Connecting the Endpoint to the Data Center

A Buyer's Guide to Remote Desktop Connection Protocols for Centralized Computing

A ClearCube Technology White Paper

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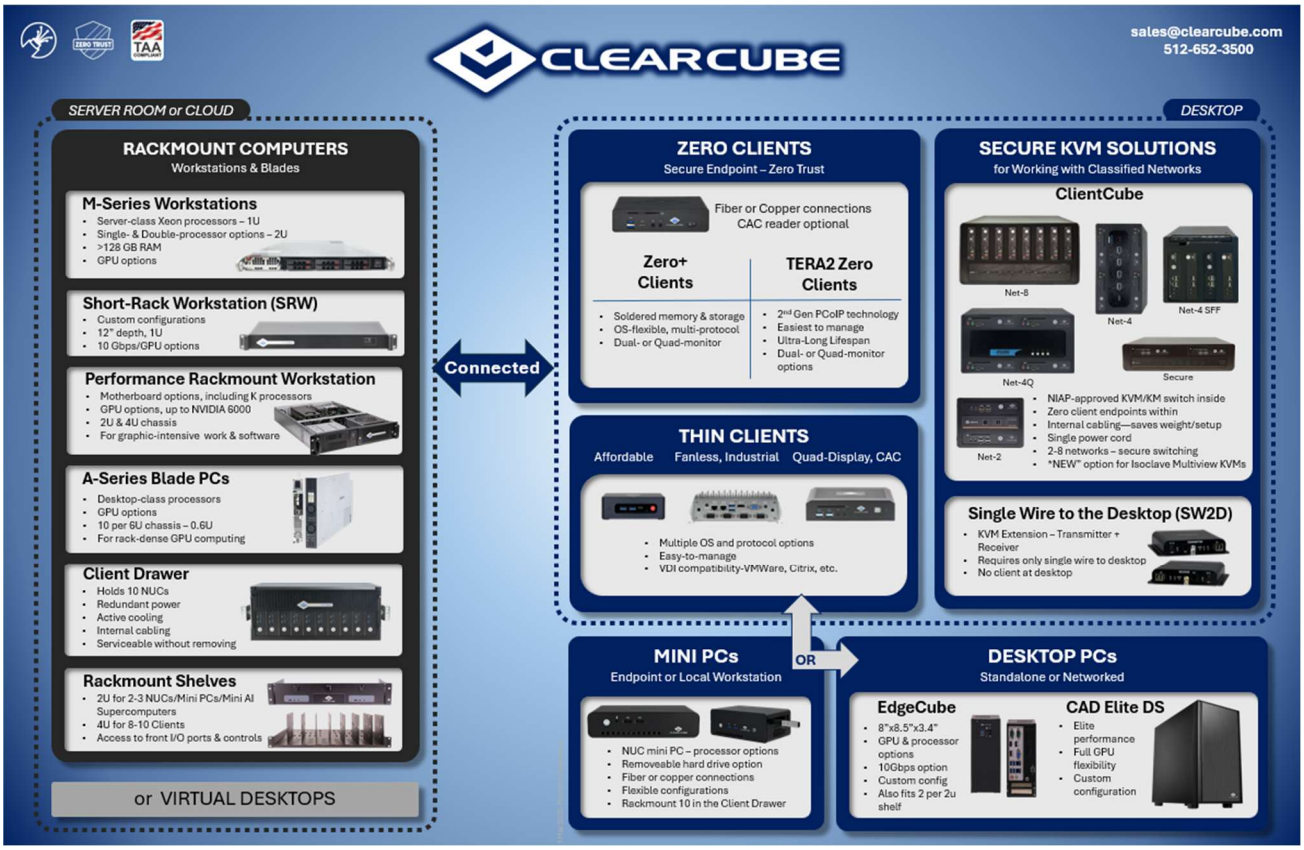
1 Executive Summary

Centralizing end-user compute in the data center — instead of deploying full desktop towers to every desk — reduces IT overhead, hardens security, and extends hardware life. But it introduces one critical design decision: how will each user's endpoint device connect to their centralized machine? The remote display protocol you choose determines the image quality, responsiveness, security posture, and ultimate satisfaction of every user on your network.

