Busca 3.0

A Era dos Agentes

Alex Salgado Developer Advocate @ Elastic

elastic | The Search AI Company

RIO INNOVATION WEEK

Alex Salgado

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LATAM

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- **Mestre** em Ciência da Computação pela UFF (Games)
- **MBA** UFF
- **PhD** Candidate UFF: Robótica/Visão Computacional

- **+ 25 anos** de experiência na área de desenvolvimento de software
- Ocupei diversos cargos, trabalhando em **startups**, pequenas e grandes empresas como Oracle, CSN, BRQ/IBM, **Chemtech/Siemens (9 anos)**.
- **8 anos** como professor universitário

aws certified Solutions Architect Associate
aws certified Cloud Practitioner
LEVEL 2 CERTIFIED Educator
Microsoft CERTIFIED

Three solutions powered by one stack

3 solutions

Enterprise Search

Observability

Security

Powered by the Elastic Stack

Kibana

Elasticsearch

Agent

Beats

Logstash

Deployed anywhere

Elastic Cloud

Elastic Cloud Enterprise

Elastic Cloud on Kubernetes

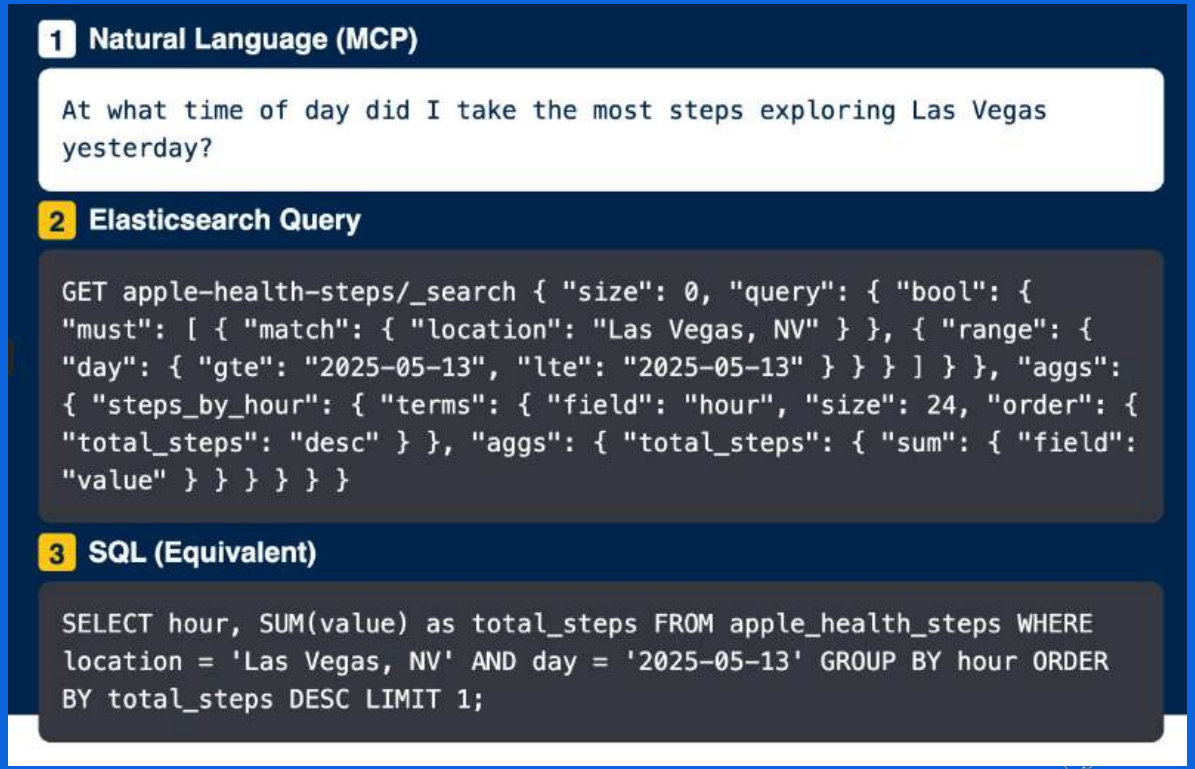
Saas

Orchestration

elastic

The Power of Elasticsearch + LLMs

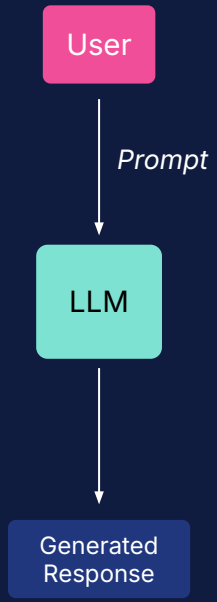
Imagine asking complex questions about your data in English, Portuguese or Chinese using natural language and taking time to reason



Da Geração de Texto à Tomada de Decisão

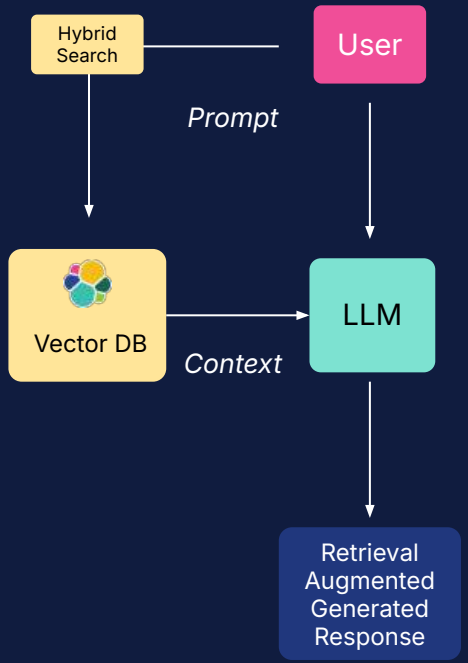
Prompting an LLM

Prompt the LLM and get a response. No other tools or components needed.



