



Rajesh  
@Gifted\_Geek

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Badass Is Back in Town ❤️❤️🔥  
#jessicajones #Netflix



Richard Hind  
@themallrat1

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13 more sleeps! #jessicajones #marvel  
#netflix [ift.tt/2EYP5mO](https://ift.tt/2EYP5mO)



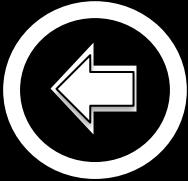
Wil Traval ✅  
@WilTraval

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My god you guys, are you excited for season  
2 of Jessica Jones ? #marvel #jessicajones2  
#netflix #jessicajones





Whoops, something went wrong...

**Netflix Streaming Error**

We're having trouble playing this title right now. Please try again later or select a different title.



bethany 🐻  
@bmj\_br

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When [#netflix](#) is down and you have no choice but to leave the house and commune with nature [#netflixdown](#)





Svenn Amish

@amishschool



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With Netflix down I had to make small talk with my kids with questions like "how was school?" and "what's your name again?"

RETWEETS

8

LIKES

26



9:50 PM



8



26

...



Imogen

@imogen\_carmel

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Netflix is down people! Panic stations! 🎉  
#netflixdown #iwanttobingewatch



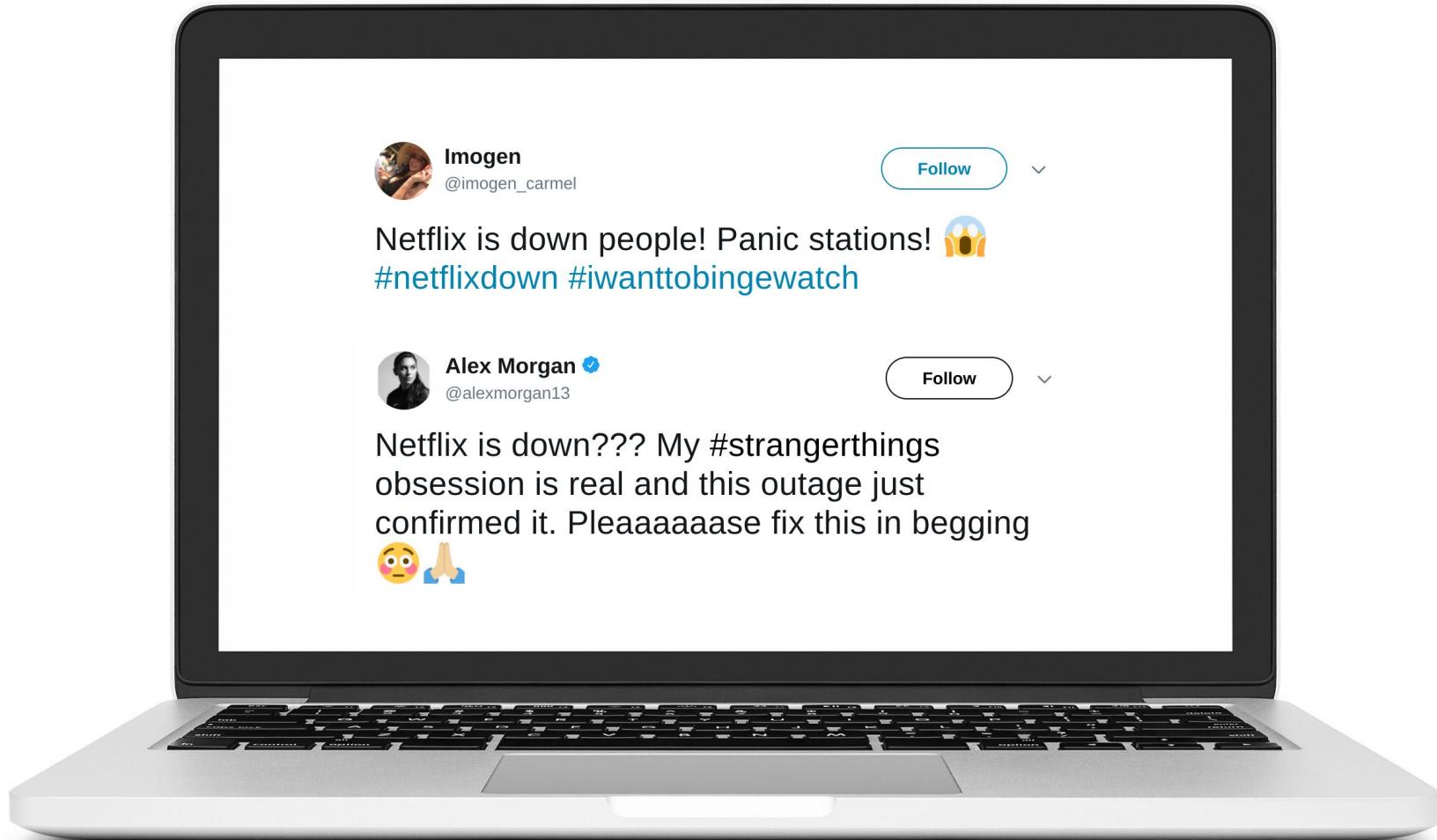
Alex Morgan ✅

@alexmorgan13

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Netflix is down??? My #strangerthings  
obsession is real and this outage just  
confirmed it. Pleaaaaaaase fix this in begging





Ernesto Valle  
@Ernesto\_V\_E



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Retweeted Bryony Anne Harris  
(@BryonyHarris2):

netflix is down i am dying #netflixdown  
[fb.me/Mqrs0zls](http://fb.me/Mqrs0zls)



GIF

LIKE

1



3:45 PM



1

...

