

USING CHAOS TO BUILD RESILIENT SYSTEMS

@tammybütow, Gremlin

What's the scale of your infra?

How many services do you
have running in production?

How many engineers do you
have at your company?

A Common Chaos Engineering Journey



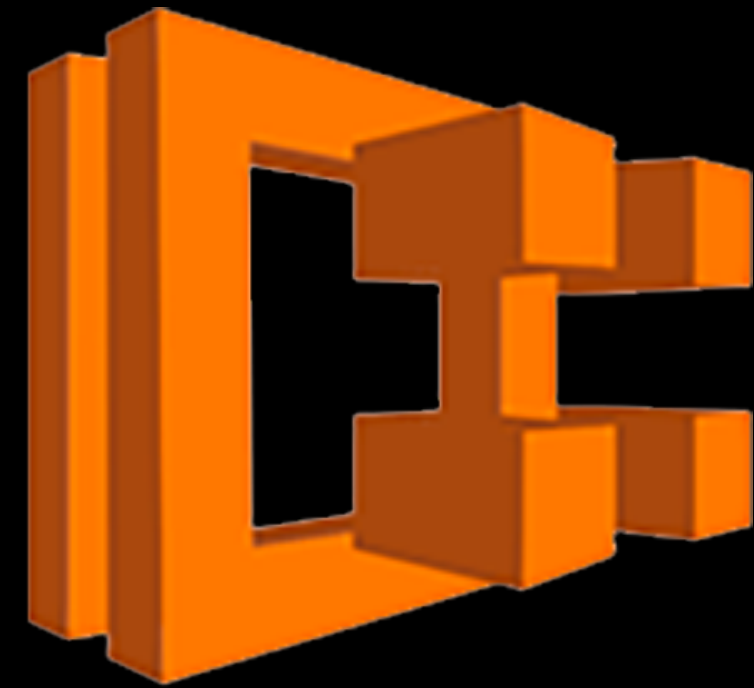
TOP 5 MOST POPULAR WAYS TO USE CHAOS ENGINEERING IN 2018



kubernetes



kafka



AWS ECS

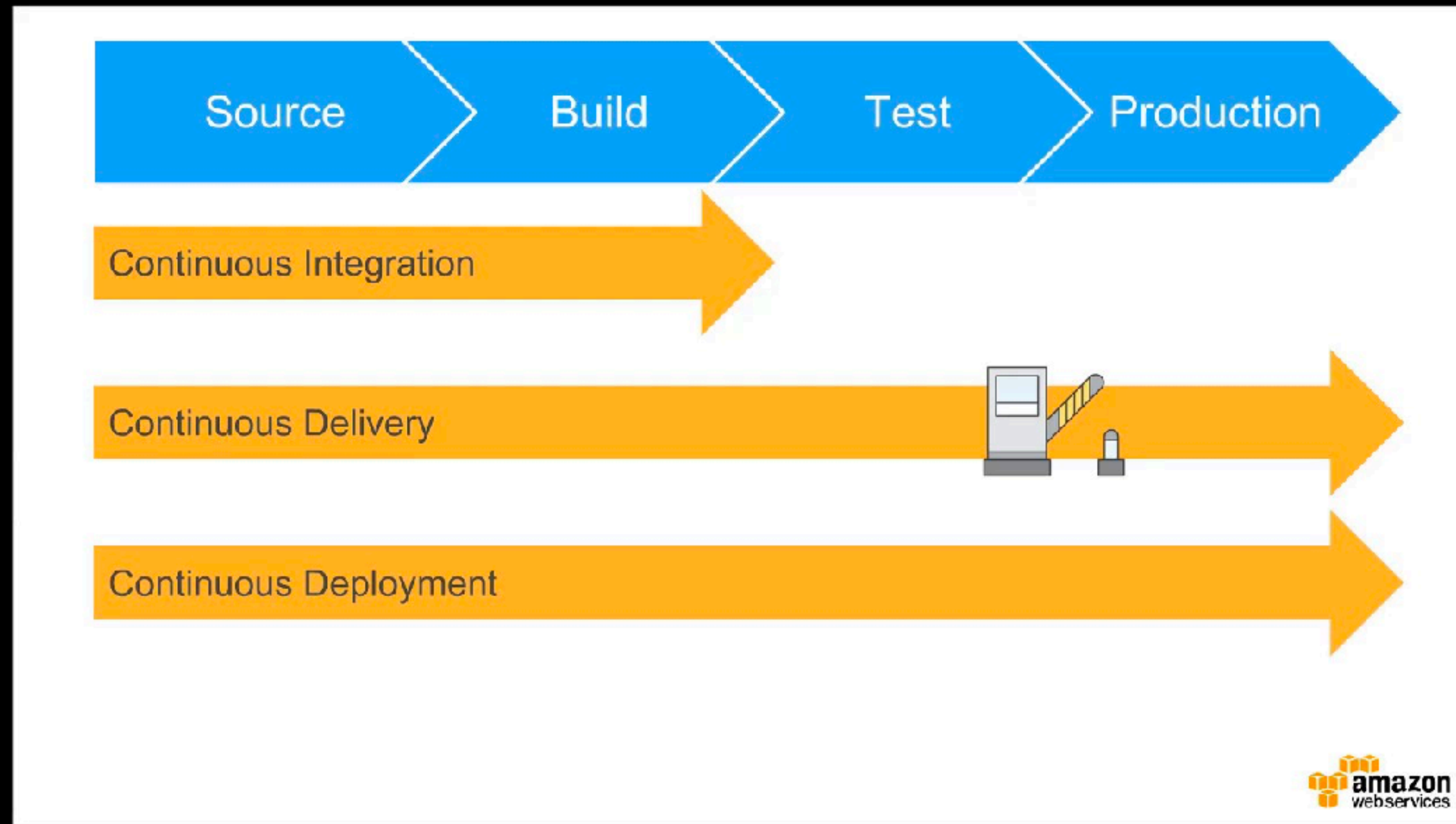


cassandra



elasticsearch

ADVANCED USES OF CHAOS ENGINEERING



What happened this week: June 2018 Slack Outage

▲ londons_explore 2 days ago [-]

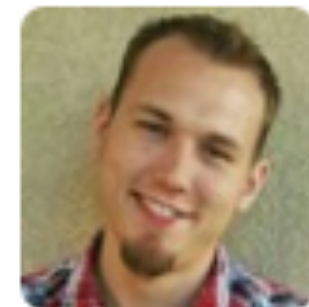
Google is expert at designing services which *you won't notice when there is downtime*.

Take Google Search for example. When there is downtime, results might be slightly less accurate, or the parcel tracking box might not appear, or the page won't say the "last visited" time beside search results.

The SRE's are running around fixing whatever subsystem is down or broken, but you the user probably don't notice.

