Assignment 2
Deadline: 3rd NOV 2020 (TUE) 11:59pm
Total: 100 marks

Late submission: within 24 hours (-20%); after 24 hours: no mark

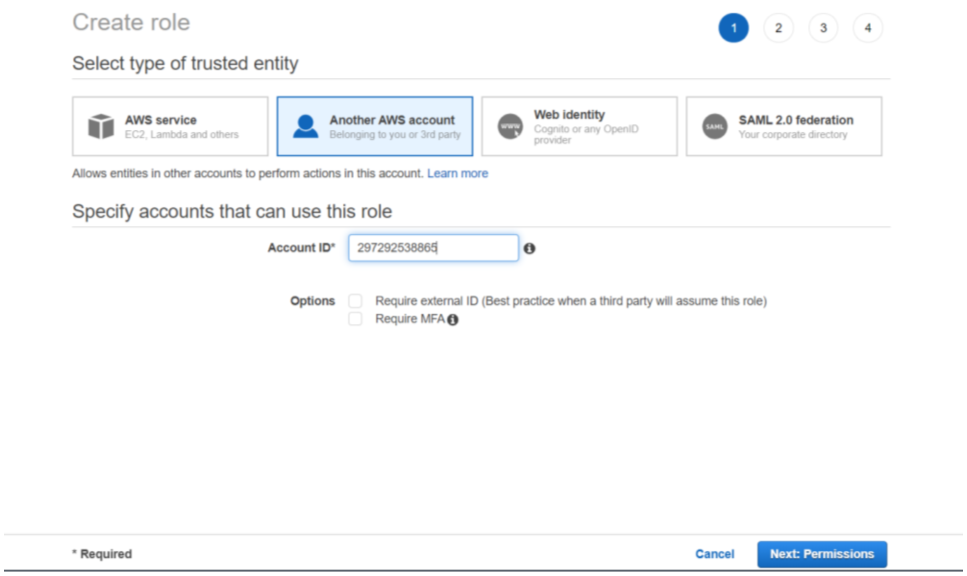
Instructions

1. Complete the following questions in AWS **us-east-1** region.

2. All attribute name, JSON format, endpoint name should match EXACTLY as the defined requirements or examples as shown in this assignment sheet

3. Create an IAM role and grant my AWS account access to your AWS S3 buckets and DynamoDB tables

Navigate to AWS IAM at https://console.aws.amazon.com/iam. Click **Roles**. Select **Create Role**.



Create role

Select type of trusted entity: Another AWS account (Belonging to you or 3rd party)

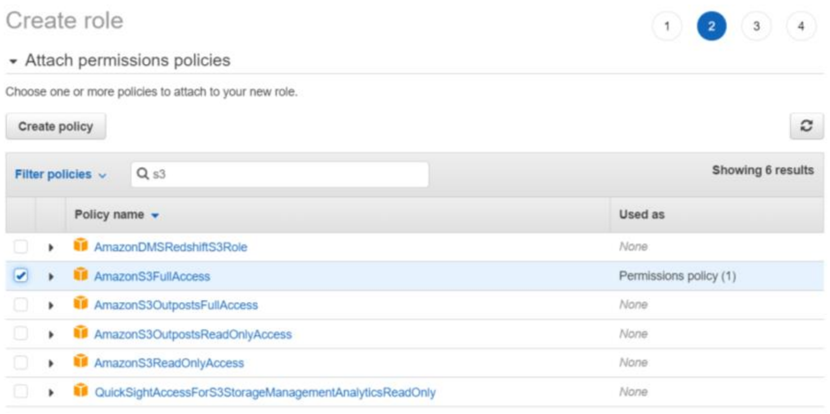
Allows entities in other accounts to perform actions in this account. Learn more

Specify accounts that can use this role

Account ID*: 297292538865

Options: Require external ID (Best practice when a third party will assume this role); Require MFA

Select **Another AWS account**. Type the account ID **297292538865**. Click **Next**. Check the permissions **AmazonS3FullAccess** and **AmazonDyamoDBFullAccess.**



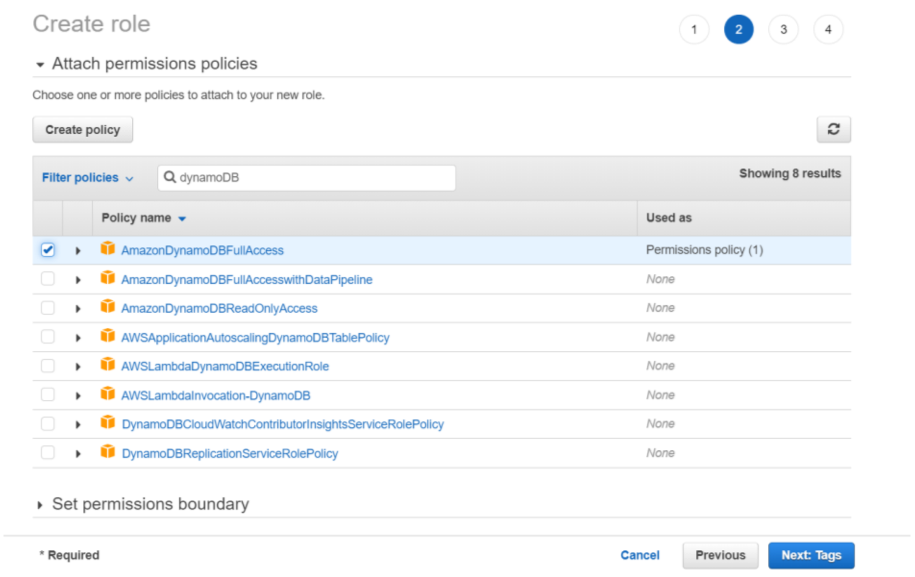
Create role

Attach permissions policies

Choose one or more policies to attach to your new role.