# Cloud Prod Engineering

AMJITH RAMANUJAM (@amjithr)  
Sr. Software Engineer, Traffic Team

NETFLIX

# Regional Failover in 7 minutes

AMJITH RAMANUJAM (@amjithr)  
Sr. Software Engineer, Traffic Team



# Regional Failover

| Standby system takes over when the main system fails

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# Netflix Open Connect

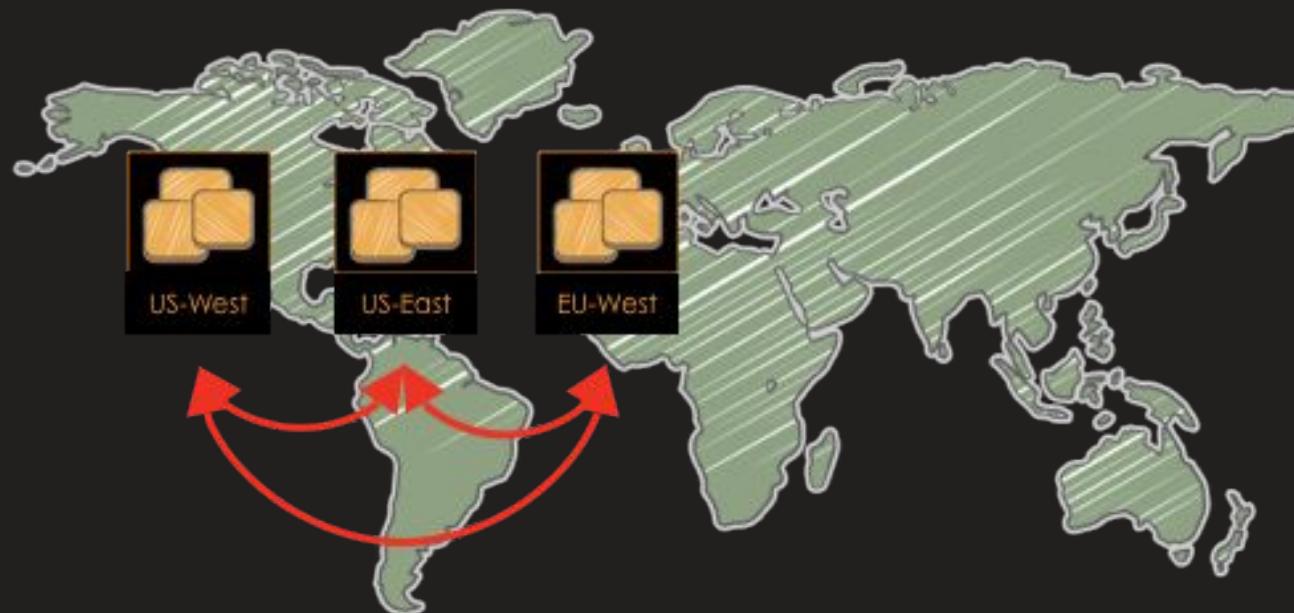
All video delivery



Amazon Web Services  
Everything else

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# Regional Failover



# Christmas Eve 2012

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# ELB Outage

## 7 Hours

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# 16,000 years in 1 day

content watched

# 4,600 years in 7 hours



~14,000 BC:  
First colonization  
of America

0 AD      2018



# Regional Failover

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# Active vs Passive

- | Active - standby system is also serving traffic
- | Passive - standby system is NOT serving traffic

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# Prerequisites

- | Stateless services
- | Regional replication of data

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# Failover Candidate

- | Infrastructure problem isolated to one region
- | Problem won't follow if we move traffic
- | Bad code deploy in a region

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# Regional Failover Process

- | Detect the problem
- | Scale the savior regions
- | Shift traffic

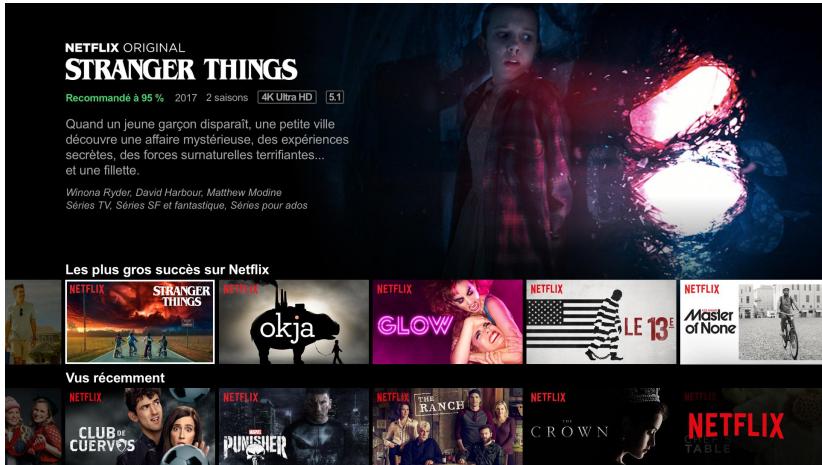
NETFLIX



# Detect the problem

NETFLIX

# Is it working?



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NETFLIX



#**netflix**everywhere

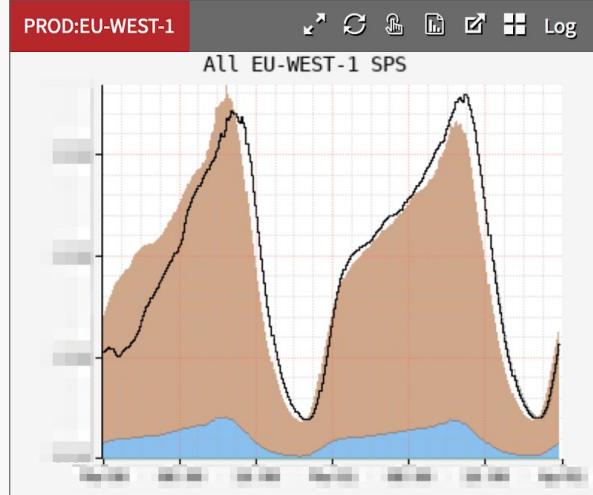
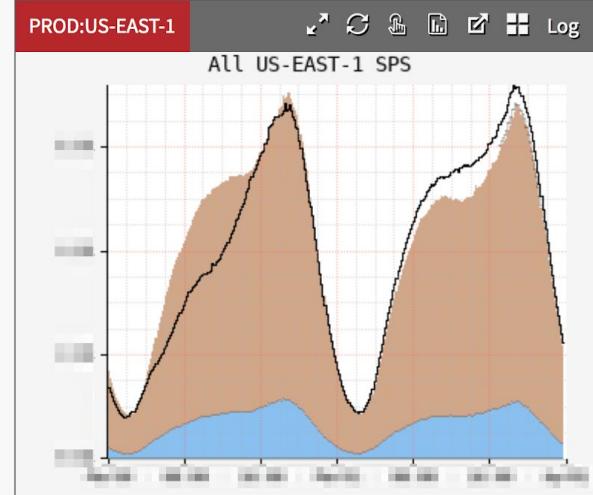
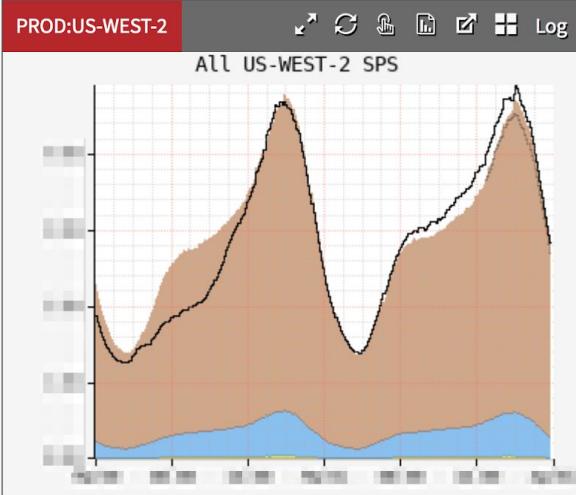