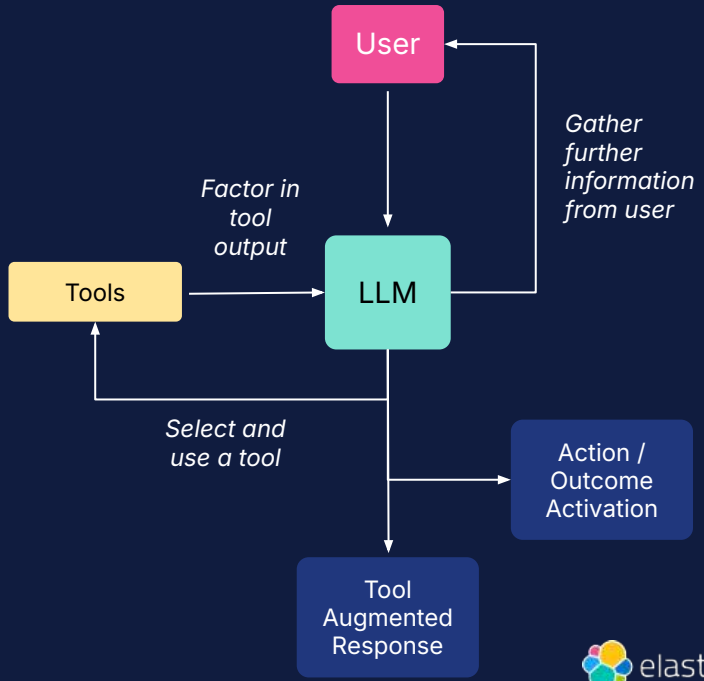
Retrieval Augmented Generation

Add a knowledge base to enhance accuracy and add novel information to the LLM



Agentic Flow

Decision Making enabled. LLM can prompt user for information, choose to use tools, interact with other agents, and affect the real world (ie. Triggering alerts, sending messages, etc...)



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A Evolução da Busca

🗄️ Busca 1.0

1970-2020

SQL, NoSQL
Queries rígidas
Só para DBAs

🔍 Busca 2.0

2020-2024

RAG + Embeddings
Vector Stores
Ainda limitado

🚀 Busca 3.0

2024+

RAG Agêntico
MCP + LLMs
Conversas naturais

De queries complexas para conversas simples

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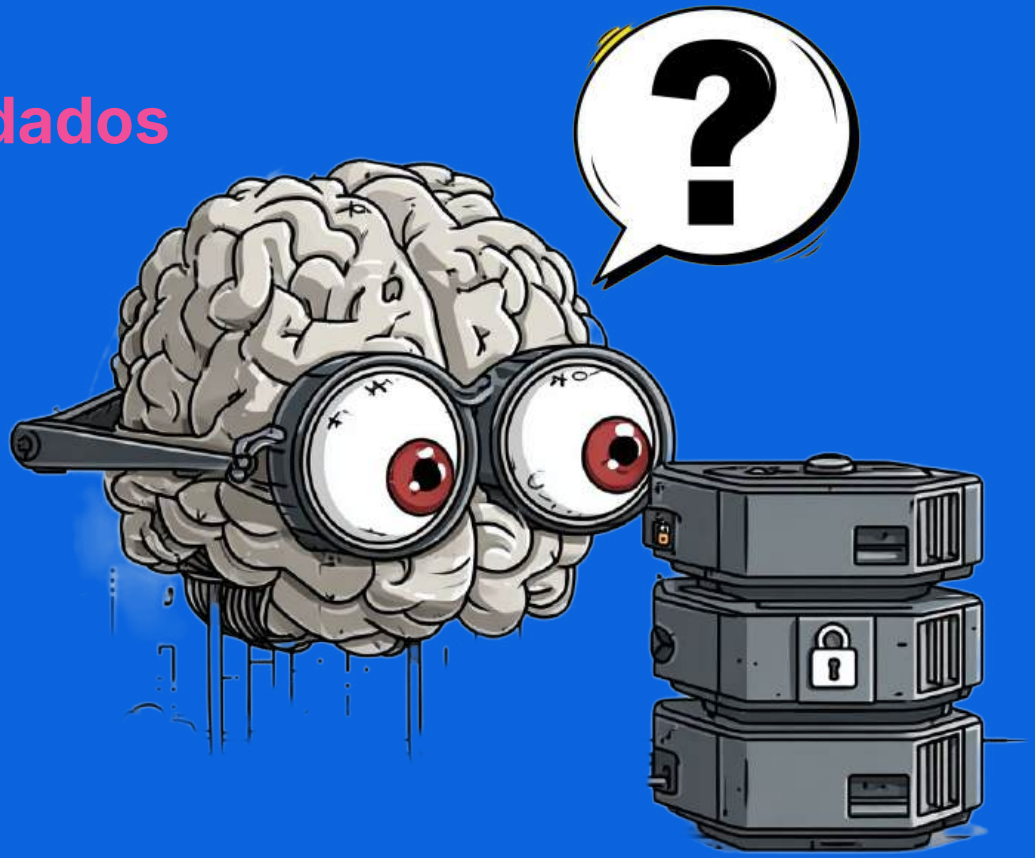
O Problema:

LLMs precisam de seus dados

- As LLMs não possuem acesso a dados privados em tempo real.
- Retrieval-Augmented Generation injecta dados no contexto da LLM.
- RAG padroniza os métodos de comunicação entre o modelo e a fonte de dados.
- LLMs sofrem com cortes de conhecimento sem dados privados.



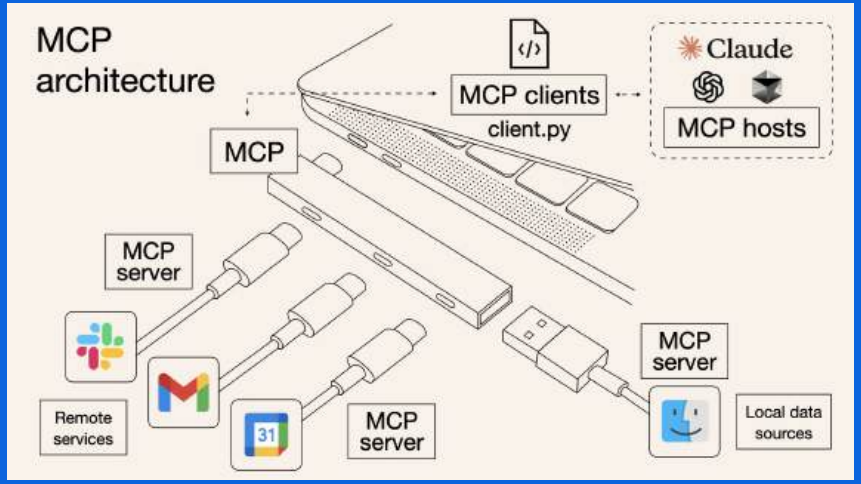
A solução:
MCP, a "Linguagem" padrão para o RAG

- Pense no MCP como o HTTP. Assim como o HTTP é uma linguagem padrão para navegadores obterem páginas de qualquer servidor web, o MCP é uma linguagem padrão para modelos de IA obterem contexto de qualquer fonte de dados.
- Ele age como um adaptador universal. O MCP define um conjunto padrão de "tools" (como busca) para que a IA não precise aprender a linguagem de consulta específica para cada banco de dados diferente com o qual precisa se comunicar.
- Qualquer modelo compatível com MCP pode descobrir e usar essas ferramentas sem código de integração personalizado.

