

## **AWS ARCHITECTURE DESIGN, IMPLEMENTATION STEPS & SCREENSHOTS**

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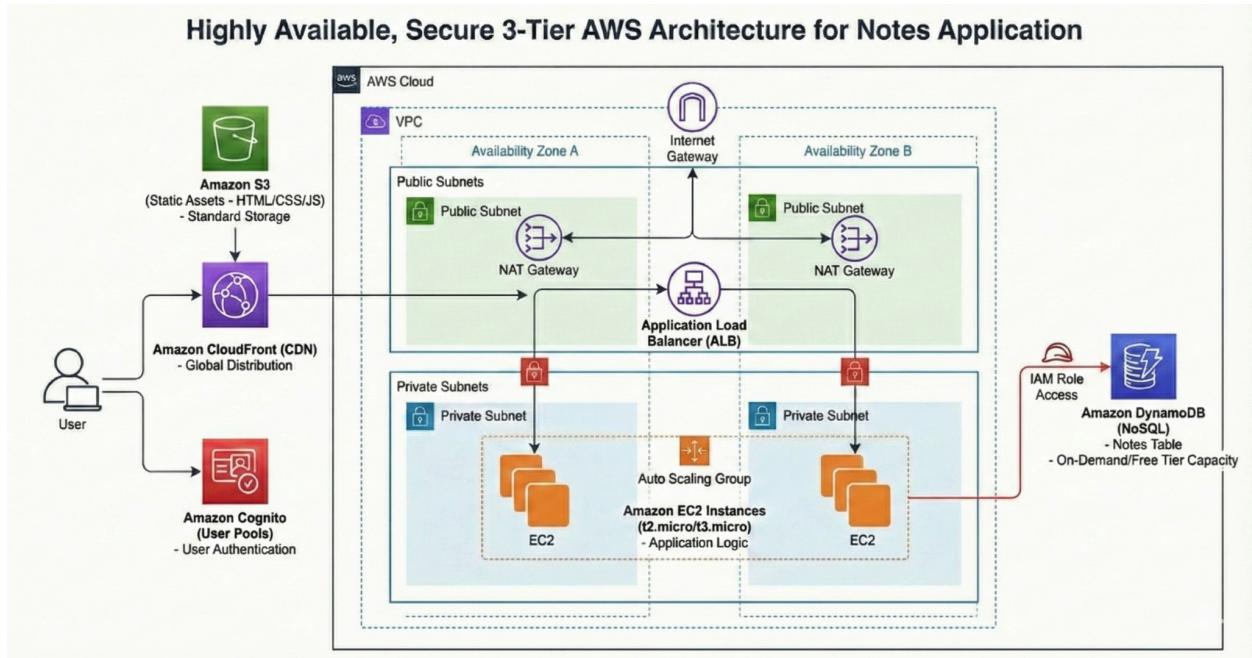
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## Architecture Design

Our project's architecture is built on a secure, three-tier cloud-native design hosted on AWS, designed to bridge the gap between static documents and intelligent AI editing. At the entry point, an Application Load Balancer (ALB) acts as a Layer-7 gateway, routing external traffic through secure listeners on Port 80 for the frontend and Port 8081 for the backend. The core logic resides on an Amazon EC2 instance, where PM2 manages two isolated processes: a lightweight HTML/CSS/Javascript presentation layer and a Node.js/Express controller. This backend serves as the "central nervous system," authenticating users via JWT and securely calling the Groq LPU™ Cloud through the Groq SDK to process semantic text modifications. By decoupling the AI inference from the document interface, the architecture ensures that document updates occur in-place and in real-time without compromising server stability or user data security.



# AI Driven Notes Application

## AWS Account Setup

The screenshot shows the AWS VPC dashboard. On the left, there's a sidebar with sections for Virtual private cloud (Your VPCs, Subnets, Route tables, Internet gateways, Egress-only internet gateways, Carrier gateways, DHCP option sets, Elastic IPs, Managed prefix lists, NAT gateways, Peering connections, Route servers) and Security. The main area displays 'Resources by Region' for N. Virginia, including VPCs (1), Subnets (7), Route Tables (1), Internet Gateways (1), and Egress-only Internet Gateways (0). It also shows Endpoint Services (0), NAT Gateways (0), VPC Peering Connections (0), Network ACLs (1), and Security Groups (3). On the right, there are boxes for Service Health, Settings (Block Public Access, Zones, Console Experiments), Additional Information (VPC Documentation, All VPC Resources, Forums, Report an Issue), and AWS Network Manager.