There is no single "best" protocol for every situation. A trading floor with dual 4K monitors has different needs than a task-worker running email and a browser, and a CAD workstation streaming 3D models has different needs than a secure government facility that cannot tolerate any writable endpoint. This white paper is a vendor-neutral guide to the connection protocols ClearCube has vetted for use with our rackmount PCs, blade PCs, and workstations, and the Zero Clients, Thin Clients, and Mini PCs (NUCs) that connect to them.

Use this guide to understand what each protocol does well, which ClearCube endpoints support it, and how to match a protocol to a use case — so your sales conversation can move from "what is a remoting protocol" to "here is the right one for your environment."

A Snapshot of ClearCube Products (This document addresses the options for the “Connected” arrow below)



A full-size version of this diagram is included at the end of this document

2 Why Centralize Computing in the First Place?

ClearCube has designed rackmount and blade computers for centralized, dedicated 1:1 computing since 1997. Rather than placing a desktop tower under every desk, a rackmount PC lives securely in a data center, IT closet, or secured facility, while the user interacts with it through a lightweight endpoint at the desk. This model is distinct from — and often complementary to — traditional virtual desktop infrastructure (VDI):

- **Dedicated, not shared:** Each user gets a physical machine with predictable, non-virtualized performance — important for GPU-intensive CAD, simulation, video, and trading workloads where shared virtual resources cause latency and jitter.
- **Security by design:** Hardware and data stay in a controlled space, and a compromised or lost endpoint holds no corporate data — an advantage for regulated, classified, or high-security environments.
- **Density and manageability:** Up to roughly 70 systems can fit in a standard 42U rack versus the same number of desktop towers spread across an office footprint, and ClearCube's Client Drawer racks up to 100 mini-PCs, thin clients, or zero clients for easy, centralized servicing.
- **Reduced end-user disruption:** A hardware issue is resolved in the data center while the user keeps working from a spare or backup endpoint — there is no desk-side truck roll.

Whether the host is a ClearCube rackmount workstation, a blade PC, or a cloud/VDI session, the same question follows: which protocol will carry the screen, keyboard, mouse, USB, and audio between that host and the user's endpoint? That is the subject of this white paper.

3 What Is a Remote Display Protocol?

A remote display (or "remoting") protocol is the software — and sometimes hardware — layer that captures a host computer's screen, encodes it, sends it across a network, and decodes it on the endpoint in near-real time, while sending keyboard, mouse, USB, and audio traffic back to the host. Every option in this guide performs that same basic job, but each makes different trade-offs among image quality, latency, bandwidth efficiency, security, and the type of endpoint required to decode the stream.

Three broad factors typically separate one protocol from another:

- **Workload fit:** Some protocols (like RDP, Omnissa Blast or Citrix HDX) are tuned for everyday office work and constrained WAN links. Others (like PCoIP, HP RGS, Mechdyne TGX, or Amazon DCV) are built for GPU-accelerated, multi-monitor, high-frame-rate workloads such as CAD, video editing, or simulation.
- **Security model:** Software clients run on a general-purpose OS and can be updated, patched, or compromised like any other application. Hardware-based protocols such as PCoIP on a Tera2 chip are decoded in fixed-function silicon, so the endpoint has no writable OS, no local storage, and effectively no attack surface.
- **Ecosystem lock-in:** Protocol choice is often dictated by what your VDI or cloud platform already uses (Omnissa Horizon, Citrix DaaS, AWS WorkSpaces) or by what your ClearCube endpoint's OS supports (IGEL, ZeeTim, Amzetta, or Windows 11).

