SharkFest'19 US

Automating Cloud Infrastructure

for network traffic analysis

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Outline

- High Level Process
- Terms and Definitions
- Data Movement and Storage
- Building Reusable Infrastructure
- Automating Processes
- Use Cases/Demo

High Level Example

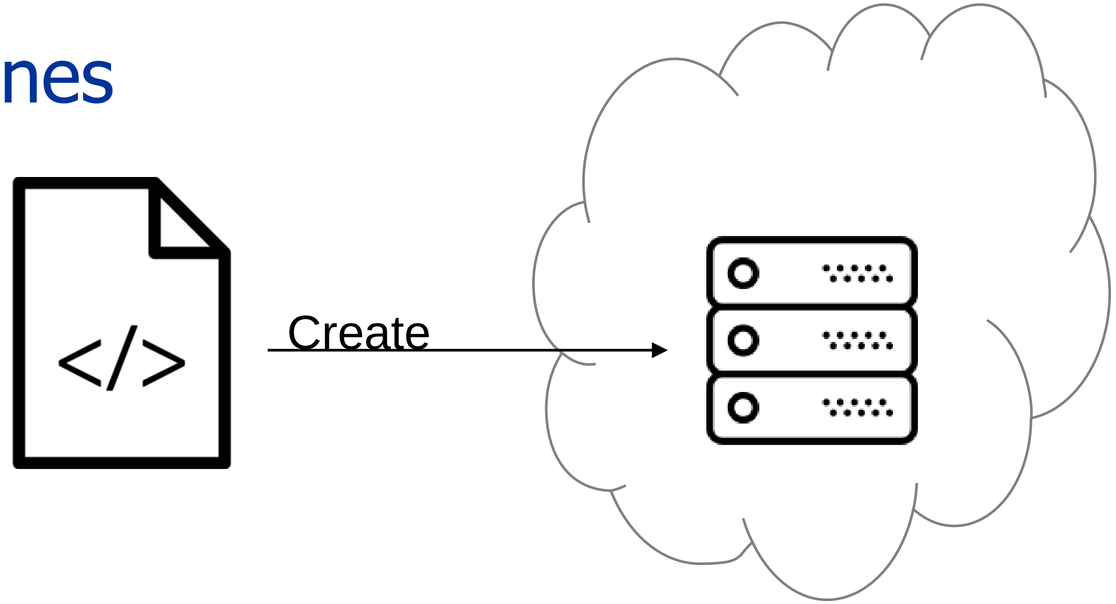
- Get data into cloud
- Pre-process using robust infrastructure and automated processes
- Analyze using robust infrastructure and manual processes