## IAM Roles

The screenshot shows the AWS IAM Roles page. The left sidebar includes Identity and Access Management (IAM) (Dashboard, Access management (User groups, Users, Roles, Policies, Identity providers, Account settings, Root access management, Temporary delegation requests), Access reports (Access Analyzer, Resource analysis, Unused access, Analyzer settings, Credential report, Organization activity, Service control policies, Resource control policies), and IAM Identity Center. The main area lists 'Roles (22)' with a search bar and a table. The table columns are Role name, Trusted entities, and Last activity. The roles listed include AWS ServiceRoleForOrganizations, AWSServiceRoleForSupport, AWSServiceRoleForTrustedAdvisor, c184191a47750351133594851w259017-LabEksClusterRole-R57Wm84QdUZ, c184191a47750351133594851w259017703-LabEksNodeRole-fQnTnQ8J0L0c, c184191a47750351133594851w259017703-LambdaSLRRole-oXMOjEjBRBtz, EMR\_AutoScaling\_DefaultRole, EMR\_DefaultRole, EMR\_EC2\_DefaultRole, EMR\_Notebooks\_DefaultRole, LabRole, myRedshiftRole, RedshiftRole, RoleForLambdaModLabRole, vocareum, and vocareum-eventbridge. The last role, vocareum, has an account ID of 894756119551 and 1 more role.

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## IAM Policies

The screenshot shows the AWS IAM Policies page. The left sidebar includes links for Dashboard, Access management, Policies, Access reports, IAM Identity Center, CloudShell, and Feedback. The main content area displays a table titled "Policies (1446) Info" with a search bar and filter options. The table columns are Policy name, Type, Used as, and Description. The table lists numerous AWS managed policies, such as AccessAnalyzerServiceRolePolicy, AccountManagementFromVercel, AdministratorAccess, and various AI Ops policies like AIOpsAssistantPolicy and AIOpsConsoleAdminPolicy.

## VPC

The screenshot shows the AWS VPC Your VPCs page. The left sidebar includes links for VPC dashboard, Virtual private cloud, Security, PrivateLink and Lattice, and a link to https://us-east-1.console.aws.amazon.com/vpcconsole/home?region=us-east-1#vpcs. The main content area displays a table titled "Your VPCs (1) Info" with a search bar and filter options. The table columns are Name, VPC ID, State, Encryption controls, Encryption control ..., Block Public..., IPv4 CIDR, IPv6 CIDR, and DHCP option set. The table shows one VPC entry: "vpc-0917bd438b004272d" with "Available" state and "Off" for Block Public. The table also shows IPv4 CIDR as 172.31.0.0/16 and DHCP option set as dopt-035fea2f1.

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## Subnets

The screenshot shows the AWS VPC Subnets page. The left sidebar includes sections for VPC dashboard, Virtual private cloud (Your VPCs, Subnets, Route tables, Internet gateways, Egress-only internet gateways, Carrier gateways, DHCP option sets, Elastic IPs, Managed prefix lists, NAT gateways, Peering connections, Route servers), Security (Network ACLs, Security groups), PrivateLink and Lattice (Getting started, Endpoints, Endpoint services, Service networks, Lattice services), and CloudShell/Feedback.

The main content area displays a table titled "Subnets (7) Info" with the following columns: Name, Subnet ID, State, VPC, Block Public..., IPv4 CIDR, IPv6 CIDR, and IPv6 CIDR association ID. The table lists 7 subnets, all in an "Available" state:

