FusionDirector
IT intelligent O&M software



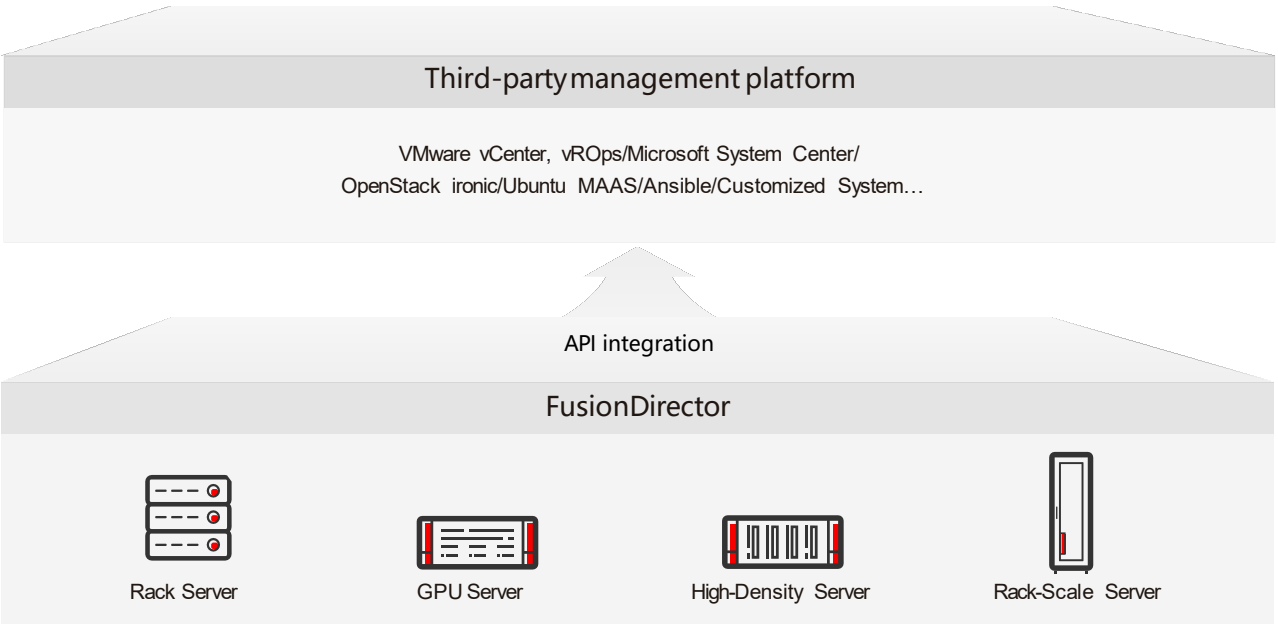
XFUSION INTERNATIONAL PTE. LTD.

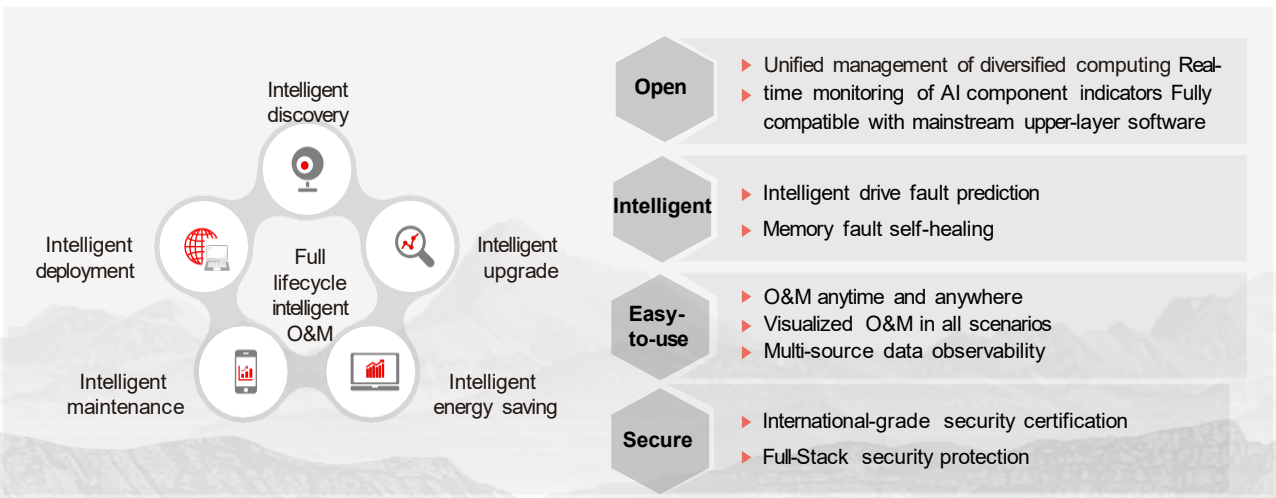
01 FusionDirector
IT intelligent O&M software

Introduction

FusionDirector is an IT intelligent O&M management software, which has the characteristics of openness, intelligence, ease of use, and security, and provides five intelligent management functions: intelligent deployment, intelligent discovery, intelligent maintenance, intelligent energy saving, and intelligent upgrade, focusing on all aspects of daily operation and maintenance of server equipment and the main OPEX expenditure elements, which can improve the operation and maintenance efficiency end-to-end by 30%, reduce the operation and maintenance cost of the data center, deeply integrate application performance management and observability, and realize AI-driven full-scene monitoring. The 3D visualization intelligent O&M platform based on digital twin provides customers with the ultimate O&M experience.

