

COEN 241: Cloud Computing

Homework 2 (Your Own Serverless Infrastructure)

Tasks:

- Provide a screenshot of invoking the figlet function

Deploying figlet:

```
ssingla@sparallels:~ (11.311s)
faas-cli store deploy figlet

Function figlet already exists, attempting rolling-update.

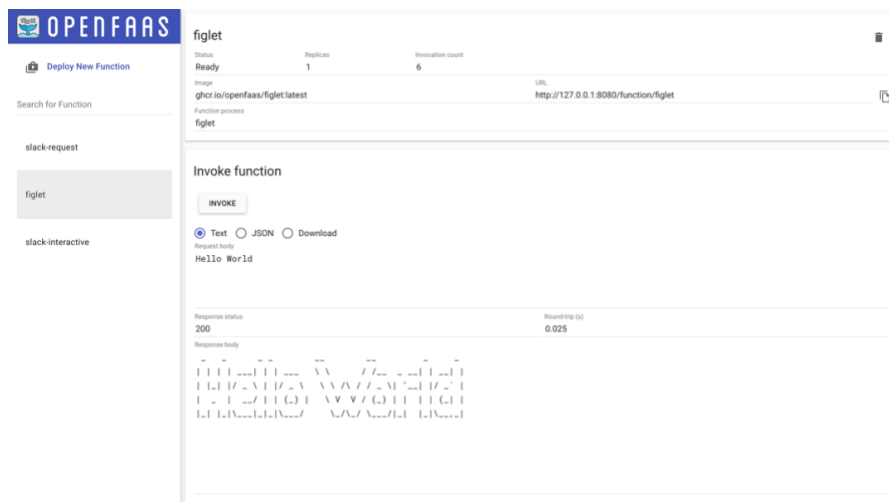
Deployed. 200 OK.
URL: http://127.0.0.1:8080/function/figlet
```

Invoking through command line:

```
ssingla@sparallels:~ (0.047s)
echo "Hello, FaaS, world" | faas-cli invoke figlet

Hello, FaaS, world
```

Invoking through OpenFaaS UI:



- Provide a screenshot of running the following command

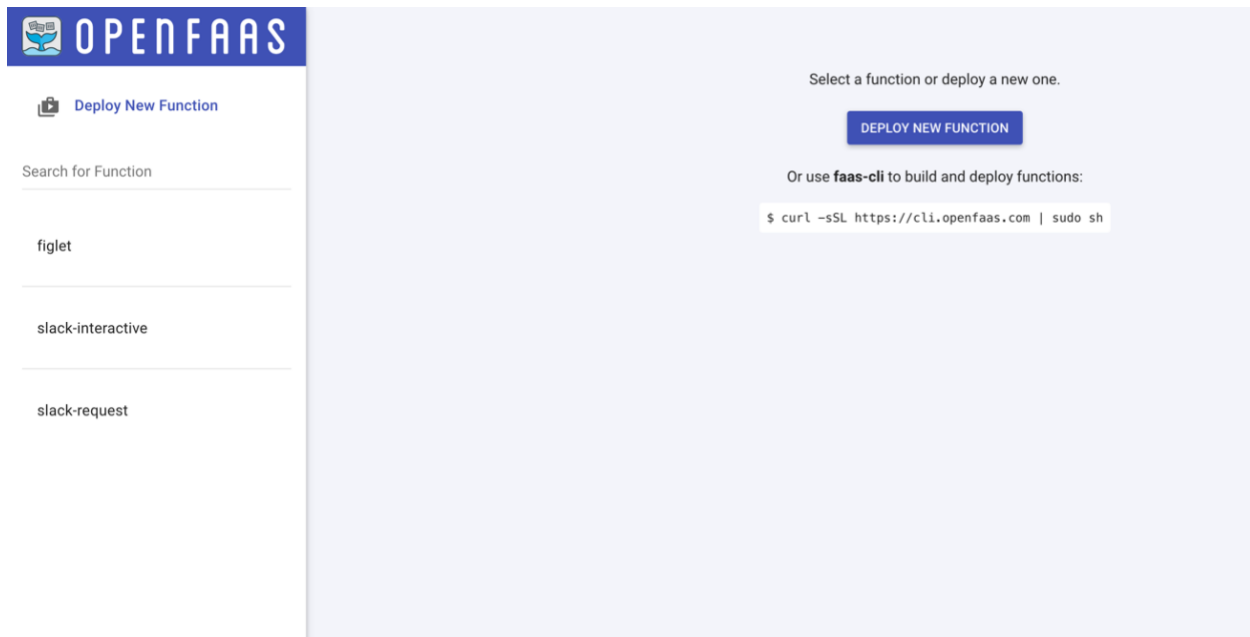
```
sudo journalctl -u faasd --lines 40
```