Filter policies: s3 — Showing 6 results

	Policy name	Used as
☐	AmazonDMSRedshiftS3Role	None
✓	AmazonS3FullAccess	Permissions policy (1)
☐	AmazonS3OutpostsFullAccess	None
☐	AmazonS3OutpostsReadOnlyAccess	None
☐	AmazonS3ReadOnlyAccess	None
☐	QuickSightAccessForS3StorageManagementAnalyticsReadOnly	None



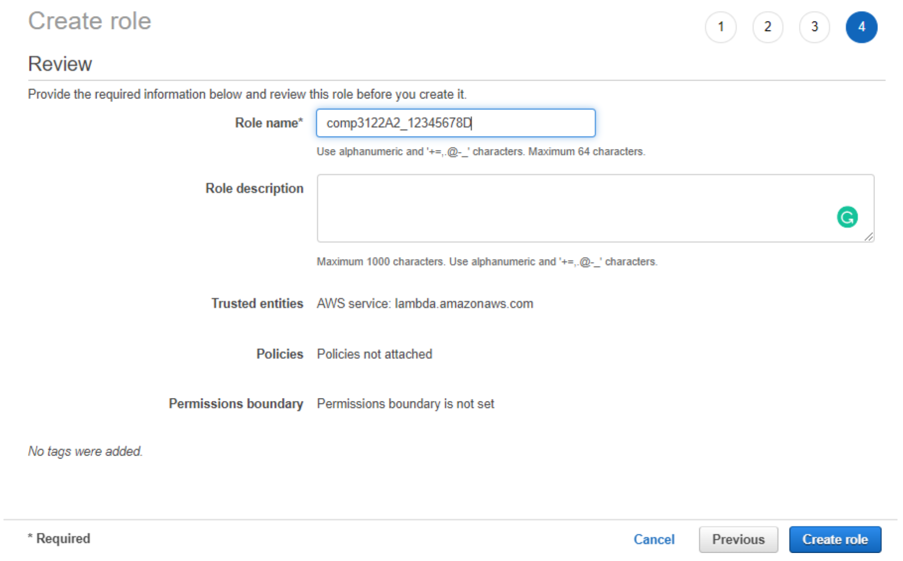
Choose one or more policies to attach to your new role.

		Policy name	Used as
✓	▸	AmazonDynamoDBFullAccess	Permissions policy (1)
	▸	AmazonDynamoDBFullAccesswithDataPipeline	None
	▸	AmazonDynamoDBReadOnlyAccess	None
	▸	AWSApplicationAutoscalingDynamoDBTablePolicy	None
	▸	AWSLambdaDynamoDBExecutionRole	None
	▸	AWSLambdaInvocation-DynamoDB	None
	▸	DynamoDBCloudWatchContributorInsightsServiceRolePolicy	None
	▸	DynamoDBReplicationServiceRolePolicy	None

Click **Next** two times

.

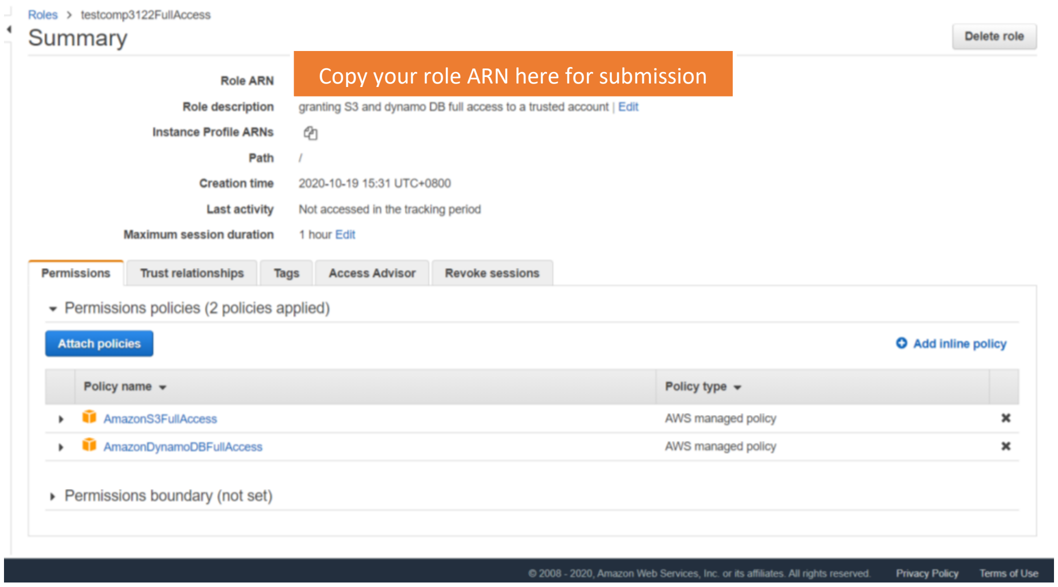
Type the role name “comp3122A2_[Your Student ID]”. Put your student ID in the role name. Click **Create role**.