4 Vetted Connection Options at a Glance

The table below summarizes the remote desktop connection options ClearCube has vetted for use across our endpoint and rackmount PC portfolio. "Endpoint Support" refers to the operating environments — IGEL, ZeeTim, Amzetta, Windows 11, or a hardware Zero Client — capable of running that protocol's client.

Term Used	Company / Owner	Core Protocol	Endpoint Support	Optimized For	Official Product
Omnissa	Omnissa (formerly VMware)	Blast Extreme	IGEL, ZeeTim, Amzetta, Windows 11	VDI, thin-client endpoints, multimedia, variable networks	Omnissa Horizon 8
Citrix	Cloud Software Group	HDX / ICA	IGEL, ZeeTim, Amzetta, Windows 11	Low-bandwidth WANs, adaptive transport, legacy integrations	Citrix DaaS
Nutanix	Dizzion / Nutanix	FRP (Frame)	IGEL, Windows 11	Clientless, browser-based (HTML5) access, hybrid cloud	Dizzion Frame
RDP	Microsoft	RDP	IGEL, ZeeTim, Amzetta, Windows 11	Native Windows environments, LAN administration, basic office workloads	Remote Desktop Services (RDS) / Azure Virtual Deskto
RGS	HP	RGS / HP-VRG	Windows 11	High-density centralized rackmount workstations, 3D CAD, creator workloads	HP ZCentral Remote Boost
Anyware	HP	PCoIP Ultra	IGEL, Windows 11	Cross-platform software digital workspaces requiring high security	HP Anyware
PCoIP (Tera2)	HP (via Teradici)	PCoIP	Zero Client	Hardware-accelerated Tera2 Zero Clients, zero attack surface	TERA2 Zero Clients
Mechdyne	Mechdyne	TGX	Windows 11	Multi-monitor 4K, ultra-low latency, demanding workstation performance	TGX Remote Desktop
NICE	Amazon (AWS)	Amazon DCV	IGEL, Windows 11, ZeeTim*	Cloud-native 3D graphics, EDA, Linux GPU sharing	Amazon DCV
Parsec	Unity Technologies	BUD	Windows 11	Ultra-low-latency video editing, VFX, game development up to 240 FPS	Parsec for Teams
NoMachine	NoMachine	NX	IGEL, Windows 11	Cross-platform desktop sharing, heterogeneous Linux environments	NoMachine Enterprise
Splashtop	Splashtop Inc.	Splashtop	Windows 11	IT helpdesk support, secure hybrid work, bypassing traditional VPNs	Splashtop Enterprise
Parallels	Parallels (Alludo)	RDP (Extended)	IGEL, Windows 11	Rapid deployment, simplified IT administration, mid-market VDI	Parallels RAS
Thinklogical	Thinklogical	KVM Extension	ThinkLogical Client Module	Point to point and matrix based direct KVM extension	Thinklogical Velocity
HDBase-T	Various	HDBase-T	HDBase-T Receivers	Multi vendor point-to-point and maxtrix based KVM extension	Various

**Amazon DCV on ZeeTim-based endpoints may be limited to connecting to Amazon WorkSpaces rather than general Amazon DCV hosts. Confirm current compatibility with your ClearCube representative before specifying.*

5 Protocol Profiles

5.1 Enterprise VDI & General-Purpose Remoting

These protocols are the workhorses of everyday virtual and centralized desktops — built to serve broad user populations across office, hybrid, and WAN-connected environments.

Omnissa (Blast Extreme) *(Omnissa Horizon 8)*

Owner: Omnissa (formerly VMware) **Best for: Centralize PC and VMware based** VDI, thin-client endpoints, multimedia, variable networks

Blast Extreme is the display protocol behind Omnissa Horizon, one of the most widely deployed VDI platforms in the enterprise. It adapts well to variable network conditions and is a strong fit for organizations already standardized on Horizon for virtual desktops, or for mixed environments where thin clients need to reach both physical and virtual hosts.

