RAG MCP 서버

With ChromaDB, LangChain, Claude LLC

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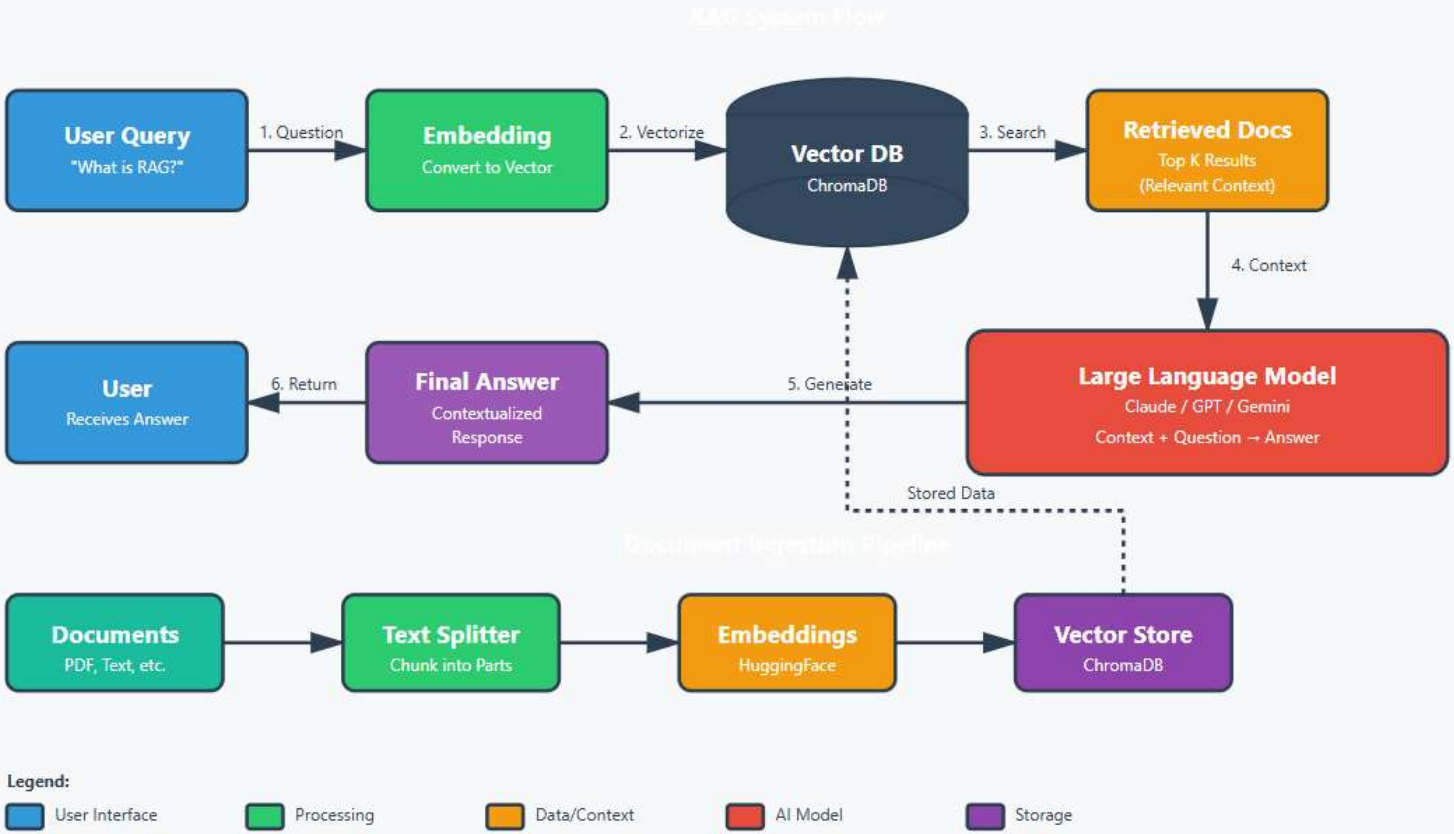
🔍 RAG (Retrieval-Augmented Generation) Architecture



RAG Process Flow

1. **Document Ingestion (add_documents)**

   Receive source documents → Split into chunks using RecursiveCharacterTextSplitter → Convert to vectors using HuggingFace embeddings → Store in ChromaDB with metadata