Name	Subnet ID	State	VPC	Block Public...	IPv4 CIDR	IPv6 CIDR	IPv6 CIDR association ID
-	subnet-0f54334e8c1e03ac	Available	vpc-0917bd438b004272d	Off	172.31.48.0/20	-	-
-	subnet-005a0b1a85fb4cd75	Available	vpc-0917bd438b004272d	Off	172.31.32.0/20	-	-
Public-Subnet-1	subnet-065ba17a1137526b2	Available	vpc-0917bd438b004272d	Off	172.31.128.0/20	-	-
-	subnet-0605c1f4594a519a	Available	vpc-0917bd438b004272d	Off	172.31.0.0/20	-	-
-	subnet-0e87ec9f6f204ebef	Available	vpc-0917bd438b004272d	Off	172.31.16.0/20	-	-
-	subnet-099d1ef4c410d29a0	Available	vpc-0917bd438b004272d	Off	172.31.64.0/20	-	-
-	subnet-022dd72e659d56262	Available	vpc-0917bd438b004272d	Off	172.31.80.0/20	-	-

Actions buttons include "Actions", "Create subnet", and a refresh icon. A message at the top right says "Last updated 1 minute ago".

## Security Groups

The screenshot shows the AWS Security Groups page. The left sidebar includes sections for Virtual private cloud (Your VPCs, Subnets, Route tables, Internet gateways, Egress-only internet gateways, Carrier gateways, DHCP option sets, Elastic IPs, Managed prefix lists, NAT gateways, Peering connections, Route servers), Security (Network ACLs, Security groups), PrivateLink and Lattice (Getting started, Endpoints, Endpoint services, Service networks, Lattice services, Resource configurations, Resource gateways, Target groups, Domain verifications), and CloudShell/Feedback.

The main content area displays a table titled "Security Groups (3) Info" with the following columns: Name, Security group ID, Security group name, VPC ID, Description, Owner, and Inbound. The table lists 3 security groups:

Name	Security group ID	Security group name	VPC ID	Description	Owner	Inbound
-	sg-026dc0266809fbcc	Notes-App-SG	vpc-0917bd438b004272d	For Notes App	259017703796	6 Per
-	sg-07e745335e257fd4	default	vpc-0917bd438b004272d	default VPC security group	259017703796	1 Per
-	sg-069a07133337604	ALB-SG	vpc-0917bd438b004272d	Security Group for ALB	259017703796	3 Per

Actions buttons include "Actions", "Export security groups to CSV", and "Create security group". A message at the bottom right says "© 2026, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences".

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## EC2 Instances

The screenshot shows the AWS EC2 Instances page. The left sidebar includes options like Dashboard, EC2 Global View, Events, Instances (selected), Instance Types, Launch Templates, Spot Requests, Savings Plans, Reserved Instances, Dedicated Hosts, Capacity Reservations, Capacity Manager, Images, AMIs, AMI Catalog, Elastic Block Store, Volumes, Snapshots, Lifecycle Manager, Network & Security, Security Groups, Elastic IPs, Placement Groups, Key Pairs, CloudShell, and Feedback. The main content area displays a table titled 'Instances (2) Info' with columns: Name, Instance ID, Instance state, Instance type, Status check, Alarm status, Availability Zone, Public IPv4 DNS, Public IPv4, and Elastic IP. Two instances are listed: 'NotesApp-Gold-Instance' (i-095d39e348bd2e25, Running, t3.micro, 3/3 checks passed, us-east-1b, ec2-34-228-59-32.com..., 34.228.59.32, -) and 'Notes-App-Server' (i-093295981dac5db3d, Running, t3.micro, 3/3 checks passed, us-east-1d, ec2-3-239-192-85.com..., 3.239.192.85, -). A modal window titled 'Select an instance' is open at the bottom.

## Dynamo DB

The screenshot shows the AWS DynamoDB Tables page. The left sidebar includes options like Dashboard, Tables (selected), Explore items, PartQL editor, Backups, Exports to S3, Imports from S3, Integrations, Reserved capacity, Settings, DAX (Clusters, Subnet groups, Parameter groups, Events), CloudShell, and Feedback. The main content area displays a table titled 'Tables (2) Info' with columns: Name, Status, Partition key, Sort key, Indexes, Replication Regions, Deletion protection, Favorite, Read capacity mode, Write capacity mode, Total size, and Table class. Two tables are listed: 'Notes' (Active, userid (\$), notid (\$), 0, 0, Off, On-demand, On-demand, 5.9 kilobytes, Standard) and 'Users' (Active, email (\$), -, 0, 0, Off, Provisioned (5), Provisioned (5), 679 bytes, Standard).