**One metric to rule  
them all - Dumbledore**

**SPS**  
**Stream Starts Per**  
**Second**

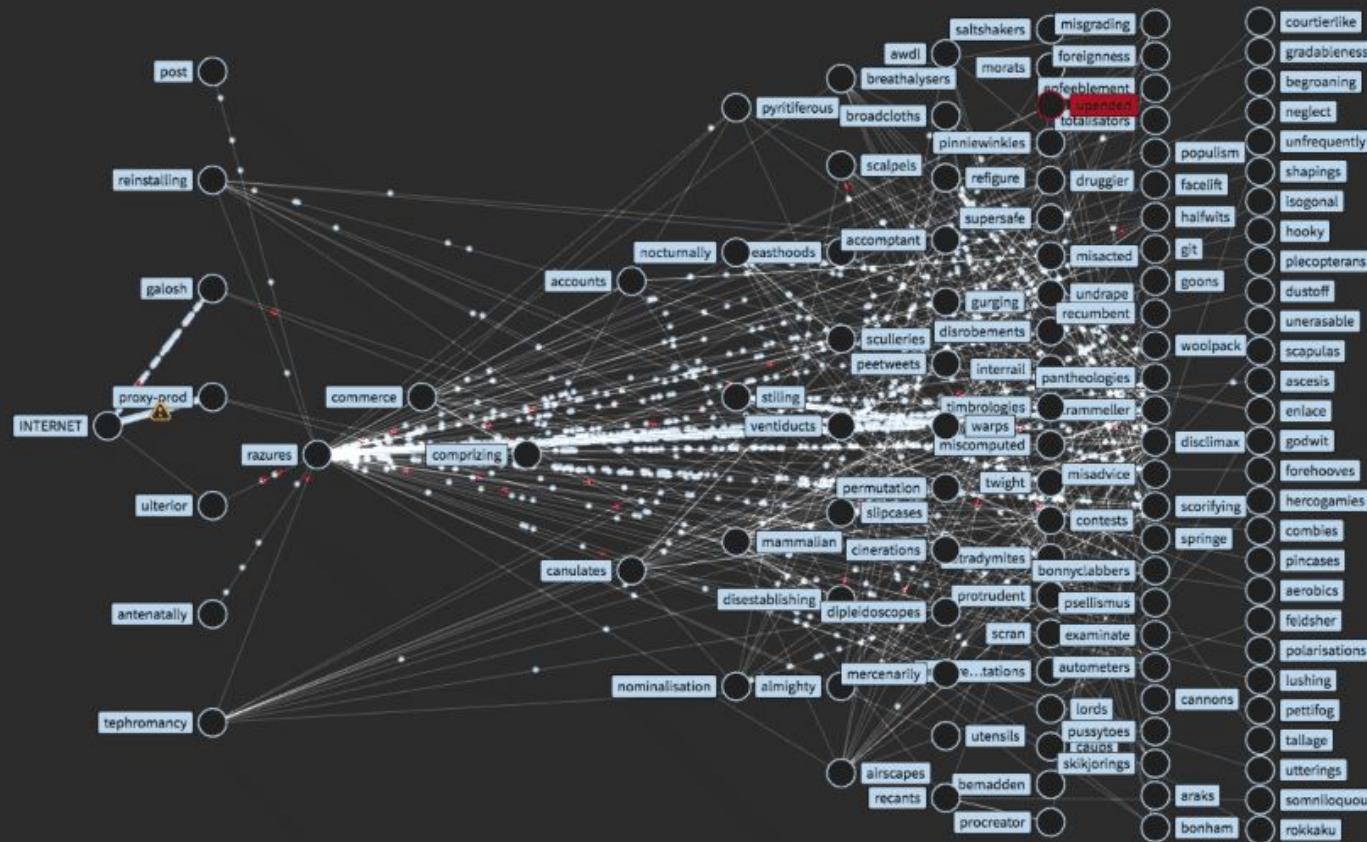
**NETFLIX**

## SPS by Region

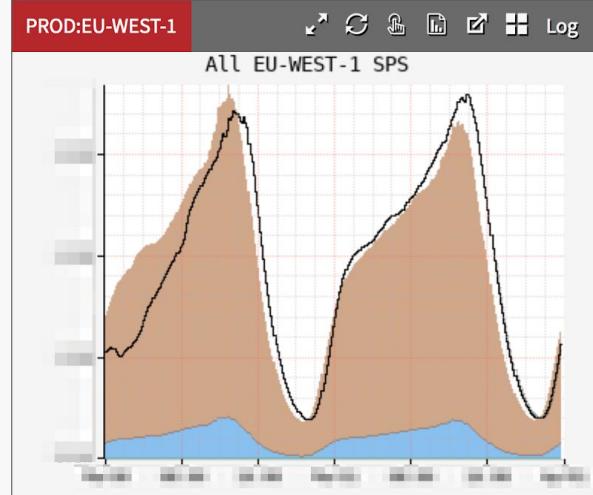
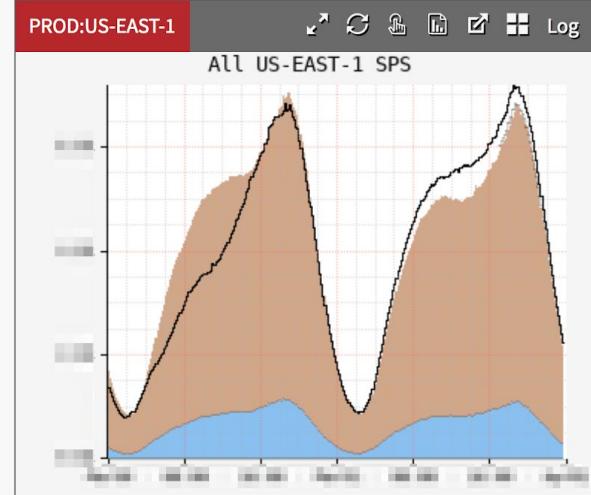
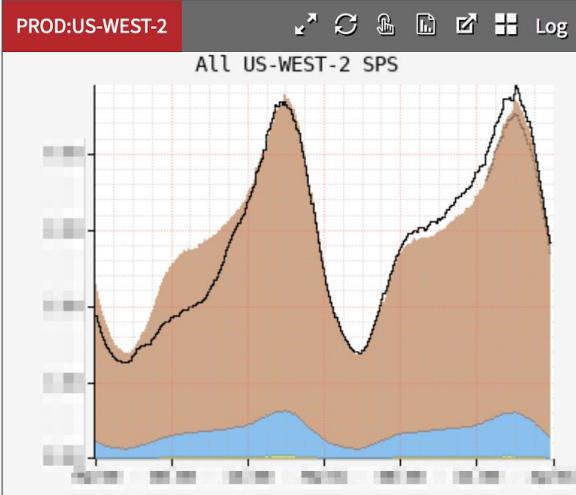


