MCP SERVER | NO CODE | CLOUD HOSTED

First-Fit Decreasing Cutter MCP for AI Agents

Optimizing material use in large-scale cutting operations

The First-Fit Decreasing Cutter calculates the most mathematically efficient ways to cut raw stock material into multiple smaller pieces. This specialized MCP uses advanced optimization logic (the FFD algorithm) to determine optimal cutting plans, drastically reducing manufacturing waste and maximizing piece yield across boards. It handles complex requirements, verifying that all requested components fit within available stock lengths before production even begins.

A+ Quality Score 100/100

cutting-plan | bin-packing | material-waste | efficiency | stock-optimization

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vinkius.com/mcp/first-fit-decreasing-cutter

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.

First-Fit Decreasing Cutter MCP

3 tools available
Cloud-hosted on Vinkius

Dealing with raw materials means managing two things: the required parts list and the inevitable scrap wood. The First-Fit Decreasing Cutter solves this optimization problem right where you need it. Instead of having an engineer manually juggle measurements across spreadsheets, this MCP runs a specialized engine that mathematically figures out how to distribute every piece onto available stock boards in the absolute best way possible. You simply feed it your total raw material length and your list of required cuts. The system returns detailed breakdowns showing exactly which pieces go on which board, minimizing the overall number of boards you have to buy or use. It’s a huge time saver for production planning and gives you confidence that every square inch of material is accounted for. You can connect this MCP through Vinkius' catalog alongside other specialized tools to build complete supply chain workflows.

Core Capabilities

01 — Calculate Optimized Cutting Plans

The MCP generates board-by-board instructions detailing the most efficient distribution of required pieces across available stock.

02 — Verify Piece Compatibility

It checks if all requested components can physically fit within a single unit of raw stock, preventing costly material errors.

03 — Analyze Material Efficiency

The tool evaluates the resulting plan, providing precise metrics on waste percentage and overall utilization rates.

04 — Determine Minimum Stock Usage

It tells you the absolute minimum total length of raw material needed to fulfill an entire order batch.

One Click on Vinkius — From Prompt to Execution

Available at **vinkius.com/mcp/first-fit-decreasing-cutter** — connect your AI agent in three steps.

01 You input two things: the total available stock length and a list detailing every specific piece size required for the job.

02 The MCP processes this data using the First-Fit Decreasing algorithm, grouping pieces onto virtual boards to minimize waste while ensuring all requirements are met.

03 You receive a detailed breakdown of the optimal cutting plan, including how many full boards were used and the calculated percentage of material that can be saved.

The bottom line is you get mathematically proven, minimal-waste cutting plans without needing specialized CAD or optimization software.

Built For

Production Planners and Materials Engineers need this MCP. If your job involves taking big sheets of material and figuring out the best way to cut them into hundreds of smaller parts, you're in pain. This tool replaces guesswork with guaranteed optimization.

Materials Engineer

Uses this MCP daily to calculate optimal yield rates for custom product runs, minimizing the cost associated with raw material waste.

Production Planner

Feeds in large orders and uses the tool to determine the minimum number of boards required before scheduling shop floor time.

Shop Floor Manager

Uses this MCP to quickly verify if a new batch of requested parts can be cut from existing stock lengths, preventing mid-shift downtime.

What Changes When You Connect

01 Stop wasting money on scrap. The `analyze_plan_efficiency` tool tells you exactly what percentage of your material is waste, letting you negotiate better pricing or adjust designs.

02 Save time and budget by getting optimal layouts instantly. Use the `calculate_cutting_plan` to figure out board breakdowns in seconds instead of hours of manual spreadsheet work.

03 Eliminate costly setup errors. Before committing to a cut, use `verify_piece_compatibility` to confirm every single component fits the raw stock length available.

04 Streamline material ordering. You get precise total stock consumption reports, ensuring you only order exactly what you need for the job batch.

05 Improve project profitability. By maximizing yield per board, this MCP directly impacts your bottom line and reduces overhead costs.

Real-World Applications

Designing Custom Furniture Components

A furniture shop needs to cut 50 drawer sides (800mm) and 10 decorative panels (250mm). The agent runs the tool, which returns an optimized plan showing the total boards needed and a clear layout for the woodworkers using `calculate_cutting_plan`.

Prototyping Electronics Boards

A design team has raw carbon fiber sheets. They ask their agent to check if 12 different component sizes can be cut from a single sheet of available stock using `verify_piece_compatibility`. The tool instantly flags which pieces are too large or incompatible.

Palletizing Shipping Crates

A logistics firm needs to pack crates with mixed sizes. They feed the required dimensions into the MCP, then use `analyze_plan_efficiency` to generate a report showing their utilization rate and minimum waste percentage per shipment.

Mass Manufacturing of Shelving Units

The factory needs 30 identical shelves (2000mm). They ask the agent to calculate the optimal cutting plan using `calculate_cutting_plan`, ensuring they don't over-order raw material and minimizing waste across hundreds of pieces.

Patterns to Avoid

Manual Spreadsheets

✗ AVOID

Attempting to calculate complex cutting patterns for 10+ different parts using Excel or Google Sheets, leading to hours of math and inevitable human error.

✓ INSTEAD

Use the `calculate_cutting_plan` tool. It handles the mathematical complexity automatically, providing an optimized and proven layout in seconds.

Skipping Compatibility Checks

✗ AVOID

Ordering enough raw stock based on piece count, only to find halfway through production that a few key parts are actually too large for the available material.