Key Terms

- Provision
- Configuration
- Orchestration

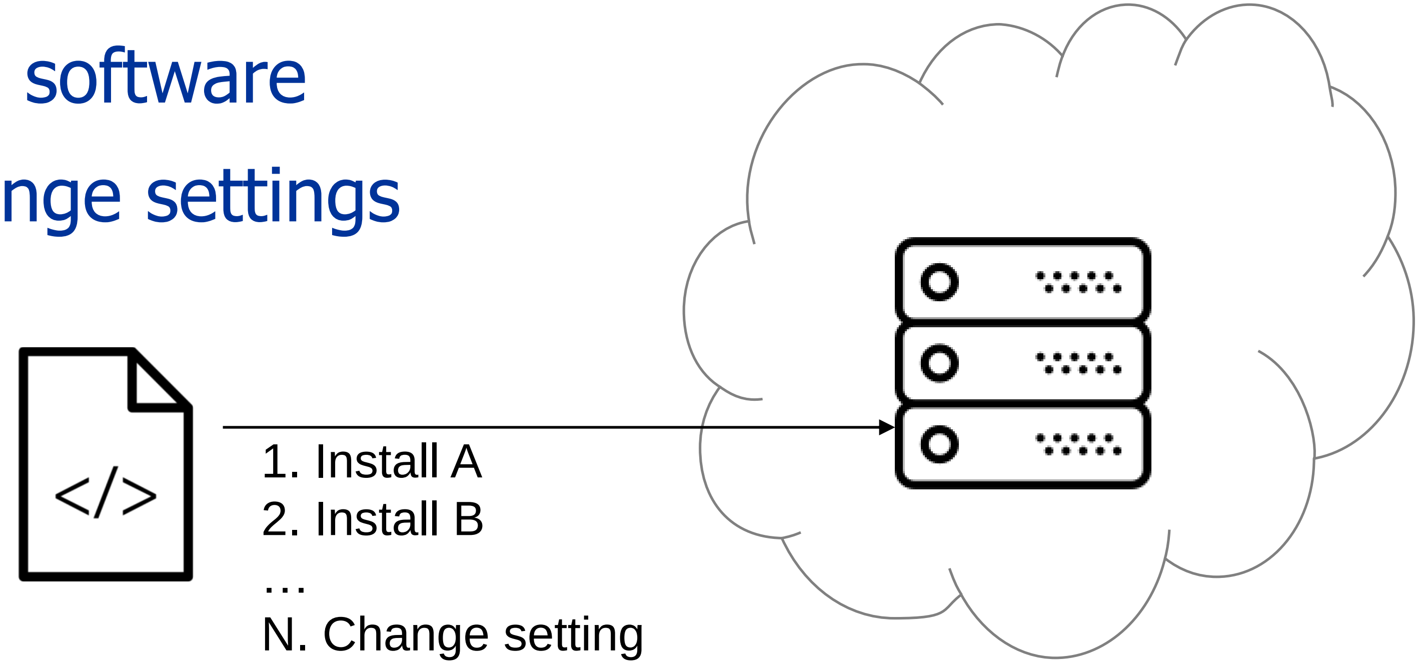
Terms: Provision

- Create new resources
  - Virtual machines
  - Networks
  - Storage



Terms: Configuration Management

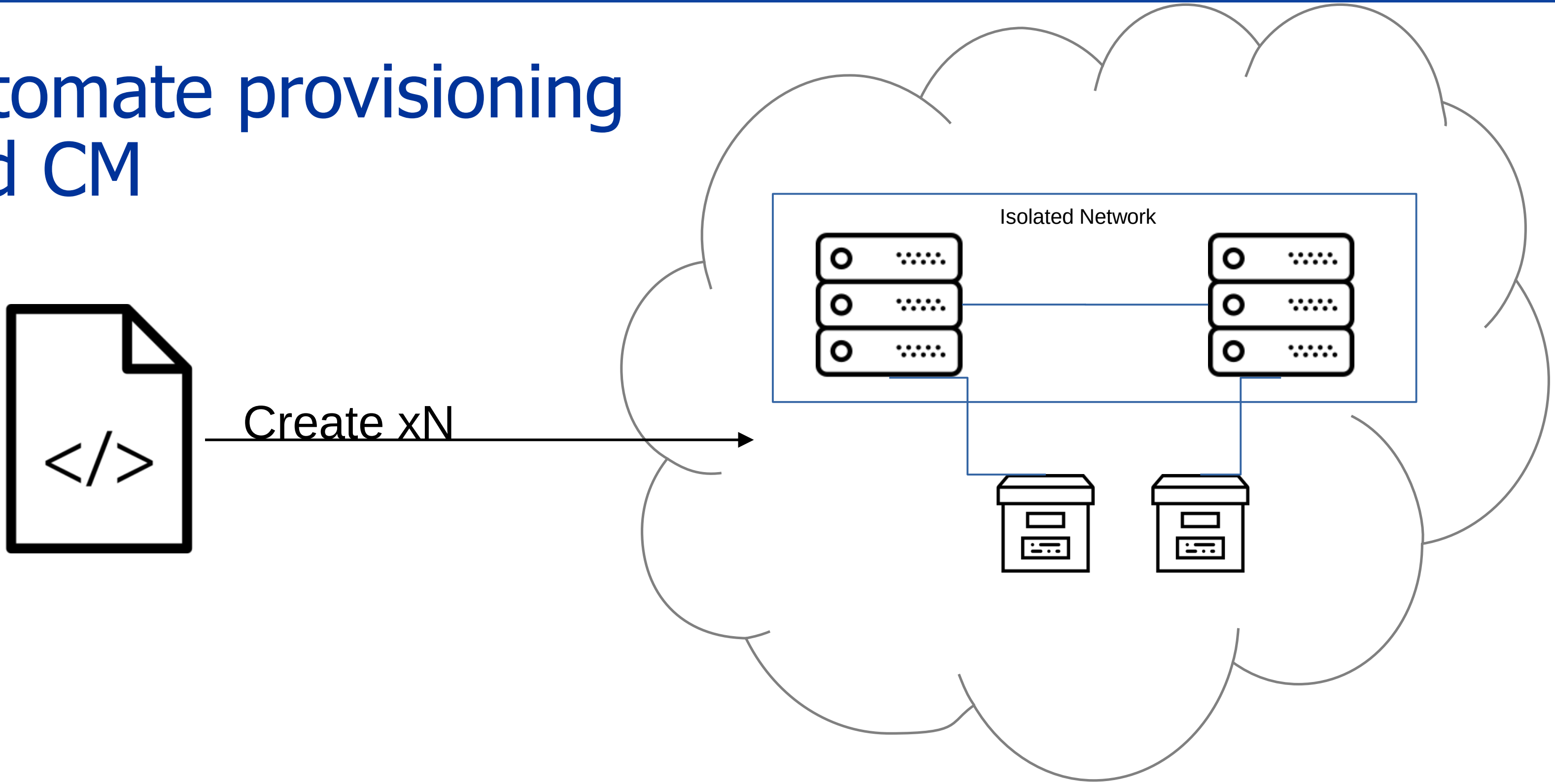
- Automate modification of hosts
  - Add software
  - Change settings