FusionDirector provides standard Redfish APIs for easy integration and is widely applicable to telecom operators and enterprise customers across multiple scenarios, including public and private clouds, artificial intelligence (AI), high-performance computing (HPC), Internet, and Safe City.

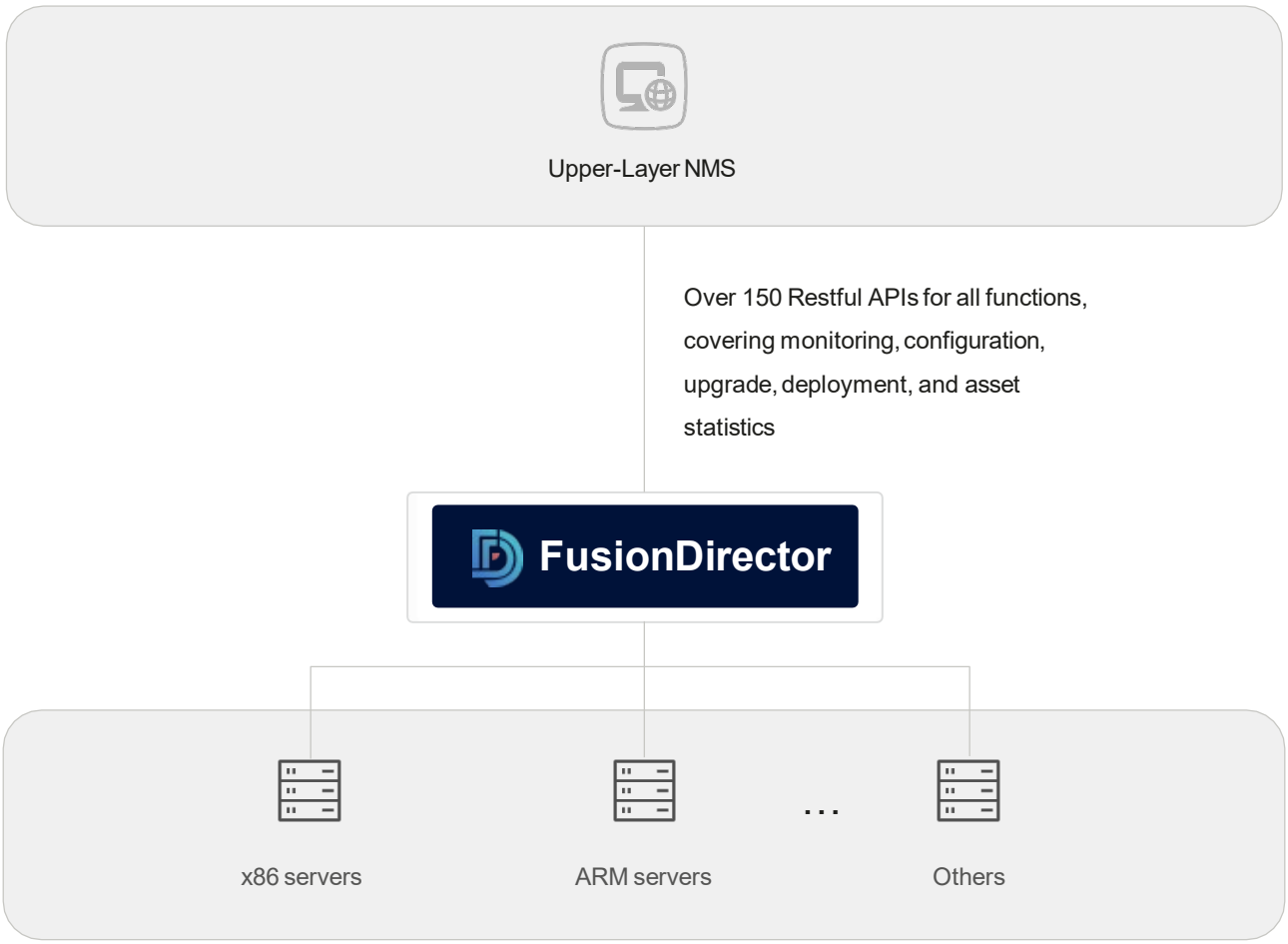




02 FusionDirector Key Features

2.1 Open Architecture

Unified Management of Diversified Computing, with Compatibility of Upper-Layer Software