Citrix (HDX / ICA) *(Citrix DaaS)*

Owner: Cloud Software Group **Best for:** Low-bandwidth WANs, adaptive transport, legacy integrations

HDX is Citrix's long-established protocol, known for its adaptive transport technology that gracefully handles low-bandwidth or high-latency WAN links. It remains a common choice for large, geographically distributed organizations and for customers with deep existing Citrix investments and integrations.

Nutanix (FRP / Frame) *(Dizzion Frame)*

Owner: Dizzion / Nutanix **Best for:** Clientless, browser-based (HTML5) access, hybrid cloud

Frame's protocol is built for clientless delivery — users can connect from an ordinary HTML5 browser with no locally installed software. This makes it attractive for hybrid-cloud deployments, contractor or BYOD access, and organizations that want to minimize what is installed on the endpoint itself.

Microsoft RDP *(Remote Desktop Services (RDS) / Azure Virtual Desktop)*

Owner: Microsoft **Best for:** Native Windows environments, LAN administration, basic office workloads

RDP is the default, built-into-Windows protocol and remains the simplest path to a native Windows experience — whether connecting to Remote Desktop Services on-premises or to Azure Virtual Desktop in the cloud. It is well suited to standard office productivity workloads and LAN-based administration where no specialized graphics or security hardware is required.

Parallels (RDP Extended) *(Parallels RAS)*

Owner: Parallels (Alludo) **Best for:** Rapid deployment, simplified IT administration, mid-market VDI

Parallels RAS extends RDP with simplified management tooling, making it a popular choice for mid-market organizations that want VDI-style centralized management without the complexity or cost of a larger enterprise platform.

5.2 High-Performance Workstation & Graphics-Intensive Remoting

When users need dedicated GPU performance — CAD, 3D rendering, video, simulation, or trading — these protocols are optimized to deliver a local-desktop-class experience from a centralized rackmount workstation.

HP RGS (RGS / HP-VRG) *(HP ZCentral Remote Boost)*

Owner: HP **Best for:** High-density centralized rackmount workstations, 3D CAD, creator workloads

Remote Graphics Software is purpose-built for high-end workstation remoting, preserving color accuracy and responsiveness for CAD, content creation, and other GPU-driven professional applications running on centralized rackmount hardware.

HP Anyware (PCoIP Ultra) *(HP Anyware)*

Owner: HP **Best for:** Cross-platform software digital workspaces requiring high security

Anyware delivers the PCoIP protocol as a software client, extending PCoIP's security and image-quality characteristics beyond hardware Zero Clients to Windows and IGEL-based endpoints — useful when a mix of hardware and software endpoints must all reach PCoIP-hosted resources.

PCoIP (Tera2) *(Trusted Zero Clients)*

Owner: HP (via Teradici) **Best for:** Hardware-accelerated Tera2 Zero Clients, zero attack surface

The original hardware implementation of PCoIP, decoded directly in the Tera2321/Tera2140 silicon inside a Zero Client. Because there is no general-purpose OS, writable storage, or local application layer, these endpoints present effectively no attack surface — a common requirement in defense, finance, and other high-security environments. ClearCube's current-generation Trusted Zero Clients connect either through a one-time-purchase host card or through HP Anyware software.

Mechdyne TGX *(TGX Remote Desktop)*

Owner: Mechdyne **Best for:** Multi-monitor 4K, ultra-low latency, demanding remote workstation performance

TGX is engineered for the most demanding visualization workloads, supporting multi-monitor 4K output with very low latency for users who need workstation-grade responsiveness from a centralized machine.

Amazon DCV (NICE) *(Amazon DCV)*

Owner: Amazon (AWS) **Best for:** Cloud-native 3D graphics, EDA, Linux GPU sharing

DCV is Amazon's high-performance remote display protocol, well suited to cloud-hosted 3D graphics, electronic design automation (EDA), and GPU-sharing scenarios on Linux hosts, including connections to Amazon WorkSpaces.