O que é MCP

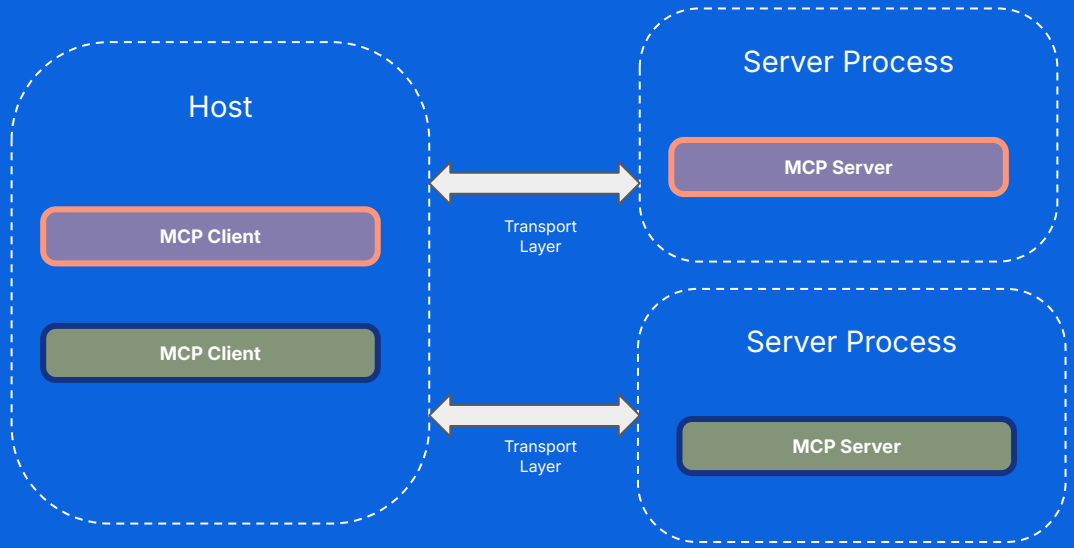
Model Context Protocol

- Forma padronizada de LLMs acessar ferramentas
- Criado pela **Anthropic** para resolver o compartilhamento de contexto
- Três primitivos principais: Recursos, Ferramentas e Prompts
- Pense nisso como uma API especificamente para ferramentas de LLM



Anthropic defines it as the USB-C port equivalent for agentic systems

MCP Server Architecture



MCP follows client-server architecture:

***Hosts** = LLM apps (Claude Desktop) that initiate connections*

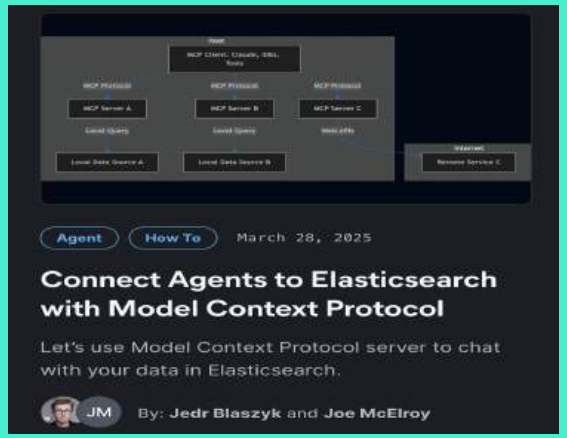
***Clients** = Maintain 1:1 connections with servers, INSIDE host*

***Servers** = Provide context, tools, prompts to client*

Duas Abordagens para MCP + Elastic

Oficial

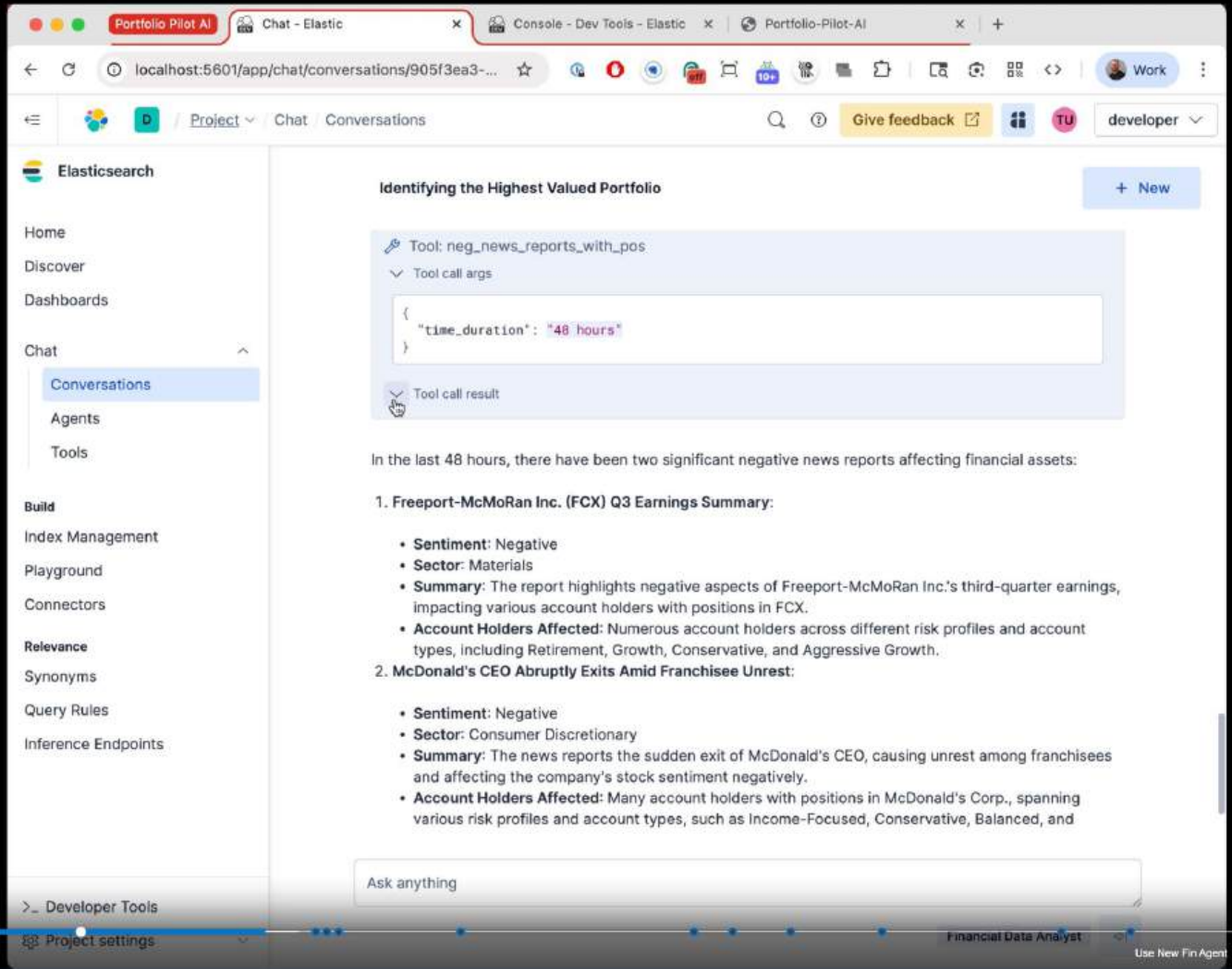
- Propósito geral *
- Configuração fácil
- Customização limitada



