

# **Chaos Engineering: Proof of Hypothesis in Production**

Catedral de Garagoa @cristiandanielma



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# Nice to meet you ...

## YURY NIÑO

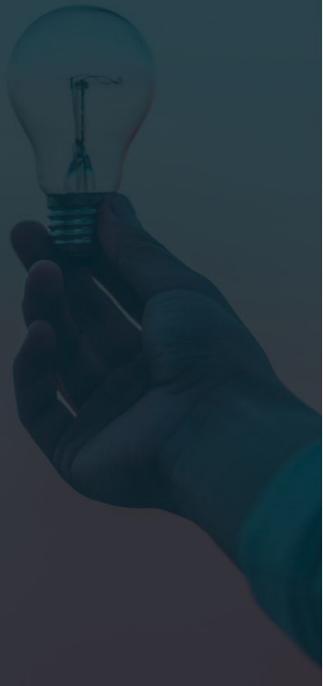


Garagoense, DevOps Engineer  
and Chaos Engineer Advocate

Love building **software applications**, solving **resilience** issues and  
**teaching**. Passionate about reading, writing and cycling.

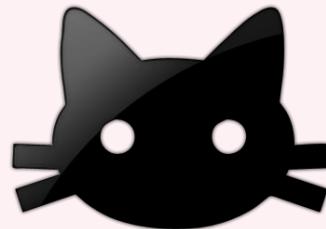


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There is an ancient proverb that says:

It is very difficult to find a black cat in a dark room, especially where there is no  
a cat!





# Agenda

- ★ **Scientific Method**
- ★ Why is **Science** important in **Engineering**?
- ★ **Chaos Engineering:** Engineering & Science
- ★ Managing Incidents with Science
- ★ **Chaos Attacks & Chaos Scenarios**
- ★ That is why I work in a **Lab** :)

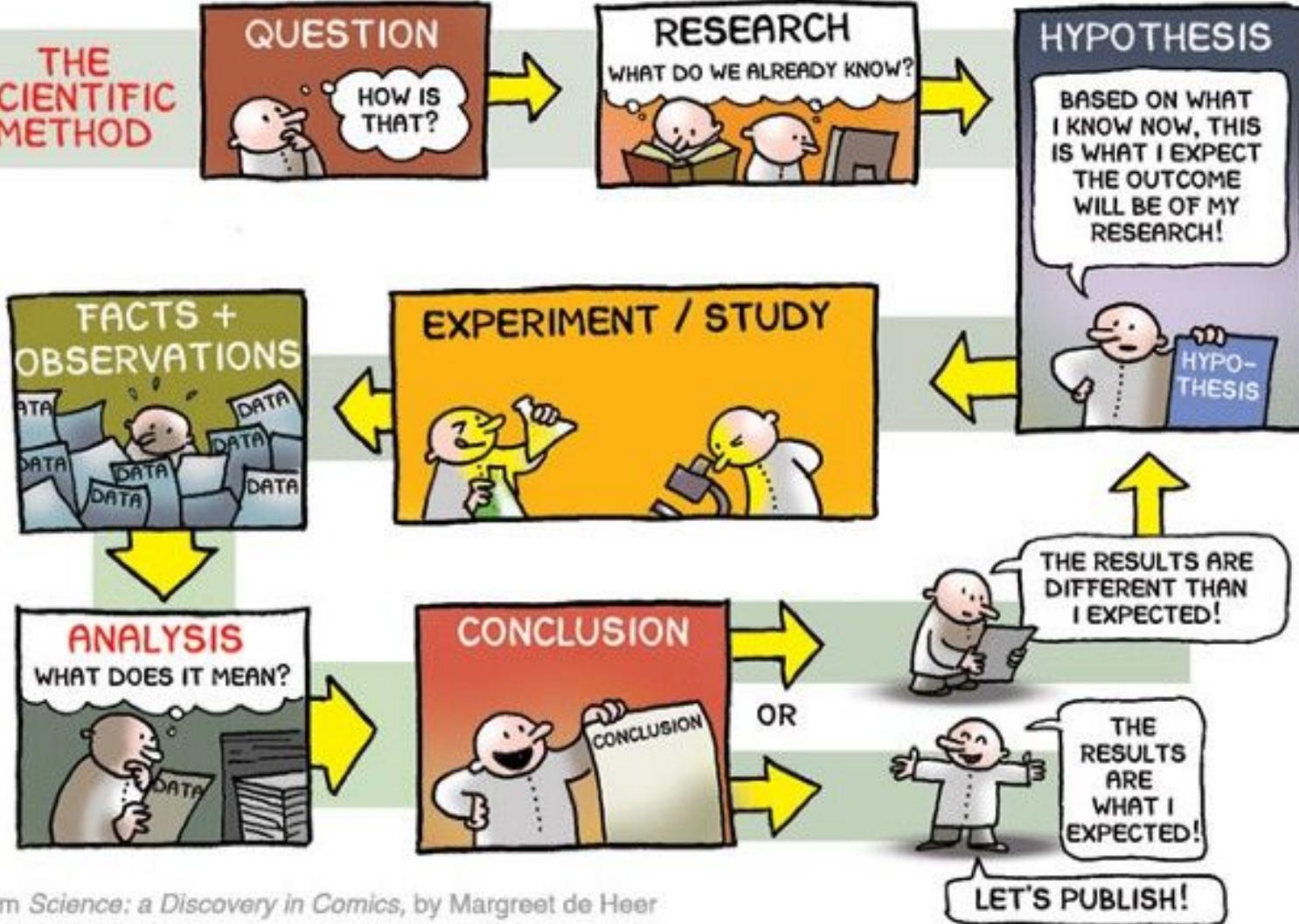
**How many of you** consider  
yourself as scientists?