It shows the log entries of faasd

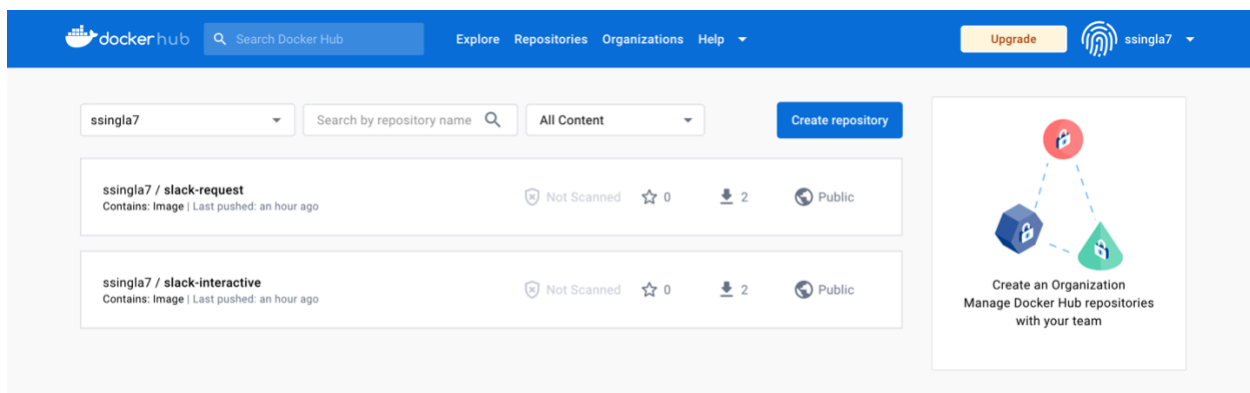
```
ssingla@sparallels:~ (2.215s)
sudo journalctl -u faasd --lines 40
[sudo] password for ssingla:
Feb 15 02:12:24 sparallels faasd[675]: 2023/02/15 02:12:24 - gateway
Feb 15 02:12:24 sparallels faasd[675]: 2023/02/15 02:12:24 - queue-worker
Feb 15 02:12:24 sparallels faasd[675]: Starting: prometheus
Feb 15 02:12:24 sparallels faasd[675]: Creating local directory: /var/lib/faasd/prometheus
Feb 15 02:12:24 sparallels faasd[675]: 2023/02/15 02:12:24 Running prometheus with user: "65534"
Feb 15 02:12:24 sparallels faasd[675]: 2023/02/15 02:12:24 Created container: prometheus
Feb 15 02:12:25 sparallels faasd[675]: 2023/02/15 02:12:25 prometheus has IP: 10.62.0.2
Feb 15 02:12:25 sparallels faasd[675]: 2023/02/15 02:12:25 Task: prometheus          Container: prometheus
Feb 15 02:12:25 sparallels faasd[675]: Starting: basic-auth-plugin
Feb 15 02:12:25 sparallels faasd[675]: 2023/02/15 02:12:25 Created container: basic-auth-plugin
Feb 15 02:12:25 sparallels faasd[675]: 2023/02/15 02:12:25 basic-auth-plugin has IP: 10.62.0.3
Feb 15 02:12:25 sparallels faasd[675]: 2023/02/15 02:12:25 Task: basic-auth-plugin    Container: basic-auth-plugin
Feb 15 02:12:25 sparallels faasd[675]: Starting: nats
Feb 15 02:12:25 sparallels faasd[675]: Creating local directory: /var/lib/faasd/nats
Feb 15 02:12:25 sparallels faasd[675]: 2023/02/15 02:12:25 Running nats with user: "65534"
Feb 15 02:12:25 sparallels faasd[675]: 2023/02/15 02:12:25 Created container: nats
Feb 15 02:12:25 sparallels faasd[675]: 2023/02/15 02:12:25 nats has IP: 10.62.0.4
Feb 15 02:12:25 sparallels faasd[675]: 2023/02/15 02:12:25 Task: nats              Container: nats
Feb 15 02:12:25 sparallels faasd[675]: Starting: gateway
Feb 15 02:12:25 sparallels faasd[675]: 2023/02/15 02:12:25 Created container: gateway
Feb 15 02:12:26 sparallels faasd[675]: 2023/02/15 02:12:26 gateway has IP: 10.62.0.5
Feb 15 02:12:26 sparallels faasd[675]: 2023/02/15 02:12:26 Task: gateway          Container: gateway
Feb 15 02:12:26 sparallels faasd[675]: Starting: queue-worker
Feb 15 02:12:26 sparallels faasd[675]: 2023/02/15 02:12:26 Created container: queue-worker
Feb 15 02:12:26 sparallels faasd[675]: 2023/02/15 02:12:26 queue-worker has IP: 10.62.0.6
Feb 15 02:12:26 sparallels faasd[675]: 2023/02/15 02:12:26 Task: queue-worker      Container: queue-worker
Feb 15 02:12:26 sparallels faasd[675]: 2023/02/15 02:12:26 Supervisor init done in: 1 second
Feb 15 02:12:26 sparallels faasd[675]: 2023/02/15 02:12:26 Looking up IP for: "gateway"
Feb 15 02:12:26 sparallels faasd[675]: 2023/02/15 02:12:26 Resolver rebuilding map
Feb 15 02:12:26 sparallels faasd[675]: 2023/02/15 02:12:26 Resolver: "localhost"="127.0.0.1"
Feb 15 02:12:26 sparallels faasd[675]: 2023/02/15 02:12:26 Resolver: "faasd-provider"="10.62.0.1"
Feb 15 02:12:26 sparallels faasd[675]: 2023/02/15 02:12:26 Resolver: "prometheus"="10.62.0.2"
Feb 15 02:12:26 sparallels faasd[675]: 2023/02/15 02:12:26 Resolver: "basic-auth-plugin"="10.62.0.3"
Feb 15 02:12:26 sparallels faasd[675]: 2023/02/15 02:12:26 Resolver: "nats"="10.62.0.4"
Feb 15 02:12:26 sparallels faasd[675]: 2023/02/15 02:12:26 Resolver: "gateway"="10.62.0.5"
Feb 15 02:12:26 sparallels faasd[675]: 2023/02/15 02:12:26 Resolver: "queue-worker"="10.62.0.6"
Feb 15 02:12:26 sparallels faasd[675]: 2023/02/15 02:12:26 Looking up IP for: "prometheus"
Feb 15 02:12:26 sparallels faasd[675]: 2023/02/15 02:12:26 Proxy from: 127.0.0.1:9090, to: prometheus:9090 (10.62.0.2)
Feb 15 02:12:26 sparallels faasd[675]: 2023/02/15 02:12:26 faasd: waiting for SIGTERM or SIGINT
Feb 15 02:12:26 sparallels faasd[675]: 2023/02/15 02:12:26 Proxy from: 0.0.0.0:8080, to: gateway:8080 (10.62.0.5)
```

