

NEXAVM

TECHNOLOGIES

NEXAVM nDesk - VDI SOLUTION

Virtual Desktop Platform

Technical White Paper

NexaVM Technologies

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CONTENTS

Innovation for Digital Transformation 3

Product Overview 4

System Architecture 4

Key Technologies 5

Features 6

Product Features 7

Summary 10

INNOVATION FOR DIGITAL TRANSFORMATION

As the wave of digitalization sweeps the globe, businesses are undergoing unprecedented and profound changes in their operating models, work styles, and productivity tools. Remote and hybrid work have become the norm, and business agility, data security, and cost optimization have become key elements of a company's core competitiveness. Simultaneously, with the rapid development of technologies such as artificial intelligence, 3D designs, scientific computing, and high-definition media processing, the demand for terminal computing power — particularly graphics processing units (GPUs) and parallel computing capabilities — has exploded.

Traditional PCs, workstations, and early virtual desktop infrastructure (VDI) are increasingly showing limitations in addressing these challenges:

- **Increased data security risks** — core business data, design drawings, source code, and sensitive models are stored in a dispersed manner on employees' local devices, facing threats such as device loss, virus attacks, and unauthorized access.
- **High operational complexity** — physical terminal management, software deployment, system updates, and troubleshooting across office locations consume significant IT resources and impact business continuity.
- **Performance bottlenecks and inflexibility** — graphics rendering, video editing, AI training and inference, and complex simulations demand extremely high GPU power that traditional workstations struggle to deliver cost-effectively or elastically.
- **Limited collaboration and mobility** — cross-region file transfer and 3D design sharing between workstations is inconvenient, raising both inefficiency and data-leakage risk.
- **Low resource utilization and TCO pressure** — uneven local workstation utilization, expensive hardware procurement, and dispersed operations drive up total cost of ownership.

NexaVM's Answer

NexaVM's high-performance Virtual Desktop solution combines powerful cloud computing resources — particularly GPU resources — with flexible, secure desktop delivery technology. It provides users with an experience superior to a local workstation, while offering the elasticity and management advantages of cloud services.

Industries Transformed

- **Design and Creativity** — powerful cloud-based graphics workstations for architects, industrial designers, VFX artists, and game developers running AutoCAD, Revit, Maya, Blender, and Adobe Creative Suite anytime, anywhere.
- **Artificial Intelligence and Machine Learning** — a ready-to-use GPU development environment for model training, tuning, and inference, with on-demand resource allocation that removes the need for local hardware investment.
- **Education, Research, and Training** — a unified, high-performance graphic design and programming environment for students, reducing hardware cost while improving the teaching experience.

- **Medical Image Processing** — efficient processing of high-resolution CT and MRI data, 3D reconstruction, and AI-assisted diagnosis.

Virtual Desktops — especially GPU-powered Virtual Desktops — are no longer just remote access tools. They are evolving into a new generation of digital workspace infrastructure that supports core business innovation, ensures data security, improves operational efficiency, and optimizes IT costs.

PRODUCT OVERVIEW

NexaVM's Virtual Desktop products are becoming a key support platform for customers' digital transformation, with advantages in multi-cloud architecture, large-scale computing power management, full terminal compatibility, flexible networking, and open system capabilities. They help customers allocate resources more efficiently and flexibly, while promoting a more diversified, open, and intelligent system architecture.

- **Multi-cloud concept** — breaks away from reliance on a single virtualization platform, offering flexible compatibility with third-party virtualization resource pools for unified management and deployment of heterogeneous resources.
- **Multi-tenant hierarchy** — each tenant receives an isolated management environment with independent resource quotas, supporting large-scale computing cluster operations.
- **Full terminal compatibility** — PCs, laptops, smartphones, tablets, and thin clients can all log in and access the Virtual Desktop seamlessly.
- **SD-WAN integrated gateway** — delivers network acceleration and encrypted data transmission across LAN, dedicated line, and Internet environments.

SYSTEM ARCHITECTURE

NexaVM's Virtual Desktop system is built from the underlying hardware upward, organized into three layers:

- **Computing Resource Layer** — provides virtual resource management and realizes the pooling capability of hardware resources.
- **Virtual Desktop Service Layer** — delivers desktop management, policy management, permission management, resource management, and monitoring — enabling centralized operation of Virtual Desktops across Windows, Tongxin UOS, KylinOS, and Zhongke Fangde.
- **Terminal Layer** — provides unified access for Windows, Kylin OS, and UOS terminals, enabling cross-platform access for PCs and thin clients.

Terminal Layer → Cloud Desktop Service Layer → Computing Resource Layer

Architecture Flow

Terminal Layer (PC / laptop / mobile / thin client) connects through the Cloud Desktop Service Layer (virtual machine management, user session management, application streaming) which orchestrates the underlying Computing Resource Layer (pooled servers, storage, and network).

KEY TECHNOLOGIES

1. Full-Stack Self-Developed and Localized

NexaVM Virtual Desktop products are fully compatible with domestic CPU chips and operating systems, establishing a robust domestic ecosystem; the core software is entirely self-developed, making the full product stack domestically produced.