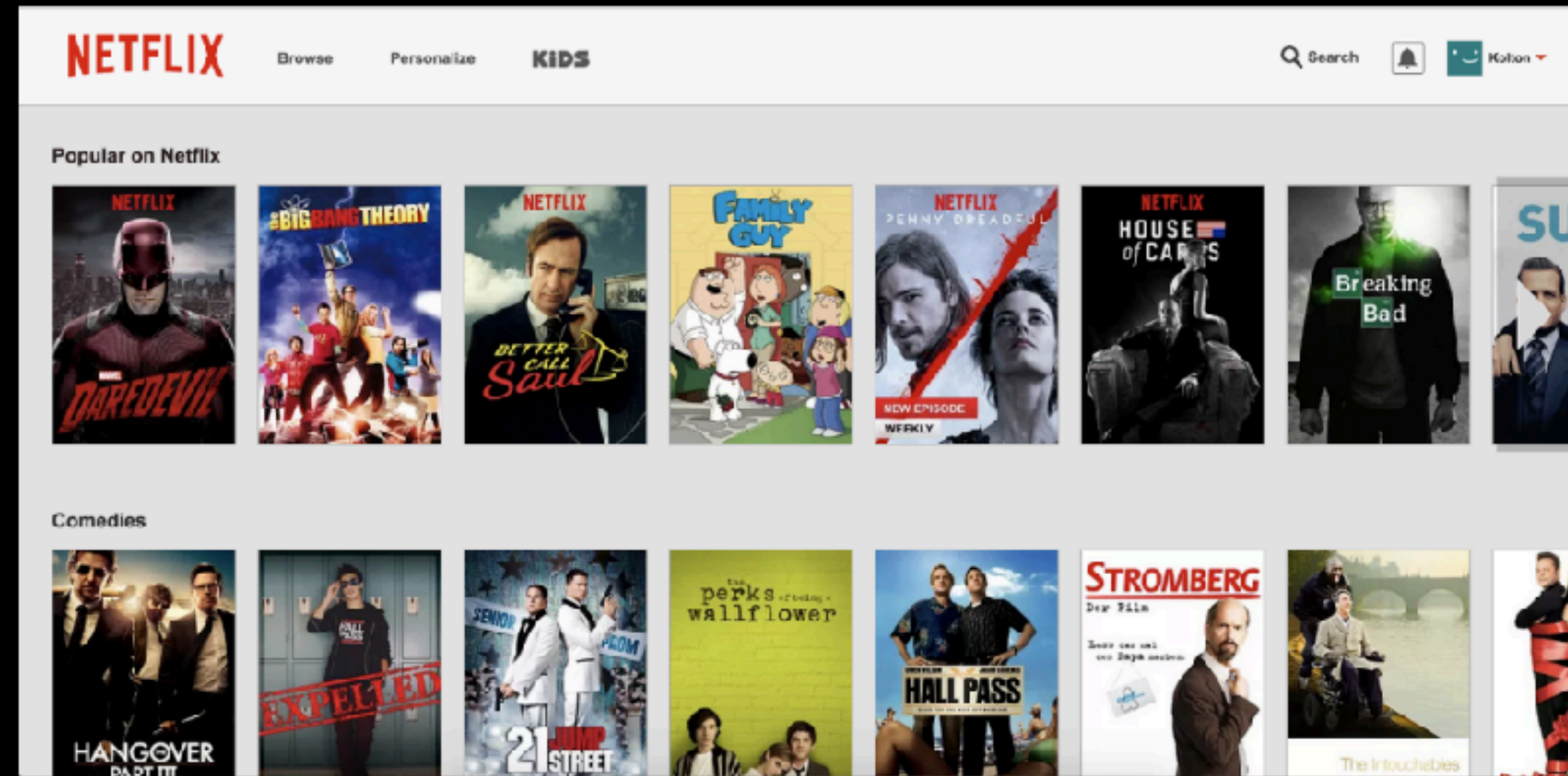
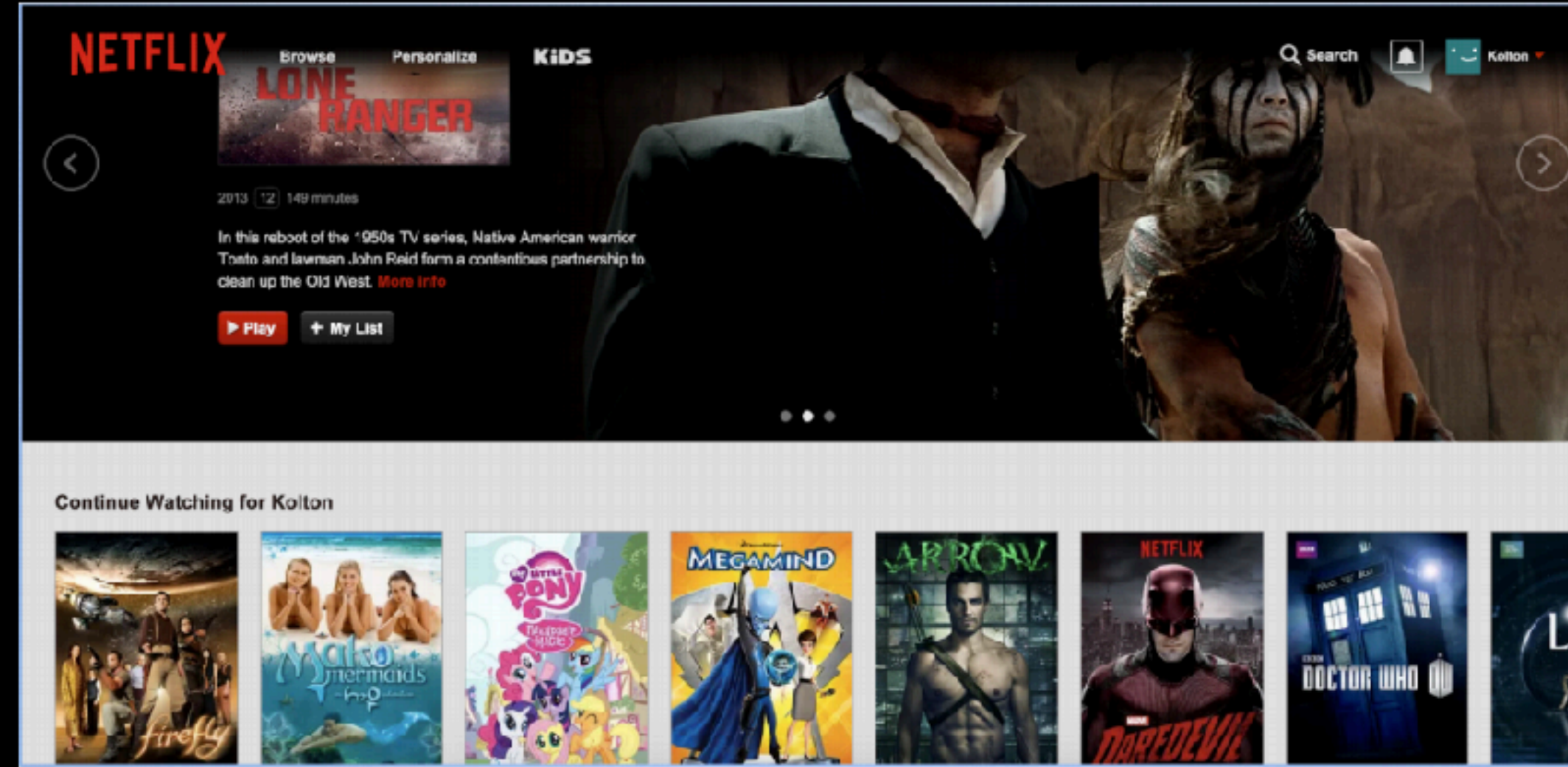
The SRE's are running around fixing whatever subsystem is down or broken, but you the user probably don't notice.