Provide the required information below and review this role before you create it.

Role name*	comp3122A2_12345678D
	Use alphanumeric and '+=,.@-_' characters. Maximum 64 characters.
Role description	
	Maximum 1000 characters. Use alphanumeric and '+=,.@-_' characters.
Trusted entities	AWS service: lambda.amazonaws.com
Policies	Policies not attached
Permissions boundary	Permissions boundary is not set

No tags were added.


Roles > testcomp3122FullAccess

Summary

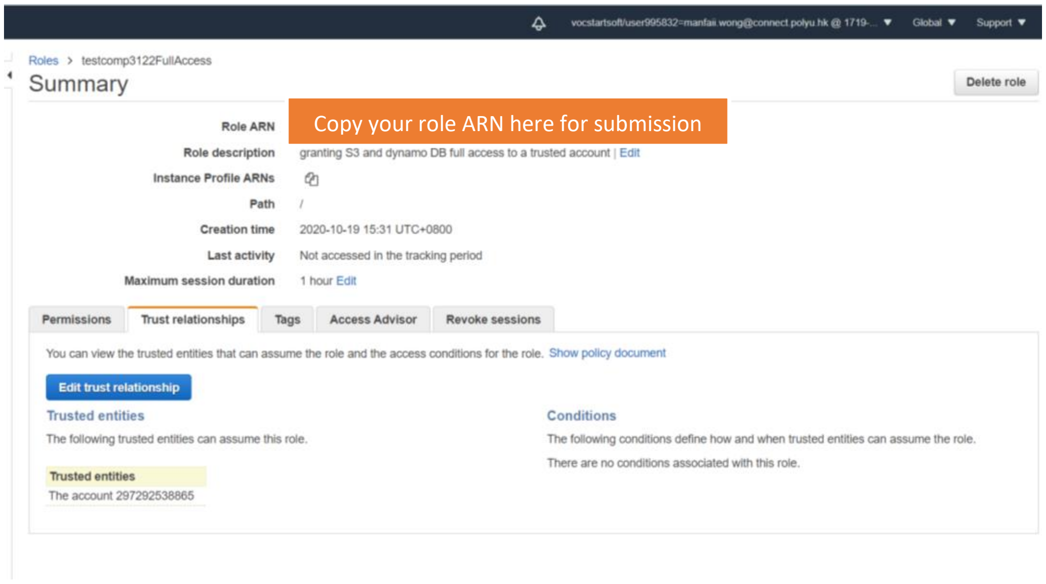
Role ARN	Copy your role ARN here for submission
Role description	granting S3 and dynamo DB full access to a trusted account | Edit
Instance Profile ARNs	
Path	/
Creation time	2020-10-19 15:31 UTC+0800
Last activity	Not accessed in the tracking period
Maximum session duration	1 hour Edit

Permissions policies (2 policies applied)

Policy name	Policy type
AmazonS3FullAccess	AWS managed policy
AmazonDynamoDBFullAccess	AWS managed policy

Permissions boundary (not set)

Click **Trust relationships**. Verify that the account **297292538865** is in trusted entities


Roles > testcomp3122FullAccess

Summary

Role ARN	Copy your role ARN here for submission
Role description	granting S3 and dynamo DB full access to a trusted account | Edit
Instance Profile ARNs	
Path	/
Creation time	2020-10-19 15:31 UTC+0800
Last activity	Not accessed in the tracking period
Maximum session duration	1 hour Edit

You can view the trusted entities that can assume the role and the access conditions for the role. Show policy document

Trusted entities

The following trusted entities can assume this role.

Trusted entities
The account 297292538865

Conditions

The following conditions define how and when trusted entities can assume the role.

There are no conditions associated with this role.

Copy your **role ARN** here for submission

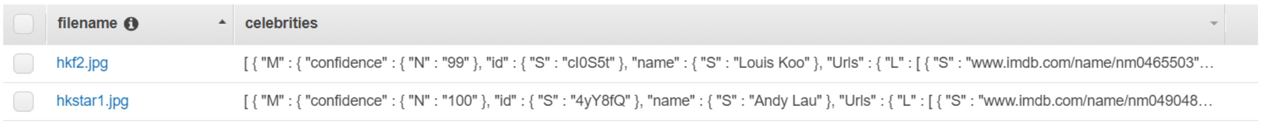
4. You should provide the following data **AT LEAST 3 days** before assignment deadline for me to test whether I can access to your AWS resources. I will let you know if there are problems. The Google form will be setup shortly.

