PiMask

Private Cloud Storage Using Raspberry Pi

Integration of Raspberry Pi with AWS(S3)

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Version History

Version	Changes
Version 1	Initial Document

Introduction

‘PiMask’ is a private cloud storage using Raspberry Pi, it is an IoT device which could be used to interact with various ‘things’ such as sensors from washing machine, driers, doors, windows, motion sensors etc. PiMask is also a ‘smart home security system’ which is capable of sending alerts to the users on any suspicious activity that has been taking place in its surroundings. As a part of PiMask system there is a smart camera which is accompanied by a motion sensor. Whenever the user is away from his place, the motion sensor is activated and the camera starts clicking the pictures as soon as it detects any motion within its range. These clicked pictures are being posted to the Raspberry Pi via FTP depending on the compatibility of the camera. Once the pictures reach the Raspberry Pi, it processes these images and sends them on to a cloud storage immediately. It would also notify user either by a text message or by an E-mail that something suspicious has occurred at his place. The user can quickly login into his cloud and check what created the alerts by checking the pictures. In this document we would be talking more about the integration of the Raspberry Pi with AWS(S3) and sending out notifications to the users.

Amazon S3(Amazon Simple Storage Service) is a cloud storage service which provides developers/users a secure, durable and highly scalable storage. It provides users with a web service interface where user could post and retrieve large amount of data. It enables user to access this data from anywhere and from any device making the cloud storage highly reliable and accessible. Amazon S3 provides web based interfaces and SDK to access and manage resources.

Twilio is a service which enables developers to send SMS text notifications to registered users. The Twilio REST API allows developers to integrate the SMS text notification service with the use cases and make simple REST calls. It simplifies the component implementation, minimize the complexity involved with connector semantics and provides high scalability of server components.

References

1. **Amazon simple storage service documentation**. Retrieved from http://aws.amazon.com/documentation/s3/

2. BMS Doug. (2015,). Performance evaluations. Retrieved from https://www.raspberrypi.org/forums/viewtopic.php?f=62&t=93724&p=667425&hilit=performance+evaluation#p667425

3. AWS (Producer), & Shuttleworth Ryan (Director). (2013).[Video/DVD] YouTube.

4. Twilio API documentation. Retrieved from https://www.twilio.com/docs/api

Requirements

- A configurable Raspberry Pi, capable of supporting REST/SOAP services.
- Access to registered Amzon S3 bucket.
- Access to registered Twilio account.
- Smart camera.

Functional Overview

The below diagram depicts the implementation of the functional specification described in this document.

