

# Crisis to Calm: A Story of Data Validation @ Netflix

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Lavanya Kanchanapalli



**Barack Obama**  @BarackObama · Feb 4 2015

Yesterday Netflix went down for about 45 minutes, I had planned to watch House of Cards

 22K  192K  851K 



**Albert Einstein**  @AlbertEinstein · May 11

As per theory of relativity, netflix being down for few hours feels like an eternity  
[netflix.com...](https://www.netflix.com)

 3  16  49 



- Rollback data
- Increase capacity
- Netflix starts to work



# Root Cause

- Duplicate objects
- Apps failed
- Cascading failures
- Netflix goes down!





Who's watching?

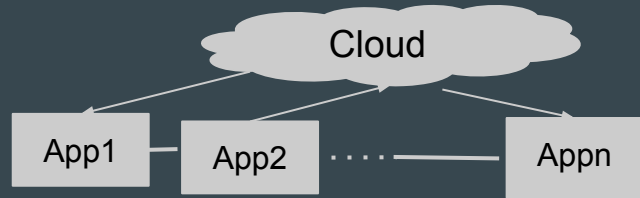




# Data Change



# Netflix Microservices



Change in Behavior ↓

**NETFLIX ORIGINAL**  
**THE CROWN**  
97% Match 2017 16+ 2 Seasons

This drama follows the political rivalries and romance of Queen Elizabeth II's reign and the events that shaped the second half of the 20th century.

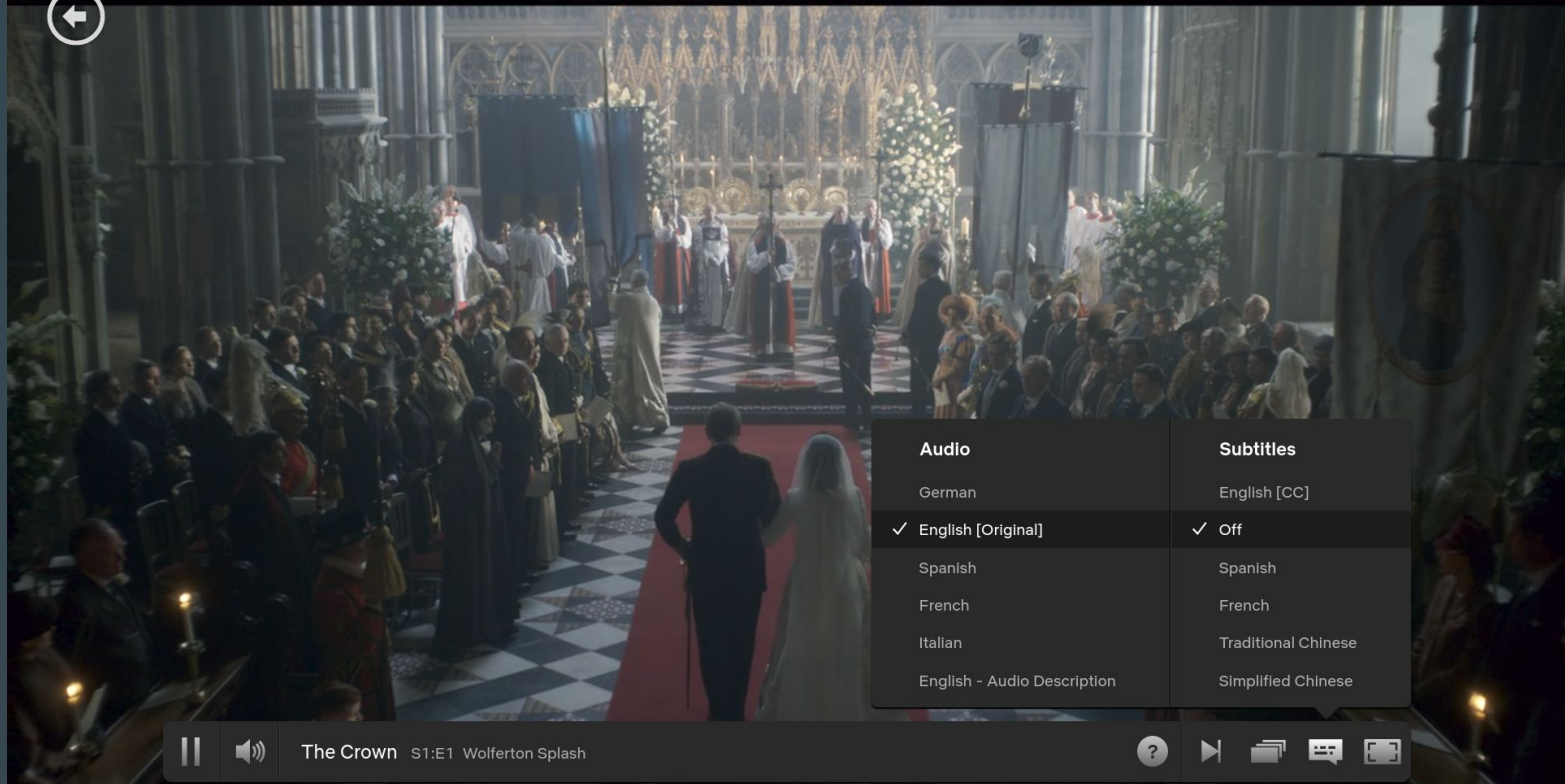
[▶ PLAY](#) [+ MY LIST](#) [👍](#) [👎](#)

Starring: Claire Foy, John Lithgow, Matt Smith  
Genres: TV Shows, British TV Shows, TV Dramas



A world map composed of many small, light gray squares, set against a dark background. The map is centered and occupies most of the frame. Overlaid on the map is the text "#netflixeverywhere".