**How many of you** have ever done an experiment?



## THE SCIENTIFIC METHOD

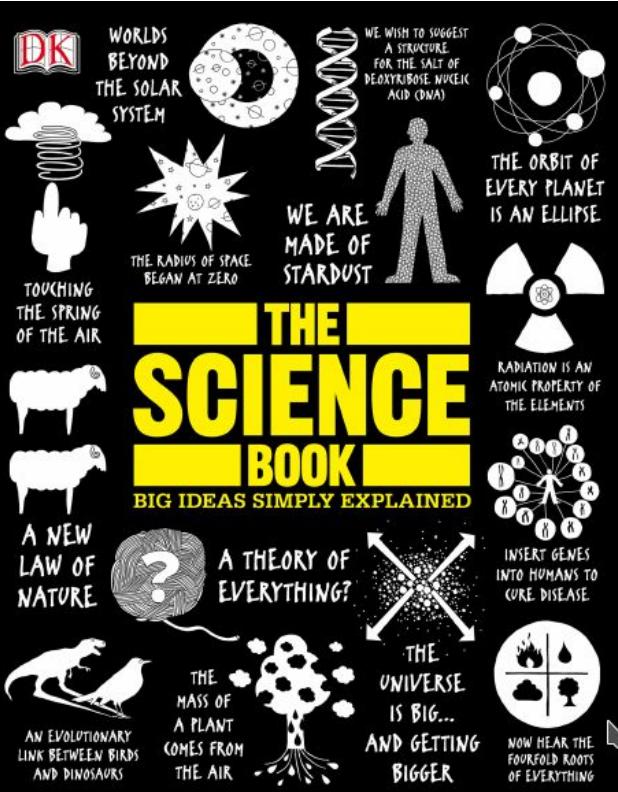




Engineers without a  
PhD can be  
Scientists also!

Really ...  
Are you kidding me





**S**cience is an ongoing search for truth—a perpetual struggle to discover how the universe works that goes back to the earliest civilizations. **Driven by human curiosity, it has relied on reasoning, observation, and experiment.** The best known of the ancient Greek philosophers,

All truths are easy to understand once they are discovered; the point is to discover them.

**Galileo Galilei**

## Engineering

From Wikipedia, the free encyclopedia

*This article is about the general field called "engineering". For the design and building of actual engines, see [Engine](#). For other uses, see [Engineering \(disambiguation\)](#).*

**Engineering** is the use of **scientific principles** to design and build machines, structures, and other items, including bridges, tunnels, roads, vehicles, and buildings.<sup>[1]</sup> The discipline of engineering encompasses a broad range of more specialized **fields of engineering**, each with a more specific emphasis on particular areas of applied mathematics, applied science, and types of application. See [glossary of engineering](#).