1. Install A
2. Install B
…
N. Change setting

Terms: Orchestration

- Automate provisioning and CM



Tools

HashiCorp Terraform

CloudFormation

ANSIBLE

puppet labs

Azure Resource Manager

cobbler

CHEF

SALTSTACK

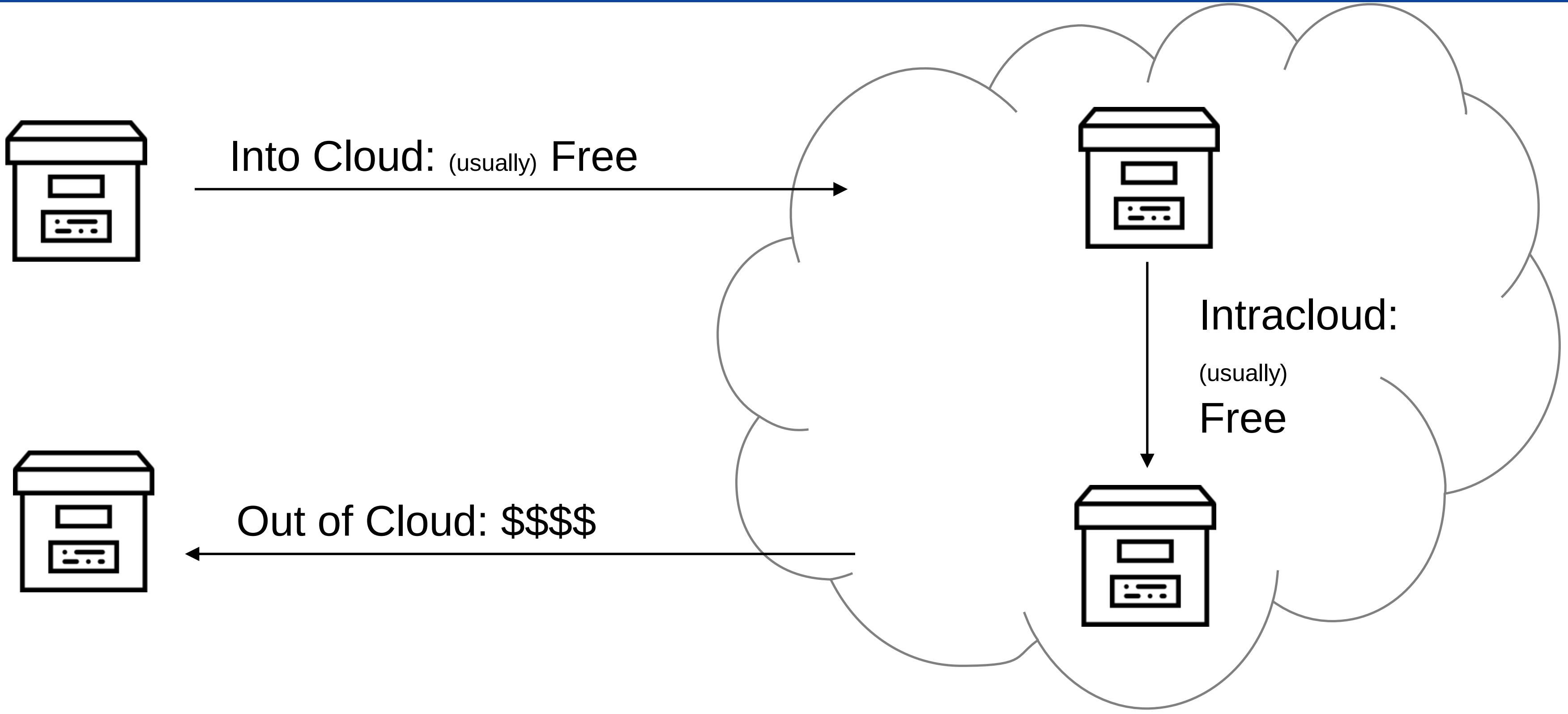
Use Cases

- Network Traffic Analysis
  - Repeatable, deterministic infrastructure
  - Scalable, on-demand infrastructure
  - Remotely accessible, collaborative infrastructure
- Toyota Lean model

Data transfer

- Considerations:
  - Cost / Direction of data flow
  - Time

Data: Transfer



Data Transfer Cost

Direction	Cost	Notes
In	$0.00	* Snowball may incur fee
Between	$4.00	Each time
Object > Block	$0.00	* Intra-region
Out	$18.00	Each time

* Assuming a 200GB file size for AWS

Data Transfer Time

- Considerations
  - Tool used
  - Location
  - Link quality

AWS Import/Export Snowball

AWS CLI

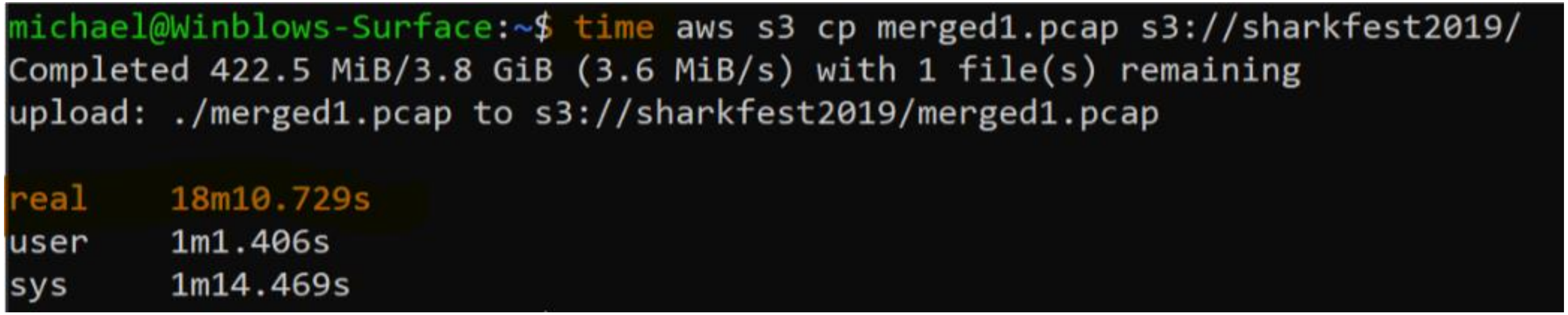
** not recommended!!

