Google Developer Groups
Jaipur

Serverless Magic: Bringing AI Agents to Life with MCP and Cloud Run

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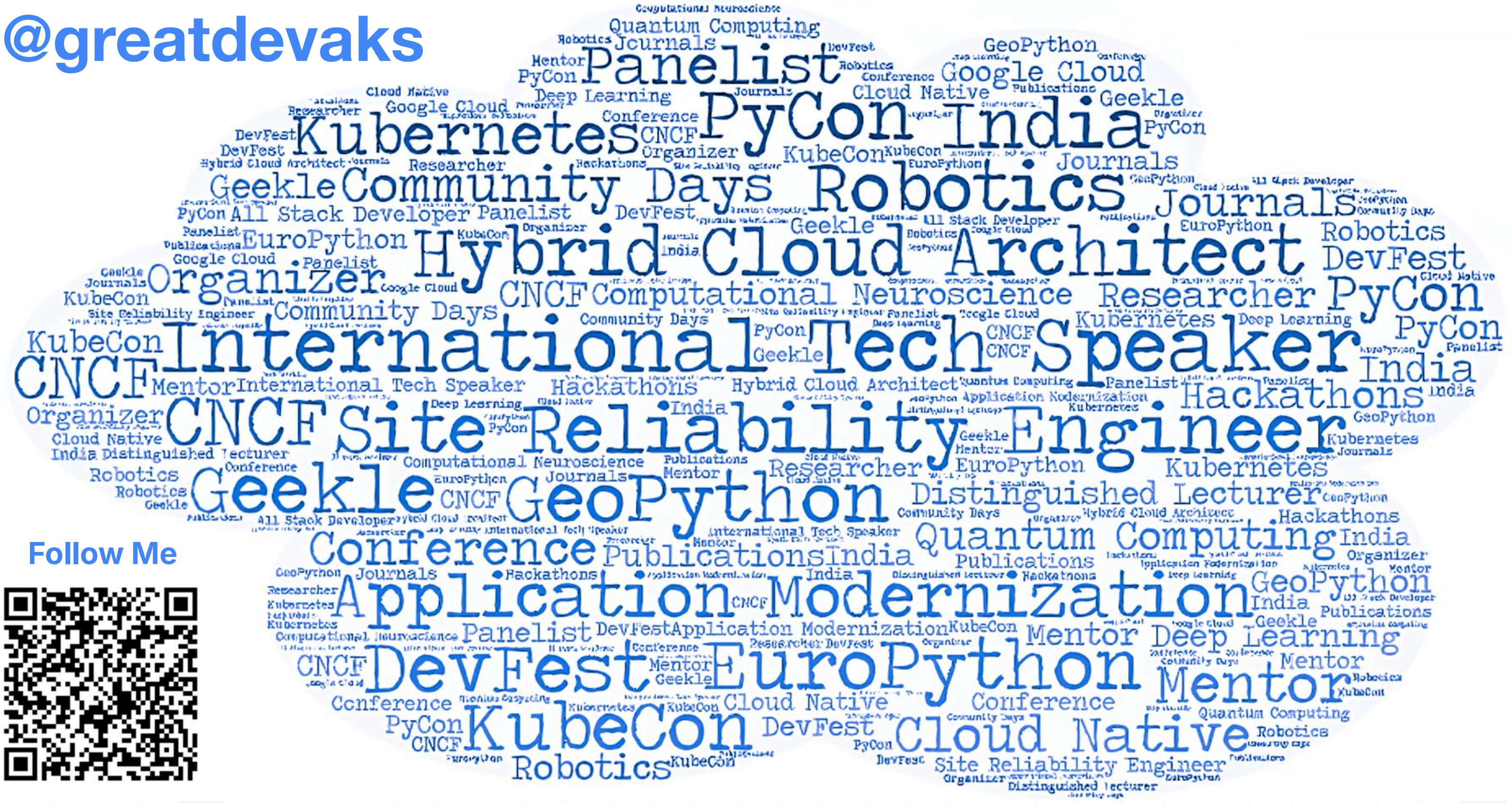
cloud community days 2025