- Provide a screenshot of your OpenFaaS gateway AFTER deploying figlet, slack-handler and slack-interactive functions

OpenFaaS Gateway, available at <http://127.0.0.1:8080> by default. It shows list of all the deployed functions on the OpenFaaS



Functions deployed can also be seen in Docker hub dashboard



- Provide a screenshot of invoking slack-request and slack-interactive functions


1. slack-request

a) Invoking function through OpenFaaS CLI

```
ssingla@sparallels:~ (0.098s)
echo "Hello World" | faas-cli invoke slack-request

{"text": "Serverless Message", "attachments": [{"fields": [{"short": true, "value": "100", "title": "Amazing Level"}], "author_icon": "", "image_url": "https://avatars.githubusercontent.com/u/49471018?s=400&v=4", "author_name": "Shubham Singla", "title": "The Awesome world of Cloud Computing! COEN 241"}, {"text": "COEN 241 is the most awesome class ever!.", "title": "About COEN 241"}, {"text": "Would you recommend COEN 241 to your friends?", "color": "#3AA3E3", "actions": [{"text": "Of Course!", "type": "button", "name": "recommend", "value": "recommend"}, {"text": "Most Definitely!", "type": "button", "name": "definitely", "value": "definitely"}], "callback_id": "response123", "fallback": "Would you recommend COEN 241 to your friends?", "attachment_type": "default"}]}
```

b) Invoking function through OpenFaaS UI

 **OPENFAAS**

[Deploy New Function](#)

Search for Function

[slack-interactive](#)

[figlet](#)

[slack-request](#)

slack-request

Status	Ready	Replicas	1	Invocation count	3	
Image	docker.io/ssingla7/slack-request:latest				URL	http://127.0.0.1:8080/function/slack-request
Function process	python index.py					

Invoke function

☒ Text ☐ JSON ☐ Download

Request body

John

Response status

200

Round-trip (s)

0.074

Response body

{
 "text": "Serverless Message",
 "attachments": [
 {
 "fields": [
 {
 "short": true,
 "value": "100",
 "title": "Amazing Level"
 }
],
 "author_icon": "",
 "image_url": "https://avatars.githubusercontent.com/u/49471018?s=400&v=4",
 "author_name": "Shubham Singla",
 "title": "The Awesome world of Cloud Computing! COEN 241"
 },
 {
 "text": "COEN 241 is the most awesome class ever!.",
 "title": "About COEN 241"
 },
 {
 "title": "Would you recommend COEN 241 to your friends?",
 "color": "#3AA3E3",
 "actions": [
 {
 "text": "Of Course!",
 "type": "button",
 "name": "recommend",
 "value": "recommend"
 },
 {
 "text": "Most Definitely!",
 "type": "button",
 "name": "definitely",
 "value": "definitely"
 }
],
 "callback_id": "response123",
 "fallback": "Would you recommend COEN 241 to your friends?",
 "attachment_type": "default"
 }
]
}