**#netflix**everywhere



**Audio**

German

✓ English [Original]

Spanish

French

Italian

English - Audio Description

**Subtitles**

English [CC]

✓ Off

Spanish

French

Traditional Chinese

Simplified Chinese



The Crown S1:E1 Wolferton Splash





NETFLIX ORIGINAL

MARVEL

# THE DEFENDERS

57% Match 2017 TV-MA Limited Series

Daredevil, Jessica Jones, Luke Cage and Iron Fist join forces to take on common enemies as a sinister conspiracy threatens New York City.



PLAY

+ MY LIST



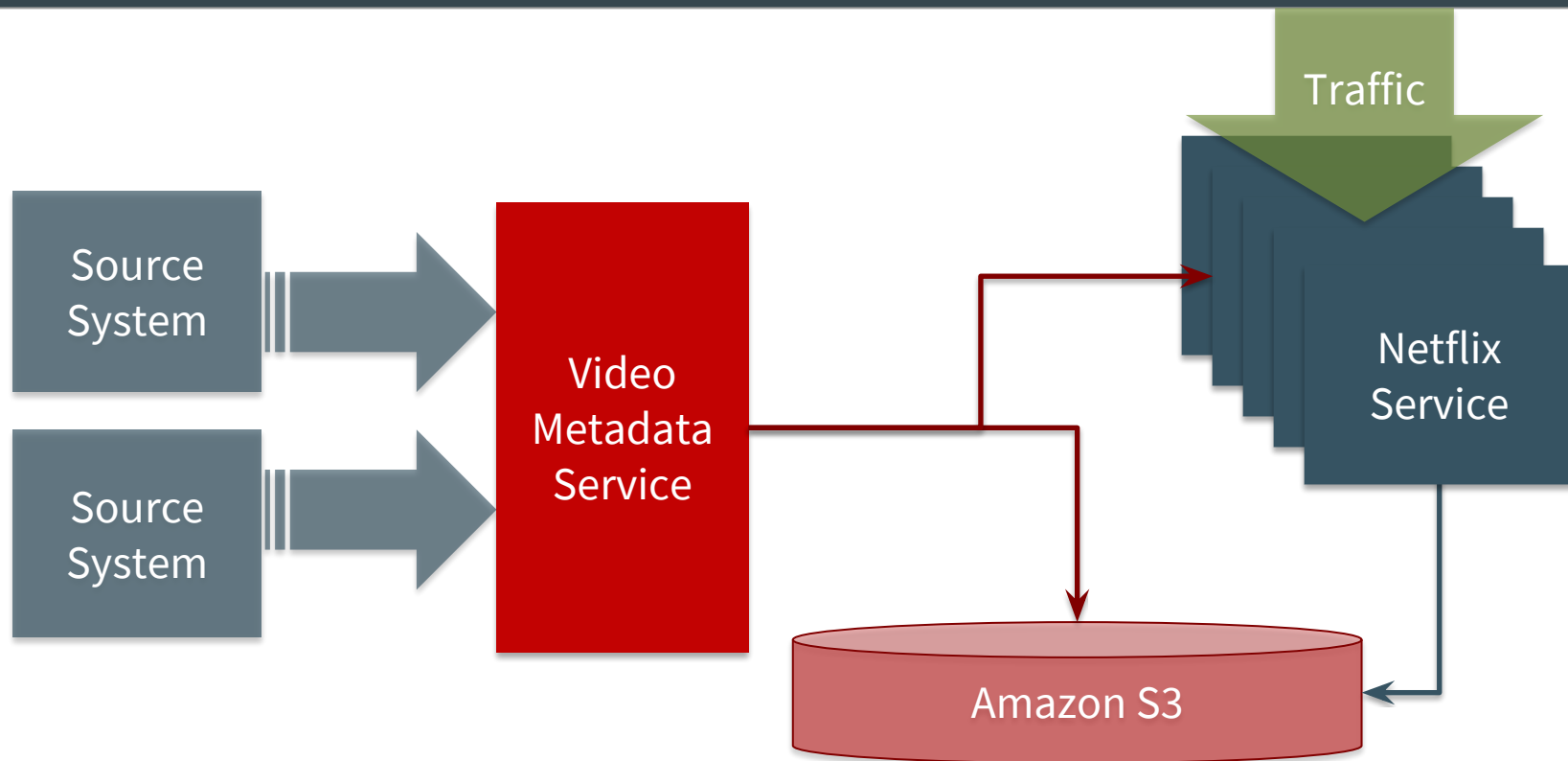
Starring: Charlie Cox, Krysten Ritter, Mike Colter

Genres: TV Shows, Crime TV Shows, TV Action &amp; Adventure

This show is: Violent, Exciting, Suspenseful

[OVERVIEW](#)[EPISODES](#)[TRAILERS & MORE](#)[MORE LIKE THIS](#)[DETAILS](#)

# Metadata Architecture



- Single publisher
- Multiple consumers
- Hollow ([hollow.how](https://hollow.how))
- Versioned data
- Fast propagation



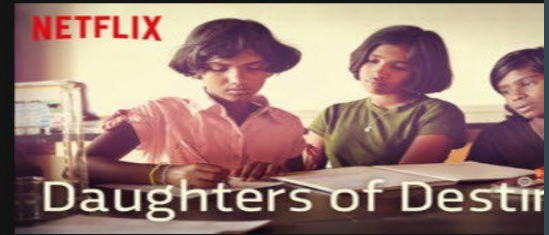
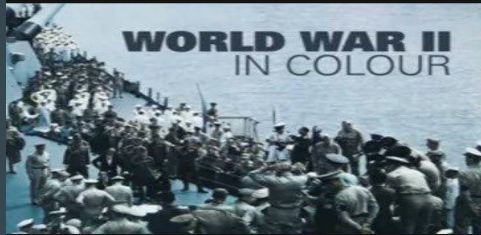
# Bad data happens!