# Why is **Science** important in Engineering?





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# Building Space Collapse

October 12 - 2013

SSIAN Support

404



Bartek Polanczyk  
@SzybkiSasza

#aws #s3 is down! @cloudfront is down! Th

1:09 PM - 28 Feb 2017

← 198    ↗ 151



GitLab.com Status  
@gitlabstatus

Follow

We accidentally deleted production data and might have to restore from backup. Google Doc with live notes  
[docs.google.com/document/d/1GC...](https://docs.google.com/document/d/1GC...)

11:44 AM - 1 Feb 2017

← 464    ↗ 341

AFTER THE RETROSPECTIVE  
**Heroku Incident**  
**#1892**

Gremlin



# TO ENGINEER IS HUMAN

The Role of Failure in Successful Design



With a new afterword by the author

"Serious, amusing, probing,  
sometimes frightening  
and always literate."  
—Los Angeles Times

HENRY PETROSKI

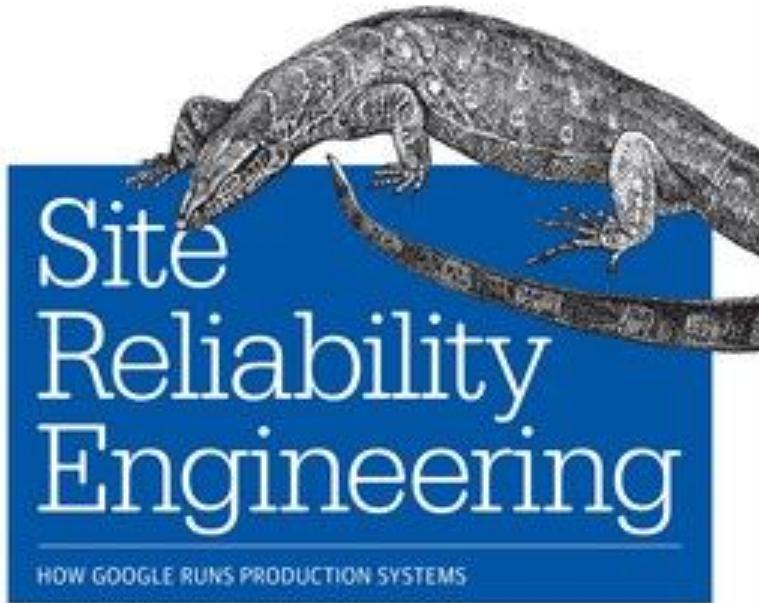
Author of *THE EVOLUTION OF USEFUL THINGS*

**Science** and **Engineering** must work together to address our world's most pressing issues,

from dealing with the prevention of natural disasters to the development of efficient **systems software!**



# Managing Incidents with Science



Apply the scientific method to  
incident response!

How?

Through ...

Edited by Betsy Beyer, Chris Jones,  
Jennifer Petoff & Niall Richard Murphy

Here, we talk about Chaos  
Engineering?





# Chaos Engineering

It is a **scientific method** that consists in specifying and evaluating **resilience hypotheses**

- 1) **injecting** faults in **production**
- 2) **observing** the impact
- 3) **building** resilience