Data Transfer Time

Time to transfer: **1 TB**

• T3:	2.7 days
• 100Mbps	1.2 days
• 1000Mbps	2.9 hours

Data Transfer Time



```
michael@Winblows-Surface:~$ time aws s3 cp merged1.pcap s3://sharkfest2019/
Completed 422.5 MiB/3.8 GiB (3.6 MiB/s) with 1 file(s) remaining
upload: ./merged1.pcap to s3://sharkfest2019/merged1.pcap

real    18m10.729s
user    1m1.406s
sys     1m14.469s
```

Data Storage

- Object Storage
  - Cheap
  - Collaboration: Easy
- Block Storage
  - More $
  - May be coupled to instance

Data Storage Cost

- Object (**200Gb** / month) (no transfer out)
  - AWS: $4.50
  - Azure: $3.70
- Block
  - AWS: $8.60
  - Azure: $10.00

Compute Costs

Instance	$ / Hour	$ / Day
2 vCPU **1** GiB RAM	$0.00*	$0.00*
2 vCPU **16** GiB RAM	$0.14	$3.36
16 vCPU **128** GiB RAM	$1.12	$26.88

Whiteboard Sesh

Live Drawing of VPC &

Cloud Concepts!

Building Example

Use Moloch for Indexing and Analysis

- Requires Moloch and separate instance(s) of Elastic search

1. Provision instance(s) of Elastic Search
2. Provision Moloch instance
3. Configure Elastic Search
4. Configure Moloch

+

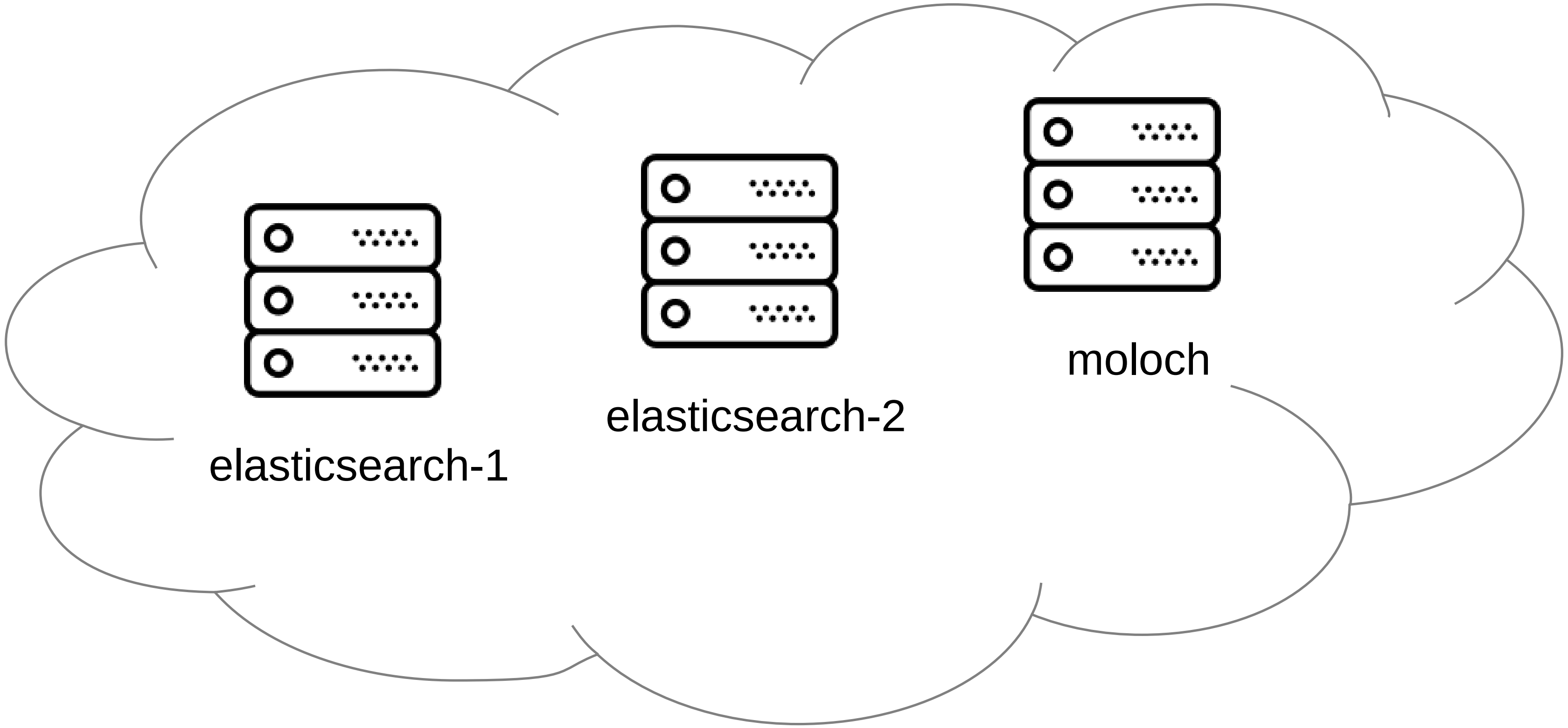
Provision: Terraform

```
resource "aws_instance" "elastic-search" {
  ami           = "ami-b374d5a5"
  instance_type = "r5.2xlarge"
  count = 2
}

resource "aws_instance" "moloch" {
  ami           = "ami-b374d5a5"
  instance_type = "t2.medium"
  count = 1
}
```