# Leaked Content



# Disables Features





# Deletes data

## Blockbuster Movies



## Blockbuster Movies





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 3  16  49 

There appears to be a display problem. Please ensure your monitor is HDCP compliant and is not mirrored using Airplay.

**Data change = Code Push**

①

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②

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③

**Detection**

**Staggering**

**Rollback**

①

—

②

—

③

**Detection**

**Staggering**

**Rollback**

①

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②

—

③

**Detection**

**Staggering**

**Rollback**

# Many Unknowns



# Would it be too slow?

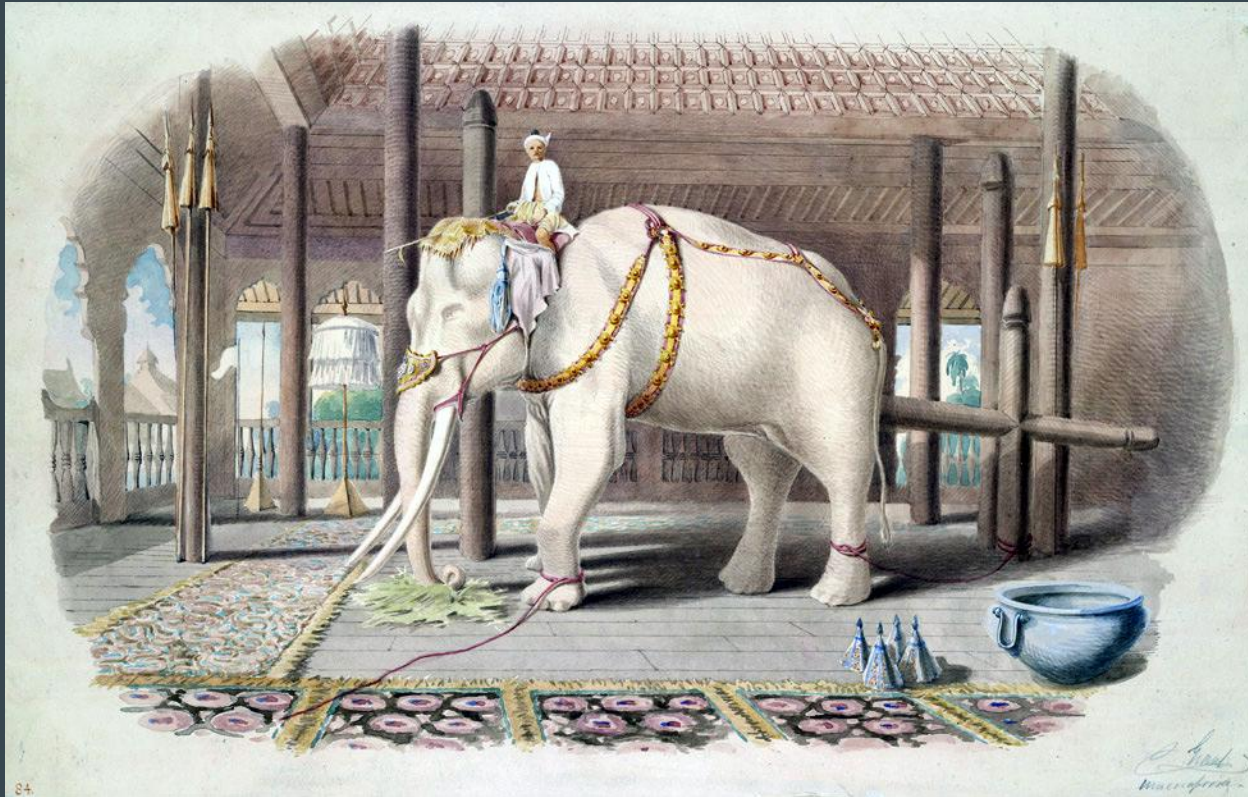




Would there be too many failures?



