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ChatBot for Catalyst Center

Open-Source GenAI Bot

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DEVNET-3000

CISCO *Live!*

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Cisco Webex App

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How

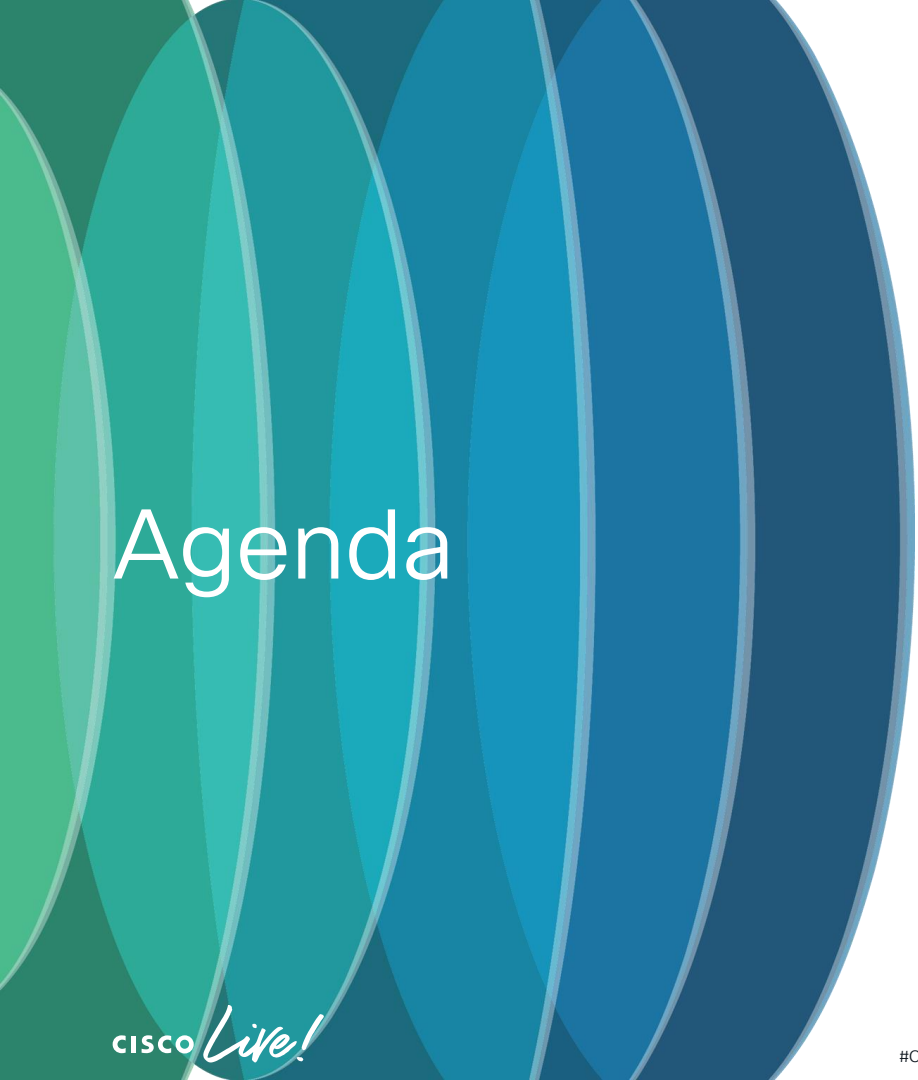
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<https://ciscolive.ciscoevents.com/ciscolivebot/#DEVNET-3000>





Agenda

- Catalyst Center Platform Overview
- Integrations
- GenAI Essentials
- GenAI for Operations
- Developers Resources
- Summary

Catalyst Center Platform Vision



Efficient

Managing infrastructure as code while lowering OPEX



Consistent

Repeatable and precise intent-based outcomes



Scalable

Able to reduce time and effort with large network automation requirements



Secure

Secure APIs and integrations



Sustainable

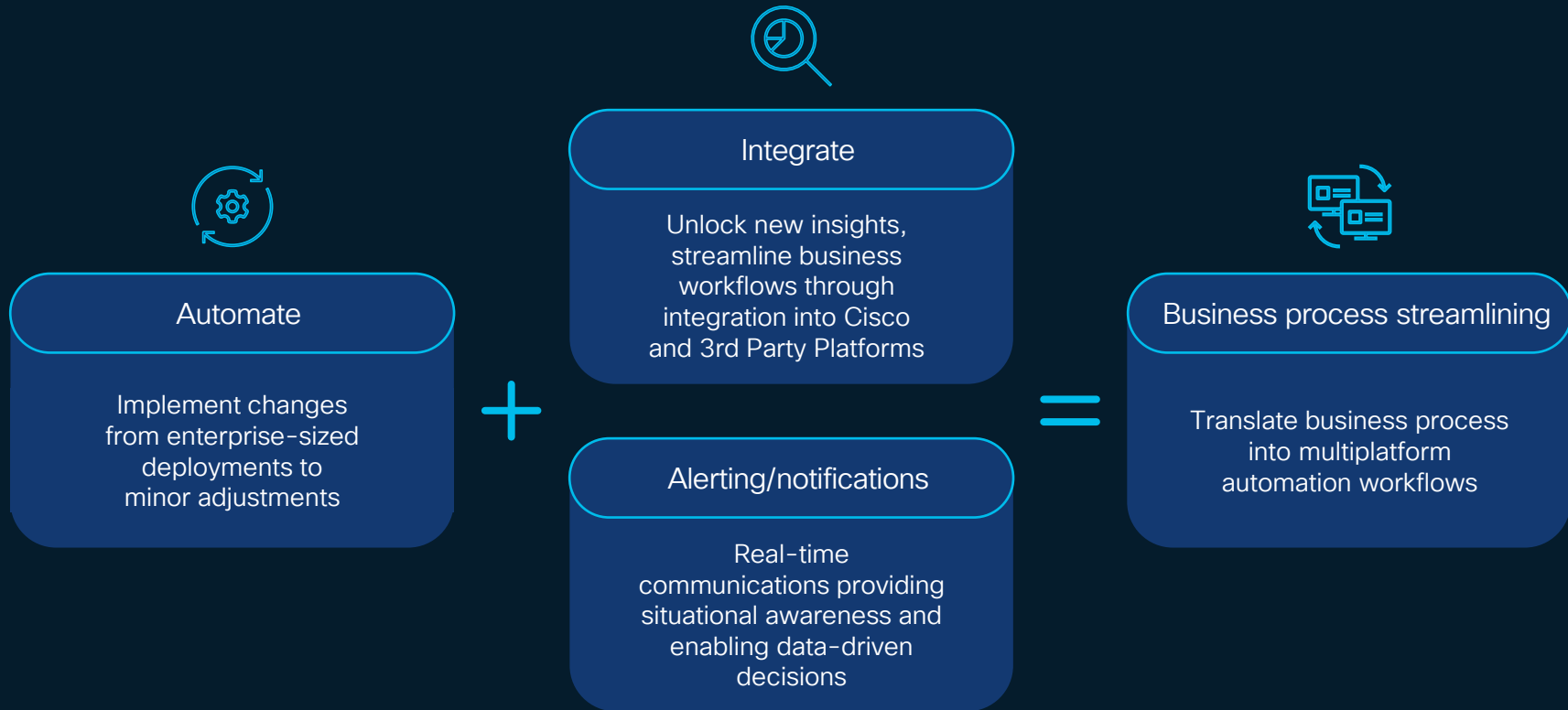
Integrate sustainable devices and systems



Smart

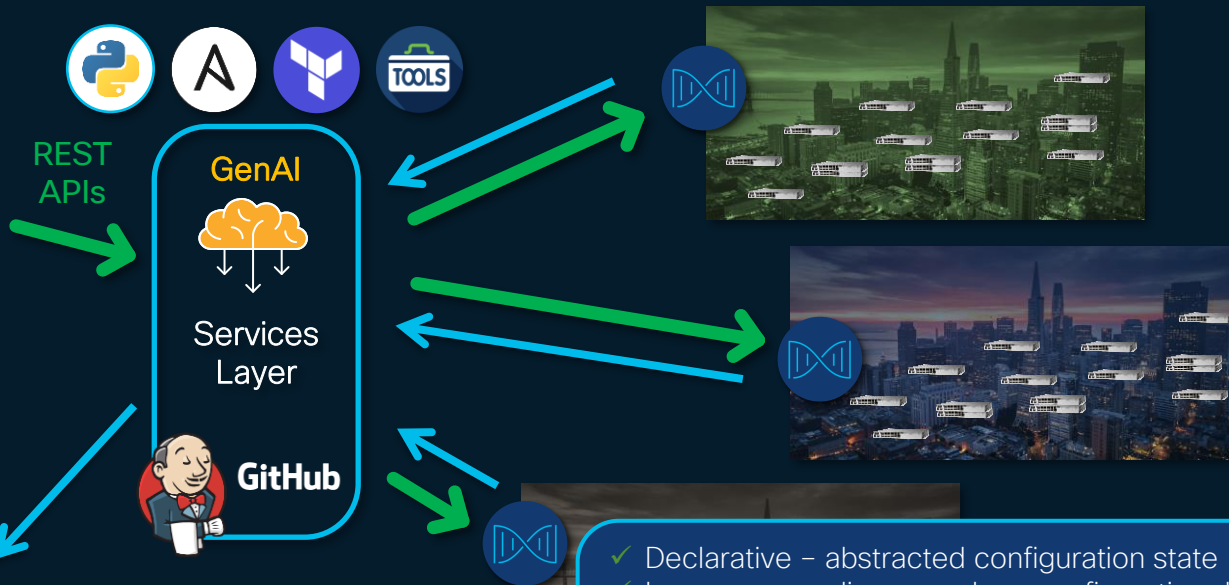
260+ real time event notifications and AI/ML capabilities

The Value of Catalyst Center Platform

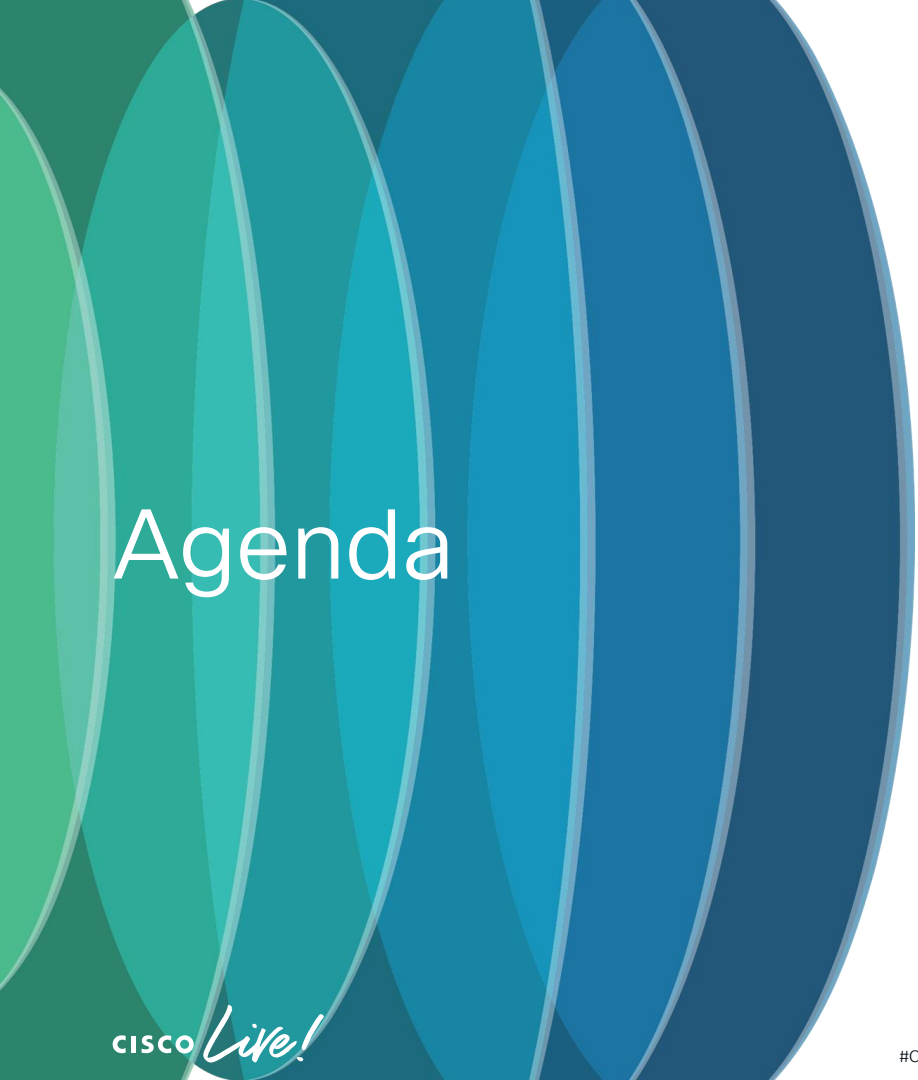


Multi Catalyst Center/Controller Managed Networks

```
1 configuration_templates:
2   - project: Jenkins with variables
3     name: Variables testing
4     file: template_with_variables.j2
5     variables:
6       - parameterName: interface_name
7         dataType: STRING
8         required: True
9         order: 1
10      - parameterName: ip_address
11        dataType: STRING
12        required: True
13        order: 2
14    devices:
15      - name: C9K-Branch-SF0.clus-demo.com
16        variables:
17          interface_name: Loopback 200
18          ip_address: 172.30.200.1
19    product_family:
20      - Routers
21      - Switches and Hubs
22
```



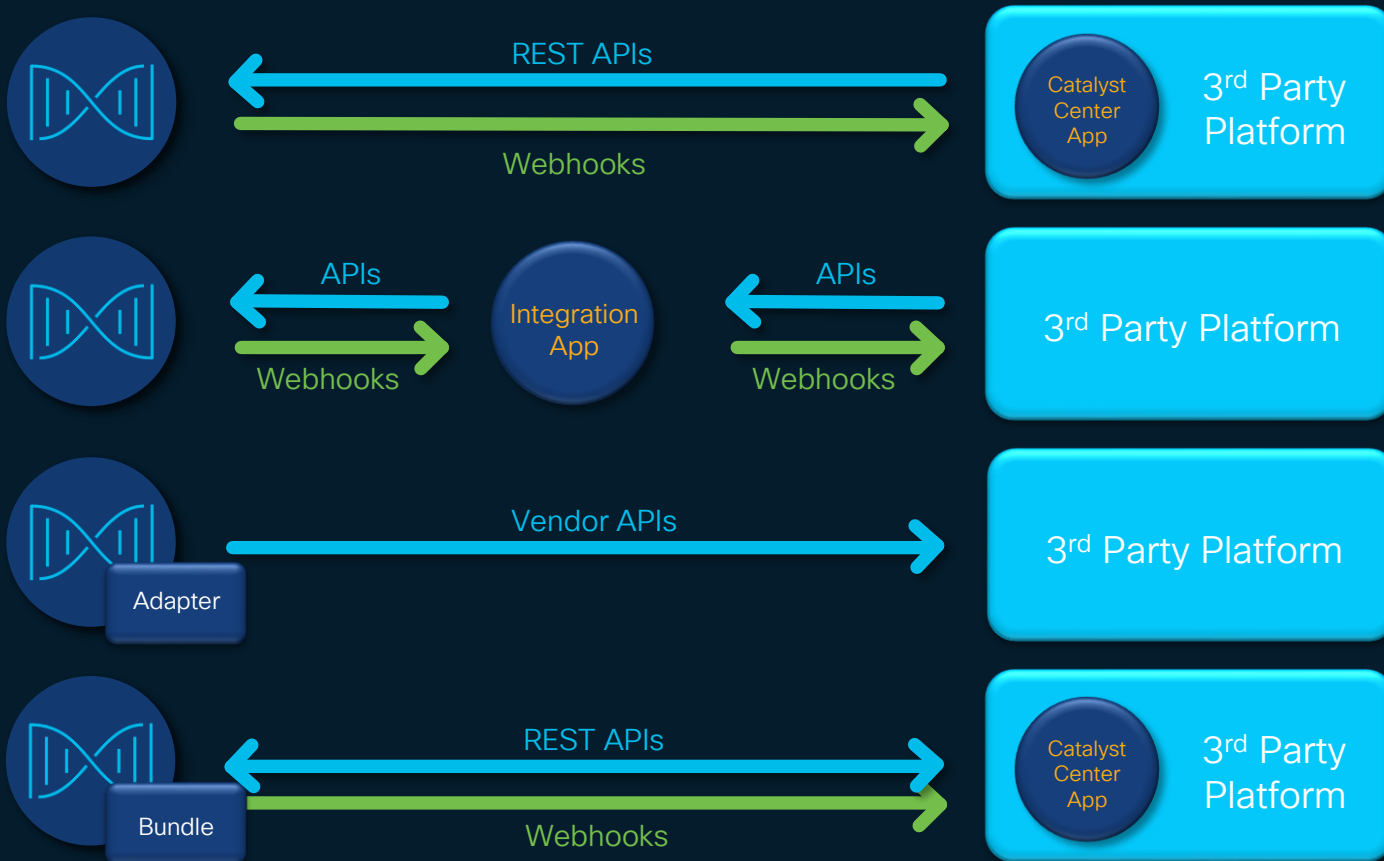
- ✓ Declarative – abstracted configuration state
- ✓ Increase compliance, reduce configuration drift
- ✓ Consistent processes and outcomes
- ✓ Rich visibility and assurance data
- ✓ Faster deployment, while reducing cost
- ✓ Enable GenAI innovation



