I want to have a command line utility **installed**

So that I can deploy apps into cloud.gov

Why the `cf` CLI?

The Cloud Foundry (CF) command-line interface (CLI) is a multiplatform binary written in `Go` to interact with the CF API. The CLI provides:

- Automation
- Collaboration
- Corroboration

Lab 2: Install cloudfoundry tools and login to cloud.gov

Video timestamp 01:45

2.1 Select and install the appropriate installer for your computer:

Go to https://github.com/cloudfoundry/cli/releases and select an `Installer` for your system. Download and go through the installation steps.

On Macs, with Homebrew, you can use:

```
brew cask install cloudfoundry-cli
```

On Workspaces, `cf` CLI is already installed.

2.1 continued...

After the installer has finished, run the command:

```
> cf
```

and you should see a list of command options.

Check your work 2.1

You should see output similar the to the following:

```
PS /Users/peterburkholder> cf
cf version 6.26.0+9c9a261fd.2017-04-06, Cloud Foundry command line tool
Usage: cf [global options] command [arguments...] [command options]

Before getting started:
  config    login,l      target,t
  help,h    logout,lo

... [snip] ...
```

Video timestamp 02:51

2.2 Login to cloud.gov with the `cf` CLI

You'll enter the command below, and you'll be directed to an authentication URL.

```
    cf login --sso -a https://api.fr.cloud.gov
```

Confirm you're logged in by seeing the orgs you belong to:

```
    cf orgs
```

Video timestamp 03:25

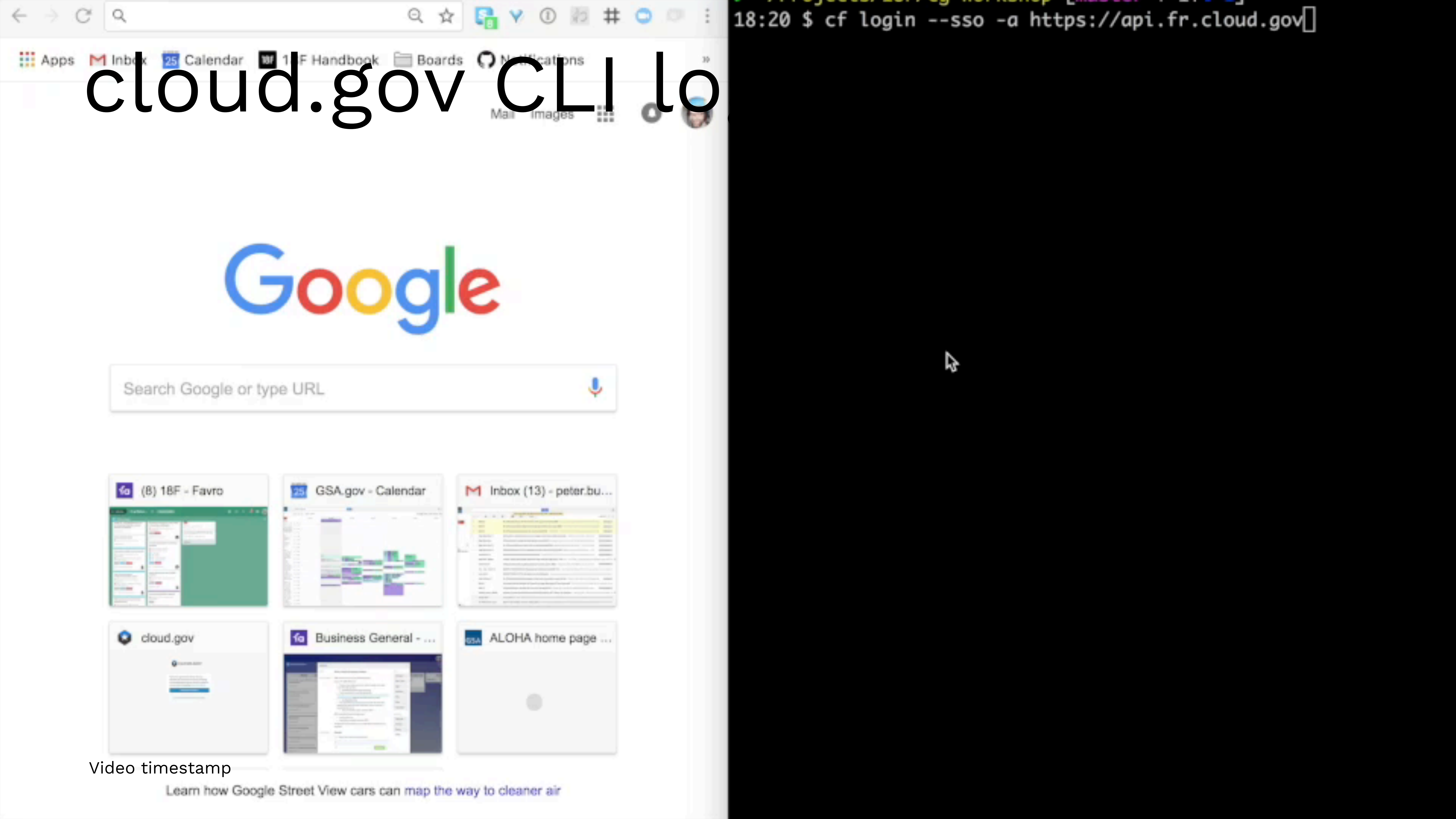
Check your work 2.2

```
> cf login --sso -a https://api.fr.cloud.gov
API endpoint: https://api.fr.cloud.gov

One Time Code ( Get one at https://login.fr.cloud.gov/passcode )>
```

Visit the URL https://login.fr.cloud.gov/passcode, complete the login to cloud.gov, and you'll get a one-time passcode. Copy/paste the passcode back into the CLI, as show in this 30s video

Video timestamp 04:27

cloud.gov CLI lo



```
18:20 $ cf login --sso -a https://api.fr.cloud.gov
```

Video timestamp

Check your work 2.2, continued

```
> cf orgs
Getting orgs as peter.burkholder@cao.gov...

name
sandbox-cao
```

Video timestamp 06:00

Further exploration

Once you have `cf orgs` working, try the following:

- `cf serviecs`: Auto-suggest on misspellings
- `cf help`: Explore other commands
  - `cf routes -h`: Explore modal help for commands
- `cf curl "/v2/spaces"`: Peek into the API internals[1]

[1] This is a peek at the guru-level view of Cloud Foundry. You'll not need this anytime soon.

Video timestamp 07:17

I want my website to be accessible at a public URL

So that the American people **can read it**

Video timestamp 09:41

Lab 3: Download workshop labs **and deploy a** static website **to** yourname**.app.cloud.gov**

Our simplest example. We'll get our lab materials, then use `cf push` to send the files to cloud.gov. Cloud.gov will package the site and start to serve it.