*Long Zhang. A Chaos Engineering System*

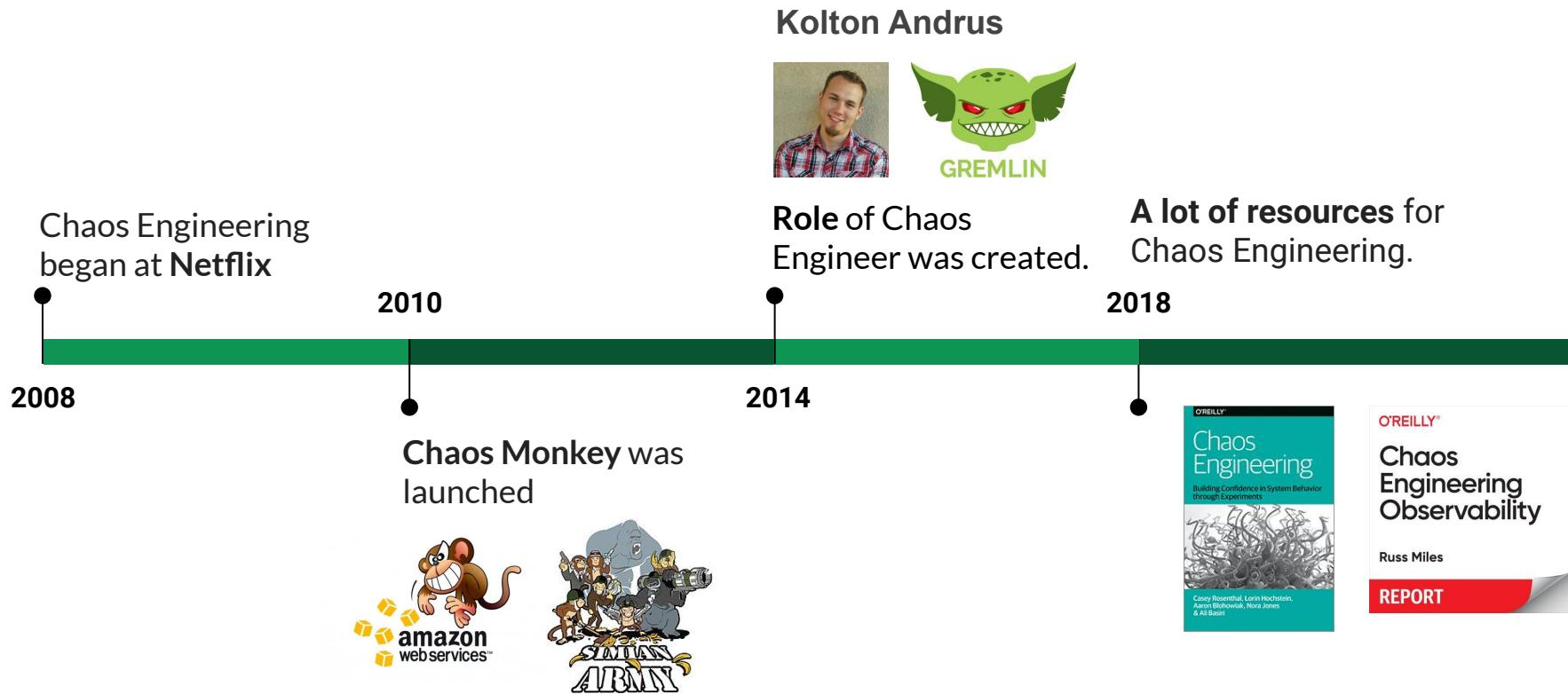
# Chaos Engineering

It is deliberately **inducing** stress or **fault** into software and/or hardware as a way of **learning/verifying** things about systems.