2. **Vector Search (search_documents)**

   Convert user query to embedding → Search ChromaDB using cosine similarity → Return top k documents (default: 4)

3. **Context Construction**

   Merge retrieved documents into unified context → Maintain document order and source information → Generate prompt template

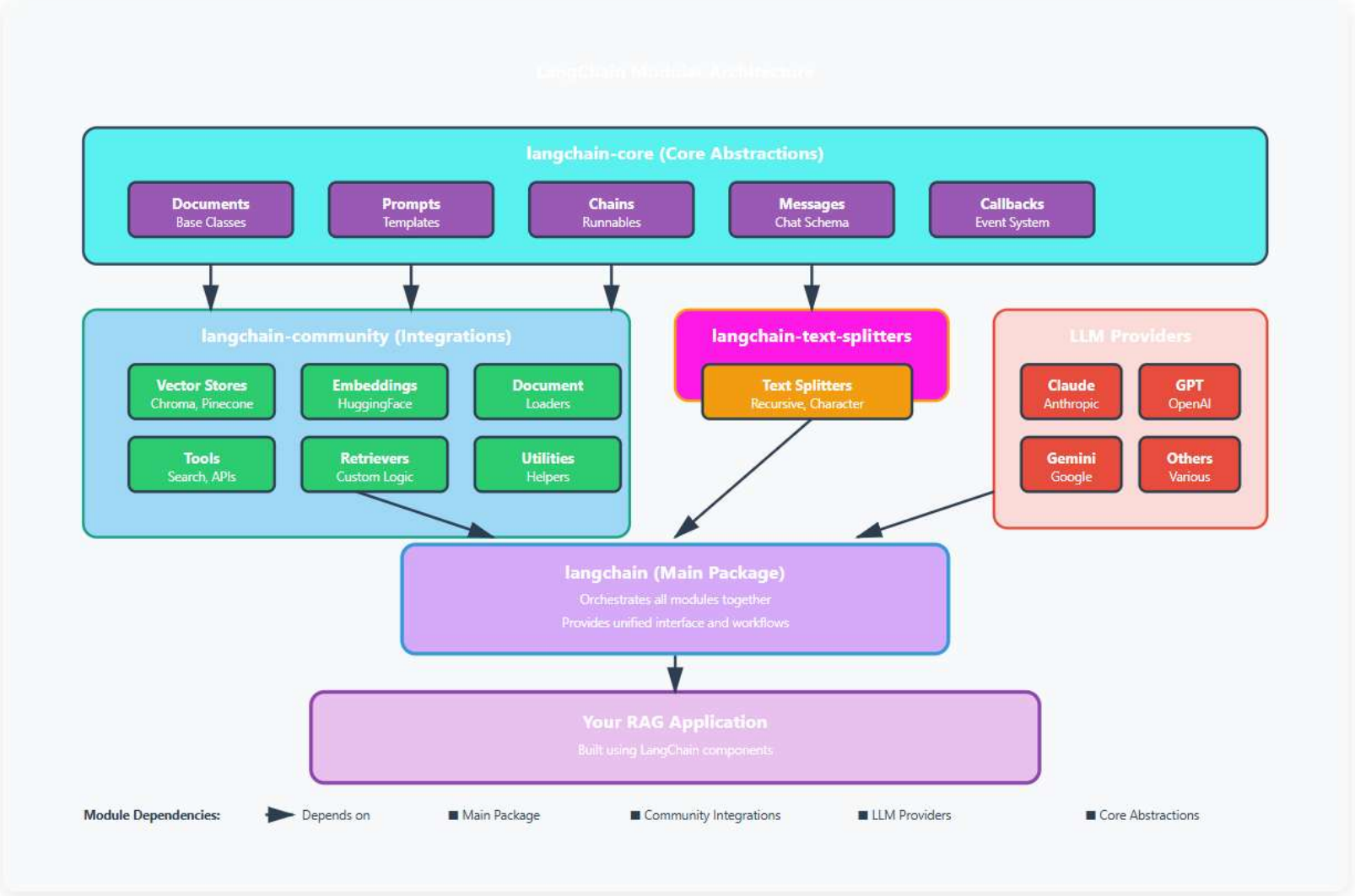
4. **AI Answer Generation (rag_query)**

   Send context + question to Claude API → Claude Sonnet 4 model generates answer → Return result with source citations

