Precise Emailer

Nurun Nahar
Sachini Nathasha Rosa
Illin Bintey Soyeb
Riyad Mohammad Raju
Nazmus Sakib

Business Case

Many businesses struggle with efficiently managing email communication, especially when it involves scheduling future emails, handling attachments, and ensuring timely delivery. Existing email services often lack seamless integration with modern cloud platforms, making it challenging to automate workflows and manage large-scale email campaigns.

Challenges

01 Send thousands of emails daily, without worrying about server performance or limitations.

02 Reduces costs associated with maintaining dedicated servers. Lack of integration with cloud platforms like Google Cloud for scalability.

03 Manual processes for managing and sending emails, leading to errors and inefficiencies.

Requirements

Automating email scheduling: Users can schedule emails for future delivery, with Firestore managing the email data and Pub/Sub triggering timely email dispatch.

Handling attachments: Securely upload and store attachments in cloud storage, ensuring availability and reliability.

Integration with SendGrid: Leverage SendGrid for high deliverability rates and email tracking.

User authentication: Secure the application with OAuth2-based JWT authentication, ensuring only authorized access.

Cloud vs On-Prem

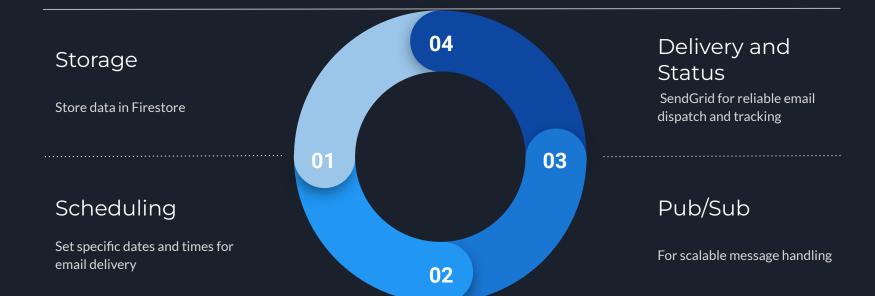| Effort	Cloud	On-Prem
Setup & Deployment	Fast deployment, minimal setup	Requires high effort on setup
Infrastructure Management	Minimal management	Require in-house management
Security & Compliance	Shared Responsibility	Full responsibility of user
Maintenance	Low	High
Scalability	Easily scalable	Scaling requires investment
Cost Management	Pay-as-you-go	High Initial Cost
Innovation & Upgrades	Access to latest tools and features	Require manual upgrades
Availability	High	Dependent on in-house resources

GCP VS AWS

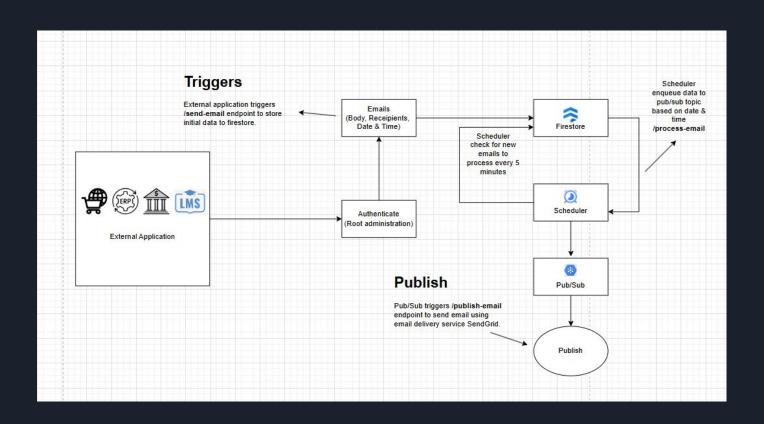| Feature	Google Cloud Platform (GCP)	Amazon Web Services (AWS)
Event-Driven & Messaging	**Pub/Sub** Pricing: $0.40 per million messages published and delivered.	**SNS (Simple Notification Service)** Pricing: $0.50 per million publishes.
Storage & Database	**Firestore** Pricing: Free tier to start with, after that $0.18 per GB stored per month, $0.026 per 100K reads, writes, or deletes.	**DynamoDB** Pricing: $1.25 per WCU (Write Capacity Unit), $0.25 per RCU (Read Capacity Unit), $0.25 per GB of storage.
Scheduling & Automation	**Google Cloud Scheduler** Pricing: 3 jobs per month free. After that $0.10 per job per month and billed per day.	**Amazon EventBridge Scheduler** Pricing: Free tier includes 14 million invocations/month, after that $1 per million invocations per month.
Authentication & Security	**Google Identity Platform** Pricing: Free tier includes up to 50K verifications/month. After that, $0.005 per verification.	**AWS IAM** (Identity and Access Management) Pricing: Free for managing users and groups; costs apply to features like AWS Multi-Factor Authentication (MFA) at $1 per month per user.
Email Processing	**SendGrid API** Pricing: Free tier includes 100 emails/day. Paid plans start at $15/month for up to 50,000 emails	**Amazon SES (Simple Email Service)** Pricing: $0.10 per 1,000 emails sent; free for up to 62,000 emails/month if sent from an EC2 instance.