Provision: Terraform

```
[user@host]$ terraform plan

[user@host]$ terraform apply

[user@host]$ terraform destroy
```

Provision Results



Configure: Ansible

```
[user@host]$ ansible-playbook -i hosts moloch.yml
```

ANSIBLE

Configure: Ansible

```
# moloch.yml
---

- hosts: elasticsearch
  roles:
    - { role: elasticsearch }

- hosts: moloch
  roles:
    - { role: moloch }
```

Configure: Ansible

```
# roles/elasticsearch/tasks.yml

---
- name: Amazon Linux - Install Elasticsearch
  become: yes
  yum:
    name: 'elasticsearch'
    state: present
    update_cache: yes
    allow_downgrade: 'yes'
  when: es_use_repository
  notify: restart elasticsearch
```

Configure: Ansible

```
---
- name: Amazon Linux - Install Elasticsearch
  become: yes
  yum:
    name: 'elasticsearch'
    state: present
    update_cache: yes
    allow_downgrade: 'yes'
  when: es_use_repository
  notify: restart elasticsearch
```

ANSIBLE

More Examples

- Carve large PCAP using tcpdump/tshark
- Analyze large PCAP using Wireshark on a heavy-duty instance
- Parallel process multiple captures using multiple cloud instances
- Build verifiable analysis tools

Parallel Processing

- 7 PCAPs (each day over a week)
- Same processing required for each prior to analysis
- Create 7 instances, pass PCAP to each, process independently, in parallel

Demo Example

- Use Case:
  - Large PCAP
  - Need to carve the PCAP
  - Needs to be done quickly

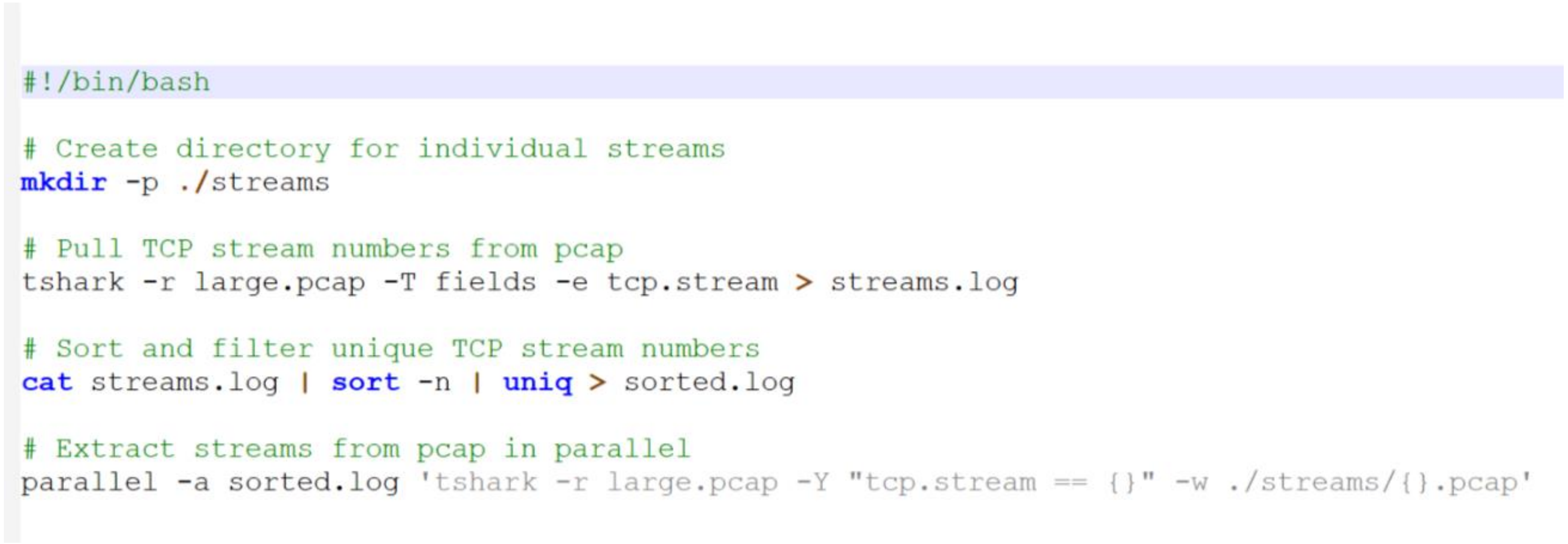
Demo Example (cont)

- Steps:
  - Move to S3 using “aws-cli” tool
  - Need to carve the PCAP
  - Needs to be done quickly

