MCP SERVER | NO CODE | CLOUD HOSTED

Mesh Geometry Calculator MCP for AI Agents

Precise 3D Mesh Analysis for Computational Engineering

Mesh Geometry Calculator performs deep analysis on 3D triangular meshes. It calculates physical properties like volume and surface area, defines spatial boundaries using AABB and bounding spheres, and analyzes the underlying mesh topology to detect manifold geometry.

A+ Quality Score 100/100

mesh | topology | 3d | geometry | vertices

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vinkius.com/mcp/mesh-geometry-calculator

SCAN TO VIEW

The connectivity layer between AI and the world's software.

Vinkius sits between AI and every application. All communication passes through Vinkius Cloud via the Model Context Protocol (MCP) — with governance, observability, and security at every layer.

Your AI Connections Run Through Vinkius Cloud

The world's largest managed MCP catalog

Vinkius is the connectivity layer where AI connects to the software your business already runs. We handle the hosting, the security, the credentials, the uptime — you get agents that actually do things.

We operate the world's largest managed MCP catalog. Major SaaS platforms, CRMs, databases, and cloud providers — running, monitored, production-ready. This MCP server is hosted and maintained by the Vinkius Cloud for AI Agents.

> *The agent doesn't manage credentials, doesn't manage uptime, doesn't manage security. Vinkius does.*
>
> — Architecture principle

Four Pillars of the Vinkius Runtime

01 — Security by design

Credentials stay encrypted at rest via AES-256. The AI agent never touches raw keys — they're injected into a sandboxed V8 isolate at runtime. Actions are logged, and connections have an emergency kill switch.

02 — Built on MCP Fusion

This MCP server was built with **MCP Fusion**, the open-source framework (Apache 2.0) that powers the entire Vinkius catalog. Schema-as-firewall strips undeclared fields, compiled PII redaction runs at zero overhead, and cryptographic lockfiles produce git-diffable audit trails.

03 — Deterministic observability

Eight immutable metrics per endpoint: request volume, p95 latency, error rate, active connections, cost attribution. A live payload feed logs every tool call with mutation detection.

04 — Autonomous operations

Servers are deployed, monitored, and patched autonomously. New capabilities and security patches ship weekly. Zero-downtime deployments ensure continuous availability across all managed MCP servers.

AES-256	Ed25519	24h TTL	V8 Isolate
Encryption at rest	PKI vault signatures	Ephemeral session keys	Sandboxed execution

One Token. Instant Access.

Every MCP server on Vinkius is accessed through a **Connection Token**. Tokens are generated in the cloud dashboard and produce a unique MCP endpoint URL. Paste this URL into any MCP-compatible client — no SDK required.

A single token can serve **multiple AI clients simultaneously**, or you can issue separate tokens per client for granular access control. Each token tracks its own request count, last activity timestamp, and can be individually enabled or revoked.

MCP ENDPOINT

```
https://edge.vinkius.com/{token}/mcp
```

Claude · Cursor · VS Code · Windsurf · Grok · Gemini

Security Is the Architecture

Security in Vinkius is not a feature — it's the foundation of the runtime. The gateway enforces multiple independent protection layers between AI agents and third-party APIs.

01 — Ed25519 PKI Vault

Every workspace has an Ed25519 Master Key. Session keys are generated ephemerally (24h TTL) and signed by the Master Key. Credentials never leave the vault boundary.

02 — V8 Isolate Sandboxing

Tool code runs inside isolated-vm V8 isolates with 64 MB memory caps and per-request timeouts. No filesystem access, no network access except through the SSRF-guarded fetch bridge.

03 — SSRF Guard

All outbound HTTP requests are DNS-resolved and validated before execution. Private IP ranges (10.x, 172.16-31.x, 192.168.x, AWS metadata 169.254.x) are blocked at the network layer.

04 — DLP & PII Redaction

A ResponseGuard pipeline intercepts every tool response. Configurable redaction patterns strip sensitive fields (emails, SSNs, card numbers) before data reaches the AI agent.

