

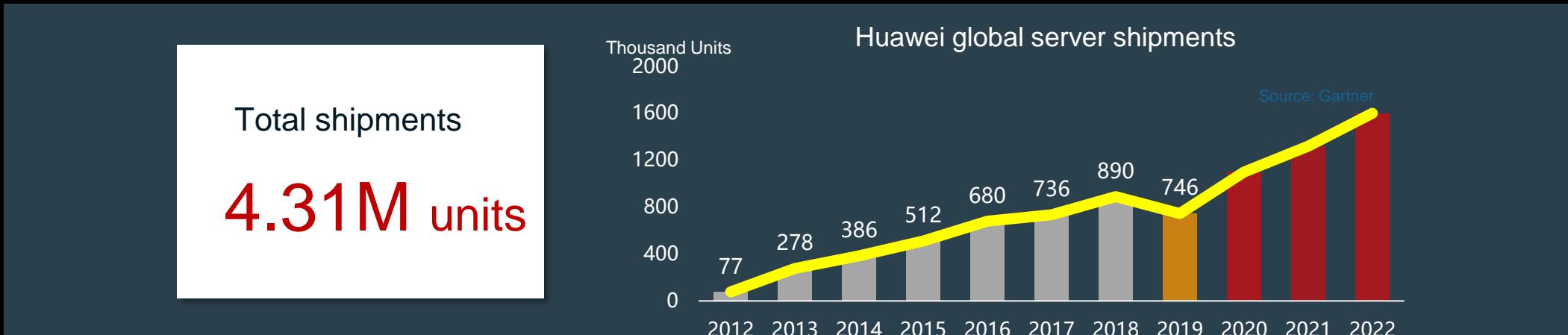
Pervasive Computing, Pervasive Intelligence

Author: Jinshui Liu, Distinguished Technologist

Date: June 16, 2020

Continuous Innovation with Intel

- ✓ 19 Years Strategic Partnership since 2001, over 4.31M Units Shipped
- ✓ FusionServer/Pro X86 Products Synchronous to Intel Processor Release Schedule



In 2001, strategic partnership Signed, and Huawei started server R&D.

High-level interaction for a long time, continuing to jointly release new products and solutions

2016 HCC Conference, jointly released the RSD server

2016, jointly released KunLun, the 32-socket mission critical server

2016, jointly built the innovation computing center in Hangzhou

2017, Jointly held CTO technical forums about AI, edge computing, and cloud computing

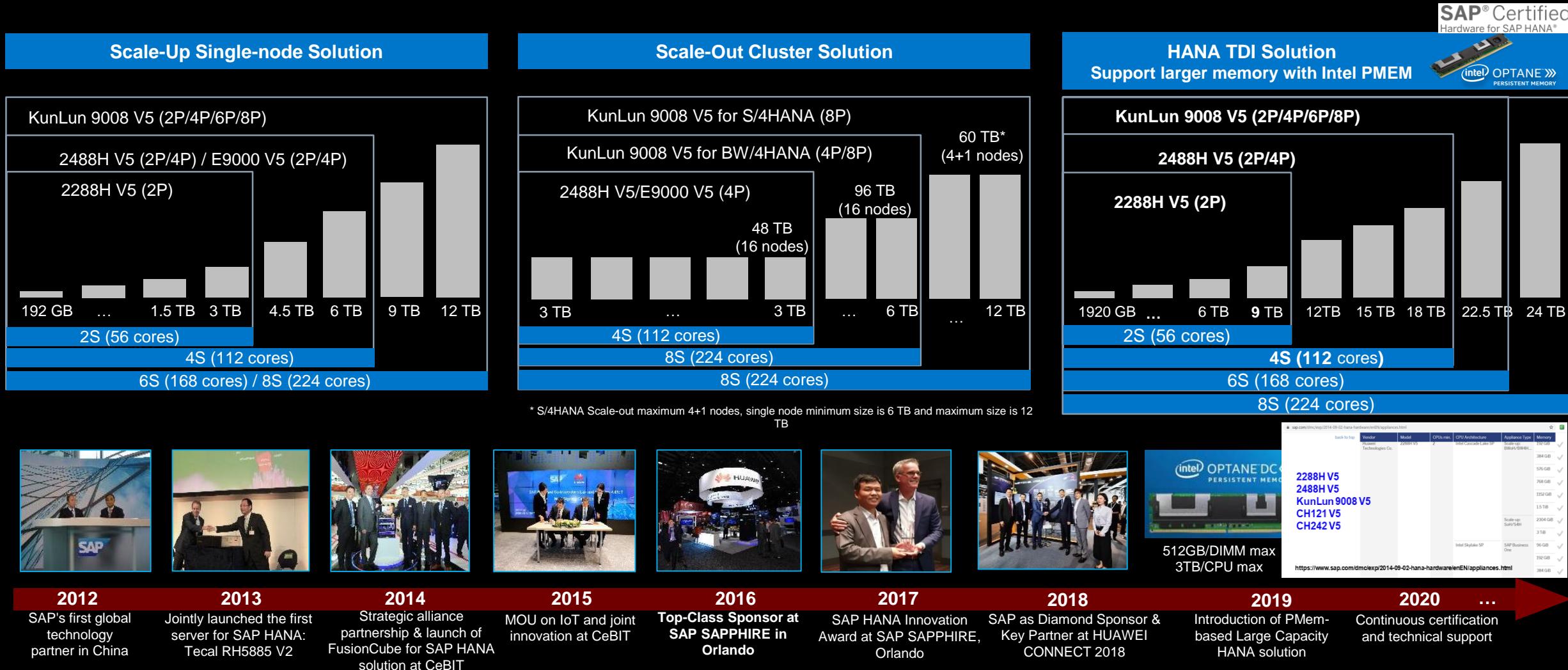
2017, HPC innovation MoU Signed

2019, jointly released the FusionServer Pro server based on 2nd generation Intel Xeon processors

Release next-generation server product

Leading Big Data Solutions with SAP

- ✓ Our Strategic Partner **SAP** will continue provide compatibility certification and technical support for **FusionServer Pro** servers.



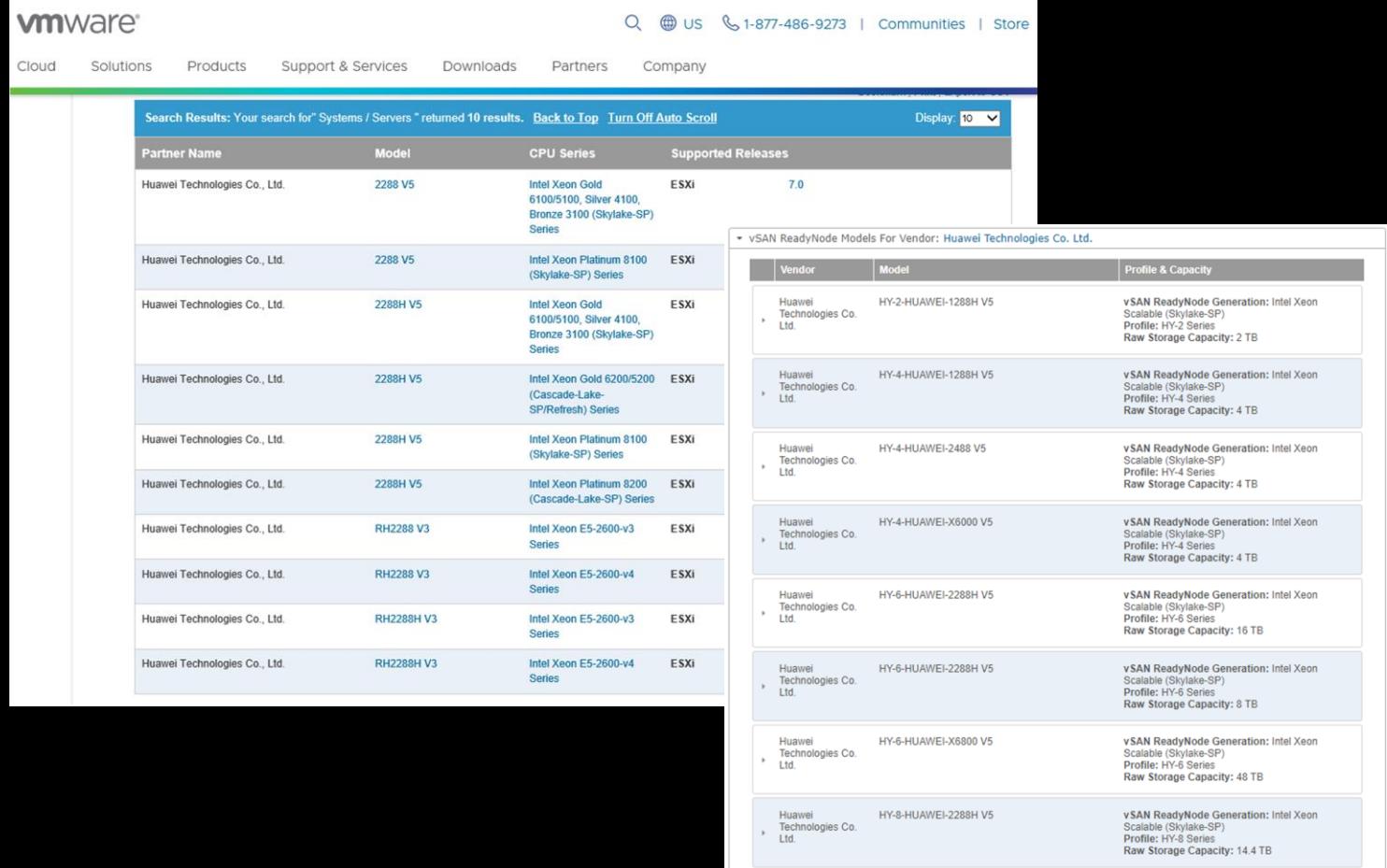
Partners Will Continue to Provide Compatibility Certification and Technical Support for Huawei Servers

- ✓ Partners such as **VMware**, **SUSE**, **CentOS**, 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.