- **Hardware** — compatible with servers and terminal devices using domestic CPU chips such as Feiteng, Kunpeng, Loongson, Hygon, and Zhaoxin.
- **Operating system** — the management platform and Virtual Desktop support openEuler, Tongxin UOS, and KylinOS, releasing desktop variants including Tongxin UOS, Kylin, and Zhongke Fangde.
- **Virtualization platform** — compatible with KVM virtualization technology, with deep security reinforcement of the hypervisor to improve efficiency and security.

2. Remote Desktop Protocol

NexaVM's remote desktop protocol is based on TCP/IP with an in-band transmission model. Clients do not interact directly with the virtualization platform; instead, underlying technologies such as device drivers, network channels, and audio/video capture and rendering enable real-time, dynamic interactive control between the client host and the Virtual Desktop. Desktop images, control signals, and data transmission travel over separate logical channels, mapping desktop resources to local hardware and fully simulating the experience of operating a local computer — anytime, anywhere.

3. Any Cloud Platform Connection

The Virtual Desktop management platform can deploy on NexaVM's self-developed virtualization platform or on a compatible third-party platform, calling the virtualization cloud API directly to automate management of underlying virtual machines. The product connects seamlessly to mainstream IaaS platforms including OpenStack, NexaVM, UCloud, and SmartX — without requiring any changes to the IaaS platform itself.

4. Multi-Tenant Architecture

Dedicated management portals, independent organizational structures, user namespaces, and AD domain configuration options are provided per tenant. Tenant administrators manage desktop pools, desktops, terminals, images, policies, and user accounts — with configurable quota limits to prevent excessive resource usage.

5. SD-WAN Remote Access

SD-WAN is a next-generation dedicated intelligent wide-area network. Using proprietary protocol-based transmission optimization, it effectively allocates network resources to provide low-cost, low-latency, high-efficiency, and intelligent network transmission. The integrated SD-WAN gateway faces the Internet directly, ensuring security, performance, and encryption — while accelerating access under suitable conditions.

FEATURES

1. Open Infrastructure Ecosystem

Virtual Desktop products are compatible with multiple hypervisors.

- Compatible with multiple processor architectures — both X86 and ARM-based servers are supported.
- Supports GPU pass-through and virtualization — fully supports pass-through and virtualization technologies for graphics processing.

2. Ultimate Interactive Experience in High-End Scenarios

NexaVM's self-developed remote desktop protocol supports high-resolution displays such as 2K and 4K for high-end design scenarios. Video encoding algorithms including H.264 / H.265 / AV1 dynamically adjust compression parameters to image characteristics — preserving text and graphic clarity while reducing data volume for a high-resolution, high-definition experience.

3. Unmatchable User Experience of VDI over Internet

Flexible Virtual Desktop access across multiple scenarios — home, office, business travel — with faster response times, smoother image and file transfers, and an enhanced user experience.

- **SD-WAN technology ensures** — encrypted data transmission, accelerated protocol connections, optimized bandwidth utilization, and high-performance, smooth access.
- **Gateway cluster deployment with load balancing** — distributes user sessions evenly to avoid access storms, ensures continuity if a node fails, and guarantees consistent access quality.

- **Client integration with SD-WAN SDK** — performs seamless VPN authentication at login and delivers network acceleration plus additional advanced functions.

4. Compatibility with Terminals

Compatible with a wide range of hardware devices:

- **Traditional PCs and laptops** — install Virtual Desktop software client to connect, reusing existing resources and saving new-equipment costs.
- **Thin Clients** — small, low-power, energy-saving, and noiseless — simply connect peripherals, power on, and log in.
- **Mobile devices** — phones and tablets can install the Virtual Desktop client app for anytime, anywhere access.

Supports multiple operating systems:

- **Windows** — supports Windows 7, 10, and 11, giving users a native PC-like application experience.
- **Linux** — supports common distributions such as Ubuntu and CentOS for developer-focused scenarios.

Thin Client Hardware

Model	CPU / Architecture	Configuration
AA301	ARM — Rockchip RK3568	Memory: 2GB · Storage: 16GB · Network: 1×1000M Ethernet (no Wi-Fi) · Interfaces: 2×USB3.0 / 4×USB2.0 / 1×Audio / 1×MIC / 1×HDMI / 1×VGA · OS: Linux (license-free)
AX201	Intel — Intel N95	Memory: 8GB · Storage: 128GB · Network: 1×1000M Ethernet (optional Wi-Fi) · Interfaces: 2×USB3.0 / 4×USB2.0 / 1×Type-C (data) / 1×MIC / 1×3.5mm Combo / 1×HDMI / 1×DP / 1×VGA · OS: Linux (license-free)

PRODUCT FEATURES

1. Cloud Platform Management

Decoupling the Virtual Desktop management platform from the underlying IaaS platform lets the IaaS layer focus on stable, high-performance basic virtualization, while virtual machines are directly managed through full lifecycle operations — creation, startup, shutdown, restart, and deletion — optimizing the delivery of desktop computing resources.