Load Assumptions

- **Requests Per Year**:
  - **100,000 requests per year**.

- **Data per Request**:
  - **5 KB per request**
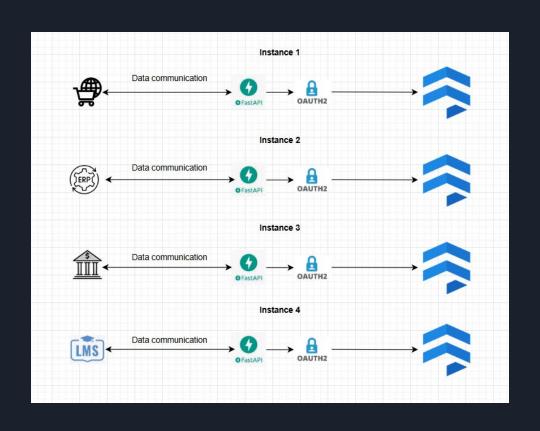 - Results in **500 MB of data processed per year** (100,000 requests × 5 KB per request).
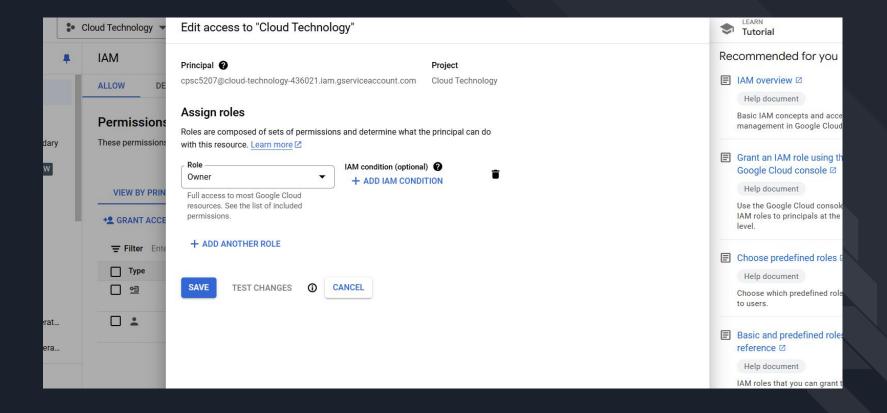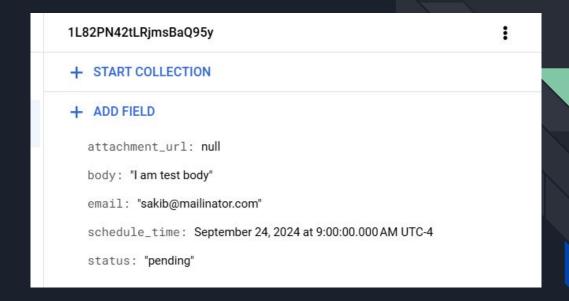
Solution Cycle

04

01

03

02

Storage

Store data in Firestore

Scheduling

Set specific dates and times for email delivery

Delivery and Status

SendGrid for reliable email dispatch and tracking

Pub/Sub

For scalable message handling

Architecture

Triggers

External application triggers **/send-email** endpoint to store initial data to firestore.

Emails (Body, Receipients, Date & Time)

Firestore

Scheduler enqueue data to pub/sub topic based on date & time **/process-email**

Scheduler check for new emails to process every 5 minutes

Scheduler

Authenticate (Root administration)

External Application

Publish

Pub/Sub

Pub/Sub triggers **/publish-email** endpoint to send email using email delivery service SendGrid.