Parsec (BUD) *(Parsec for Teams)*

Owner: Unity Technologies **Best for:** Ultra-low-latency video editing, VFX, and game development up to 240 FPS

Parsec targets the most latency-sensitive creative and interactive workloads — video editing, visual effects, and game development — supporting frame rates up to 240 FPS for a near-local feel from a remote host.

5.3 Hardware based KVM extension.

Unlike software-based remote display protocols (such as VMware Blast Extreme or Citrix HDX) that compress and transmit display data over standard IP networks, hardware-based KVM (Keyboard, Video, Mouse) extensions rely on dedicated physical transmitters, host cards, and receivers. This approach provides uncompressed or hardware-

optimized, zero-latency performance and physical network isolation, making it ideal for high-security, broadcast, or mission-critical environments where workstations must be secured in a central data center rather than at the user's desk.

Thinklogical (Thinklogical Fiber/CATx KVM)
Owner: Thinklogical (A Belden Brand) **Best for:** Mission-critical security, zero-latency broadcast, and uncompressed fiber extension Thinklogical provides high-performance, uncompressed KVM extension and matrix switching primarily over fiber optic cabling. Because it does not rely on software compression or standard IP network routing, it delivers pixel-perfect, artifact-free video with absolute zero latency. It is heavily utilized in military operations (offering secure, physical separation of classified systems), air traffic control, and high-end video post-production where flawless color accuracy and instant peripheral response are mandatory.

HDBaseT (HDBaseT Extenders)
Owner: HDBaseT Alliance **Best for:** Cost-effective, single-cable remote desktop extension over standard twisted-pair (copper) infrastructure HDBaseT is a global connectivity standard for transmitting uncompressed high-definition video, audio, USB, Ethernet, and power over a single Category 5e/6 cable. In a remote desktop context, HDBaseT extenders allow organizations to securely rack PCs or VDI thin clients in an IT closet while extending the display and USB peripherals to the user's desk. It offers a highly efficient hardware solution for trading floors, medical imaging, and control rooms that require pristine video and local-feeling USB connectivity without the higher infrastructure cost of fiber optics.

Tera2 PCoIP Host Cards & Zero Clients
Owner: HP (formerly Teradici) **Best for:** Pixel-perfect 3D graphics, VFX, and engineering workloads with zero host CPU overhead Rather than relying on a software agent, Tera2 hardware uses dedicated PCIe host cards installed directly into the data center workstation to capture the video output from the GPU and hardware-encode it using the PCoIP (PC-over-IP) protocol. This stream is decoded at the user's desk by a stateless, highly secure hardware Zero Client. While HP has begun sunsetting the HP Anyware and Teradici hardware ecosystem (with the final End of Life for Tera2 Desktop Access set for December 31, 2029), these devices remain a viable and robust solution for specific needs. They are still actively utilized in VFX studios, EDA foundries, and federal environments that require secure, hardware-locked pixel delivery without taxing the host machine's resources during this multi-year transition period.

5.4 Remote Support, Hybrid Work & Cross-Platform Access

These protocols emphasize flexibility across operating systems and connection scenarios, from IT helpdesk support to heterogeneous Linux/Windows environments.

NoMachine (NX) *(NoMachine Enterprise)*

Owner: NoMachine **Best for:** Cross-platform desktop sharing, heterogeneous Linux environments

NX is well suited to organizations running a mix of Linux and Windows systems, offering straightforward cross-platform desktop sharing without requiring a specific VDI platform.

Splashtop *(Splashtop Enterprise)*

Owner: Splashtop Inc. **Best for:** IT helpdesk support, secure hybrid work, bypassing traditional VPNs

Splashtop is frequently chosen for IT support and hybrid-work scenarios where a fast, secure connection is needed without standing up a full VPN, making it a lightweight option for remote access and helpdesk use cases.