- Your student ID and name
- Bucket name
    - The name of your S3 bucket should be **polyu-comp3122A2_[student ID]**
        - E.g. polyu-comp3122a2-12345678d
- Base URL of your API endpoint (created using AWS gateway)
    - E.g. https://vvuabckz2l.execute-api.us-east-1.amazonaws.com/v1
        - Your stage name should be v1 (when your API is deployed in API gateway)
- Your **role ARN** for me to access your S3 bucket and DynamoDB tables

5. Zip your AWS lambda code and submit to blackboard before the deadline.

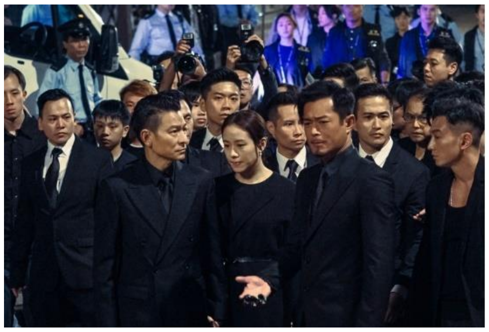
a) Create a DynamoDB table “**celebrities”** with the primary key of the celebrities being “filename” (the partition key). Define a serverless AWS lambda function which is listening to AWS S3 PUT events. When images are uploaded to a defined S3 bucket, the function will invoke a AWS Lambda function which will invoke the AWS Rekognition API to identify the celebrities in the image. The image and celebrity data will be inserted into the **celebrities** table in DynamoDB. When the images are removed from the S3 bucket, the corresponding item in the DynamoDB table will removed.

For instance, consider the following **celebrities** table in DynamoDB. The two rows correspond to the celebrities identified by the AWS rekognition service (https://aws.amazon.com/rekognition) for the two images in the S3 bucket.



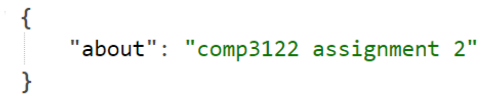
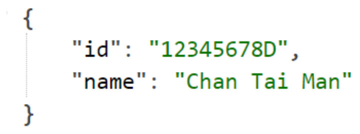
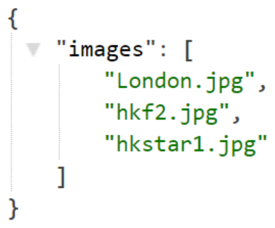
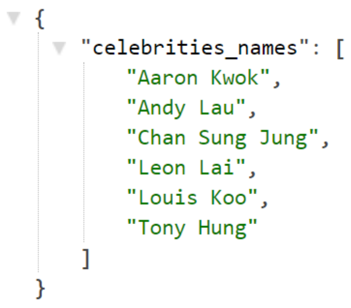
filename	celebrities
hkf2.jpg	[{ "M" : { "confidence" : { "N" : "99" }, "id" : { "S" : "cl0S5t" }, "name" : { "S" : "Louis Koo" }, "Urls" : { "L" : [{ "S" : "www.imdb.com/name/nm0465503"…
hkstar1.jpg	[{ "M" : { "confidence" : { "N" : "100" }, "id" : { "S" : "4yY8fQ" }, "name" : { "S" : "Andy Lau" }, "Urls" : { "L" : [{ "S" : "www.imdb.com/name/nm049048…

Filename	Celebrities data	Images
hkstar1.jpg	{ "celebrities": [{ "confidence": 100, "id": "4yY8fQ", "name": "Andy Lau", "Urls": ["www.imdb.com/name/nm0490489"] }, { "confidence": 100, "id": "31Uz1a", "name": "Leon Lai", "Urls": ["www.imdb.com/name/nm0481709"] }, { "confidence": 100, "id": "2Bf8fx3l", "name": "Aaron Kwok", "Urls": ["www.imdb.com/name/nm0477209"] }, { "confidence": 76, "id": "1wo1x3j", "name": "Tony Hung", "Urls": [ ] }], "filename": "hkstar1.jpg" }	