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Catalyst Center Integration Options

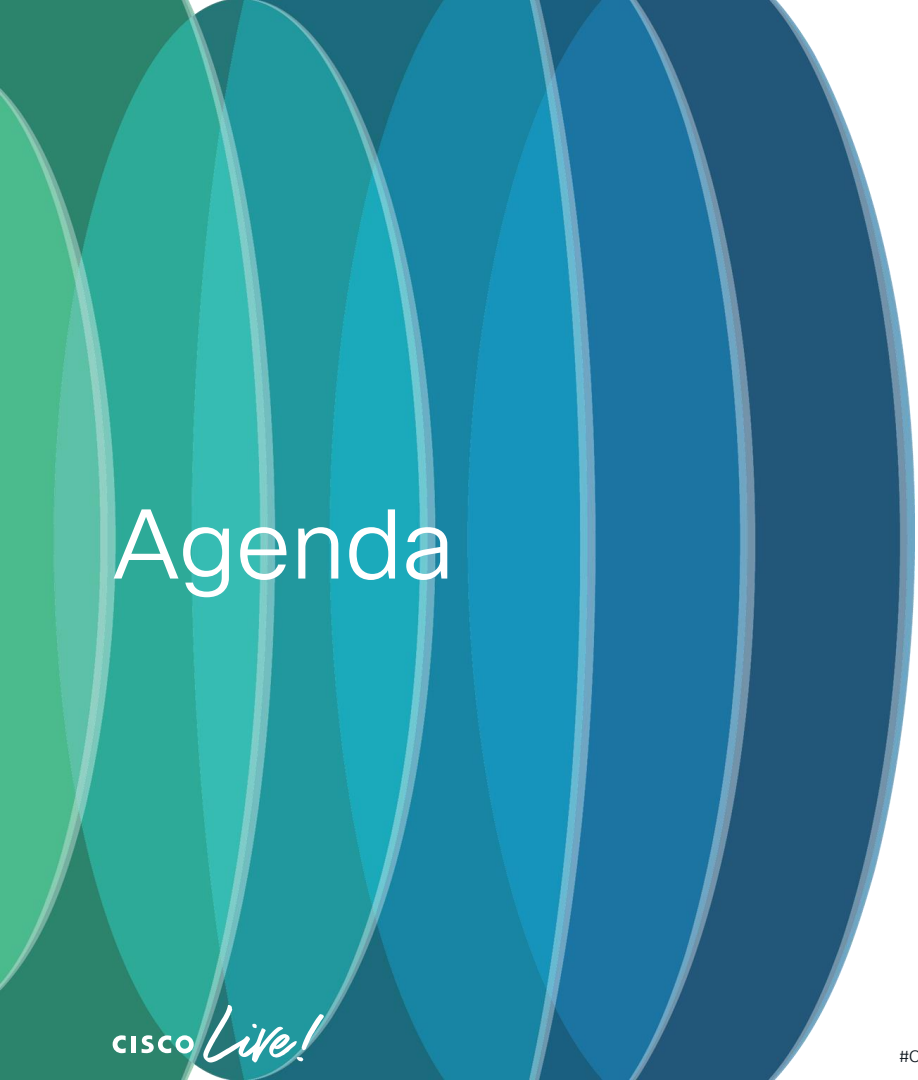


Integration Apps

- Rich features, innovation and maximum extensibility
- Enables GenAI use cases
- Supports non-matching API architectures, auth options, data encoding and data structures
- Ability to build custom integrations with any platforms
- May be required as a proxy between Catalyst Center and cloud platforms

The device state and configuration data, used for our GenAI Bot, is collected using API calls to Catalyst Center.





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AI, ML, LLM, Function Calling, GenAI, RAG, ... ?

- **Artificial Intelligence (AI)** – use of data and algorithms to allow systems to perform tasks similar with human intelligence
- **Machine Learning (ML)** – AI subset, focused on performing steps without being explicitly programmed. Learn from data patterns and insights to create recommendations
- **Large Language Model (LLM)** – neural network model designed to understand and generate human language
- **Function calling** – Use LLM models to interface with external platforms (usually with API calls), to identify and perform tasks or retrieve data
- **Generative AI (GenAI)** – Use patterns in existing data to create new content. This content could be text, numbers or multimedia
- **Retrieval-Augmented Generation (RAG)** – Retrieves matches in provided dataset and uses NLPs to create high-confidence content

Retrieval-Augmented Generation (RAG) Ops Bot

- Collect device operational data
- Encode the data
- Save to database
- Query and find closest match
- Provide answers using natural language

How may I help you? [Provide details about the configured IP Protocols](#)

The router you're looking at has three configured IP protocols: EIGRP (AS 123), LISP, and BGP (AS 65100).

1. ****EIGRP (AS 123)**:**

- Metric weights: K1=1, K2=0, K3=1, K4=0, K5=0
- NSF-aware route hold timer: 240 seconds
- Default networks exchanged in updates
- Router-ID: 10.93.141.20
- Total Prefix Count: 16
- Routing for Networks: 10.93.140.4/32, 10.93.141.20/32
- Routing Information Sources: Gateways with a distance of 90
- Distance for internal routes: 90, external: 170

2. ****LISP**:**

- Maximum path: 32
- No specific configured networks or routing information sources

3. ****BGP (AS 65100)**:**

- Route Reflector for VPNv4 Unicast, with 1 client
- IGP synchronization is disabled
- Automatic route summarization is disabled
- Neighbor: 10.93.141.28
- Maximum path: 1
- Distance for external routes: 20, internal: 200, local: 200

If you need more specific details about any of these protocols, feel free to ask!

Retrieval-Augmented Generation App Workflow

Dataset (collected with APIs from Catalyst Center)

```
interface Loopback0
ip address 10.93.141.20 255.255.255.255
```

Text
splitting +
Embeddings
model

```
[-2.18464285e-02 4.79203351e-02 -5.23540303e-02 -2.06714533e-02  
1.23669589e-02 2.14911737e-02 6.28002435e-02 3.91882733e-02  
-2.81998049e-02 -8.86559635e-02 7.28104562e-02 3.62688117e-02  
9.80289094e-03 -8.77185445e-03 -3.98535993e-02 3.19208466e-02  
-2.86364499e-02 -1.56388357e-02 -8.34894273e-03 -4.92241867e-02  
2.87111066e-02 7.39215463e-02 1.77850178e-03 -4.21317369e-02  
...]
```

Embeddings Created

Save dataset and
embeddings to
database

ChromaDB



Query

What is the IP address of interface loopback0?

Embeddings
model

```
[-2.18464285e-02 4.79203351e-02 -5.23540303e-02 -2.06714533e-02  
1.23669589e-02 2.14911737e-02 6.28002435e-02 3.91882733e-02  
-2.81998049e-02 -8.86559635e-02 7.28104562e-02 3.62688117e-02  
9.80289094e-03 -8.77185445e-03 -3.98535993e-02 3.19208466e-02  
-2.86364499e-02 -1.56388357e-02 -8.34894273e-03 -4.92241867e-02  
2.87111066e-02 7.39215463e-02 1.77850178e-03 -4.21317369e-02  
...]
```

Create Query
Embeddings

Similarity
Search

Matching
Docs
Metadata

Answer

The IP address of interface Loopback0 is 10.93.141.20.

Embeddings

- Embeddings – encoding data, representing it as a multi-dimensional vector, mapping text to numbers
- They are used to encode both the data and query
- Use various models, depending on the application

```
interface Loopback0  
ip address 10.93.141.20 255.255.255.255
```



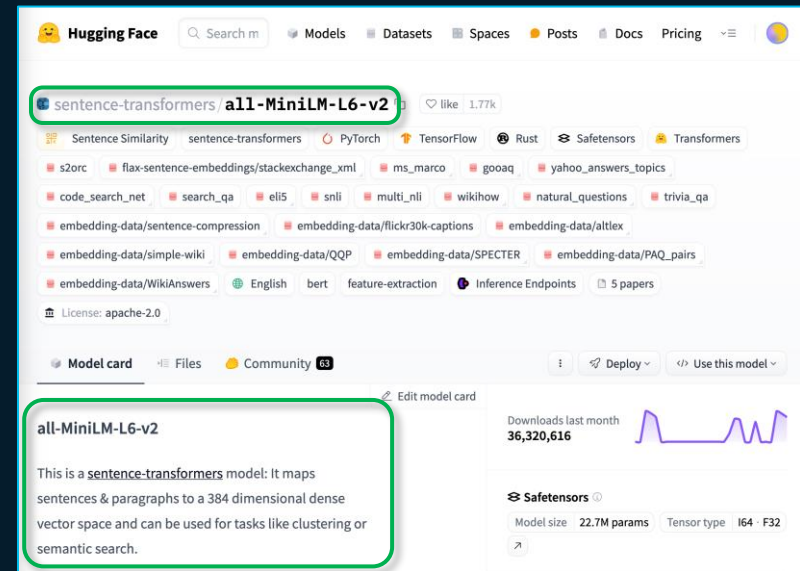
```
[-2.18464285e-02  4.79203351e-02 -5.23540303e-02 -2.06714533e-02  
 1.23669589e-02  2.14911737e-02  6.28002435e-02  3.91882733e-02  
 -2.81998049e-02 -8.86559635e-02  7.28104562e-02  3.62688117e-02  
 9.80289094e-03 -8.77185445e-03 -3.96535993e-02  3.19208466e-02  
 -2.86364499e-02 -1.56388357e-02 -8.34894273e-03 -4.92241867e-02  
 2.87111066e-02  7.39215463e-02  1.77850178e-03 -4.21317369e-02  
 ...]
```

Creating embeddings may be costly and there are data privacy requirements.
Please follow your organisation policies for a Responsible AI implementation.

Models

Defined how to encode data
There are 660k+ embeddings
models just on Hugging Face

Ref.: <https://huggingface.co/models>



Intended uses

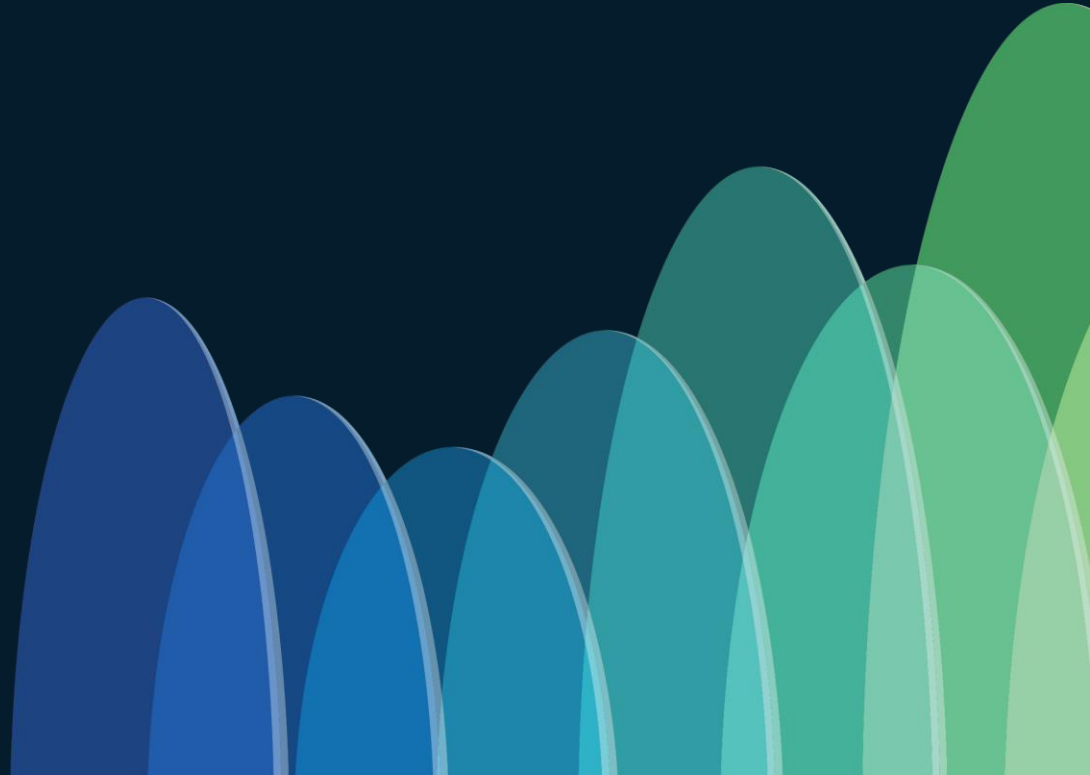
Our model is intended to be used as a sentence and short paragraph encoder. Given an input text, it outputs a vector which captures the semantic information. The sentence vector may be used for information retrieval, clustering or sentence similarity tasks.

By default, input text longer than 256 word pieces is truncated.

[sentence-transformers/all-MiniLM-L6-v2](https://huggingface.co/sentence-transformers/all-MiniLM-L6-v2)

Optimised for text, sentences and short paragraphs. 384 multi-dimensional vector for each segment of text

Demo Create Embeddings



Embeddings Storage

- Memory storage:
 - Simple applications, easy to develop, great for learning
 - Will not scale, there is no data persistence, embeddings will be re-created every time, app slow to start
- Database server:
 - Store embeddings for large data sets
 - Traditional databases may be used
 - Vector databases are optimised for proximity search (semantic matching)

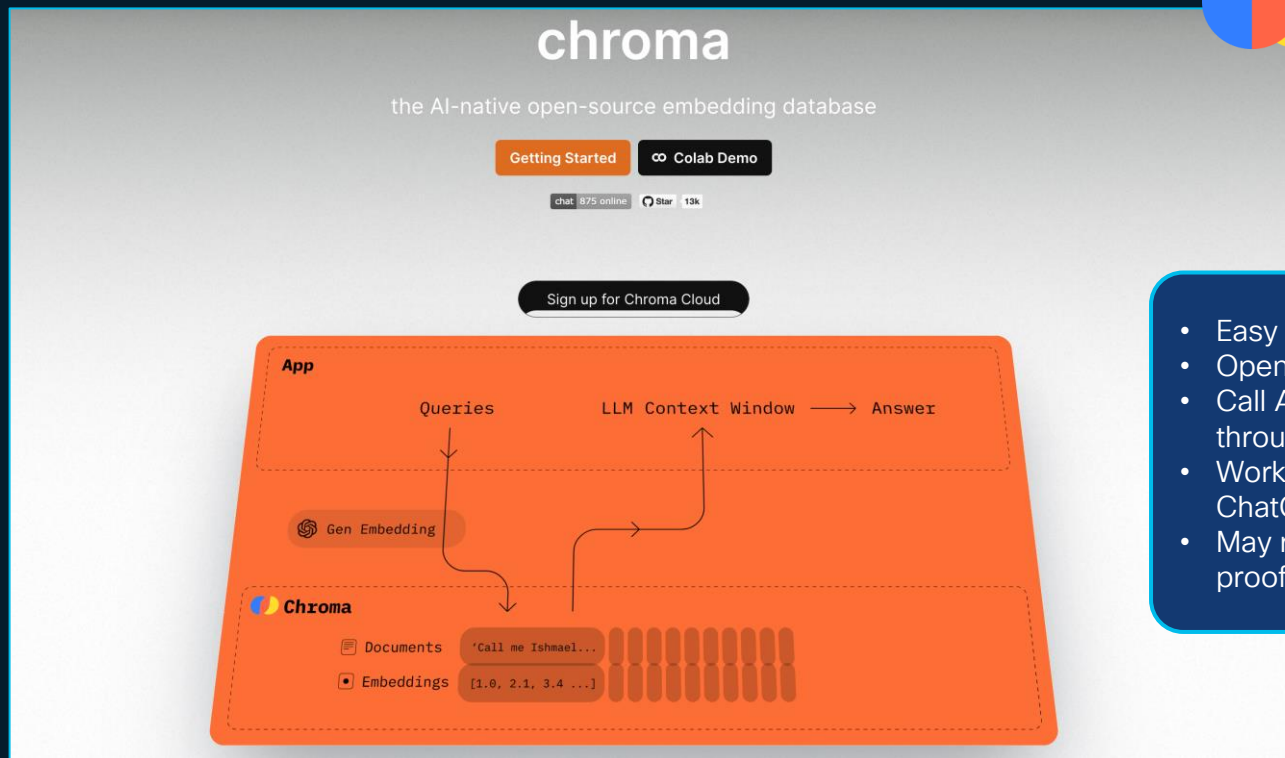
Vector Databases:

- Weaviate
- Pinecone
- Faiss
- ChromaDB
- Elastic
- MongoDB Atlas
- OpenAI
- ...