Customizada

- Específica para o domínio
- Requer codificação
- Controle completo

Hoje vamos focar na abordagem personalizada =)


Portfolio Pilot AI
Chat - Elastic
Console - Dev Tools - Elastic
Portfolio-Pilot-AI
localhost:5601/app/chat/conversations/905f3ea3-...
Work
Project
Chat
Conversations
Give feedback
TU
developer
Elasticsearch
Home
Discover
Dashboards
Chat
Conversations
Agents
Tools
Build
Index Management
Playground
Connectors
Relevance
Synonyms
Query Rules
Inference Endpoints
Developer Tools
Project settings
Identifying the Highest Valued Portfolio
+ New
Tool: neg_news_reports_with_pos
Tool call args
{
"time_duration": "48 hours"
}
Tool call result
In the last 48 hours, there have been two significant negative news reports affecting financial assets:
1. Freeport-McMoRan Inc. (FCX) Q3 Earnings Summary:
• Sentiment: Negative
• Sector: Materials
• Summary: The report highlights negative aspects of Freeport-McMoRan Inc.'s third-quarter earnings, impacting various account holders with positions in FCX.
• Account Holders Affected: Numerous account holders across different risk profiles and account types, including Retirement, Growth, Conservative, and Aggressive Growth.
2. McDonald's CEO Abruptly Exits Amid Franchisee Unrest:
• Sentiment: Negative
• Sector: Consumer Discretionary
• Summary: The news reports the sudden exit of McDonald's CEO, causing unrest among franchisees and affecting the company's stock sentiment negatively.
• Account Holders Affected: Many account holders with positions in McDonald's Corp., spanning various risk profiles and account types, such as Income-Focused, Conservative, Balanced, and
Ask anything
Financial Data Analyst
Use New Fin Agent
elastic

Desafio:

Converse com sua saúde

Pergunta 1:
"Quantos passos eu dei **ontem**?"

Question 2:
"Quantas voltas ao redor do maracanã eu teria completado se eu caminhasse o mesmo número de passos que dei **ontem**?"

Construindo um servidor MCP personalizado que conecta o **Claude AI Desktop** aos meus dados de **fitness**

Claude

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HealthKit

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RAG Agêntico: A Inteligência da Busca 3.0

RAG Tradicional

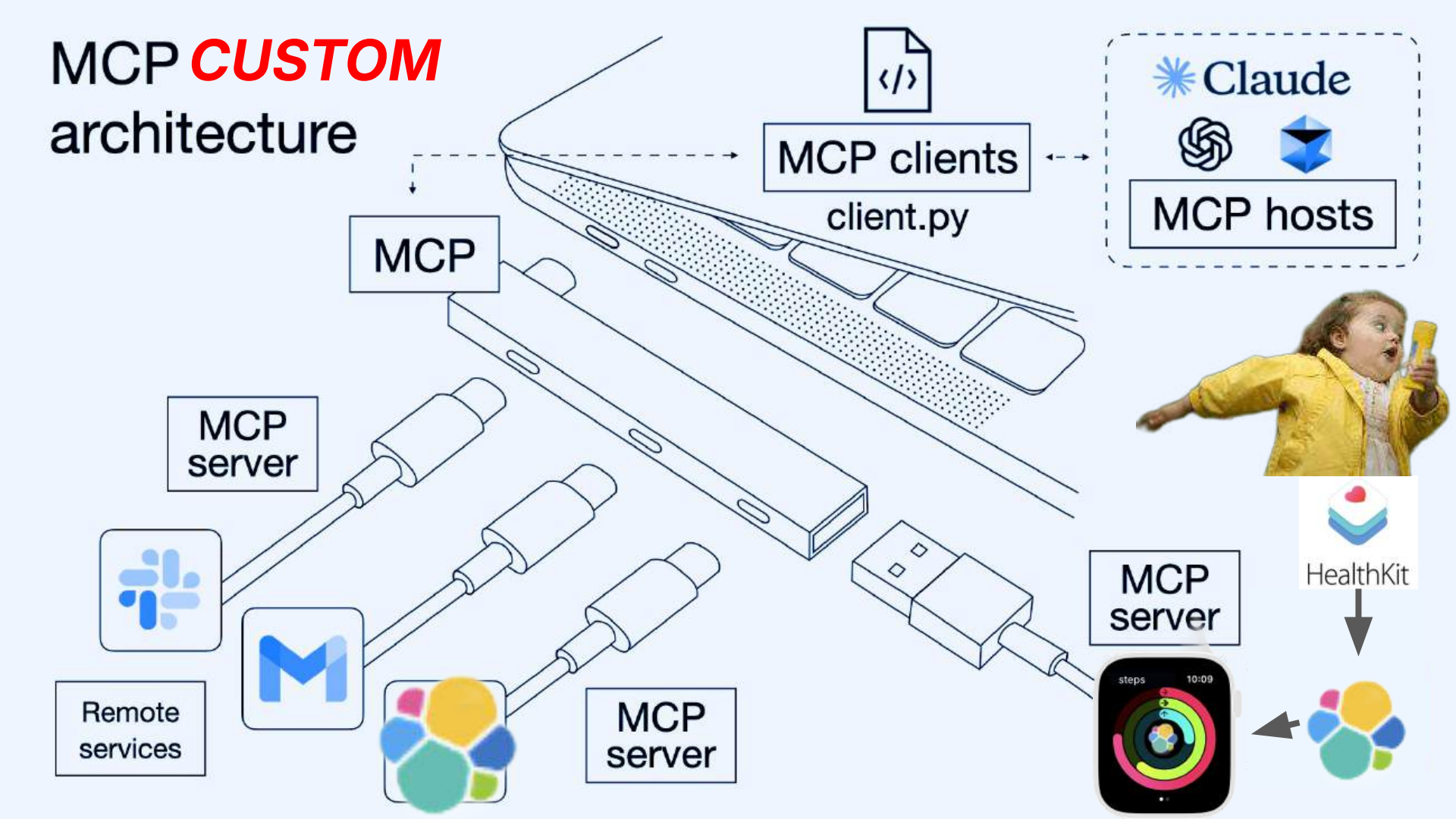
- Busca → Retrieve → Generate
- Pipeline fixo
- Uma fonte por vez
- Sem raciocínio