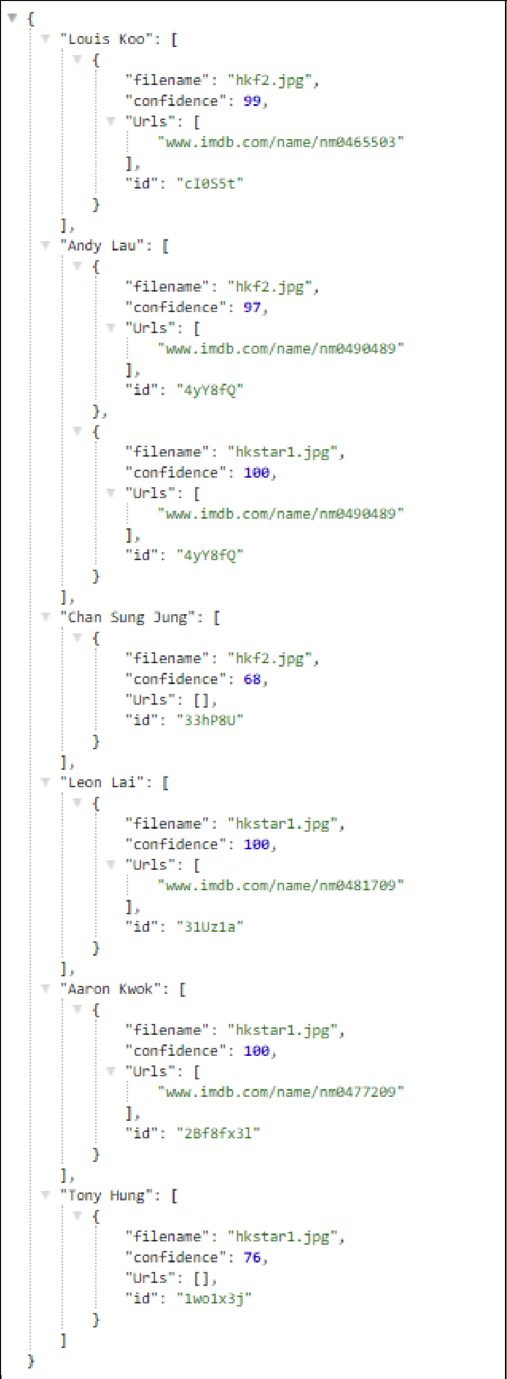
hkf2.jpg	{
	"celebrities": [
	{
	"confidence": 99,
	"id": "cI0S5t",
	"name": "Louis Koo",
	"Urls": [
	"www.imdb.com/name/nm0465503"
	]
	},
	{
	"confidence": 97,
	"id": "4yY8fQ",
	"name": "Andy Lau",
	"Urls": [
	"www.imdb.com/name/nm0490489"
	]
	},
	{
	"confidence": 68,
	"id": "33hP8U",
	"name": "Chan Sung Jung",
	"Urls": [
	
	]
	}
	],
	"filename": "hkf2.jpg"
	}
		

b) Implement a REST API using AWS API Gateway which will integrate with an AWS Lambda function to retrieve and return the image and celebrity data obtained from the **celebrities** table in DynamoDB.

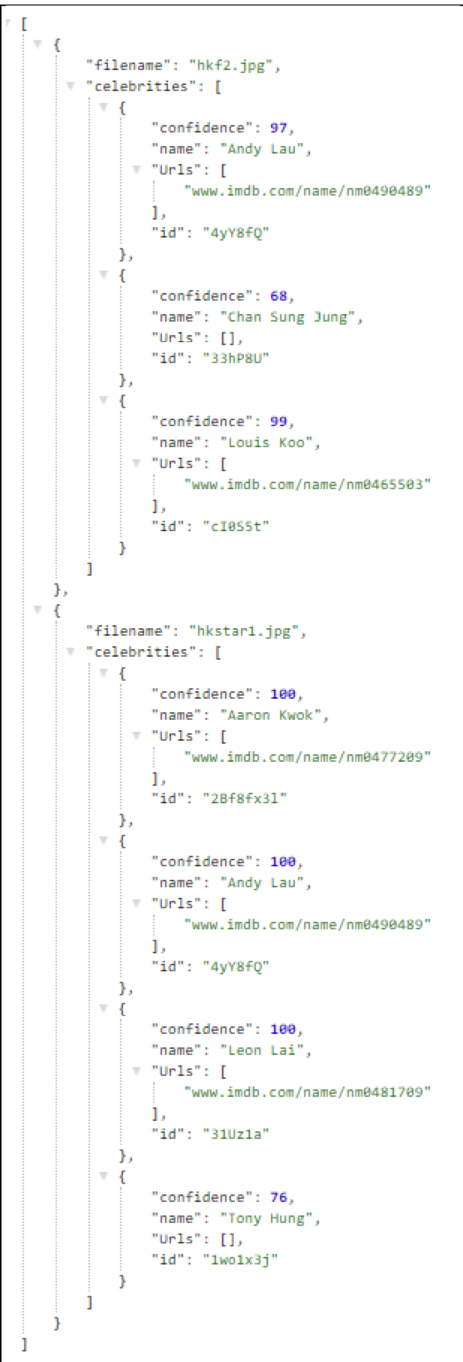
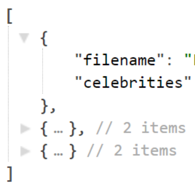
Define the following endpoints in API gateway. The endpoints should return HTTP status code 200 unless otherwise specified.

Endpoints	Examples	Remarks
/	 `{ "about": "comp3122 assignment 2" }`	-
/me	 `{ "id": "12345678D", "name": "Chan Tai Man" }`	- Include your student ID and name in the JSON output
/images_names	 `{ "images": [ "London.jpg", "hkf2.jpg", "hkstar1.jpg" ] }`	- Empty list will be returned if there is no image in the S3 bucket
/celebrities_names	 `{ "celebrities_names": [ "Aaron Kwok", "Andy Lau", "Chan Sung Jung", "Leon Lai", "Louis Koo", "Tony Hung" ] }`	- Empty list will be returned if there is no celebrity identified in the images in S3 bucket

c) Extend your API in part (b) to support the following endpoints. The endpoints should return 200 status code unless otherwise specified.