You won't notice the last visited time beside search results.



kolton 12:04 PM

And testing those graceful degradations ... is where chaos eng comes in. :)



@tammybutow

#QCONNYC

TAMMY BÜTOW

Principal SRE, Gremlin
Causing chaos in prod since 2009.

Previously SRE Manager @ Dropbox
leading Databases, Block Storage and
Code Workflows for 500 million users
and 800 engineers.

@tammybütow



GREMLIN

- We are practitioners of Chaos Engineering
- We build software that helps engineers build resilient systems in a safe, secure and simple way.
- We offer 11 ways to inject chaos for your Chaos Engineering experiments (e.g. host/container packet loss and shutdown)



PART 1: LAYING THE FOUNDATION

@tammybutow

#QCONNYC

Let's Define A Resilient System:

- A resilient system is a highly available and durable system.
- A resilient system can maintain an acceptable level of service in the face of failure.
- A resilient system can weather the storm (a misconfiguration, a large scale natural disaster or controlled chaos engineering).

It would be silly to give an Olympic pole-vaulter a broom and ban them from practicing!

“Thoughtful planned experiments designed to reveal the weaknesses in our systems”

- Kolton Andrus, Gremlin CEO

Think of it like a vaccination:
Inject something harmful in order to
build an immunity.

Eventually systems will break
in many undesired ways.

Break them first on purpose with
controlled chaos! 

DOGFOODING

- Using your own product.
- For us that means using Gremlin for our Chaos Engineering experiments.
- Failure Fridays



Failure Fridays are dedicated time for teams to collaboratively focus on using Chaos Engineering practices to reveal weaknesses in your services.

WHY DO DISTRIBUTED SYSTEMS NEED CHAOS?

- Unusual hard to debug failures are common
- Systems & companies scale rapidly and Chaos Engineering helps you learn along the way



FULL-STACK CHAOS ENGINEERING

- You can inject chaos at any layer.
- API, App, Cache, Database, OS, Host, Network, Power & more.



WHY RUN CHAOS ENGINEERING EXPERIMENTS?

@tammybutow

#QCONNYC

Are you confident that your metrics and alerting are as good as they should be?

#pagerpain  555-3215

Are you confident your customers are
getting as good an experience
as they should be?

#customerpain 🙄

Are you losing money due to downtime
and broken features?

#businesspain 

HOW DO YOU RUN CHAOS ENGINEERING EXPERIMENTS?

@tammybutow

#QCONNYC

HOW TO RUN A CHAOS ENGINEERING EXPERIMENT

- Form a hypothesis
- Consider blast radius
- Run experiment
- Measure results
- Find & fix issues or scale



Don't run before you can walk

The 3 Prerequisites for Chaos Engineering

1. Monitoring & Observability
2. On-Call & Incident Management
3. Know Your Cost of Downtime Per Hour


What Do I Use For Monitoring & Observability?



We All Need To Know The Cost Of Downtime

Bloomberg the Company & Its Products | Bloomberg Anywhere Remote Login | Bloomberg Terminal Demo Request

Menu Search **Bloomberg** Sign In Subscribe



Photographer: Matthew Lloyd/Bloomberg

Markets

British Airways Owner Says Power Outage Cost 80 Million Pounds

By [Maria Tadeo](#) and [Christopher Jasper](#)
15 June 2017, 09:44 GMT-4

- ▶ IAG chief provides estimate at group's shareholder meeting
- ▶ Walsh apologizes for disruption, but says cuts not to blame

British Airways owner said a power outage that led to the cancellation of hundreds of flights last month probably cost it about 80 million pounds

▶ Walsh apologizes for disruption, but says cuts not to blame

LIVE ON BLOOMBERG
Watch Live TV >
Listen to Live Radio >

@tammybutow

#QCONNYC

We All Need Incident Management

The screenshot shows the Gremlin Community website. The navigation bar includes 'Product', 'Team', 'Careers', 'Docs', and 'Community'. The breadcrumb trail is 'Tutorials > SRE'. The article title is 'How To Establish a High Severity Incident Management Program', last updated on January 18th, 2018. A table of contents on the left lists various topics related to incident management. A featured image at the bottom of the article shows a line graph and the Gremlin logo.

Gremlin | Community

Product Team Careers Docs Community

Tutorials > SRE

Introduction

- What is High Severity Incident Management?
- What are SEVs?
- What are common types of SEVs?
- What are examples of SEVs?
- What are SEV levels?
- How do your resolution times impact SLOs/SLAs?
- What is the full lifecycle of a SEV?
- How are SEVs measured?
- How do you create SEV levels for free and paid products?
- Example: SEV levels for data loss

How To Establish a High Severity Incident Management Program

Last Updated January 18th, 2018 **SRE**

How to establish a **HIGH SEVERITY INCIDENT MANAGEMENT PROGRAM**

Gremlin

Date	Value
13:00	100
13:30	90
14:00	80
14:30	90
15:00	100

@tammybutow

#QCONNYC

HOW TO CHOOSE A CHAOS EXPERIMENT

- Identify top 5 critical systems
- Choose 1 system
- Whiteboard the system
- Select attack: resource/
state/network
- Determine scope



WHAT SHOULD WE MEASURE?

- Availability — 500s
- Service specific KPIs
- System metrics: CPU, IO, Disk
- Customer complaints



HOW TO RUN YOUR OWN GAMEDAY!