2. slack-interactive

a) Invoking function through OpenFaaS CLI

```
ssingla@parallels:~ (0.127s)
echo '{"Name":"John"}' | faas-cli invoke slack-interactive

{"attachments": [{"footer": "Slack Apps built on OpenFaas", "author_link": "https://github.com/shubhamsingla27/COEN241_CloudComputing.git", "color": "#36a64f", "text": "Head over to COEN 241", "title": "COEN 241", "ts": 123456789, "author_name": "", "title_link": "https://www.scu.edu/engineering/academic-programs/department-of-computer-engineering/graduate/course-descriptions/", "image_url": "https://www.scu.edu/media/offices/umc/scu-brand-guidelines/visual-identity-amp-photography/visual-identity-toolkit/logos-amp-seals/Mission-Dont3.png", "response_type": "ephemeral", "replace_original": true, "footer_icon": "https://a.slack-edge.com/45901/marketing/img/_rebrand/meta/slack_hash_256.png", "pretext": "Ahh yeah! Great choice, COEN 241 is absolutely amazing!", "fallback": "Required plain-text summary of the attachment.", "thumb_url": "https://www.scu.edu/engineering/academic-programs/department-of-computer-engineering/graduate/course-descriptions/", "author_icon": "https://avatars.githubusercontent.com/u/49471018?s=400&v=4"}]}
```

b) Invoking function through OpenFaaS UI

**OPENFAAS**

[Deploy New Function](#)

Search for Function

slack-interactive

figlet

slack-request

slack-interactive

Status	Replicas	Invocation count
Ready	1	10

Image
docker.io/ssingla7/slack-interactive:latest

Function process
python index.py

URL
http://127.0.0.1:8080/function/slack-interactive

Invoke function

☐ Text ☒ JSON ☐ Download

Request body
{
 "Name": "John"
}

Response status
200

Round trip (s)
0.112

Response body
{
 "attachments": [
 {
 "footer": "Slack Apps built on OpenFaas",
 "author_link": "https://github.com/shubhamsingla27/COEN241_CloudComputing.git",
 "color": "#36a64f",
 "text": "Head over to COEN 241",
 "title": "COEN 241",
 "ts": 123456789,
 "author_name": "",
 "title_link": "https://www.scu.edu/engineering/academic-programs/department-of-computer-engineering/graduate/course-descriptions/",
 "image_url": "https://www.scu.edu/media/offices/umc/scu-brand-guidelines/visual-identity-amp-photography/visual-identity-toolkit/logos-amp-seals/Mission-Dont3.png",
 "response_type": "ephemeral",
 "replace_original": true,
 "footer_icon": "https://a.slack-edge.com/45901/marketing/img/_rebrand/meta/slack_hash_256.png",
 "pretext": "Ahh yeah! Great choice, COEN 241 is absolutely amazing!",
 "fallback": "Required plain-text summary of the attachment.",
 "thumb_url": "https://www.scu.edu/engineering/academic-programs/department-of-computer-engineering/graduate/course-descriptions/",
 "author_icon": "https://avatars.githubusercontent.com/u/49471018?s=400&v=4"
 }
]
}

Questions:

1. What is the command to invoke the slack-request function?

a. Via Curl

Ans. `curl http://127.0.0.1:8080/function/slack-request --data 'Hello World'`

b. Via faas-cli

Ans. `echo "Hello World" | faas-cli invoke slack-request`

2. What is the output you see when you invoke the slack-request function?

Ans. We see the JSON response as returned by the slack-request/handler.py python file

```
ssingla@sparallels:~ (0.195s)
curl http://127.0.0.1:8080/function/slack-request --data 'Hello World'
{"text": "Serverless Message", "attachments": [{"fields": [{"short": true, "value": "100", "title": "Amazing Level"}], "author_icon": "", "image_url": "https://avatars.githubusercontent.com/u/49471018?s=400&v=4", "author_name": "Shubham Singla", "title": "The Awesome world of Cloud Computing! COEN 241"}, {"text": "COEN 241 is the most awesome class ever!.", "title": "About COEN 241"}, {"title": "Would you recommend COEN 241 to your friends?", "color": "#3AA3E3", "actions": [{"text": "Of Course!", "type": "button", "name": "recommend", "value": "recommend"}, {"text": "Most Definitely!", "type": "button", "name": "definitely", "value": "definitely"}], "callback_id": "response123", "fallback": "Would you recommend COEN 241 to your friends?", "attachment_type": "default"}]}
```

```
ssingla@sparallels:~ (0.098s)
echo "Hello World" | faas-cli invoke slack-request
{"text": "Serverless Message", "attachments": [{"fields": [{"short": true, "value": "100", "title": "Amazing Level"}], "author_icon": "", "image_url": "https://avatars.githubusercontent.com/u/49471018?s=400&v=4", "author_name": "Shubham Singla", "title": "The Awesome world of Cloud Computing! COEN 241"}, {"text": "COEN 241 is the most awesome class ever!.", "title": "About COEN 241"}, {"title": "Would you recommend COEN 241 to your friends?", "color": "#3AA3E3", "actions": [{"text": "Of Course!", "type": "button", "name": "recommend", "value": "recommend"}, {"text": "Most Definitely!", "type": "button", "name": "definitely", "value": "definitely"}], "callback_id": "response123", "fallback": "Would you recommend COEN 241 to your friends?", "attachment_type": "default"}]}
```

