

Automating Chaos Experiments In Production

Ali Basiri - Chaos Team
@abasiri

A world map composed of many small, light gray squares on a black background. The squares are arranged to form the outlines of the continents. The text "#netflix everywhere" is overlaid on the map.

#netflix everywhere

The diagram consists of two white rounded rectangular boxes on a dark background, separated by a vertical white line. The left box contains the text 'CDN' and is positioned above the text 'Movie Bits'. The right box contains the text 'Control Plane' and is positioned above a list of services including 'Website, Apps, Signup, Login, Browsing, Search Playback control, Bookmarks, ...'.

CDN

Movie Bits

**Control
Plane**

**Website, Apps,
Signup, Login,
Browsing, Search
Playback control,
Bookmarks, ...**



Ali Basiri

Software Engineer @ Netflix

- Chaos Engineer
- Distributed Systems Engineer
- Co-author of Principles of Chaos





Amy

@amynewton193



Follow

My Netflix isn't working, call the police!!!

3:57 PM - 3 Feb 2015



Tim Urban 

@TimUrbanMusic



Follow

My Netflix is down.... I hadn't planned on actually having to talk to anyone tonight....

4:19 PM - 3 Feb 2015



38



77



Jazzy

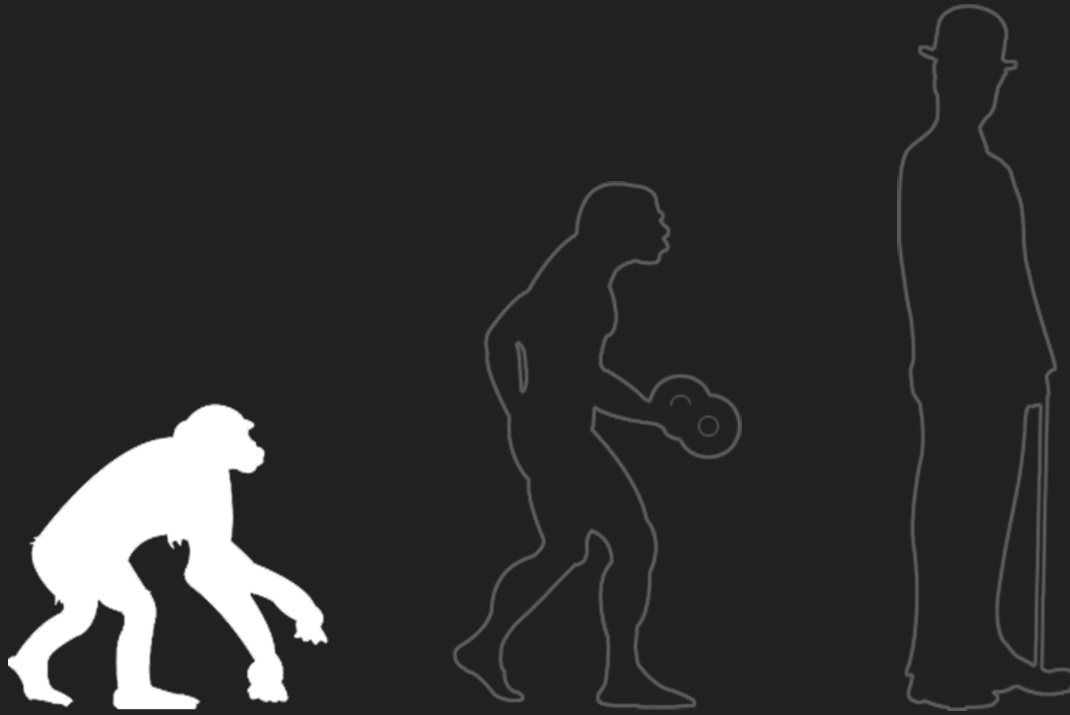
@JazzyLuchini



Follow

my netflix isnt working, is this what it feels like to
have your heart shatter into little tiny pieces

February 4, 2015



Chaos Monkey



Service
Availability

Anatomy of a Failure

NETFLIX ORIGINAL

THE

CROWN

Watch Season 1 Now

Duty. Family. Power. A young woman rises to rule an empire amid the challenges of the modern age.