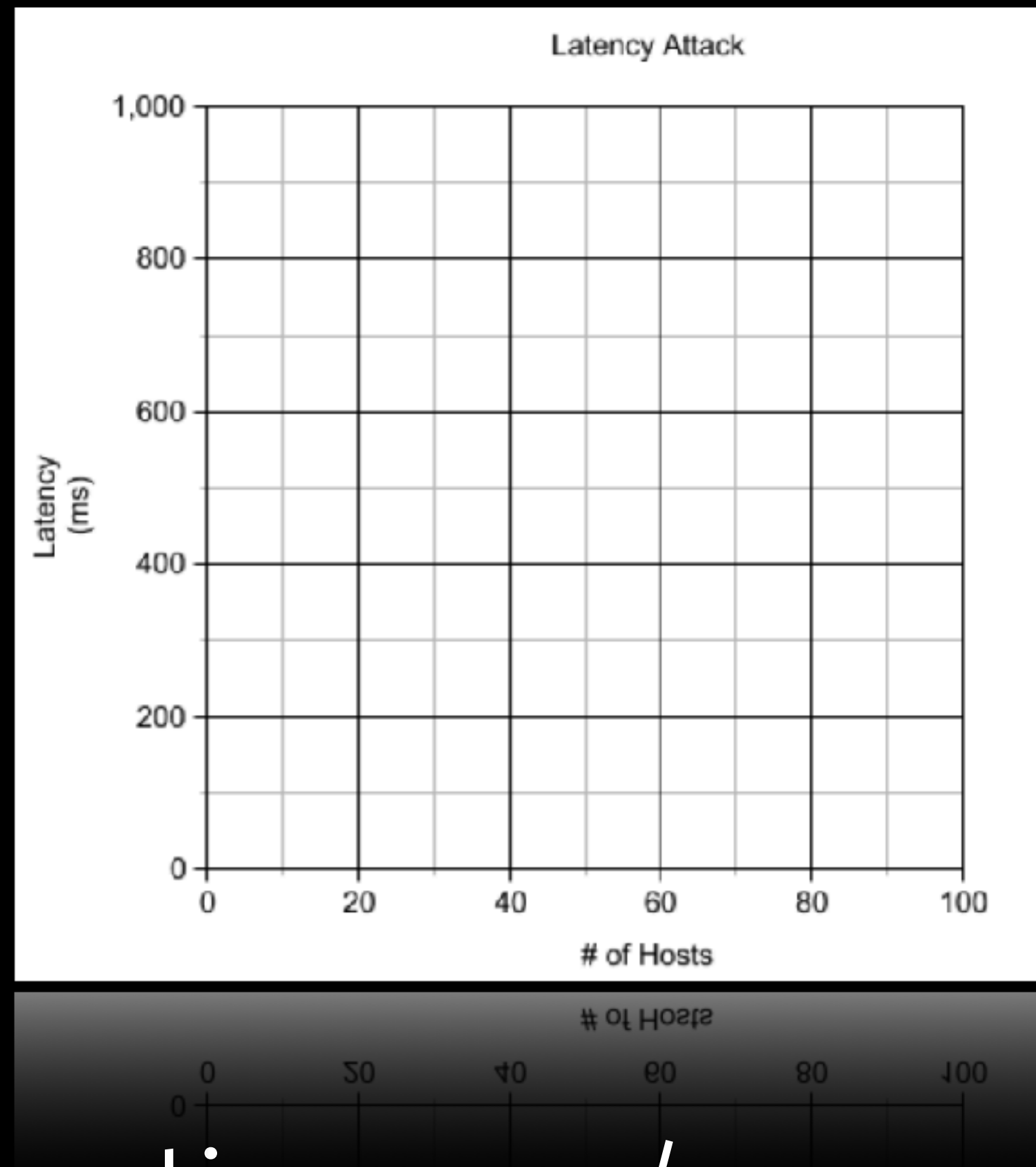
RESOURCE DOWNLOADS

GameDay Agenda DOWNLOAD ↓	GameDay Execution Template DOWNLOAD ↓	GameDay Recording Template DOWNLOAD ↓
Objective Communication Template DOWNLOAD ↓	Placeholder Invite for Participants DOWNLOAD ↓	Pre GameDay Checklist DOWNLOAD ↓

[DOWNLOAD ALL](#)

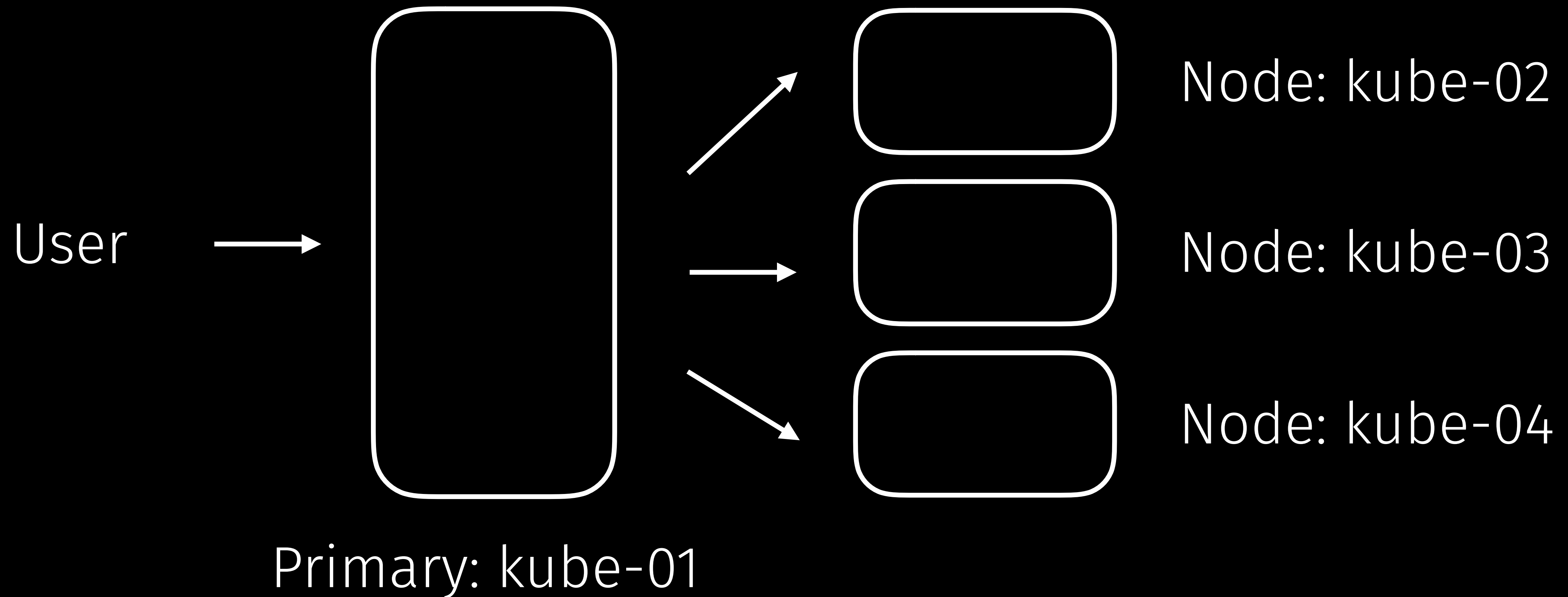
gremlin.com/gameday

HOW TO RUN YOUR OWN GAMEDAY!



gremlin.com/gameday

EXAMPLE SYSTEM: KUBERNETES RETAIL STORE



PART 2: RESOURCE CHAOS ENGINEERING

RESOURCE CHAOS

We can increase CPU, Disk, IO & Memory consumption to ensure monitoring is setup to catch problems.

Important to catch issues before they turn into high severity incidents (unable to purchase new product!) and downtime for customers.