# AI Driven Notes Application

## AMI Images

The screenshot shows the AWS EC2 console with the 'AMI Images' section selected. A single AMI entry is listed:

Name	AMI ID	Source	Owner	Visibility	Status	Creation date
NotesApp-Gold-Image	ami-0cb10c3428d97b38	259017703796/NotesApp-Gold-Image	259017703796	Private	Available	2026/01/02 19:50 GMT+5

The left sidebar includes links for Instances, Images, Elastic Block Store, Network & Security, and Load Balancing.

## Application Load Balancer

The screenshot shows the AWS EC2 console with the 'Load balancers' section selected. One load balancer is listed:

Name	State	Type	Scheme	IP address type	VPC ID	Availability Zones	Security groups	DNS name
notes-app-alb	Active	application	Internet-facing	IPv4	vpc-0917bd438b004272d	2 Availability Zones	sg-06e9a0313337605...	notes-app-alb-1042177633...

The left sidebar includes links for Instances, Images, Elastic Block Store, Network & Security, and Load Balancing.

# AI Driven Notes Application

## Target Groups

The screenshot shows the AWS CloudWatch Metrics console. On the left, there's a navigation sidebar with links like 'Reserved Instances', 'Dedicated Hosts', 'Capacity Reservations', 'Capacity Manager', 'Images', 'AMIs', 'AM Catalog', 'Elastic Block Store', 'Volumes', 'Snapshots', 'Lifecycle Manager', 'Network & Security', 'Security Groups', 'Elastic IPs', 'Placement Groups', 'Key Pairs', 'Network Interfaces', 'Load Balancing', 'Load Balancers', 'Target Groups' (which is selected), 'Trust Stores', 'Auto Scaling', 'Auto Scaling Groups', and 'Settings'. The main area is titled 'CloudWatch Metrics' and shows a table with two rows of data:

Name	ARN	Port	Protocol	Target type	Load balancer	VPC ID
Notes-App-TG	arn:aws:elasticloadbalancing:us-east-1:123456789012:targetgroup/Notes-App-TG/1234567890123456	8080	HTTP	Instance	notes-app-alb	vpc-0917bd438b004272d
Notes-Backend-TG	arn:aws:elasticloadbalancing:us-east-1:123456789012:targetgroup/Notes-Backend-TG/1234567890123456	8081	HTTP	Instance	notes-app-alb	vpc-0917bd438b004272d

Below the table, it says '0 target groups selected' and 'Select a target group above.' At the bottom, there's a URL bar with 'https://us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#TargetGroups:' and a footer with '© 2026, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences'.

## Website Running on ALB

The screenshot shows a web browser window with the URL 'notes-app-alb-1042177633.us-east-1.elb.amazonaws.com/notes'. The page displays a Notion-style workspace with a sidebar on the left containing 'My Notes' and a list of pages: 'Test Note 123', 'Hello 9:45', 'Hello Test ALB abdul's Acc', and 'Login Test 1 Day 2 abdul's acc'. The main content area shows a note titled 'Test Note 123' with the following text:  
Hello My name is ABC and here is my AI integrated notes app test:  
  
The sun was setting over the rolling hills, casting a warm orange glow over the landscape. The air was filled with the sweet scent of blooming wildflowers, and the gentle breeze rustled through the tall grass, creating a soothing melody. As I walked through the fields, I felt a sense of peace wash over me, the stress and worries of everyday life melting away with each step. It was a moment of perfect tranquility, a fleeting glimpse of serenity in a world that often seems chaotic and overwhelming.  
  
As I strolled across the serene landscape, the fading light of the sun painted the hills with a warm, golden hue. The air was alive with the delicate fragrance of blooming wildflowers, and the soft rustle of the wind through the tall grass created a calming symphony. With each step, my worries seemed to dissipate, replaced by a deep sense of peace that enveloped me. In this tranquil moment, the world's chaos receded, leaving only a glimpse of perfect serenity.  
  
At the bottom right of the page, there's a 'GEMINI ASSISTANT' box with a message: 'Hi! I am your Gemini assistant. Ask me anything about your notes.' and a 'Use in note' button. Below the box is a text input field 'Ask Gemini...' and a 'Send' button.