Carving a large pcap

- ~ 4 Gb
- > 3.6 Million Packets
- Encrypted HTTP captured on trunk port w/ VLAN tags
- A tale of two machines

Code



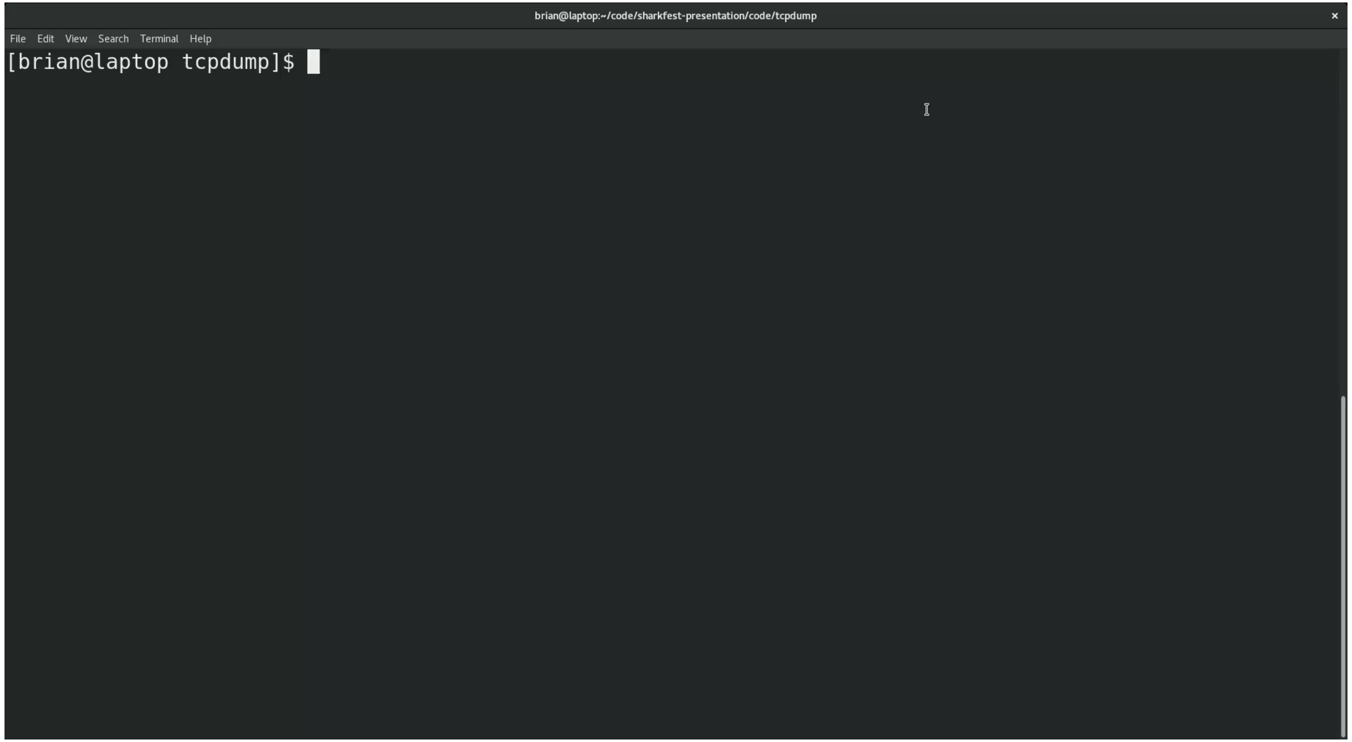
```bash
#!/bin/bash

# Create directory for individual streams
mkdir -p ./streams

# Pull TCP stream numbers from pcap
tshark -r large.pcap -T fields -e tcp.stream > streams.log

# Sort and filter unique TCP stream numbers
cat streams.log | sort -n | uniq > sorted.log

# Extract streams from pcap in parallel
parallel -a sorted.log 'tshark -r large.pcap -Y "tcp.stream == {}" -w ./streams/{}.pcap'
```

Attempt #1 Local Demo

- This ran for 8hrs
- Never finished the first part of the parsing script
- 2,367 streams were found of the 6.6M streams that were actually there
- Could not complete the job, given the tool!

What Do?

Provision Demo

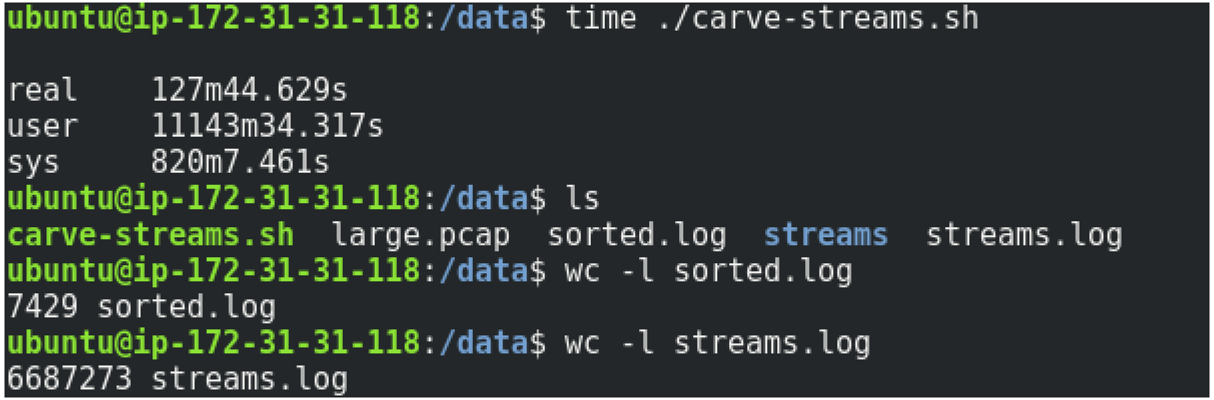

brian@laptop:~/code/sharkfest-presentation/code/tcpdump
File Edit View Search Terminal Help

```
[brian@laptop tcpdump]$ 
```