CPU CHAOS

@tammybutow

#QCONNYC

LET'S CREATE A "KNOWN-KNOWN" EXPERIMENT

```
su - chaos  
cd scripts  
ls  
cat burncpu.sh  
./burncpu.sh
```

<https://github.com/tammybutow/chaosengineeringbootcamp>

CHAOS IN TOP

```
top - 07:30:27 up 18 min, 1 user, load average: 28.42, 12.45, 5.54
Tasks: 266 total, 33 running, 233 sleeping, 0 stopped, 0 zombie
%Cpu(s): 96.9 us, 2.8 sy, 0.0 ni, 0.0 id, 0.0 wa, 0.0 hi, 0.0 si, 0.3 st
KiB Mem : 4046532 total, 316792 free, 2351380 used, 1378360 buff/cache
KiB Swap: 0 total, 0 free, 0 used, 1386896 avail Mem
```

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
18087	chaos	20	0	13936	3516	3080	R	6.2	0.1	0:07.10	openssl
18107	chaos	20	0	13936	3472	3036	R	6.2	0.1	0:07.13	openssl
18125	chaos	20	0	13936	3592	3160	R	6.2	0.1	0:07.10	openssl
18093	chaos	20	0	13936	3336	2900	R	5.9	0.1	0:07.23	openssl
18094	chaos	20	0	13936	3464	3032	R	5.9	0.1	0:07.05	openssl
18102	chaos	20	0	13936	3500	3064	R	5.9	0.1	0:07.10	openssl
18103	chaos	20	0	13936	3520	3084	R	5.9	0.1	0:07.30	openssl
18108	chaos	20	0	13936	3424	2992	R	5.9	0.1	0:07.08	openssl
18109	chaos	20	0	13936	3464	3028	R	5.9	0.1	0:07.14	openssl
18110	chaos	20	0	13936	3492	3056	R	5.9	0.1	0:07.21	openssl
18111	chaos	20	0	13936	3460	3012	R	5.9	0.1	0:06.99	openssl
18112	chaos	20	0	13936	3520	3084	R	5.9	0.1	0:07.09	openssl
18117	chaos	20	0	13936	3596	3160	R	5.9	0.1	0:06.97	openssl
18118	chaos	20	0	13936	3592	3156	R	5.9	0.1	0:07.01	openssl
18121	chaos	20	0	13936	3588	3156	R	5.9	0.1	0:07.09	openssl
18122	chaos	20	0	13936	3512	3076	R	5.9	0.1	0:07.08	openssl
18124	chaos	20	0	13936	3444	3000	R	5.9	0.1	0:07.05	openssl
18126	chaos	20	0	13936	3512	3076	R	5.9	0.1	0:07.13	openssl
18127	chaos	20	0	13936	3532	3096	R	5.9	0.1	0:07.05	openssl
18088	chaos	20	0	13936	3308	2884	R	5.6	0.1	0:07.17	openssl
18089	chaos	20	0	13936	3240	2820	R	5.6	0.1	0:07.21	openssl
18091	chaos	20	0	13936	3420	2984	R	5.6	0.1	0:07.19	openssl
18099	chaos	20	0	13936	3464	3028	R	5.6	0.1	0:07.06	openssl
18106	chaos	20	0	13936	3524	3088	R	5.6	0.1	0:07.11	openssl
18113	chaos	20	0	13936	3492	3056	R	5.6	0.1	0:06.96	openssl
18114	chaos	20	0	13936	3592	3160	R	5.6	0.1	0:07.18	openssl
18115	chaos	20	0	13936	3516	3080	R	5.6	0.1	0:07.18	openssl
18116	chaos	20	0	13936	3564	3132	R	5.6	0.1	0:07.20	openssl
18119	chaos	20	0	13936	3516	3080	R	5.6	0.1	0:07.09	openssl
18120	chaos	20	0	13936	3524	3084	R	5.6	0.1	0:07.12	openssl
18123	chaos	20	0	13936	3484	3048	R	5.6	0.1	0:07.04	openssl
18090	chaos	20	0	13936	3348	2916	R	5.2	0.1	0:07.18	openssl
8503	root	20	0	462516	89856	42868	S	4.9	2.2	0:56.51	kubelet
8781	root	20	0	104668	70156	41708	S	2.0	1.7	0:25.40	kube-controller
1479	root	20	0	1436024	80344	29960	S	1.0	2.0	3:09.70	dockerd
8975	root	20	0	178744	138264	46524	S	1.0	3.4	0:22.28	kube-apiserver
8835	root	20	0	10.045g	40892	16656	S	0.7	1.0	0:11.76	etcd
13340	10001	20	0	1649936	274304	9816	S	0.7	6.8	1:02.37	java
13370	999	20	0	950384	58624	27752	S	0.7	1.4	0:03.93	mongod

LET'S KILL THE CHAOS NOW

```
pskill -u chaos
```

NO MORE CHAOS IN TOP

```
Tasks: 200 total, 2 running, 198 sleeping, 0 stopped, 0 zombie
%Cpu(s): 4.9 us, 2.6 sy, 0.0 ni, 91.8 id, 0.2 wa, 0.0 hi, 0.2 si, 0.3 st
KiB Mem : 4846532 total, 344328 free, 2322212 used, 1379992 buff/cache
KiB Swap: 0 total, 0 free, 0 used, 1416592 avail Mem
```

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
8503	root	20	0	463572	90832	42928	S	6.0	2.2	1:10.34	kubelet
8781	root	20	0	104668	70144	41708	R	3.0	1.7	0:31.37	kube-controller
8975	root	20	0	178744	138524	46524	S	2.0	3.4	0:26.85	kube-apiserver
1479	root	20	0	1436024	80408	29960	S	1.3	2.0	3:12.67	dockerd
13924	999	20	0	952880	59340	27772	S	1.3	1.5	0:05.45	mongod
8835	root	20	0	10.045g	42148	16836	S	1.0	1.0	0:14.81	etcd
14590	999	20	0	297828	62520	29340	S	1.0	1.5	0:05.99	mongod
9064	root	20	0	49088	33684	23516	S	0.7	0.8	0:04.02	kube-proxy
7	root	20	0	0	0	0	S	0.3	0.0	0:01.85	rcu_sched
1601	root	20	0	885796	19192	8968	S	0.3	0.5	0:00.83	containerd
1931	dd-agent	20	0	210460	14376	7456	S	0.3	0.4	0:01.02	trace-agent
1938	dd-agent	20	0	195604	27456	7008	S	0.3	0.7	0:04.10	python
13370	999	20	0	950384	58624	27752	S	0.3	1.4	0:05.36	mongod
13604	10001	20	0	1650072	269164	9456	S	0.3	6.7	1:03.40	java
14680	1001	20	0	616976	58028	14108	S	0.3	1.4	0:04.10	node
20766	chaos	20	0	40540	3880	3192	R	0.3	0.1	0:00.05	top
1	root	20	0	37948	6164	4128	S	0.0	0.2	0:05.35	systemd
2	root	20	0	0	0	0	S	0.0	0.0	0:00.00	kthreadd
3	root	20	0	0	0	0	S	0.0	0.0	0:00.32	ksoftirqd/0
5	root	0	-20	0	0	0	S	0.0	0.0	0:00.00	kworker/0:0H
8	root	20	0	0	0	0	S	0.0	0.0	0:00.00	rcu_bh
9	root	rt	0	0	0	0	S	0.0	0.0	0:00.04	migration/0
10	root	rt	0	0	0	0	S	0.0	0.0	0:00.00	watchdog/0
11	root	rt	0	0	0	0	S	0.0	0.0	0:00.00	watchdog/1
12	root	rt	0	0	0	0	S	0.0	0.0	0:00.05	migration/1
13	root	20	0	0	0	0	S	0.0	0.0	0:00.37	ksoftirqd/1
14	root	20	0	0	0	0	S	0.0	0.0	0:00.01	kworker/1:0
15	root	0	-20	0	0	0	S	0.0	0.0	0:00.00	kworker/1:0H
16	root	20	0	0	0	0	S	0.0	0.0	0:00.00	kdevtmpfs
17	root	0	-20	0	0	0	S	0.0	0.0	0:00.00	netns
18	root	0	-20	0	0	0	S	0.0	0.0	0:00.00	perf