Certification results are available on the VMware official website:
https://www.vmware.com/resources/compatibility/search.php?deviceCategory=server&details=1&partner=242&releases=448&keyword=2288&page=1&display_interval=10&sortColumn=Partner&sortOrder=Asc

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

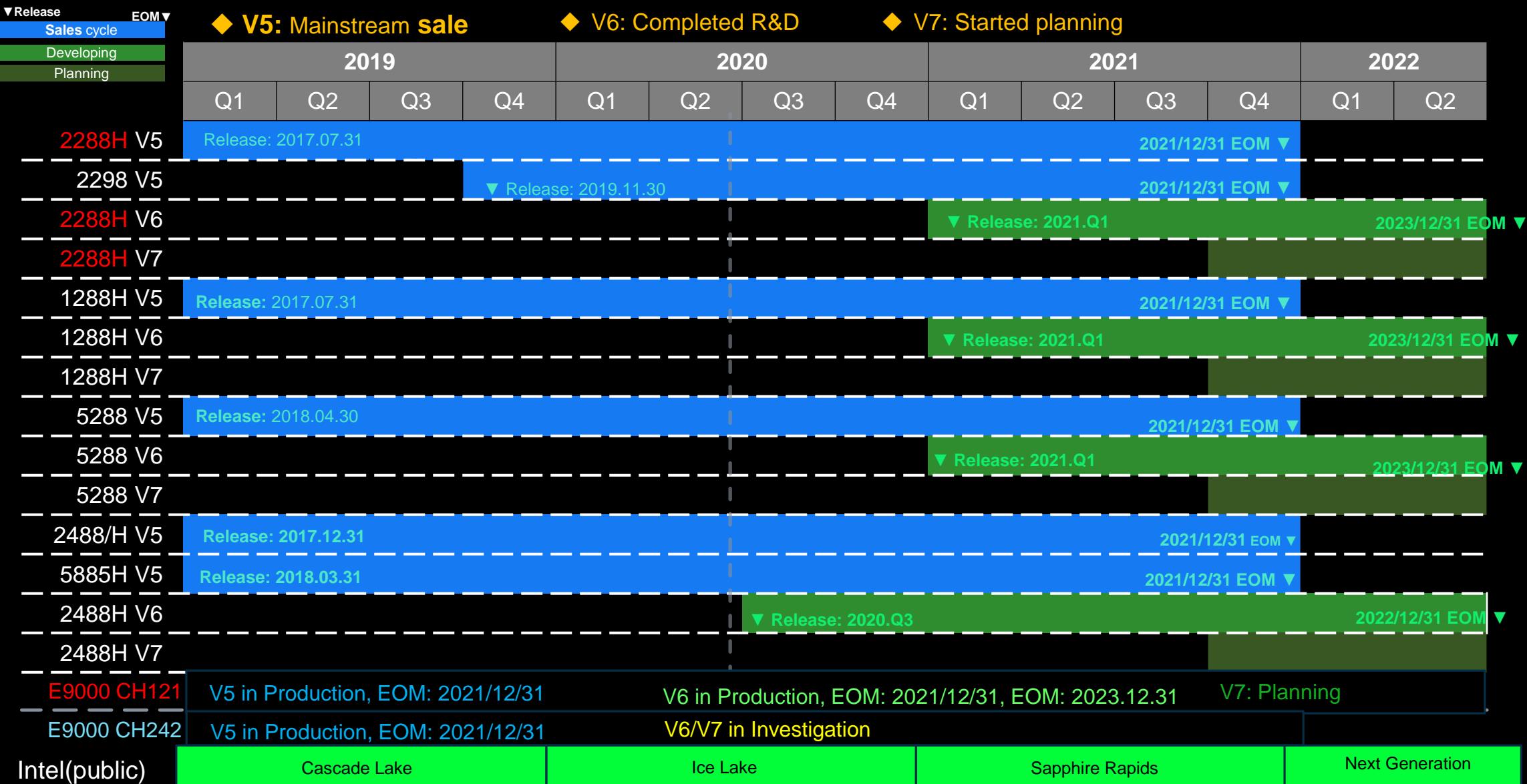


The screenshot shows the VMware compatibility search results for "Systems / Servers". The results table lists 10 entries, all from Huawei Technologies Co., Ltd., showing compatibility with vSphere 7.0. The table includes columns for Partner Name, Model, CPU Series, and Supported Releases. To the right of the main table, there is a sidebar titled "vSAN ReadyNode Models For Vendor: Huawei Technologies Co. Ltd." which lists various models with their vendor, model, and profile details.

Partner Name	Model	CPU Series	Supported Releases
Huawei Technologies Co., Ltd.	2288 V5	Intel Xeon Gold 6100/5100, Silver 4100, Bronze 3100 (Skylake-SP) Series	ESXi 7.0
Huawei Technologies Co., Ltd.	2288 V5	Intel Xeon Platinum 8100 (Skylake-SP) Series	ESXi
Huawei Technologies Co., Ltd.	2288H V5	Intel Xeon Gold 6100/5100, Silver 4100, Bronze 3100 (Skylake-SP) Series	ESXi
Huawei Technologies Co., Ltd.	2288H V5	Intel Xeon Gold 6200/5200 (Cascade-Lake-SP/Refresh) Series	ESXi
Huawei Technologies Co., Ltd.	2288H V5	Intel Xeon Platinum 8100 (Skylake-SP) Series	ESXi
Huawei Technologies Co., Ltd.	2288H V5	Intel Xeon Platinum 8200 (Cascade-Lake-SP) Series	ESXi
Huawei Technologies Co., Ltd.	RH2288 V3	Intel Xeon E5-2600-v3 Series	ESXi
Huawei Technologies Co., Ltd.	RH2288 V3	Intel Xeon E5-2600-v4 Series	ESXi
Huawei Technologies Co., Ltd.	RH2288H V3	Intel Xeon E5-2600-v3 Series	ESXi
Huawei Technologies Co., Ltd.	RH2288H V3	Intel Xeon E5-2600-v4 Series	ESXi

Vendor	Model	Profile & Capacity
Huawei Technologies Co. Ltd.	HY-2-HUAWEI-1288H V5	vSAN ReadyNode Generation: Intel Xeon Scalable (Skylake-SP) Profile: HY-2 Series Raw Storage Capacity: 2 TB
Huawei Technologies Co. Ltd.	HY-4-HUAWEI-1288H V5	vSAN ReadyNode Generation: Intel Xeon Scalable (Skylake-SP) Profile: HY-4 Series Raw Storage Capacity: 4 TB
Huawei Technologies Co. Ltd.	HY-4-HUAWEI-2488 V5	vSAN ReadyNode Generation: Intel Xeon Scalable (Skylake-SP) Profile: HY-4 Series Raw Storage Capacity: 4 TB
Huawei Technologies Co. Ltd.	HY-4-HUAWEI-X6000 V5	vSAN ReadyNode Generation: Intel Xeon Scalable (Skylake-SP) Profile: HY-4 Series Raw Storage Capacity: 4 TB
Huawei Technologies Co. Ltd.	HY-6-HUAWEI-2288H V5	vSAN ReadyNode Generation: Intel Xeon Scalable (Skylake-SP) Profile: HY-6 Series Raw Storage Capacity: 16 TB
Huawei Technologies Co. Ltd.	HY-6-HUAWEI-2288H V5	vSAN ReadyNode Generation: Intel Xeon Scalable (Skylake-SP) Profile: HY-6 Series Raw Storage Capacity: 8 TB
Huawei Technologies Co. Ltd.	HY-6-HUAWEI-X6800 V5	vSAN ReadyNode Generation: Intel Xeon Scalable (Skylake-SP) Profile: HY-6 Series Raw Storage Capacity: 48 TB
Huawei Technologies Co. Ltd.	HY-8-HUAWEI-2288H V5	vSAN ReadyNode Generation: Intel Xeon Scalable (Skylake-SP) Profile: HY-8 Series Raw Storage Capacity: 14.4 TB