# Would it cost too much?



①

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②

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③

**Detection**

**Staggering**

**Rollback**

①

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②

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③

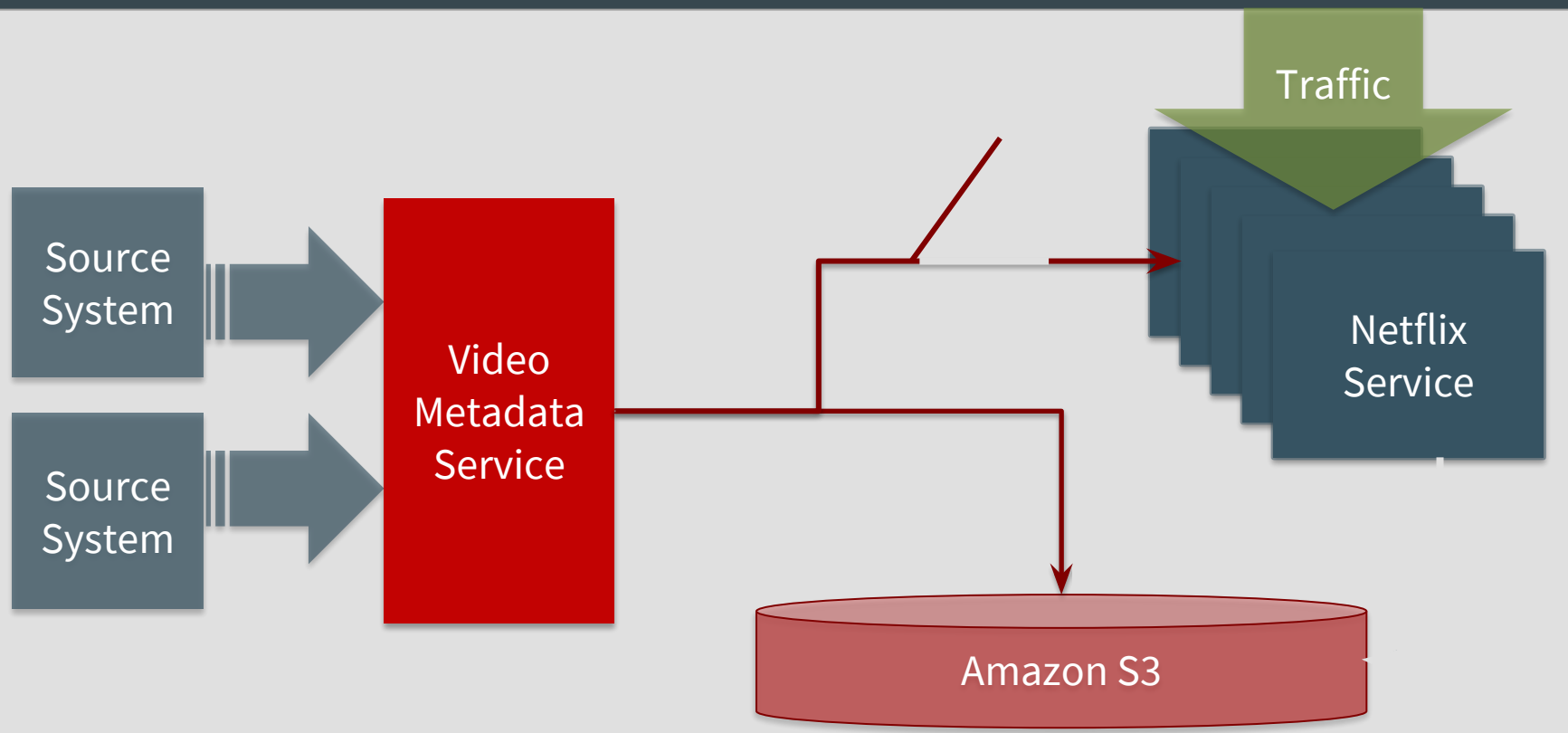
**Detection**

**Staggering**

**Rollback**

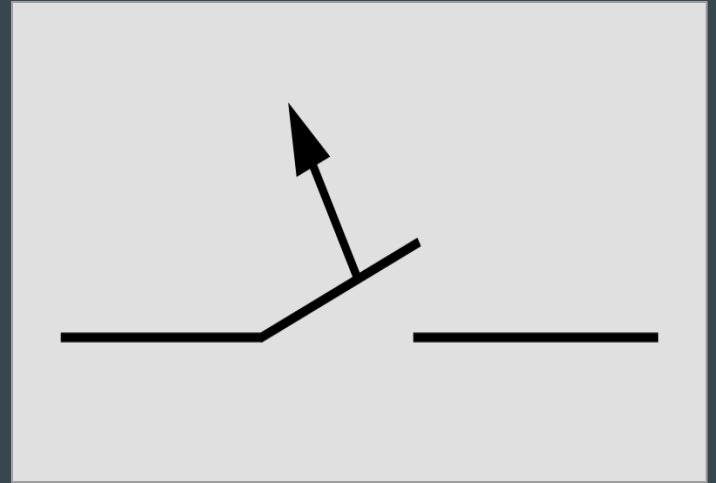
# Chapter 1: Circuit Breakers

# Metadata Architecture

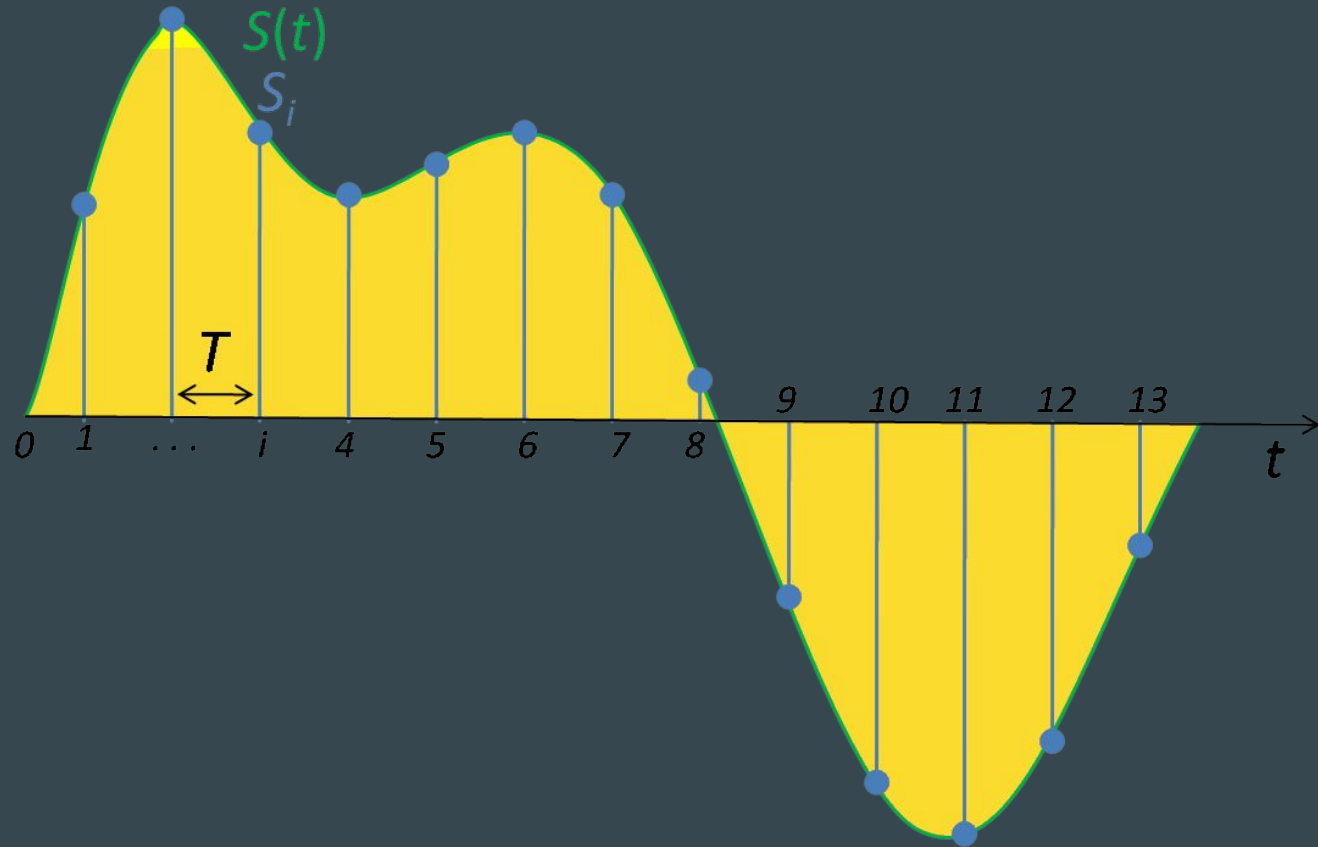


# Circuit Breakers

- Integrity checks
- Duplicate detection
- Object counts
- Semantic checks



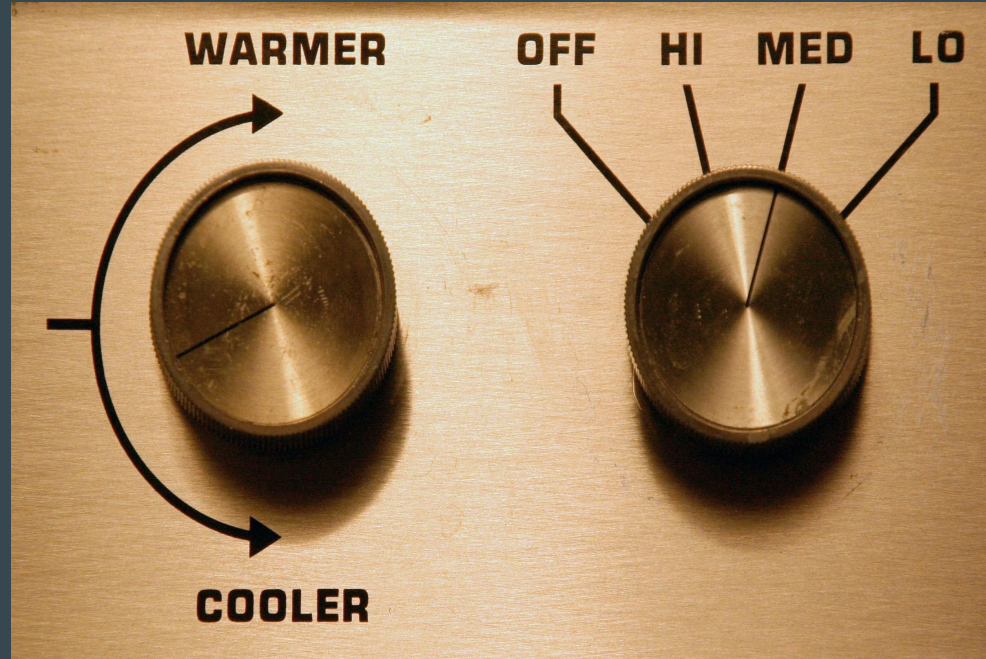
# Know your data change





# Knobs are key to sanity

- On/ off
- Threshold
- Exclusions



# Test Patterns

2014 G 4 Seasons

This is a collection of video test patterns organized by source resolution and native frame rate. The resolution indicated in the pattern's title identifies the title's source resolution, and...

▶ PLAY

+ MY LIST



Genres: TV Shows, US TV Shows, TV Dramas

OVERVIEW

EPISODES

MORE LIKE THIS

DETAILS

Test patterns  
developed for Netflix  
by [www.archimediotech.com](http://www.archimediotech.com)



NETFLIX ORIGINAL

# THE CROWN

96% Match 2017 TV-MA 2 Seasons

S1:E1 "Wolferton Splash"

12 of 56m

A young Princess Elizabeth marries Prince Philip. As King George VI's health worsens, Winston Churchill is elected prime minister for the second time.