DISK CHAOS

@tammybutow

#QCONNYC

DISK CHAOS

```
root@ubuntu-s-1vcpu-1gb-sfo2-01:~# df -h
Filesystem      Size  Used Avail Use% Mounted on
udev            490M   0 490M   0% /dev
tmpfs           100M  3.1M   97M   4% /run
/dev/vda1       25G   1.1G  23G   5% /
tmpfs           497M   0 497M   0% /dev/shm
tmpfs           5.0M   0  5.0M   0% /run/lock
tmpfs           497M   0 497M   0% /sys/fs/cgroup
/dev/vda15      105M  3.4M  101M   4% /boot/efi
tmpfs           100M   0  100M   0% /run/user/0
root@ubuntu-s-1vcpu-1gb-sfo2-01:~# █
```



MEMORY CHAOS

@tammybutow

#QCONNYC

MEMORY CHAOS

FREE(1) User Commands FREE(1)

NAME

`free` - Display amount of free and used memory in the system

SYNOPSIS

`free` [options]

DESCRIPTION

`free` displays the total amount of free and used physical and swap memory in the system, as well as the buffers and caches used by the kernel. The information is gathered by parsing `/proc/meminfo`. The displayed columns are:

total Total installed memory (MemTotal and SwapTotal in `/proc/meminfo`)

used Used memory (calculated as **total** - **free** - **buffers** - **cache**)

free Unused memory (MemFree and SwapFree in `/proc/meminfo`)

shared Memory used (mostly) by tmpfs (Shmem in `/proc/meminfo`, available on kernels 2.6.32, displayed as zero if not available)

buffers



`free -m`

PART 3: STATE CHAOS ENGINEERING

PROCESS CHAOS

@tammybutow

#QCONNYC

PROCESS CHAOS

Ways to create process chaos on purpose:

- Kill one process
- Loop kill a process
- Spawn new processes
- Fork bomb

PROCESS CHAOS

PGREP(1)

User Commands

PGREP(1)

NAME

`pgrep`, `pkill` - look up or signal processes based on name and other attributes

SYNOPSIS

```
pgrep [options] pattern  
pkill [options] pattern
```

DESCRIPTION

`pgrep` looks through the currently running processes and lists the process IDs which match the selection criteria to stdout. All the criteria have to match. For example,

```
$ pgrep -u root sshd
```

will only list the processes called `sshd` AND owned by `root`. On the other hand,

```
$ pgrep -u root,daemon
```

will list the processes owned by `root` OR `daemon`.



`pkill -u chaos`

SHUTDOWN CHAOS

@tammybutow

#QCONNYC

SHUTDOWN CHAOS

SHUTDOWN(8)

shutdown

SHUTDOWN(8)

NAME

shutdown - Halt, power-off or reboot the machine

SYNOPSIS

shutdown [OPTIONS...] [TIME] [WALL...]

DESCRIPTION

shutdown may be used to halt, power-off or reboot the machine.

The first argument may be a time string (which is usually "now"). Optionally, this may be followed by a wall message to be sent to all logged-in users before going down.

The time string may either be in the format "hh:mm" for hour/minutes specifying the time to execute the shutdown at, specified in 24h clock format. Alternatively it may be in the syntax "+m" referring to the specified number of minutes m from now. "now" is an alias for "+0", i.e. for triggering an immediate shutdown. If no time argument is specified, "+1" is implied.

Note that to specify a wall message you must specify a time argument, too.



shutdown -h

WHAT ARE OTHER WAYS YOU CAN
TURN OFF A SERVER?

WHAT IF YOU WANT TO
TURN OFF EVERY SERVER
WHEN IT'S ONE WEEK OLD?

HALT, REBOOT & POWEROFF CHAOS

HALT(8)

halt

HALT(8)

NAME

halt, poweroff, reboot - Halt, power-off or reboot the machine

SYNOPSIS

halt [OPTIONS...]

poweroff [OPTIONS...]

reboot [OPTIONS...]

DESCRIPTION

halt, poweroff, reboot may be used to halt, power-off or reboot the machine.

OPTIONS

The following options are understood:

--help

Print a short help text and exit.

--halt

Halt the machine, regardless of which one of the three commands is



halt

WHAT ABOUT SHUTTING DOWN
CONTAINERS AND K8'S PODS?

@tammybutow

#QCONNYC

THE MANY WAYS TO KILL CONTAINERS

- Kill self
- Kill a container from the host
- Use one container to kill another
- Use one container to kills several containers
- Use several containers to kill several


The average lifespan of a container is 2.5 days
And they fail in many unexpected ways.

TIME TRAVEL CHAOS

@tammybutow

#QCONNYC

TIME TRAVEL CHAOS AKA CLOCK SKEW

 Questions Tags

Clock skew on my VPS server

▲ I am having a problem with the time on my VPS hosted at Rackspace. Its running Red Hat Enterprise Linux 5.4. Date commands gives a time which is 11 minutes ahead of the actual time.

1 I am running `ntpd` and my `/etc/ntp.conf` is as per the 2nd option given [here](#)

▼ I also modified `/etc/sysconfig/ntp` and changed `SYNC_HWLOCK=yes` and rebooted the server.

★ None of this has helped so far. I contacted Rackspace and their answer was the time on the main host is OK.

Output of `ntpq -p` is:

```
root@webserver [/etc/sysconfig]# ntpq -p
      remote           refid      st t when poll reach   delay   offset  jitter
-----
*ln1.dijudi.co 128.138.140.44  2 u   7   64  377   24.645 -673871  19.246
+ns1.your-site.c 72.8.140.240    3 u  24   64  377   20.666 -673874  24.355
+linode.aput.net 10.0.0.250      3 u  10   64  377   54.058 -673838  23.812
LOCAL(0)       .LOCL.         10 l  40   64  377    0.000  0.000   0.001
root@webserver [/etc/sysconfig]#
```

I would appreciate any assistance on this.



ntpq

PART 4: NETWORK CHAOS ENGINEERING

BLACKHOLE CHAOS

@tammybutow

#QCONNYC

BLACKHOLE CHAOS

ROUTE(8)

Linux Programmer's Manual

ROUTE(8)

NAME

`route` - show / manipulate the IP routing table

SYNOPSIS

`route` [-CFvnee]

`route` [-v] [-A family] **add** [-net|-host] target [netmask Nm] [gw Gw] [metric N] [mss M] [window W] [irtt I] [reject] [mod] [dyn] [reinstate] [[dev] If]

`route` [-v] [-A family] **del** [-net|-host] target [gw Gw] [netmask Nm] [metric N] [[dev] If]

`route` [-V] [--version] [-h] [--help]

DESCRIPTION

Route manipulates the kernel's IP routing tables. Its primary use is to set up static routes to specific hosts or networks via an interface after it has been configured with the **ifconfig(8)** program.