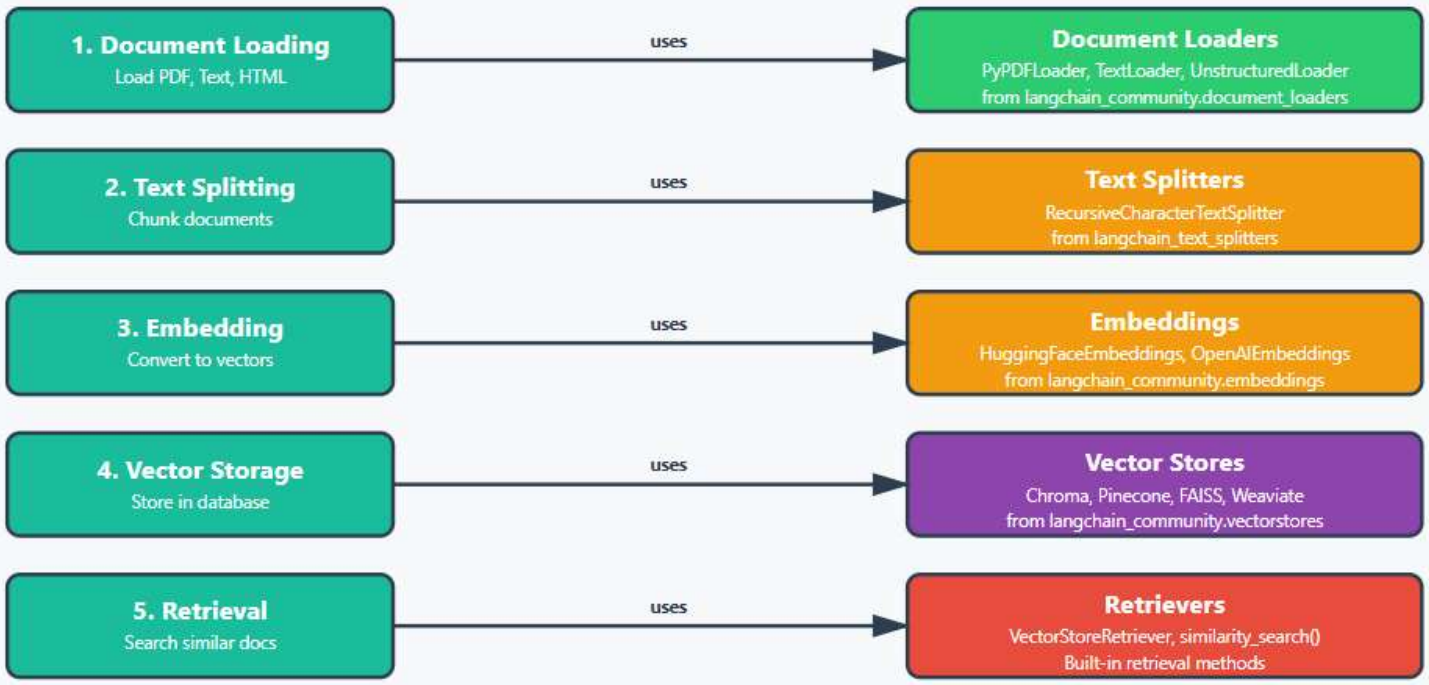
5. **Result Formatting & Return**

   Format answer text + reference document info → Include metadata (source, chunk position, etc.) → Deliver final result to user