 **PLAY**

 **MY LIST**

API

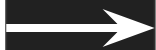


**Movie
Info**



**CDN
Selection**

API



**Movie
Info**

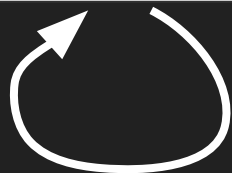
**CDN
Selection**



API

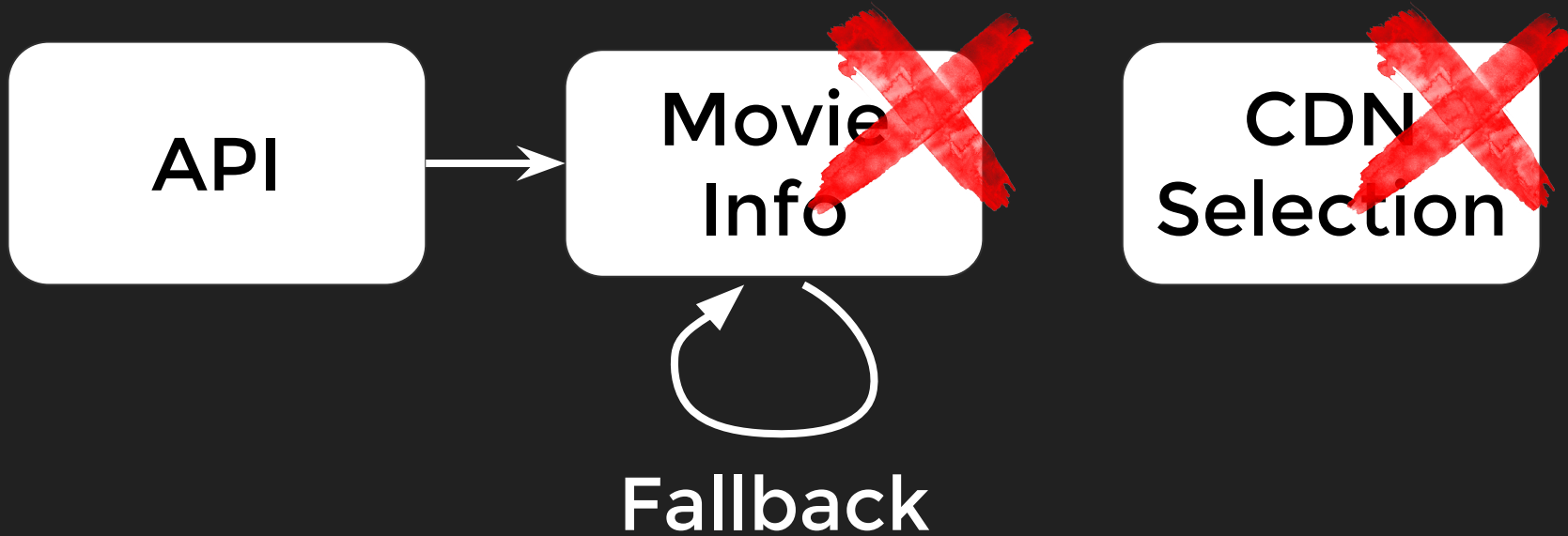


Movie
Info



Fallback

~~CDN
Selection~~



Fallback

API

~~Movie
Info~~

~~CDN
Selection~~

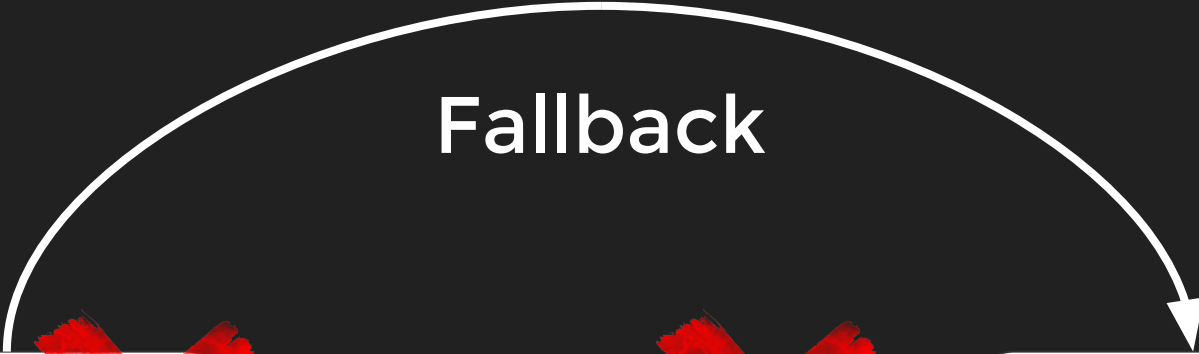


Fallback

~~API~~

~~Movie
Info~~

~~CDN
Selection~~





FIT

Request Level Failure Injection

Request Level Failure Injection



NETFLIX

Browse ▾

DVD

the GIRL who PLAYED with FIRE

Search



Ali ▾

TV Thrillers & Mysteries



Top Picks for Ali



Watch It Again



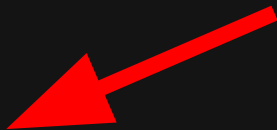
Top Picks for Ali



Watch It Again



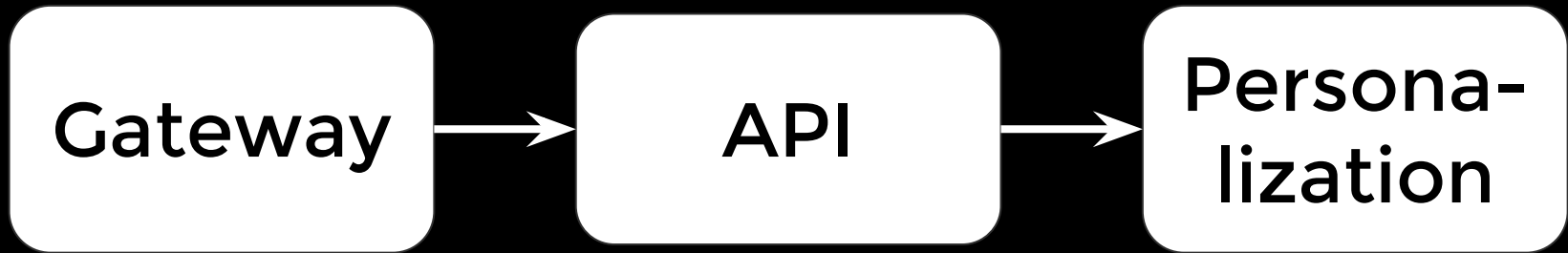
Popular on Netflix



Goofy Comedies



Is API resilient to failure of Personalization?



Failure Scope

| | | | |
|---------|-----------------------------------|----------|--|
| Device | <input type="text"/> | Customer | <input type="text"/> |
| Traffic | <input type="text" value="10"/> % | App | <input type="text" value="API"/> |
| | | Region | <input type="text" value="us-east-1"/> |

Scenario

| | |
|----------|---|