RAG Agêntico com MCP

- Planeja → Executa → Valida → Itera
- Adaptativo
- Multi-fonte simultâneo
- Raciocínio complexo

O LLM decide quando, onde e como buscar

MCP *CUSTOM* architecture



Como começar?

```bash
# Create project and install dependencies
uv init apple-watch-mcp
cd apple-watch-mcp
uv venv
source .venv/bin
uv add "mcp[cli]" elasticsearch httpx pydantic
```

Configuração simples com ferramentas Python comuns

A CLI do MCP fornece ferramentas de desenvolvimento

Apenas algumas dependências necessárias

Os dados de exemplo

devtools

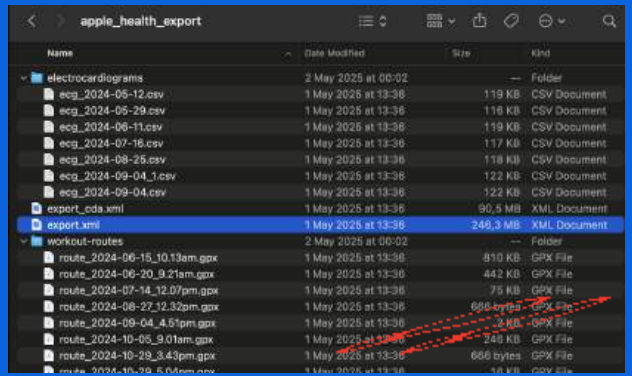
```
{
  "type": "HKQuantityTypeIdentifierStepCount",
  "sourceName": "Apple Watch",
  "startDate": "2025-05-01 07:58:42",
  "endDate": "2025-05-01 07:59:10",
  "value": 34,
  "day": "2025-05-01",
  "dayOfWeek": "Thursday",
  "hour": 7
}
```

Dados de fitness de série temporal no Elasticsearch

Múltiplos dispositivos rastreando as mesmas métricas

Perfeito para demonstrar capacidades de busca

HealthKit



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Inicialização do servidor

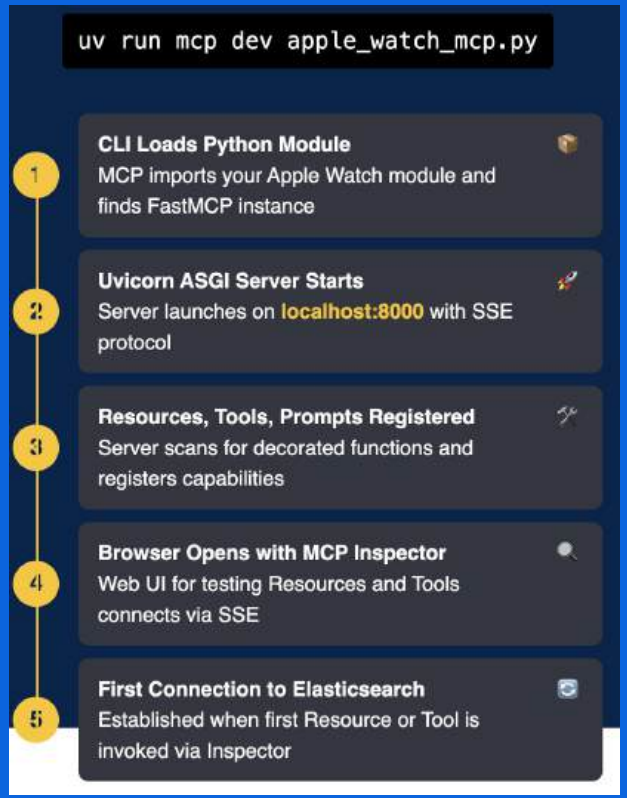
apple_watch_mcp.py

```python
# Step 1: Import the FastMCP framework
from mcp.server.fastmcp import FastMCP
import httpx

# Step 2: Create your MCP server instance
# FastMCP handles protocol details so you focus on implementation
mcp = FastMCP("apple-watch-steps")

# Step 3: Define your Elasticsearch connection params
ES_HOST = "http://localhost:9201"
ES_INDEX = "apple-health-steps"

# Step 4: Create a helper function for Elasticsearch queries
# This centralizes your query logic and error handling
async def query_elasticsearch(query: dict):
    async with httpx.AsyncClient() as client:
        response = await client.post(
            f"{ES_HOST}/{ES_INDEX}/_search", json=query
        )
        return response.json()
```