When the **add** or **del** options are used, **route** modifies the routing tables. Without these options, **route** displays the current contents of the routing



ip route show

DNS CHAOS

@tammybutow

#QCONNYC

DNS CHAOS

2016 Dyn cyberattack

From Wikipedia, the free encyclopedia

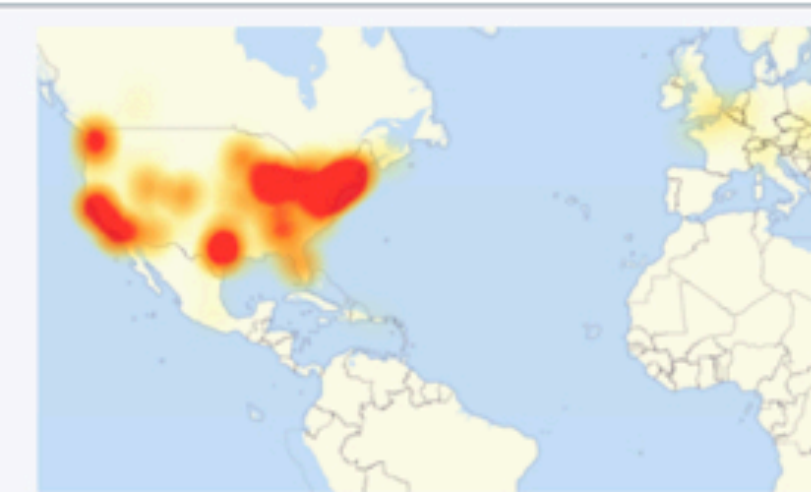
The **2016 Dyn cyberattack** took place on October 21, 2016, and involved multiple **distributed denial-of-service attacks** (DDoS attacks) targeting systems operated by **Domain Name System** (DNS) provider **Dyn**, which caused major Internet platforms and services to be unavailable to large swathes of users in Europe and North America.^{[2][3]} The groups **Anonymous** and **New World Hackers** claimed responsibility for the attack, but scant evidence was provided.^[4]

As a DNS provider, Dyn provides to end-users the service of mapping an Internet **domain name**—when, for instance, entered into a **web browser**—to its corresponding **IP address**. The **distributed denial-of-service** (DDoS) attack was accomplished through a large number of DNS lookup requests from tens of millions of IP addresses.^[5] The activities are believed to have been executed through a **botnet** consisting of a large number of **Internet-connected devices**—such as **printers**, **IP cameras**, **residential gateways** and **baby monitors**—that had been infected with the **Mirai** malware.

Contents [hide]

- 1 **Timeline and impact**
 - 1.1 **Affected services**
- 2 **Investigation**
- 3 **Perpetrators**
- 4 **See also**
- 5 **References**

Dyn cyberattack



Map of areas most affected by attack, 16:45 UTC, 21 October 2016.^[1]

Date	October 21, 2016
Time	12:10 – 14:20 UTC 16:50 – 18:11 UTC 21:00 – 23:11 UTC <i>[citation needed][needs update]</i>
Location	Europe and North America, especially the Eastern United States
Type	Distributed denial-of-service
Participants	Unknown



DNS CHAOS

tammy ▼
tammy

Create Attack Halt All Attacks 👤 ▼

ATTACKS | CREATE ATTACK

Choose Your Gremlin: Network ✕ ▼ DNS ✕ ▼

Define The Impact

🕒 Length	60	The length of the attack (seconds)
📄 IP Addresses	-i	Prevent lookups from these DNS servers Whitelist a host with a leading "*"
📡 Device	-d	Impact traffic over this network interface Defaults to the first device it finds (Ex: 'eth0')
🔄 Protocol	-P	Impact traffic over this network interface Defaults to the first device it finds (Ex: 'eth0')
🌐 Service Providers	Service Providers ▲	External service providers to affect

Save a new impact template

Choose The Targets

Exact Random

A designated amount of your clients will be

Search client tags...

Gremlin



LATENCY CHAOS

@tammybutow

#QCONNYC

LATENCY CHAOS

```
My traceroute [v0.86]
ubuntu-s-1vcpu-1gb-sfo2-01 (0.0.0.0) Sat Jun 9 06:46:26 2018
resolver: Received error response 2. (server failure)er of fields quit

  Packets
Host      Loss%  Snt  Last  Avg  Best  Wrst  StDev
1. 206.189.208.253  0.0%  25   0.3  1.7  0.3  18.7  3.7
2. 138.197.249.152  0.0%  25   0.4  0.5  0.4  1.3  0.0
3. 206.41.106.63    0.0%  25   1.9  1.2  1.0  2.1  0.0
4. 108.170.242.241  0.0%  24   2.6  2.6  2.4  3.9  0.2
5. 108.170.237.147  0.0%  24   1.5  1.5  1.4  1.7  0.0
6. nuq04s29-in-f14.1e100.net 0.0%  24   1.6  1.5  1.4  1.7  0.0
```



mtr google.com

PACKET LOSS CHAOS

@tammybutow

#QCONNYC

PACKET LOSS CHAOS

Package: wireshark (2.4.5-1) [universe]

network traffic analyzer - meta-package

Other Packages Related to wireshark

● depends ♦ recommends ■ suggests • enhances

- wireshark-qt
network traffic analyzer - Qt version
or wireshark-gtk
network traffic analyzer - GTK+ version

Download wireshark

Architecture	Package Size	Installed Size	Files
amd64	4.4 kB	54.0 kB	[list of files]
arm64	4.4 kB	54.0 kB	[list of files]
armhf	4.4 kB	54.0 kB	[list of files]
i386	4.4 kB	54.0 kB	[list of files]
ppc64el	4.4 kB	54.0 kB	[list of files]
s390x	4.4 kB	54.0 kB	[list of files]

Links for wireshark



Ubuntu Resources:

- Bug Reports
- Ubuntu Changelog
- Copyright File

Download Source Package wireshark:

- [\[wireshark_2.4.5-1.dsc\]](#)
- [\[wireshark_2.4.5.orig.tar.xz\]](#)
- [\[wireshark_2.4.5-1.debian.tar.xz\]](#)

Maintainer:

- Ubuntu MOTU Developers (Mail Archive)



PART 5: COMPLEX OUTAGES

We can combine different types of chaos engineering experiments to reproduce complicated outages.

Reproducing outages gives you confidence you can handle it if/when it happens again.

Let's go back in time to look at some of the worst outage stories that kicked off the introduction of chaos engineering.

DROPBOX'S WORST OUTAGE EVER

Some master-replica pairs were impacted which resulted in the site going down.