| Scenario | <input type="text" value="Personalization Client"/> |
|----------|---|

Impact

| | |
|-------|-------------------------------------|
| Fail | <input checked="" type="checkbox"/> |
| Delay | <input type="text" value="0"/> ms |

Run

Failure Scope

Device

Customer

Traffic

10

%

App

API

Region

us-east-1

Scenario

Scenario

Personalization Client

Impact

Fail

Delay

0

ms

Run

Failure Scope

Device

Customer

Traffic %

App

Region

Scenario

Scenario

Impact

Fail

Delay ms

Run

Failure Scope

Device Customer

Traffic %

App

Region

Scenario

Scenario

Impact

Fail

Delay ms

Run

Failure Scope

| | | | |
|---------|-----------------------------------|----------|--|
| Device | <input type="text"/> | Customer | <input type="text"/> |
| Traffic | <input type="text" value="10"/> % | App | <input type="text" value="API"/> |
| | | Region | <input type="text" value="us-east-1"/> |

Scenario

Scenario

Impact

Fail

Delay ms

Run

Failure Scope

| | | | |
|---------|-----------------------------------|----------|--|
| Device | <input type="text"/> | Customer | <input type="text"/> |
| Traffic | <input type="text" value="10"/> % | App | <input type="text" value="API"/> |
| | | Region | <input type="text" value="us-east-1"/> |