Cloud Managed databases may be costly and have data privacy concerns

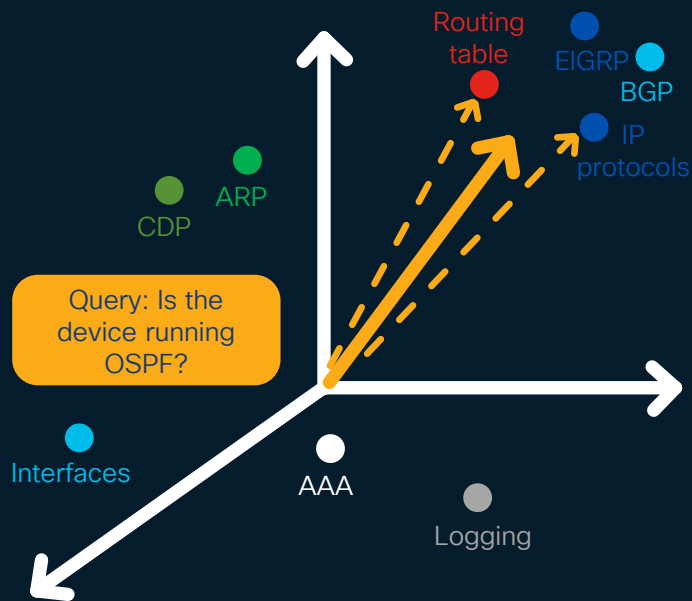
ChromaDB

<https://www.trychroma.com/>



- Easy to get started
- Open-source, no license fees
- Call APIs directly or integrate through LangChain
- Works with various LLMs – ChatGPT or Llama
- May run on laptop, or server if proof-of-concept

Similarity Searches



Multi-dimensional vector
The “all-MiniLM-L6-v2” model uses 384 dimensions

- Create the embedding for the query
- From the multi-dimensional space identify the match, or matches in the proximity of the query
- Retrieve the document, or documents represented by the proximity vectors

Large Language Model (LLM) – Do I need one?

LLMs:

- GPT (OpenAI)
- Gemini (Google)
- Llama 3 (Meta)
- Ollama (framework)
- Cohere
- ...

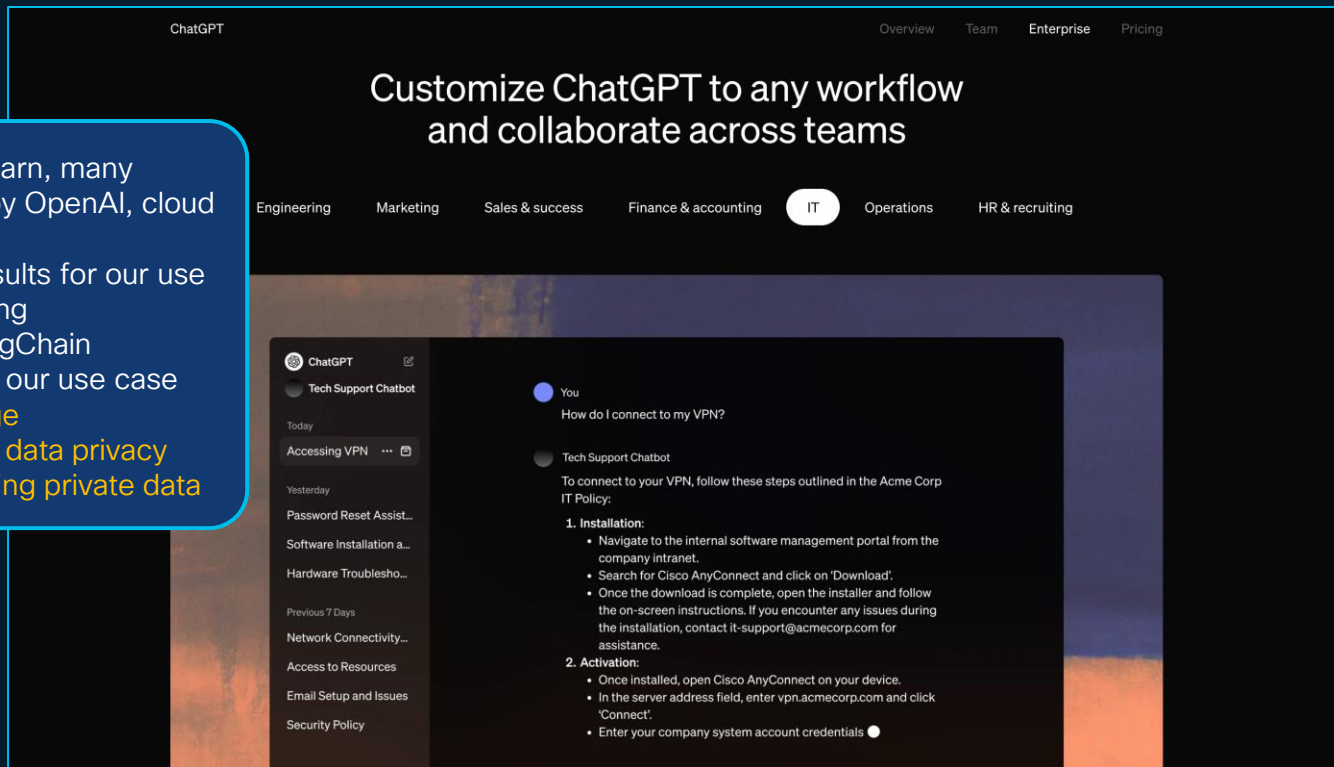
Consider cost and data privacy

- Large Language Model is an AI Model designed to understand and generate human language
- Will answer our query, using natural language, based on the similarity search results
- Trained on massive data sets (billions of text chunks)
- Understand context and are **general-purpose**
- Provide other features, like function calling
- Support code development of network automation tasks

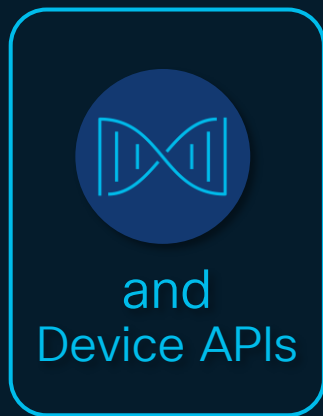
ChatGPT LLM (Generative Pre-trained Transformer)

<https://openai.com/chatgpt/>

- Very easy to use and learn, many examples, developed by OpenAI, cloud based
- Versatile, very good results for our use case, without any training
- Integration through LangChain
- Efficient, works well for our use case
- Cost may be a challenge
- Follow your policies for data privacy and be aware of exposing private data



Why Retrieval-Augmented Generation GenAI?

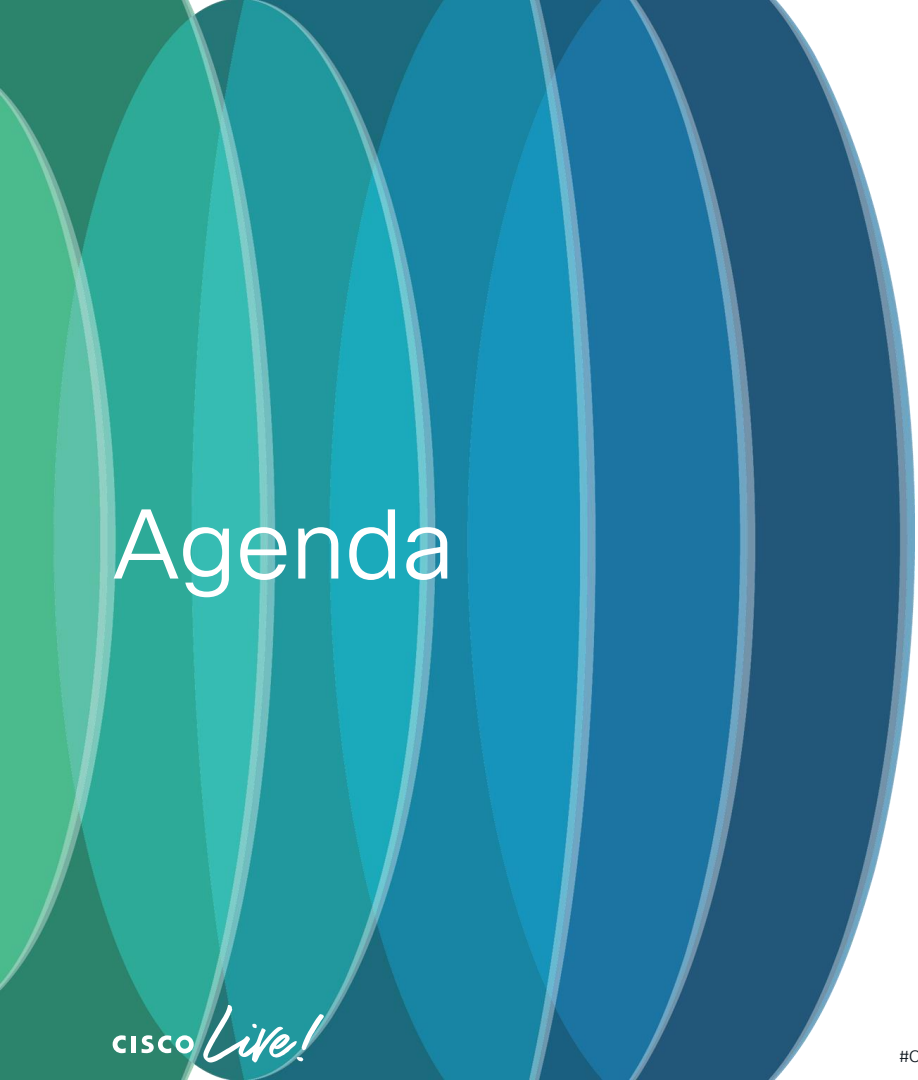


+

Retrieval-Augmented
Generation

GenAI LLM

- Config and operational data is collected from Catalyst Center or Device APIs
- Your data is the dataset (RAG)
- End-to-end workflow automation: data collection, data transform, vector database updates, query and answer
- Benefit from massive training of the existing LLM models
- Follow your Corporate policies for Responsible AI, data privacy, and be aware of cost



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Retrieval-Augmented Generation (RAG) Ops Bot

- Collects device operational and configuration data
- Encodes the data and saves to vector database
- Troubleshooting queries sent to bot
- Provides answers using natural language

How may I help you? *Provide details about the configured IP Protocols*

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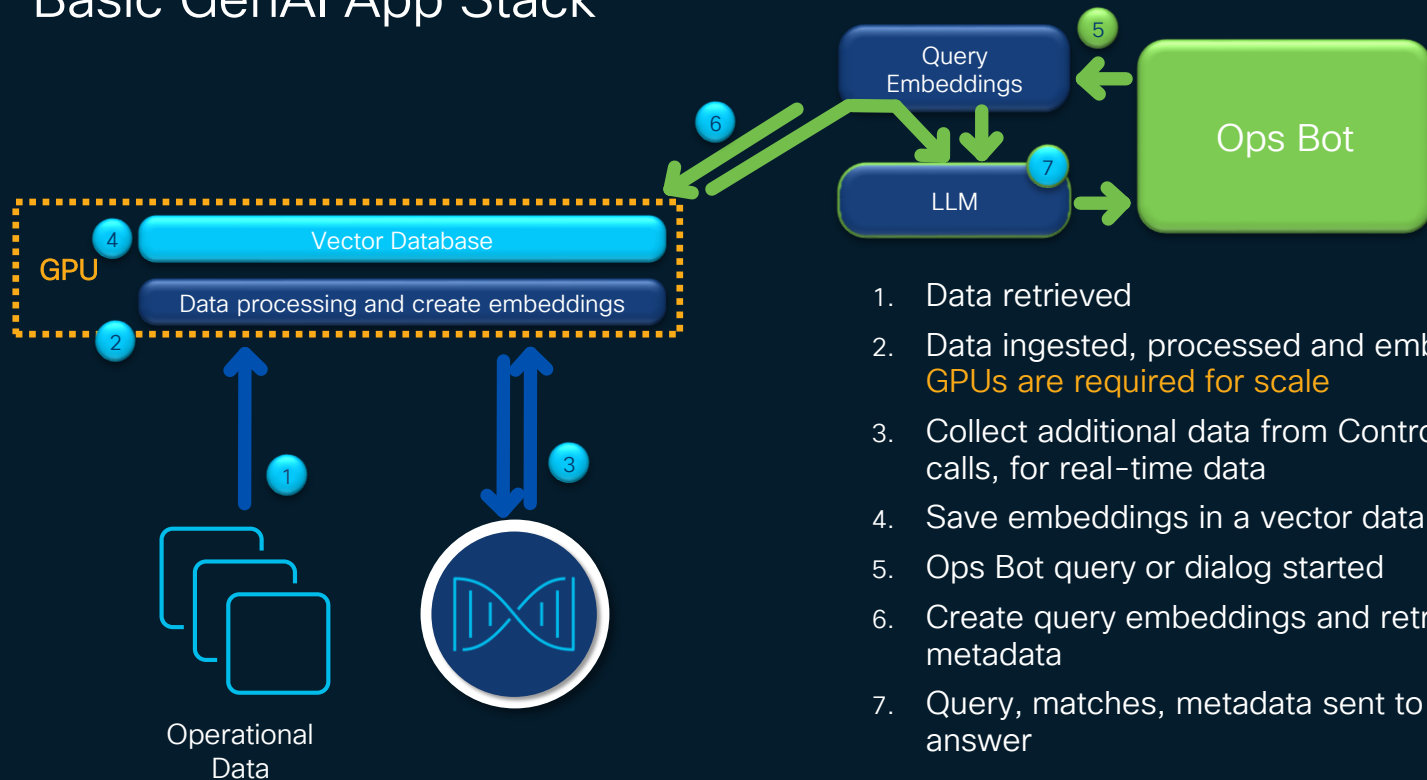
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Retrieval-Augmented Generation

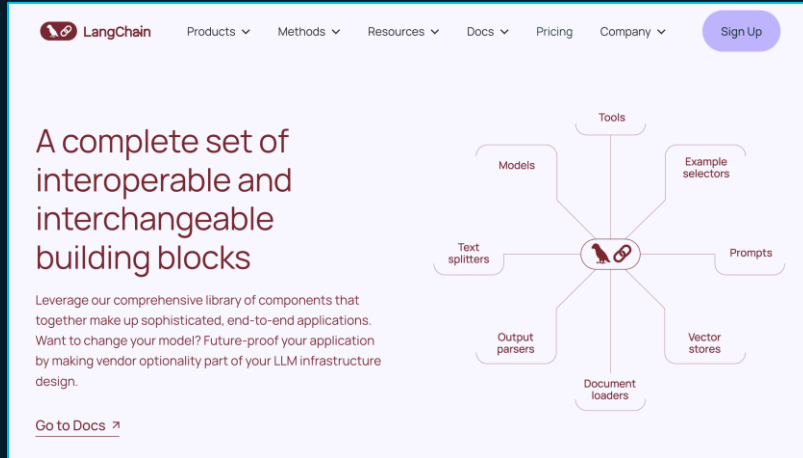
Basic GenAI App Stack



1. Data retrieved
2. Data ingested, processed and embeddings created, **GPUs are required for scale**
3. Collect additional data from Controllers with REST API calls, for real-time data
4. Save embeddings in a vector database
5. Ops Bot query or dialog started
6. Create query embeddings and retrieve close matches, metadata
7. Query, matches, metadata sent to LLM to provide answer

Note: Basic app workflow, other apps and functions are recommended for scale and production