▶ RESUME

+ MY LIST



Creators: Peter Morgan

OVERVIEW

EPISODES

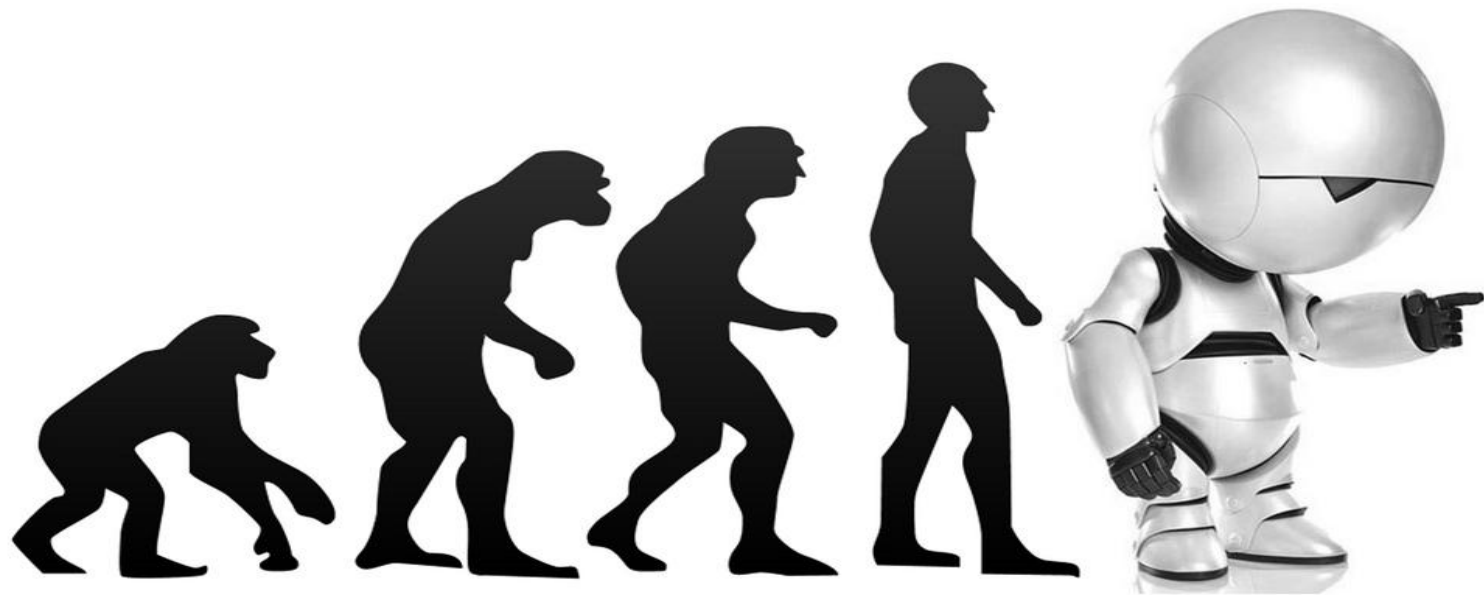
TRAILERS & MORE

MORE LIKE THIS

DETAILS

# Business value is the key





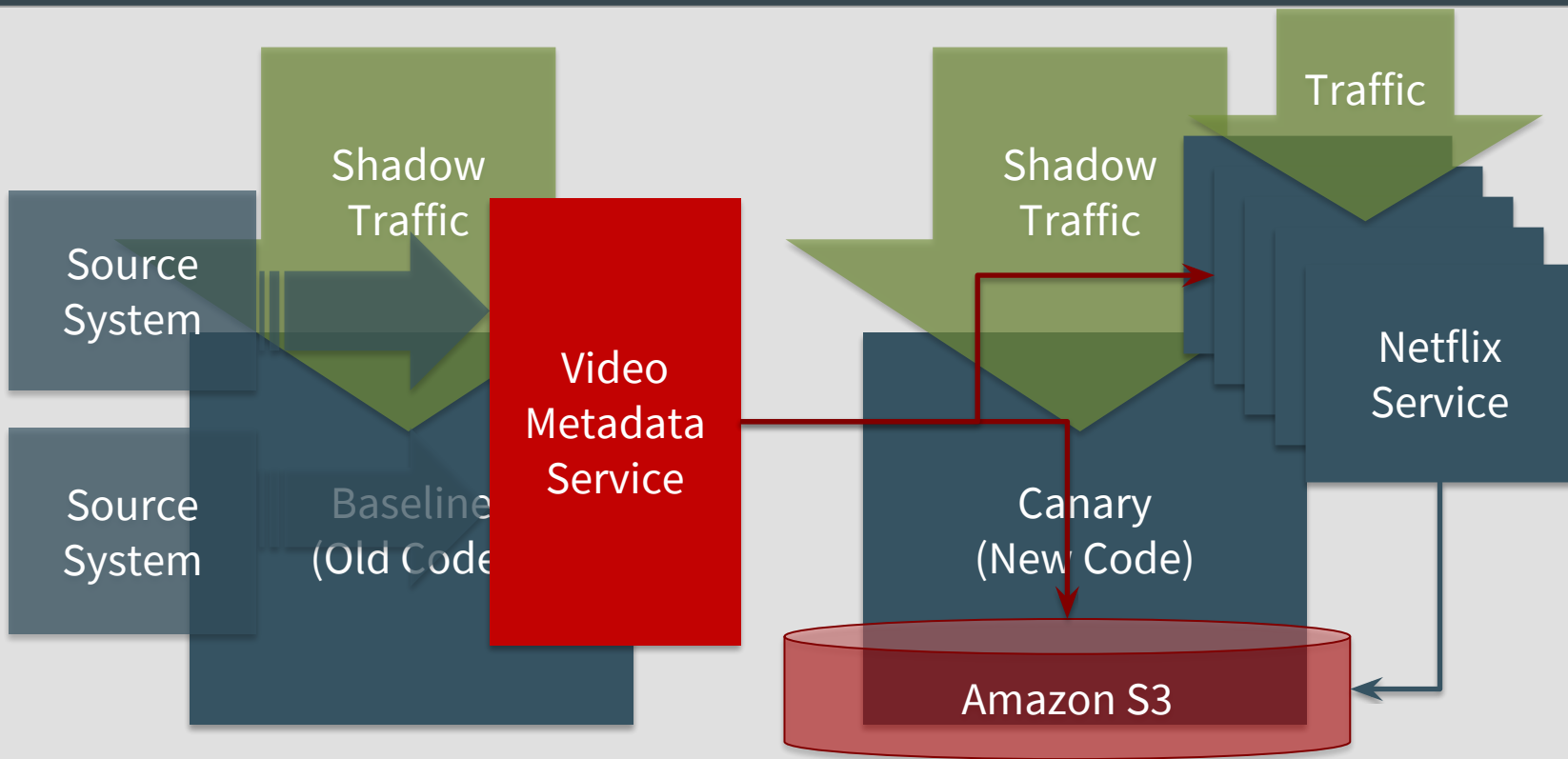
# Efficiency

- Change Isolation
- Sampling



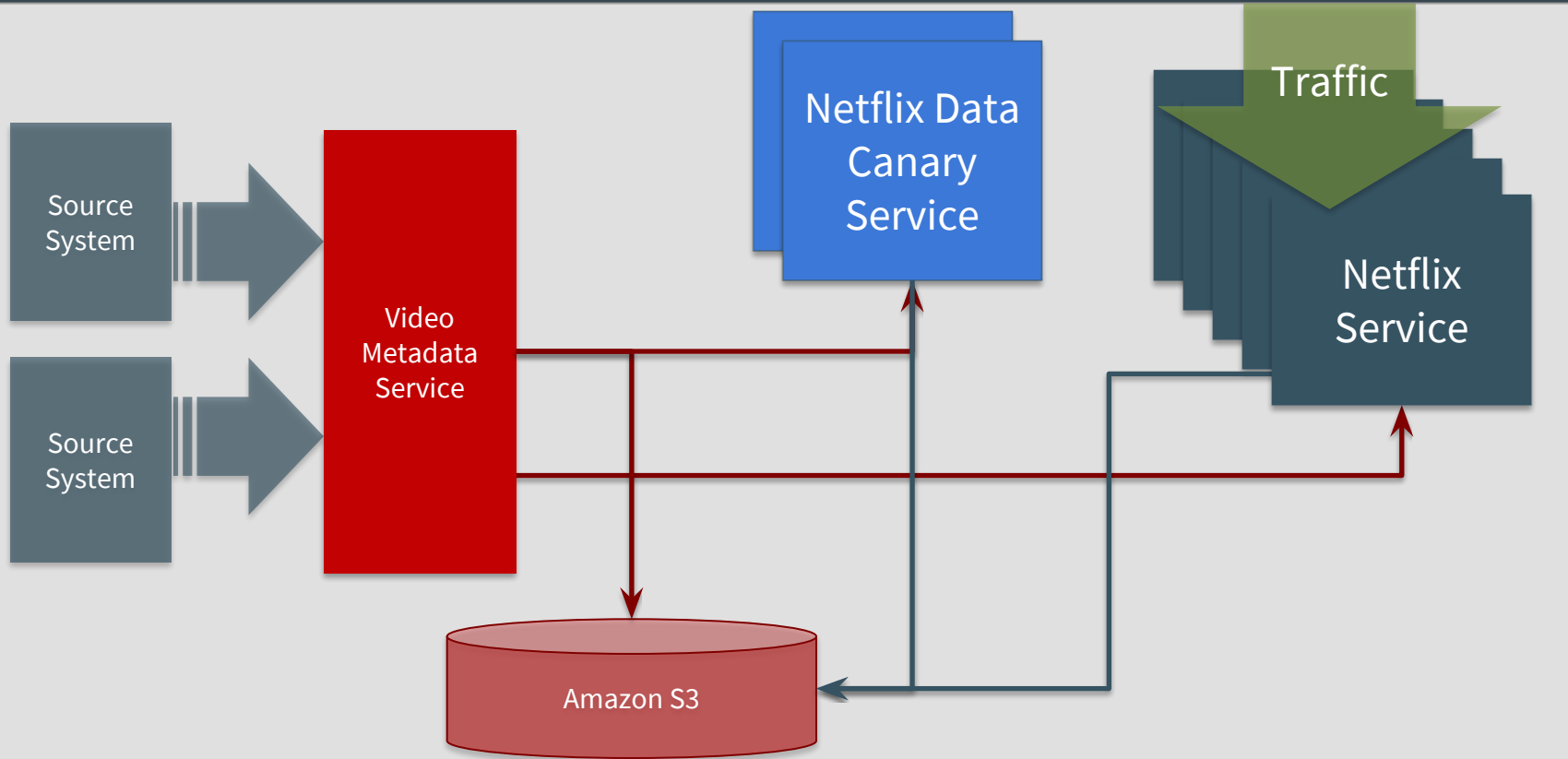
# Chapter 2: Canaries

# Traditional Canaries





# Data Canaries



# Netflix Data Canary Service

- Pick key use case(s)
- Pick data to test
- Test with latest data



①

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②

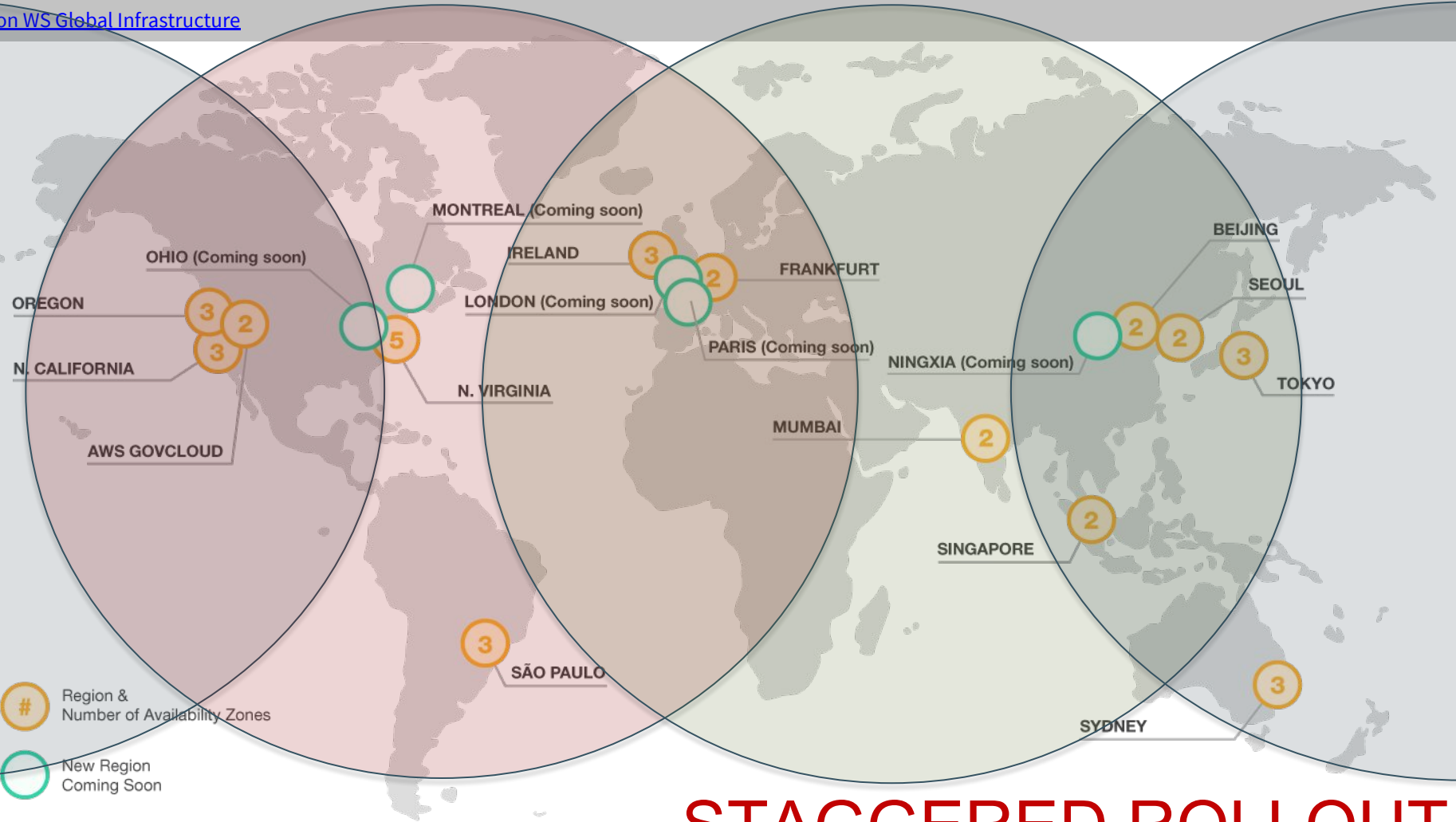
—

③

**Detection**

**Staggering**

**Rollback**



# STAGGERED ROLLOUT

①

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②

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③

**Detection**

**Staggering**

**Rollback**

# Keep calm & rollback

- Pin back