*<https://www.gremlin.com>*



# History of Chaos Engineering





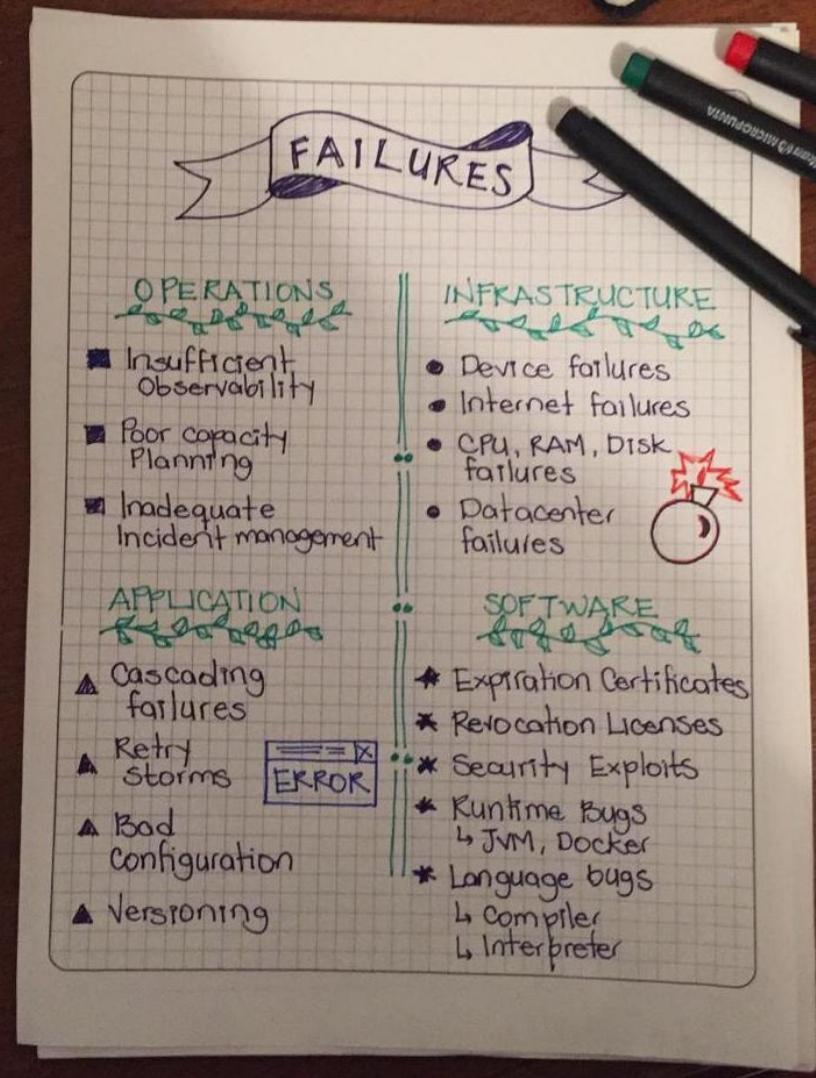
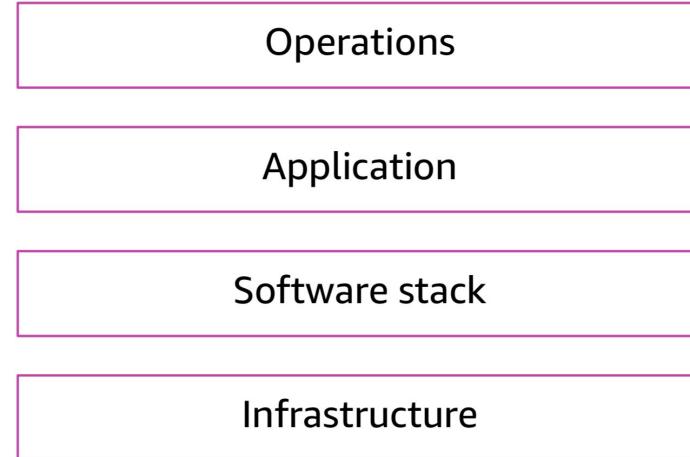
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# Designing Experiments



1. Pick a Hypothesis
2. Choose the Scope
3. Identify the Metrics to Monitor
4. Notify the Organization
5. Run the Experiment
6. Analyze the Results
7. Automate

# Taxonomy Failure layers





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Name \_\_\_\_\_ Date \_\_\_\_\_

### Scientific Method Chart

Problem/Question	
Hypothesis	
Procedure	
Data	
Observations	
Conclusions	



Application  
Name

**GCP Instance**

Hypothesis **Cloud can fail :O**

Environment **My Home**

Duration **2 minutes**

Load **1 request**

Observability **GCP Console**

Results **???**



**DEMO TIME**

# Configuration

≡ Google Cloud Platform 🔍

New Project

⚠️ You have 20 projects remaining in your quota. Request an increase or delete projects. [Learn more](#)

[MANAGE QUOTAS](#)

Project Name \*  
my-gremlin ?

Project ID: my-gremlin. It cannot be changed later. [EDIT](#)

Location \*  
 No organization [BROWSE](#)

Parent organization or folder

[CREATE](#) [CANCEL](#)

Name ?  
koala-leopard-1

Region ? Zone ?  
us-east1 (South Carolina) us-east1-b

Machine type  
Customize to select cores, memory and GPUs.