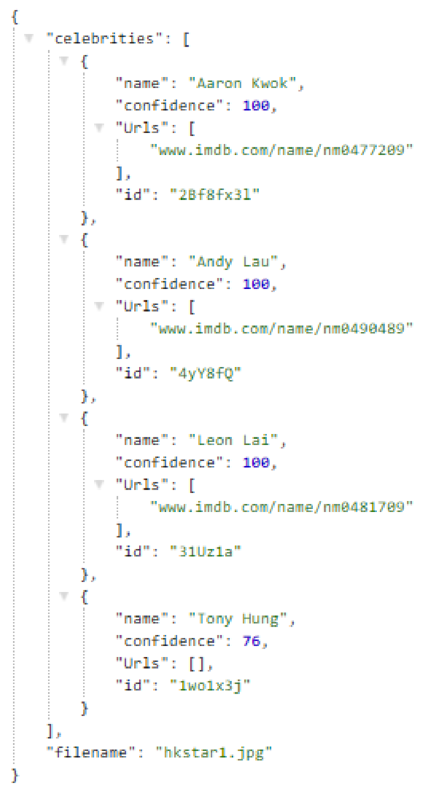
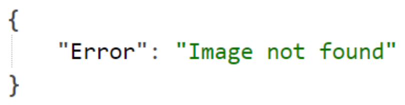
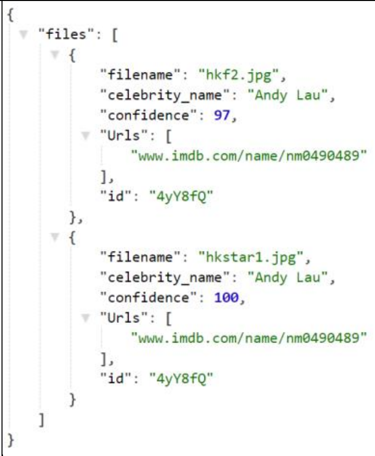
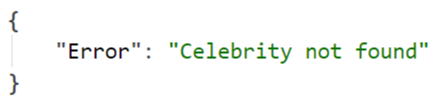
Endpoints	Examples	Remarks
/celebrities		- Returns all celebrities identified in all images - The filenames are sorted by filename in alphabetical order if a certain celebrity appears in more than one images. - This endpoint should always return HTTP status code 200

```
{
    "Louis Koo": [
        {
            "filename": "hkf2.jpg",
            "confidence": 99,
            "Urls": [
                "www.imdb.com/name/nm0465503"
            ],
            "id": "cI0S5t"
        }
    ],
    "Andy Lau": [
        {
            "filename": "hkf2.jpg",
            "confidence": 97,
            "Urls": [
                "www.imdb.com/name/nm0490489"
            ],
            "id": "4yY8fQ"
        },
        {
            "filename": "hkstar1.jpg",
            "confidence": 100,
            "Urls": [
                "www.imdb.com/name/nm0490489"
            ],
            "id": "4yY8fQ"
        }
    ],
    "Chan Sung Jung": [
        {
            "filename": "hkf2.jpg",
            "confidence": 68,
            "Urls": [],
            "id": "33hP8U"
        }
    ],
    "Leon Lai": [
        {
            "filename": "hkstar1.jpg",
            "confidence": 100,
            "Urls": [
                "www.imdb.com/name/nm0481709"
            ],
            "id": "31Uz1a"
        }
    ],
    "Aaron Kwok": [
        {
            "filename": "hkstar1.jpg",
            "confidence": 100,
            "Urls": [
                "www.imdb.com/name/nm0477209"
            ],
            "id": "2Bf8fx3l"
        }
    ],
    "Tony Hung": [
        {
            "filename": "hkstar1.jpg",
            "confidence": 76,
            "Urls": [],
            "id": "1wo1x3j"
        }
    ]
}
```