@greatdevaks



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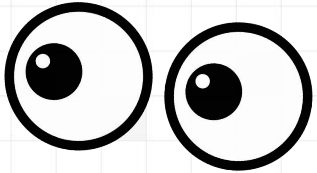


Agenda

1 Drawing Parallels

2 MCP Architecture

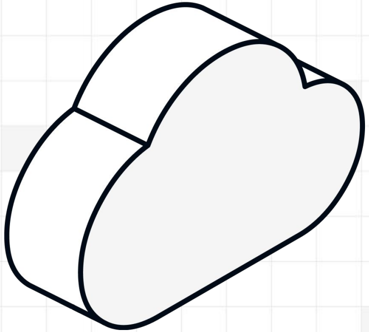
3 Key Terminologies and Processes

4 Hands-On

5 Conclusion and Key Takeaways

Chapter One

Drawing Parallels



The Startup Founder: An Analogy

Hi XYZ, I got to know you run a startup…what all resources does one need to run a startup?

A startup generally needs services for HR, Tech., Legal, Finance, Marketing, and Operations.

The Startup Founder: An Analogy

**Oh, great…
How do you connect with all these different service providers?**

Actually, each service provider has a different on-boarding process…it is a very tedious job.

The Startup Founder: An Analogy

Hmm…
Is just on-boarding a
service provider enough?

No! On-boarding a service
provider is of no use unless
one is able to continuously
coordinate with them.

The Startup Founder: An Analogy

**I understand…
How do you get visibility into status of each service provider?**

**Well, there is no real visibility as of now.
My team has other priority tasks to fulfill.**

The Startup Founder: An Analogy

I wonder if you were to get a centralized dashboard for on-boarding and operating the service providers…

**Wow! That would be one of the most useful things.
I will talk with my colleagues about this.**

The Startup Founder: An Analogy

Since you are taking interest, just having a dashboard is not enough… No compromise on security.

I almost totally forgot about this important aspect. Access controls and data handling are important.

The Startup Founder: An Analogy

Imagine you got this central platform, will that be all?

We will aim to design the platform as a unified facade with integrations and flexibility in mind :)

The Startup Founder: An Analogy

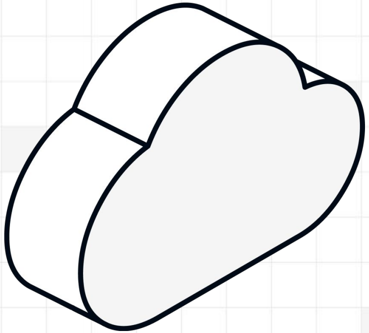
Startup Founder Scenario	LLM Scenario	Terminology / Area
Services needed to run a startup: HR, Tech., Legal, Finance, Marketing, Operations, etc.	Resources needed to run effectively: Data Schemas, Data Records, Files, APIs, additional context, etc.	Resources and Tools [Provided by MCP Servers]
Contracts with Service Providers	Integrations with data sources and tools	Custom Integrations [Pre-MCP Scenario]
Service Provider Integration Standardization	API Contract and Data Schema Standardization	Developer Overhead [Pre-MCP Scenario]
Service Provider Communication	Message Exchange between components	Protocols and Transports [MCP Architecture]
Centralized Dashboard	Universal Adapter	Protocols and Architecture