Continuous Evolution Roadmap Synchronous to Intel Release Schedule



What Customers Considered When Choosing Huawei Computing

✓ Quality Products

- DNA of Telecomm Products, E2E Quality Control

✓ Innovative Product Features

- Enabled by Self-Developed ASICs for Management, Perf, Deployment & Diagnosis

✓ Knowledgeable & Experienced Team

- Both Hardware & Software, Applications & Operations

✓ Long-Term Commitment & Support

- Both spare Parts & Software

✓ Secure & Reliable Supply Chain

- Quick Delivery, Security & Source Quality Control
- Fewer Suppliers to Manage

✓ Local Support

- Quick response & Easy to reach

✓ Competitive Pricing for TCO

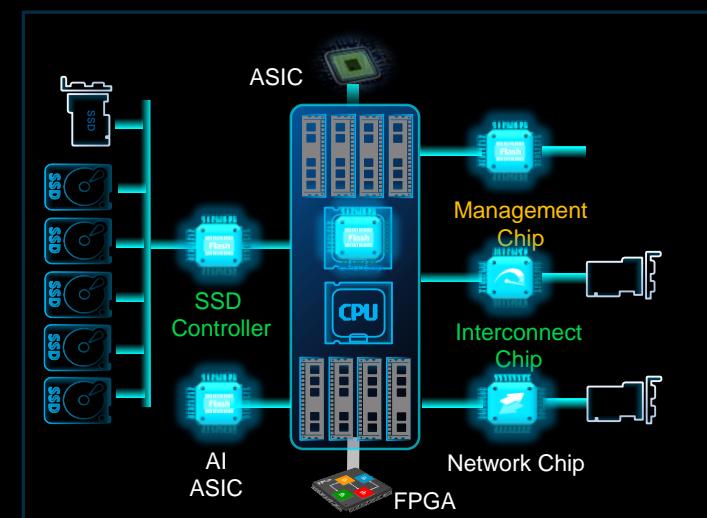
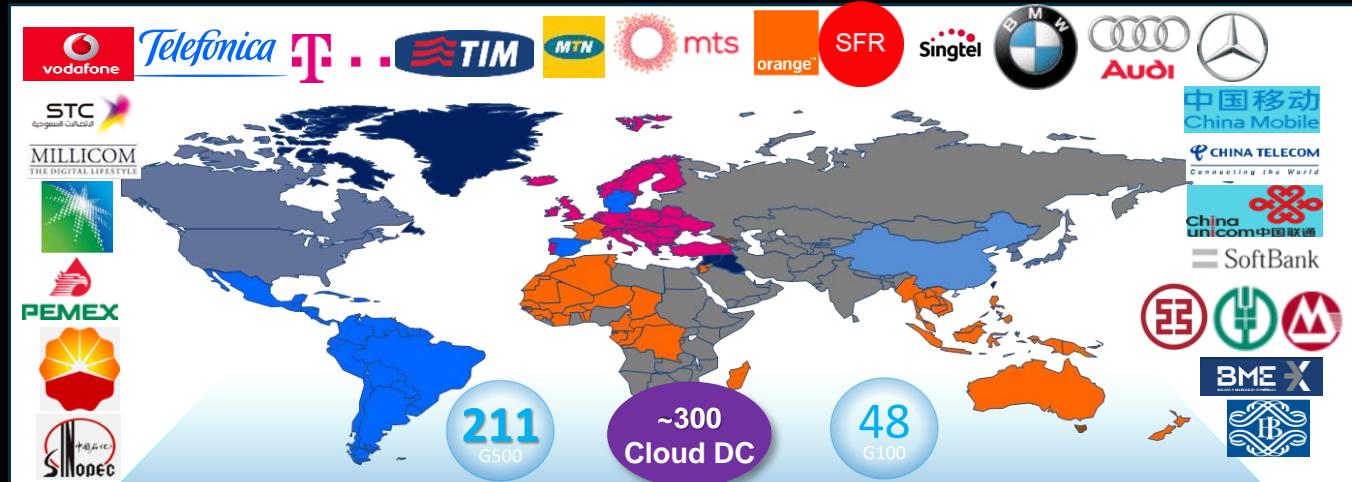
- Not Only CAPEX, but also OPEX

✓ Partnership & Ecosystem

- Strategic Partnership with key players, X86 ecosystem

✓ Rich Product Portfolio

- No One Fits All, Rich Models to choose



Monetize the New “Oil” with Real-Time Analytics, HPC & AI

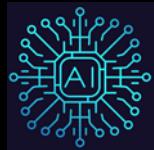
Market Opportunities



\$717B Smart Cities Market by 2023 (M&M)



\$484B Global MaaS Market Value by 2024 (MRFR)



\$391B Global AI Market Size by 2025 (Grand View Research)



\$103B Big Data Analytics Market by 2027 (Wikibon)



6.9M Units of Autonomous Driving Vehicles by 2030 (M&M)

Data Generated & Projected



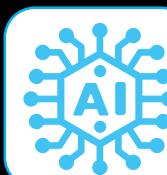
40 ZettaBytes in 2020
175 ZettaBytes in 2025
80 ZettaBytes by IoT Devices in 2025 (IDC)



2.5 Exabytes data generated everyday by Internet users by 2020 (iorgforum.org)



Nearly 30% of the data to be processed in real-time in 2025 (IDC)



97.2% of organizations are investing in big data and AI



63% Americans would give up cars for UBER & Lyft (investors.com)

Digital around the World in 2019 (source: most datareportal.com)

World's Population



7.676 Billion
Urbanization 56%

Unique Mobile Users



5.112 Billion
Penetration 67%

Internet Users



4.388 Billion
Penetration 57%

Active Social Media Users



3.484 Billion
Penetration 45%

Mobile Social Media Users



3.256 Billion
Penetration 42%

Facebook Active Users



2.3 Billion
Generated a Lot of data

Active IoT Devices



9.5 Billion
Generated a Lot of data

Estimated Data / AD

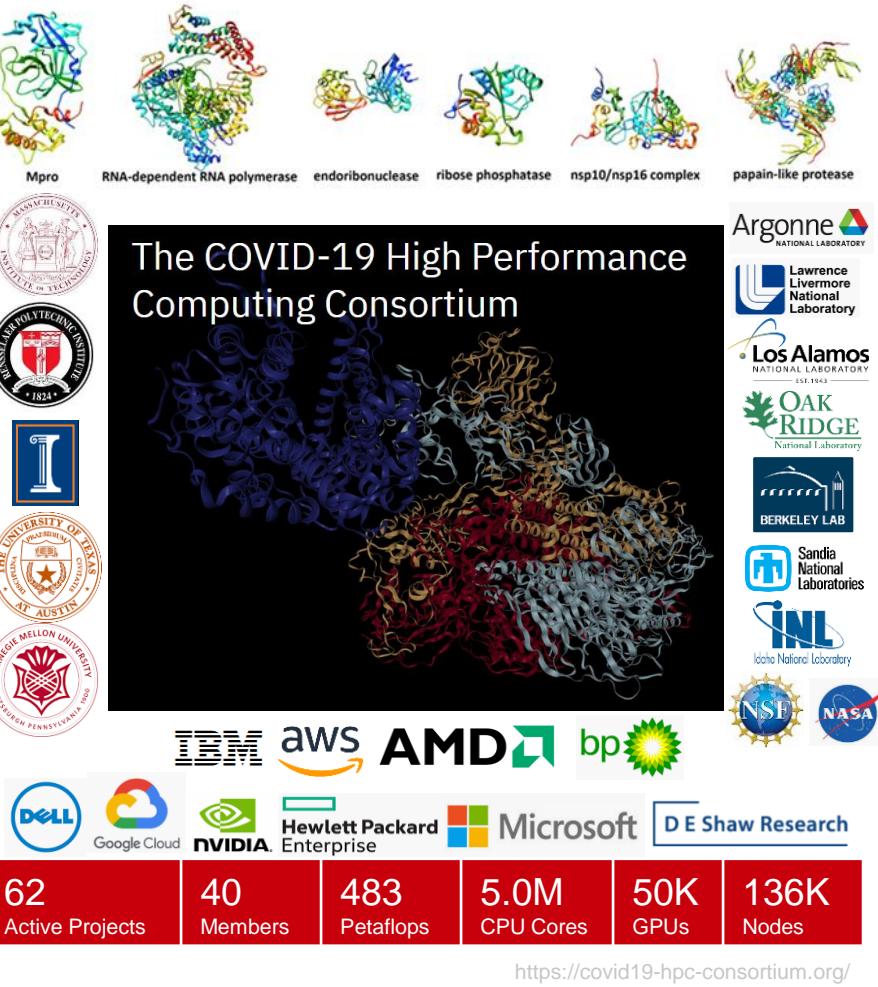


4TB/day
3000X of People

HPC & AI to Combat COVID-19 Pandemic

- ✓ HPC & AI for Development of Treatments, Medicines and Vaccines; CT Images Analysis; Tracing, Tracking & Predicting

Development of Treatments, New Medicines and Vaccines



Tracing, Tracking & Predicting in Real-Time



Contract Tracing

- ✓ 160B rows of data
- ✓ 5M Mobile devices

Monitoring of Effectiveness of movement restrictions

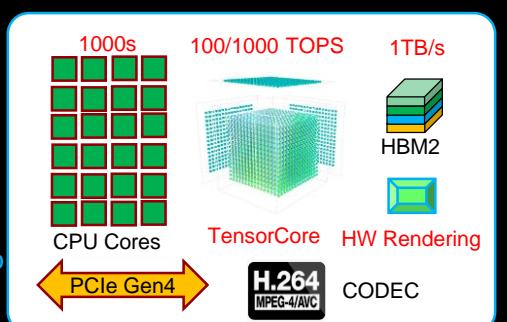
Predicting

- ✓ 16B location records
 - ✓ 6M Mobile devices
- Which community will be impacted & when?
Which business, school to open, where and when?