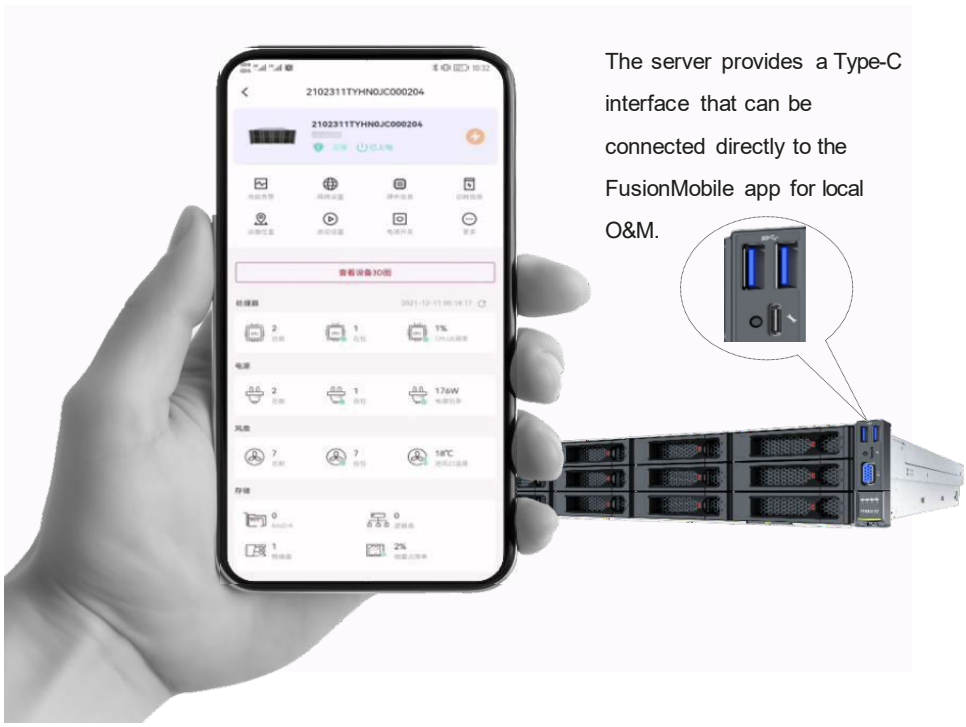


- ✓ Management of all servers (x86/ARM/others) in the data center, with flexible plug-in adaptation and compatibility with Kunpeng computing
- ✓ Compatible with over 20 mainstream commercial and open-source software applications (for example, vCenter, SCCM, Ansible, Zabbix, and Nagios)
- ✓ Restful APIs for All functions with interface development guide
- ✓ AI component monitoring and management (Including localized AI computing power such as Ascend, Muxi, Suiyuan, and Tianshu Tiangai), supporting metrics monitoring, one-click diagnosis, and firmware upgrades

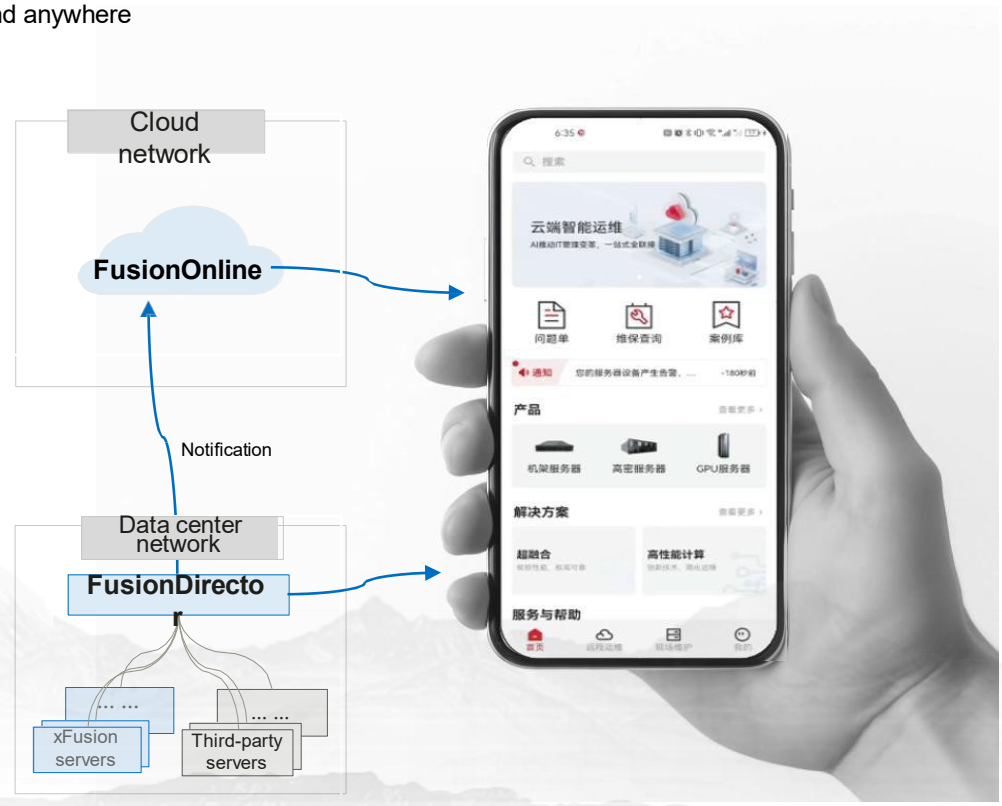
02 FusionDirector Key Features

2.2 O&M Anytime and Anywhere

Local O&M: FusionMobile Directly Connected to Servers for Easy Local O&M



Remote O&M: FusionMobile interconnected with FusionOnline or FusionDirector for O&M anytime and anywhere