<https://blogs.dropbox.com/tech/2014/01/outage-post-mortem/>

UBER'S DATABASE OUTAGE

1. Master log replication to S3 failed
2. Logs backed up on the primary
3. Alerts fired to engineer but they are ignored
4. Disk fills up on database primary
5. Engineer deletes unarchived WAL files
6. Error in config prevents promotion

— Matt Ranney, Uber, 2015

OUTAGES HAPPEN.

@tammybutow

#QCONNYC

THERE ARE MANY MORE OUTAGES
YOU CAN READ ABOUT HERE:

<https://github.com/danluu/post-mortems>

HOW CAN YOU CONTINUE YOUR
CHAOS ENGINEERING JOURNEY?

@tammybutow

#QCONNYC

JOIN THE CHAOS SLACK

chaosengineering | tammy

Jump to...

- All Unreads
- All Threads
- Starred
- # announcements
- # general
- # get_started
- # introductions
- # iri
- # learning
- # meetup-organisers
- # random
- # security
- # tech_news
- o ankit
- pgurn
- Scilly

Channels

- # alerts
- # capacity_planning
- # change_management
- # chaos_podcast
- # chaosconf
- # cool
- # efficiency
- # experiments
- # hardware
- # incident_management
- # jcbs
- # k8s
- # mentoring
- # mobile
- # monitoring

#general | 988 | 8 | Channel to discuss all things Chaos Engineering

Tuesday, June 5th

Getting Started with Chaos Engineering | Gremlin Blog

We all want more time to innovate, to dream, and to make an impact. But unstable applications and fragile architectures rob us of that time. We spend too much of it reacting to outages instead of building stronger systems. (134 kB)

tammy 1:42 PM
@Channy @Nile and @Ara Medina 🙌 thank you for your work with chaos engineering meetups and talks across the world!

1 reply 12 days ago

tammy 1:43 PM
Thinking of some other ways we can highlight the great work everyone is doing! Let me know if you have ideas 🙌

tammy 1:43 PM
uploaded this image: [Chaos Champs :\)](#)

9. Become a Chaos Champion

Chaos Champions organize community meetups all around the world to help the community thrive. Here are three Chaos Champions from across the world.

Sizazy: Korean Chaos Champion	Ada: Californian Chaos Champion	Ziss: German Chaos Champion

Does your city have a Chaos Engineering Meetup? Find out here!

Michael Kehoe 2:04 PM

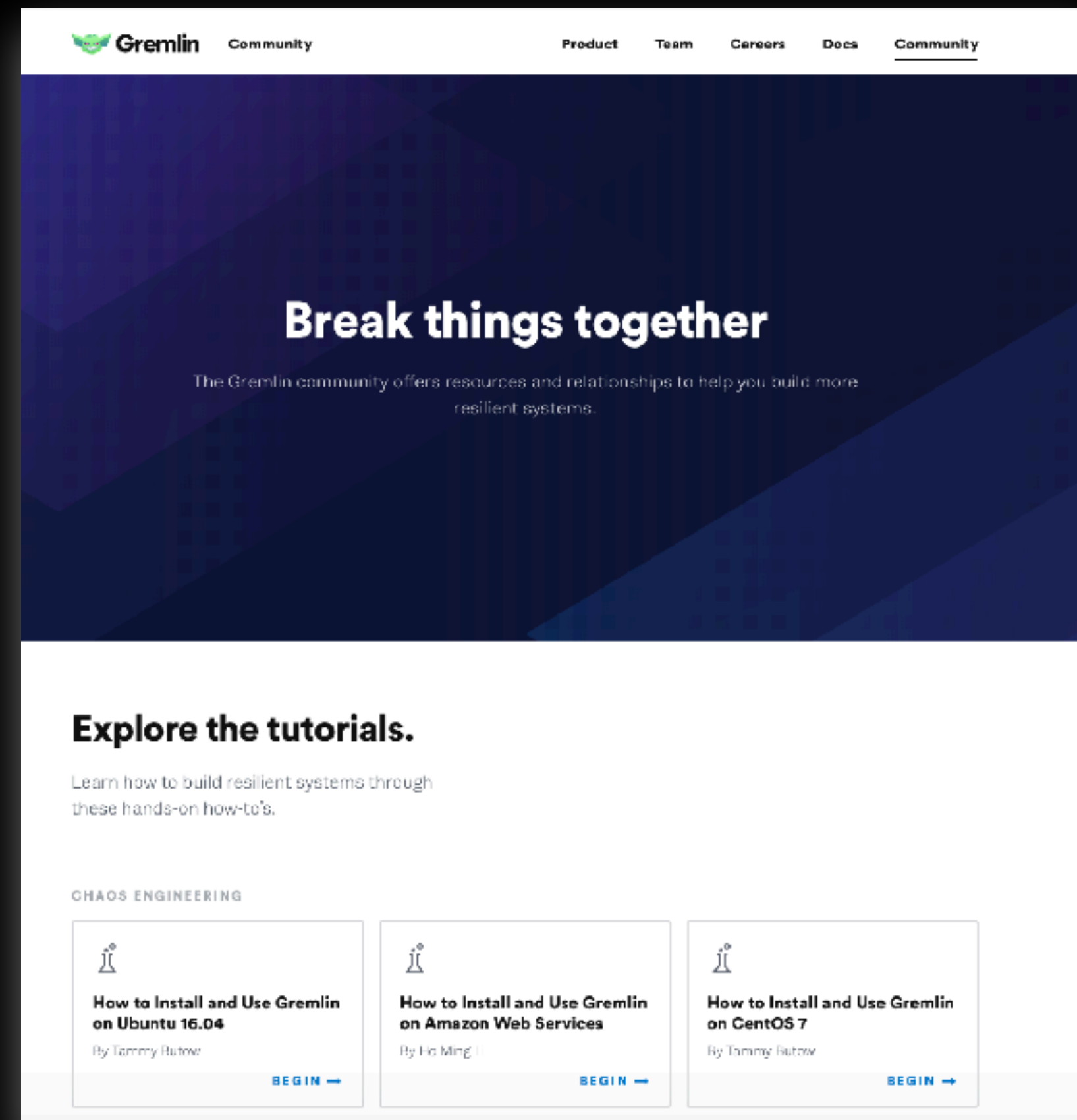
+ Message #general

GREMLIN.COM/SLACK

@tammybutow

#QCONNYC

LEARN WITH THE GREMLIN COMMUNITY



GREMLIN.COM/COMMUNITY

@tammybutow

#QCONNYC

THE FIRST CHAOS ENGINEERING CONFERENCE!

Chaos Conf.

Tweets 37 Following 9 Followers 357 Likes 27 [Follow](#)

Chaos Conf
@ChaosConf

The Flagship Chaos Engineering Conference. #ChaosConf 2018 is happening September 28th at the @DraftHouseSF. Proudly supported by @gremlininc #chaosengineering

San Francisco, CA

San Francisco, CA

Chaos Conf @ChaosConf · Jun 26
Join the community! Tutorials, Talks, Meetups & a Slack Group #chaosengineering 🙌

JOIN THE Gremlin

[CHAOSCONF.IO](https://chaosconf.io)

@tammybutow

#QCONNYC

THANK YOU

QCON NYC

@tammybutow



#CHAOSENGINEERING