# Scale Saviors

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## SPS by Region



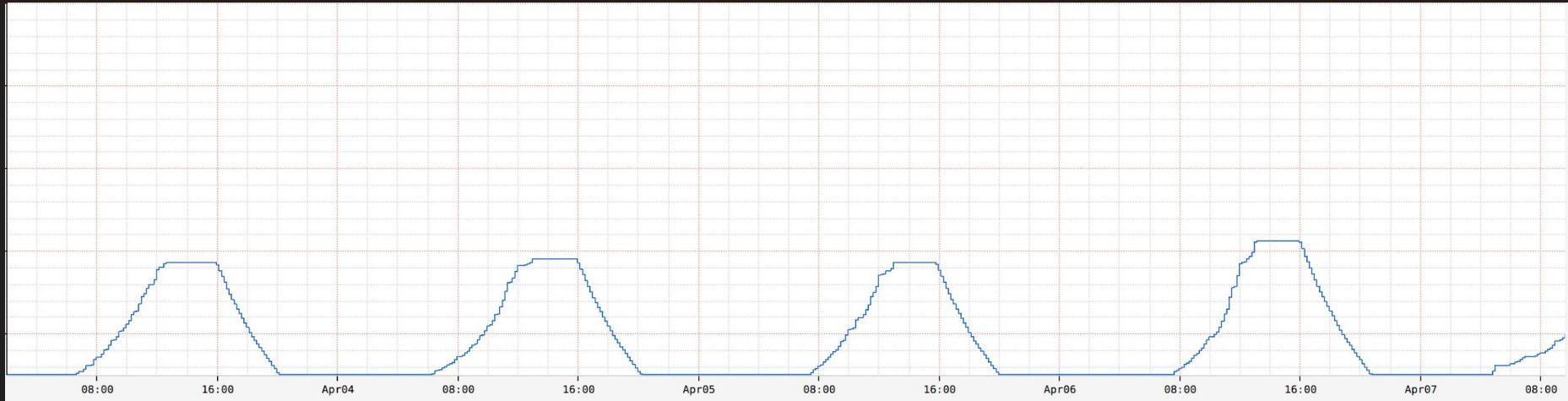
Psychic Vision®

Present  
Past ★ Future

TAROT CARDS



# Scaling Pattern



| Linear Regression

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# Shift Traffic

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# Traffic Shift

| Proxy Traffic

| Switch DNS

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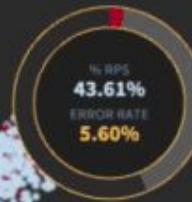
## Service Traffic Map

