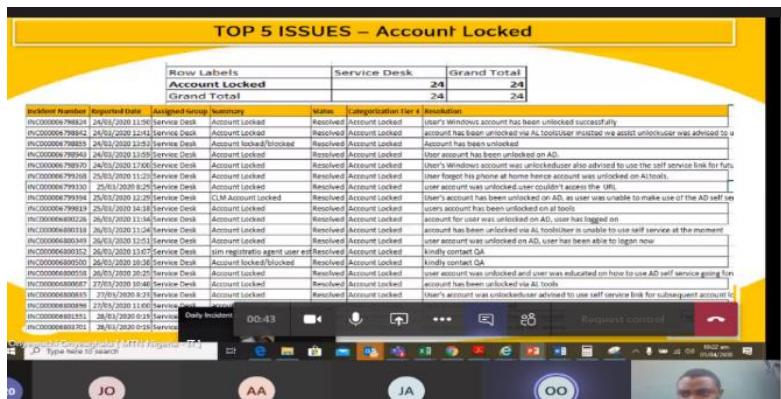
Governance Weekly meeting with IS Operation



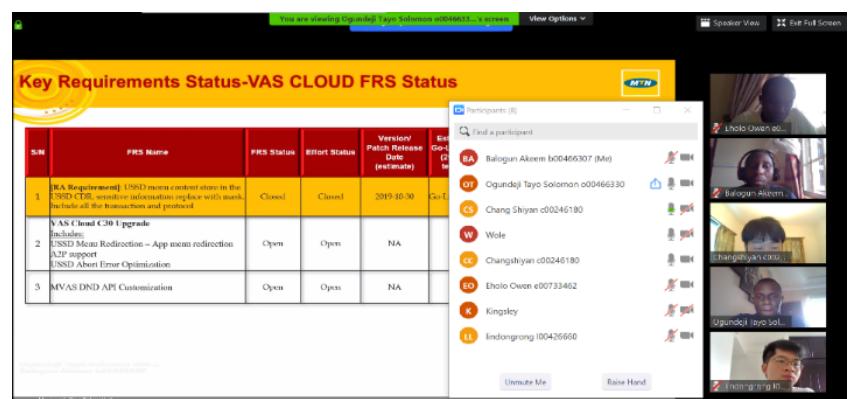
Technical team Leader Evening meeting 5PM



MTN Remedy Teams Meeting



Delivery Weekly meeting with IS Planning



Key Take-Aways

- **R&D Capabilities:**

- 1) All Self-developed, Not OEM

Best compatibility and performance, Industry leading Computing Reliability and **99.9999%** reliability Storage

- 2) Long-term evolution guarantee:

Huawei continuous strategic investment in ICT ,10000+ R&D Engineers, 7 Global R&D centers.

- 3) Huawei has rich experience in Telecom Industry, understand Carrier demand better and we understand MTN MUNIC strategy very well.

- **Services:**

- ✓ End-to-End global service guarantee Fastest Response and High-Quality Maintenance & Support.

- **Delivery:**

- ✓ Stable supply, supporting MTN digital transformation;

- ✓ Quick response due to plentiful local resource to cover MTN OPCOs

- **Global Customers:**

- ✓ Currently, Short list members of **83%** global tier-1 carriers



Thank you.

把数字世界带入每个人、每个家庭、
每个组织，构建万物互联的智能世界。
Bring digital to every person, home, and
organization for a fully connected,
intelligent world.

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