6 Matching ClearCube Endpoints to Protocols

ClearCube endpoints — Trusted Zero Clients, Zero+ Clients, Thin Clients, and Mini PCs (NUCs) — are built to pair with our rackmount and blade PCs. Which protocols an endpoint can run depends largely on its operating environment. The table below maps ClearCube endpoint categories to the protocols they support, based on the vetted options in this guide.

ClearCube Endpoint	Compatible Protocols
TERA2 Zero Client (Tera2 hardware chip)	PCoIP (Tera2) only — the protocol is decoded in silicon, giving these endpoints a fixed-function, non-writable design with effectively no attack surface for malware or data-at-rest. (EOS 12/31/ 2029). Supported in Omnissa Horizon environments through
Zero+ Client (IGEL / ZeeTim / Amzetta OS)	Omnissa (Blast Extreme), Citrix (HDX/ICA), Microsoft RDP, HP Anyware (PCoIP Ultra — IGEL only), Amazon DCV (IGEL/ZeeTim), Nutanix Frame (IGEL only), NoMachine (IGEL only), Parallels RAS (IGEL only).
Thin Client — Windows 11	All thirteen software protocols in this guide run on a Windows 11 thin client, making it the most flexible endpoint choice when the exact protocol may change over time or vary by user group.
Mini PC / NUC — Windows 11	Same broad compatibility as a Windows 11 thin client, with additional local CPU/GPU headroom for protocols that benefit from client-side hardware decode (e.g., Mechdyne TGX, Parsec, HP ZCentral Remote Boost).

For the highest security posture — for example, facilities that cannot permit any writable endpoint OS or local data storage — a network bootable client or point-to-point KVM extension technology remains the most restrictive and secure options. For maximum protocol flexibility, a Windows 11 thin client or NUC lets IT standardize on a single endpoint hardware platform while still supporting whichever protocol a given VDI platform, application, or customer requirement calls for.

7 How to Choose the Right Protocol

Work through these questions with your ClearCube representative to narrow the field:

- **What is the workload?** Standard office productivity generally works well over RDP, Citrix HDX, or Omnissa Blast Extreme. GPU-intensive CAD, video, simulation, or trading workloads point toward HP RGS, PCoIP, Mechdyne TGX, Amazon DCV, or Parsec.
- **What is the security requirement?** Regulated, defense, or classified environments often require the fixed-function, non-writable design of a Tera2 hardware Zero Client running PCoIP or a 3rd party KVM extension technology. Less restrictive environments have more latitude to use a software-based protocol.
- **What is the network environment?** Remote or branch-office users on constrained WAN links benefit from protocols with strong adaptive transport, such as Citrix HDX or Omnissa Blast Extreme. LAN-connected users in the same facility as the rackmount host have more flexibility, including PCoIP, RGS, or TGX.
- **What platform do you already run?** If you already run Omnissa Horizon, Citrix DaaS, or AWS WorkSpaces, your protocol may already be determined by that platform. If you are deploying dedicated, non-virtualized rackmount workstations, you have a free choice among the high-performance options in Section 5.2.

- **How much endpoint standardization do you want?** A single endpoint hardware standard (e.g., Windows 11 thin clients) that supports many protocols simplifies procurement and support, while dedicating specific endpoint types to specific protocols can optimize cost and security per user group.

8 Why ClearCube for Centralized Computing

ClearCube has designed and built rackmount blade PCs and workstations in Austin, Texas since 1997, and pairs them with a full line of custom-engineered Zero Clients, Thin Clients, and Mini PCs (NUCs). Because we build and test both sides of the connection, we can tell you — with confidence — which protocols are vetted, supported, and field-proven across our product line.