3. What is the command to invoke the slack-interactive function?

a. Via Curl

Ans. `curl http://127.0.0.1:8080/function/slack-interactive --data '{"Name": "John"}'`

b. Via faas-cli

Ans. `echo '{"Name": "John"}' | faas-cli invoke slack-interactive`

4. What is the output you see when you invoke the slack-interactive function?

Ans. We see the JSON response as returned by the slack-interactive/handler.py python file

```
ssingla@sparallels:~ (0.129s)
curl http://127.0.0.1:8080/function/slack-interactive --data '{"Name":"John"}'
{"attachments": [{"footer": "Slack Apps built on OpenFaas", "author_link": "https://github.com/shubhamsingla27/COEN241_CloudComputing.git", "color": "#36a64f", "text": "Head over to COEN 241", "title": "COEN 241", "ts": 123456789, "author_name": "", "title_link": "https://www.scu.edu/engineering/academic-programs/department-of-computer-engineering/graduate/course-descriptions/", "image_url": "https://www.scu.edu/media/offices/umc/scu-brand-guidelines/visual-identity-amp-photography/visual-identity-toolkit/logos-amp-seals/Mission-Dont3.png", "response_type": "ephemeral", "replace_original": true, "footer_icon": "https://a.slack-edge.com/45901/marketing/img/_rebrand/meta/slack_hash_256.png", "pretext": "Ahh yeah! Great choice, COEN 241 is absolutely amazing!", "fallback": "Required plain-text summary of the attachment.", "thumb_url": "https://www.scu.edu/engineering/academic-programs/department-of-computer-engineering/graduate/course-descriptions/", "author_icon": "https://avatars.githubusercontent.com/u/49471018?s=400&v=4"}]}
```

```
ssingla@sparallels:~ (0.127s)
echo '{"Name":"John"}' | faas-cli invoke slack-interactive
{"attachments": [{"footer": "Slack Apps built on OpenFaas", "author_link": "https://github.com/shubhamsingla27/COEN241_CloudComputing.git", "color": "#36a64f", "text": "Head over to COEN 241", "title": "COEN 241", "ts": 123456789, "author_name": "", "title_link": "https://www.scu.edu/engineering/academic-programs/department-of-computer-engineering/graduate/course-descriptions/", "image_url": "https://www.scu.edu/media/offices/umc/scu-brand-guidelines/visual-identity-amp-photography/visual-identity-toolkit/logos-amp-seals/Mission-Dont3.png", "response_type": "ephemeral", "replace_original": true, "footer_icon": "https://a.slack-edge.com/45901/marketing/img/_rebrand/meta/slack_hash_256.png", "pretext": "Ahh yeah! Great choice, COEN 241 is absolutely amazing!", "fallback": "Required plain-text summary of the attachment.", "thumb_url": "https://www.scu.edu/engineering/academic-programs/department-of-computer-engineering/graduate/course-descriptions/", "author_icon": "https://avatars.githubusercontent.com/u/49471018?s=400&v=4"}]}
```

5. How would you pass different arguments to the functions?

Ans. To pass different argument to the functions, in the curl command, we can change the string passed to the data flag, and, for faas-cli, we can change the stdin by changing the string passed with echo which is then piped to the command itself.

Example:

```
$ curl http://127.0.0.1:8080/function/function_name --data <string>
```

```
$ echo <string> | faas-cli invoke function_name
```

Note: <string> can be a type of JSON object as well.

6. How would you change the slack-interactive function to react to different inputs?

Ans. We can modify the slack-interactive function to take input as ****kwargs** which is equivalent to taking in the list of arguments like command-line arguments and handle it appropriately inside the function.

Other way is we can take in string input and parse it to JSON and process the information as required inside the function and return JSON as the response of the function.

Extra Credit:

To get a public routable address, I used [ngrok](https://ngrok.com).

```
ngrok (Ctrl+C to quit)

Add Okta or Azure to protect your ngrok dashboard with SSO: https://ngrok.com/dashSSO

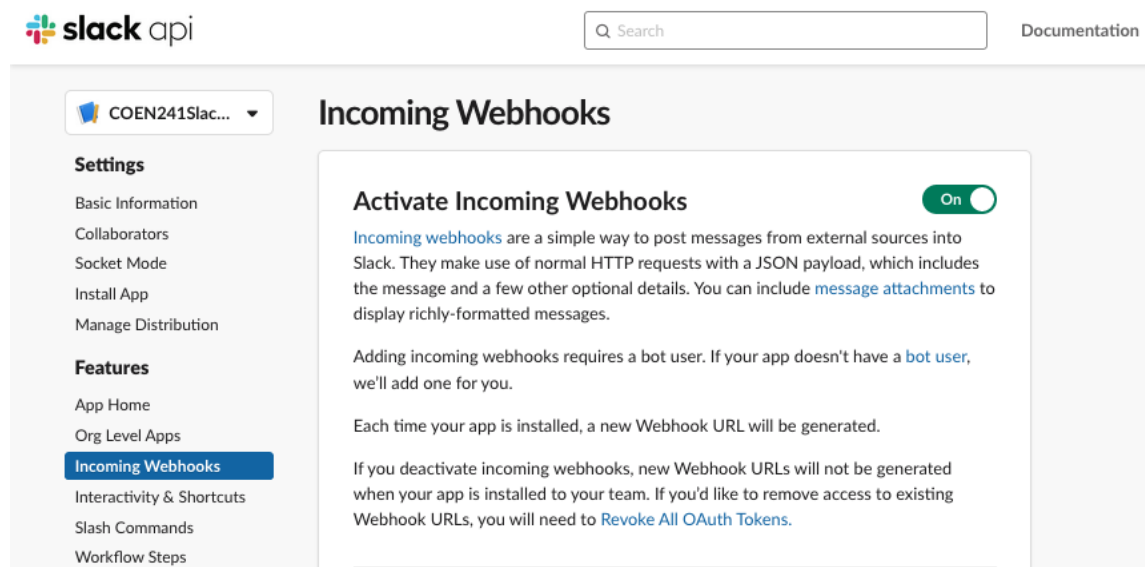
Session Status      online
Account             Shubham Singla (Plan: Free)
Version             3.1.1
Region              United States (us)
Latency             71ms
Web Interface       http://127.0.0.1:4040
Forwarding           https://b836-70-228-75-24.ngrok.io -> http://localhost:8080

Connections          ttl    opn    rt1    rt5    p50    p90
                   13     2      0.11   0.04   2.14   12.67

HTTP Requests
-----
GET /system/functions 200 OK
GET /system/functions 200 OK
GET /system/functions 200 OK
GET /system/functions 200 OK
GET /system/functions 200 OK
GET /system/functions 200 OK
GET /system/functions 200 OK
GET /system/functions 200 OK
GET /system/functions 200 OK
GET /system/functions 200 OK
```

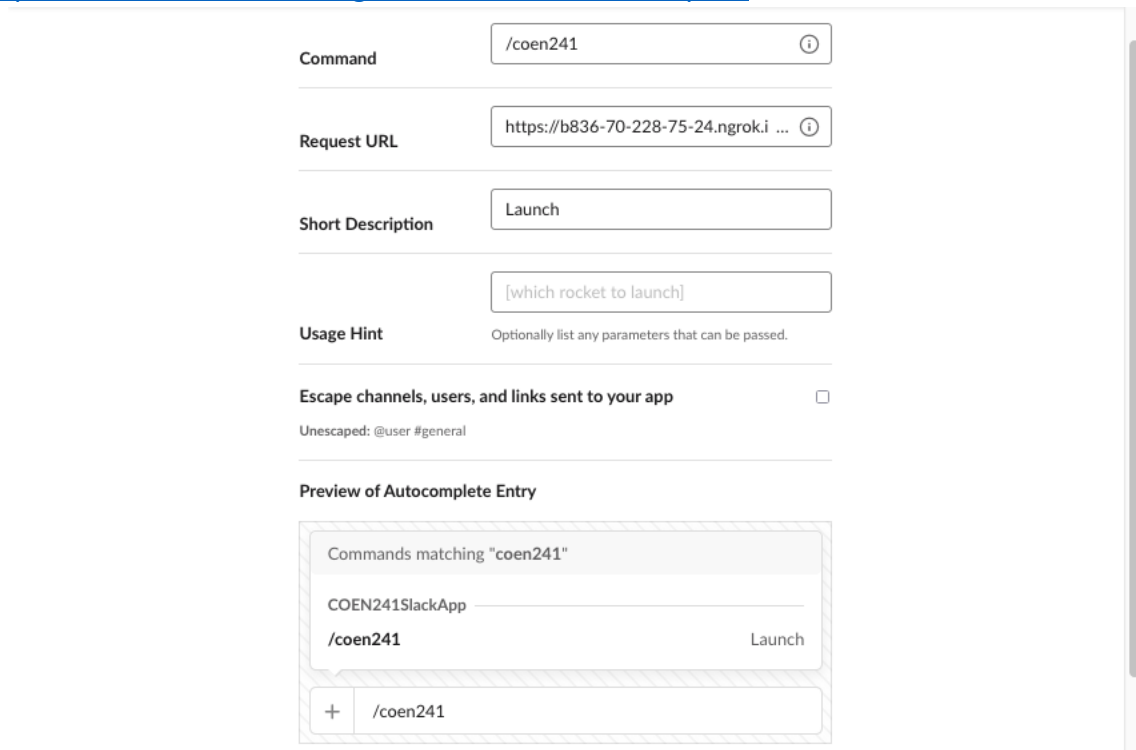
Steps to use our function as slack app are:

1. First head to <https://api.slack.com/apps>, select Create New App
2. Next go to Incoming Webhooks section, enable it, and then create a new webhook.