- **Self-developed virtualization platform** — flexible, efficient management of virtual resources, policies, and users.
- **Third-party commercial IaaS platform** — public API docking with platforms such as NexaVM, SmartX, and UCloud, converting existing infrastructure into Virtual Desktop resources.
- **Open-source OpenStack** — standard API docking that converts Keystone projects into desktop pools, syncing Glance images, Cinder storage, and Nova virtual machine lifecycle.

2. Tenant / User Management

NexaVM's multi-tenant architecture gives each tenant independent administrative permissions to manage user accounts, desktop pool allocation, and policy configuration — ensuring complete isolation so no tenant affects another. Resources are pooled and allocated on demand: large enterprises can divide desktops by department, subsidiary, or project team, while cloud vendors can dynamically adjust tenant quotas as customer scale changes.

Applicable Scenarios

- **Department / subsidiary management** — a single platform creates independent tenant accounts per department or subsidiary, each with its own administrator privileges, improving IT efficiency without duplicated infrastructure.
- **Cross-regional office support** — headquarters can centrally manage resources while granting regional administrators (e.g. Asia Pacific, Europe, North America) independent control over their own users.
- **Multi-customer delivery by cloud providers** — public cloud and hosting providers can serve multiple enterprise customers within one environment, greatly reducing operating costs.

3. User Management

Users can be created locally or integrated with an existing Active Directory for authentication. Local users support organizational directory trees, two-dimensional grouping, and password or SMS authentication. Administrators can create custom permission roles and assign users accordingly.

4. Desktop Pool Management

NexaVM Virtual Desktop supports three types of desktop pools:

- **Dedicated desktop pools** — for users needing long-term, fixed personal desktops with persistent data across sessions, used for office work, design, and R&D.
- **Dynamic desktop pools** — for one-time work tasks such as window services, call centers, or course learning; desktops are destroyed after use and recreated fresh to avoid failures.
- **Hosted desktop pools** — bring existing physical or virtual desktops — including high-performance workstations — under unified resource scheduling and management.

5. Policy Group Management

System or tenant administrators associate Virtual Desktops with policy groups to control connection protocol options, peripheral access, data transmission, and bandwidth usage.

- **Protocol strategy** — controls speaker/microphone sound quality and device redirection for microphones, cameras, controllers, printers, clipboard, and folders.
- **Peripheral redirection policy** — prohibit all external devices, prohibits specific device types (e.g. USB storage) while allowing printers/scanners, or authorize specific peripherals only.
- **Data transfer strategy** — controls whether screenshots are allowed and whether the screen watermark function is enabled.
- **Bandwidth control policy** — flexible channel bandwidth control prioritizing user experience across display, audio, camera, and data channels.

6. Session Management

Tenant administrators can view currently connected sessions — terminal source, connected desktop, connection time, and total duration — and disconnect sessions as needed, as well as review historical session records including disconnection reasons.

7. Log Audit

Administrators can view and audit management and login operation logs. System administrators can view both management and login logs; tenant administrators can view login logs only.

8. Gateway Access

A dedicated SD-WAN access gateway can be configured per connected cloud platform, with IP address segments pre-defined for external gateway access versus direct private-network access — the client software automatically selects the suitable path. For long-distance external access, Internet acceleration nodes can be deployed on demand to improve bandwidth experience.

9. Terminal Login

Client software supports installation on Windows 7/10/11, macOS, open-source Linux, and mobile devices, with regular username/password or SMS verification code login, optional password memory, and auto-login at startup. Desktop connection options include clarity priority, smoothness priority, or adaptive mode; lossless H.265 hardware encoding is recommended for high-end design scenarios where the graphics card supports it, while lower frame rates suit cost-effective, low-end terminals. Network detection and client log collection assist

operations teams in diagnosing connection failures. Administrators can also manage terminal software versions, with clients auto-updating at startup.

SUMMARY

NexaVM's VDI solution is a high-performance Virtual Desktop platform built to overcome the challenges of modern work — remote and hybrid models, data security, and high computing power needs. It delivers performance comparable to local workstations while offering flexibility, scalability, and centralized management of cloud services.

Key Challenges Solved

Data Security	Prevents data leaks by keeping information centralized and secure.
Operational Complexity	Simplifies IT management with centralized deployment, updates, and troubleshooting.
Performance Bottlenecks	Supports GPU-powered tasks like 3D rendering, AI training, and scientific computing.
Collaboration & Mobility	Enables seamless access and teamwork across devices and locations.
Cost Efficiency	Optimizes resource utilization and reduces total cost of ownership (TCO).

Core Features

Multi-Hypervisor Support	Compatible with OpenStack, NexaVM, KVM, and more for flexible resource allocation.
Multi-Tenant Architecture	Secure, isolated environments for departments or customers.
Wide Device & OS Compatibility	Works with PCs, thin clients, mobiles, and systems like Windows, Linux, UOS, and Kylin.
SD-WAN Integration	Ensures secure, optimized, high-performance remote access.
GPU & Protocol Enhancements	GPU pass-through, virtualization, and advanced video encoding for smooth HD experiences.
Desktop Pool Management	Dedicated, Dynamic, and Hosted pools for different user needs.
Centralized Policy Control	Unified management of security, bandwidth, and user access policies.