Scenario

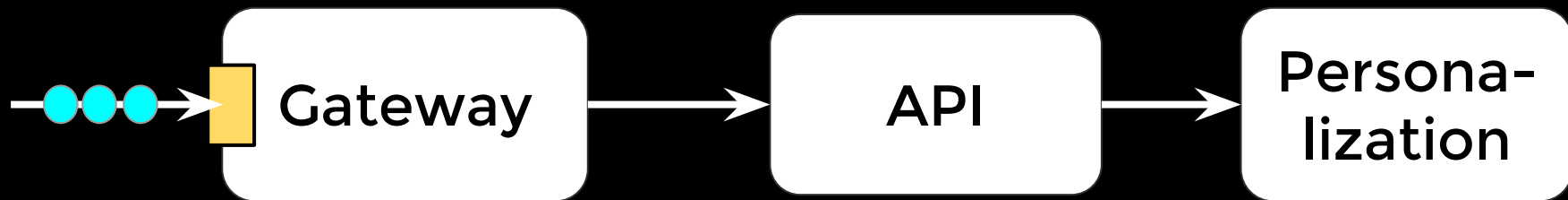
| | |
|----------|---|
| Scenario | <input type="text" value="Personalization Client"/> |
|----------|---|

Impact

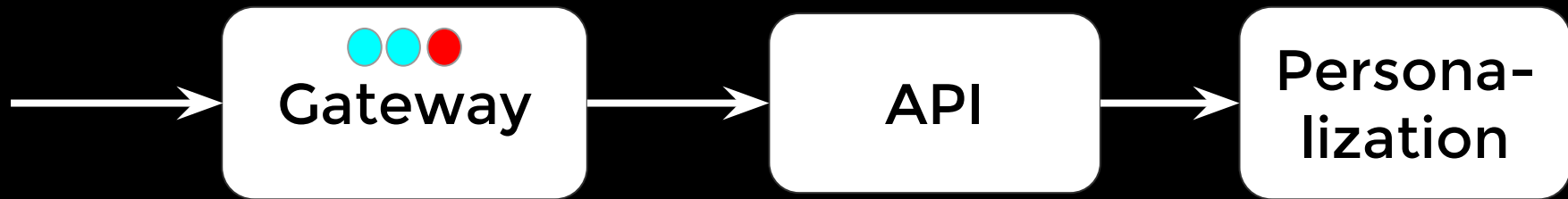
Fail

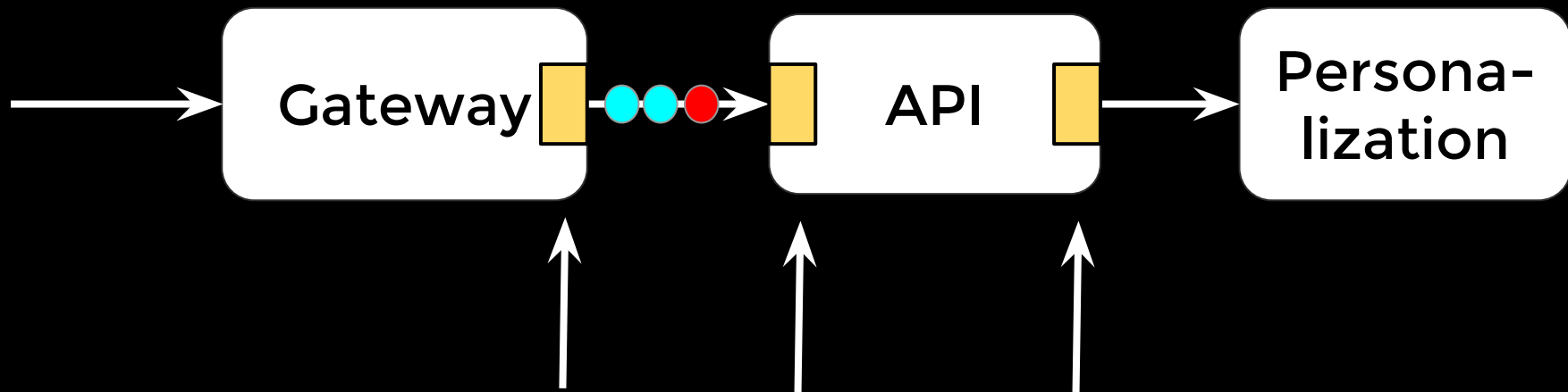
Delay ms

Run

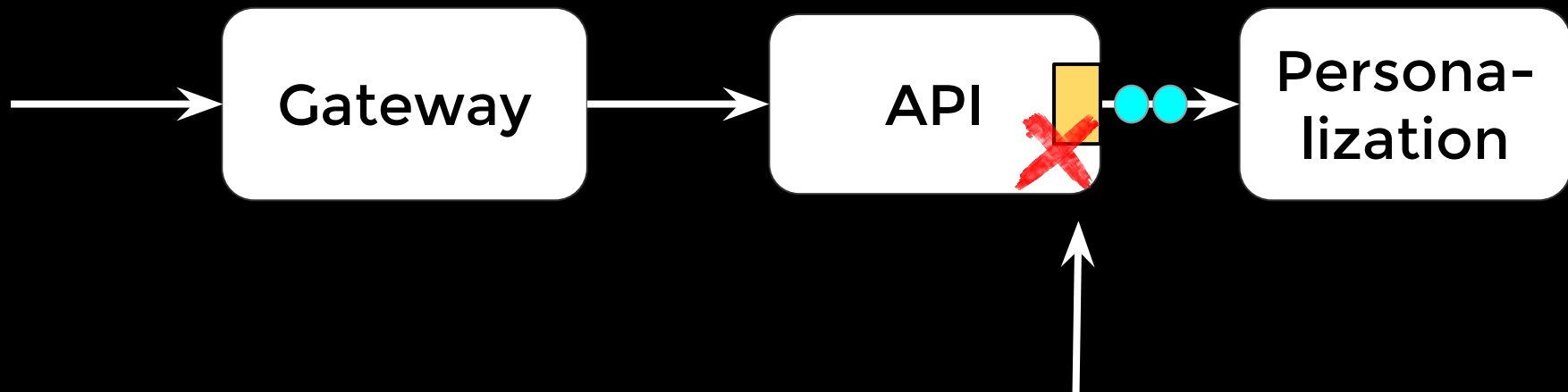


Randomly select 10% of requests to participate in experiment



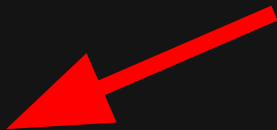


if (shouldFail == true)



if (shouldFail == true)