- Now head over to slash commands and create a new command, e.g., /coen241, and set the Request URL to the public endpoint of your function:

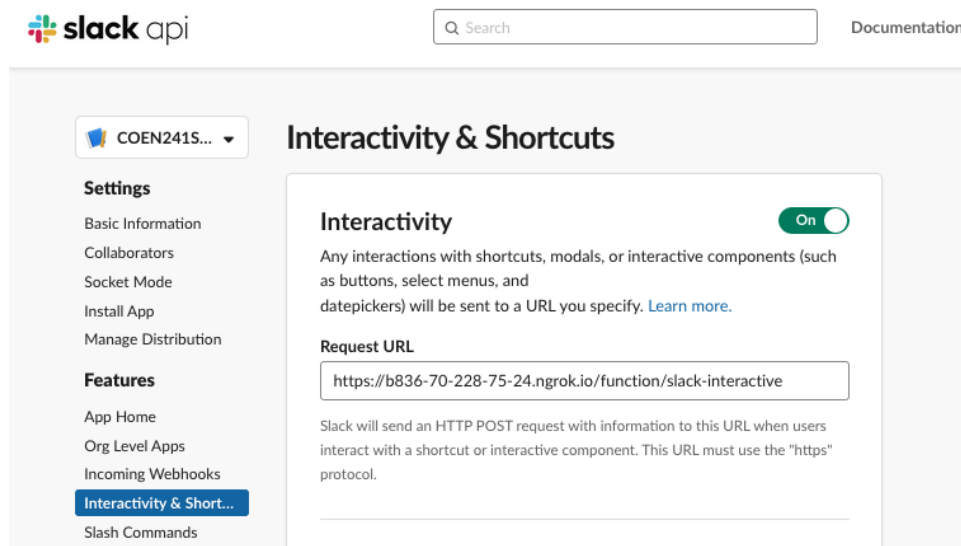
<https://b836-70-228-75-24.ngrok.io/function/slack-request>



The screenshot shows the Slack slash command configuration page. The 'Command' field is set to '/coen241'. The 'Request URL' field is set to 'https://b836-70-228-75-24.ngrok.i ...'. The 'Short Description' field is set to 'Launch'. Below this, there is a placeholder '[which rocket to launch]'. The 'Usage Hint' section is empty. The 'Escape channels, users, and links sent to your app' checkbox is unchecked. The 'Preview of Autocomplete Entry' shows a list of commands matching 'coen241', with the first entry being 'COEN241SlackApp' and the second entry being '/coen241' with the description 'Launch'.

- Next go to Interactivity & Shortcuts and set the request URL for interactivity:

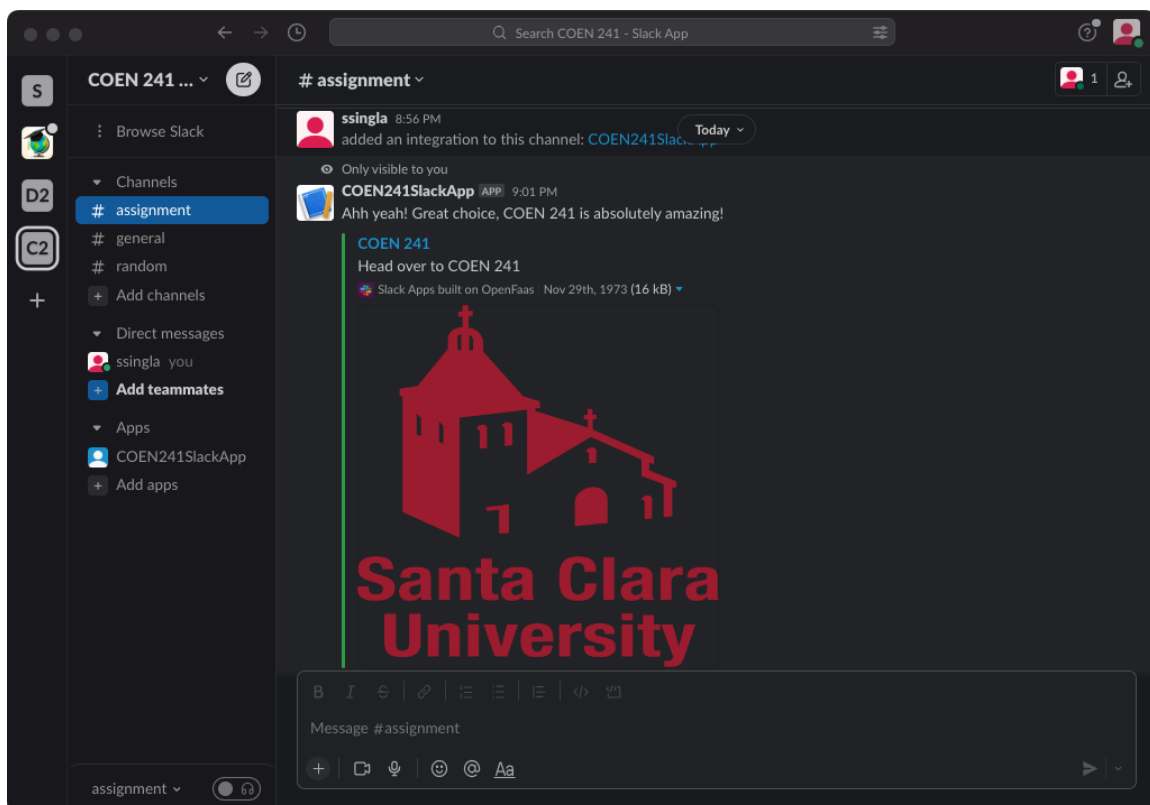
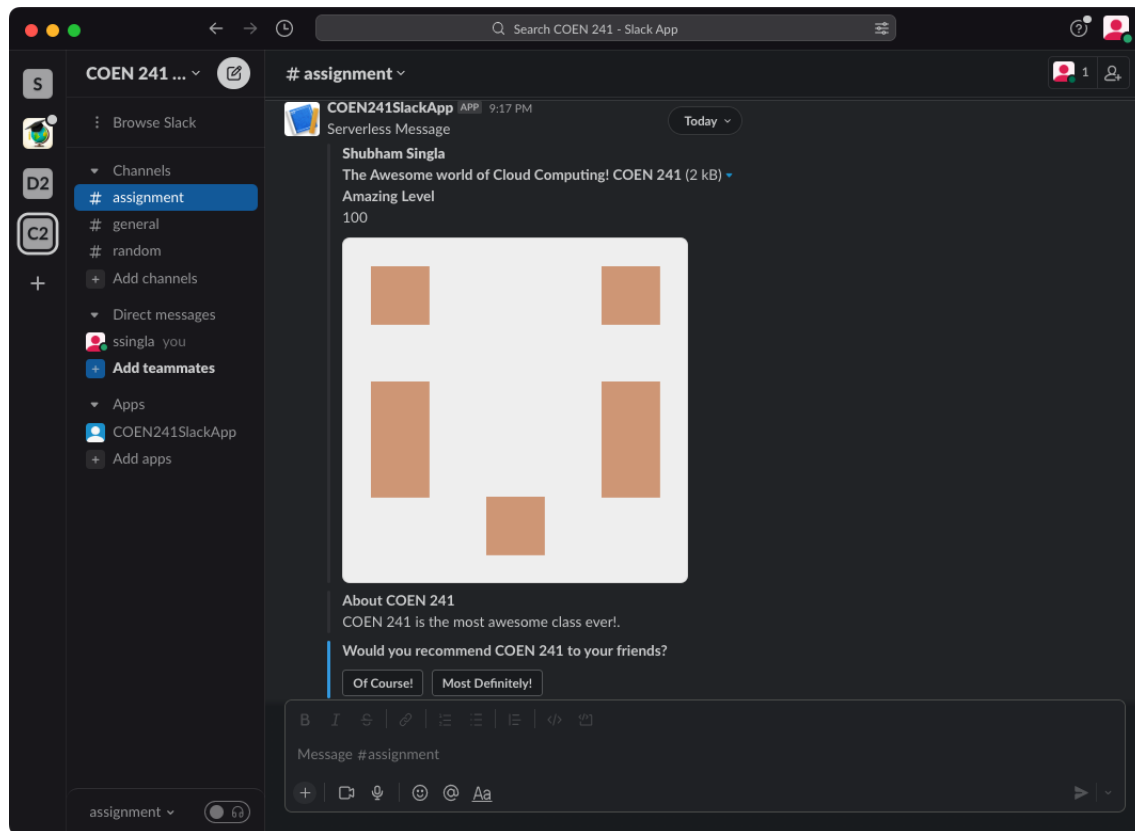
<https://b836-70-228-75-24.ngrok.io/function/slack-interactive>



The screenshot shows the Slack API 'Interactivity & Shortcuts' settings page. The 'Interactivity' toggle is turned 'On'. The 'Request URL' field is set to 'https://b836-70-228-75-24.ngrok.io/function/slack-interactive'. The page also includes a sidebar with 'Settings' and 'Features' sections, and a 'Documentation' link in the top right corner.

- Once this is done, you should be able to see the slash command integration in your slack workspace.

Slack App: (working screenshots)



Slack App: (Links to application)

Private URL: <https://app.slack.com/client/T04PGOCFK62/C04PR2HMMGC>

This URL will only work on my personal workspace.

Public Url:

https://slack.com/oauth/v2/authorize?client_id=4798012529206.4804615658626&scope=incoming-webhook,commands&user_scope=

For this, the redirect URL is set to google, so it will just redirect one to google.com when install app option is clicked. As there was no requirement to enable distribution, I skipped on this step.