Automated AI CT images Analysis



- Atlas 800 Server w/ Atlas 300 AI Cards
- Identify COVID-19 Symptoms in 2 to 3 minutes, down from 15-20 minutes
- Accuracy of 98%+ from 90%

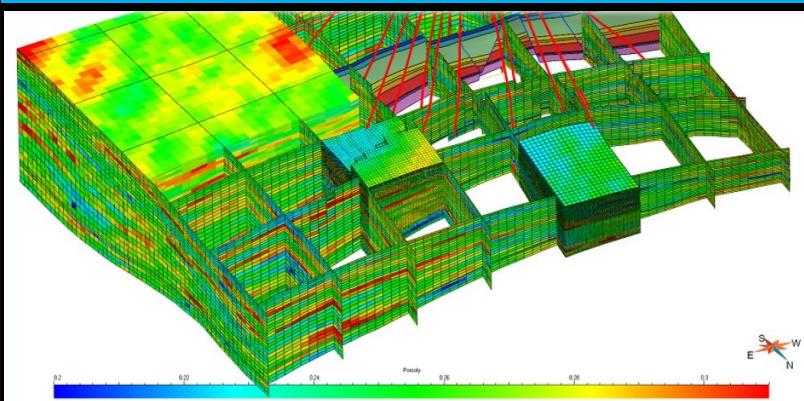
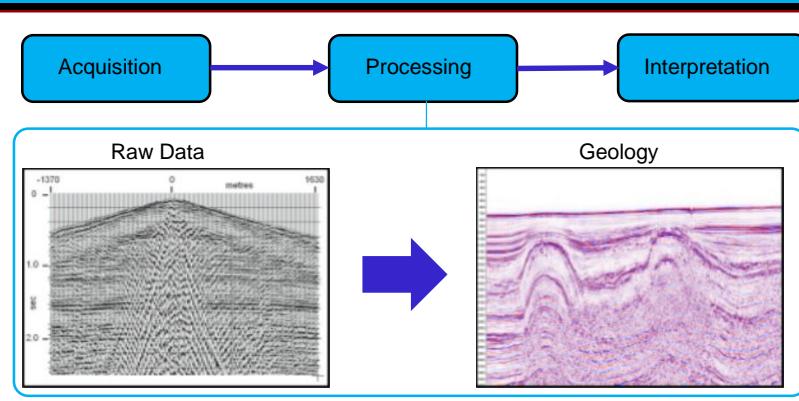
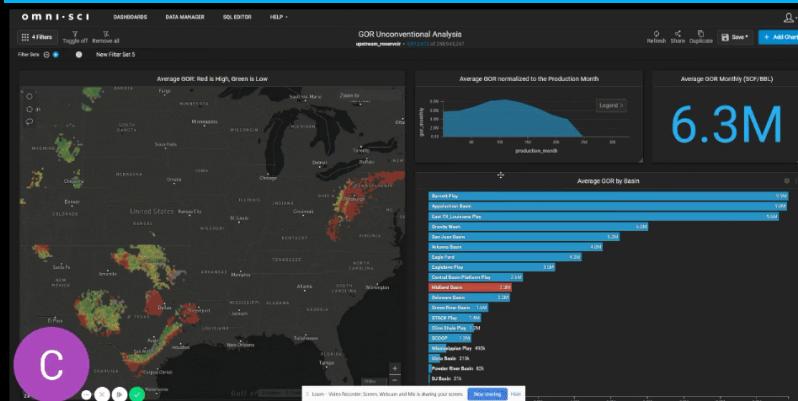


HPC & AI for Oil & Gas

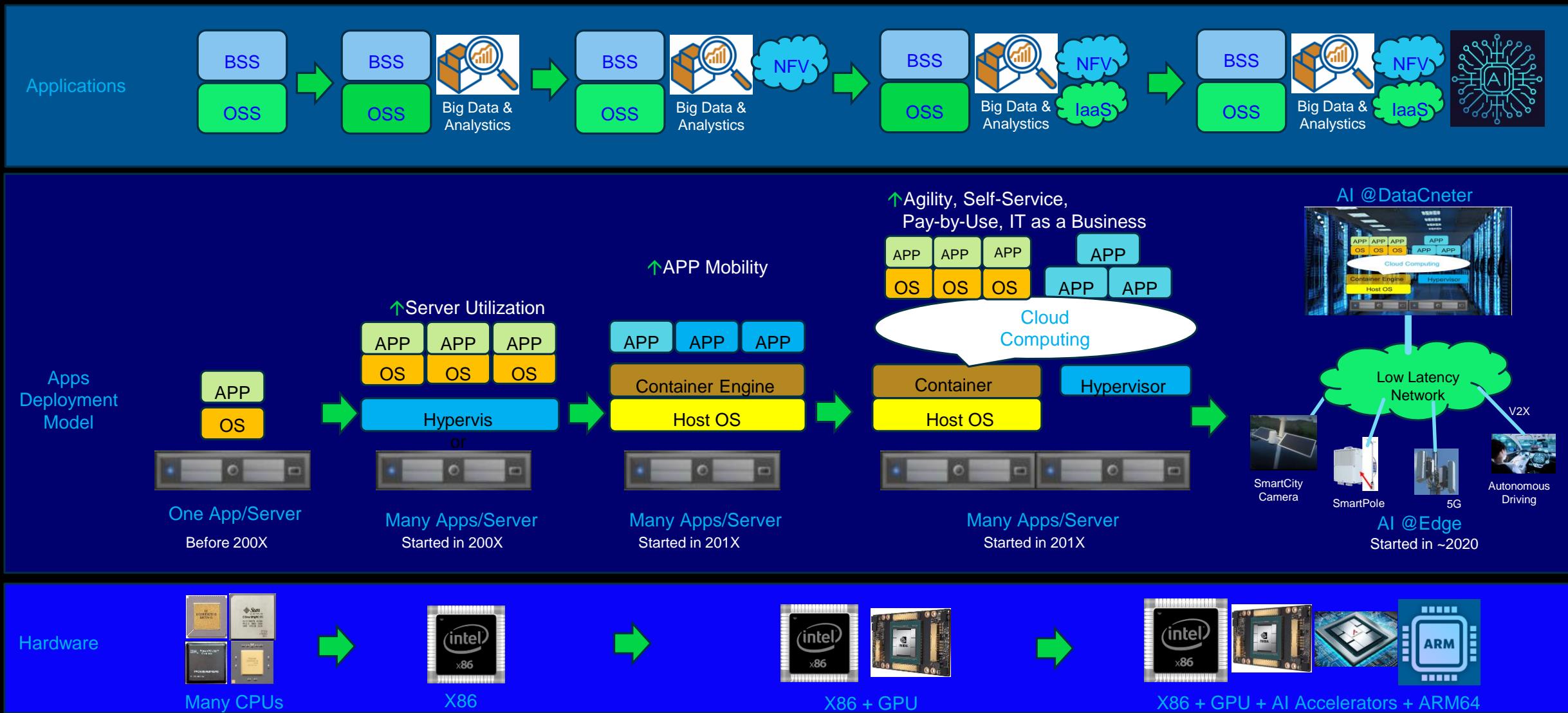
- Well Monitoring & Predictive Maintenance in Real-time & Geospatial Visualization
- Reservoir behavior tracking and analysis for Investment evaluation in Real-time & Geospatial Visualization
- Fleet Management based on Vehicle Telematics data in Real-time & Geospatial Visualization

- Highly Parallel and INT/SP-FP Intensive
- DL/AI to build HD 3D Earth Model
- DL/AI to enhance Synthetic Logs
- DL/AI to interpret subsurface images from seismic studies

- Highly Parallel and DP-FP Intensive
- GPU accelerated Reservoir Simulation
- DL/AI for Automated Simulation Result Analysis for Simulation Iteration Process Optimization
- DL/AI to solve fluid flow equations

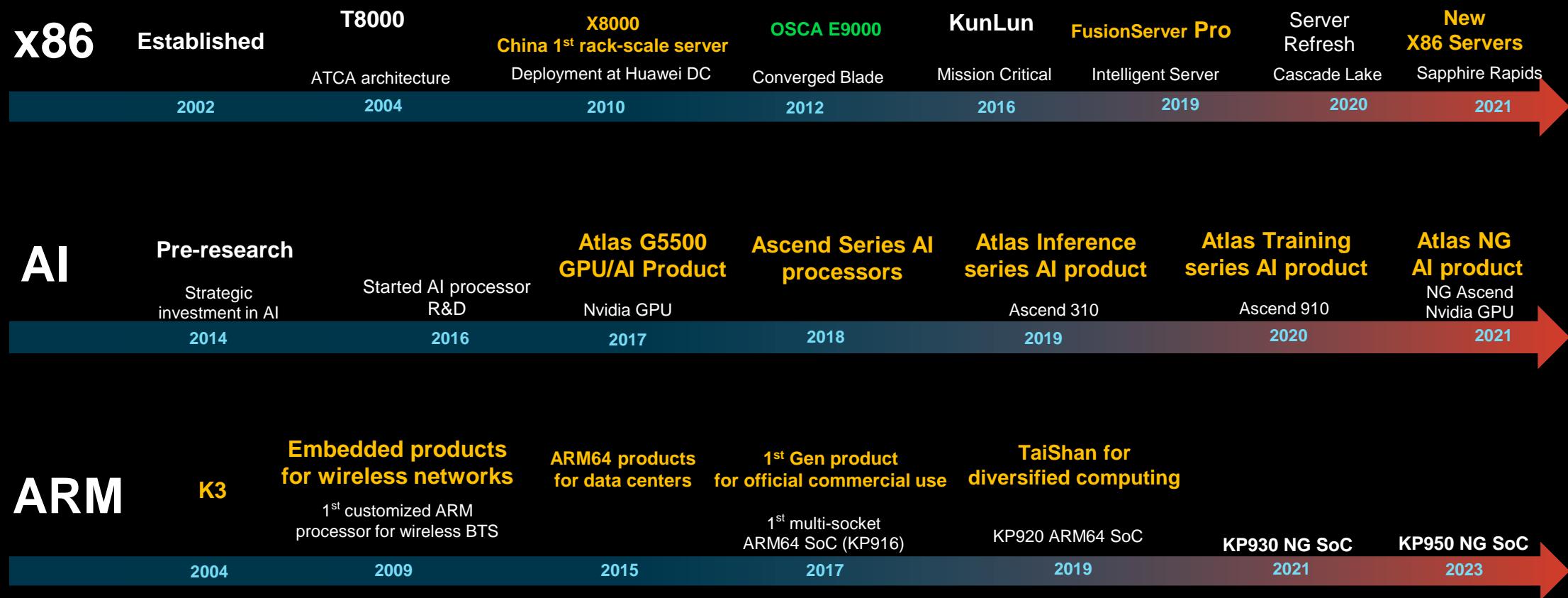


Telco Computing Evolution: Cloud, 5G, AI, Intelligent Edge



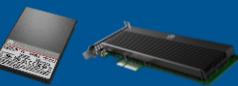
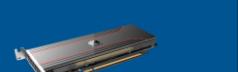
The Best Platform for the Most Suitable Applications