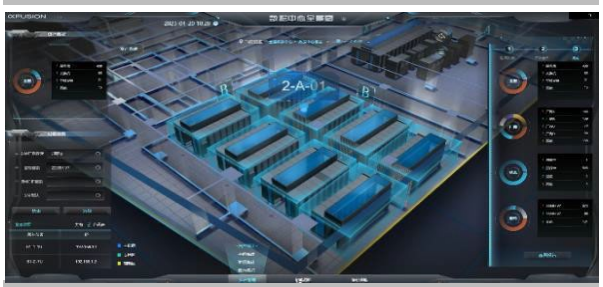


02 FusionDirector Key Features

2.3 Visualized O&M in All Scenarios

Asset Management, Deployment and Upgrade, Temperature View, and Monitoring and Alarming Supported by the Digital Twin Platform for Data Centers

Asset Management and Space Statistics



OS Installation and Firmware Upgrade for Servers



Temperature View and Power Statistics



Monitoring and Alarming



Digital Twin Platform

Visualization

Digital twin visualized screens for data centers | VR/AR/MR applications

Digital Twin Applications

Digital twin entity modeling | Asset lifecycle management | Intelligent O&M | AI analysis for energy saving | AI capacity prediction and analysis | AI risk prediction and drill

Data Middle Platform

Discrete data transformation and association | Time series data analysis and management | Digital twin object data modeling | Digital twin data compression and storage | Log alarm parsing and diagnosis | Process information processing and delivery

Data Convergence

Data Standardization Module | Data collector framework | Data collection of management platforms

Control and Management

O&M process management | Control system framework | Configuration delivery for management platforms

External systems interconnected as plug-ins

Management and Monitoring Platforms

DCIM | CMDB | ITOM | ITSM | Other monitoring systems

Physical Entities

Park/Building	Infrastructure	Network	Servers	Storage	Virtualization	Middleware	Database	Application system
L0	L1		L2			L3		L4

Service Expansion Plug-ins

Customized by partners

(Development) Expand features

↓

(Commissioning) Invoke platform interfaces

↓

(Test) Import and test plug-ins

↓

(Deployment) Deploy plug-ins on the platform

↓

(Front end) Update plug-ins in a visualized way

↓

(Release) Release and manage plug-ins

02 FusionDirector
Key Features

2.4 Multi-source data observability

Integrated Intelligent Observability Platform: Multi-source data fusion, intelligent monitoring and management of infrastructure, middleware, back-end applications and user analysis, providing real-time interactive dashboards and reports.

Improve user experience

proactively identify performance bottlenecks (such as slow page loading and interface timeouts), optimize the interactive experience of end users, enhance user stickiness, and indirectly promote corporate competitiveness and revenue growth

Accelerate fault repair

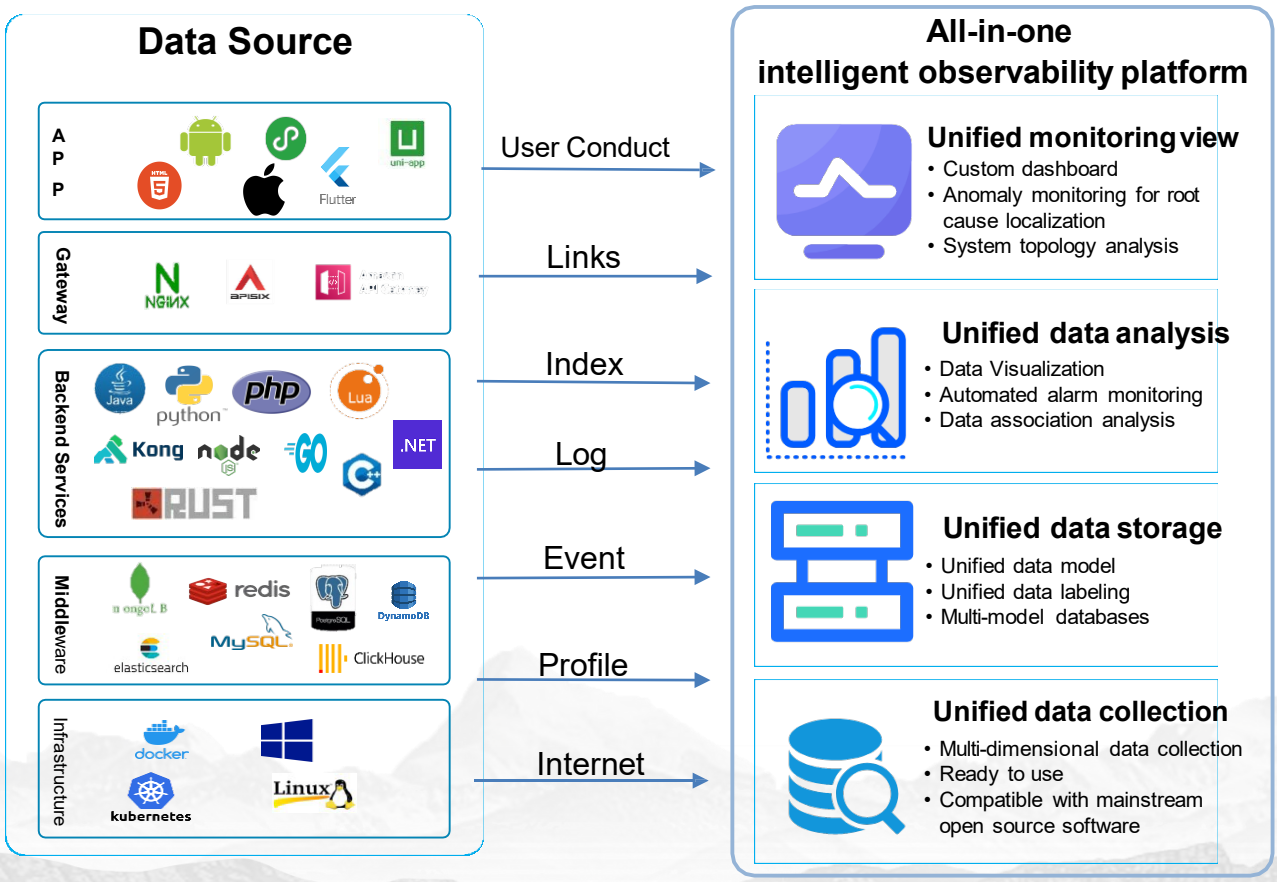
Through multi-dimensional data correlation and root cause analysis, quickly and accurately locate problems, shorten the mean time to repair (MTTR), and reduce the impact of faults on business and waste of resources.