Video timestamp 10:00

3.1: Download labs

Mac/Linux shell:

```
cd $HOME
curl -Lo cgw.zip http://bit.ly/cgw-zip
unzip cgw.zip
cd cg-workshop-master
```

Windows Powershell:

```
cd $HOME
iwr -o cgw.zip https://bit.ly/cgw-zip
7z x cgz.zip   # If no 7zip, use File Explorer to unpack
cd cg-workshop-master
```

Check your work 3.1

Run `ls`. You should see output similar to the following:

```
PS D:\Users\cao.burkholder\cg-workshop-master> ls

    Directory: D:\Users\cao.burkholder\cg-workshop-master

Mode                LastWriteTime         Length Name
----                -------------         ------ ----
d-----        9/25/2017   9:13 PM                admin
d-----        9/25/2017   9:13 PM                images
d-----        9/25/2017   9:13 PM                lab01-setup
d-----        9/25/2017   9:13 PM                lab03-site
d-----        9/26/2017  10:49 PM                lab04-app
d-----        9/26/2017  10:49 PM                lab05-state
...
```

Video timestamp 11:57

Lab 3.2: Deploy static website

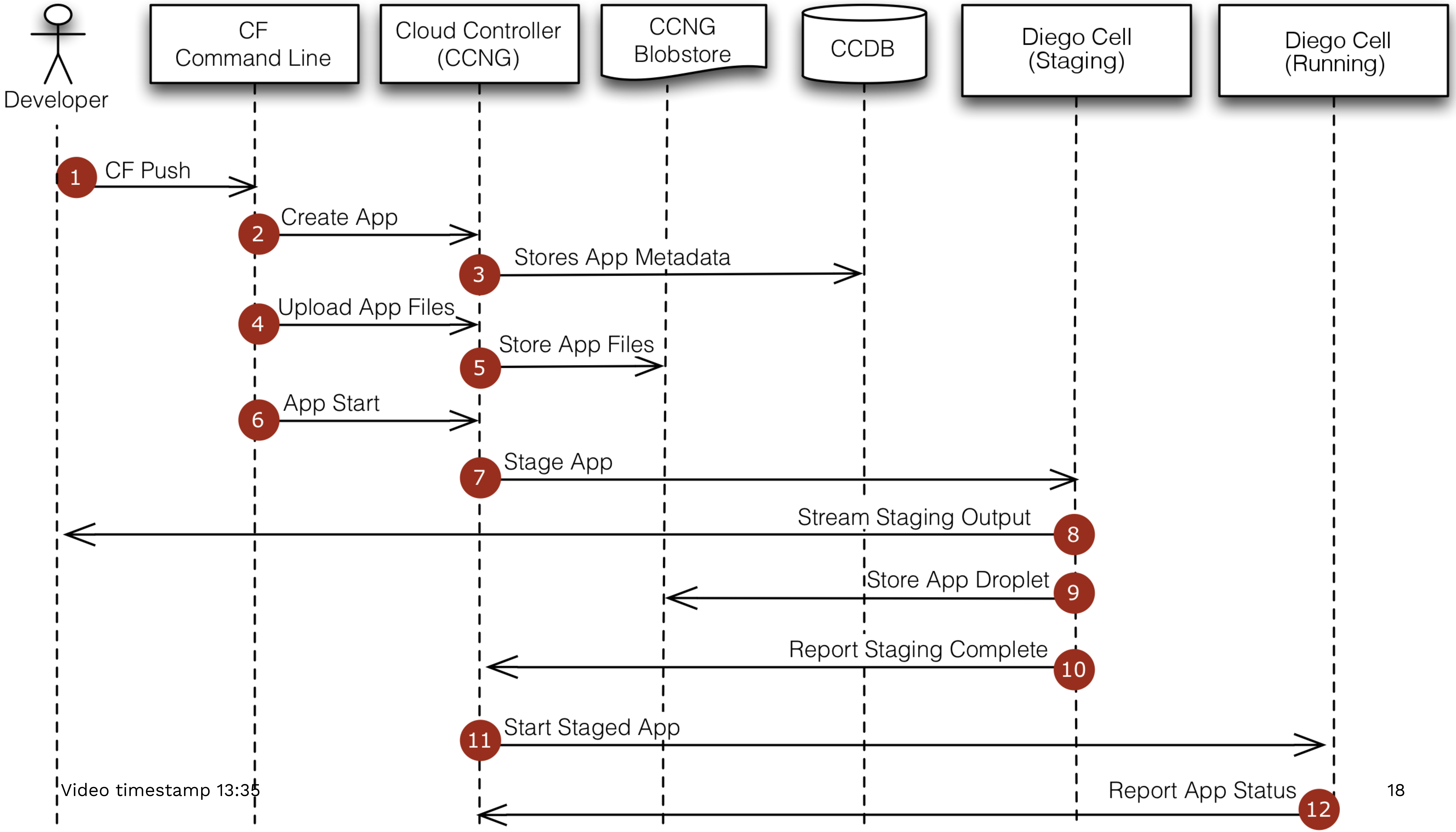
Don't literally use myfname-lname below. Use your own name like, jane-doe:

```
cf push -f lab03-site/manifest.yml myfname-lname
```

Video timestamp 12:24

What happens when I `cf push`? (v1.0)

- Upload: Files are sent to CF for new app myfname-lname
  - `-f lab-03-site/manifest.yml` is a deployment manifest
- Staging:
  - Artifact is created (droplet)
- Running:
  - A route is created to the app



Developer

CF Command Line

Cloud Controller (CCNG)

CCNG Blobstore

CCDB

Diego Cell (Staging)

Diego Cell (Running)

1 CF Push

2 Create App

3 Stores App Metadata

4 Upload App Files

5 Store App Files

6 App Start

7 Stage App

8 Stream Staging Output

9 Store App Droplet

10 Report Staging Complete

11 Start Staged App

12 Report App Status

Check your work 3.2

The `cf push` results should resemble:

```
$ cf push -f lab03-site/manifest.yml peter-burkholder
Creating app peter-burkholder in org s-cao / space p.burk...
OK
Uploading peter-burkholder...
... [snip]...
rrequested state: started
instances: 1/1
usage: 16M x 1 instances
urls: peter-burkholder.app.cloud.gov
last uploaded: Tue Sep 26 14:27:12 UTC 2017
stack: cflinuxfs2
buildpack: staticfile

     state     since                    cpu    memory        disk          details
#0   running   2017-09-26 10:27:29 AM   0.0%   3.9M of 16M   6.2M of 32M
```