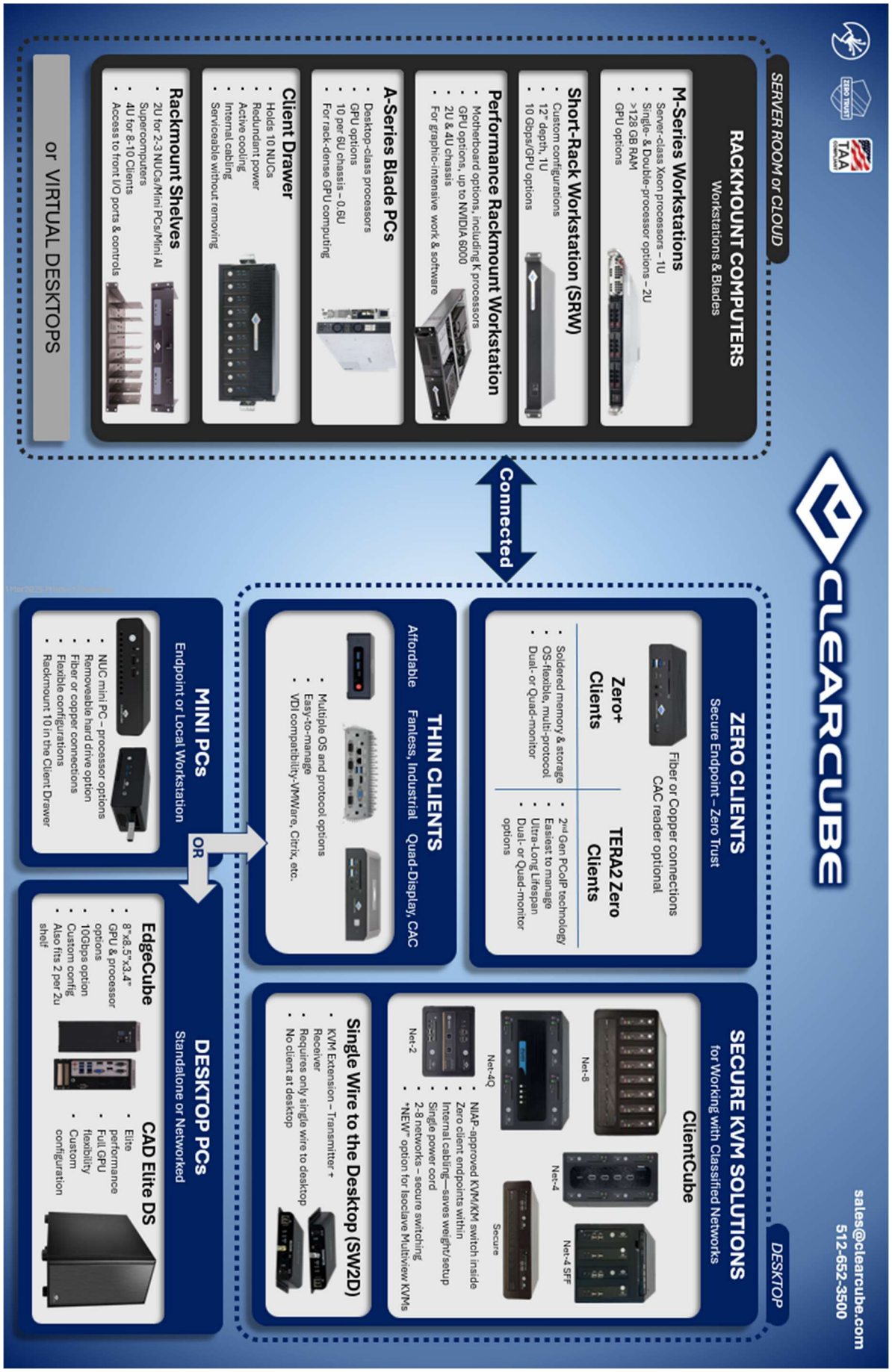
- **Purpose-built hardware:** Custom-built, TAA-compliant rackmount and blade PCs with redundant power, internal cabling, and active cooling, sized from 1U short-depth desktop-chipset systems to 2U/4U full-rack configurations.
- **High-density endpoint management:** The Client Drawer racks up to 100 Mini-PCs, Thin Clients, or Zero Clients in a standard rack for simplified cabling and serviceability, with support for KVM extension and fiber-optic cabling to the desktop for EMP shielding in secure facilities.
- **Endpoint breadth:** From Trusted Zero Clients with a fixed-function Tera2 chip to full Windows 11 thin clients and NUCs, our endpoints cover the full spectrum from maximum security to maximum protocol flexibility.
- **Proven track record:** Decades of deployments across federal, defense, and commercial customers, including trading floors, network operations centers, and command environments where uptime and security are non-negotiable.