*Video of provisioning the analysis machine within AWS

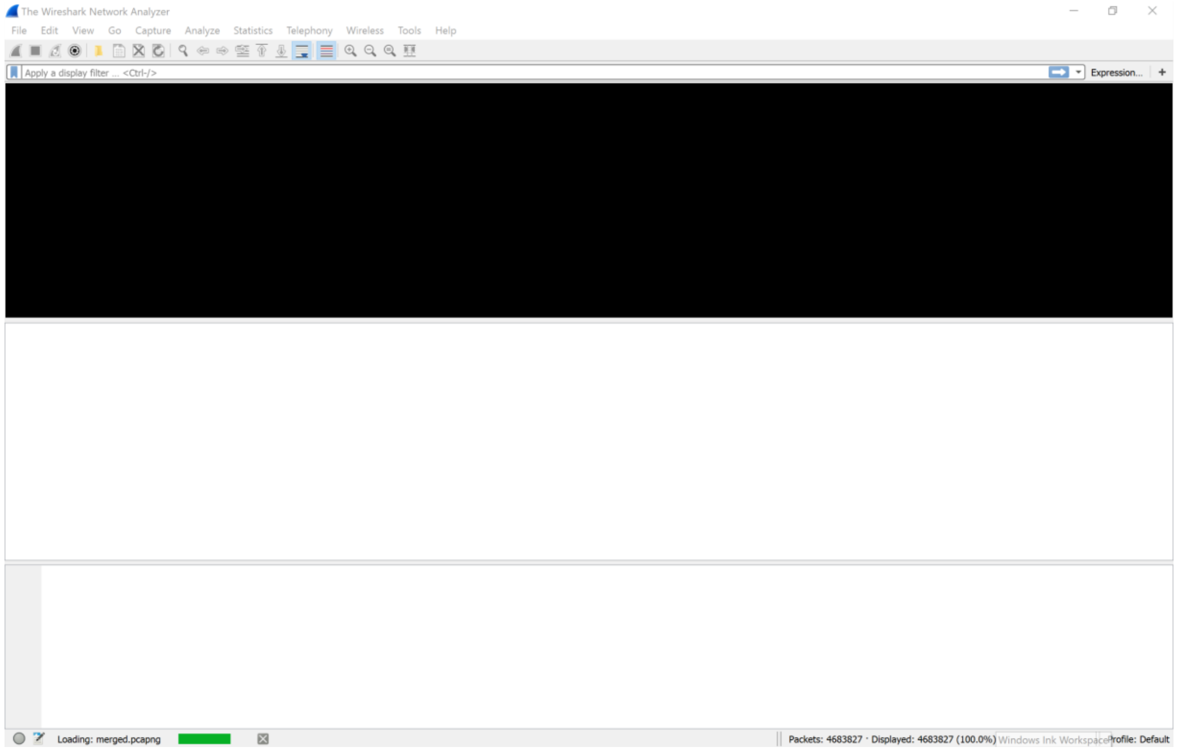
Attempt #2 Cloud Demo

- r5.24XL
- 96 vCPUs
- 768GB RAM
- Task took ~2hrs



```
ubuntu@ip-172-31-31-118:/data$ time ./carve-streams.sh

real	127m44.629s
user	11143m34.317s
sys	820m7.461s
ubuntu@ip-172-31-31-118:/data$ ls
carve-streams.sh  large.pcap  sorted.log  streams  streams.log
ubuntu@ip-172-31-31-118:/data$ wc -l sorted.log
7429 sorted.log
ubuntu@ip-172-31-31-118:/data$ wc -l streams.log
6687273 streams.log
```