Popular on Netflix



Goofy Comedies



NETFLIX

Browse ▾

Kids

DVD

🔍 Search



Ali ▾

TV Thrillers & Mysteries

Top Picks for Ali

Watch It Again

FIT

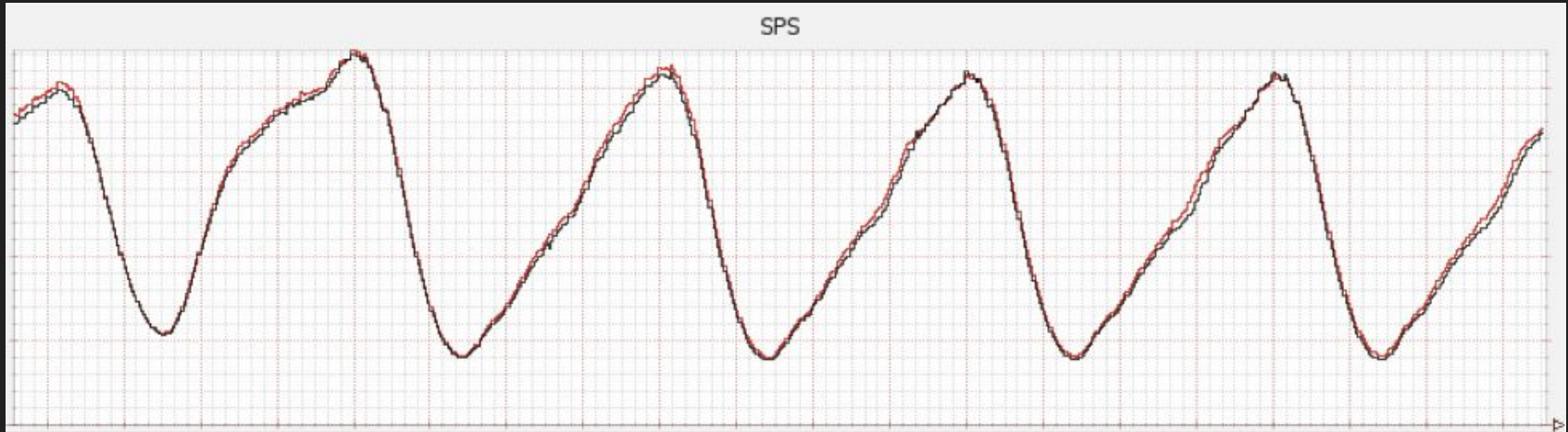


**Even More
Availability**

CHAOS ENGINEERING

Chaos Engineering is the discipline of experimenting on a distributed system in order to build confidence in the system's capability to withstand turbulent conditions in production.

Stream Starts Per Second (SPS)