LangChain Framework



- Simplifies development of Retrieval Augmented Generation solutions
- Connects dataset import, models, vector databases, LLMs
- Modular, easy to swap apps, models, vector databases
- Accelerates innovation
- Easy to start, may not be the best in production

Vector Database Server

Configure and run the Chroma DB Server

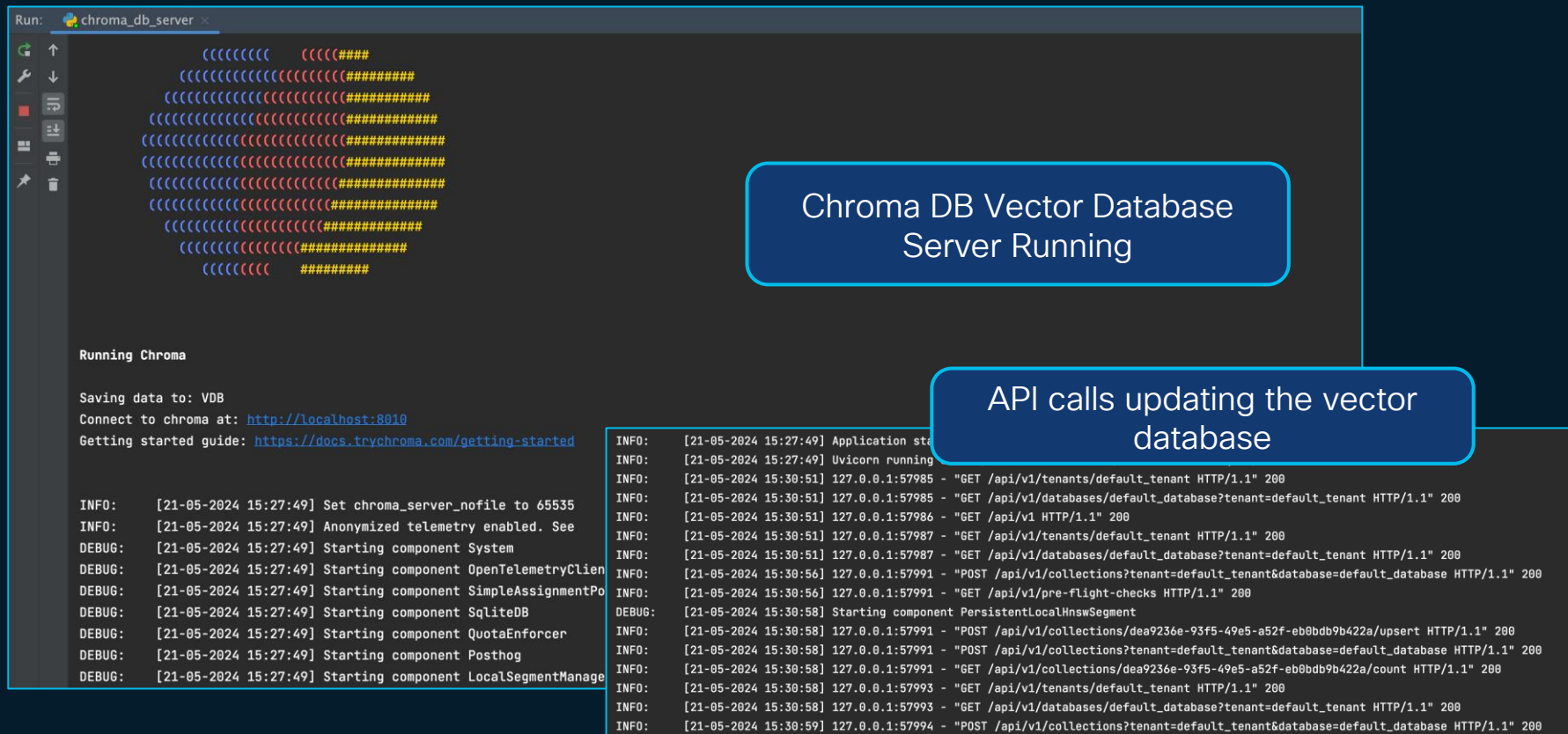
Create or delete a collection
Useful while development or troubleshooting

The vector database may run on your laptop, recommended on a server

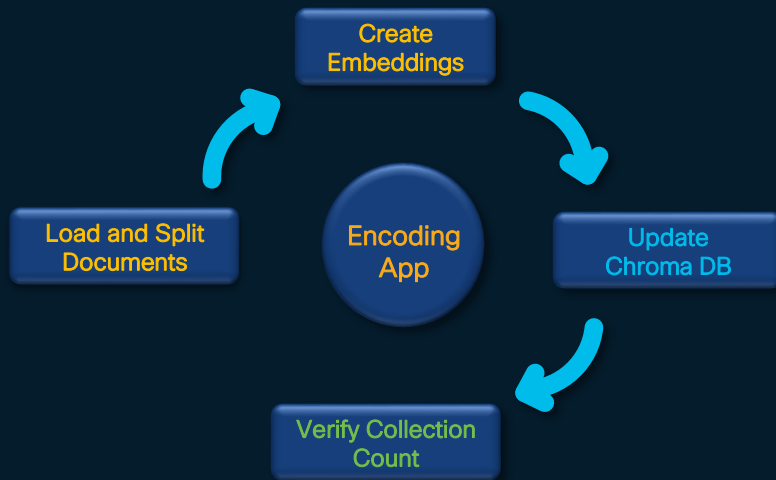
```
39
40 # database server details
41 DB_PATH = os.getenv('DB_PATH')
42 DB_PORT = os.getenv('DB_PORT')
43
44
45 def main():
46     """
47     This application will start a new Chroma DB server, providing the path for the database, and the port
48     """
49     if not os.path.exists(DB_PATH):
50         os.makedirs(DB_PATH)
51     os.system('chroma run --port ' + DB_PORT + ' --path ' + DB_PATH)
52
53
```

```
43
44 def main():
45     """
46     This app will ask the user for input for creating or deleting a collection from the Chroma DB server
47     """
48
49     # configure the Chroma DB server
50     chroma_client = chromadb.HttpClient(host=DB_SERVER, port=DB_PORT)
51
52     # create or erase the collection
53     user_input = input('Delete (d) or Create (c) collection? ')
54     if user_input == 'd':
55         collection = chroma_client.delete_collection(name=DB_COLLECTION)
56         logging.info('Collection erased')
57     elif user_input == 'c':
58         collection = chroma_client.get_or_create_collection(name=DB_COLLECTION)
59         logging.info('Collection existing or created')
60
61     # chromadb heartbeat
62     chroma_client.heartbeat()
```

Chroma DB Server Running



Transform Dataset



```
91
92 def create_doc_embeddings(document):
93     """
94     The function will create the embeddings for the {doc}, with the metadata provided, using
95     {sentence-transformers/all-MiniLM-L6-v2} model.
96     Update the ChromaDB vector database with the new embeddings
97     :param document: document to be embedded
98     :return: collection count, after updating it
99     """
100
101     # connection to the Chroma DB server
102     chroma_db_server = chromadb.HttpClient(host=DB_SERVER, port=DB_PORT)
103
104     # split the document, create embeddings
105     docs = split_docs(document=document, chunk_size=100, chunk_overlap=25, separator="!")
106     embeddings = SentenceTransformerEmbeddings(model_name=MODEL_NAME)
107
108     # update the chroma db collection with the new embeddings
109     chroma_db = Chroma.from_documents(
110         documents=docs,
111         embedding=embeddings,
112         client=chroma_db_server,
113         collection_name=DB_COLLECTION
114     )
115
116     # get the updated collection count
117     chroma_collection = Chroma(
118         client=chroma_db_server,
119         collection_name=DB_COLLECTION
120     )
```

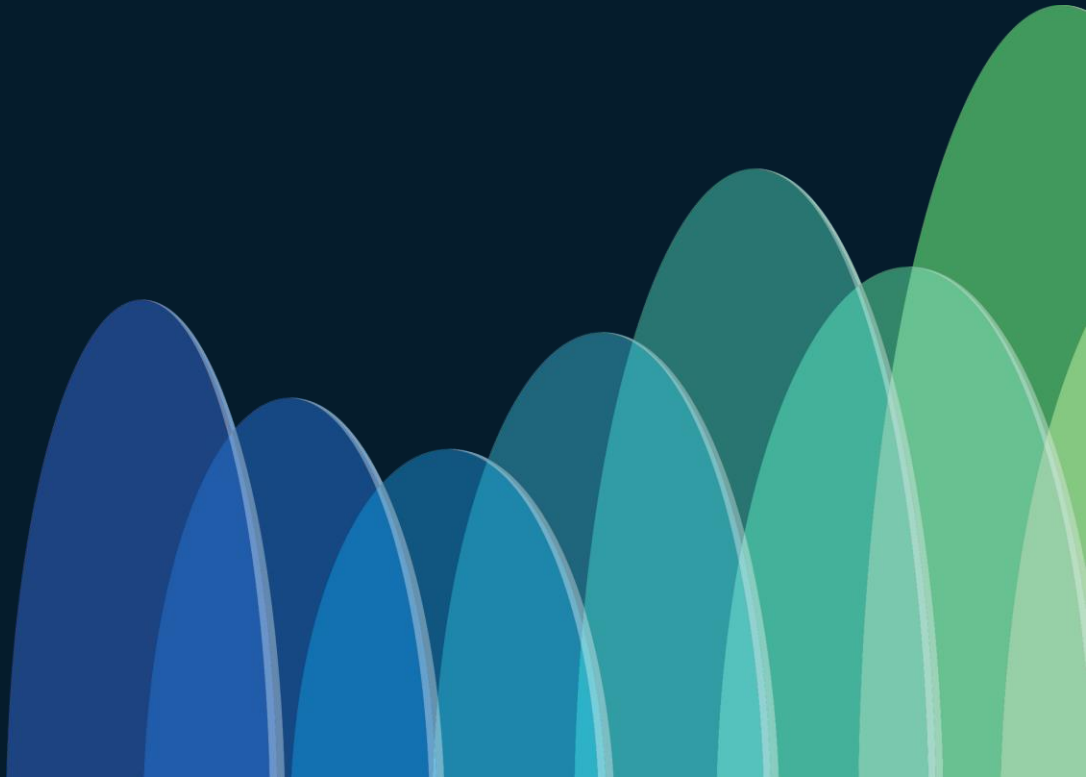
Create Embeddings and Update Vector Database

```
1 INFO:root: The folder with the data to be embedded is: OPS_DATA
2 INFO:root: There are 7 documents in the folder
3 INFO:root:The files to be embedded are:
4 INFO:root: LO-CN_cdp.txt
5 INFO:sentence_transformers.SentenceTransformer:Load pretrained SentenceTransformer: all-MiniLM-L6-v2
6 INFO:sentence_transformers.SentenceTransformer:Use pytorch device_name: mps
7 INFO:root: Collection count is 1
8 INFO:root: LO-CN_ip_arp.txt
9 INFO:sentence_transformers.SentenceTransformer:Load pretrained SentenceTransformer: all-MiniLM-L6-v2
10 INFO:sentence_transformers.SentenceTransformer:Use pytorch device_name: mps
11 INFO:root: Collection count is 2
12 INFO:root: LO-CN_sh_ver.txt
13 INFO:sentence_transformers.SentenceTransformer:Load pretrained SentenceTransformer: all-MiniLM-L6-v2
14 INFO:sentence_transformers.SentenceTransformer:Use pytorch device_name: mps
15 INFO:root: Collection count is 3
16 INFO:root: LO-CN_ip_route.txt
17 INFO:sentence_transformers.SentenceTransformer:Load pretrained SentenceTransformer: all-MiniLM-L6-v2
18 INFO:sentence_transformers.SentenceTransformer:Use pytorch device_name: mps
19 INFO:root: Collection count is 4
20 INFO:root: LO-CN_config.txt
21 INFO:sentence_transformers.SentenceTransformer:Load pretrained SentenceTransformer: all-MiniLM-L6-v2
22 INFO:sentence_transformers.SentenceTransformer:Use pytorch device_name: mps
23 INFO:root: Collection count is 121
24 INFO:root: LO-CN_ip_int.txt
25 INFO:sentence_transformers.SentenceTransformer:Load pretrained SentenceTransformer: all-MiniLM-L6-v2
26 INFO:sentence_transformers.SentenceTransformer:Use pytorch device_name: mps
27 INFO:root: Collection count is 122
28 INFO:root: LO-CN_ip_protocols.txt
29 INFO:sentence_transformers.SentenceTransformer:Load pretrained SentenceTransformer: all-MiniLM-L6-v2
30 INFO:sentence_transformers.SentenceTransformer:Use pytorch device_name: mps
31 INFO:root: Collection count is 123
```

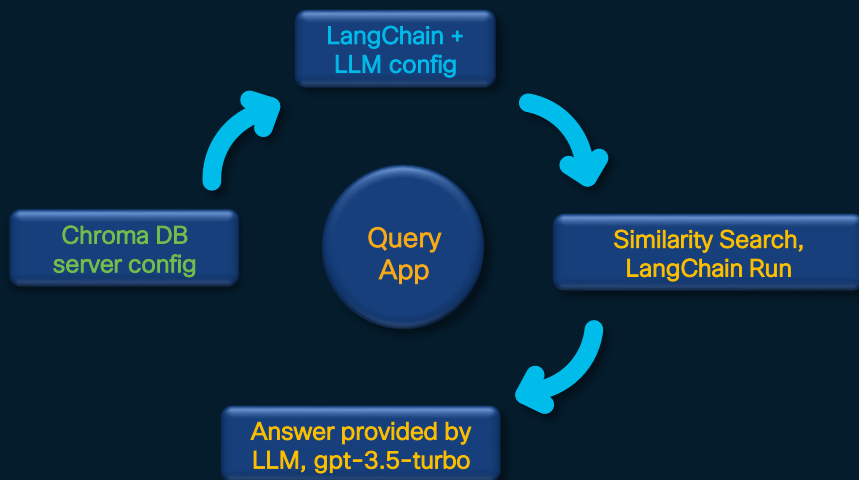
Documents encoded and
collection count incrementing.

Dataset of 70 KB text encoded
requires 2 MB of storage.

Demo Embeddings to Chroma



Similarity Search Query and Answer



```
61
62 # Chroma DB server details
63 chroma_db_server = chromadb.HttpClient(host=DB_SERVER, port=DB_PORT)
64
65 # define the model for creating embeddings for the query
66 embeddings = SentenceTransformerEmbeddings(model_name=MODEL_NAME)
67
68 # initialize the Chroma DB connection to server and collection
69 chroma_db = Chroma(
70     client=chroma_db_server,
71     collection_name=DB_COLLECTION,
72     embedding_function=embeddings
73 )
74
75 # define the LLM used - OpenAI, model 'gpt-3.5-turbo'
76 llm = ChatOpenAI(model_name=OPENAI_MODEL, temperature=1)
77 chain = load_qa_chain(llm, chain_type="stuff", verbose=False)
78
79 query = "y"
80 while query != ' ':
81     # prompt the user for the query input
82     query = input('\n\nHow may I help you? ')
83
84     # search for the similarity matches from the Chroma DB server/collection
85     matching_docs = chroma_db.similarity_search(query)
86
87     # The similarity search result and query will be used to generate the answer using the LLM
88     answer = chain.run(input_documents=matching_docs, question=query, set_verbose=False)
89     print(answer)
90 return
91
```

Query and Answer – gpt-3.5-turbo model

Query

How may I help you?
Is there an entry for
this IP address
10.93.140.7 in the
ARP Table?

LLM Answer

How may I help you? *Is there an entry for this IP
address 10.93.140.7 in the ARP Table?*
Yes, there is an entry for the IP address 10.93.140.7
in the ARP Table.

Here is the relevant entry:
- IP Address: 10.93.140.7
- Age: 238 min
- Hardware Address: 9077.eeac.abde
- Type: ARPA
- Interface: Vlan140

Matching Docs

```
[Document(page_content='
L0-CN#show ip arp
Protocol Address      Age (min)  Hardware Addr  Type   Interface
Internet 10.10.10.1      -         308b.b2ba.c2d1 ARPA    Vlan100
Internet 10.93.140.1     149       501c.bf6d.77de ARPA    Vlan140
Internet 10.93.140.2     148       00af.1f41.82de ARPA    Vlan140
Internet 10.93.140.4     -         308b.b2ba.c2de ARPA    Vlan140
Internet 10.93.140.6     130       9077.ee06.945e ARPA    Vlan140
Internet 10.93.140.7     238       9077.eeac.abde ARPA    Vlan140
Internet 10.93.140.17    -         308b.b2ba.c2d0 ARPA    Vlan240
L0-CN#',
metadata={'source': 'OPS_DATA/L0-CN_ip_arp.txt'})]

Document(page_content='
!
!router eigrp 123
 network 10.93.140.4 0.0.0.0
 network 10.93.141.20 0.0.0.0',
metadata={'source': 'OPS_DATA/L0-CN_config.txt'})]
```

The LLM selects only the
relevant document for the
query/dialog, and uses NLP
to provide the answer

Retrieval-Augmented Generation Query Testing

Data

Text with no operational data.