Demo 2 – Local FAIL

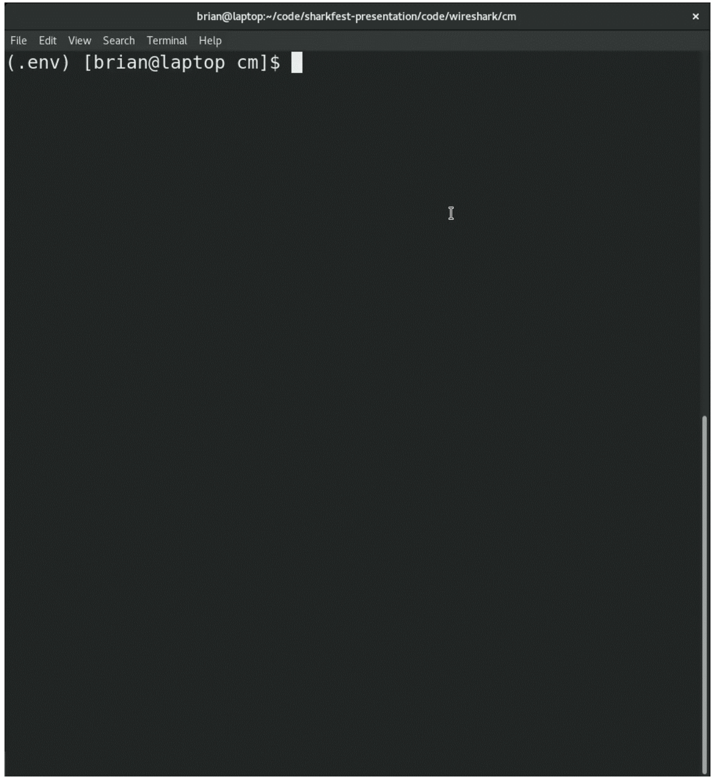

The Wireshark Network Analyzer
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Apply a display filter ... <Ctrl-/>
Expression...

Loading: merged.pcapng

Packets: 4683827 · Displayed: 4683827 (100.0%) Windows Ink Workspace Profile: Default

*Trying to have Wireshark open the file on a laptop

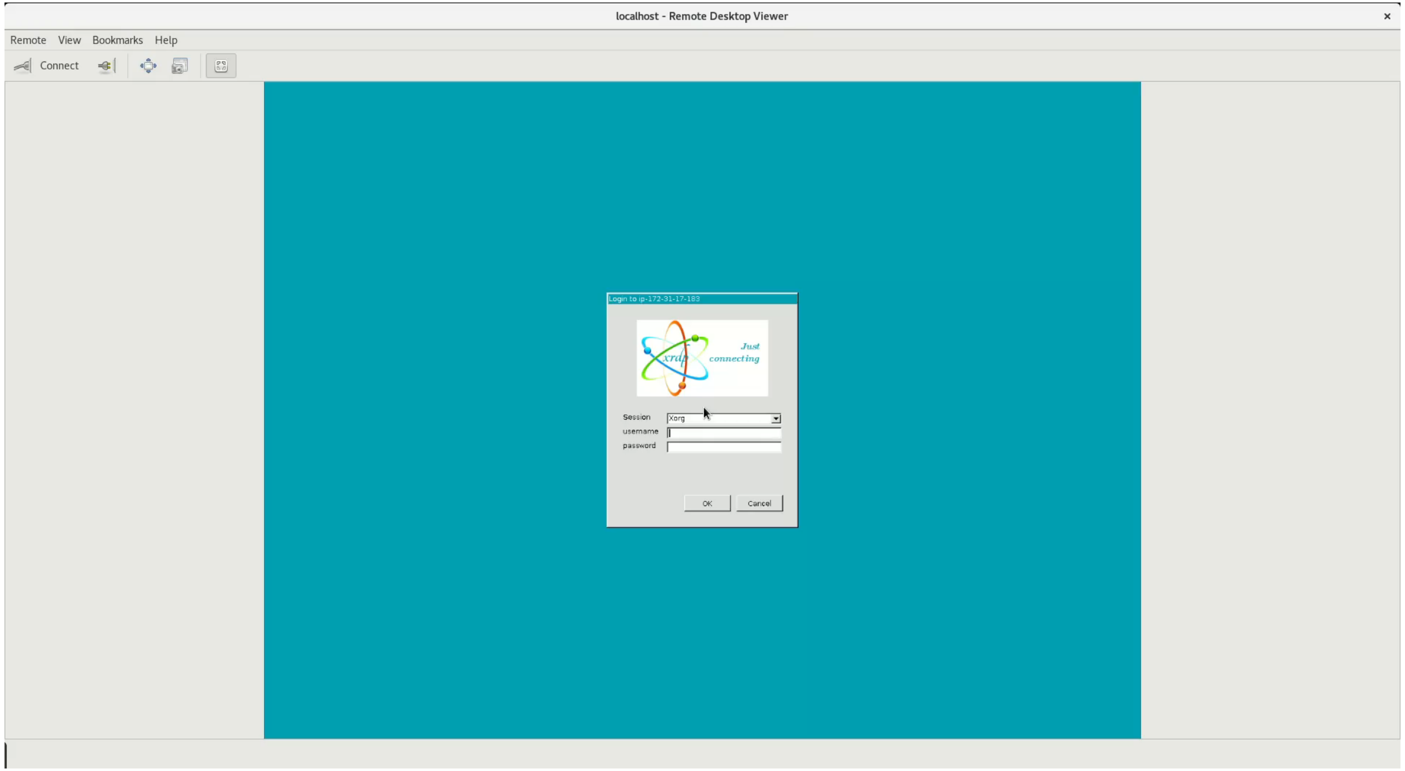
Demo 2 Configure


brian@laptop:~/code/sharkfest-presentation/code/wireshark/cm
File Edit View Search Terminal Help

```
(.env) [brian@laptop cm]$ 
```

*Video of configuring the cloud analysis machine with Wireshark

Demo 2 – Cloud WIN



*Video of remotely connecting to cloud resource and then successfully opening the large PCAP in Wireshark

Questions???

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