Video timestamp 14:37

Check your work 3.2, continued

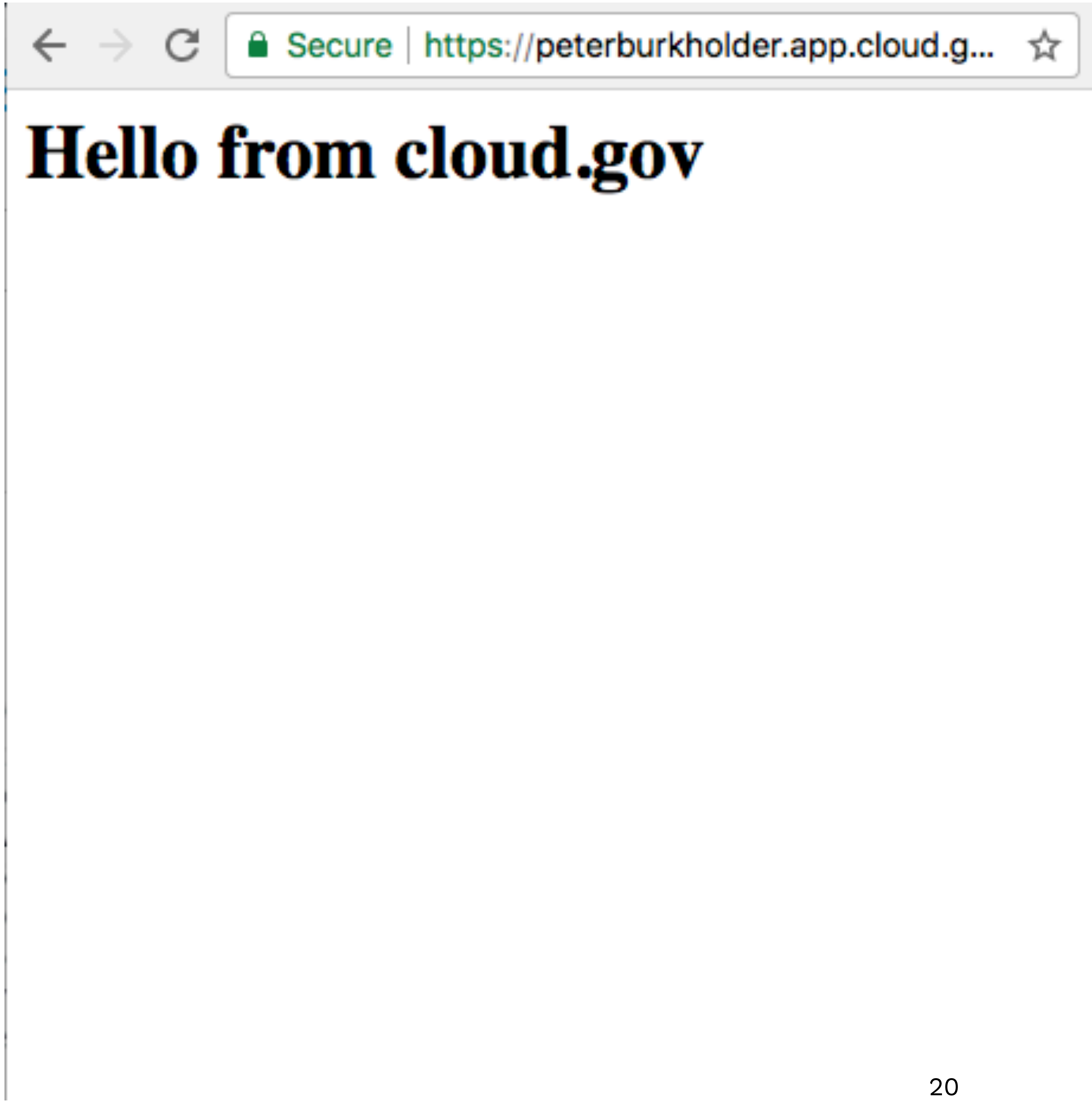
Now try accessing your site at

https://fname-lname.app.cloud.gov

(If you care to try from command line…):

```
> curl https://fname-lname.app.cloud.gov
<body>
  <h1>Hello from cloud.gov</h1>
</body/
```

Video timestamp 15:15



Hello from cloud.gov

Further exploration

When you can access your site, try the following:

- Try HTTP, e.g., `http://myfname-lname.app.cloud.gov`
  - Does it work? Is it secured?
- `cf app myfname-lname`
  - What info do you get about your app?
- `cf push -f lab03-site/manifest.yml --random-route myfname-lname`
  - What URL do you use now?

Video timestamp 15:27

BREAK BACK at 10:30 ET

We'll break so folks can catch up with:

— workstation setup

— account creation - can you login to: https://dashboard.fr.cloud.gov?

— CLI install - can you run?

```
cf
```

— labs download - can you ?

```
cd $HOME/cg-workshop-master
```

Video timestamp 15:48

I want to run a dynamic webapp

So that users can interact **with us**

Video timestamp 16:00

Lab 4: Sinatra Application

We'll use cf push again, but this time to stage and run a dynamic web application. We'll see how to use the manifest.yml to set deployment options.

The manifest provides application metadata to CloudFoundry. We use it for non-default settings so we don't have to always specify them on the command line, and we can bundle the manifest with the application.

Video timestamp 16:55

What happens when I cf push? (v2.0)

- Upload: **App** files are sent to CF for new app myfname-lname
- Staging:
  - **Executable** artifact is created (droplet)
  - **All build dependencies are bundled into droplet**
- Running:
  - A route is created to the **app** ~~site~~
  - ~~Site~~ **App** starts on an ~~web~~ **app** host

Video timestamp 17:56

Buildpacks create a runnable artifact called a droplet

App Files + Runtime Dependencies = App Artifact (droplet)

Apps are started on specialized VMs called cells

If it’s a web process, it binds to a TCP port.
Instances are distributed across multiple cells.
The Router distributes traffic across instances.

Video timestamp 18:35

Where does the app run?

```
                     CONSUMER

                        |

                      ROUTER

                      /    \
                     /      \
                    /        \
                   /          \

                CELL 1       CELL 2

                  |            |
APP A INSTANCE 1 -|            |- APP A INSTANCE 2
APP B INSTANCE 2 -|            |- APP B INSTANCE 1
```

Video timestamp 20:46

Lab 4.1: Review the deployment manifest

```
more lab04-app/manifest.yml
```

How much memory/disk are we saving compared to defaults of 512Mb RAM and 1024Mb disk quota?
<!-- CSEnd -->

Video timestamp 21:12

Check your work 4.1

The manifest should contain:

```
---
applications:
- name: cglab
  memory: 64m
  disk-quota: 128m
  random-route: true
#  buildpack: ruby_buildpack
```

All of us will have an app, cglab, but we can't all have it routed to https://cglab.app.cloud.gov. random-route will append random words to the URL.

Lab 4.2 Push the application

```
cf push -f lab04-app/manifest.yml cglab
```

Video timestamp 22:06

Check your work 4.2, 1/3

The cf push results should resemble those below. Note all the buildpacks (and use of buildpack detection)

```
$ cf push -f lab04-app/manifest.yml cglab
Using manifest file lab04-app/manifest.yml cglab
... [snip] ...
Starting app cglab in org sandbox-cao / space peter.burkholder as peter.burkholder@cao.gov...
Downloading nodejs_buildpack...
Downloading php_buildpack...
Downloading dotnet_core_buildpack...
Downloading java_buildpack...
Downloaded ruby_buildpack (81.6K)
... [snip] ...
```

Video timestamp 22:19

check your work 4.2, continued 2/3

The cf push output should resemble what's below. Note the highlighted `urls`. Since we use `random-route` the URL here is https:/cglab-confessable-pardner.app.cloud.gov

```
...
instances: 1/1
usage: 64M x 1 instances
urls: cglab-confessable-pardner.app.cloud.gov
last uploaded: Thu Sep 21 01:48:46 UTC 2017
stack: cflinuxfs2
buildpack: ruby

     state     since                    cpu    memory      disk        details
#0   running   2017-09-20 09:49:19 PM   0.0%   0 of 64M   0 of 128M
```