Filters ▾ Display ▾

US-WEST-2



US-EAST-1



TOTAL RPS  
###,###  
ERROR RATE  
3.06%

EU-WEST-1



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# Regional Failover Process

- | Detect the problem - 5 minutes
- | Scale the savior regions - 35 minutes

- | Shift traffic - 10 minutes

**Total = 45 mins**



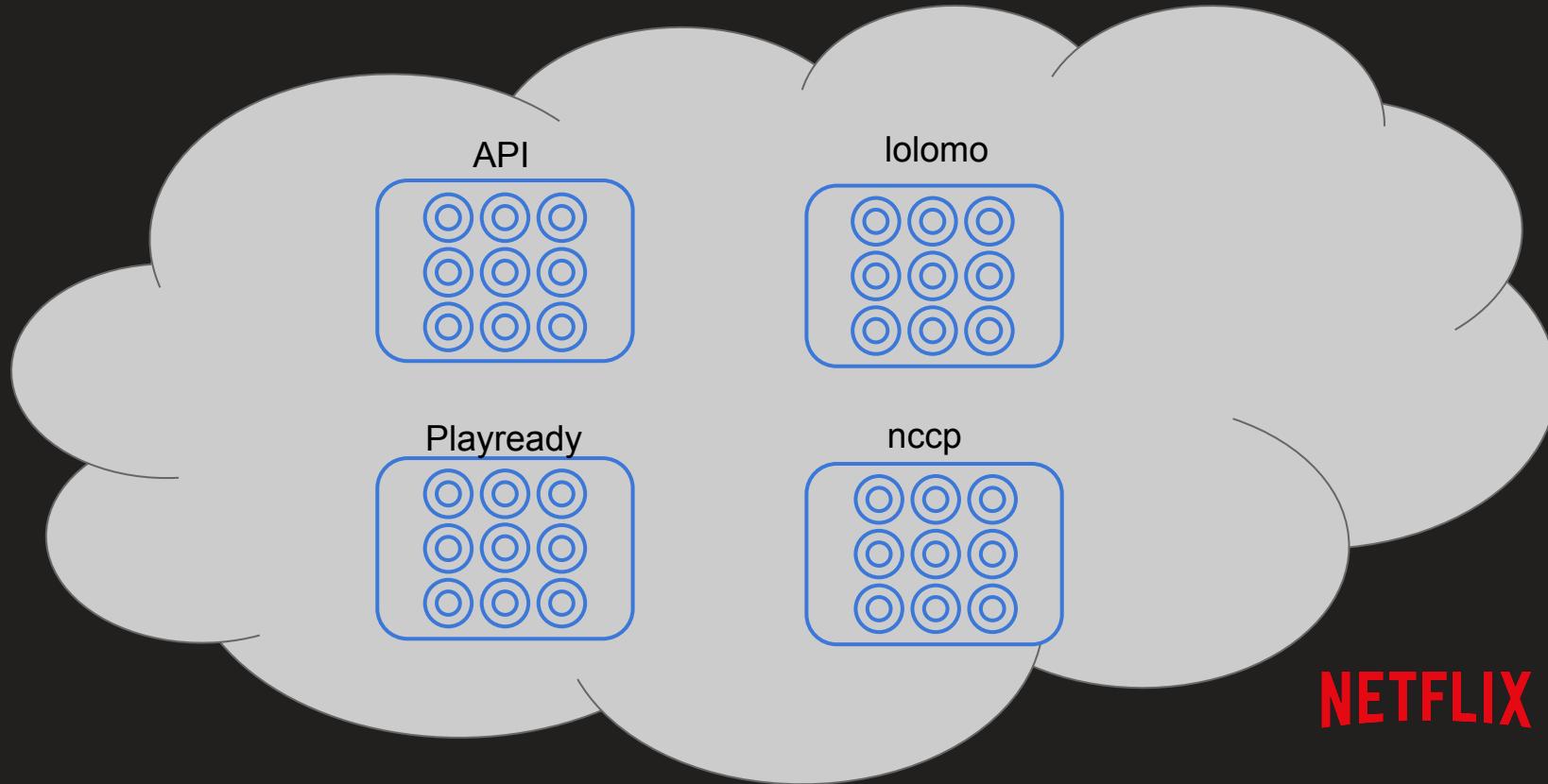
# Nimble

## Goals

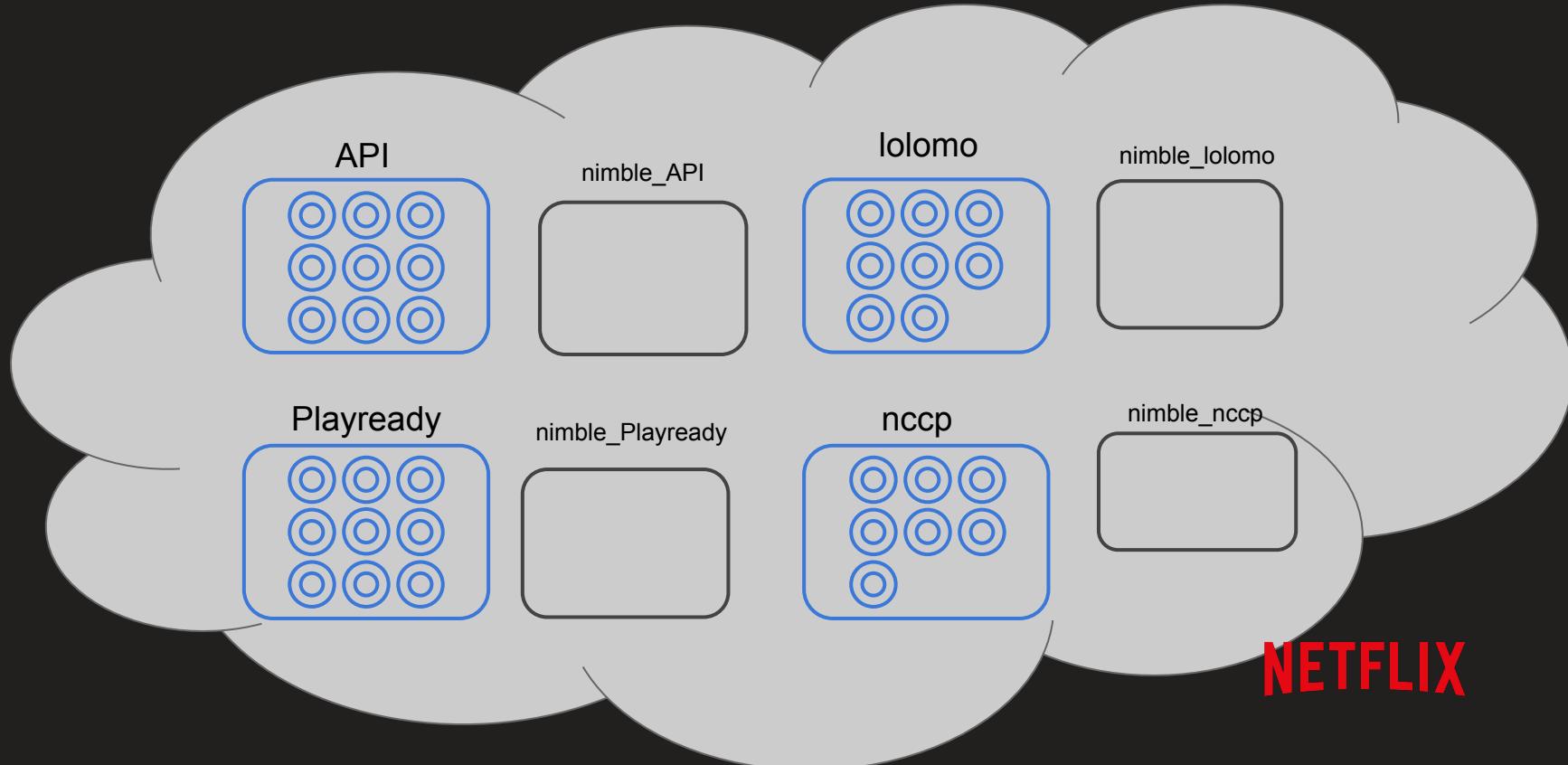
- Fast failover (**<10mins**)
  - Pre-scale
- Transparent to service owners
  - No code changes for service owners
  - No auto-scaling changes

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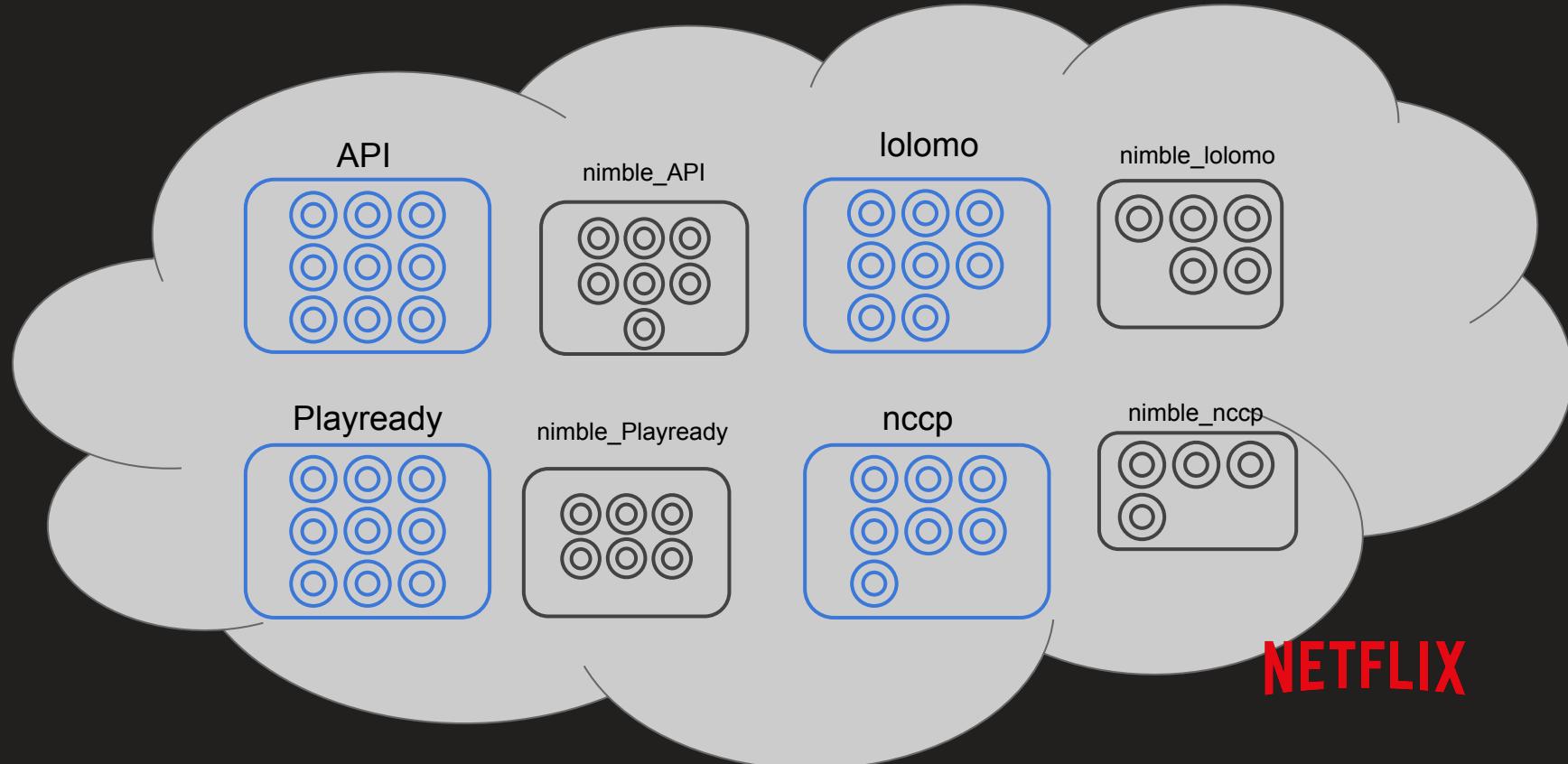
# us-west