- Root cause
- Unpin



# Rollback

- Visibility
- Traversing

**State: 20170524184939019**

<a href="#">Movie</a>	138 ( $\Delta$ : 136, +: 0, -: 2)
<a href="#">Actor</a>	1 ( $\Delta$ : 1, +: 0, -: 0)

[< prev version](#)

[> next version](#)

# Data Diff UI

05/24 11:50 <

From		To	
	. └─>(Movie)		. └─>(Movie)
	... └─>id: 1004125		... └─>id: 1004125
+	... └─>title: (String)	+	... └─>title: (String)
☒	... └─>actors: (SetOfActor)	☒	... └─>actors: (SetOfActor)
-	1 ..... └─>element: (Actor)	-	
0	..... └─>actorId: 1000172		
-	1 ..... └─>actorName: (String)	-	
0	..... └─>value: vmwzcs1		
-	9 ..... └─>element: (Actor)	-	
0	..... └─>actorId: 1000285		
-	1 ..... └─>actorName: (String)	-	
0	..... └─>value: uriwrlvhztkft		
-		-	6 ..... └─>element: (Actor)
		0	..... └─>actorId: 1000273
-		-	1 ..... └─>actorName: (String)
		0	..... └─>value: labxcnbolwkurzkl



# Circuit Breaker UI

Name	Enabled / Disabled
DuplicateDetection	<input checked="" type="checkbox"/> On
CatalogSize	<input checked="" type="checkbox"/> On

# Pinning UI

## All Blobs

31 Oct 2018 — 20:39:09

Pin all



20181101032316021

31 Oct 2018 — 20:17:00

Pin all



20181101030138020

31 Oct 2018 — 19:55:21

Pin all



20181101024039019

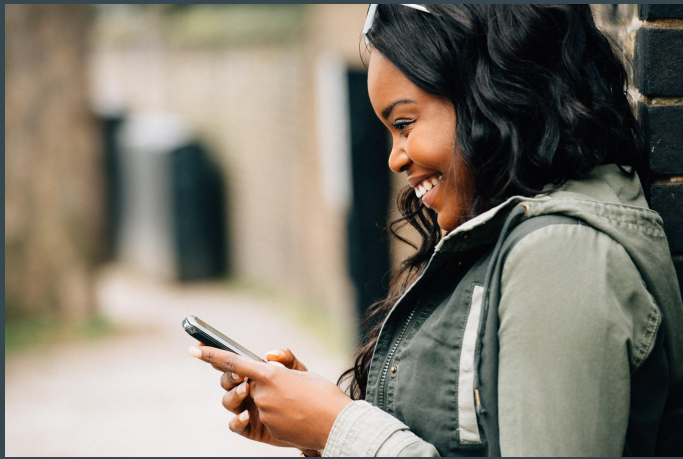
```
'replace_interests' => false,  
'send_welcome'      => false,
```

```
});
```

```
if ($result == 'error') {  
    $result = array ('response' => 'error', 'message'  
    );  
}
```

```
$result = array ('response' => 'success');  
}
```

```
$response = json_encode($result);
```



# Data validation is key to high availability

- Data change = Code push
- Circuit breakers & canaries
- Staggering and rollback

**Thank You**