05 — Cryptographic Audit Trail

Every request is signed into a SHA-256 hash chain with Ed25519 signatures. Events form a tamper-proof, SIEM-exportable forensic record.

06 — Honeytoken Trap System

Phantom credentials are injected into isolated environments. If a honeytoken is used outside Vinkius infrastructure, the server is quarantined instantly.

Emergency Kill Switch

EU AI Act Art. 14(1) Compliant

The kill switch is an **emergency halt** mechanism — not a simple toggle. When triggered, it executes three actions atomically:

01 — Server deactivated

The MCP server is immediately taken offline across the entire cluster.

02 — All tokens revoked

Every connection token is invalidated. Total lockout — reconnection blocked until new tokens are issued.

03 — WebSocket connections killed

Active connections terminated via Redis pubsub broadcast. Propagates to every runtime node in the cluster.

Full Visibility. Zero Guesswork.

The Vinkius cloud dashboard includes a full MCP Governance suite — real-time analytics and security controls for production AI operations.

Control Plane

KPI dashboard with request volume, latency, success rate, token consumption, and AI-generated operational briefings.

Agent Activity

Which AI clients are connecting, how often, and what they're doing — real-time session tracking.

FinOps

Cost tracking per tool, payload compression savings, budget optimization signals, and consumption trends.

Tool Health

Slowest and most error-prone tools, with actionable root-cause insights and performance baselines.

Firewall & DLP

PII redaction activity, sensitive data protection counters, and security event timeline.

Incident Log

Error trends, failure rates, status-code breakdowns, and forensic audit trail access.

> Get started at **cloud.vinkius.com** — connect your AI agent in under 60 seconds.

Mesh Geometry Calculator MCP

3 tools available
Cloud-hosted on Vinkius

When you're working with complex digital assets, you can't just assume a mesh is perfect. This MCP gives your AI client the tools to analyze 3D triangular meshes down to their fundamental structure. You can calculate real-world metrics like volume and surface area, which is essential for physics simulations or resource management. It also tells you how much space an asset occupies by computing its spatial boundaries—things like Axis-Aligned Bounding Boxes and bounding spheres. Beyond size, the calculator checks the mesh's integrity. It confirms if the geometry is manifold, ensuring that every edge is correctly connected to guarantee clean simulation results. If your workflow demands reliable geometric data, connecting this MCP via Vinkius gives your agents immediate access to these specialized calculations.

Core Capabilities

01 — Determine physical size and mass metrics

Calculate the total surface area, enclosed volume, and center of mass for any given mesh.

02 — Define accurate spatial boundaries

Compute the minimum bounding box (AABB) and the smallest possible enclosing sphere for a 3D asset.

03 — Analyze structural integrity and connectivity

Assess if the mesh is topologically sound, detecting manifold geometry and calculating weighted vertex normals.

One Click on Vinkius — From Prompt to Execution

Available at **vinkius.com/mcp/mesh-geometry-calculator** — connect your AI agent in three steps.

01 Your AI client sends the mesh data (vertices and indices) to this MCP.

02 You specify exactly what analysis you need—for instance, just the bounding box, or full volume metrics.

03 The MCP executes the calculation and returns a clean, structured set of geometric measurements.

The bottom line is that your agent gets precise, calculated data about the mesh's size and structure without you needing to run complex external geometry software.

Built For

Computational engineers and game developers use this MCP when they hit geometric dead ends. If your project involves simulating physics, optimizing assets for rendering, or checking the structural integrity of CAD models, you need reliable mesh data. This is for anyone who can't trust their geometry just by looking at it.

Computational Engineer

Uses this to verify that complex CAD assemblies are watertight and calculate precise volumes for material costing or fluid dynamics simulations.

Game Developer / Technical Artist

Rely on it to quickly generate bounding boxes for collision detection systems, ensuring assets don't overlap or fall through the map.

3D Modeler / Digital Sculptor

Checks if a mesh is manifold and calculates accurate surface normals before exporting models for advanced rendering pipelines.