- ✓ No One Fits All: New Applications Need Optimized Hardware Platform for the Best Efficiency & TCO
- ✓ FusionServer/Pro X86 Products Synchronous to Intel Processor Release Schedule



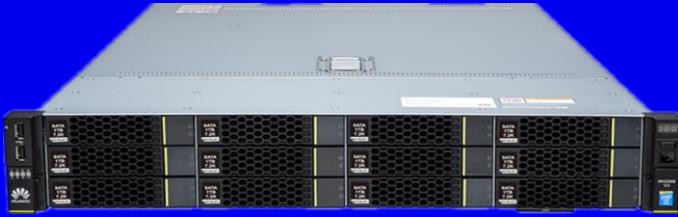
Rich Portfolio to Meet Your Every Intelligent Computing Need

- ✓ 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 processor, synchronous to Intel CPU Release Schedule

<p>Mission Critical</p>  <p>KunLun 9008 V5</p>	<p>Full Liquid Cooling Solution</p>   <p>X6000 XH321L V5 E9000 CH121L V5</p>			 <p>E9000</p>	<p>Converged Blade Servers</p>   <p>General Compute-intensive</p> <p>CH121 V5 CH242 V5</p>
<p>Rack Servers</p>  <p>1288H V5</p>  <p>2288H V5</p>  <p>2298 V5</p>  <p>5288 V5</p>  <p>2488/H V5</p>  <p>5885H V5</p> <p>New</p>	<p>High-Density Servers</p>  <p>2U 4-node</p>  <p>Compute-intensive</p>  <p>4U 4-node</p>  <p>Storage-intensive</p>  <p>X6000 XH321 V5 XH321L V5 X6800 XH628 V5</p>				
<p>Intelligent Acceleration Engine</p>  <p>NVMe SSD</p>  <p>Intelligent NIC</p>  <p>AI accelerator card</p> <p>Atlas 300</p>	<p>Intelligent Management Engine</p>  <p>FusionDirector</p> <p>5 intelligent management features</p>	<p>Heterogeneous Servers</p>  <p>G5500 full-width server</p>  <p>G5500 half-width server</p> <p>Nvidia V100 GPU shipping Ampere GPU coming</p>			

Our X86 Flagship FusionServer Pro Products: RH2288 & E9000

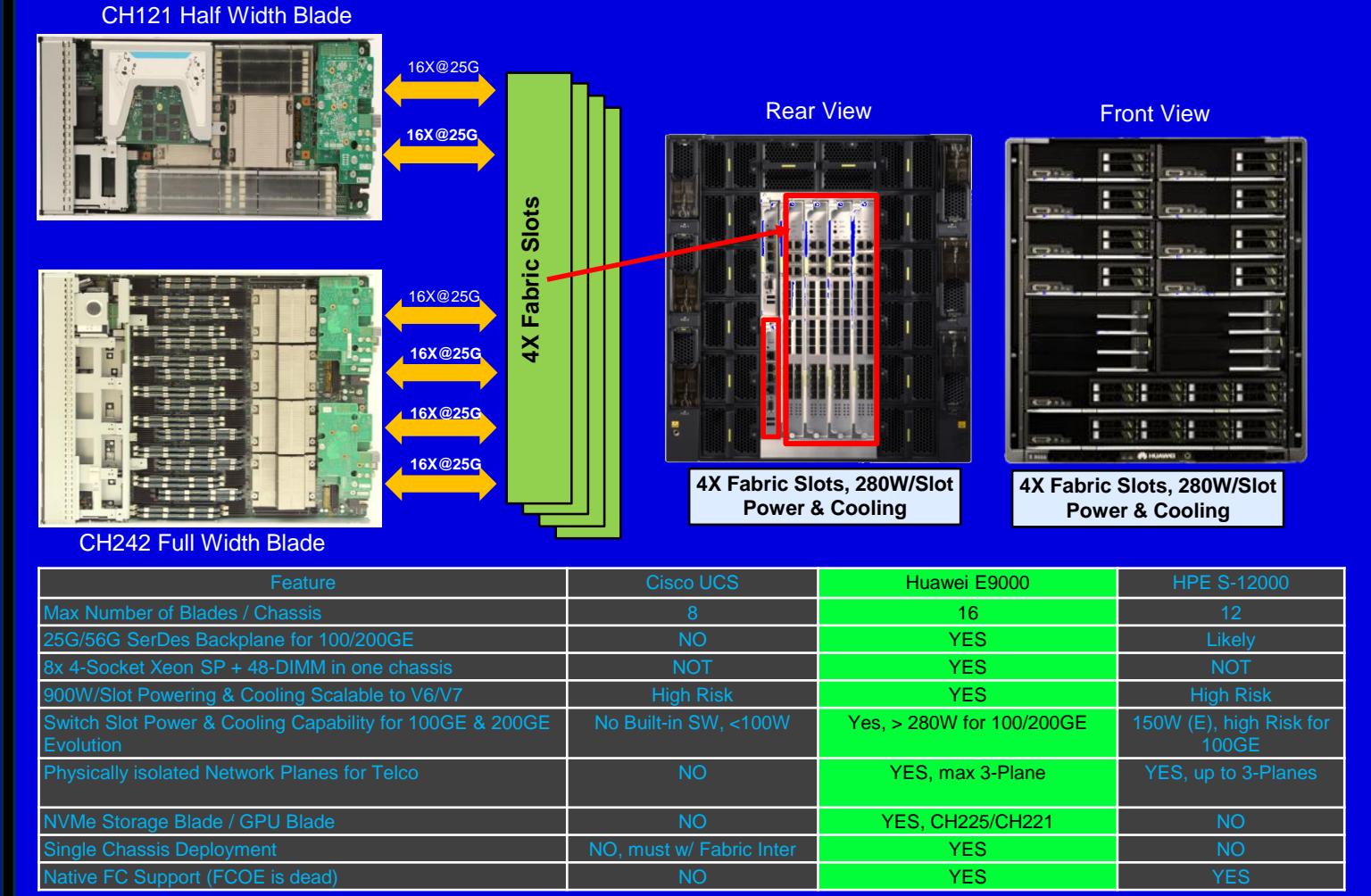
RH2288H V5: 2U Rack Server



Key Features:

- ✓ 1-2 Sockets in 2U, any TDP X86 CPU;
- ✓ 24x-DDR4-2933 Memory
- ✓ 8x External PCIe Gen3 Expansion Slots
- ✓ 2x Internal PCIe Gen 3 Expansion Slots
- ✓ 2x10GE+2xGE LOM
- ✓ Max. 20x 3.5" or 31x 2.5" SATA/SAS HDDs
- ✓ 4/8/12/24/28 2.5" NVMe SSD
- ✓ 1+1 Redundant 96% efficiency PSUs
- ✓ 3+1 Redundant Cooling Fans

E9000 Scalable, Reliable & Converged Blade Server



<https://support-it.huawei.com/server-3D/res/server/2288hv5/index.html?lang=en>

<https://support-it.huawei.com/server-3D/res/server/e9000/index.html?lang=en>

E9000: Better Utilize Your Rack Power Budget w/ Lower Cost

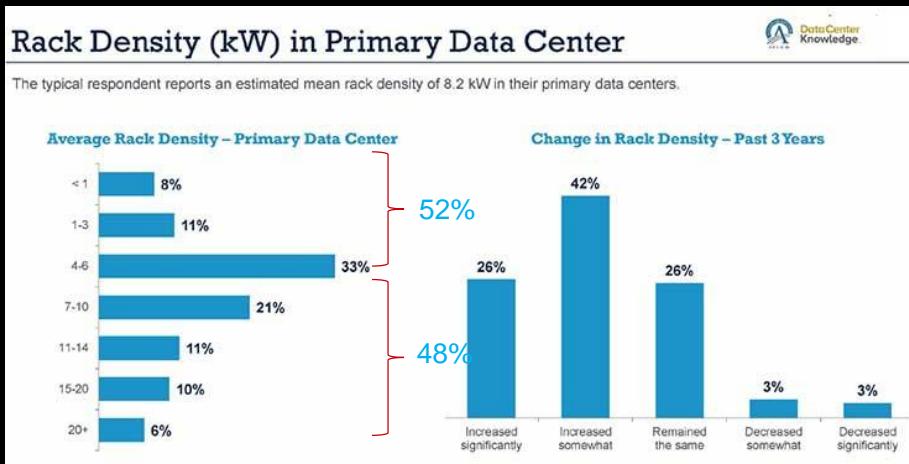
Average Data Center Rack Power Density Going Up