Queries

What is the device hostname?

How many interfaces does this device have?

Answers

I'm sorry, but without specific details or operational data, I am unable to determine the device hostname.

I don't know.

Query Testing

Data

Output only from
“show ip interface brief”:

```
LD-CN#sh ip interface brief
```

Interface	IP-Address	OK?	Method	Status	Protocol
Vlan1	unassigned	YES	NVRAM	administratively down	down
Vlan100	10.10.10.1	YES	NVRAM	up	up
Vlan140	10.93.140.4	YES	NVRAM	up	up
Vlan240	10.93.140.17	YES	NVRAM	up	up
GigabitEthernet0/0	10.93.141.4	YES	NVRAM	up	up
Tel0/1	unassigned	YES	unset	down	down

Queries

How many interfaces does this device have?

Who are the CDP neighbors?

Answers

This device has a total of 57 interfaces based on the provided output.

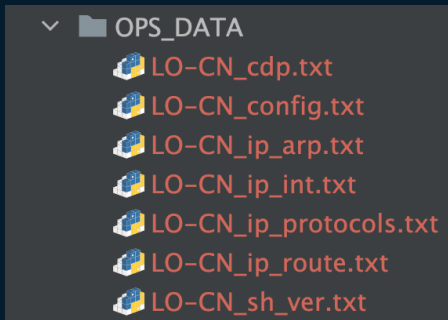
Based on the provided context, the Command Line Interface (CLI) output does not show the CDP (Cisco Discovery Protocol) neighbors directly. ...

Query Testing

Dataset

show commands output

OPS_DATA



Dataset of 70 KB text encoded
requires 2 MB of storage.

Queries

What is the software version?

Is this IP address 10.93.141.45 in the
ARP table?

What are the configured routing
protocols?

Are there any LISP routes in the
routing table?

Answers

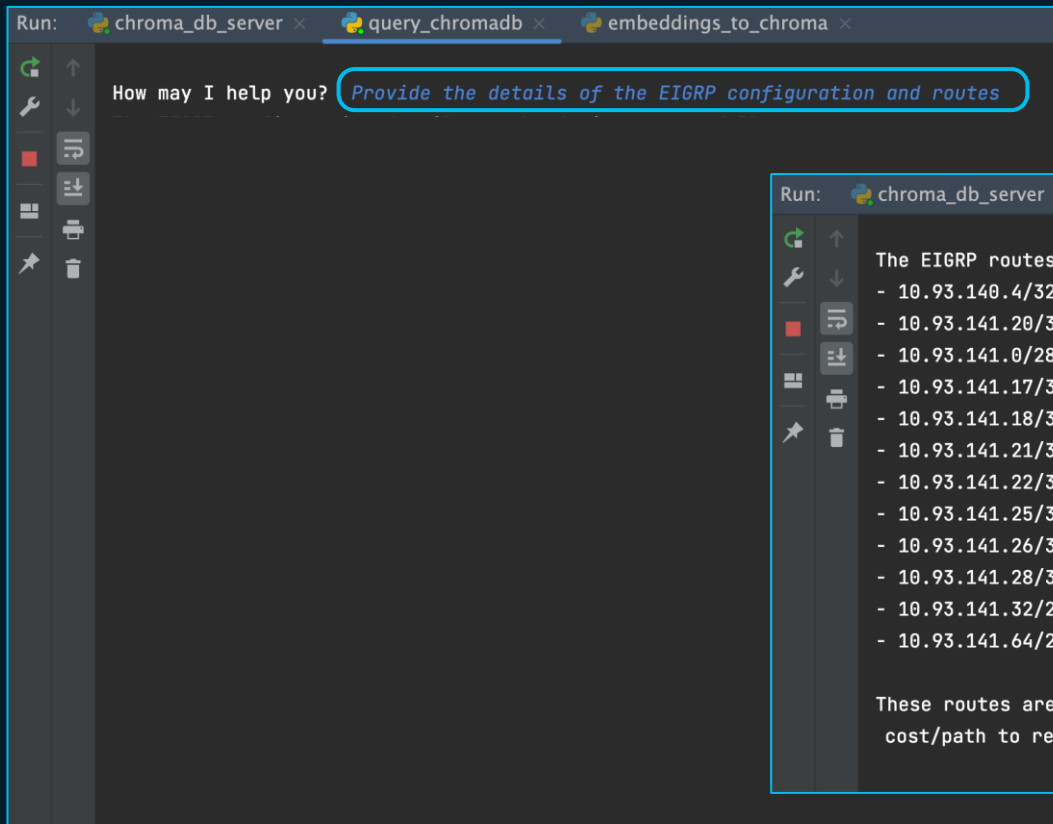
The software version is `Cisco IOS XE
Software, Version 17.09.04a`.

The IP address 10.93.141.45 is not
listed in the ARP table. The ARP table
includes entries for 10.93.140.x
addresses, ...

The configured routing protocols on
the device are EIGRP (Autonomous
System 123), LISP, and BGP
(Autonomous System 65100).

Based on the provided outputs, there
are no LISP routes listed in the routing
table.

Multiple Matching Documents



Multiple matching documents:
ip protocols, routing table,
running configuration

GenAI Hallucination – Incorrect Answers

How may I help you? *What is the hostname?*

The hostname is "LO-CN".

Available from the
show running-config

How may I help you? *What is the device hostname?*

Based on the provided configuration snippets, the device hostname is not explicitly shown. To determine the device hostname, you would typically look for a command like "hostname <hostname>" in the configuration. If this information is not available, it might be checking a different part of the configuration not provided here.

Available from the
show version

How may I help you? *What is the uptime?*

Based on the provided configuration, there is no specific command output or information indicating the current uptime of the device. This information is typically obtained by running commands like "show version" or "show system uptime" on the device. If you have access to the device, you can run one of these commands to determine the uptime.

AI Hallucination:

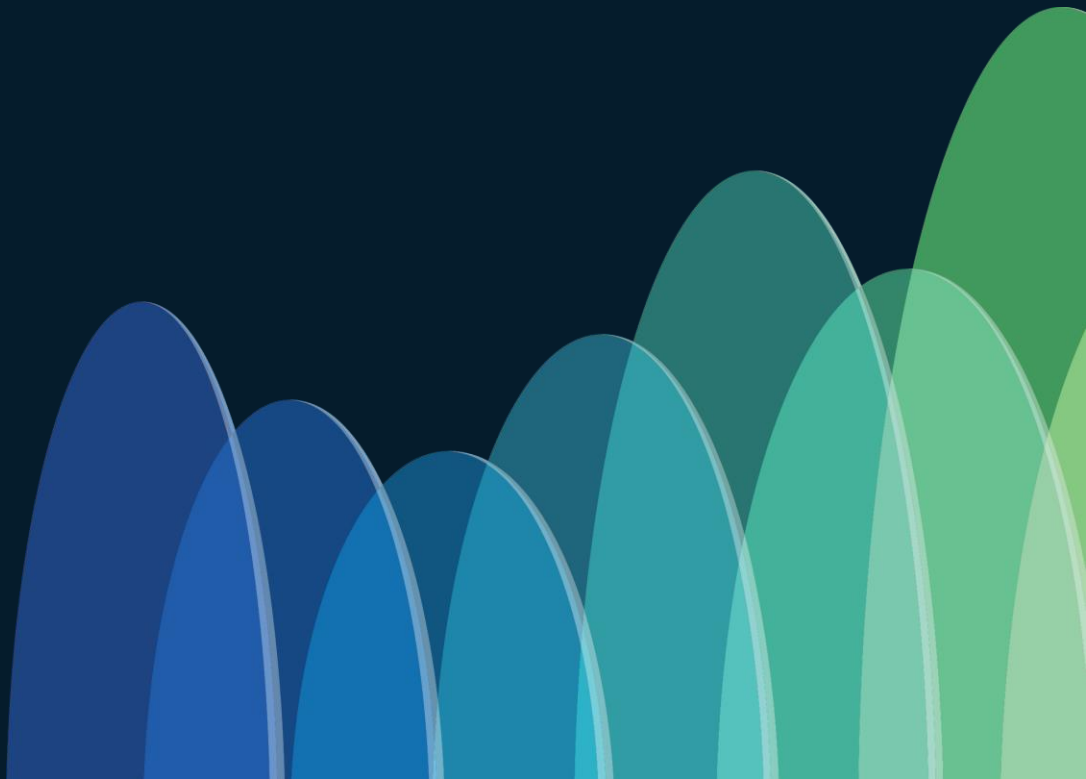
- GenAI outputs that are incorrect, fabricated, or missing data provided.
- They may be created due to the used models, lack of model training, imprecise or too complex queries, or limited datasets.

How may I help you? *give me the show version details*

The output of the "show version" command provides information about the Cisco device's software version, hardware details, uptime, licensing information, and more. Here are some key details from the output you provided:

- Cisco IOS XE Software Version: 17.09.04a
- Cisco IOS Software Version: 17.9.4a, Catalyst L3 Switch Software (CAT9K_IOSXE)
- Uptime: 20 weeks, 1 day, 5 hours, 17 minutes
- System restarted at: 15:07:58 PDT Wed Oct 25 2023
- System image file: "flash:packages.conf"
- License Information: Network Advantage, DNA Advantage
- Smart Licensing Status: Smart Licensing Using Policy
- Model Number: C9300-24UX

Demo GPT-3.5-turbo



Replace Model “gpt-3.5-turbo” with “gpt-4o”

gpt-3.5-turbo

How may I help you? *Who are the CDP neighbors?*

The CDP neighbors of device L0-CN are:

1. Device ID: L0-BN, connected through interface TenGigabitEthernet1/0/23.
2. Device ID: PDX-M, connected through interface GigabitEthernet0/0.
3. Device ID: PDX-M, connected through interface TenGigabitEthernet1/0/24.

- Changing just the LLM model is very easy, one line of code
- GPT 3.5 turbo is fast, works very well for our use case, simple, mostly accurate answers
- GPT-4o feels a little slower, includes more details, more human-like responses

gpt-4o

How may I help you? *Who are the CDP neighbors?*

The CDP neighbors for the device "L0-CN" are:

1. ****Device ID: L0-BN****
 - Local Interface: TenGigabitEthernet1/0/23
 - Port ID: GigabitEthernet1/0/23
 - Platform: cisco C9300-24U
2. ****Device ID: PDX-M****
 - Local Interface: GigabitEthernet0/0
 - Port ID: GigabitEthernet1/0/4
 - Platform: cisco WS-C3850-48U
3. ****Device ID: PDX-M****
 - Local Interface: TenGigabitEthernet1/0/24
 - Port ID: GigabitEthernet1/0/24
 - Platform: cisco WS-C3850-48U

Replace Model “gpt-3.5-turbo” with “gpt-4o”

How may I help you? *What are the EIGRP routes in the routing table?*

The EIGRP routes in the routing table are as follows:

```
- D      10.93.140.4/32
- D      10.93.141.0/28
- D      10.93.141.17/32
- D      10.93.141.18/32
- C      10.93.141.20/32
- D      10.93.141.21/32
- D      10.93.141.22/32
- D      10.93.141.25/32
- D      10.93.141.26/32
- D      10.93.141.28/32
- D      10.93.141.32/27
- D      10.93.141.64/29
```

These are the networks learned through EIGRP in the routing

gpt-3.5-turbo

gpt-4o

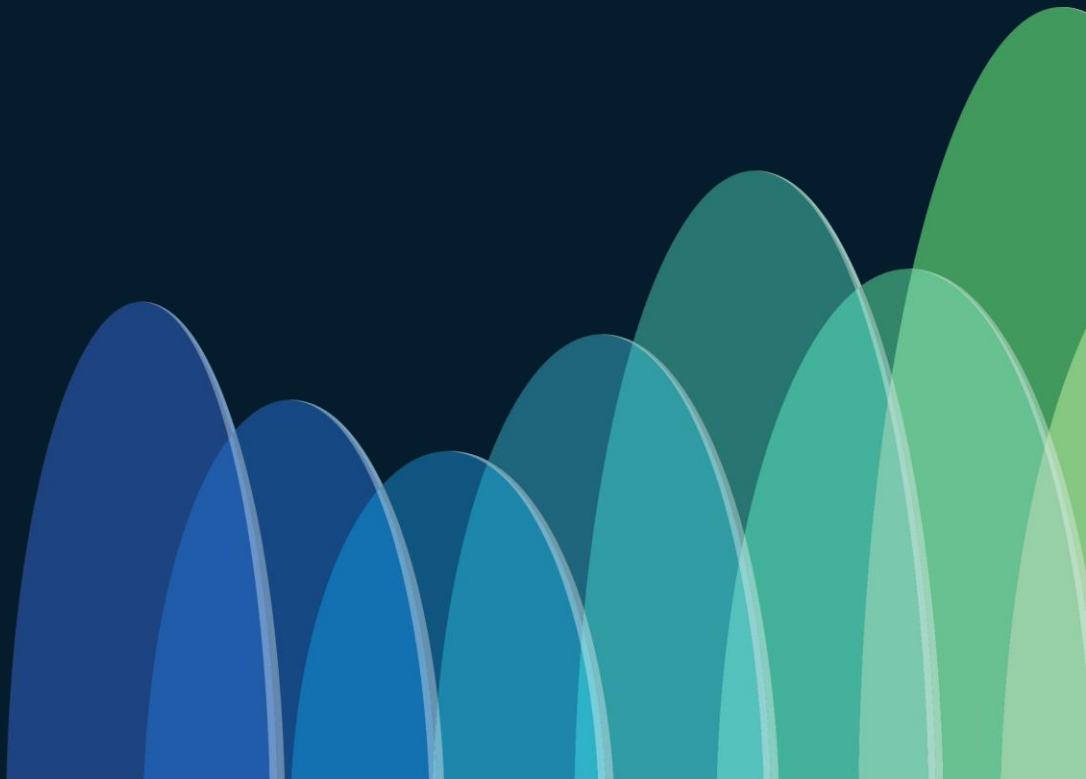
How may I help you? *What are the EIGRP routes in the routing table?*

The EIGRP routes in the routing table are identified with the letter "D" (or "D*EX" for external EIGRP routes). Here is the list of EIGRP routes from the provided routing table output:

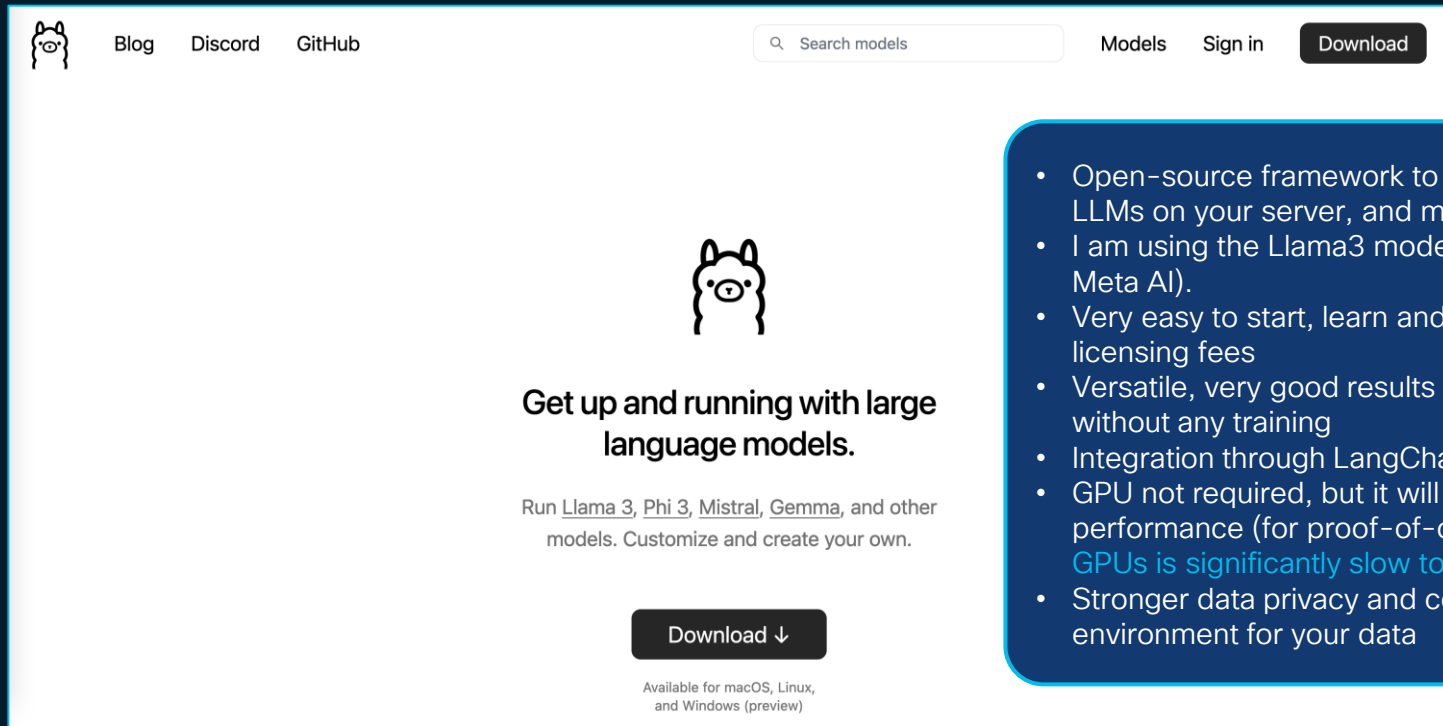
```
- `D*EX 0.0.0.0/0 [170/3072] via 10.93.140.1, 1w3d, Vlan140`
- `D      10.93.131.0/30 [90/3328] via 10.93.140.1, 16:24:00, Vlan140`
- `D      10.93.131.4/30 [90/3584] via 10.93.140.1, 16:23:53, Vlan140`
- `D      10.93.131.8/29 [90/3840] via 10.93.140.1, 16:23:53, Vlan140`
- `D      10.93.141.0/28 [90/3072] via 10.93.140.1, 1w3d, Vlan140`
- `D      10.93.141.17/32 [90/130816] via 10.93.140.1, 1w3d, Vlan140`
- `D      10.93.141.18/32 [90/130816] via 10.93.140.2, 1w3d, Vlan140`
- `D      10.93.141.21/32 [90/130816] via 10.93.140.6, 1w3d, Vlan140`
- `D      10.93.141.22/32 [90/131072] via 10.93.140.1, 1w3d, Vlan140`
- `D      10.93.141.25/32 [90/131584] via 10.93.140.1, 16:23:53, Vlan140`
- `D      10.93.141.26/32 [90/131840] via 10.93.140.1, 16:23:53, Vlan140`
- `D      10.93.141.28/32 [90/130816] via 10.93.140.7, 1w3d, Vlan140`
- `D      10.93.141.32/27 [90/3072] via 10.93.140.1, 1w3d, Vlan140`
- `D      10.93.141.64/29 [90/3072] via 10.93.140.1, 1w3d, Vlan140`
```

- GPT 3.5 turbo answer provided in 4 seconds, GPT-4o in 10 seconds (average for few tries)
- Nicer answer formatting for GPT 4o, better trained model, answering questions with higher accuracy (being able to identify external routes)

Demo GPT-4o



Replace ChatGPT with Ollama and Llama3 Model



The screenshot shows the Ollama website homepage. At the top, there is a navigation bar with links for 'Blog', 'Discord', and 'GitHub' on the left, a search bar labeled 'Search models' in the center, and 'Models', 'Sign in', and a 'Download' button on the right. The main content area features a large llama icon in the center. Below the icon, the text reads 'Get up and running with large language models.' followed by 'Run Llama 3, Phi 3, Mistral, Gemma, and other models. Customize and create your own.' At the bottom of this section is a 'Download' button with a downward arrow. Below the button, it says 'Available for macOS, Linux, and Windows (preview)'.

Get up and running with large language models.

Run [Llama 3](#), [Phi 3](#), [Mistral](#), [Gemma](#), and other models. Customize and create your own.

Download ↓

Available for macOS, Linux, and Windows (preview)

- Open-source framework to enable running LLMs on your server, and maybe your laptop
- I am using the Llama3 model (developed by Meta AI).
- Very easy to start, learn and no need for licensing fees
- Versatile, very good results for our use case, without any training
- Integration through LangChain
- GPU not required, but it will improve the performance (for proof-of-concepts). **Without GPUs is significantly slow to answer**
- Stronger data privacy and controlled environment for your data

Code Changes – Diff

<pre>from langchain._api import LangChainDeprecationWarning from langchain.chains.question_answering import load_qa_chain from langchain_community.embeddings import SentenceTransformerEmbedder from langchain_community.vectorstores.chroma import Chroma from langchain_openai import ChatOpenAI warnings.simplefilter("ignore", category=LangChainDeprecationWarning)</pre>	<pre>29 29 30 30 31 31 32 32 33 33 34 34 35 35</pre>	<pre>from langchain._api import LangChainDeprecationWarning from langchain.chains.question_answering import load_qa_chain from langchain_community.embeddings import SentenceTransformerEmbedder from langchain_community.vectorstores.chroma import Chroma from langchain_community.chat_models import ChatOllama warnings.simplefilter("ignore", category=LangChainDeprecationWarning)</pre>	<pre>29 29 30 30 31 31 32 32 33 33 34 34 35 35</pre>	<p>Import ChatOllama Removed ChatOpenAi</p>
<pre># OpenAi key OPENAI_API_KEY = os.getenv('OPENAI_API_KEY') MODEL_NAME = 'all-MiniLM-L6-v2' OPENAI_MODEL = 'gpt-3.5-turbo' os.environ["OPENAI_API_KEY"] = OPENAI_API_KEY os.environ["TOKENIZERS_PARALLELISM"] = "false"</pre>	<pre>>> 46 39 47 40 48 41 49 42 >> 50 43 51 44 52 45 53 46 54 47</pre>	<pre># database server details DB_SERVER = os.getenv('DB_SERVER') DB_PORT = os.getenv('DB_PORT') DB_COLLECTION = os.getenv('DB_COLLECTION') MODEL_NAME = 'all-MiniLM-L6-v2' OLLAMA_MODEL = 'llama3'</pre>	<pre>39 39 40 40 41 41 42 42 43 43 44 44 45 45 46 46 47 47</pre>	<p>Removed OpenAI API Key Changed to new LLM Model</p>
<pre># Chroma DB server details chroma_db_server = chromadb.HttpClient(host=DB_SERVER, collection_name=DB_COLLECTION, embedding_function=embeddings) # define the LLM used - OpenAI, model 'gpt-3.5-turbo' llm = ChatOpenAI(model_name=OPENAI_MODEL, temperature=1 chain = load_qa_chain(llm, chain_type="stuff", verbose=</pre>	<pre>61 54 62 55 63 56 64 57 65 58 66 59 67 60 68 61 69 62 70 63 71 64 72 65 73 66 74 67 75 68 76 69 77 70 78 71</pre>	<pre># Chroma DB server details chroma_db_server = chromadb.HttpClient(host=DB_SERVER, collection_name=DB_COLLECTION, embedding_function=embeddings) # define the LLM used - Ollama, llama3 llm = ChatOllama(model=OLLAMA_MODEL) chain = load_qa_chain(llm, chain_type="stuff", verbose=</pre>	<pre>54 54 55 55 56 56 57 57 58 58 59 59 60 60 61 61 62 62 63 63 64 64 65 65 66 66 67 67 68 68 69 69 70 70 71 71</pre>	<p>Change the LLM to be used with LangChain</p>

ChatGPT and Llama3 Answers – LLMs Default Config

Query

What are the routing protocols configured?

Are there any LISP routes in the routing table?

ChatGPT 3.5

The routing protocols configured on the device are EIGRP (AS 123), LISP, and BGP (AS 65100).

Based on the provided outputs, there are no LISP routes listed in the routing table.

Llama3

1. EIGRP (Enhanced Interior Gateway Routing Protocol) with AS number 123.
2. LISP (Locator/Identifier Separation Protocol).
3. BGP (Border Gateway Protocol) with autonomous system number 65100.

Based on the `show ip route` output, I don't see any LISP-specific routes in the routing table. The routing table appears to be primarily populated with EIGRP and BGP routes, as well as some directly connected networks.

If you'd like to verify if there are any LISP-related routes present in the routing table, you can try running a command like `show ip lisp map-cache` or `show ip lisp forwarding-table`.

...

ChatGPT and Llama3 Answers – LLMs Default Config

Query

What is the next hop for the route to 0.0.0.0?

What are the CDP neighbors?

ChatGPT 3.5

The next hop for the route to 0.0.0.0 is 10.93.140.1.

The CDP neighbors are:

1. Device with the ID "LO-BN" with IP address 10.93.140.7, a Cisco C9300-24U platform on interface TenGigabitEthernet1/0/23, connected to GigabitEthernet1/0/23.
2. Device with the ID "PDX-M" with IP address 10.93.141.1, a Cisco WS-C3850-48U platform on interface GigabitEthernet0/0, connected to GigabitEthernet1/0/4.
3. Device with the ID "PDX-M" with IP address 10.93.141.33, a Cisco WS-C3850-48U platform on interface TenGigabitEthernet1/0/24, connected to GigabitEthernet1/0/24.

Llama3

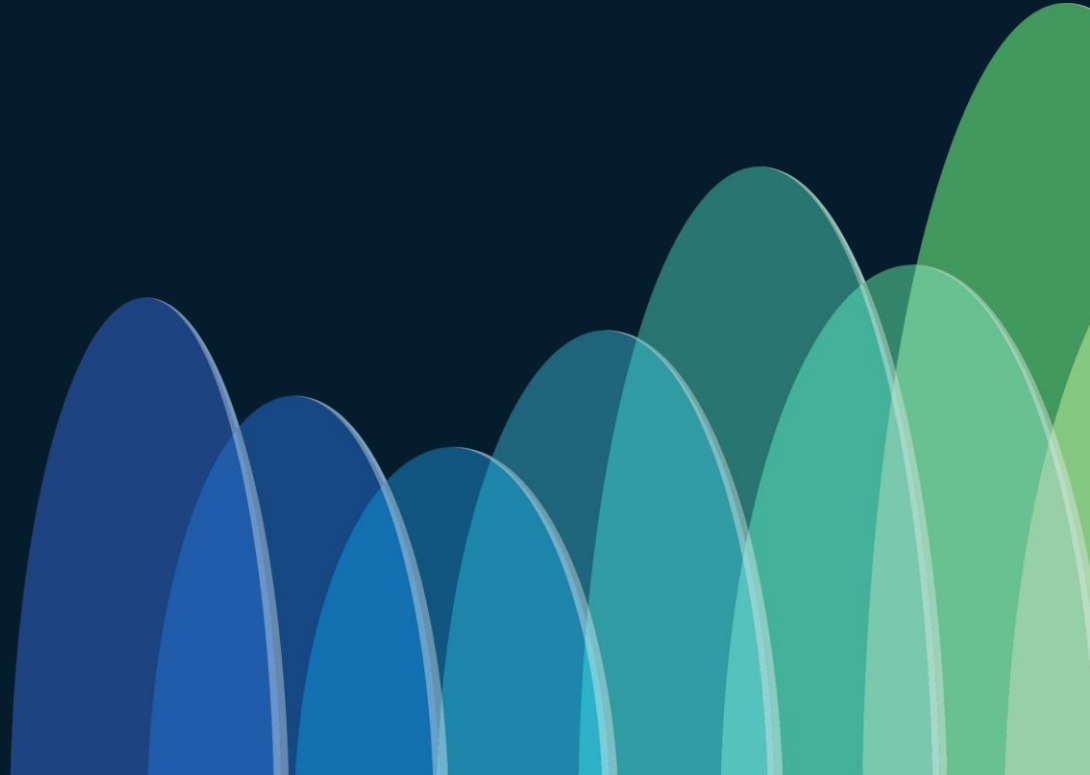
According to the output of `show ip route`, the next hop for the route to 0.0.0.0 is `10.93.140.1`.

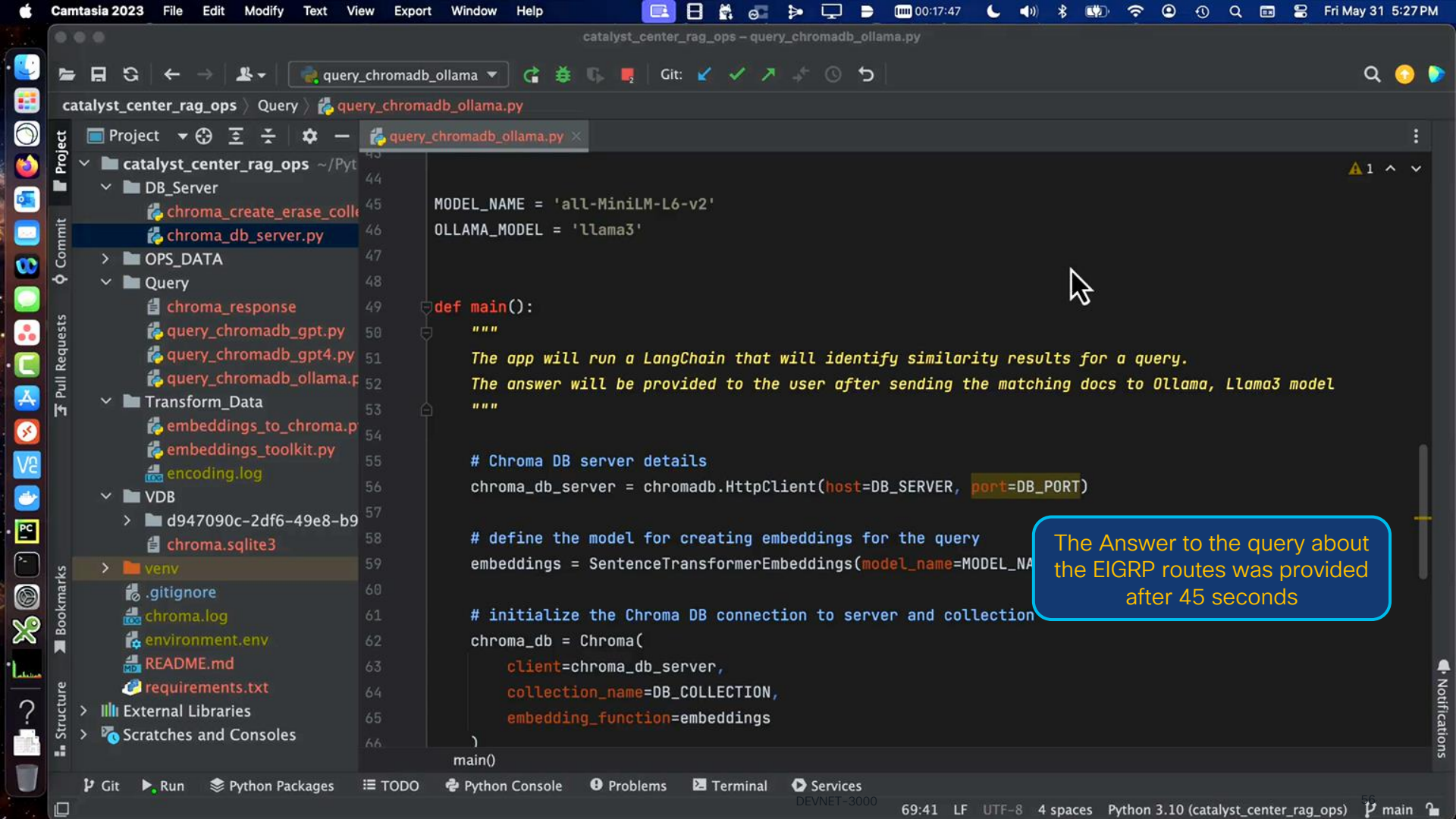
Based on the provided output, the CDP neighbors are:

1. Device ID: LO-BN
 - * Interface: Ten 1/0/23
 - * Platform: Cisco C9300-24U
 - * IP address: 10.93.140.7
2. Device ID: PDX-M (appears twice)
 - * Interface: Gig 0/0 and Ten 1/0/24
 - * Platform: Cisco WS-C3850-48U
 - * IP addresses: 10.93.141.1 and 10.93.141.33

Note that CDP neighbors are devices that have established a CDP (Cisco Discovery Protocol) adjacency with the device running the command, which is LO-CN in this case.