What Changes When You Connect

01 Accurate Volume and Surface Area: Instead of guessing, you use get_mesh_metrics to calculate exact volumes and surface areas needed for physics or material estimates.

02 Optimized Collision Detection: Using get_mesh_enclosures, your agent instantly gets the AABB and bounding sphere data required for faster, more reliable collision checks in games.

03 Structural Validation: The ability to run get_mesh_topology confirms if a mesh is truly manifold, saving hours of debugging time caused by faulty geometry.

04 Center of Mass Calculation: Get precise center-of-mass coordinates using get_mesh_metrics, which is vital for simulating realistic physics interactions in your models.

05 Fast Connectivity Checks: Quickly analyze the mesh structure with get_mesh_topology to ensure vertices and edges are connected correctly before export.

Real-World Applications

Checking asset readiness for a game engine

A developer needs to know if all environmental props passed into the game are collision-ready. They ask their agent to run get_mesh_enclosures on 50 assets, getting immediate AABB and bounding sphere data for optimized collision meshes.

Estimating material volume for a sculpture

A sculptor needs to know the exact capacity of a complex, organic shape. They run get_mesh_metrics, which returns a precise volume measurement, allowing them to order the correct amount of resin or filler.

Debugging CAD models for leakage

An engineering team suspects their simulated pipe network has gaps. Using get_mesh_topology, they verify if the mesh is truly manifold and identify exactly where edges are only used by one face, pointing out structural leaks.

Verifying physics simulation boundaries

A researcher needs to calculate the total gravitational influence of a complex object. They use get_mesh_metrics to get the center of mass and surface area, ensuring their simulation's physical constants are correct.

Patterns to Avoid

Assuming perfect geometry

✗ AVOID

The artist just exports a model from Blender and assumes it'll work for physics, only to find the engine crashes because some edges aren't properly connected.

✓ INSTEAD

Don't trust assumptions. Use get_mesh_topology first. It checks connectivity and tells you right away if the mesh is manifold, guaranteeing clean data before simulation.

Calculating bounding boxes manually

✗ AVOID

A developer wastes time writing custom scripts to find min/max coordinates for collision detection every time an asset changes.

✓ INSTEAD

Let get_mesh_enclosures handle it. It calculates the AABB and bounding sphere in one call, saving you hours of manual math and scriptwriting.

Using generic area metrics

✗ AVOID

A team needs to know the total mass of an object but only has a rough estimate of its surface size.

✓ INSTEAD

You need precise volume. Run get_mesh_metrics; it gives you the true enclosed volume and center of mass, which is exactly what physics simulations require.

The Right Fit

Use this MCP if your project requires mathematical certainty about 3D geometry. You need to know volumes, surface areas, or if a mesh can handle physical forces; that's where get_mesh_metrics and get_mesh_topology shine. It’s perfect for computational engineers working on CAD or complex simulations. Don't use this if you just need basic visual checks—if all you need is to see an object, skip it. If your goal is simple data visualization without underlying geometric analysis, a standard file loader will work better. But when the structural integrity or physical dimensions are critical, this MCP is non-negotiable.

Mesh Geometry Calculator: Analyzing 3D Mesh Topology for Simulation

Manual mesh preparation involves exporting a model, opening it in multiple specialized programs (like CAD software and then a simulation package), and painstakingly running integrity checks. You're constantly copying vertex lists between tabs, trying to confirm if the geometry is 'watertight,' only to find subtle leaks that break your entire simulation.

With this MCP, you run get_mesh_topology once. Your agent analyzes the mesh connectivity, instantly detecting whether it is manifold and calculating weighted vertex normals. You don't just assume the model works; you know it does.

Mesh Geometry Calculator: Calculating Physical Metrics like Volume

Traditionally, figuring out a mesh's volume meant slicing cross-sections or running complex finite element analysis (FEA) in highly specialized software. This process is slow, requires expert knowledge, and often leaves you with approximation errors.

Now, simply run get_mesh_metrics. You receive the exact surface area, enclosed volume, and center of mass immediately. The calculation provides definitive data points, allowing your workflow to move past guesswork.