1 vCPU 3.75 GB memory [Customize](#)

Container ?  
 Deploy a container image to this VM instance. [Learn more](#)

Boot disk ?  
 New 10 GB standard persistent disk  
Image  
Debian GNU/Linux 9 (stretch) [Change](#)

Identity and API access ?

Service account ?  
Compute Engine default service account

# Configuration

A screenshot of a cloud provider's interface for managing VM instances. At the top, there is a search bar labeled "Filter VM instances" and a "Columns" dropdown menu. Below this is a table with the following columns: Name, Zone, Recommendation, In use by, Internal IP, External IP, and Connect. One row is visible, representing a VM named "koala-leopard" located in the "us-east1-b" zone. The "Internal IP" is listed as "10.142.0.2 (nic0)" and the "External IP" is "34.73.126.113". The "Connect" column shows "SSH" with a dropdown arrow and a three-dot menu icon.

<input type="checkbox"/> Name ^	Zone	Recommendation	In use by	Internal IP	External IP	Connect
<input checked="" type="checkbox"/> koala-leopard	us-east1-b			10.142.0.2 (nic0)	34.73.126.113	SSH

Then install the Gremlin client and daemon:

```
sudo apt-get update && sudo apt-get install -y gremlin gremlind
```

Then initialise Gremlin and follow the prompts:

```
gremlin init
```

# Configuration

Ana  
Ana

- Attack
- Clients
- Users
- Team Report



Attacks > New

Halt All Attacks  

 **Choose The Targets**  
Specify the coverage and details for impact.

 **Choose a Gremlin**  
Select the type of attack to unleash.

Category	Attack
Resource	CPU

**Length**  
The length of the attack (seconds)  
60

**Cores**  
The number of CPU cores to hog  
1

 **Run the attack**  
Unleash now or schedule for later.



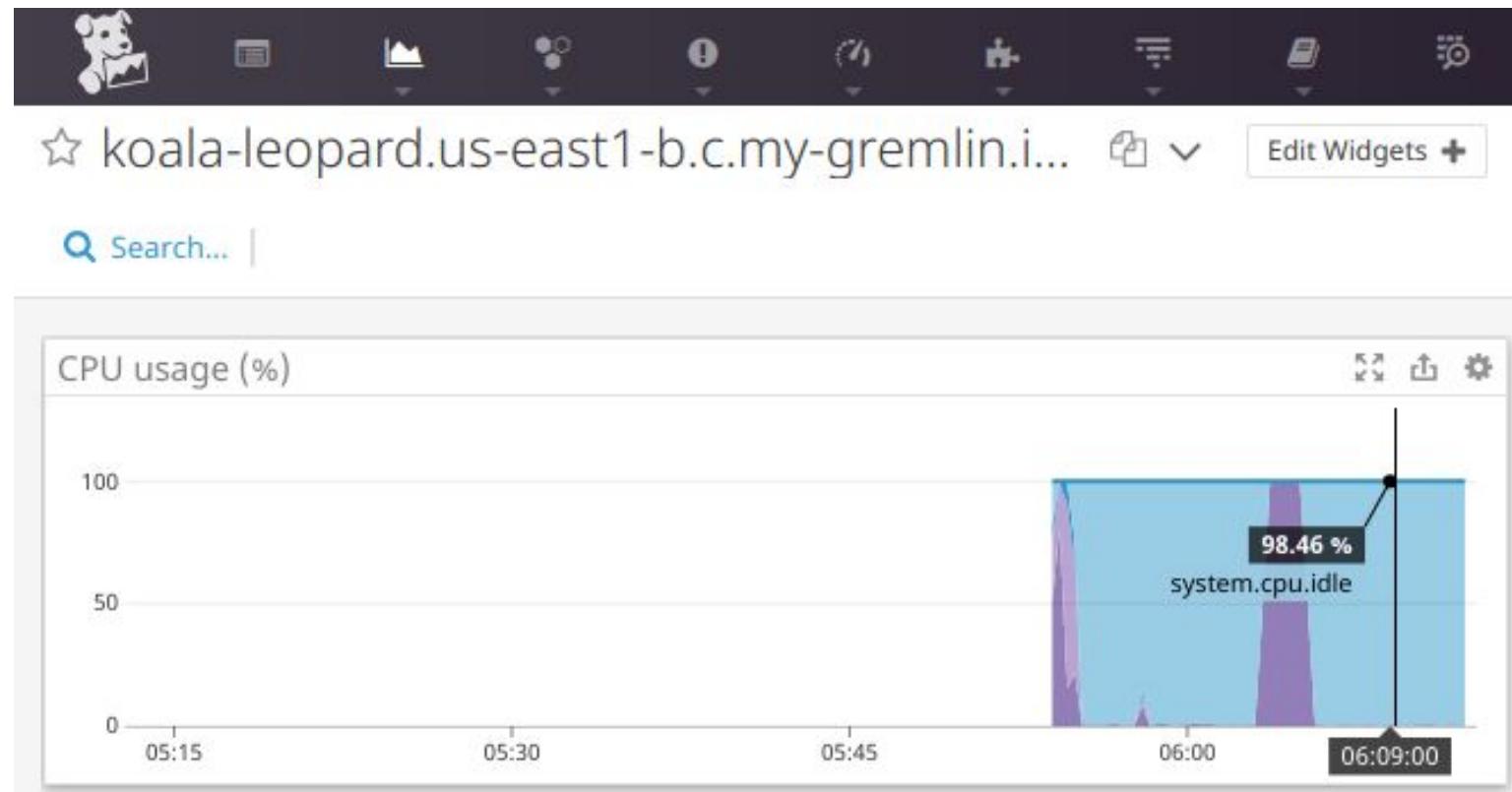
# Configuration

```
top
```

On the top, these processes displayed:

8160	gremlin	20	0	37736	9856	6180	S	99.7	0.1	0:16.30	greml
2682	gremlin	20	0	44720	11936	5632	S	0.7	0.1	0:16.68	greml

# Observability





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# Chaos Scenarios

SCENARIO NAME		HYPOTHESIS