LangChain 1.0 Architecture



🔗 RAG + LangChain Integration



System Architecture

Download source

#Download source

$> **git clone https://github.com/hjkim7796/RAG-CHROMA-MCP-SERVER.git**

$> dir RAG-CHROMA-MCP-SERVER

Directory: C:₩hjkim₩PythonProject₩RAG-CHROMA-MCP-SERVER

Mode	LastWriteTime	Length	Name
d-----	11/21/2025 12:06 PM		.venv
d-----	11/21/2025 11:58 AM		docs
-a----	11/21/2025 11:58 AM	68	.gitignore
-a----	11/21/2025 11:58 AM	227607	abc.pdf
-a----	11/21/2025 11:58 AM	16847	add_pdf_to_mcp.py
-a----	11/21/2025 11:58 AM	5657	mcp-http-proxy.py
-a----	11/21/2025 11:58 AM	383	query-chromaDB.py
-a----	11/21/2025 11:58 AM	20699	rag_mcp_http_server.py
-a----	11/21/2025 11:58 AM	7821	README_HTTP.md
-a----	11/21/2025 11:58 AM	347	requirements.txt
-a----	11/21/2025 11:58 AM	6936	requirements_freeze.txt
-a----	11/21/2025 11:58 AM	11420	test_server.py
-a----	11/21/2025 11:58 AM	2034	test_server_with_proxy.py

Run rag-mcp-server

#Go to the source folder
$> **cd <user-project-folder>**

#Config a virtual environment (venv) in VS Code for Python to ensure your project uses the correct isolated environment.
$> **python -m venv .venv**
$> **.venv/Scripts/activate.ps1**

#Install all python packages
(.venv)> **pip install -r requirements.txt**

#Run rag mcp server
(.venv)> **python rag_mcp_http_server.py**

Test rag-mcp-server

#Go to the source folder
(.venv)> **cd <user-project-folder>**

#Check server is working properly
(.venv)> **python test_server.py**

#Check proxy server is working properly
(.venv)> **python test_server_with_proxy.py**

Config for Claude Desktop integration

File location: %APPDATA%₩Claude₩claude_desktop_config.json

```
{
  "mcpServers": {
    "rag-search": {
      "command": "C:₩₩hjkim₩₩PythonProject₩₩RAG-CHROMA-MCP-SERVER₩₩.venv₩₩Scripts₩₩python",
      "args": ["C:₩₩hjkim₩₩PythonProject₩₩RAG-CHROMA-MCP-SERVER ₩₩rag_mcp_server.py"]
  }
}
```

Test rag-mcp-server

#Go to the source folder
(.venv)> **cd <user-project-folder>**

#Check server is working properly
(.venv)> **python test_server.py**

#Check proxy server is working properly
(.venv)> **python test_server_with_proxy.py**

Add a pdf document

#Go to the source folder
(.venv)> **cd <user-project-folder>**

#Add pdf document to RAG system
(.venv)> **python add_pdf_to_mcp.py abc.pdf**

...

```
============================================================
✅ PDF successfully added to RAG system!
============================================================
```

Test query on claude desktop

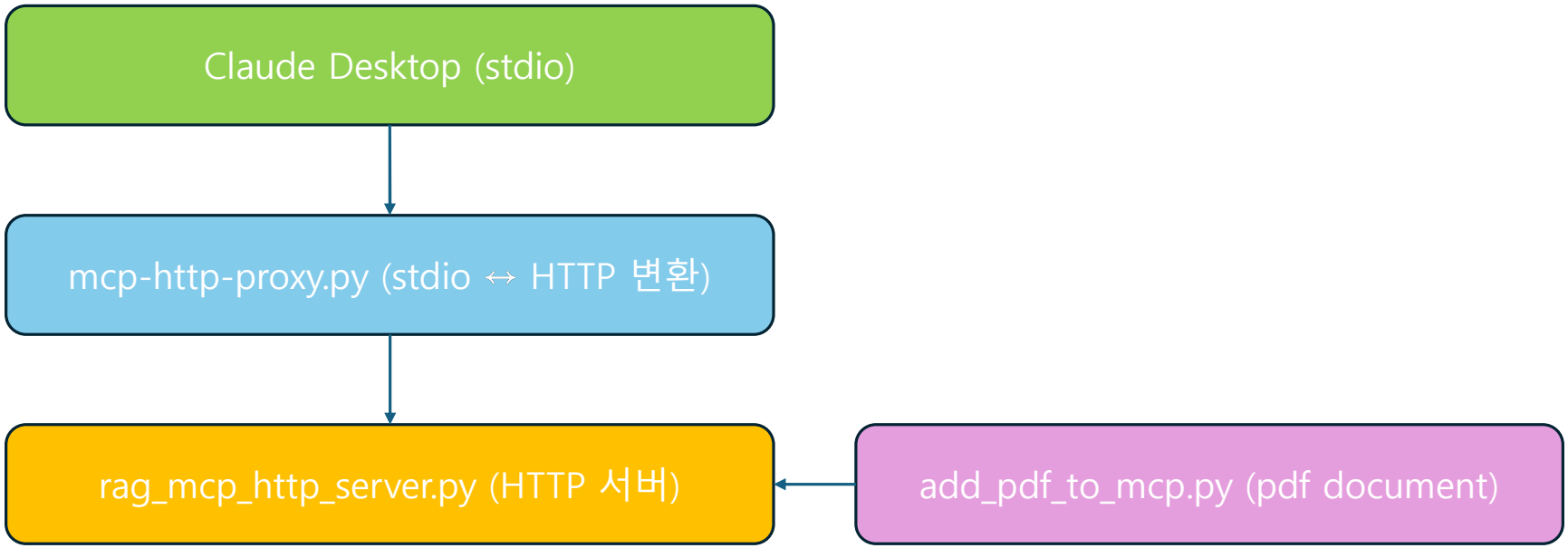
Query: **rag-search MCP 서버에 접속해서 "EO Patch Wearable Insulin Pump" 에 대해서 요약해죠**