Demo Llama3





```
MODEL_NAME = 'all-MiniLM-L6-v2'
```

```
OLLAMA_MODEL = 'llama3'
```

```
def main():
```

```
    """
```

```
    The app will run a LangChain that will identify similarity results for a query.
```

```
    The answer will be provided to the user after sending the matching docs to Ollama, Llama3 model
```

```
    """
```

```
# Chroma DB server details
```

```
chroma_db_server = chromadb.HttpClient(host=DB_SERVER, port=DB_PORT)
```

```
# define the model for creating embeddings for the query
```

```
embeddings = SentenceTransformerEmbeddings(model_name=MODEL_NAME)
```

```
# initialize the Chroma DB connection to server and collection
```

```
chroma_db = Chroma(
```

```
    client=chroma_db_server,
```

```
    collection_name=DB_COLLECTION,
```

```
    embedding_function=embeddings
```

```
)
```

```
main()
```

The Answer to the query about
the EIGRP routes was provided
after 45 seconds

LLMs Language Support

How may I help you? *What are the routing protocols configured? Answer in Romanian*

Protocoloalele de rutare configurate sunt:

1. ****EIGRP**:**

- AS: 123
- ID Router: 10.93.141.20
- Active: Da

2. ****LISP**:**

- Maximum cale: 32

3. ****BGP**:**

- AS: 65100
- Route Reflector pentru familia de adrese VPNv4 Unicast, 1 client
- Vecin: 10.93.141.28

Ask question in English,
answer in another language,
(dataset is in English)

How may I help you? *Care sint rutele EIGRP?*

Rutele EIGRP sunt notate cu codul "D" în tabela de rutare. În urma ieșirii comenzii
`show ip route`, rutele EIGRP sunt următoarele:

- 10.93.131.0/30 [90/3328] via 10.93.140.1, 16:24:00, Vlan140
- 10.93.131.4/30 [90/3584] via 10.93.140.1, 16:23:53, Vlan140
- 10.93.131.8/29 [90/3840] via 10.93.140.1, 16:23:53, Vlan140
- 10.93.141.0/28 [90/3072] via 10.93.140.1, 1w3d, Vlan140
- 10.93.141.17/32 [90/130816] via 10.93.140.1, 1w3d, Vlan140
- 10.93.141.18/32 [90/130816] via 10.93.140.2, 1w3d, Vlan140
- 10.93.141.21/32 [90/130816] via 10.93.140.6, 1w3d, Vlan140
- 10.93.141.22/32 [90/131072] via 10.93.140.1, 1w3d, Vlan140
- 10.93.141.25/32 [90/131584] via 10.93.140.1, 16:23:53, Vlan140
- 10.93.141.26/32 [90/131840] via 10.93.140.1, 16:23:53, Vlan140
- 10.93.141.28/32 [90/130816] via 10.93.140.7, 1w3d, Vlan140
- 10.93.141.32/27 [90/3072] via 10.93.140.1, 1w3d, Vlan140
- 10.93.141.64/29 [90/3072] via 10.93.140.1, 1w3d, Vlan140

Ask question in another language,
answer in another language,
(dataset is in English)

LLMs Language Support

How may I help you? *What are the CDP neighbors? Answer in French*

Les voisins CDP sont:

1. L0-BN

- Interface locale: TenGigabitEthernet1/0/23
- Temps de maintien: 167 secondes
- Capacités: Routeur, Commutateur, IGMP
- Plate-forme: Cisco C9300-24U
- Port ID: GigabitEthernet1/0/23
- Adresse IP: 10.93.140.7

2. PDX-M

- Interface locale: GigabitEthernet0/0
- Temps de maintien: 143 secondes
- Capacités: Routeur, Commutateur, IGMP
- Plate-forme: Cisco WS-C3850-48U
- Port ID: GigabitEthernet1/0/4
- Adresse IP: 10.93.141.1

3. PDX-M

- Interface locale: TenGigabitEthernet1/0/24

How may I help you? *Was sind die EIGRP-Routen in der Routing-Tabelle?*

Die EIGRP-Routen in der Routing-Tabelle sind durch das Kennzeichen "D" (für dynamische EIGRP-Routen) gekennzeichnet. Die spezifischen EIGRP-Routen sind:

- 10.93.131.0/30 [90/3328] via 10.93.140.1, 16:24:00, Vlan140
- 10.93.131.4/30 [90/3584] via 10.93.140.1, 16:23:53, Vlan140
- 10.93.131.8/29 [90/3840] via 10.93.140.1, 16:23:53, Vlan140
- 10.93.141.0/28 [90/3072] via 10.93.140.1, 1w3d, Vlan140
- 10.93.141.17/32 [90/130816] via 10.93.140.1, 1w3d, Vlan140
- 10.93.141.18/32 [90/130816] via 10.93.140.2, 1w3d, Vlan140
- 10.93.141.21/32 [90/130816] via 10.93.140.6, 1w3d, Vlan140
- 10.93.141.22/32 [90/131072] via 10.93.140.1, 1w3d, Vlan140
- 10.93.141.25/32 [90/131584] via 10.93.140.1, 16:23:53, Vlan140
- 10.93.141.26/32 [90/131840] via 10.93.140.1, 16:23:53, Vlan140
- 10.93.141.28/32 [90/130816] via 10.93.140.7, 1w3d, Vlan140
- 10.93.141.32/27 [90/3072] via 10.93.140.1, 1w3d, Vlan140
- 10.93.141.64/29 [90/3072] via 10.93.140.1, 1w3d, Vlan140

LLMs Configuration Support – Maybe? Not Yet!

How may I help you? *Create a CLI template to enable BGP authentication for the configuration provided.*

Certainly! Below is a CLI template that enables BGP authentication using MD5 on the provided configuration. This template assumes you want to apply the authentication to all BGP neighbors.

```
```plaintext
router bgp 65100
 neighbor 10.93.141.28 password 7 <MD5_ENCRYPTED_PASSWORD>
```
```

Replace ``<MD5_ENCRYPTED_PASSWORD>`` with the actual MD5 encrypted password you intend to use. If neighbors or specific neighbors you wish to apply the authentication to, you can repeat the ``neighbor <IP_ADDRESS> password 7 <MD5_ENCRYPTED_PASSWORD>`` command for each neighbor.

Here is how the updated configuration would look integrating it with the provided configuration

```
```plaintext
!
router bgp 65100
 bgp router-id interface Loopback0
 bgp log-neighbor-changes
 bgp graceful-restart
 neighbor 10.93.141.28 remote-as 65100
 neighbor 10.93.141.28 update-source Loopback0
 neighbor 10.93.141.28 password 7 <MD5_ENCRYPTED_PASSWORD>
```
```

Question

Existing Device Config

```
!
router bgp 65100
  bgp router-id interface Loopback0
  bgp log-neighbor-changes
  bgp graceful-restart
  neighbor 10.93.141.28 remote-as 65100
  neighbor 10.93.141.28 update-source Loopback0
!
address-family vpnv4
  neighbor 10.93.141.28 activate
  neighbor 10.93.141.28 send-community both
  neighbor 10.93.141.28 weight 45000
  neighbor 10.93.141.28 route-reflector-client
  neighbor 10.93.141.28 route-map tag_local_eids out
exit-address-family
!
```

Source-Code

https://github.com/zapodeanu/catalyst_center_rag_ops

zapodeanu / catalyst_center_rag_ops

Type to search

Code Issues Pull requests Actions Projects Wiki Security Insights Settings

catalyst_center_rag_ops Private

Unwatch 1 Fork 0 Star 0

main 1 Branch 0 Tags

Go to file

Code

zapodeanu initial commit 0f623c5 · 1 minute ago 2 Commits

| | | |
|------------------|----------------|--------------|
| DB_Server | initial commit | 1 minute ago |
| Query | initial commit | 1 minute ago |
| Transform_Data | initial commit | 1 minute ago |
| .gitignore | initial commit | 1 minute ago |
| README.md | initial commit | 1 minute ago |
| requirements.txt | initial commit | 1 minute ago |

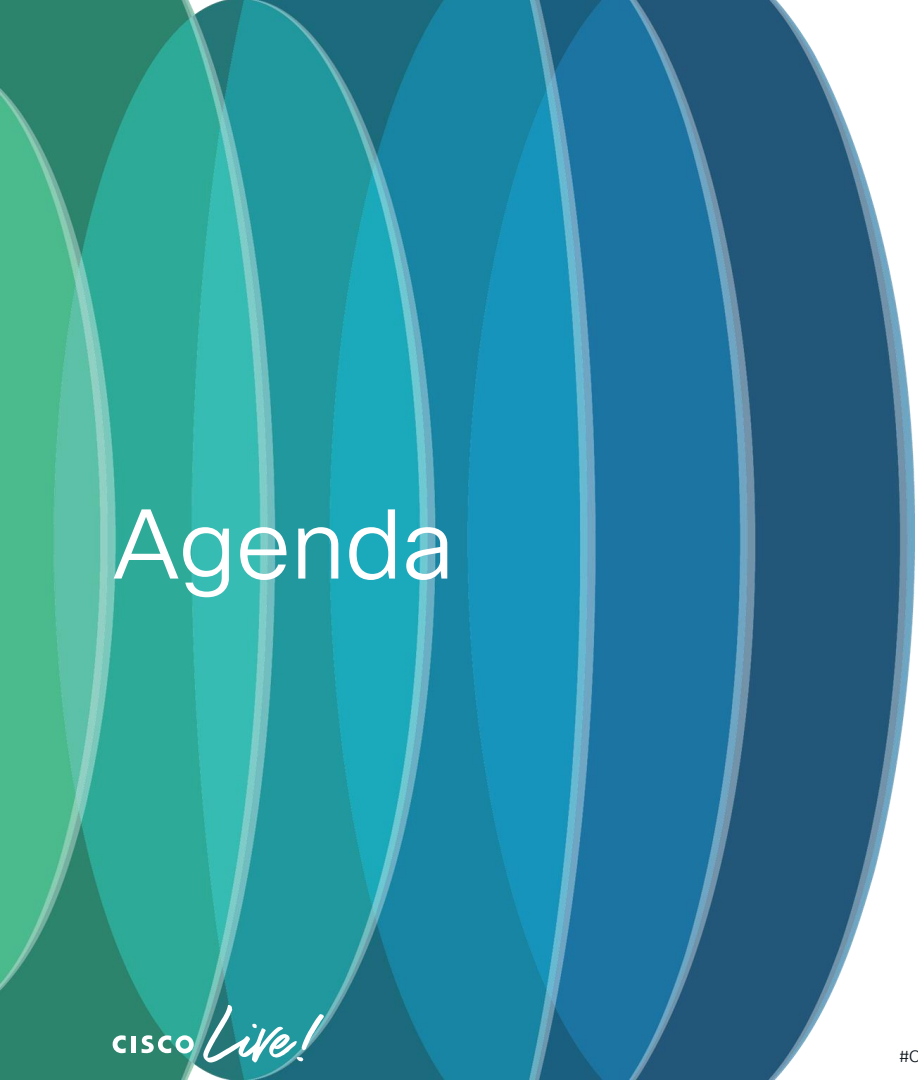
About

The repo hosts file for a RAG GenAI for Catalyst Center Ops Data

Readme Activity 0 stars 1 watching 0 forks

Releases

No releases published
[Create a new release](#)



Agenda

- Catalyst Center Platform Overview
- Integrations
- GenAI Essentials
- GenAI for Ops Bot
- Developers Resources
- Summary

Catalyst Center: API journey/progression



Cisco API
platform launch



Python SDK



Ansible
collection



Ansible
RedHat certified
Terraform provider
Jenkins open-
source



Ansible community
certification
Intent Ansible
modules introduced



Python SDK,
Ansible, Terraform
Support for
Catalyst Center
2.3.5.3



AI enabled use
cases
Support for
Catalyst Center
2.3.7.6

2018

2019

2020

2021

2022

2023

2024

API adoption



2 billion API calls per year, 45% customers



850+ APIs available (300+ new APIs in 2.3.7.6)



269 events and 65 reports

DevOps resources



Python SDK – 6,300 downloads/month



Ansible collection – 66,000
downloads



Terraform provider – 44,000 downloads

25 New Catalyst Center DevNet sandboxes

Catalyst Center API focus areas



Usability

Documentation

Ease of API use

Developer Resources



Completeness

Improve API coverage

Backward compatibility and
versioning

Better Prioritisation



Scale

Rate Limit

Concurrence

Bulk Operations



Conformance

Cisco Standards

API governance,
Open API

API Best Practices

Quality

New Cisco EN Splunk integration apps

The screenshot shows the Splunkbase interface for the 'Cisco Catalyst Add-on for Splunk' app. The header includes the Splunkbase logo, navigation links for 'Collections' and 'Apps', a search bar with the text 'Find an app', and buttons for 'Submit an App' and 'Log In'. The app title is 'Cisco Catalyst Add-on for Splunk' with the Cisco logo. Below the title is a description: 'Cisco Catalyst Add-on for Splunk collects data for different Cisco Products - **Cisco Identity Services Engine**, **Cisco Catalyst SD-WAN**, and **Cisco Catalyst Center**. The add-on parses the data from these sources and stores them into the Splunk indexes. * Author - Cisco Systems *...'. It is noted as 'Built by Cisco EN Programmability'. A 'Login to Download' button is visible. The bottom section shows 'Latest Version 1.0.0' (September 10, 2024), 'Compatibility' (Splunk Enterprise, Splunk Cloud, Platform Version: 9.3, 9.2, CIM Version: 5.X), and a 'Rating' of 0 stars (0 reviews).

- Integrate with ISE, Catalyst SD-WAN and Catalyst Center
- Two apps – Visualisations and Add-on for data collection
- Apps released September 10, 2024
- Splunk Enterprise + Cloud certified

The screenshot shows the Splunkbase interface for the 'Cisco Enterprise Networking for Splunk Platform' app. The header is identical to the previous screenshot. The app title is 'Cisco Enterprise Networking for Splunk Platform' with the Cisco logo. The description states: 'The **Cisco Enterprise Networking for Splunk Platform** presents visualizations in dashboards for different Cisco Products - **Cisco Identity Services Engine**, **Cisco Catalyst SD-WAN**, and **Cisco Catalyst Center**. The App uses the data collected by "Cisco Catalyst Add-on for...'. It is noted as 'Built by Cisco EN Programmability'. A 'Login to Download' button is visible. The bottom section shows 'Latest Version 1.0.0' (September 10, 2024), 'Compatibility' (Splunk Enterprise, Splunk Cloud, Platform Version: 9.3, 9.2, CIM Version: 5.X), a 'Rating' of 0 stars (0 reviews), 'Support' (Developer Supported App), and 'Ranking' (#6 in Network Access Control, #26 in Firewall).

Catalyst Center Python SDK

- Covers all Cisco Catalyst Center REST APIs
- Support for Cisco Catalyst Center version 2.3.7.6
- First SDK version August 2019
- Average downloads/month 6,000+ (last 30 days 12,000+)

🏠 / dnacentersdk

dnacentersdk

Simple, lightweight, scalable Python API wrapper for the DNA Center APIs

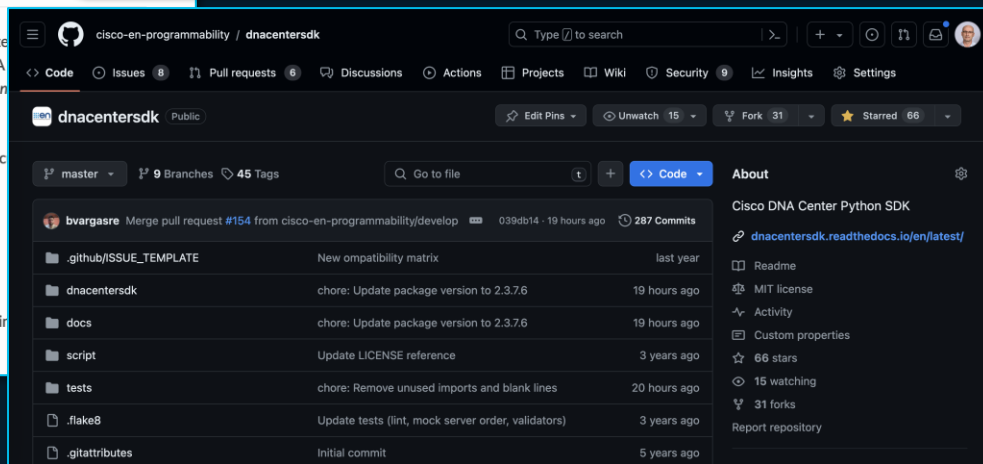
Welcome to the docs! dnacentersdk is a *community developed* Pythonic wrapping of the DNA Center versions: 2.2.2.3, 2.2.3.3, 2.3.3.0, 2.3.5.3 and 2.3.7.6). The package represents all of the Cisco DNA interactions via native Python tools. Making working with the Cisco DNA Center APIs in Python a n experience.

dnacentersdk helps you get things done faster. We take care of the API semantics, and you can focus on your code.