# us-west

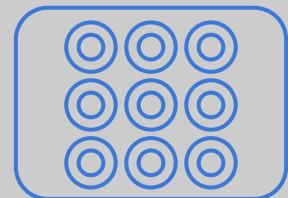


# us-west

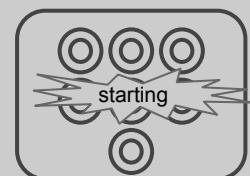


# us-west

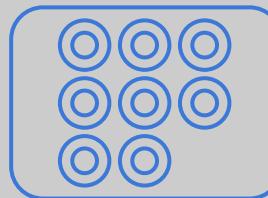
API



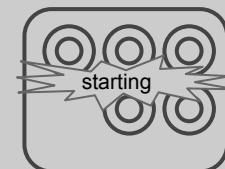
nimble\_API



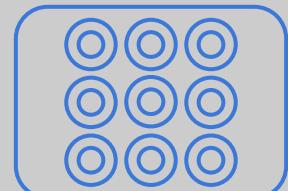
lolomo



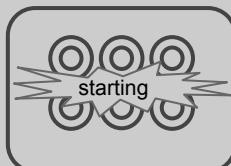
nimble\_lolomo



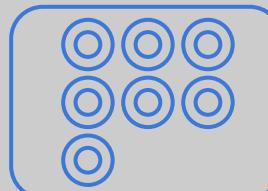
Playready



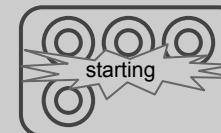
nimble\_Playready



nccp

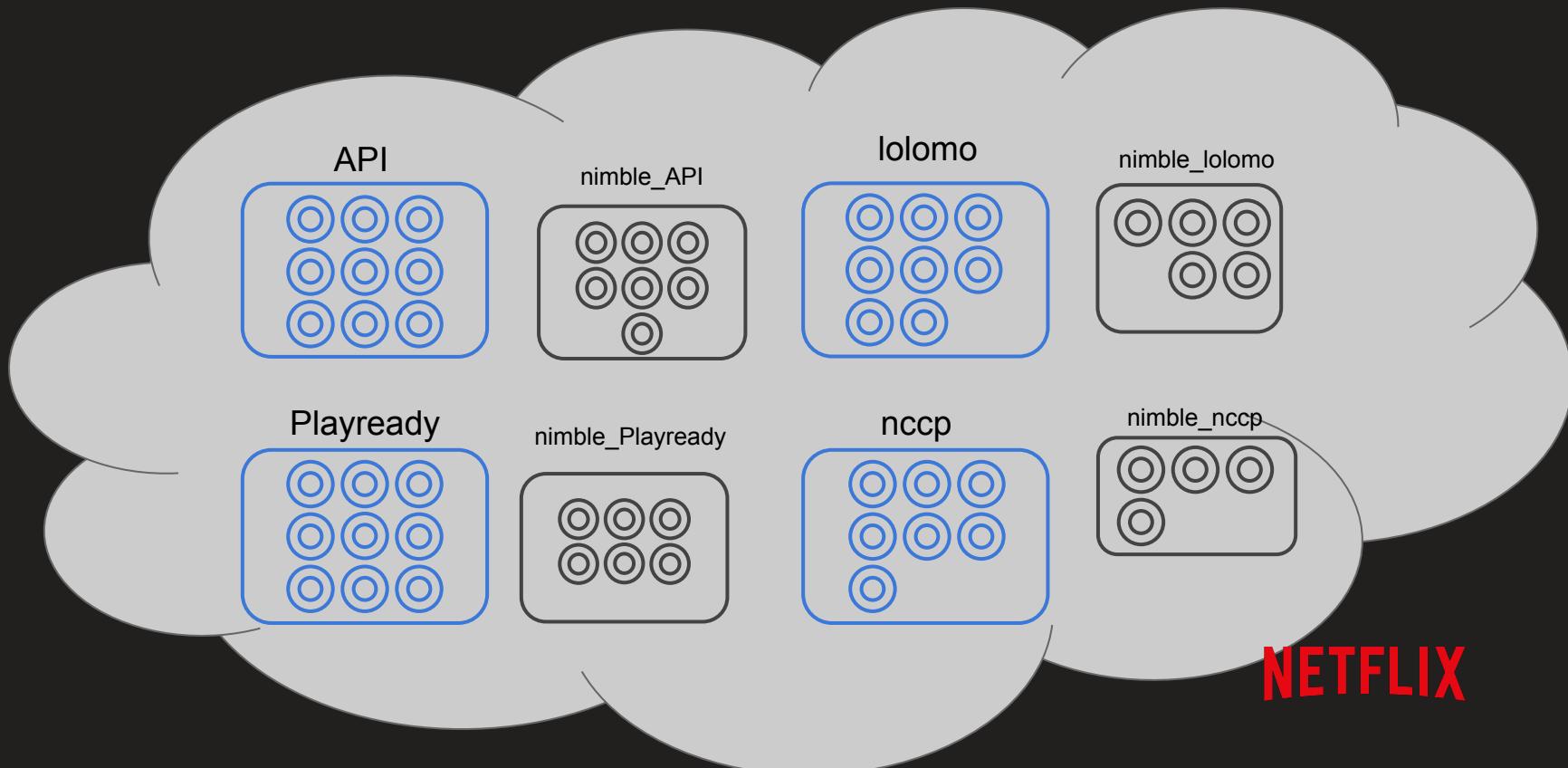


nimble\_nccp

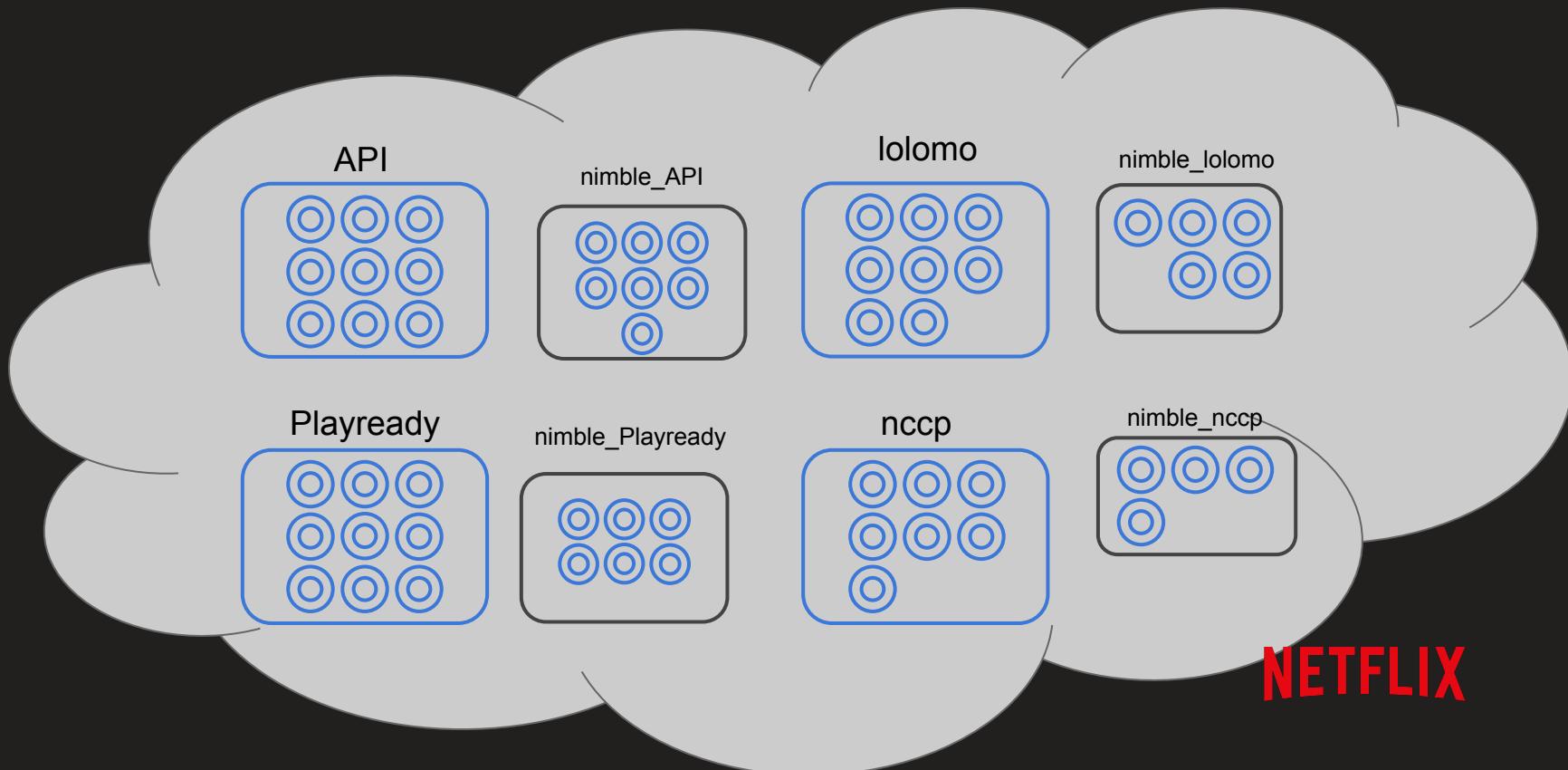


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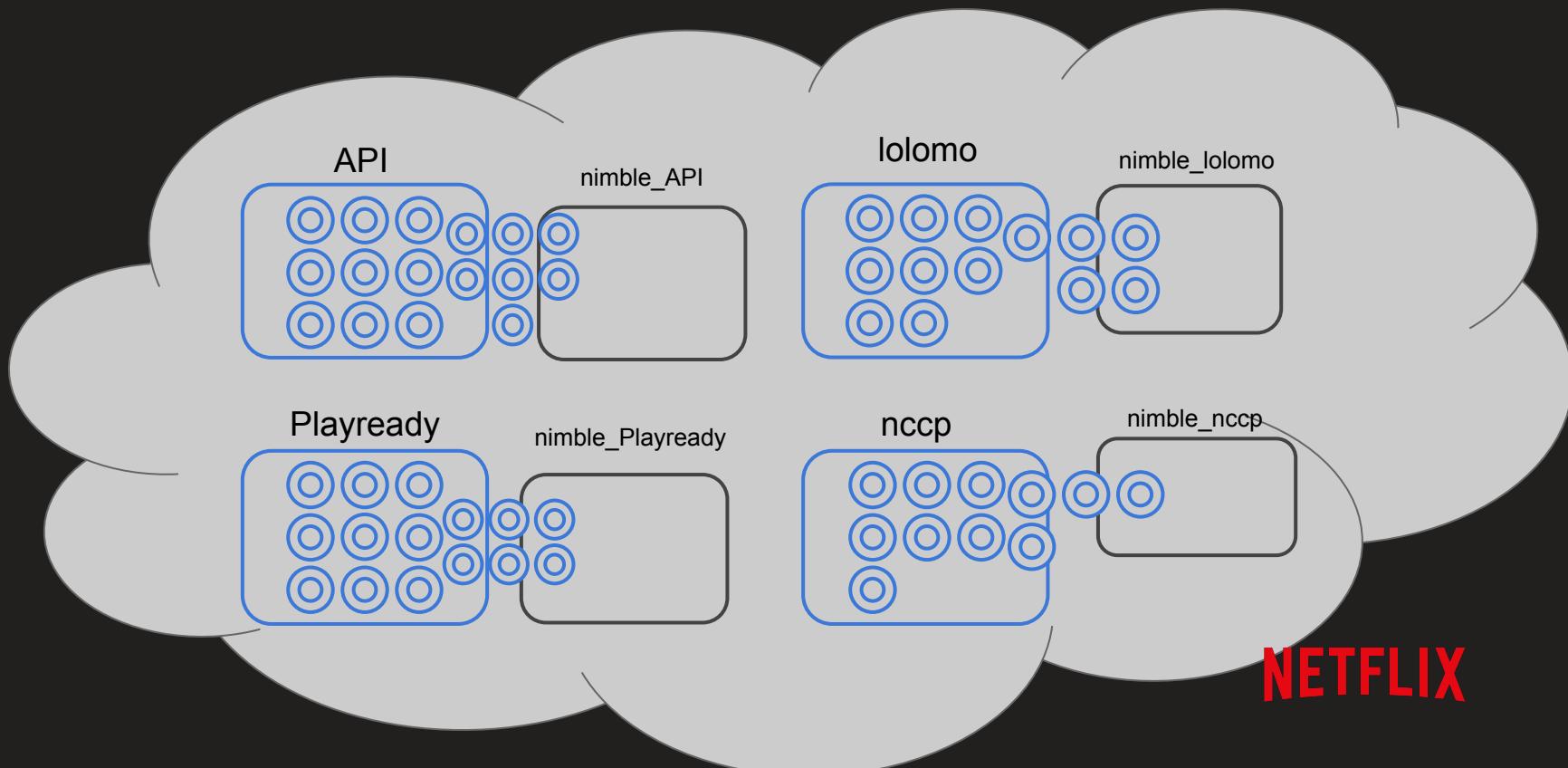
# Failover