The Startup Founder: An Analogy

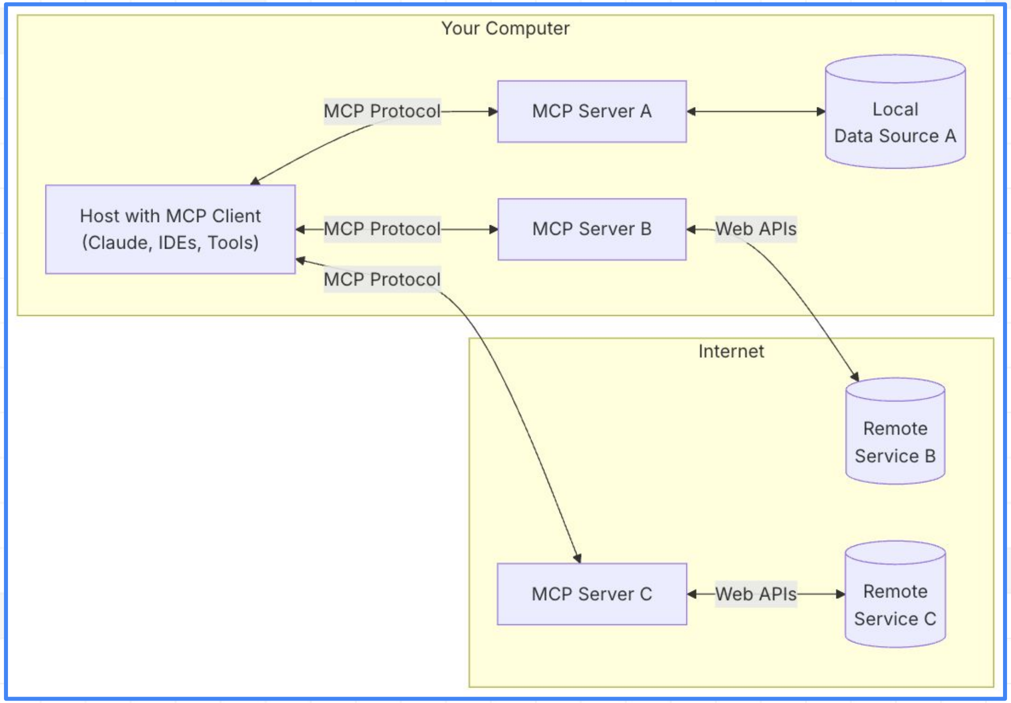
Startup Founder Scenario	LLM Scenario	Terminology / Area
Top-Down / Bottom-Up Communication	Unidirectional / Bidirectional Message Streams	Messages (Bidirectional) Notifications (Unidirectional)
Requirements for services by Startup	Need for accessing resources, tools, context, etc.	MCP Server capabilities
Requirements from Service Providers	Need for getting user inputs or non-sensitive privileged data	MCP Client capabilities
Need for Strategic Guidance from Founder	LLM requiring additional context without burdening the MCP Server	Sampling

Chapter Two

MCP Architecture



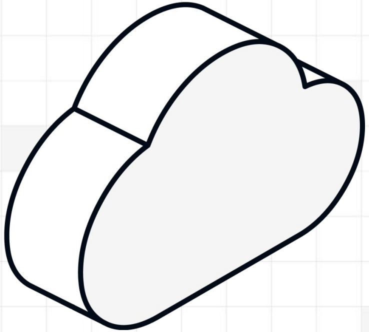
The Client-Server Architecture



Source: Official Documentation for MCP

Chapter Three

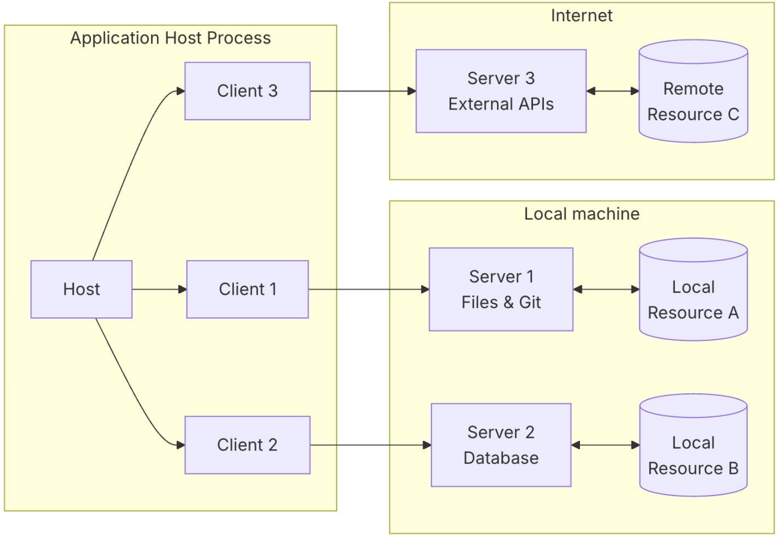
Key Terminologies and Processes



Key Terminologies and Processes

Component	Feature
MCP Server	Prompts
	Resources
	Tools
MCP Client	Roots
	Sampling
	Elicitation