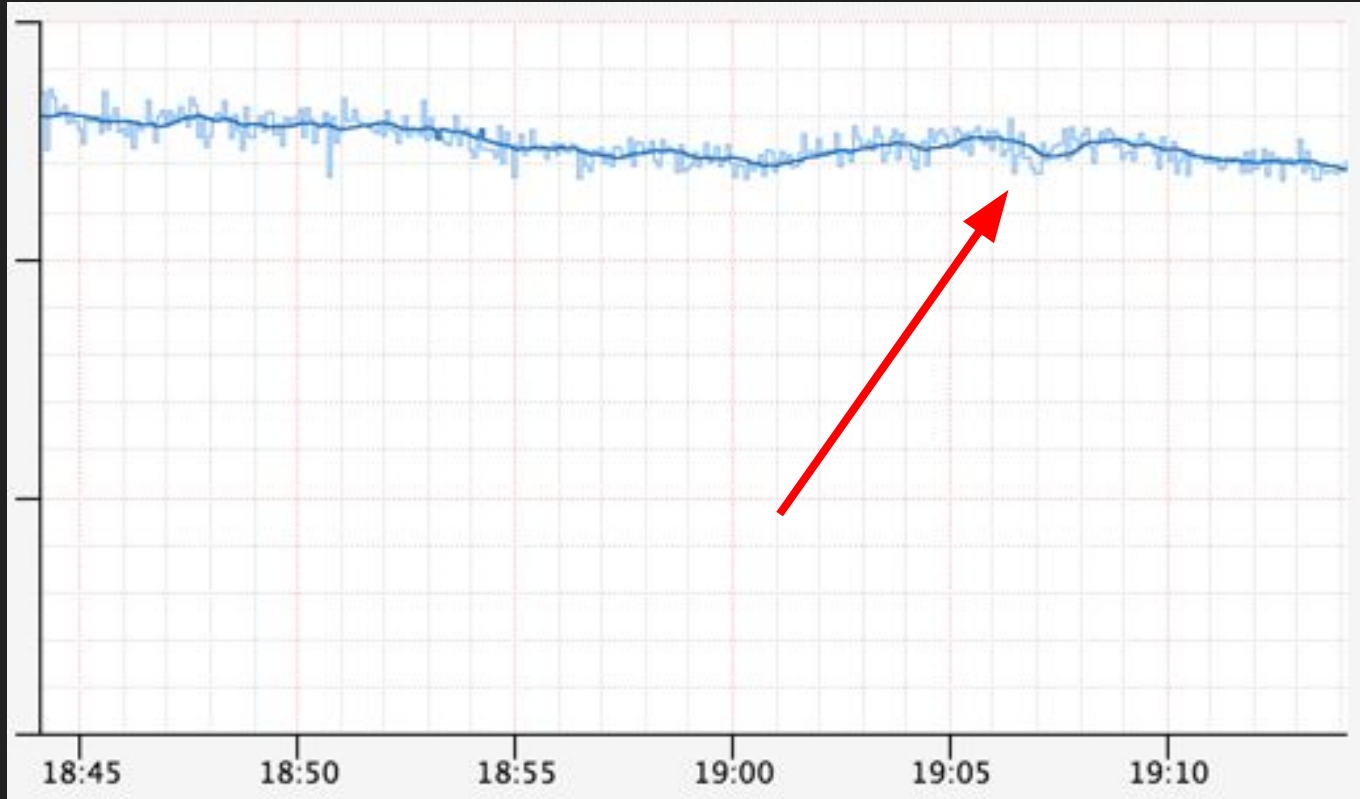


Principles Of Chaos Engineering

<http://principlesofchaos.org>

- Build a Hypothesis around Steady State Behavior
- Vary Real-world Events