MCP: Os Três Primitivos Fundamentais

Resources

Data Access
Provide context to LLM
Like GET endpoints

Tools

Actions & Computation
Execute operations
Like POST endpoints

Prompts

Interaction Templates
Guide conversations
Like workflow recipes

juntos, essas primitivas formam um sistema completo para conectar LLMs a funcionalidades externas

Resources: Os Olhos do LLM

apple_watch_mcp.py

```python
@mcp.resource("health://steps/latest")
async def get_latest_steps() -> str:
    """Get latest step counts"""
    # URI pattern choice: namespaced by domain
    # Return format: Always JSON strings for consistency
    # Query design: Simple, focused on single concern
    query = {
        "query": {"match_all": {}},
        "sort": [{"endDate": {"order": "desc"}}],
        "size": 10
    }
    data = await query_elasticsearch(query)
    # Process and return formatted results...
```

- **URI Pattern:** "health://steps/latest"
- **Purpose:** Retrieves data without modification
- **Acts like:** Read-only GET endpoints

Recursos fornecem **contexto** ao expor seus dados diretamente ao LLM

Tools: As Mãos do LLM

apple_watch_mcp.py

```python
@mcp.tool()
async def query_step_data(params: QueryParams) -> str:
    """Query step data with parameters"""
    # Extract parameters
    start_date = params.start_date
    end_date = params.end_date
    aggregation = params.aggregation

    # Build Elasticsearch query
    query = {"query": {"match_all": {}}}
    filters = []

    # Add date filters if specified
    if start_date or end_date:
        date_filter = {"range": {"day": {}}}
        if start_date:
```

- **Accepts Parameters:** Structured input objects
- **Dynamic Logic:** Varies based on parameters
- **Active Processing:** Not just data retrieval

Tools enable **action and computation** — essential for complex queries and analysis

Prompts: Os Mapas para o LLM

apple_watch_mcp.py

```python
@mcp.prompt()
def daily_report(date: str = None) -> str:
    """Daily step analysis report"""
    if date:
        return f"""Analyze my step data for {date}.
Please include:
1. Total steps taken
2. Most active periods
3. Device breakdown
4. Compare to my weekly average
5. Visualize my activity pattern"""
    else:
        return """Analyze today's step data..."""
```

- **Appears as:** / commands in Claude
- **Provides Structure:** For common tasks
- **User-Triggered:** Start specific workflows

Prompts criam **experiências consistentes** para padrões de análise frequentes.

Validação de Tipo - Crítico para Confiabilidade

apple_watch_mcp.py

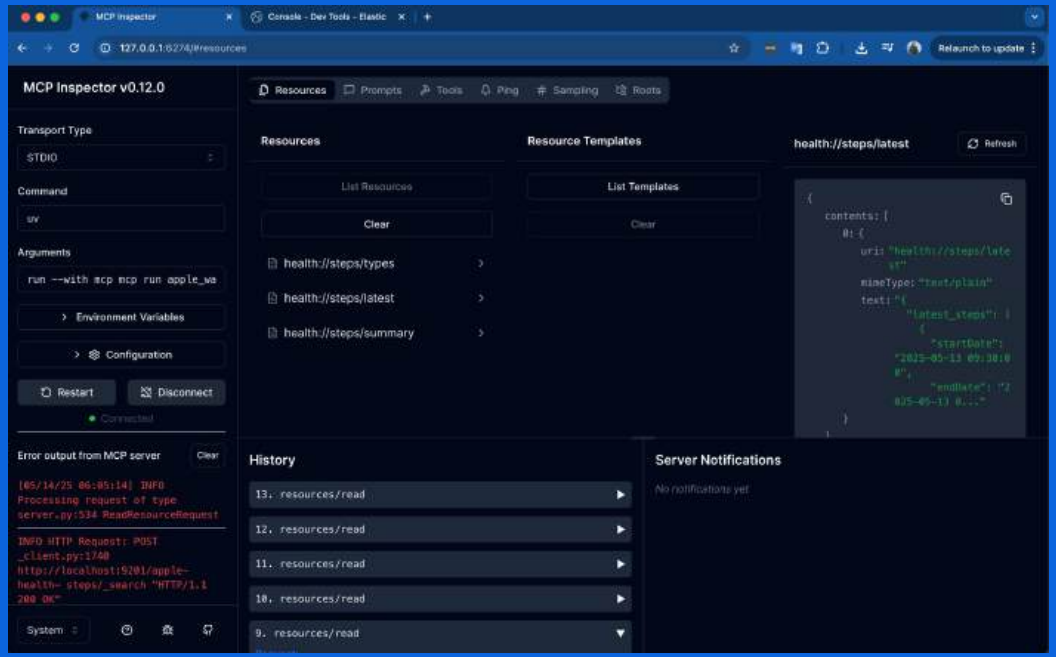
```python
# Pydantic model for parameter validation
class QueryStepDataParams(BaseModel):
    start_date: Optional[str] = None
    end_date: Optional[str] = None
    aggregation: Optional[str] = None
    device: Optional[str] = None

    @field_validator('start_date', 'end_date')
    def validate_date_format(cls, value):
        if value is None:
            return value
        try:
            datetime.strptime(value, "%Y-%m-%d")
            return value
        except ValueError:
            raise ValueError("Invalid date format. Use YYYY-MM-DD")
```

Why Pydantic?

1. Runtime **validation** with clear error messages
2. Self-**documenting** code
3. **Seamless** FastMCP integration

Testando com o MCP Inspector



For Developers

- Test resources and tools interactively
- View raw JSON responses from Elasticsearch