Mesh Geometry Calculator: 3 Tools for Advanced Mesh Topology Analysis

Use these tools to calculate physical dimensions, define spatial bounds, or analyze the structural integrity of any 3D mesh.

#	TOOL	DESCRIPTION
01	`get_mesh_enclosures`	Calculates the Axis-Aligned Bounding Box (AABB) and the minimal bounding sphere that contains the entire mesh.
02	`get_mesh_metrics`	Computes critical physical properties: surface area, enclosed volume, and the center of mass for a given mesh.
03	`get_mesh_topology`	Analyzes mesh connectivity to determine if the geometry is manifold and calculates weighted vertex normals for accurate shading.

See It in Action

Real prompts you can use once this MCP is connected to your AI agent through Vinkius Cloud.

U What are the total volume and surface area for these vertices?

Mesh Analysis Results

- **Surface Area:** 12.5 square units
- **Enclosed Volume:** 8.9 cubic units
- **Center of Mass:** (4.2, -1.1, 0.5)

This data is ready for immediate use in your physics engine calculations.

U Calculate the bounding box and sphere size for this asset:

Bounding Geometry Report

- **AABB:** Min (0, 0, -5) to Max (10, 2, 5)
- **Bounding Sphere Radius:** 7.8 units

This gives you the tightest possible spatial bounds for efficient collision checks.

U Is this mesh valid for simulation? Check its topology:

Topology Scan Status: Passed.

The mesh is confirmed as manifold. Connectivity analysis shows consistent edge usage across all faces, and the weighted vertex normals are calculated successfully. You're good to simulate.

Frequently Asked Questions

01 **How can I check if my 3D model geometry is suitable for physics simulation?**

Use this MCP to run a topology analysis, which confirms if the mesh is manifold. This ensures every edge and face is correctly connected, eliminating structural errors that break simulations.

02 **What specific metrics can I calculate for a complex 3D object?**

You get precise calculations of surface area, enclosed volume, and the center of mass. This level of detail lets you accurately estimate material needs or simulate gravitational pulls.

03 **Does Mesh Geometry Calculator help with collision detection setup?**

Yes, it calculates both the Axis-Aligned Bounding Box (AABB) and the bounding sphere for your assets. These tight boundaries drastically improve performance in game engines' physics systems.

04 **I need to know if my mesh has any structural gaps or errors.**

Running a topology check will tell you immediately if the geometry is manifold, pointing out exactly where edges are improperly connected. It’s essential for clean data transfer between programs.

05 **Can I use this MCP to get dimensions like total size?**

It provides comprehensive measurements including the exact surface area and volume of your mesh, allowing you to quantify the object's physical space accurately.

Go Live in 60 Seconds

Get your connection token from **cloud.vinkius.com**, then paste the endpoint URL into any MCP-compatible client.

YOUR MCP ENDPOINT

```
https://edge.vinkius.com/[TOKEN]/mcp
```

CLIENT	WHERE TO CONFIGURE
Claude AI	Profile → Customize → Connectors → "+" → Add custom connector → Paste endpoint
Cursor	Settings → Features → MCP Servers → "+ Add New MCP Server" → Type: SSE → Paste endpoint
VS Code	Ctrl/Cmd+Shift+P → "MCP: Add Server" → add `"mesh-geometry-calculator": { "url": "…" }`
Windsurf	MCP Settings → `mcp_settings.json` → Add endpoint URL
ChatGPT	Settings → Tools & plugins → Add MCP server → Paste endpoint
Gemini	Extensions → Add MCP Server → Paste endpoint URL

ASK AN AI ABOUT THIS

Let your preferred AI explain this MCP server

- Ask ChatGPT
- Ask Claude
- Ask Perplexity
- Ask Gemini
- Ask Grok

READY TO CONNECT

Mesh Geometry Calculator is live on Vinkius Cloud.

Get your connection token, paste it into your AI agent, and start building. No SDK. No deployment. Just results.

Start at cloud.vinkius.com →

vinkius.com · support@vinkius.com

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DOCUMENT INFORMATION

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