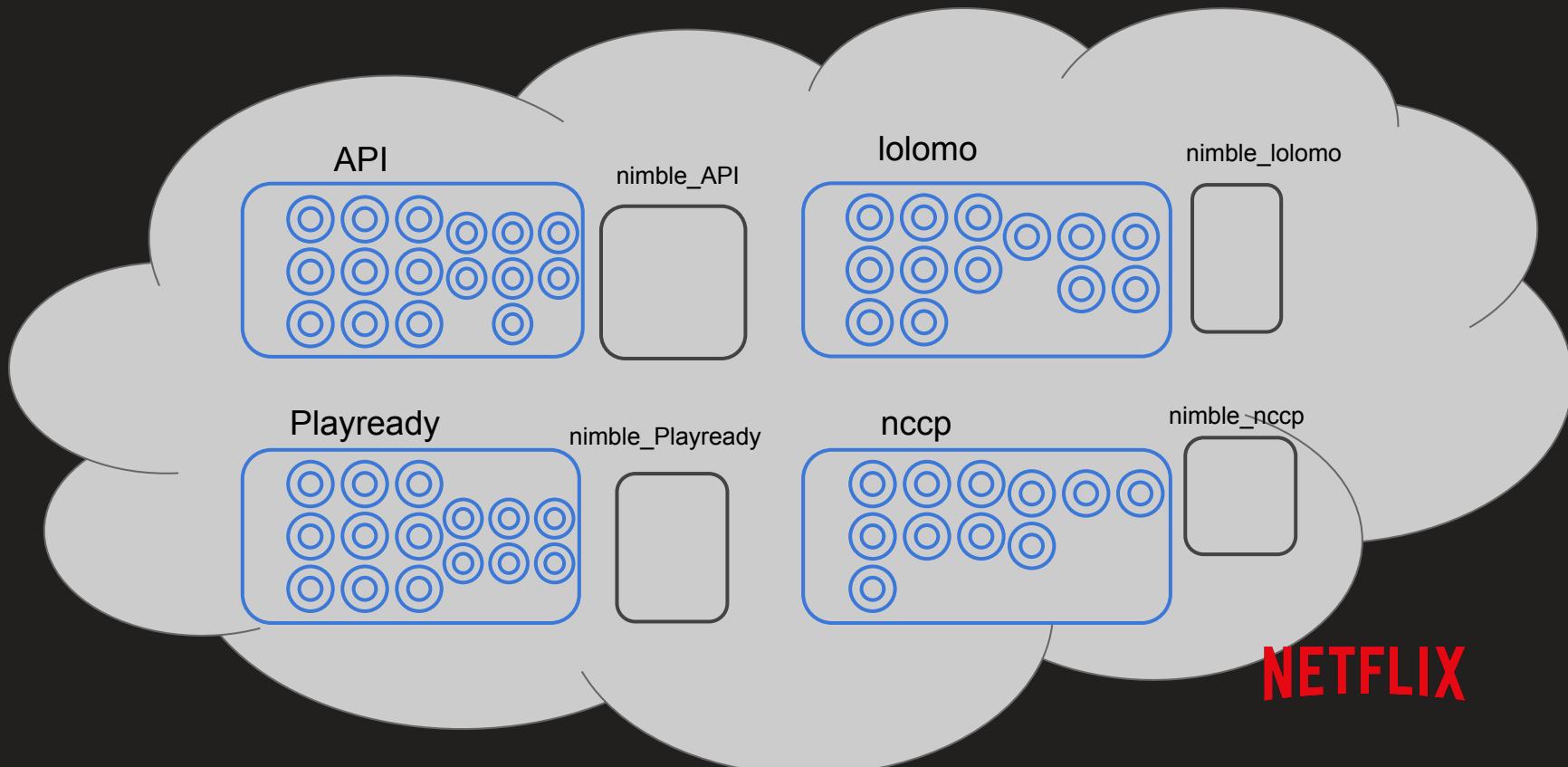
# Failover



# Failover



# Failover



# Regional Failover Process

- | Detect the problem - 2 minutes
- | Scale the savior regions - 4 minutes
- | Shift traffic - 3 minutes

**Total = 7 mins**



# Architecture

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# Actions

- Fetch historical data
- Predict the demand
- Manage dark clusters
- Ungate dark instances
- Transplant instances
- Traffic shift
- Orphan cleaner

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# Nanoservices

- Python Scripts
- Flask - API endpoints
- Redis
- Files on disk
- RQ for task workers

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# Characteristics

- Anticipate failure
- Build fallbacks for everything
- Cache everything
- Assume eventual consistency
- Favor idempotent actions

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# Anticipate Failure

- Multi-region
- Rebuild the state from scratch
- Don't rely on saved state

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# Fallbacks

- AWS State - [EDDA](#)
- Historical data - [ATLAS](#)
- Local Cache - Redis, Filesystem

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# Eventual Consistency

- AWS state
- Idempotent actions
- Cleanup scripts

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# Orphan Cleaner

- Terminate detached instances
- Safety features
  - Terminate slowly
  - Don't terminate large volume of instances
  - Warn user about large inputs

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# Learnings

- Build fallbacks for everything
- Cross-region data replication
- Stateless
- Exercise the functionality

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# We're hiring!

@amjithr

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