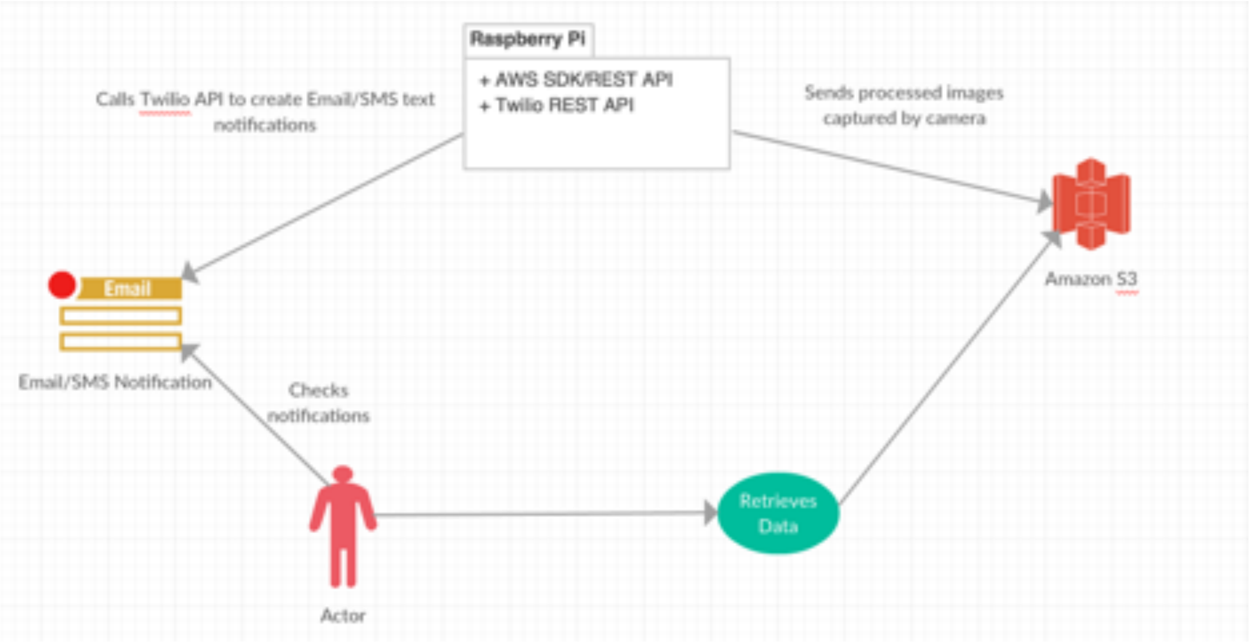


Figure 1: Implementation of AWS(S3) & Email/SMS Notifications

- Raspberry Pi receives images from the smart camera.
- An application program developed processes these images to append necessary information such as timestamp when the picture has been taken and posts these images with its associated information to S3 using AWS SDK/ REST API.
- Application program generates message body and notifies user through Email/SMS text.
- User upon receipt of the notification logs into his cloud storage to view the files(pictures).
- User takes necessary action depending on the severity of the incident.

Configuration/ External Interfaces

External Configurations:

- Setting up of Amazon S3 account.
- Configuration of S3 bucket per IoT device and obtain security key for handshake.
- Setting up of Twilio account for Email/SMS text notifications.
- Configuration of Twilio to register the application to allow access from application.
- Configuration of the user info to whom notifications needs to be sent.
- Configuration of AWS SDK and Twilio REST API on Raspberry Pi.

Dependancies:

- Amazon S3 account is operational.
- Twilio account is operational and has dependable user information.
- IoT device is always connected on the same network used by smart camera.
- IoT device establishes handshake with S3 and Twilio services.

Debug

- AWS(S3) maintains logs which could be used for debugging.
- Application in Raspberry Pi could be programmed to log events.

Implementation

1. Raspberry Pi Configuration

   - Install AWS SDK/ REST API
     In order to integrate Raspberry Pi using web services, we need to download and install AWS SDK/REST API. Develop the application using this SDK to transfer medial files to S3.
   - Install Twilio REST API interface
     This allows the application to establish a secured connection and make REST call to the Twilio Instance to send notifications to the users.
   - Enable SSH
     As Raspberry Pi uses a basic Linux OS, Install SSH to generate secure keys which might be need to set up AWS/Twilio accounts to pair Raspberry Pi with cloud services.

2. Deploying cloud services

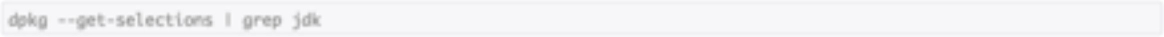
   - Deploy S3 bucket and pair it with the Raspberry Pi.
   - Deploy Twilio instance and configure it to accept API calls from Raspberry Pi.

Testing

1. Configuration Testing

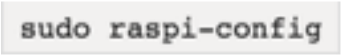
   This is done in-order to confirm that the all the required dependancies are correctly installed such as JDK, AWS SDK, SSH, REST API etc.

   - Check JDK installed.



```
dpkg --get-selections | grep jdk
```

   - Check if SSH is installed.



```
sudo raspi-config
```

- Check AWS SDK is installed.

2. Performance Testing

   This test is done to check if Raspberry Pi is able to take multiple picture frames and process them and check it behavior with respect to ideal case. Tests are performed to check the total turnaround time.