Video timestamp 22:31

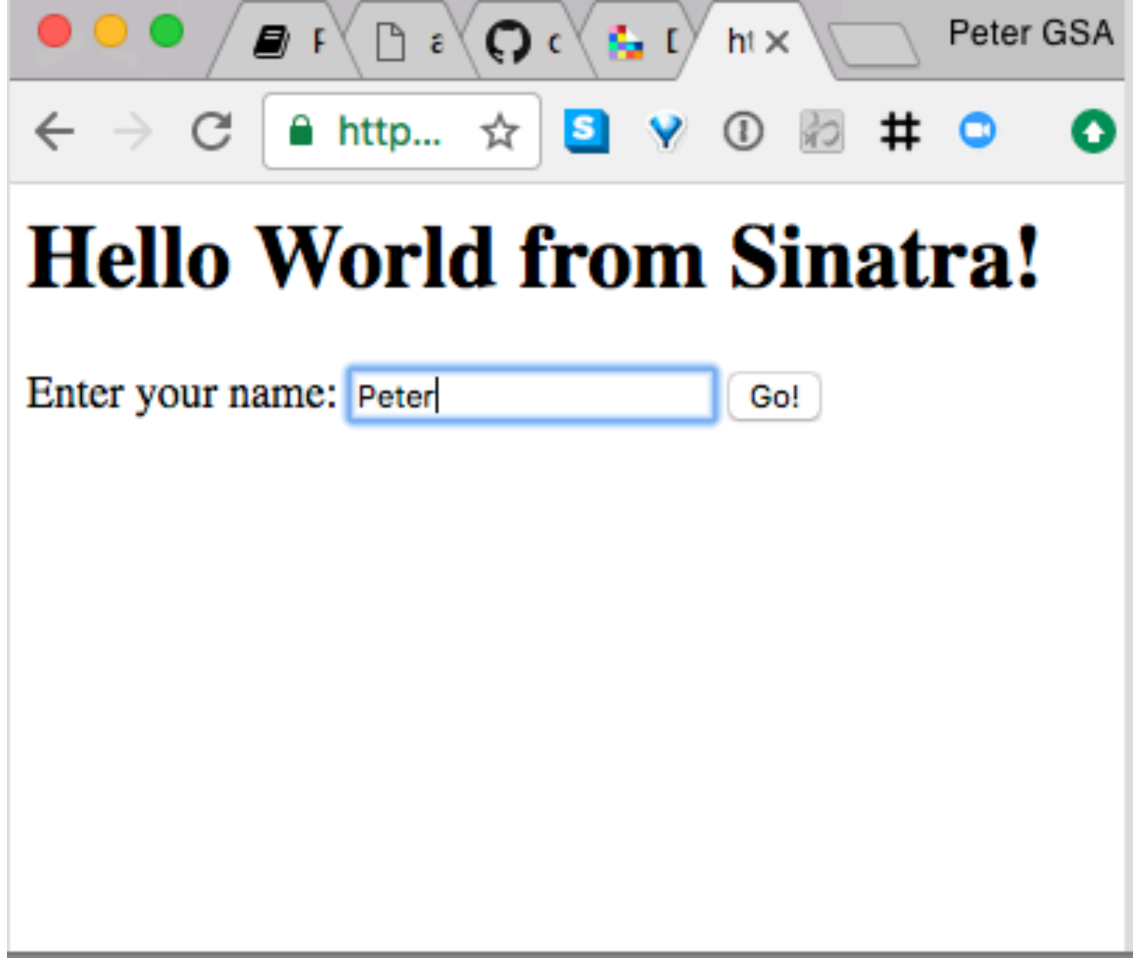
check your work 4.2, continued 3/3

Interact with the webpage at

https://cglab-RANDOM-WORDS.app.cloud.gov

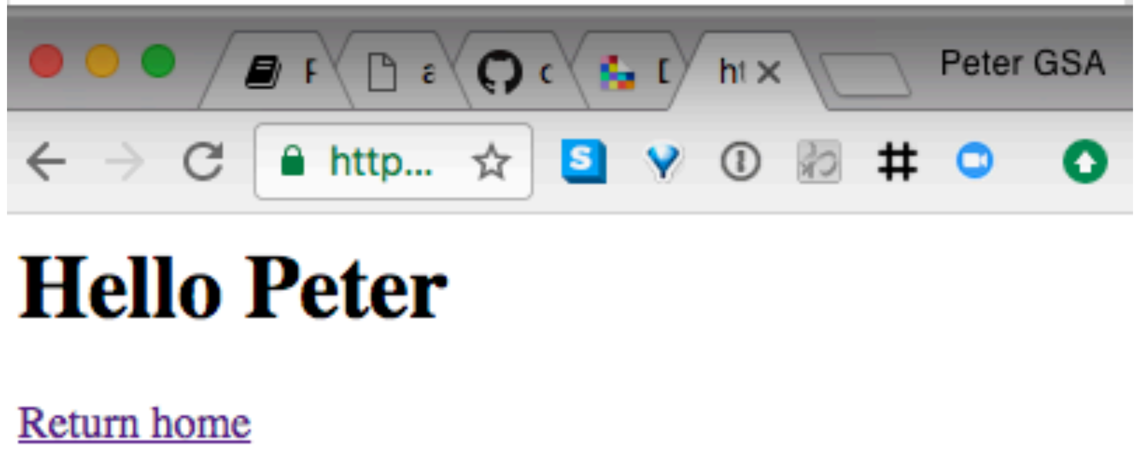
e.g.,

https:/cglab-confessable-pardner.app.cloud.gov



Hello World from Sinatra!

Enter your name: Peter Go!



Hello Peter

Return home

Video timestamp 22:41

Lab 4.3 Review the app status and health

Run:

```
    cf app cglab
```

How much memory and disk is it using?

<!-- CSEnd -->

Check your work 4.3

The cf app output should resemble:

Video timestamp 22:54

Further exploration

Once you've visited your app and viewed `cf app cglab`, try the following:

- Run `cf buildpacks`. What languages are available by default?
- Uncomment the `manifest.yml` line with `buildpack`, then run `cf push` and check status with `cf app cglab`. What's changed in staging or application status?
- Does the updated manifest change release time? Try `time cf push` (shell) or `Measure-Command {cf push}`

Video timestamp 23:38

I want to store data in a service

So that it is persistent and shared

Lab 5. I can share persistent data between app instances

First we'll see the services available to us in the marketplace, then use create-service to provision a simple Redis data store.

We'll then bind that service to our application.

Our application wll use its environment variables to determine its connection information

Lab 5.1 Review the available services

Run the command below. How many Redis services are there?

```
    cf marketplace
```

Examine `redis32` service details with the `-s` option.

```
    cf marketplace -s redis32
```

What's the max memory of the `micro` plan?

Video timestamp 25:42

Check your work 5.1

```
> cf marketplace
Getting services from marketplace in org sandbox-cao / space p.burkholder ...
OK

...
redis28         standard         An open source in-memory data structure store.
redis32         micro, standard-ha, standard       An open source in-memory database.
```

Video timestamp 26:11

Check your work 5.1, continued 2/2

```
> cf marketplace -s redis32
Getting service plan information for service redis32 as peter.burkholder@cao.gov...
OK

service plan   description                                                free or paid
standard-ha    Redis 3.2 Redis Sentinel, persistent storage, 512Mb limit   free
standard       Redis 3.2, persistent storage, 512Mb memory limit           free
micro          Redis 3.2, persistent storage, 64Mb memory limit            free
```

Video timestamp 26:22

Lab 5.2: Create a Redis service with create-service

The format for create-service redis32 is:

```
cf create-service redis32  PLAN  NAME
```

Run:

```
cf create-service redis32 micro cglab-redis
```

Wait one minute, then check your service with:

```
cf service cglab-redis
```

Video timestamp 26:26

Check your work 5.2

```
> cf create-service redis32  micro cglab-redis
Creating service instance cglab-redis in org sandbox-cao
OK

Create in progress. Use 'cf services to check


> cf service cglab-redis

Service instance: cglab-redis
Service: redis32
Bound apps:
... [snip] ...
Status: create succeeded
Started: 2017-09-21T14:40:57Z
Updated: 2017-09-21T14:42:01Z
```

Video timestamp 27:08

Lab 5.3 Associate service and app with bind-service

The app, cglab needs to know about cglab-redis. The bind-service shares service information by setting environment variables in the app container.