Rag query를 활성화 하려면 .env 파일을 생성한 후 아래와 같이 추가
ANTHROPIC_API_KEY=your-api-key-here

📦 File Description

- rag_mcp_server.py - Main RAG MCP server
- add_pdf_to_mcp.py – Example for adding a PDF document to RAG system
- query-chromaDB.py – Example for querying to chromaDB
- test_server.py - Example for testing the RAG MCP server
- test_server_with_proxy.py - Example for testing the Proxy server
- requirements.txt – All python package list
- README_HTTP.md - Detailed User Guide

How it works


Claude Desktop (stdio)
mcp-http-proxy.py (stdio ↔ HTTP 변환)
rag_mcp_http_server.py (HTTP 서버)
add_pdf_to_mcp.py (pdf document)

🚀 Key Features

- **add_documents** - Adding documents to the vector DB
- **search_documents** - Similarity-based search
- **rag_query** - Query via RAG (using Claude), Need API key
- **delete_collection** - Delete collection

🛠️ Available MCP Tools

1 add_documents

Add documents to the vector database. Automatically handles chunk splitting and embedding.

Parameters:

- texts: Array of document texts
- metadatas: Array of metadata objects
- chunk_size: Chunk size (default: 1000)
- chunk_overlap: Overlap size (default: 200)

2 search_documents

Search for similar documents in the vector database using cosine similarity.

Parameters:

- query: Search query string
- k: Number of results (default: 4)
- filter: Optional metadata filter

3 rag_query

Answer questions using RAG. Retrieves relevant documents and generates answers with Claude.

Parameters:

- question: Question text
- k: Number of docs to search (default: 4)
- language: Answer language (ko/en)

4 get_collection_info

Retrieve current collection information including document count and storage location.

Parameters:

- None (no parameters required)

5 delete_collection

Delete entire collection. All documents and embeddings will be permanently removed.

Parameters:

- confirm: Confirmation flag (must be true)

✨ Key Features

🔤 Automatic Text Chunking

Documents are automatically split into manageable chunks (1000 chars with 200 char overlap) while preserving semantic coherence.

🧠 Smart Embeddings

Uses sentence-transformers/all-MiniLM-L6-v2 model for high-quality embeddings. Runs locally without API keys.

💾 Persistent Storage

ChromaDB stores vectors persistently on disk. Data survives server restarts and can be queried anytime.

🎯 Similarity Search

Cosine similarity-based vector search efficiently finds the most relevant documents for any query.

🏷️ Metadata Management

Store and filter documents by custom metadata (source, category, tags, etc.) for precise retrieval.

🌍 Multilingual Support

Supports multiple languages through HuggingFace embeddings and Claude's multilingual capabilities.

💻 Technology Stack

LangChain
v1.0.7

ChromaDB
v1.3.5

Claude AI
Sonnet 4

HuggingFace
Transformers v5.1.2

MCP
v1.21.2

Python
v3.12