✓ INSTEAD

Always run `verify_piece_compatibility` first. This ensures every single part is physically possible before any cuts are made.

Ignoring Waste Reports

✗ AVOID

Accepting a cutting plan without checking the waste metrics, resulting in over-ordering raw material and unnecessary costs.

✓ INSTEAD

Run `analyze_plan_efficiency` on every completed plan. This metric is key to proving cost savings and optimizing future material purchases.

The Right Fit

Use this MCP if your core problem involves maximizing the usable yield from a limited, expensive raw material source. Specifically, you need guaranteed mathematical optimization for mixed-size cuts—that's where it shines. Don't use it if you are simply measuring and cutting identical pieces (a ruler will do fine). Also, don't rely on it to design the initial piece list; that must come from your own product specifications. If you just need a simple inventory count or basic measurement conversion, this is overkill. But if you're dealing with complex logistics where every board matters, this MCP is essential.

First-Fit Decreasing Cutter for Material Optimization in Manufacturing

Right now, figuring out how to cut a large sheet of raw material into dozens of specific components feels like an art form—or maybe just a nightmare. You're staring at complex spreadsheets, trying to fit every required piece onto the minimum number of boards. It's tedious, error-prone, and you always end up guessing, meaning you over-order wood and waste money on scrap.

With this MCP, that guesswork vanishes. You provide your list of required pieces, and we run it through the FFD algorithm. Instead of spending hours arguing with a spreadsheet, you get an instant, optimized plan showing exactly how to arrange every single component across the fewest boards possible. It's math, not magic.

First-Fit Decreasing Cutter and Stock Usage Planning for Logistics

The manual steps that disappear are the endless rounds of checking measurements against available stock lengths. You waste time calling suppliers to verify if your required parts can even fit on their standard board size, which slows down your entire supply chain.

Now you connect this MCP and run `verify_piece_compatibility`. It validates everything instantly. This means your planning cycle shrinks from days of back-and-forth emails to a few clicks, giving you immediate confidence in every order.

First-Fit Decreasing Cutter: 3 Tools for Material Waste Optimization

Use these tools to generate optimized cutting plans, verify piece compatibility, and analyze the waste percentage of any complex material job.

#	TOOL	DESCRIPTION
01	`analyze_plan_efficiency`	Calculates the material waste percentage and utilization rate based on a completed cutting plan.
02	`calculate_cutting_plan`	Determines how to distribute required pieces across multiple boards to minimize total stock consumption.
03	`verify_piece_compatibility`	Checks if every single requested piece is physically capable of being cut from a unit of available raw stock length.

See It in Action

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

U I need to cut 15 pieces: three at 2000mm, five at 800mm, and seven at 450mm. My raw stock is 6000mm long.

Optimal Cutting Plan Generated

- **Total Boards Used:** 3
- **Waste Percentage:** 12.5%

Board Breakdown:

- **Board 1 (6000mm):** Cuts [2000, 2000, 800]. Waste: 1000mm.
- **Board 2 (6000mm):** Cuts [2000, 450, 450, 450]. Waste: 700mm.
- **Board 3 (6000mm):** Cuts [800, 450, 450, 450, 450]. Waste: 1300mm.

U Can I cut a 2100mm panel from a raw stock length of 2000mm? And what about two 900mm pieces?

Compatibility Check Results

❌ **Incompatible Pieces Detected:** [2100mm]. This piece exceeds the available stock length of 2000mm.

✅ **Compatible Plan Found:** The two 900mm panels fit easily. They use a total length of 1800mm, leaving 200mm of usable scrap material from that board.

U Analyze the efficiency for a job where I used 5000mm of stock and ended up with 750mm of waste.

Plan Efficiency Report

- **Total Stock Used:** 5000mm
- **Total Waste Detected:** 750mm
- **Utilization Percentage:** 85.0%
- **Waste Percentage:** 15.0%

This suggests you're doing well, but there might be room to consolidate cuts for the next job.

Frequently Asked Questions

01 **How does the First-Fit Decreasing Cutter help me minimize waste on custom projects?**

It calculates optimal cutting plans that ensure you use every bit of expensive raw material. Instead of guessing, it mathematically tells you how to arrange mixed pieces onto the fewest boards possible, reducing scrap and saving money.

02 **What if I have a very large piece that might not fit on my standard stock size?**

You can use the compatibility check feature. This tool verifies whether every single part you need is physically capable of being cut from your available raw material length, stopping errors before they cost time or money.

03 **Is the First-Fit Decreasing Cutter just a calculator for how many boards I need?**

It's much more than that. It provides detailed board breakdowns—showing *which* pieces go on *which* board and exactly how much scrap is left over, giving you full control over your material yield.

04 **Can I use this MCP for different types of materials, like wood or metal?**

The tool focuses on dimensional optimization. As long as the raw material has a consistent linear stock length and you can provide accurate dimensions, it will calculate the best way to cut those pieces.

05 **What if my cutting plan is finished? How do I know how good it was?**

The efficiency analysis tool gives you a clear report showing your utilization percentage and waste percentage. This helps you measure profitability and improve material buying for next time.

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 `"first-fit-decreasing-cutter": { "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

First-Fit Decreasing Cutter 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

INDEPENDENT PLATFORM DISCLAIMER

DOCUMENT INFORMATION

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MCP Server	First-Fit Decreasing Cutter MCP
Server ID	`019f250f-f5f4-7075-988e-474cdfa07649`
Platform	Vinkius Cloud for AI Agents
Endpoint	`https://edge.vinkius.com/{token}/mcp`

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