Run:

```
cf bind-service cglab cglab-redis
```

View the environment variables in the app with:

```
cf env cglab
```

Video timestamp 27:23

Check your work 5.3

Your results should resemble:

```
> cf bind-service cglab cglab-redis
Binding service cglab-redis to app cglab in sandbox-cao
OK
TIP: Use 'cf restage cglab' to ensure your changes ...

> cf env cglab
Getting env variables for app cglab in sandbox-cao
OK

System-Provided:
{
 "VCAP_SERVICES": {
  "redis32": [
...
```

Video timestamp 27:52

Lab 5.4 Push the new version of our app

Now we can push the version of the app that uses the data store. Run:

```
    cf push cglab -f lab05-state/manifest.yml
```

Has the app's URL changed?

Visit your app at the URL. Refresh page multiple times. What does the app do?

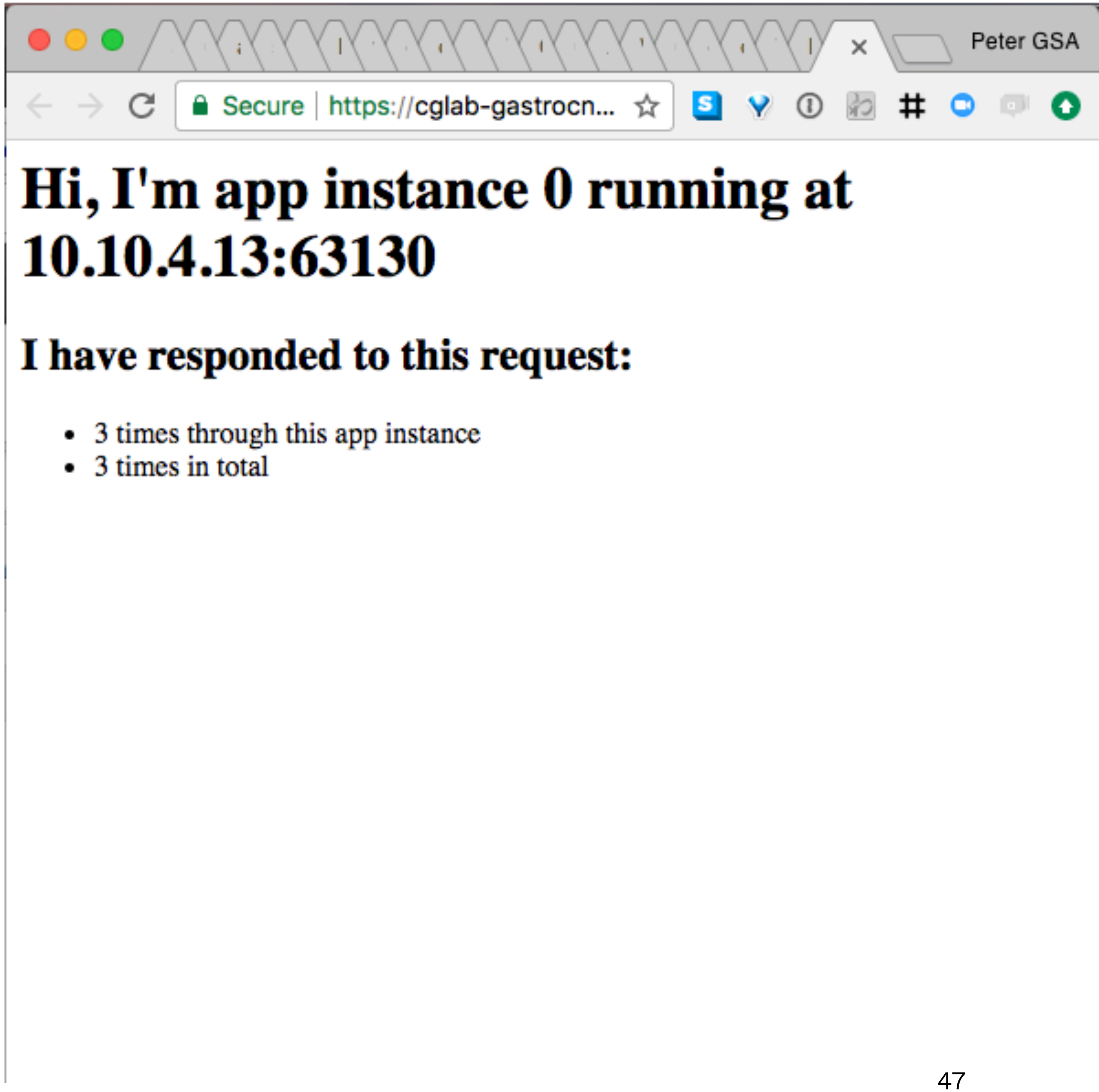
Video timestamp 28:10

Check your work 5.4

```
> cf push cglab -f lab05-state/manifest.yml
Using manifest file lab05-state/manifest.yml

Updating app cglab in org sandbox-cao / space peter.burkholder
OK

Uploading cglab...
...
requested state: started
instances: 1/1
usage: 64M x 1 instances
urls: cglab-gastrocnemian-calefaction.app.cloud.gov
last uploaded: Wed Sep 27 03:24:38 UTC 2017
stack: cflinuxfs2
buildpack: ruby_buildpack

     state     since                    cpu    memory        disk
#0   running   2017-09-26 11:25:11 PM   0.0%   980K of 64M   1.5M of 128M
```

Video timestamp 28:41

Check your work 5.4, continued



Hi, I'm app instance 0 running at 10.10.4.13:63130

I have responded to this request:

- 3 times through this app instance
- 3 times in total

Video timestamp 28:56

Lab 5.5 Scaling

Since CF stores executable artifacts and runs them in containers, you can quickly scale your app to meet demand.