9 Next Steps

Choosing a remote desktop connection protocol is easiest when it starts with your workload, your security requirements, and your existing platform investments — not the other way around. Your ClearCube representative can help you map any of the options in this guide to a specific rackmount PC, blade PC, and endpoint configuration.

> **Talk to ClearCube**
>
> Contact your ClearCube representative or visit clearcube.com to discuss which rackmount computers, Zero Clients, Thin Clients, or Mini PCs best fit your remote desktop connection requirements.

This guide reflects ClearCube's currently vetted connection options and is intended as a general reference for sales and customer discussions. Protocol availability, endpoint OS support, and vendor product names may change over time — confirm current specifications with your ClearCube representative before finalizing a design.


SERVER ROOM or CLOUD
RACKMOUNT COMPUTERS
Workstations & Blades
M-Series Workstations
Server-class Xeon processors – 1U
Single- & Double-processor options – 2U
>128 GB RAM
GPU options
Short-Rack Workstation (SRW)
Custom configurations
12" depth, 1U
10 Gbps/GPU options
Performance Rackmount Workstation
Motherboard options, including K processors
GPU options, up to NVIDIA 6000
2U & 4U chassis
For graphic-intensive work & software
A-Series Blade PCs
Desktop-class processors
GPU options
10 per 6U chassis – 0.6U
For rack-dense GPU computing
Client Drawer
Holds 10 NUCs
Redundant power
Active cooling
Internal cabling
Serviceable without removing
Rackmount Shelves
2U for 2-3 NUCs/Mini PCs/Mini AI Supercomputers
4U for 8-10 Clients
Access to front I/O ports & controls
or VIRTUAL DESKTOPS
Connected
CLEARCUBE
sales@clearcube.com
512-652-3500
DESKTOP
ZERO CLIENTS
Secure Endpoint – Zero Trust
Zero+ Clients
Fiber or Copper connections
CAC reader optional
Soldered memory & storage
OS-flexible, multi-protocol
Dual- or Quad-monitor
TERA2 Zero Clients
2nd Gen PCoIP technology
Easiest to manage
Ultra-Long Lifespan
Dual- or Quad-monitor options
THIN CLIENTS
Affordable Fanless, Industrial Quad-Display, CAC
Multiple OS and protocol options
Easy-to-manage
VDI compatibility-VMWare, Citrix, etc.
SECURE KVM SOLUTIONS
for Working with Classified Networks
ClientCube
Net-8
Net-4
Net-4 SFF
Net-4Q
Secure
Net-2
NIAP-approved KVM/KM switch inside
Zero client endpoints within
Internal cabling—saves weight/setup
Single power cord
2-8 networks – secure switching
NEW option for Isoclave Multiview KVMs
Single Wire to the Desktop (SW2D)
KVM Extension – Transmitter +
Receiver
Requires only single wire to desktop
No client at desktop
OR
MINI PCs
Endpoint or Local Workstation
NUC mini PC – processor options
Removeable hard drive option
Fiber or copper connections
Flexible configurations
Rackmount 10 in the Client Drawer
DESKTOP PCs
Standalone or Networked
EdgeCube
8"x8.5"x3.4"
GPU & processor options
10Gbps option
Custom config
Also fits 2 per 2u shelf
CAD Elite DS
Elite performance
Full GPU flexibility
Custom configuration