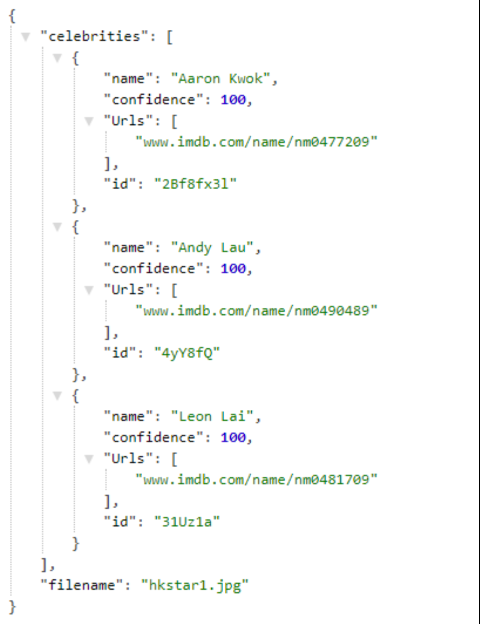
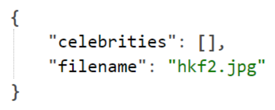
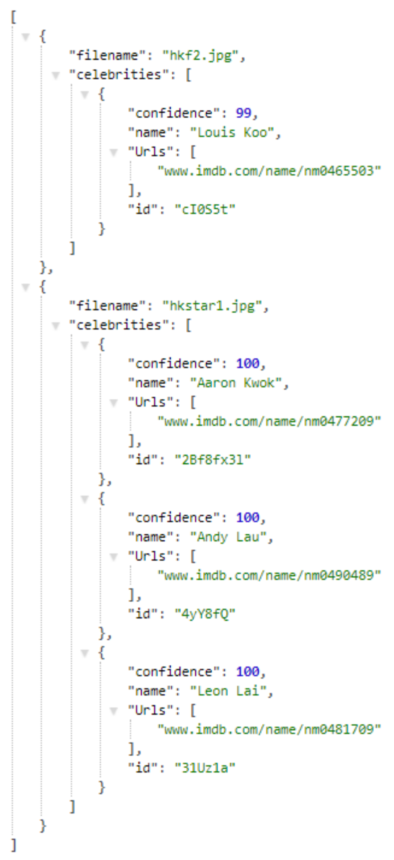
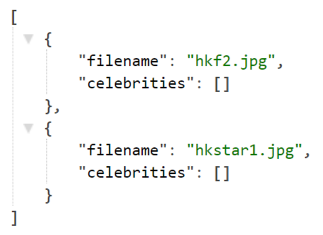
/images		- Returns all the images and the celebrities in those images - The images are sorted by filename in alphabetical order - The celebrities within each image is sorted by celebrity name in alphabetical order - This endpoint should always return HTTP status code 200 - If an image has no identified celebrities, the celebrities list should be empty. E.g.  -

```
[
    {
        "filename": "hkf2.jpg",
        "celebrities": [
            {
                "confidence": 97,
                "name": "Andy Lau",
                "Urls": [
                    "www.imdb.com/name/nm0490489"
                ],
                "id": "4yY8fQ"
            },
            {
                "confidence": 68,
                "name": "Chan Sung Jung",
                "Urls": [],
                "id": "33hP8U"
            },
            {
                "confidence": 99,
                "name": "Louis Koo",
                "Urls": [
                    "www.imdb.com/name/nm0465503"
                ],
                "id": "cI0S5t"
            }
        ]
    },
    {
        "filename": "hkstar1.jpg",
        "celebrities": [
            {
                "confidence": 100,
                "name": "Aaron Kwok",
                "Urls": [
                    "www.imdb.com/name/nm0477209"
                ],
                "id": "2Bf8fx3l"
            },
            {
                "confidence": 100,
                "name": "Andy Lau",
                "Urls": [
                    "www.imdb.com/name/nm0490489"
                ],
                "id": "4yY8fQ"
            },
            {
                "confidence": 100,
                "name": "Leon Lai",
                "Urls": [
                    "www.imdb.com/name/nm0481709"
                ],
                "id": "31Uz1a"
            },
            {
                "confidence": 76,
                "name": "Tony Hung",
                "Urls": [],
                "id": "1wo1x3j"
            }
        ]
    }
]
```

```
[
    {
        "filename": "London.jpg",
        "celebrities": []
    },
    { … }, // 2 items
    { … } // 2 items
]
```

/images/[filename] E.g. /images/hkstar1.jpg	 `{ "celebrities": [{ "name": "Aaron Kwok", "confidence": 100, "Urls": ["www.imdb.com/name/nm0477209"], "id": "2Bf8fx3l" }, { "name": "Andy Lau", "confidence": 100, "Urls": ["www.imdb.com/name/nm0490489"], "id": "4yY8fQ" }, { "name": "Leon Lai", "confidence": 100, "Urls": ["www.imdb.com/name/nm0481709"], "id": "31Uz1a" }, { "name": "Tony Hung", "confidence": 76, "Urls": [], "id": "1wo1x3j" }], "filename": "hkstar1.jpg" }`	- Returns the celebrities in the specified image - The celebrities within each image is sorted by celebrity name in alphabetical order - If the specified image is found, HTTP status code 200 should be returned. Otherwise, it should return HTTP status code 404 with the following JSON object.  `{ "Error": "Image not found" }`
/celebrities/[celebrity name] E.g. /celebrities/Andy%20Lau	 `{ "files": [ { "filename": "hkf2.jpg", "celebrity_name": "Andy Lau", "confidence": 97, "Urls": [ "www.imdb.com/name/nm0490489" ], "id": "4yY8fQ" }, { "filename": "hkstar1.jpg", "celebrity_name": "Andy Lau", "confidence": 100, "Urls": [ "www.imdb.com/name/nm0490489" ], "id": "4yY8fQ" } ] }`	- Returns the images where a certain celebrity appears - The filenames are sorted in alphabetical order - If the specified celebrity is found, HTTP status code 200 should be returned. Otherwise, it should return HTTP status code 404 with the following JSON object.  `{ "Error": "Celebrity not found" }`

The four endpoints above should support an optional query string parameter “conf” which specifies the minimum confidence of the identified celebrities returned by the API. The endpoints should return 200 status code unless otherwise specified.