Scale cglab to two instances, then immediately, refresh the cglab webapp page multiple times

```
cf scale cglab -i 2
```

How long until a new instance was available?
<!-- CSEnd -->

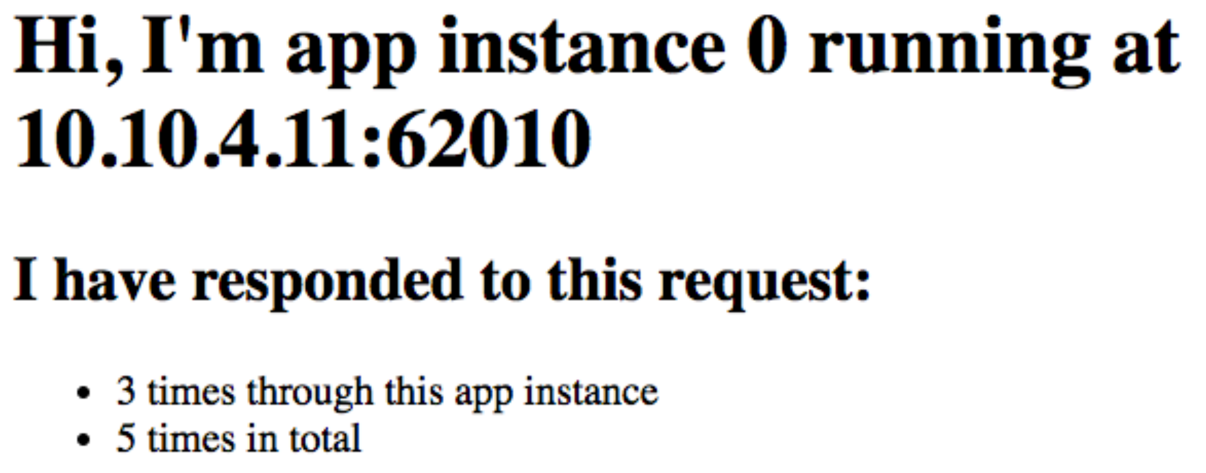
Video timestamp 29:13

Check your work 5.5

Scaling output should resemble:

```
> cf scale cglab -i 2
Scaling app cglab in org sandbox-cao
OK
```

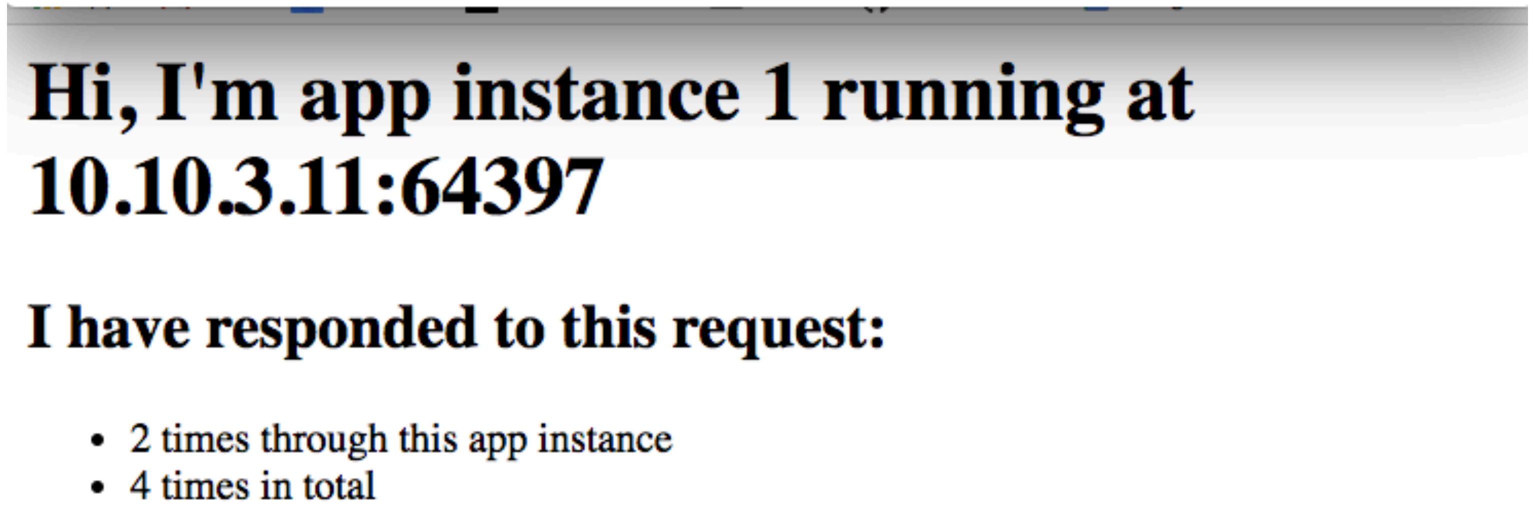
About 10 seconds for new instance to come up



Hi, I'm app instance 0 running at 10.10.4.11:62010

I have responded to this request:

- 3 times through this app instance
- 5 times in total



Hi, I'm app instance 1 running at 10.10.3.11:64397

I have responded to this request:

- 2 times through this app instance
- 4 times in total

Video timestamp 29:25

Review: Where does the app run?

```
                     CONSUMER

                        |

                      ROUTER

                      /    \
                     /      \
                    /        \
                   /          \

                CELL 1       CELL 2

                  |            |
APP A INSTANCE 0 -|            |- APP A INSTANCE 1
APP B INSTANCE 1 -|            |- APP B INSTANCE 0
```

Video timestamp 29:42

Further exploration

Once you've seen the app count visits per scaled instance:

- Go to your app's URL + '/env'[2]. E.g. http://cglab....app.cloud.gov/env
- Can you use `cf set-env` to add new variables?
  - Hint: You'll need `cf restage` for your app to pick them up.

[2] These environment variables are deliberately exposed by the app for demonstration purposes. You would never have this feature in any real app.

Video timestamp 29:55

I want to know what my app is doing

So that I can debug **it**

Video timestamp 30:38

Lab 6. I can investigate my apps to determine the cause of errors

Let's look at application logs, events and live debugging over ssh.

In the long-term, you'll need to do application maintenance via restage to pick up Buildpack updates

Video timestamp 30:53

Lab 6.1: View live application logs

View current app activity:

```
cf logs cglab
```

Then interact with your cglab webpage. Press `Ctrl-C` to stop log streaming

Do you see any logs from the router? From the app?

<!-- CSEnd -->

Check your work 6.1

Video timestamp 31:57

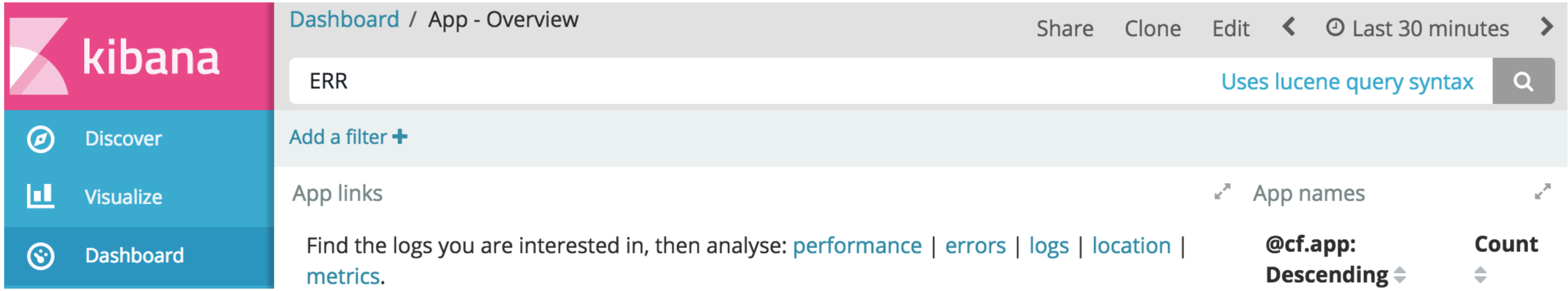
Lab 6.2: View historical logs in Kibana

— Visit: https://logs.fr.cloud.gov

— Enter ERR in the Search box, then search

— Click the ▶ triangle to expand, then seek @message

— What error is our cglab application giving?