JSON-RPC 2.0 (Protocol)



Source: Official Documentation for MCP

Resources, Prompts, and Tools

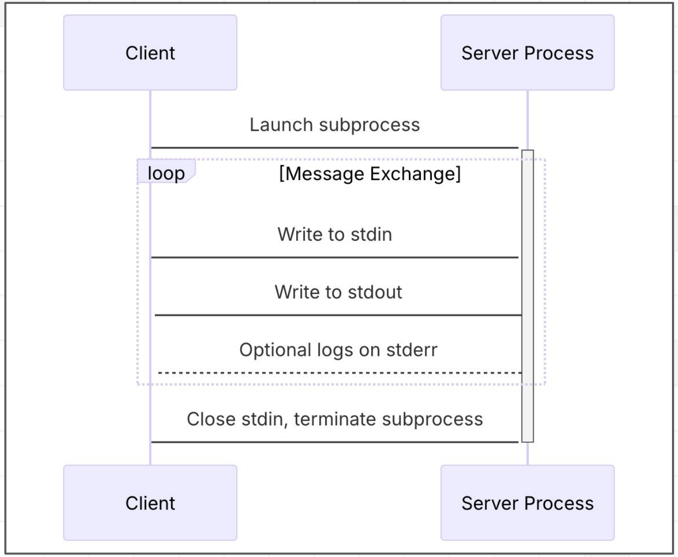
Concept	Definition
Resources	Read-only information; data, context, API response, files, etc. **Application-Controlled**
Prompts	Instructions given to an LLM; better to templatize and leverage **User-Controlled**
Tools	An executable function or service that performs some action - like calculator, code generator, etc. **Model-Controlled**

Roots, Sampling, and Elicitation

Concept	Definition
Roots	Helps define boundaries or scope that MCP Servers should respect; hard enforcement is not guaranteed
Sampling	Allows MCP Servers to request LLM-assisted completions from MCP Clients MCP Servers shouldn’t store LLM Keys/Credentials; MCP Clients can
Elicitation	Enables interactive, user-in-the-loop flows MCP Servers can request additional inputs from users

Transports

Transport	Use-Case
Stdio (Standard Input / Output)	Local CLI Tools Testing Embedding
Server-Sent Events (SSE) [Deprecated - Standalone]	Real-Time Streaming over HTTP (legacy MCP)
Streamable HTTP [With Optional SSE; JSON responses by default]	Modern default for remote servers, large payloads, or streaming use-cases
Custom	Special requirements - WebSockets, gRPC, etc.



Source: Official Documentation for MCP

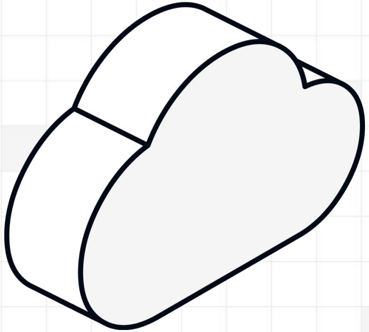
Chapter Four

Hands-On

tinyurl.com/ccdj-2025

Chapter Five

Conclusion and Key Takeaways



Noteworthy Points

1. MCP Unlocks Module LLM Agent Workflows

2. Hybrid Orchestration (Local + Remote) is powerful and easy

3. Use Sampling for LLM-in-the-loop kind of tools; track cost, and use token limits and stop seq.

4. Use Elicitation for exercising user-in-the-loop pattern

5. Opt for Serverless for scale; both MCP Clients and MCP Servers can run on Serverless

6. Serverless pattern can turn out to be cost efficient

7. Leverage MCP Inspector for quick debugging

8. Security, sanitization, and governance are critical; don't forget enforcing them

9. Access Controls, Pagination, Auth*, and Rate Limiting patterns should be exercised

10. MCP on Embedded / IOT Devices and Shared Web Hosting (cPanel) is a BIG NO (as of today)

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Jaipur

👋 Thanks Everyone !

#Agents #LLM #MCP
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