With dnacentersdk, you can easily:

- Interact with the DNA Center APIs in an interactive Python session
- Quickly create code that enables you get something done in DNA Center
- Leverage the API wrapper to cleanly add DNA Center functionality to your project without having boilerplate code for working with the DNA Center APIs

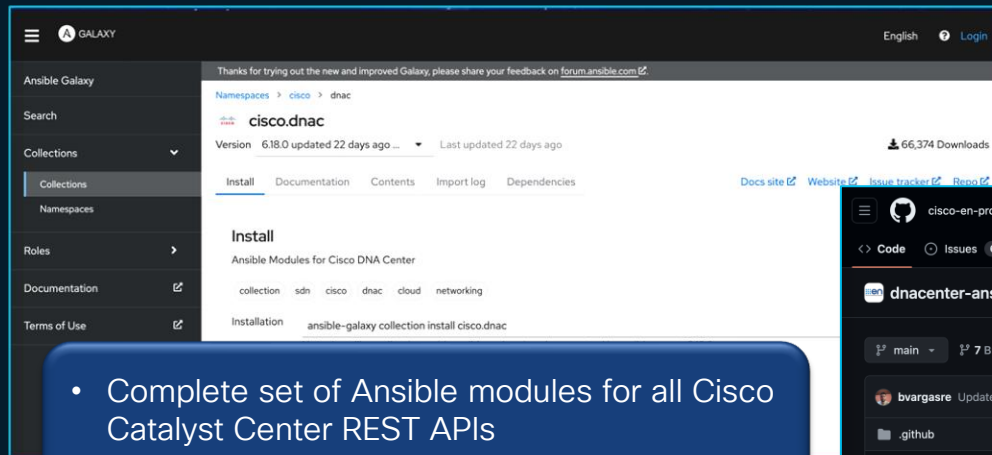
<https://dnacentersdk.readthedocs.io>



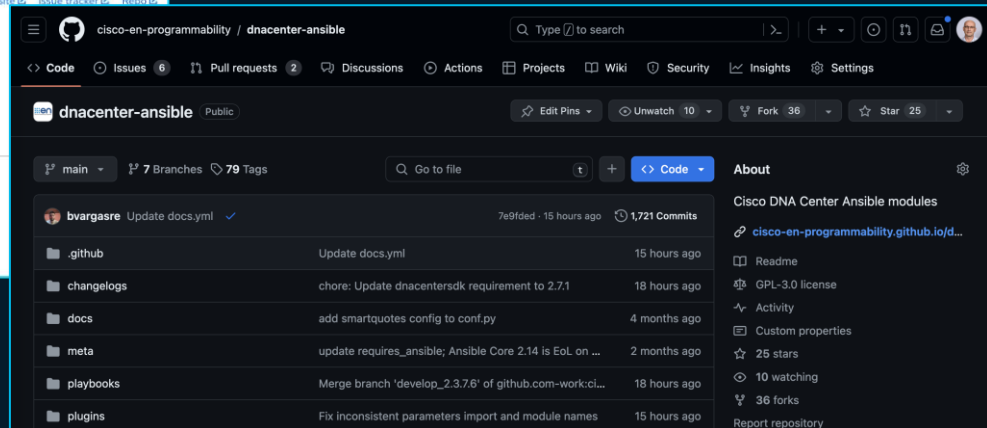
<https://github.com/cisco-en-programmability/dnacentersdk>

Cisco Catalyst Center Ansible Modules

<https://galaxy.ansible.com/ui/repo/published/cisco/dnac>



- Complete set of Ansible modules for all Cisco Catalyst Center REST APIs
- First library version Dec 2020
- Certified by RedHat v 2.9 – 04/2021
- Community certified – 05/2022
- Support for Cisco Catalyst Center version 2.3.7.6
- 66,300+ downloads
- 33% increase in last 3 Months



<https://github.com/cisco-en-programmability/dnacentre-ansible>

Cisco Developed, TAC/Engineering Supported

cisco.dnac
Version 6.18.0 updated 22 days ago ... Last updated 22 days ago 66,374 Downloads

Install Documentation Contents Import log Dependencies Docs site Website Issue tracker Repo

Q workflow x

Documentation (0) ▾

Modules (21) ▾

- accesspoint_workflow_mana...
- device_configs_backup_wor...
- device_credential_workflow...
- discovery_workflow_manager
- events_and_notifications_wo...
- fabric_sites_zones_workflow...
- inventory_workflow_manager
- ise_radius_integration_workf...
- network_compliance_workfl...

Ansible Collection - cisco.dnac

Ansible Modules for DNA Center

The dnacenter-ansible project provides an Ansible collection for managing and automating your Cisco DNA Center environment. It consists of a set of modules and roles for performing tasks related to DNA Center.

This collection has been tested and supports Cisco DNA Center 2.3.7.6.

Note: This collection is not compatible with versions of Ansible before v2.8.

Other versions of this collection have support for previous Cisco DNA Center versions. The recommen below on the [Compatibility matrix](#).

Compatibility matrix

The following table shows the supported versions.

| Cisco DNA Center version | Ansible "cisco.dnac" version | Python "dnacentersdk" version |
|--------------------------|------------------------------|-------------------------------|
| 2.2.2.3 | 3.3.1 | 2.3.3 |
| 2.2.3.3 | 6.4.0 | 2.4.11 |
| 2.3.3.0 | 6.6.4 | 2.5.5 |

- Support starting with Cisco Catalyst Center version 2.3.7.6
- Identified with the module name including "workflow_manager"
- Ansible playbooks for common operations for sites, PnP, SWIM, compliance, templates, network settings, ...

Terraform Provider and Go SDK

<https://registry.terraform.io/providers/cisco-en-programmability/dnacenter>

The screenshot shows the Terraform Registry page for the **dnacenter** provider. The page is titled "dnacenter" and includes a "USE PROVIDER" button. The left sidebar lists various resources under the "dnacenter provider" section. The main content area is titled "dnacenter Provider" and contains a description: "The Cisco DNA Center provider is used to interact with Cisco DNA Center APIs (2.3.5.3). The provider needs to be configured with the proper credentials before it can be used." Below this, there is an "Example Usage" section with a code block showing the configuration for the provider.

dnacenter Provider

The Cisco DNA Center provider is used to interact with Cisco DNA Center APIs (2.3.5.3). The provider needs to be configured with the proper credentials before it can be used.

Use the navigation to the left to read about the available resources.

Example Usage

```
# Configure provider with your Cisco DNA Center SDK credentials
provider "dnacenter" {
  # Cisco DNA Center user name
  username = "admin"
  # it can be set using the environment variable DNAC_BASE_URL
}
```

- Extended coverage of Cisco Catalyst Center REST APIs
- Support for Catalyst Center version 2.3.7.6
- Released January 2021
- 44,000+ downloads

The screenshot shows the GitHub repository for the **terraform-provider-dnacenter** project. The repository is public and has 11 branches and 65 tags. The main branch is selected. The repository includes a README, a MIT license, and a Code of conduct. The repository is managed by **fmunozmiranda** and has 496 commits. The repository is linked to the Terraform Registry at <https://registry.terraform.io/providers/cisco-en-programmability/dnacenter>. The repository has 13 stars, 9 watchers, and 10 forks. The repository is reported as a repository. The repository has 61 releases, with the latest release being **v1.1.31-beta** on Dec 7, 2023. There are + 60 releases in total.

terraform-provider-dnacenter Public

11 Branches 65 Tags

Go to file Add file Code

fmunozmiranda Merge pull request #199 from cisco-en-programmability/... cca4be · last month 496 Commits

| File | Commit | Time |
|-----------------|--|-------------|
| .github | Merge pull request #199 from cisco-en-programmability/... | last month |
| dnacenter | dnacenter_wireless_rf_profile does not properly read or s... | last month |
| docs | dnacenter_wireless_rf_profile does not properly read or s... | last month |
| examples | Nwe version 1.1.31-beta | last month |
| scripts | first commit | 4 years ago |
| tools | Update to use DNACenter 2.2.3.3 | 2 years ago |
| .gitignore | BINARYS AND MAKE FILE | 2 years ago |
| .goreleaser.yml | Add Github actions files | 3 years ago |
| CHANGELOG.md | ## 1.1.31-beta (December 07, 2023) | last month |
| LICENSE | Update to use DNACenter 2.2.3.3 | 2 years ago |

About

registry.terraform.io/providers/cisco-e...

Readme MIT license Code of conduct Activity Custom properties 13 stars 9 watching 10 forks Report repository

Releases 61

v1.1.31-beta Latest on Dec 7, 2023 + 60 releases

<https://github.com/cisco-en-programmability/terraform-provider-dnacenter>

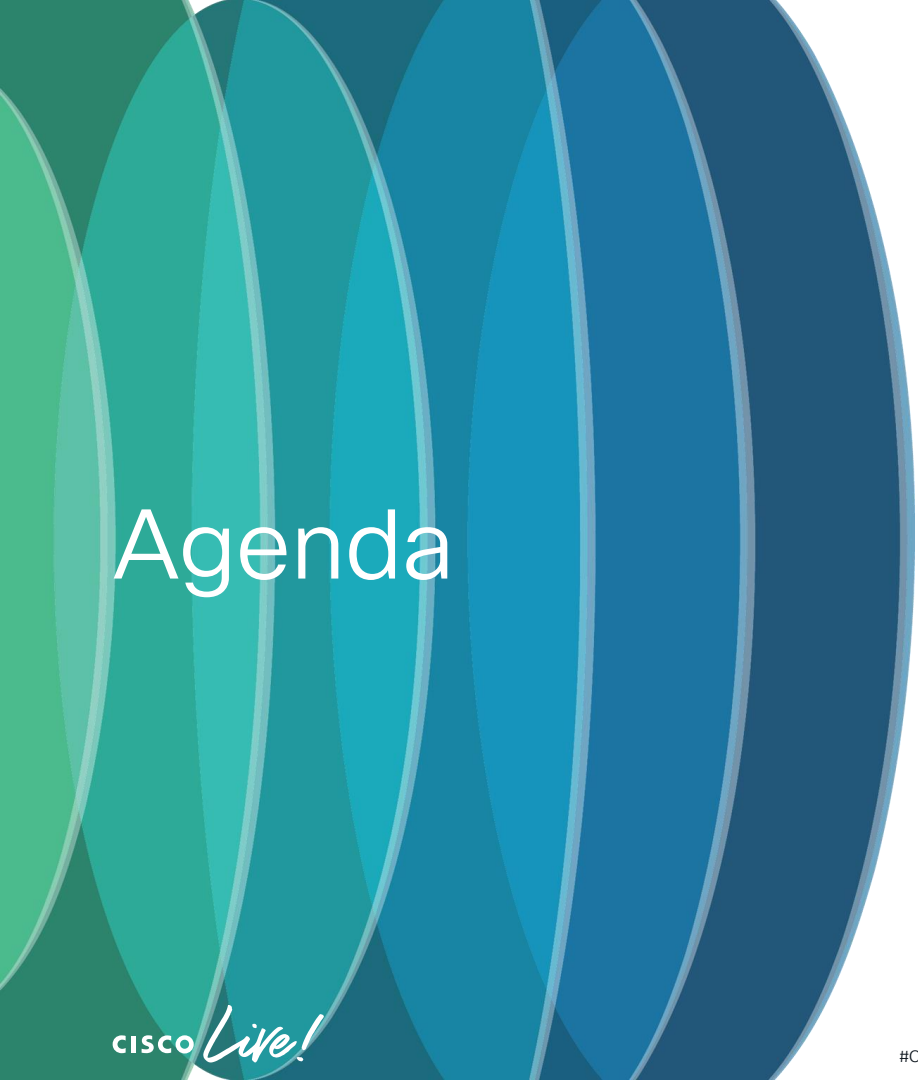
Cisco EN Programmability GitHub Org

The screenshot shows the GitHub organization page for 'cisco-en-programmability'. The header includes navigation links: Overview, Repositories (41), Projects, Packages, Teams (1), People (6), and Settings. The organization profile features the Cisco EN logo and the name 'Cisco EN Programmability'. Below the profile, a 'Pinned' section displays six repositories:

- dnacentersdk** (Public): Cisco DNA Center Python SDK. 62 stars, 29 forks.
- dnacenter-ansible** (Public): Cisco DNA Center Ansible modules. 22 stars, 24 forks.
- terraform-provider-dnacenter** (Public): Cisco DNA Center Terraform Provider. 13 stars, 11 forks.
- splunk-apps** (Public): Splunk Add-On App for Cisco DNA Center. 2 stars, 2 forks.
- dnacenter_day_n** (Public): Applications that will automate Day N operations using Cisco DNA Center APIs and these libraries: Cisco DNA Center Python SDK, Cisco DNA Center Ansible Collection, Cisco DNA Center Terraform Provider.
- dnacenter_webhook_receiver** (Public): Sample code for a Cisco DNA Center Webhook Receiver.

- DevOps Catalyst Center use cases
- Python SDK (support 2.3.7.6)
- Ansible modules (support 2.3.7.6)
- Go SDK and Terraform provider (support 2.3.5.x, pending support 2.3.7.6)
- Splunk Integration Apps
- GenAI use case
- SDA-as-Code
- Report Operations
- Day N use cases – Python SDK, Ansible, Terraform
- Jenkins open-source Integration and pipelines
- GitHub/GitLab open-source Integrations
- Compliance Use Cases
- Custom Integration App (Jira Service Desk)
- Webhook Receiver
- Other sample code

<https://github.com/cisco-en-programmability>

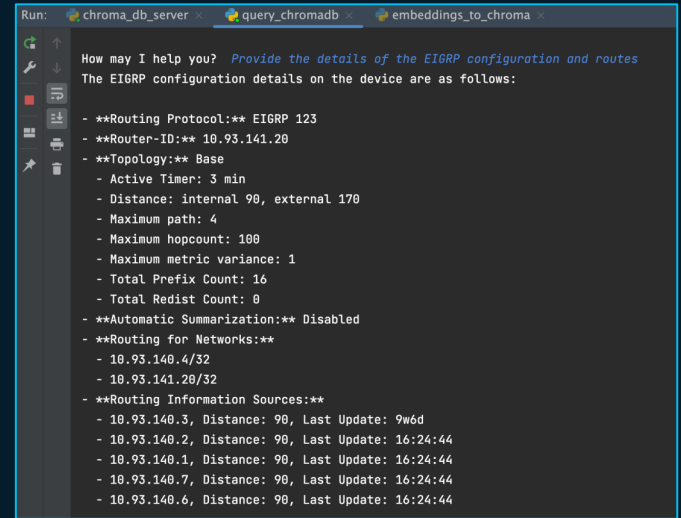


Agenda

- Catalyst Center Platform Overview
- Integrations
- GenAI Essentials
- GenAI for Ops Bot
- Developers Resources
- Summary

Summary

- Support innovative use cases with data provided by Catalyst Center REST APIs or device APIs
- Massive scale for large data sets
- Training the existing models and add metadata, organise datasets, to reduce AI hallucination



The screenshot shows a terminal window with three tabs: 'chroma_db_server', 'query_chromadb', and 'embeddings_to_chroma'. The active tab is 'query_chromadb'. The terminal displays a prompt 'How may I help you?' followed by a user input 'Provide the details of the EIGRP configuration and routes'. The output shows the EIGRP configuration details on the device as follows:

```
How may I help you? Provide the details of the EIGRP configuration and routes
The EIGRP configuration details on the device are as follows:

- **Routing Protocol:** EIGRP 123
- **Router-ID:** 10.93.141.20
- **Topology:** Base
  - Active Timer: 3 min
  - Distance: internal 90, external 170
  - Maximum path: 4
  - Maximum hopcount: 100
  - Maximum metric variance: 1
  - Total Prefix Count: 16
  - Total Redist Count: 0
- **Automatic Summarization:** Disabled
- **Routing for Networks:**
  - 10.93.140.4/32
  - 10.93.141.20/32
- **Routing Information Sources:**
  - 10.93.140.3, Distance: 90, Last Update: 9w6d
  - 10.93.140.2, Distance: 90, Last Update: 16:24:44
  - 10.93.140.1, Distance: 90, Last Update: 16:24:44
  - 10.93.140.7, Distance: 90, Last Update: 16:24:44
  - 10.93.140.6, Distance: 90, Last Update: 16:24:44
```

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