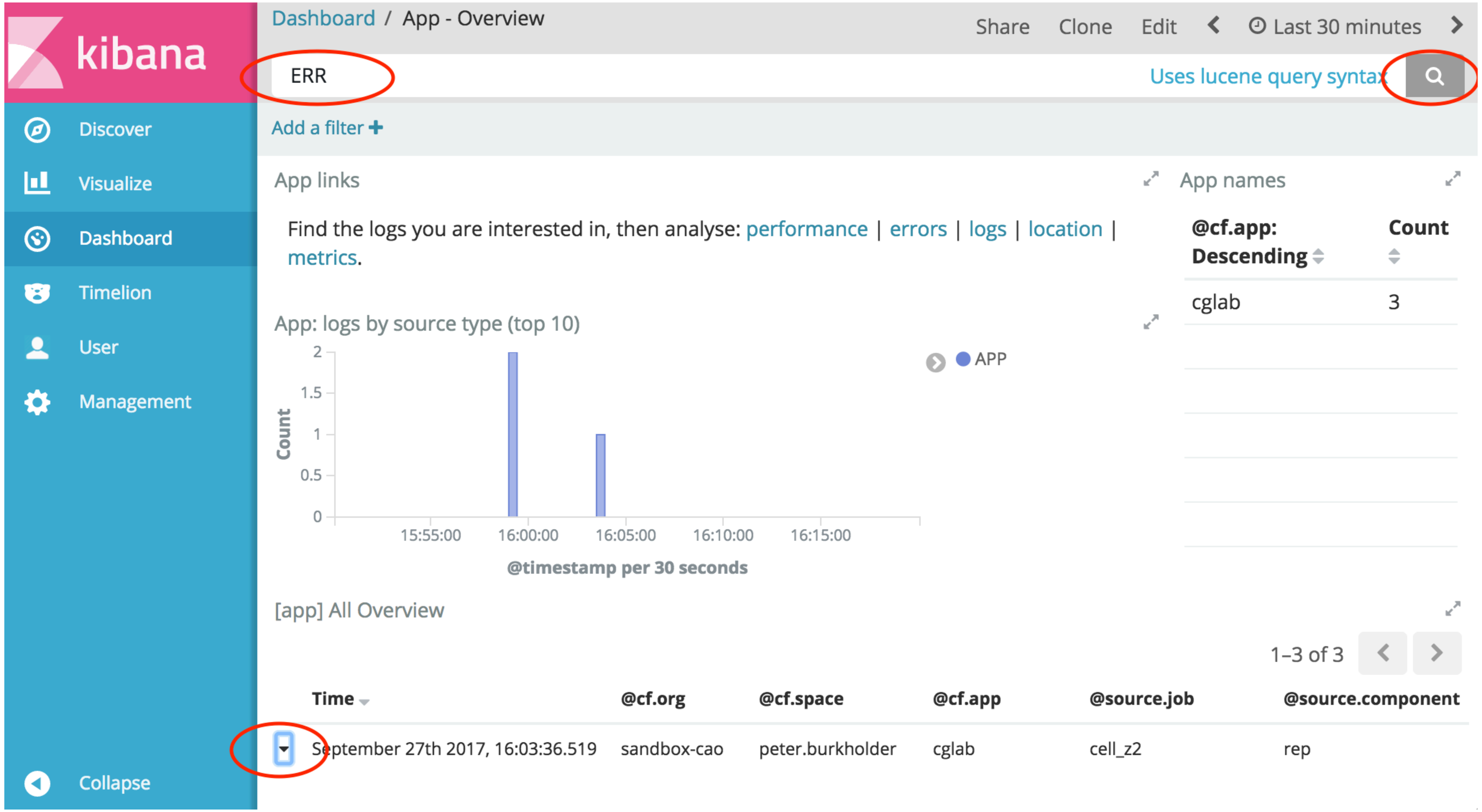


ERR

Find the logs you are interested in, then analyse: performance | errors | logs | location | metrics.

Video timestamp 33:27

Check your work 6.2 1/2



ERR

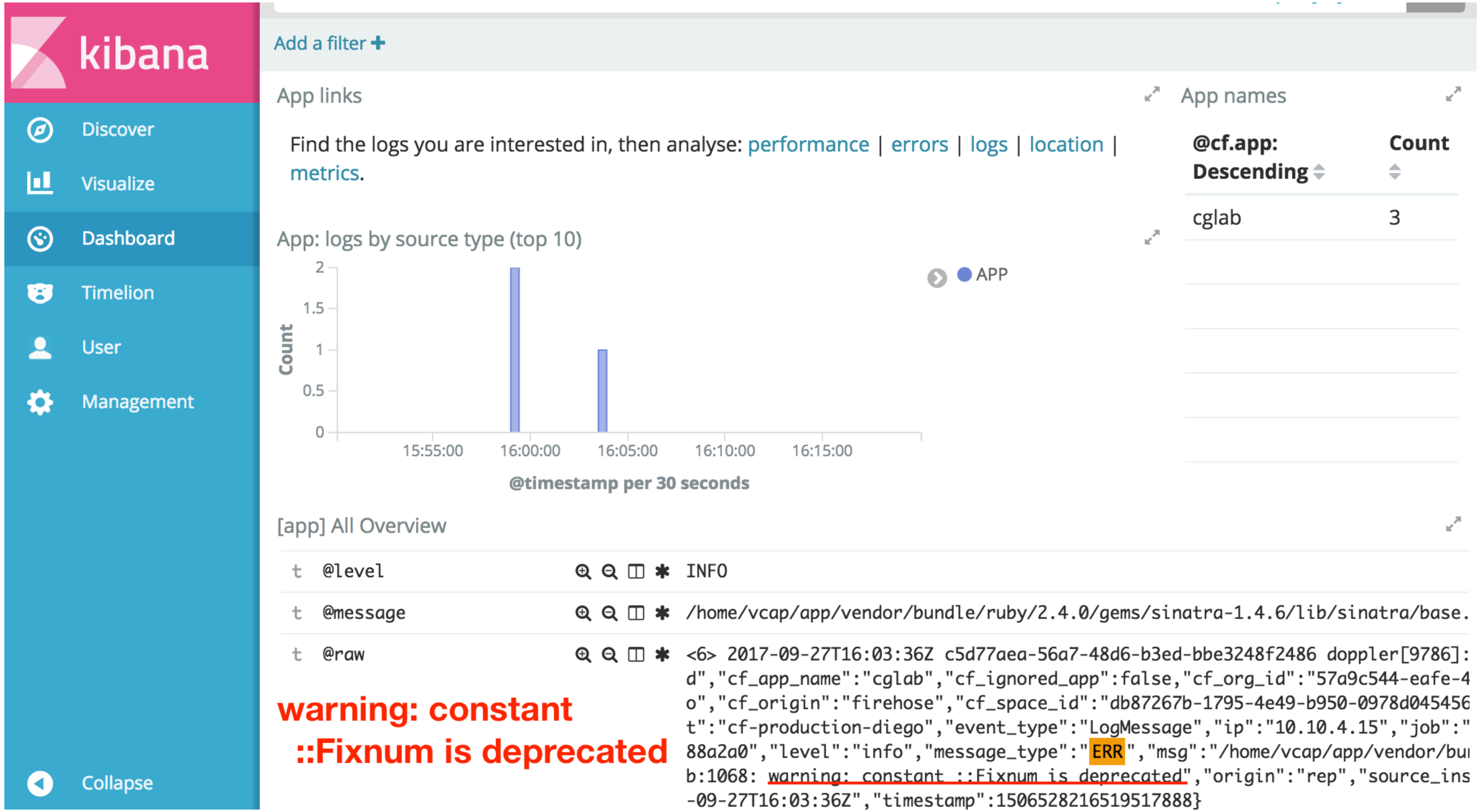
Find the logs you are interested in, then analyse: performance | errors | logs | location | metrics.