Key Features

- Real-time API testing
- Request history tracking

Integration

- Shows live Elasticsearch queries
- Helps debug before deploying to Claude

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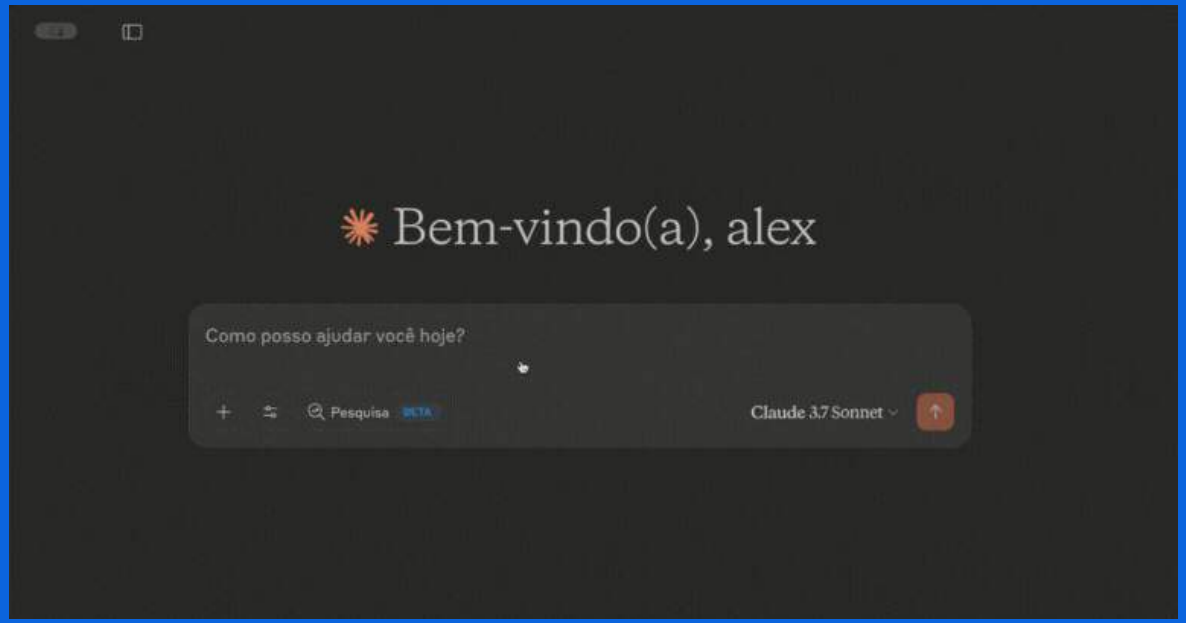
Deployment & Integration

mcp install apple_watch_mcp.py



claude_desktop_config.json

```
{
  "mcpServers": {
    "Apple Health Steps": {
      "command":
"/Users/alexsalgado/.local/bin/uv",
      "args": [
        "--directory",

"/Users/alexsalgado/Desktop/blog-mcp-
server/new-blog/apple-watch-mcp",
        "run",
        "apple_watch_mcp.py"
      ]
    }
  }
}
```

Demo: A Mágica Acontecendo

Busca 2.0 (Tradicional)

```
GET /health_metrics/_search
{
  "query": {
    "bool": {
      "must": [
        { "range": {
          "timestamp": {
            "gte": "now-30d"
          }
        }},
        { "match": { "user_id": "user123" }}
      ]
    }
  },
  "aggs": {
    "daily_steps": {
      "date_histogram": {
        "field": "timestamp",
        "interval": "day"
      },
      "aggs": {
        "avg_steps": {
          "avg": { "field": "metrics.steps" }
        }
      }
    }
  }
}
```

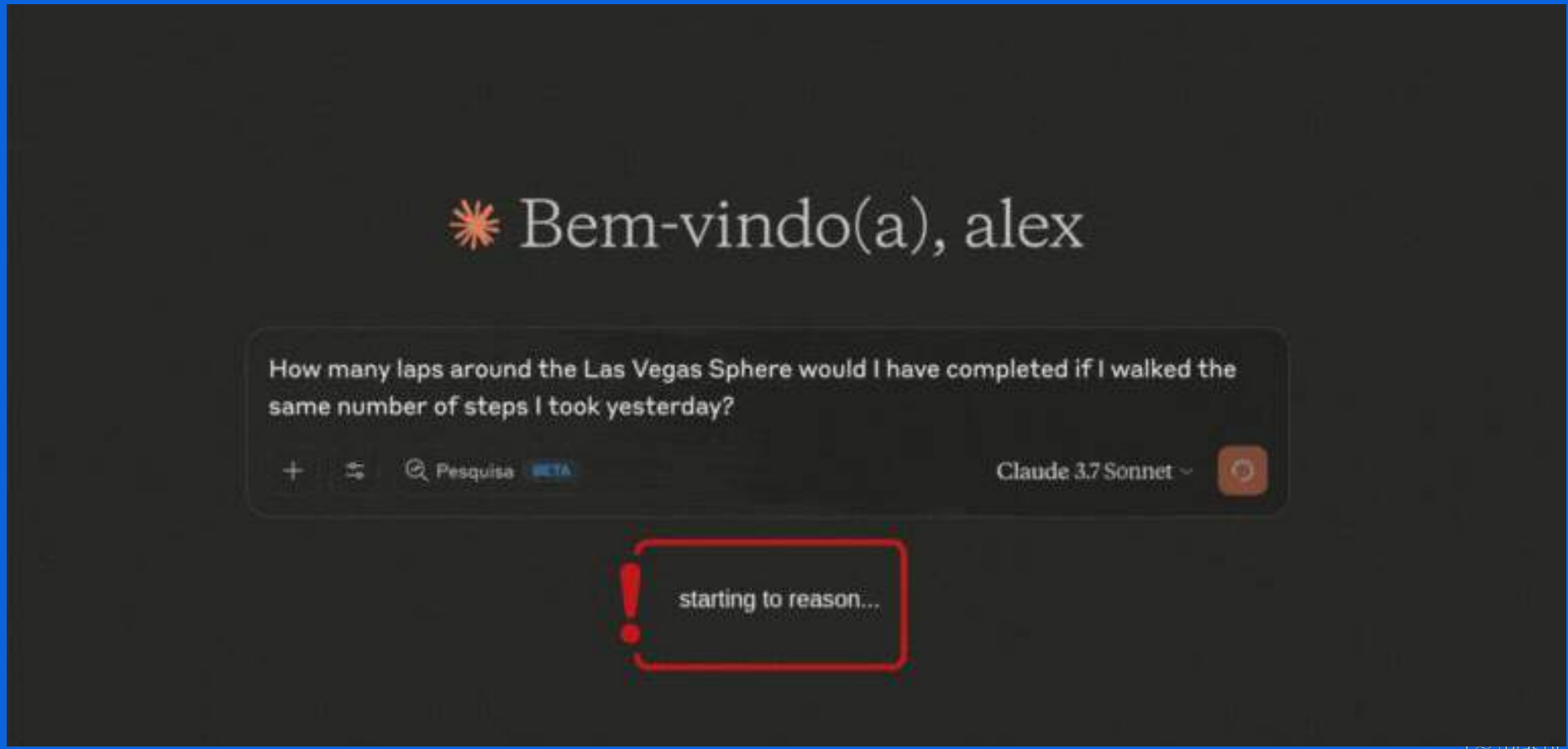
Busca 3.0 (Com MCP)

💬 "Como foram meus passos este mês?"