DESCRIPTION		NO IMPACT
		DEGRADED PERFORMANCE
		SERVICE OUTAGE
		IMPROVED PERFORMANCE
SCENARIO DETAILS		
GREMLIN ATTACK TYPE		TAGS
DURATION OF FAILURE	IMPACT/MAGNITUDE	DELAY
GREMLIN ATTACK TYPE		TAGS
DURATION OF FAILURE	IMPACT/MAGNITUDE	DELAY
GREMLIN ATTACK TYPE		TAGS
DURATION OF FAILURE	IMPACT/MAGNITUDE	DELAY
GREMLIN ATTACK TYPE		TAGS
DURATION OF FAILURE	IMPACT/MAGNITUDE	DELAY
GREMLIN ATTACK TYPE		TAGS
DURATION OF FAILURE	IMPACT/MAGNITUDE	DELAY
NOTES & OBSERVATIONS		CONCLUSIONS
		EXPECTED
		DETECTED
		HANDLED
		DIG DEEPER

Gremlin

JOIN US ON GREMLIN.COM/SLACK





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# Chaos Scenarios

Custom Drafts Recommended

Archived

## Validate Auto-Scaling

Confidently adopt cloud auto-scaling services. Verify your users have a positive experience and your application behaves as expected while hosts come and go.



CPU

4 steps

[View Details](#)

## Prepare for Host Failure

Hosts will inevitably fail. Are you prepared for what happens next? Prepare for adopting cloud based instances by shutting down a percentage of your hosts and...



Shutdown

3 steps

[View Details](#)

## Unreliable Networks

PRO

Migrating to microservices relies heavily on frequent and responsive API calls. Are your users affected when supporting API calls take 100s and 1000s of milliseconds t...



Latency

6 steps

[View Details](#)

## Unavailable Dependency

PRO

Microservices handle many functions for your application, which are all necessary to provide a great user experience. When one or many of those services...



Blackhole

6 steps

[View Details](#)

## Region Evacuation

PRO

Starting with one cloud region is natural, but is a single point of failure. Is your service available in more than one region and will your customers notice when their tra...



Blackhole

2 steps

[View Details](#)

## DNS Outage

PRO

Who is your primary DNS provider? Do you have a secondary to fall back on? What happens when one or both are unavailable? Are your customers able to reach your...