@cf.app: Descending	Count
cglab	3

Time	@cf.org	@cf.space	@cf.app	@source.job	@source.component
September 27th 2017, 16:03:36.519	sandbox-cao	peter.burkholder	cglab	cell_z2	rep

Video timestamp 34:26

Check your work 6.2 2/2



Find the logs you are interested in, then analyse: performance | errors | logs | location | metrics.

@cf.app: Descending	Count
cglab	3

```
t  @level      INFO
t  @message    /home/vcap/app/vendor/bundle/ruby/2.4.0/gems/sinatra-1.4.6/lib/sinatra/base.
t  @raw        <6> 2017-09-27T16:03:36Z c5d77aea-56a7-48d6-b3ed-bbe3248f2486 doppler[9786]:
               d","cf_app_name":"cglab","cf_ignored_app":false,"cf_org_id":"57a9c544-eafe-4
               o","cf_origin":"firehose","cf_space_id":"db87267b-1795-4e49-b950-0978d045456
               t":"cf-production-diego","event_type":"LogMessage","ip":"10.10.4.15","job":"
               88a2a0","level":"info","message_type":"ERR","msg":"/home/vcap/app/vendor/bu
               b:1068: warning: constant ::Fixnum is deprecated","origin":"rep","source_ins
               -09-27T16:03:36Z","timestamp":1506528216519517888}
```

warning: constant ::Fixnum is deprecated

Video timestamp 34:41

Lab 6.3: Application Events

Events are generated by CloudFoundry, about your application.

View application events. Do you see any CRASH events?

```
cf events cglab
```

Video timestamp 34:46

Check your work 6.3

```
>  cf events cglab
Getting events for app cglab in org sandbox-cao / space peter.burkholder as p.b...

time                           event                        actor          description
2017-09-26T23:28:35.00-0400   audit.app.update             p...@cao.gov   instances: 2
2017-09-26T23:25:00.00-0400   audit.app.droplet.create     p...@cao.gov
2017-09-26T23:24:46.00-0400   audit.app.update             p...@cao.gov   state: STARTED
```

You shouldn't see any CRASH events

Video timestamp 35:18

Lab 6.4: SSH to debug cglab

Connect to your cglab application[3]

```
cf ssh cglab
```

You'll be connected a Linux container. To see all processes, run the command below. How many processes are running?

```
ps -ef
```

[3] `cf ssh` uses port 2222. If port 2222 is blocked, you'll get a connection error

Check your work, 6.4

```
$ cf ssh cglab
vcap@96b3e4b6-d74a-4d64-4579-3567:~$ ps -ef
UID          PID    PPID  C STIME TTY          TIME CMD
root           1       0  0 05:01 ?        00:00 /proc/self/exe init
vcap           6       0  0 05:02 ?        00:00 /tmp/lifecycle/diego-sshd ...
vcap          11       0  0 05:02 ?        00:00 /bin/bash /home/vcap/app/bin...
vcap          33      11  0 05:02 ?        00:00 /bin/bash /home/vcap/app/bin...
vcap          40      33  0 05:02 ?        00:05 /home/vcap/app/vendor/bundle...
vcap       16109       6  0 18:23 pts/1    00:00 /bin/bash
vcap       16120   16109  0 18:23 pts/1    00:00 ps -ef
```

About 7 or 8 processes running. To end a session, run:

```
exit
```

Video timestamp 36:26

Further exploration, Lab 6

Once you've seen logs, events and used ssh, try:

- Maintenance: Your app may need a new version of Ruby/Java/etc. You can update a Buildpack with:

```
cf restage cglab
```

- Use built-in help to find ways to disable SSH. Try

```
cf help -a
```

- View cloud.gov status: https://cloudgov.statuspage.io

I want to manage unused resources,

so that I am cost-effective and secure

Lab 8: Clean-up

Unused apps and resources expend resources and may present an attack surface.

We'll clean up from today with delete (app), delete-services and delete-orphaned-routes.

Most of these delete commands expect a Y confirmation.

Lab 8.1: Delete apps with `cf delete`

List all your apps with:

```
cf apps
```

Then delete each one, e.g.:

```
cf delete cglab
cf delete myfname-lname # use the real app name
```

Video timestamp 39:07

Check your work, 8.1

```
> cf apps
Getting apps in org sandbox-cao / space peter.burkholder as peter.burkholde
...
name            requested   instances   memory   disk   urls
cao-burkholder  started     1/1         16M      32M    cao-burkholder.app.
cglab           started     2/2         64M      128M   cglab-gastro-action

> cf delete cglab
Really delete the app cglab?> y
Deleting app cglab in org sandbox-cao / space peter.burkholder as peter.bur
OK
```

Video timestamp 39:33

Lab 8.2: Delete services

List all your services with:

```
cf services
```

Then delete each one, e.g.:

```
cf delete-service cglab-redis
```

Video timestamp 39:45

Check your work, 8.2

```
> cf services
Getting services in org sandbox-cao / space peter.burkholder as
OK

name          service   plan       bound apps   last operation
cglab-redis   redis32   standard                create succeeded

> cf delete-service cglab-redis
Really delete the service cglab-redis?> y
Deleting service cglab-redis in org sandbox-cao / space peter.b
OK
```

Video timestamp 39:57

Lab 8.3: Delete unused routes

CloudFoundry automatically creates routes for your web application. List your routes with:

```
cf routes
```

Routes that no longer connect to apps are orphaned. Clean them all up with:

```
cf delete-orphaned-routes
```

Check your work, 8.3

```
> cf routes
Getting routes for org sandbox-cao / space peter.burkholder as peter.bur

space              host                     domain          apps
peter.burkholder   peterburkho              app.cloud.gov
peter.burkholder   cglab-gastralefaction    app.cloud.gov

> cf delete-orphaned-routes
Really delete orphaned routes? [yN]: y
Getting routes as peter.burkholder@cao.gov ...

Deleting route peterburkho.app.cloud.gov ...
Deleting route cglab-gastrofaction.app.cloud.gov ...
OK
```

Video timestamp 40:49

Congratulations!

All of these should show no active resources:

```
cf apps
cf services
cf routes
```

You have completed the workshop
and tidied up after yourself!

Video timestamp 41:15

Docs

cloud.gov docs: https://cloud.gov/docs/

Cloud Foundry docs: https://docs.cloudfoundry.org

Books

Cloud Foundry: The Definitive Guide: Develop, Deploy, and Scale (2017, O'Reilly)

Cloud Foundry eBooks: https://content.pivotal.io/ebooks

Courses

edX Course: https://edx.org

CloudFoundry training materials: https://basics-workshop.cfapps.io

Other

Inquires: cloud-gov-inquiries@gsa.gov

Twitter: @18F

Video timestamp 41:35