- 8.2kW/Rack in 2019
 - 7.3kW/Rack in 2018
 - 7.2kW/Rack in 2017
 - ~68% of respondents reported that rack density has increased over the past three years,
 - ~26% saying the increase was "significant."
 - 1kW/U is the current trend for HPC/AI servers
- ✓ Driven by AI Workloads & X86 CPU TDP growth

Source: AFCOM 2020 State of the Data Center report

AFCOM DC Power Density Definition

- Low: <=4kW/Rack
- Medium: 5kW-8kW/Rack
- High: 8kW-15 kW/Rack
- Extreme: >=16kW/Rack



Huawei E9000



- 12U-16 Blades
- 9KW Max Capability

HPE S-12000



- 10U-12 Blades
- 7.5KW Max Capability

Rack Power Density	HPE S12000	Huawei E9000	E9000 Advantages
<=7.5KW/Rack	1 chassis /rack	1 chassis / rack	Higher energy efficiency
7.5KW-9KW/Rack	2 chassis /rack	1 chassis /rack	1 chassis saving
9KW-15KW/Rack	2 chassis / rack	2 chassis / rack	Higher energy efficiency
15KW-18KW/Rack	3 chassis / rack	2 chassis / rack	1 chassis saving

Accelerating X86 Server Performance

ES3000 series intelligent SSDs



- Optimal performance: PCIe Gen4 1.66M Random read IOPS, 7.0GB/s sequential read bandwidth
- All-scenarios: low latency, high performance, large capacity
- Service-aware: intelligent multi-stream, SR-IOV, atomic write

Performance
100% up

Service life
20% longer

IN200/300 series intelligent NICs



- Converged: 10GE/25GE/40GE/100GE, 8G/16G/32G FC
- Accelerated: RoCE
- Reliable: industry unique to support firmware upgrade without service interruption

CPU offload
15%

Latency
30% less

Atlas 300 AI accelerator card

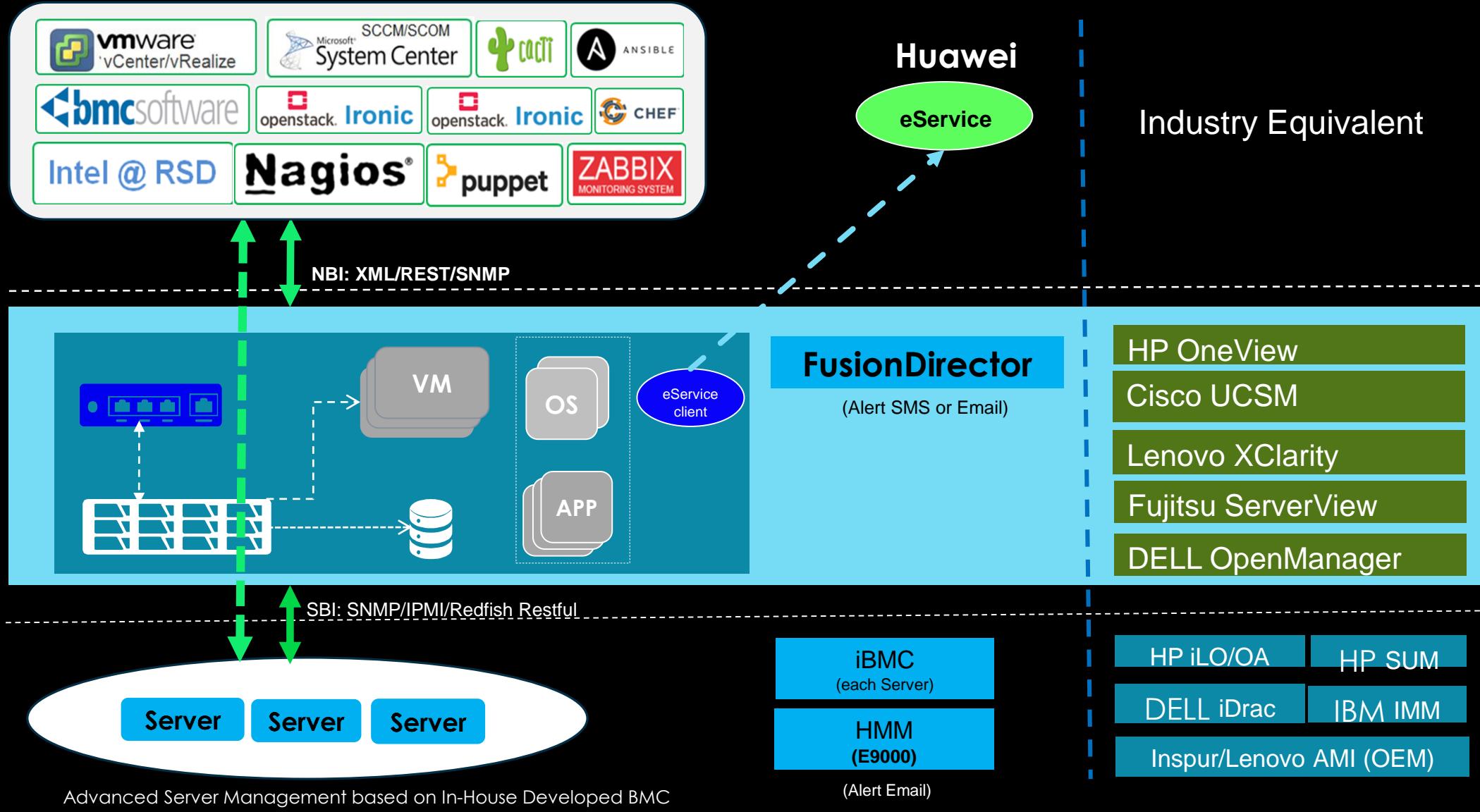


- Powerful computing: 64 TOPS of INT8
- High-density video parsing: 64-channel HD video real-time analytics