DNS

3 steps

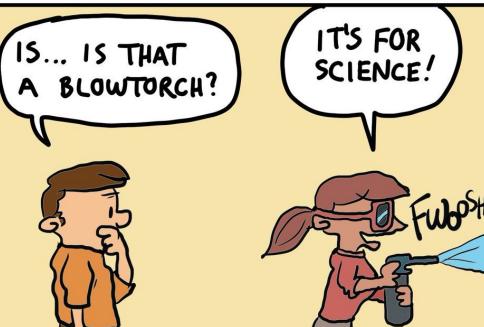
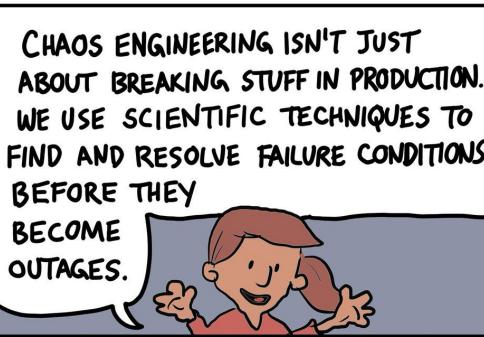
[View Details](#)



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# That is why I work in a Lab :)

- We practice Engineering
- We practice Science
- We practice Methods
- We practice Chaos Engineering



# How to begin ...

<https://www.gremlin.com>

<https://chaosengineering.slack.com>

<https://github.com/dastergon/awesome-chaos-engineering>

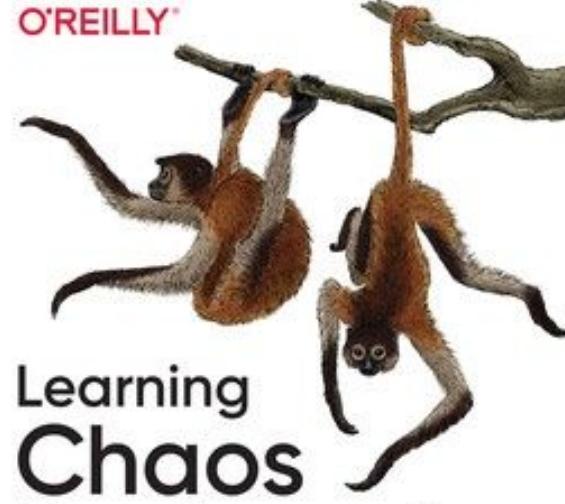
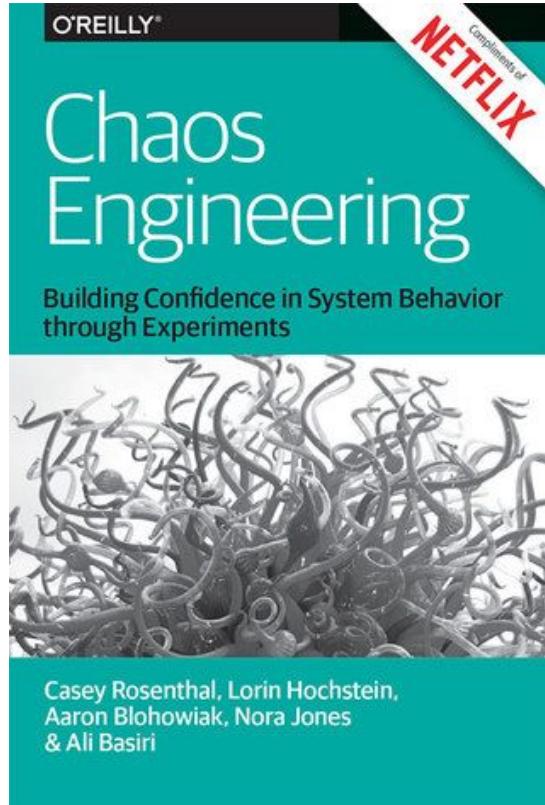
<https://www.infoq.com/chaos-engineering>





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# How to begin ...



Discovering and Overcoming System Weaknesses through Experimentation

Russ Miles

# Thanks for coming!!!



@yurynino