Ensure business continuity

Through real-time monitoring and intelligent early warning, the system failure rate is greatly reduced, the service interruption time is shortened, the core business is ensured to run continuously and stably, and customer trust is enhanced.

Optimize operating costs

Based on performance data analysis, resources are reasonably allocated to avoid excessive redundancy or insufficient capacity, helping customers reduce hardware and O&M costs and improve resource utilization.



02 FusionDirector Key Features

2.5 Intelligent Deployment

Easy, Efficient, and One-click Mode Switch with Process Automation Solution

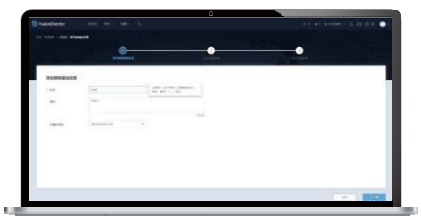
Process automation from firmware commissioning, server commissioning, and software commissioning and acceptance improves installation efficiency by 10 times. Intelligent deployment allows one-click switch among high performance work modes including distributed storage, big data, database, virtualization, Web server, HPC, and more.

Online planning: quickly import device information with one click, and set the device portfolio in an easy and efficient way

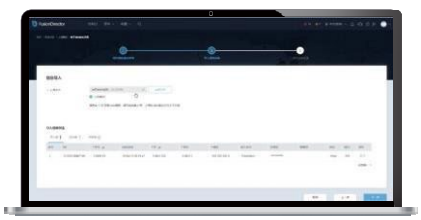
Automatic identification: implements U space automatic identification for device access management

Automatic deployment: automatically configure the BMC, BIOS, RAID, and the OS

Automatic verification: automatically verify device configurations to ensure that the device is configured right after upgrade



Step 1: set the device portfolio



Step 2: import the configured devices



Step 3: set the device configurations

	Description	Specification
Configuration	▸ Enable device configuration information integration into a Profile configuration management file and copy to other devices for batch configuration.	▸ Configuration template: batch management of the Profile configuration file, including creating, importing, binding, applying, unbinding, deleting, exporting, and replicating the file. ▸ Component configuration: BIOS, RAID, NTP, DNS, LDAP, HBA, CNA, LOM, and more
Device deployment	▸ OS image: manual OS image import ▸ OS deployment: BMC out-of-band network access, OS batch installation functions based on the SP mounted image, and simultaneous deployment of up to 30 devices.	▸ Supported OS image types and versions: FusionOS, CentOS, RedHat, VMware, SUSE, Windows, Ubuntu, EulerOS, OpenEuler, Debian, BC-Linux, NeoKylin, and Kylin ▸ Supported devices: rack server, high-density server, GPU server, and rack-scale server

02 FusionDirector Key Features

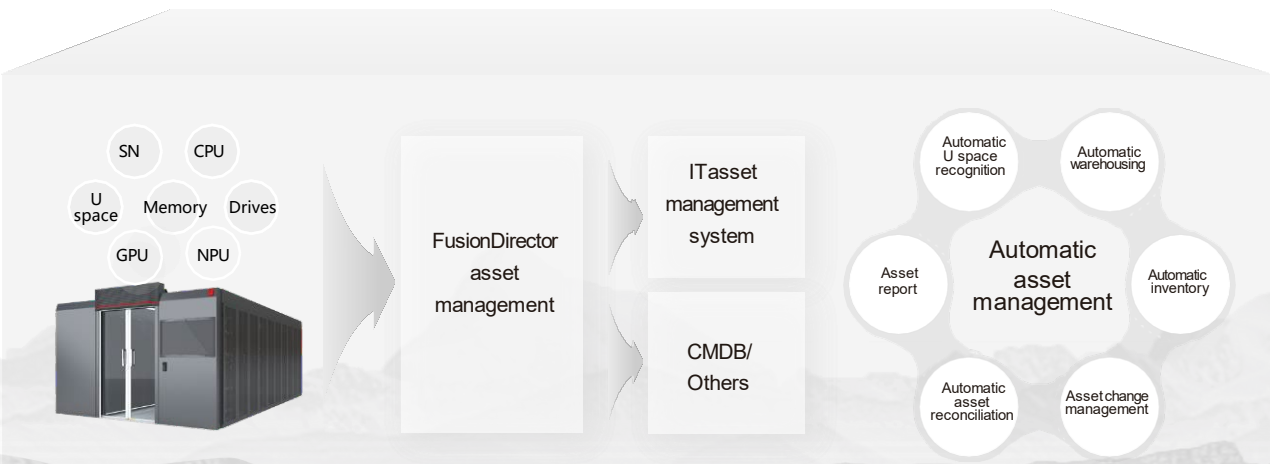
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2.6 Intelligent Discovery