## Deployment Process

The deployment was executed in three distinct phases: Infrastructure Provisioning, Server Environment Configuration, and Application Orchestration.

## Phase 1: Infrastructure Provisioning (AWS Management Console)

1. **EC2 Instance Launch:** Provisioned an Amazon EC2 instance using the Ubuntu 24.04 LTS Amazon Machine Image (AMI) on a t2.micro instance type to remain within the AWS Free Tier.
2. **Security Group Configuration: Port 22 (SSH):** Opened for remote administrative access.
  - a. Port 80 (HTTP): Opened to receive public web traffic via the ALB.
  - b. Port 8081 (Custom TCP): Dedicated port for the Node.js backend API.
3. **Application Load Balancer (ALB) Setup:** Created an internet-facing ALB with two listeners: one for the frontend (Port 80) and one for the backend API (Port 8081).
  - a. Associated Target Groups with health checks configured to monitor the status of the Node.js service.

## Phase 2: Server Environment Setup (Terminal/SSH)

1. **Secure Connection:** Established an SSH connection to the instance using the downloaded .pem key pair:
  - a. `ssh -i "your-key.pem" ubuntu@your-ec2-public-ip`.
2. **Dependency Installation:** Updated the package repository and installed the Node.js runtime environment and NPM:
  - a. `sudo apt update && sudo apt install -y nodejs npm`.
3. **Application Deployment:** Cloned the project repository from GitHub and installed the required libraries:
  - a. `git clone <repository-url> && cd <project-folder> && npm install`.

## Phase 3: Application Orchestration (PM2 Management)

To ensure high availability and background execution, PM2 was utilized as the process manager.

- Global Installation:** Installed PM2 globally on the Ubuntu server: sudo npm install -g pm2.
- Process Launch:** Started the frontend and backend as independent background daemons: pm2 start server.js --name "notes-backend".
- Persistence Configuration:** Enabled the startup script to ensure the application automatically relaunches if the EC2 instance reboots: pm2 startup followed by pm2 save.

## Testing Workflow

```
ubuntu@ip-172-31-143-207:~$ pm2 list
  id | name        | namespace | version | mode | pid | uptime |  ↻ | status |  cpu | mem | user | watching
---+---+---+---+---+---+---+---+---+---+---+---+---+---+
  1 | notes-backend | default   | 1.0.0   | fork | 931 | 91m    | 0 | online | 0%  | 75.4mb | ubuntu | disabled
  0 | notes-frontend | default   | N/A     | fork | 930 | 91m    | 0 | online | 0%  | 91.4mb | ubuntu | disabled
ubuntu@ip-172-31-143-207:~$ |
```

The screenshot shows a web browser window with the URL `notes-app-alb-1042177633.us-east-1.elb.amazonaws.com/notes`. The page has a sidebar on the left titled 'My Notes' with a list of pages: 'Test Note 123', 'Hello 9:45', 'Hello Test ALB abdul's Acc', and 'Login Test 1 Day 2 abdul's acc'. The main content area is titled 'Notes' and contains a note titled 'Test Note 123'. The note content is as follows:

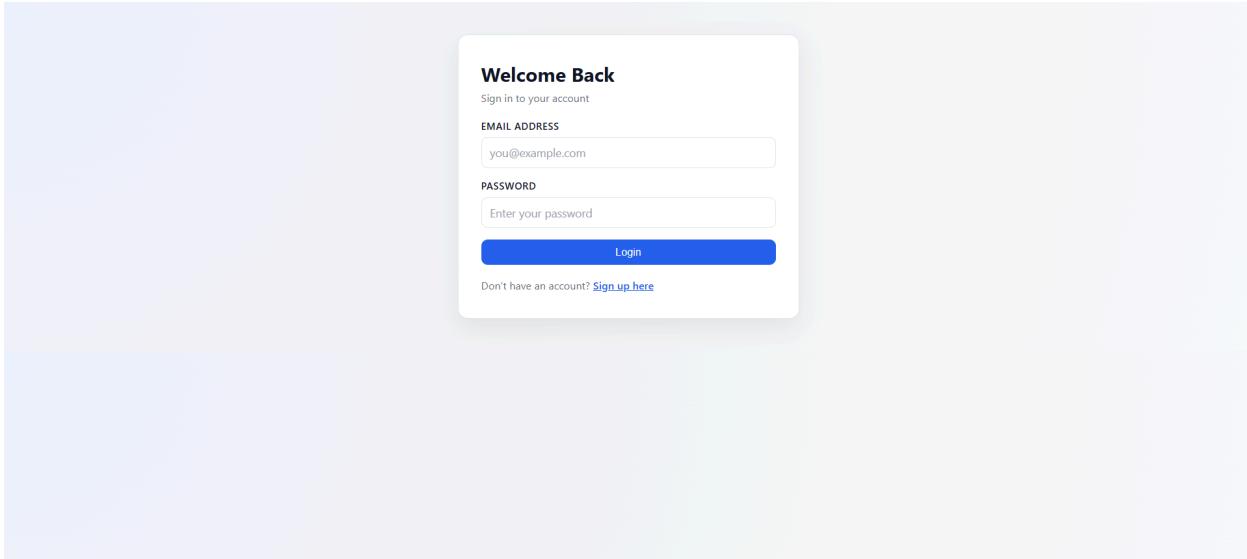
Hello My name is ABC and here is my AI integrated notes app test:

The sun was setting over the rolling hills, casting a warm orange glow over the landscape. The air was filled with the sweet scent of blooming wildflowers, and the gentle breeze rustled through the tall grass, creating a soothing melody. As I walked through the fields, I felt a sense of peace wash over me, the stress and worries of everyday life melting away with each step. It was a moment of perfect tranquility, a fleeting glimpse of serenity in a world that often seems chaotic and overwhelming.

As I strolled across the serene landscape, the fading light of the sun painted the hills with a warm, golden hue. The air was alive with the delicate fragrance of blooming wildflowers, and the soft rustle of the wind through the tall grass created a calming symphony. With each step, my worries seemed to dissipate, replaced by a deep sense of peace that enveloped me. In this tranquil moment, the world's chaos receded, leaving only a glimpse of perfect serenity.

At the bottom of the note area, there is a 'Save' button. To the right of the main content, there is a 'GEMINI ASSISTANT' sidebar with a message from the AI: 'Hi! I am your Gemini assistant. Ask me anything about your notes.' There is also a 'Use in note' button and an input field for 'Ask Gemini...' with a 'Send' button.

# AI Driven Notes Application



## Final Output & AI testing

The screenshot displays a notes application interface. On the left, a sidebar shows "My Notes" with a list of pages: "Test Note 123", "Hello 9:45", "Hello Test ALB abdul's Acc", and "Login Test 1 Day 2 abdul's acc". The main area is titled "Notes" and contains a note titled "Test Note 123". The note content is:

Hello My name is ABC and here is my AI integrated notes app test:

The sun was setting over the rolling hills, casting a warm orange glow over the landscape. The air was filled with the sweet scent of blooming wildflowers, and the gentle breeze rustled through the tall grass, creating a soothing melody. As I walked through the fields, I felt a sense of peace wash over me, the stress and worries of everyday life melting away with each step. It was a moment of perfect tranquility, a fleeting glimpse of serenity in a world that often seems chaotic and overwhelming.

As I strolled across the serene landscape, the fading light of the sun painted the hills with a warm, golden hue. The air was alive with the delicate fragrance of blooming wildflowers, and the soft rustle of the wind through the tall grass created a calming symphony. With each step, my worries seemed to dissipate, replaced by a deep sense of peace that enveloped me. In this tranquil moment, the world's chaos receded, leaving only a glimpse of perfect serenity.

...  
[Save](#)

On the right, there is a "GEMINI ASSISTANT" interface. It shows a conversation:

Hello Whats up

Not much. How can I assist you with your notes today? Do you want to create a new note, search for an existing one, or perhaps organize your notes?

Use in note

Write a paragraph for me

Here's a paragraph for you:

"As the sun set over the rolling hills, a warm orange glow spread across the landscape. The sky was painted with hues of pink and purple, a breathtaking sight that took my breath away. A gentle breeze rustled the leaves of the trees, creating a soothing melody that seemed to match the rhythm of my heart. It was a moment of perfect peace, a time to let go of worries and simply be present in the beauty of nature."

Would you like me to add it to your notes or

Ask Gemini... [Send](#)