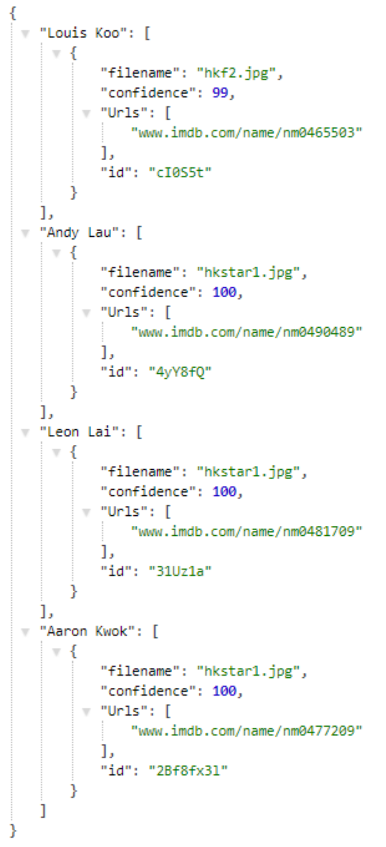
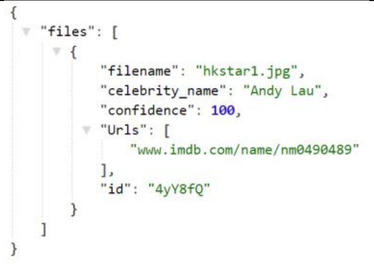
Endpoints	Examples	Remarks
/images/hkstar1.jpg?conf=80		- if none of the celebrities in an image has the required confidence, return empty celebrities list for the image 
/images?conf=98		- if none of the celebrities in an image has the required confidence, return empty celebrities list in the corresponding image. 

```
{
  "celebrities": [
    {
      "name": "Aaron Kwok",
      "confidence": 100,
      "Urls": [
        "www.imdb.com/name/nm0477209"
      ],
      "id": "2Bf8fx3l"
    },
    {
      "name": "Andy Lau",
      "confidence": 100,
      "Urls": [
        "www.imdb.com/name/nm0490489"
      ],
      "id": "4yY8fQ"
    },
    {
      "name": "Leon Lai",
      "confidence": 100,
      "Urls": [
        "www.imdb.com/name/nm0481709"
      ],
      "id": "31Uz1a"
    }
  ],
  "filename": "hkstar1.jpg"
}
```

```
{
    "celebrities": [],
    "filename": "hkf2.jpg"
}
```

```
[
  {
    "filename": "hkf2.jpg",
    "celebrities": [
      {
        "confidence": 99,
        "name": "Louis Koo",
        "Urls": [
          "www.imdb.com/name/nm0465503"
        ],
        "id": "cI0S5t"
      }
    ]
  },
  {
    "filename": "hkstar1.jpg",
    "celebrities": [
      {
        "confidence": 100,
        "name": "Aaron Kwok",
        "Urls": [
          "www.imdb.com/name/nm0477209"
        ],
        "id": "2Bf8fx3l"
      },
      {
        "confidence": 100,
        "name": "Andy Lau",
        "Urls": [
          "www.imdb.com/name/nm0490489"
        ],
        "id": "4yY8fQ"
      },
      {
        "confidence": 100,
        "name": "Leon Lai",
        "Urls": [
          "www.imdb.com/name/nm0481709"
        ],
        "id": "31Uz1a"
      }
    ]
  }
]
```

```
[
  {
    "filename": "hkf2.jpg",
    "celebrities": []
  },
  {
    "filename": "hkstar1.jpg",
    "celebrities": []
  }
]
```

/celebrities?conf=98	 `{ "Louis Koo": [{ "filename": "hkf2.jpg", "confidence": 99, "Urls": ["www.imdb.com/name/nm0465503"], "id": "cI0S5t" }], "Andy Lau": [{ "filename": "hkstar1.jpg", "confidence": 100, "Urls": ["www.imdb.com/name/nm0490489"], "id": "4yY8fQ" }], "Leon Lai": [{ "filename": "hkstar1.jpg", "confidence": 100, "Urls": ["www.imdb.com/name/nm0481709"], "id": "31Uz1a" }], "Aaron Kwok": [{ "filename": "hkstar1.jpg", "confidence": 100, "Urls": ["www.imdb.com/name/nm0477209"], "id": "2Bf8fx3l" }] }`	- An empty dictionary {} should be returned if no celebrity has found to have the required confidence in any image
/ celebrities/Andy%20Lau?conf=98	 `{ "files": [ { "filename": "hkstar1.jpg", "celebrity_name": "Andy Lau", "confidence": 100, "Urls": [ "www.imdb.com/name/nm0490489" ], "id": "4yY8fQ" } ] }`	- If no image has found to contain the celebrity with the required confidence, the API should return 404 HTTP status code. `{ "Error": "Celebrity not found" }`

Appendix

Sample JSON object returned by AWS rekognition service for `hkstar1.jpg`.

```
{'CelebrityFaces': [{'Face': {'BoundingBox': {'Height': 0.25333333015441895,
                                              'Left': 0.7668750286102295,
                                              'Top': 0.1133333370089531,
                                              'Width': 0.14249999821186066},
                              'Confidence': 99.99979400634766,
                              'Landmarks': [{'Type': 'eyeLeft',
                                             'X': 0.8073047399520874,
                                             'Y': 0.22322264313697815},
                                            {'Type': 'eyeRight',
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