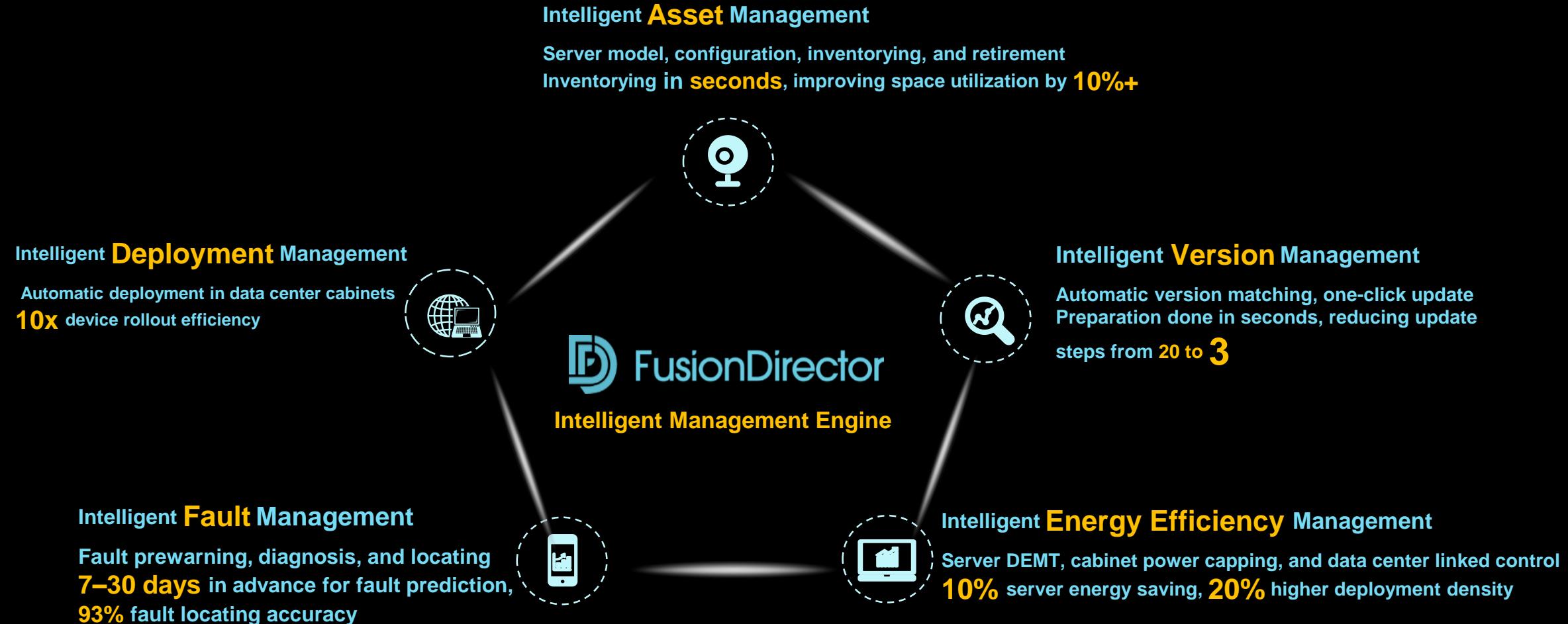
CPU offload
15%

Performance
64-Ch HD

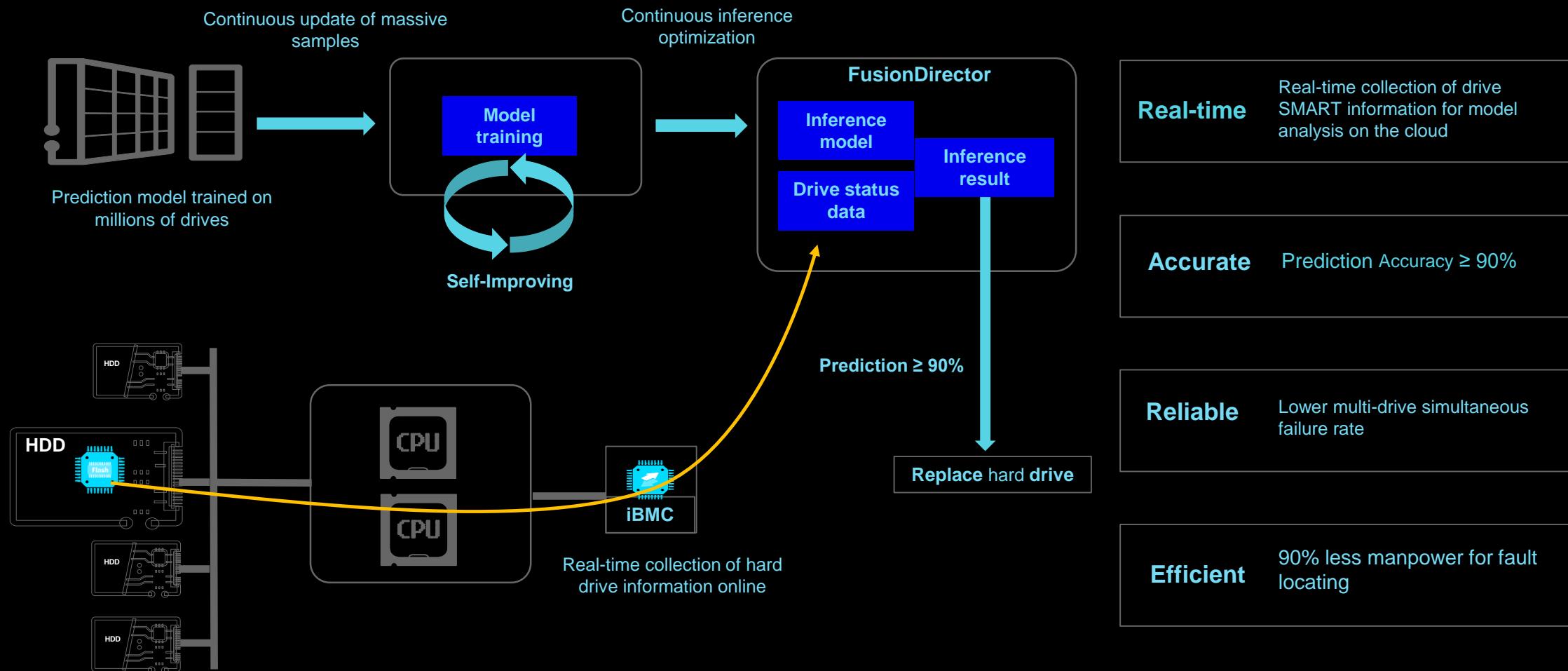
Open & Standard-Based Server Management



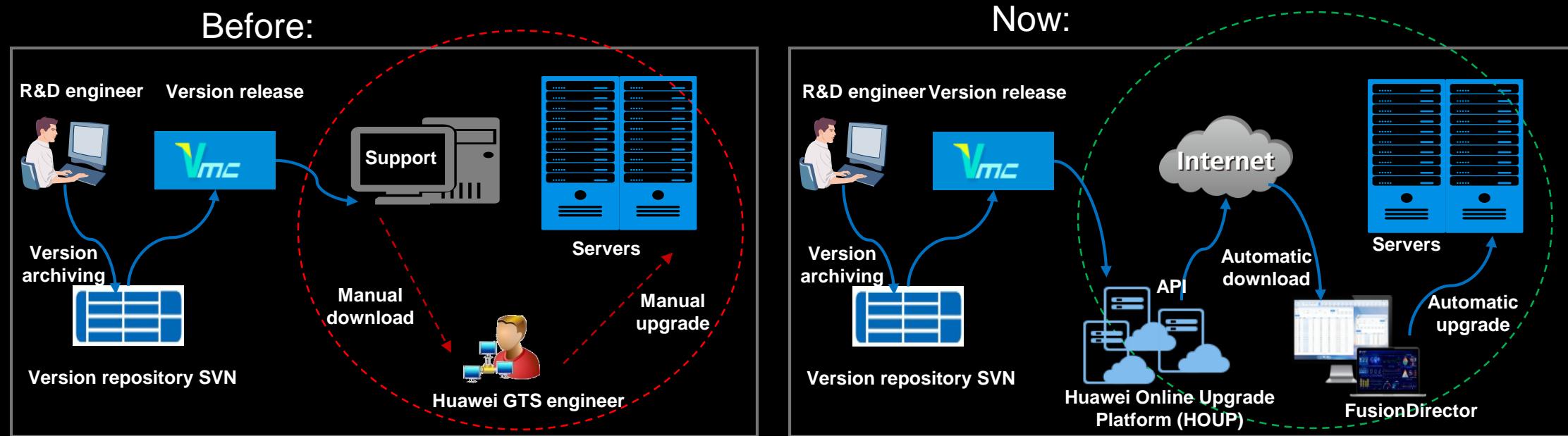
FusionDirector: 5 Intelligent Management Features Reduce OPEX



Intelligent Fault Prediction: Predicts Risky Hard Drives 7–30 Days in Advance



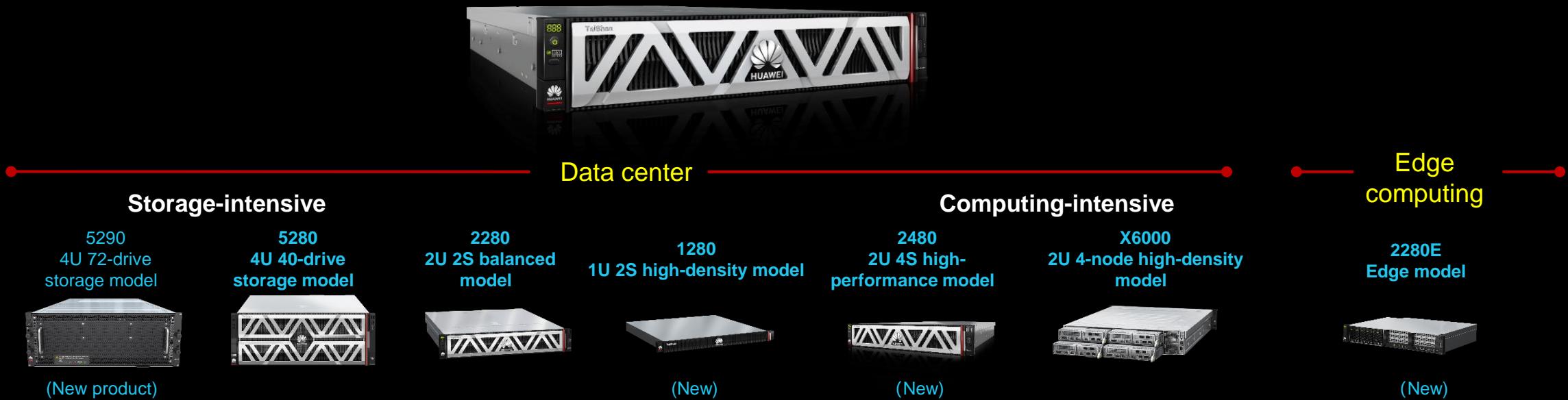
Intelligent Version Management: Automatic Upgrade Of Device Software



- Automatic download: Automatically detects the firmware and drivers of servers of different models and manages firmware versions comprehensively
- O&M engineers do not need to manually download, upload, or upgrade firmware
- Independent out-of-band upgrade, without occupying service bandwidth