Real-Time Automatic Management of Component-Level Visualization

The Intelligent Discovery feature avoids common challenges in manual asset management including human error, high cost, track difficulties, and wasted spaces. With industry-leading U space anti-interference technology, FusionDirector enables automatic component-level asset management covering CPUs, memory modules, GPUs、NPUs、 drives, PSUs, RAID controller cards, fan modules, and more. Intelligent Discovery can reach 100% accuracy rate and output management report in seconds, delivering real-time visualized track and maximizing space utilization. It helps save 100,000 dollars for every 1000 cabinets per year compared with manual management.

- Asset automatic upload, inventory in seconds, with 100% accuracy rate
- Component-level DC asset management and asset information display at-a-glance
- Real-time tracking of asset changes and asset data analysis, improving asset utilization by 6%
- REST interfaces and third-party CMDB connection for system integration



02 FusionDirector Key Features

Item	Description
Asset statistics overview	▸ Displays data center total assets, cabinet space usage, service time, and more. ▸ Displays asset change overview, including installation, uninstallation, components replacement, and more.
Asset details display	▸ Displays detailed device information about servers, storage, networks, racks, and cabinets, including device name, serial number, IP address, location, manufacturer, model, space utilization, installation date, and more. ▸ Displays the detailed information about server CPUs, memory modules, GPUs, NPUs, drives, and mainboards, including component name, manufacturer, model, related devices, serial number, and more.
Asset change record	▸ Records the device change events and trends, including the change date, change type, device name, asset code, device type, device location, and change description. ▸ The asset change record is an explicit display of the overall change trend of each stage and the latent risks in devices and components.
Cabinet detailed view	▸ Basic cabinet information, including the cabinet location, rated power, size, height, power supply, temperature, space, and more ▸ Cabinet power consumption information, including power capping status and power consumption statistical trend ▸ Cabinet device list, including device name, type, model, serial number, power consumption, alarm status, and temperature

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2.7 Intelligent Maintenance

Stable and Secure Operation, Accurate Fault Locating, and Integration of Prevention, Diagnosis, and Self-Healing

According to statistics, drive failures account for more than 48% of data center server failures, and memory failures account for 61% of system downtime accidents. Equipped with intelligent fault diagnosis technology, drive fault prediction technology, and memory fault self-recovery technology, FusionDirector provides a diagnosis accuracy rate up to 96 %, reporting drive faults 7 to 30 days in advance to prevent accidents. In addition, the intelligent memory fault recovery technology reduces the downtime rate by over 66%.

Detects faults of all components, including CPUs, memory modules, GPUs, NPUs, PSUs, drives, RAID controller cards, fans, and more, while locating faults within minutes.

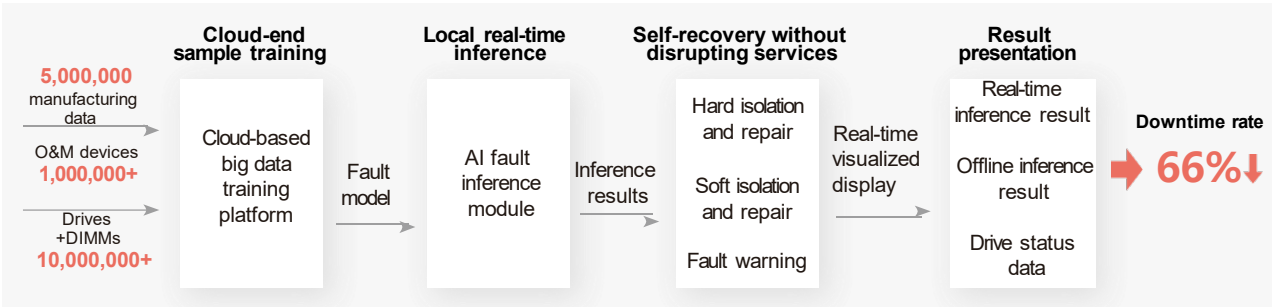
Connects the in-band and out-of-band data links, supporting data detection in normal and abnormal system states.

Based on the fault feature model, Intelligent Maintenance conducts real-time local inference of memory state data, and carries out isolation, repair, and result presentation.

Real-time collection of drive SMART information to the cloud for model analysis with prediction accuracy rate no less than 90%, reducing the risk of concurrent drive faults and ensuring operation continuity.

