

MCP SERVER

NO CODE

CLOUD HOSTED

Network Flow Calculator MCP for AI Agents

Modeling and Optimizing Network Capacity in Complex Systems

Network Flow Calculator solves complex network problems using graph theory. It determines the absolute maximum flow capacity between two points, identifies critical bottlenecks (minimum cuts), and handles resource assignment tasks like scheduling or matching workers to jobs.

A+ Quality Score 100/100

max-flow

min-cut

bipartite-matching

graph-theory

edmonds-karp



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.

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.

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.

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

Encryption at rest

Ed25519

PKI vault signatures

24h TTL

Ephemeral session keys

V8 Isolate

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.

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.

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.

06 — Honeypot Trap System

Phantom credentials are injected into isolated environments. If a honeypot 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.

FinOps

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

Firewall & DLP

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

Agent Activity

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

Tool Health

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

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.

Network Flow Calculator MCP

3 tools available

Cloud-hosted on Vinkius

Do you need to know the real limit of throughput in a data pipeline or logistics route? This MCP calculates maximum network flow using established computational methods. You can model any directed graph—from city road networks to internal server routing paths—and determine its peak capacity. Beyond just finding the highest possible flow, it pinpoints exactly where the system fails: identifying minimum cuts reveals the single most critical edge that limits performance. Furthermore, if your problem involves matching resources, like assigning specialized equipment to limited job slots or scheduling staff members to shifts, this tool handles those complex bipartite assignments. When you connect this MCP through Vinkius, your AI client gets access to a powerful computational engine that takes abstract graph theory problems and gives you concrete answers about bottlenecks, capacity, and resource limits.

Core Capabilities

01 — Determine maximum network throughput

Calculates the highest possible flow value between a designated source node and a sink node in any given network.

02 — Identify critical capacity bottlenecks

Pinpoints the minimum cut, revealing the specific edges or links that limit the overall data or resource throughput of a network.

03 — Solve complex resource assignments

Matches items from two distinct sets—like workers and tasks—to find the maximum number of viable pairings.

One Click on Vinkius — From Prompt to Execution

Available at vinkius.com/mcp/network-flow-calculator — connect your AI agent in three steps.

- 01 Define your network structure, specifying all nodes (points) and directed edges (connections), along with their current capacities.
- 02 Instruct your AI client to run the appropriate calculation—whether it's calculating maximum flow, finding a minimum cut, or computing a bipartite matching.
- 03 The MCP executes the required graph algorithm and returns precise numerical results and the specific set of limiting edges or optimal assignments.

The bottom line is that you define the network constraints once, and the MCP calculates all the complex optimization outcomes for you automatically.

Built For

Operations researchers and data architects need this. If your job involves optimizing physical supply chains or routing massive amounts of data through interconnected systems, this MCP cuts out weeks of manual modeling. It's built for the person who gets frustrated staring at flow charts that can't prove their bottleneck theory.

Logistics Planner

Determines optimal routes and identifies single points of failure in a supply chain network, ensuring maximum delivery capacity.

Data Architect

Models data center topologies to calculate peak bandwidth usage and identify which network links are throttling overall service performance.

Operations Researcher

Solves complex resource allocation puzzles, such as matching limited specialized equipment to high-priority jobs.

What Changes When You Connect

-
- 01** Pinpoint critical failure points. Instead of guessing where a bottleneck exists, use `find_min_cut` to mathematically prove the exact link that limits network capacity.

 - 02** Determine total system throughput instantly. The MCP calculates maximum flow, giving you the absolute peak capacity for data pipelines or supply routes without manual simulation.

 - 03** Solve complex scheduling puzzles efficiently. Use `compute_bipartite_matching` to match limited resources—like specialized machines—to available jobs in seconds.

 - 04** Reduce modeling time dramatically. You don't have to run multiple simulations; you feed the constraints into this MCP and get a definitive answer on network limits.

 - 05** Validate resource allocation theories. Test if your proposed infrastructure upgrades actually increase throughput by calculating the new maximum flow after changes.
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Real-World Applications

A global shipping company needs to optimize its major freight routes.

The logistics planner models their network of ports and rail lines. By running the max flow calculation, they confirm that a specific railway link is the critical bottleneck, allowing them to focus immediate investment on upgrading just that single point.

A university department needs to assign limited research assistants to projects.

The operations researcher uses bipartite matching to model available students and required skills. The MCP determines the maximum number of student-project pairings possible while satisfying all prerequisite connections.

A tech company needs to ensure its data center can handle peak traffic.

The data architect models all server connections. Running the min cut function reveals that a single core switch connection, not the main fiber line, is limiting overall bandwidth capacity, saving millions in unnecessary upgrades.

Patterns to Avoid

Assuming flow is limited by total input.**X AVOID**

The engineer looks at the sum of all incoming links and assumes that's the capacity, failing to account for how the internal paths restrict movement. This leads to over-engineering expensive hardware.

✓ INSTEAD

Instead, use `find_min_cut` to identify the actual bottleneck edges that limit throughput, giving you a precise figure much more useful than simple summing.