Publish

Data Collection

Service Account

Data Structure

1L82PN42tLRjmsBaQ95y

+ START COLLECTION

+ ADD FIELD

attachment_url: null

body: "I am test body"

email: "sakib@mailinator.com"

schedule_time: September 24, 2024 at 9:00:00.000 AM UTC-4

status: "pending"
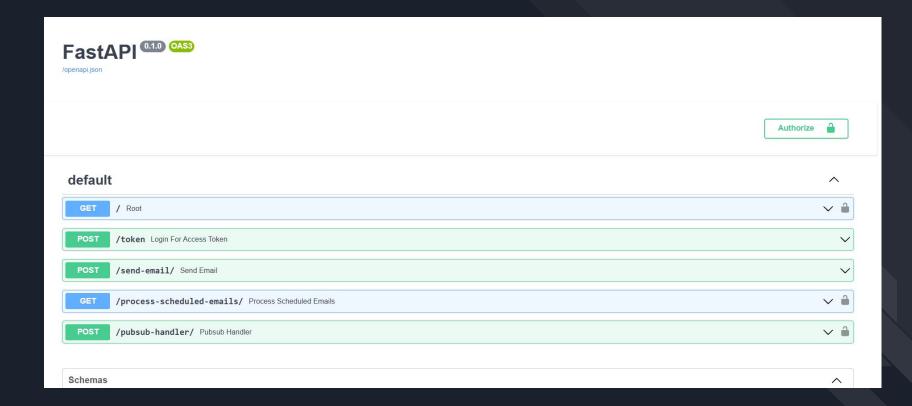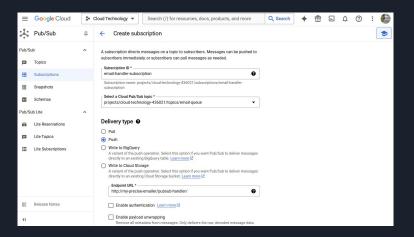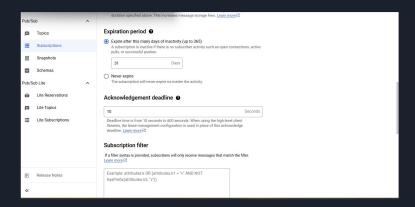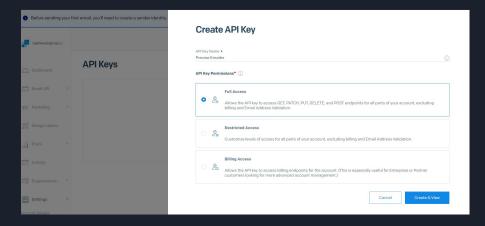
Debugging - Swagger UI

How to setup Cloud Pub/Sub

- Go to Cloud Pub/Sub dashboard (As you already enabled the service)
- Create a topic.
- Create subscription.
- Select subscription type - push
- Set endpoint url - https://your-domain/pubsub-handler
- Set acknowledgement deadline to 10 seconds (If the response status code is not 200 ok, the pubsub will retry)
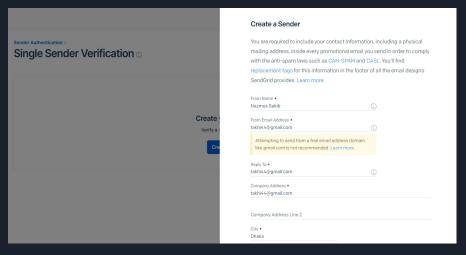
SendGrid

- Login to SendGrid
- Generate API key through Full Access
- Add the saved API key to projects .env file
- Go to settings, Sender Verification.
- Add Sender to details to verify your sender email.
- Add the verified email to projects .env file (Which will be used as from Email to deliver the emails)
- Manually trigger the pubsub handler endpoint from swagger ui to test the emails are deliverying or not.

Future Improvements

Advanced Email Analytics

analytics to track email performance, such as open rates, click-through rates, and delivery status.

Enhanced Scheduling Features

Allow users to set recurring schedules (e.g., daily, weekly emails) or send emails at specific time zones

References

https://www.hpe.com/ca/en/what-is/on-premises-vs-cloud.html
http://aws.amazon.com/lambda/pricing/
http://cloud.google.com/functions/pricing
http://aws.amazon.com/sns/pricing/
http://cloud.google.com/pubsub/pricing
http://aws.amazon.com/dynamodb/pricing/
http://cloud.google.com/firestore/pricing
http://aws.amazon.com/eventbridge/pricing/
http://cloud.google.com/scheduler/pricing
http://aws.amazon.com/iam/pricing/
http://cloud.google.com/identity-platform/pricing
http://aws.amazon.com/ses/pricing/
http://sendgrid.com/pricing/

Thank You