FDM fault expert library enables intelligent diagnostics with up to 96% accuracy in locating CATEER faults, reducing 90% manpower in fault locating.

02 FusionDirector
Key Features



Item	Description
Component monitoring	CPUs, memory modules, GPUs, NPUs, PSUs, drives, RAID controller cards, fans, and other components are monitored for status and resource usage, with full out-of-band monitoring and management, supporting graphical display.
Fault prediction	SAS/SATA drive data are collected, using AI algorithm to predict drive failure in advance.
Fault self-recovery	Based on the AI fault inference module, the memory status is diagnosed and analyzed, and memory fault isolation and self-recovery are automatically performed.

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2.8 IntelligentEnergy

Cost Reduction, Efficiency Improvement, Dynamic Energy Saving, and Elaborate Fine Tuning

Data center power consumption accounts for 60% of the OPEX, 44% of which owes to server power consumption. Server energy saving is critical to data center efficient operation. FusionDirector energy-saving technology has been upgraded again. Light-load efficient PSUs, efficient VRD energy-saving, and virtual sensor technologies, MPC+PID machine learning energy-saving algorithms, and energy loss reduction technologies are integrated, saving up to 8% energy compared with the industry average under the same configuration and workload as well as approximately USD 870,000 per 10,000 servers in OPEX annually.

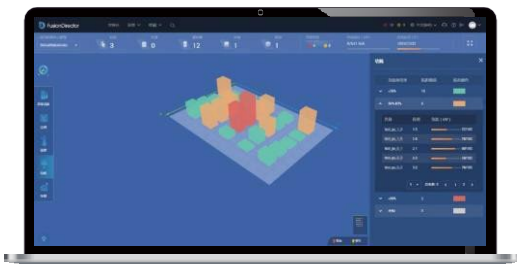
The 3D data model visualizes the information about the data center and cabinet such as temperature, power consumption, space, and more.

The dynamic energy management technology (DEMT) dynamically adjusts server operation status, making transient energy saving adjustments without affecting the performance.

With the help of AI technology, it precisely predicts the power supply trends and provides cabinet-level power consumption management.

The analysis of power supply risks, space utilization, ambient temperature, and low-load servers of the cabinet facilitates workload adjustment and improves resource utilization.

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Key Features



3D data visualization



Power consumption trend analysis

Server energy saving by 8%

Intelligent Energy Saving Technology	Light-load efficient PSUs	Bridgeless PFC technology enables the first high-efficiency CQC level 6 titanium PSUs
	VRD energy saving	Efficient DrMOS technology reduces CPU power consumption by 7.7% (from 6.5% to 6%).
	MPC+PID speed regulation	Intelligent AI algorithms adjust the power consumption and find the lowest power consumption point of servers.
	Virtual sensors	The AI algorithm implements high-precision virtual temperature sensors, fully covering the areas for heat dissipation and speed adjustment.
	Intelligent voltage adjustment	Component voltage adjustment is in multi-level linkage, reducing conversion path loss.
	Processor DEMT	Enables dynamic power adjustment for processors.

Item	Description
Cabinet-level power consumption management	Analyzes the power consumption trend of the server, dynamically adjusts the power consumption capping value of the server, and ensure the power supply security of the cabinet without affecting the performance.
Low-load server analysis	Analyzes long-term low-load server lists to support workload adjustments and take further energy-saving measures.
Power distribution & space optimization analysis	Collects statistics on the power supply and space distribution of cabinets, analyzes power supply risks, and provides solutions.
Temperature risk analysis	Analyzes the high-temperature environment and identify hot spots.

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02 FusionDirector
Key Features

2.9 Intelligent Upgrade

Cloud-Based, Responsive, and One-Click Automated Delivery Makes Users Worry Free

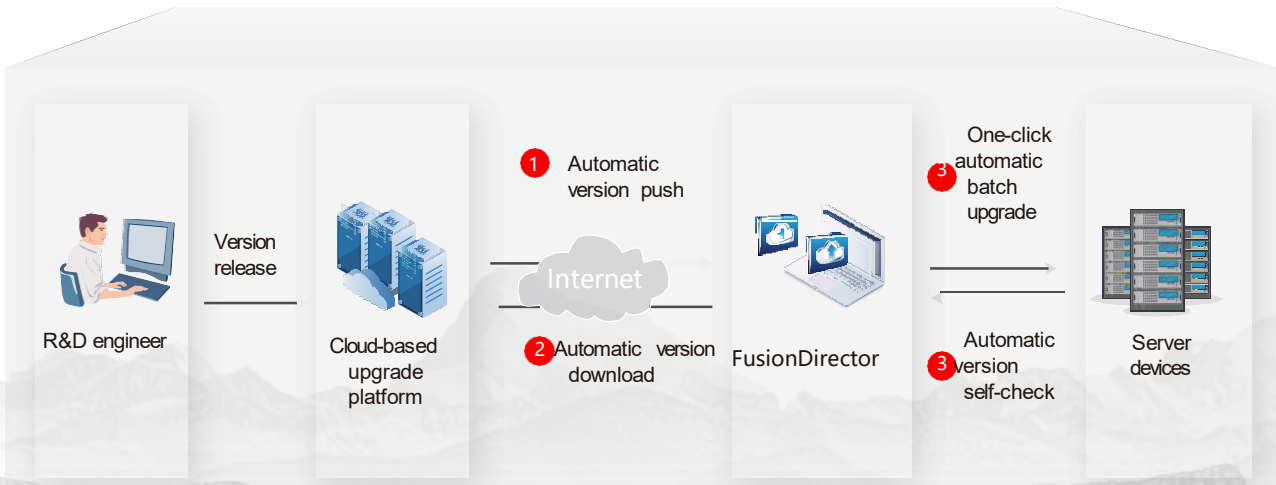
FusionDirector prevents the presence of frequent manual interventions, high security risks, and insufficient concurrency during upgrade process. Based on the xFusion online upgrade platform, FusionDirector enables fast upgrade for firmware and drives. The E2E feature provides one-click delivery covering automatic push, automatic download, automatic matching, and automatic upgrade, increase upgrade efficiency by 20 times and saving costs.