Treating resource matching as brute force.**X AVOID**

Manually listing every possible assignment combination for workers and tasks, which quickly becomes impossible to calculate when the number of participants grows past ten.

✓ INSTEAD

Use `compute_bipartite_matching` to automatically find the largest possible set of optimal assignments without needing to check every single permutation.

Ignoring directional flow constraints.**X AVOID**

Modeling a system as undirected, which fails when capacity is only available in one direction (e.g., data flowing from Server A to B but not vice versa).

✓ INSTEAD

Always model the network with directed edges and use `calculate_max_flow` to respect the specific one-way constraints of your real-world system.

The Right Fit

Use this MCP if your problem can be modeled as a graph: finding limits (min cut), maximizing throughput (max flow), or optimizing assignments (bipartite matching). You need it when you suspect the failure point isn't the most expensive component, but the weakest link. Don't use it if your challenge is qualitative—like predicting market sentiment or writing policy documents. For those tasks, stick to general knowledge bases; this MCP is purely for quantitative network analysis and resource optimization.

Network Flow Calculator: Solving Capacity Bottlenecks in Logistics Planning

Running a major shipping operation involves constant manual checks. You have to map out dozens of ports, rail lines, and trucking routes, then calculate the cumulative throughput. This requires copying data from one spreadsheet into another just to see if adding capacity at Point X helps, or if the real limit is actually further down the line.

With this MCP, you model your entire network once. Then, running the minimum cut calculation immediately highlights the single most restrictive link—whether it's a port's crane capacity or a rail segment's maximum weight. You get an actionable answer on where to invest first.

Network Flow Calculator: Optimizing Resource Assignments in Academia

Assigning students to research projects is usually messy. Faculty must track student skill sets against project needs, manually cross-checking availability and prerequisites to ensure every available resource gets assigned optimally.

The MCP handles this complexity. By running the bipartite matching tool, you instantly determine the absolute maximum number of successful assignments possible, giving you a definitive plan that maximizes departmental output.

Network Flow Calculator: 3 Tools for Graph Theory Analysis

These tools allow you to model real-world networks to calculate peak capacity, identify failure points, or solve complex resource assignment puzzles.

#	TOOL	DESCRIPTION
01	<code>compute_bipartite_matching</code>	Finds the largest possible set of connections between two different groups of items or people.
02	<code>calculate_max_flow</code>	Calculates the maximum amount of material, data, or resource that can pass from a start point to an end point in a network.
03	<code>find_min_cut</code>	Identifies the smallest set of edges whose removal would completely disconnect a network, pinpointing its weakest link.

See It in Action

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

U What's the max flow for my network connecting sources S and T?



Maximum Flow Report

The maximum throughput capacity between Source (S) and Sink (T) is **15 units**. This calculation was performed using the Edmonds-Karp algorithm.

- **Key Findings:** The system is limited by three primary saturated edges:
 - * (S, A): 10 units
 - * (S, B): 5 units
 - * (A, T): 8 units (or similar combination)
- This means no matter how much capacity you add elsewhere, the total flow cannot exceed 15.

U Find the bottleneck edge in my network.



Minimum Cut Analysis

The minimum cut is found by separating nodes {S, B} from {A, T}. The capacity of this cut is **7 units**.

This means that adding capacity to any single link within the set {(S, A), (B, T)} will not increase the total flow above 7 until a more restrictive edge is addressed.

U I have workers and tasks. Can you match them up?



Optimal Assignment Results

We found an optimal assignment set of size **3**. This means three unique worker-task pairs can be established simultaneously.

- **Assignment 1:** Worker Alpha \rightarrow Task Gamma (Connection Weight: 9)
- **Assignment 2:** Worker Beta \rightarrow Task Delta (Connection Weight: 7)
- **Assignment 3:** Worker Charlie \rightarrow Task Epsilon (Connection Weight: 6)

Frequently Asked Questions

01 How does the Network Flow Calculator help with logistics routing?

It determines the absolute capacity of your supply chain routes. Instead of just looking at distance, you find the critical choke point—the single link or facility that limits how much freight can move through your network.

02 What is a minimum cut in the context of this MCP?

A minimum cut identifies the weakest part of your system. It shows you the set of edges that, if removed, would break the connection and limit throughput to the lowest possible capacity.

03 Can I use Network Flow Calculator for scheduling employees?

Yes, it handles resource assignments using bipartite matching. You give it your pool of available staff and their required skills against a list of open jobs, and it finds the maximum number of perfect matches.

04 Is this MCP better than just calculating simple averages?

Absolutely. Simple averages ignore network structure. This tool calculates true peak capacity based on complex flow dynamics, giving you a definitive ceiling for how much your system can handle under ideal conditions.

05 What kind of data does Network Flow Calculator need to run?







It needs nodes (the locations or resources) and directed edges (the connections between them), along with the specific capacity limit for each connection. That's all it requires.

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 <code>"network-flow-calculator": { "url": "..." }</code>
 Windsurf	MCP Settings → <code>mcp_settings.json</code> → 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

Network Flow 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](https://cloud.vinkius.com) →

vinkius.com · support@vinkius.com

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