O LLM:

1. Entende a pergunta
2. Chama search_health_data()
3. Processa resultados
4. Gera resposta natural

Demo time


Bem-vindo(a), alex
How many laps around the Las Vegas Sphere would I have completed if I walked the same number of steps I took yesterday?
Pesquisa
BETA
Claude 3.7 Sonnet
starting to reason...

Casos de Uso Prático com MCP Customizado

Análise de Logs

"Por que o sistema caiu ontem às 15h?"

MCP conecta aos logs de aplicação, servidores e infraestrutura para identificar padrões e causas raiz automaticamente.

Business Intelligence

"Qual produto tem melhor margem no Q3?"

Integra dados de vendas, custos e inventário para análises complexas sem necessidade de SQL ou dashboards.

DevOps & Monitoramento

"Qual serviço está consumindo mais recursos?"

Conecta métricas de Prometheus, CloudWatch ou Datadog para insights operacionais em tempo real.

Gestão de Documentos

"Quais contratos vencem este mês?"

Analisa PDFs, contratos e documentos legais extraindo informações críticas automaticamente.

Segurança & Compliance

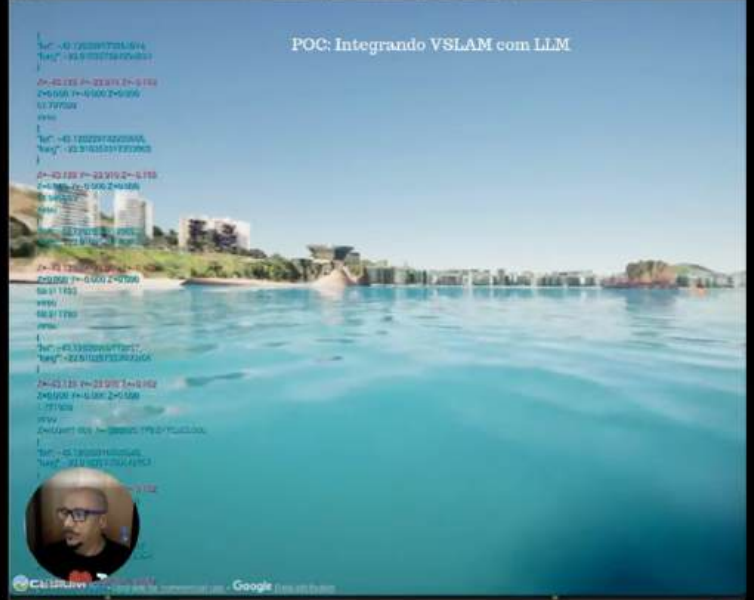
"Houve tentativas de acesso suspeitas?"

Monitora logs de segurança, detecta anomalias e garante conformidade com políticas internas.

Integração de Sistemas

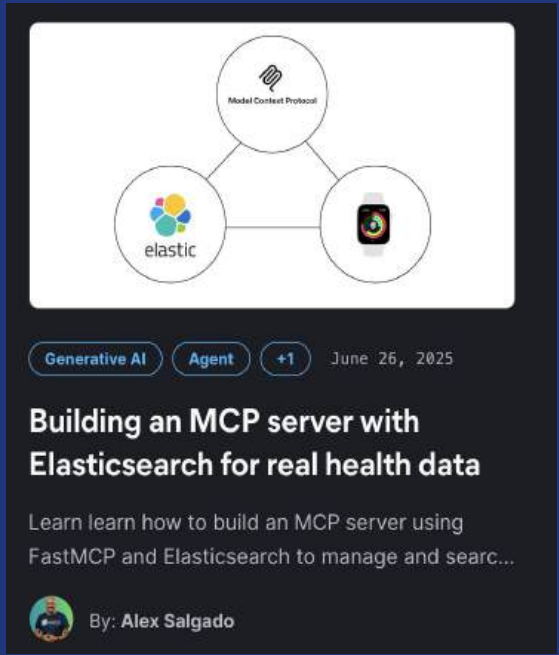
"Sincronize dados entre CRM e ERP"

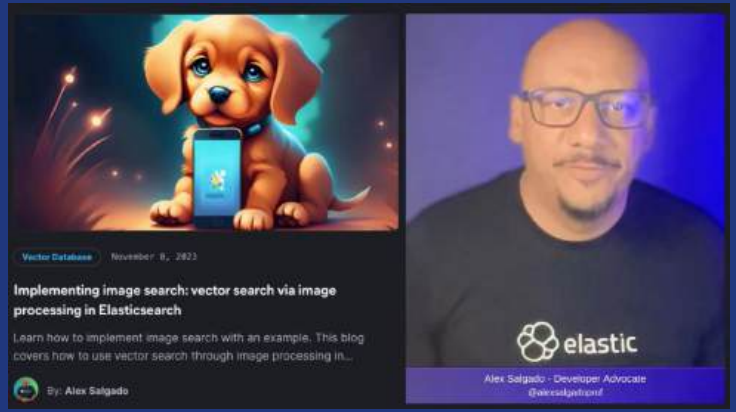
Orquestra fluxos de dados entre sistemas legados e modernos sem código adicional.



Barcos Autonomos

Recursos para desenvolvedores: Elasticsearch Labs





youtube.com/**@OfficialElasticCommunity**

elastic.co/**search-labs**

github.com/elastic/**elasticsearch-labs**

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Recursos para desenvolvedores: Junte-se à Comunidade Elastic

Meetups

Elastic User Groups

Estamos sempre em busca de organizadores, palestrantes e participantes.
Encontre mais eventos Elastic em todo o mundo em **community.elastic.co**

elastic.co/community

Meetup Elastic: Rio de Janeiro/RJ

Meetup Python Floripa: Florianópolis/SC

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100% FREE
ELASTIC
Cursos
POR TEMPO LIMITADO
@alexsalgadoprof

@alexsalgadopro

RIO INNOVATION WEEK

Não se trata de **se** você vai usar, mas **quando**. E, nessa jornada, cada **passo** importa.

Apenas comece.

Obrigado