- Automatic downloads and checking of firmware, drives and OS versions, without manual intervention
- Separate management on firmware upgrade and running, reducing impacts on business system
- Firmware baseline management, enabling quick upgrade or downgrade for the firmware
- Independent out-of-band upgrade channel, increasing business bandwidth availability

Upgrade efficiency improved by 20 times

One-click automatic batch upgrade

Productive E2E cloud-based collaboration



02 FusionDirector Key Features

Item	Description	Specification
Upgrade package repository management	▸ Automatic: online cloud platform website for automatic import of upgrade packages ▸ Manual: manual import of upgrade packages from the FusionDirector	Device range for upgrade: ▸ Server models: rack server, high-density server, GPU server, and rack-scale server ▸ Out-of-band firmware: BIOS, BMC, CPLD, NVMe, GPU, NPU and PSU ▸ In-band firmware: NIC, RAID, HDD, PCIe-SSD, MCU, CDR, and Retimer ▸ OS Versions: FusionOS, SUSE Linux Enterprise, RedHat Linux Enterprise,CentOS/Windows Server, Vmware ESXi, and Ubuntu
Upgrade scenario	▸ Automatic: online creation of upgrade plans, and automatic execution when device versions do not match the specified version in the plan ▸ Automatic: online creation of upgrade plans, to manually specify that the device will be upgraded immediately or at a specified time	

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3.0 Full-lifecycle security system

Secure boot	Secure operation	Secure data streams	Security compliance	Secure retirement
Ultimate firmware protection	In-operation security check and protection	Server data protection	Compliance with laws and regulations	Data and infrastructure security handling
• Integrates chip-level root of trust (RoT) secure boot, whose secure core cannot be tampered with • Software package signature build & signature publish preventing risks	• iBMC & BIOS platform firmware resilience • Key management, certificate manage -ment, account and password management, security isolation, least privilege, stack protection and anti-ex -ploitation	• Protocol safety enabled by choosing recognized secure communication • Algorithm safety enabled by choosing latest secure encryption algorithm	• CC EAL 4+ security certification • ISO 27001 management system certification	• Offline drive secure erase mode performing in-depth cleaning on a drive for nine rounds

03 FusionDirector
Technical specifications

Basic manage -ment	xFusion servers	Mainstream models of xFusion servers
	Non-xFusion servers	Mainstream models of non-FusionServer servers
	Alarm monitoring	24/7 remote alarm monitoring and automatic trouble ticket creation
	Device management scale	Single set: Up to 12,000 servers Multiple sets: Cascading 256 sets and up to 3 million (256 x 12,000) servers
	Network constrains	IPV4 and IPV6 networks
	Resolution	Recommended resolution: 1920 x 1080/1680 x 1050
	Browser	Google Chrome, Mozilla Firefox, Safari, and Microsoft Edge
Intelligent O&M	Intelligent deployment	Supports the deployment of mainstream operating systems, improves 10 times installation efficiency from hardware planning to upper-layer software, and achieves automatic configuration, management, and OS deployment for 100 servers per day.
	Intelligent discovery	FusionDirector realizes automatic asset inventory with 100% accuracy, outputs inventory report in seconds, visualizes real-time track tracing, and improves space utilization. Compared with manual inventory, it saves about $100,000 per 1,000 cabinets per year.
	Intelligent maintenance	FusionDirector diagnoses faults with an accuracy rate up to 96%. AI-powered memory fault recovery technology integrates prevention, diagnosis, and self-healing functions, reducing breakdown rate by 66%. AI-powered drive fault prediction technology reports drive faults 7 to 30 days in advance.
	Intelligent energy saving	Intelligent energy-saving technologies and xFusion-developed MPC+PID energy-saving algorithms are integrated, saving up to 8% energy compared with the industry
	Intelligent upgrade	One-time strategy formulation and one-click batch upgrade improve O&M quality, reduce O&M costs, and increase upgrade efficiency by 20 times.
Digital twin	Data center visualization	The 3D data model is adopted for visualized display and management of abnormal devices, assets, space, temperature, power consumption, and service life in data center and cabinet views.
Open interfaces	Open interfaces	Northbound API interfaces that follow the RESTful protocol, including basic management and intelligent O&M interfaces, greatly simplifies integration with third-party systems and shortens installation time.

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