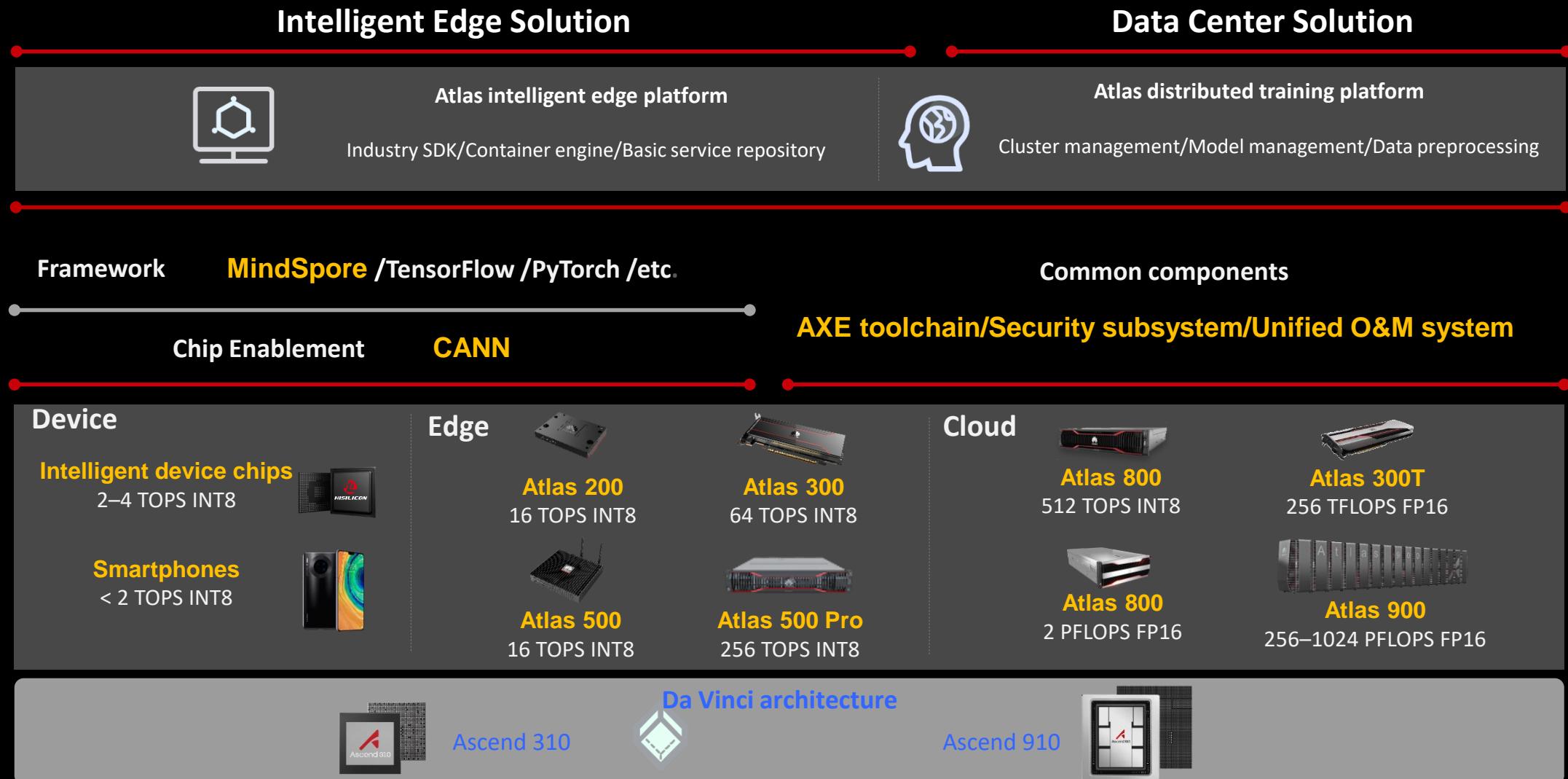
TaiShan ARM64 Servers for ARM-Native & New Applications

- ✓ More High Performance Cores and Memory Bandwidth (64 cores & 8-CH DDR4 / Socket)
- ✓ Lower Power Consumption per CPU & per Server with Higher Integration
- ✓ Software Ecosystem is maturing rapidly
- ✓ Ideal for: ARM-Native Workloads, High Scalable & High Memory Bandwidth Workloads



*New Product: Released in 2020

Powerful AI Computing Platform to Enable Intelligent Transformation



Huawei Server Helps Spain to Build 5G Core Network (2019)



The Vodafone Group, the world's second largest mobile communications company, is a multinational mobile phone operator. Headquartered in Newbury, Berkshire, UK and Düsseldorf, Germany. It is one of the world's largest mobile operators, with a network covering 26 countries and providing network services with its partners in 31 other countries. Vodafone has the world's most complete enterprise information management system and customer service system, and has a strong advantage in increasing customers, providing services and creating value. Vodafone's global strategy is to cover voice, data, Internet access services and provide customer satisfaction. Vodafone Group has more than 100,000 employees worldwide

Challenges

- Spain's VDF 5G subnet is an important position for VDF Group's 5G strategy. It needs to rapidly deploy 5G networks and quickly occupy the 5G market.
- The deployment scale is large and involves many business modules.

Solution

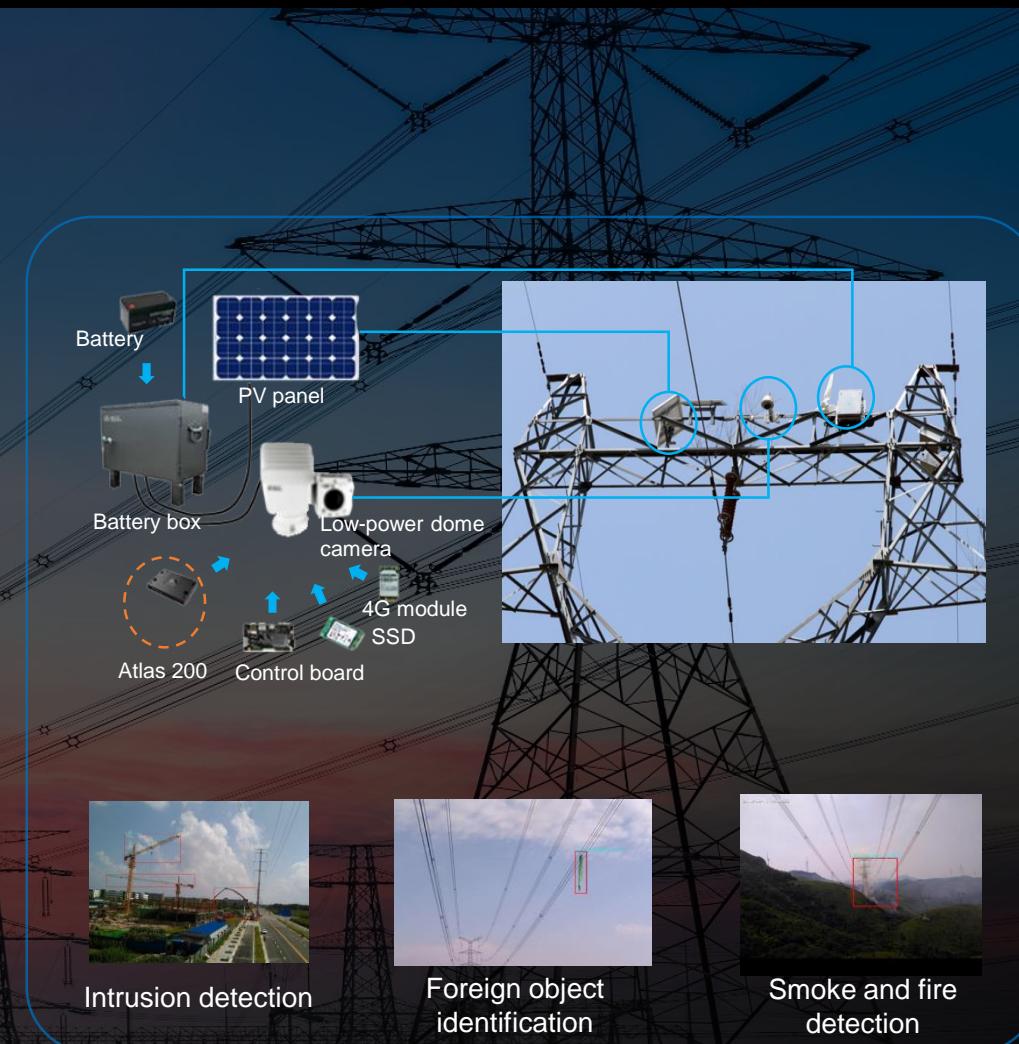
- Huawei provides 2S FusionServer Pro 2288H V5 rack servers and E9000 blade servers (2S CH121 V5 blade nodes).
- Huawei's next-generation V5 server with Intel Cascade CPU provides a stronger computing power, while supporting GPU cards to meet customers' desire to deploy GPU heterogeneous computing power.
- The eSight management system provides unified intelligent operation and maintenance of servers, storage, and networks.

Customer Benefits

- The modular design of the blade Server greatly simplifies maintenance and allows for flexible expansion.
- Server with heterogeneous computing capabilities, saving customers' investment.
- eSight enhances the O&M capabilities of customer and unified management of IT infrastructure such as servers, storage, and networks to improve customer operation and maintenance efficiency.

Huawei Atlas Enables Intelligent Inspection of Power Lines

- The Atlas 200 AI accelerator module is embedded into traditional tower cameras. Atlas 200 uses AI inference algorithms to **analyze images and videos locally, and reports alarms in a timely manner, implementing unattended power line inspection.**
- The Atlas deep learning solution and Atlas 300 AI accelerator card are deployed at the master station to implement cloud-based training and inference, remotely deliver and deploy models using management software.
- Atlas 200 has a low-power design. The entire camera consumes 8 W, **runs on solar power**, and is maintenance-free throughout its lifecycle.



Take-Aways

- ✓ Big Data Analytics, Infrastructure as a Service, AI, Intelligent Video Analysis and Autonomous Driving will be ubiquitous in new era. All Industry must be ready to support these new workloads to keep competitive.
- ✓ In working with partners like Intel, VMware, SAP, Huawei has been offering a rich and innovative X86, AI & ARM64 Product Portfolio, and is ready to support your needs for transformation to the Era of Digital & AI.
- ✓ E9000 and 2288H V5 are Huawei's current mainstream server products, which meet the need of operator's mainstream computing scenarios. Compared with other vendors, it has great performance and reliability advantages

Thank you