- Run Experiments in Production
- Automate Experiments to Run Continuously

Stream Starts Per Second (SPS)





ChAP

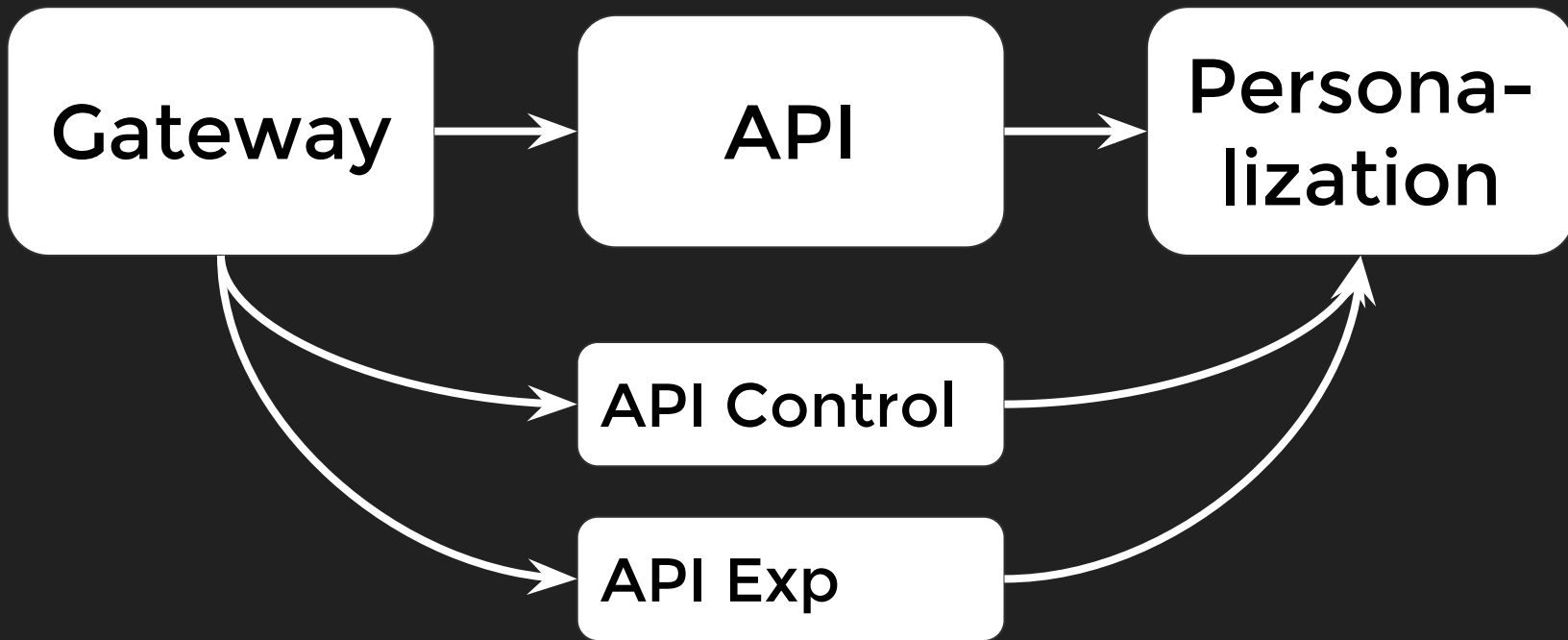
Goal:
Chaos All The Things

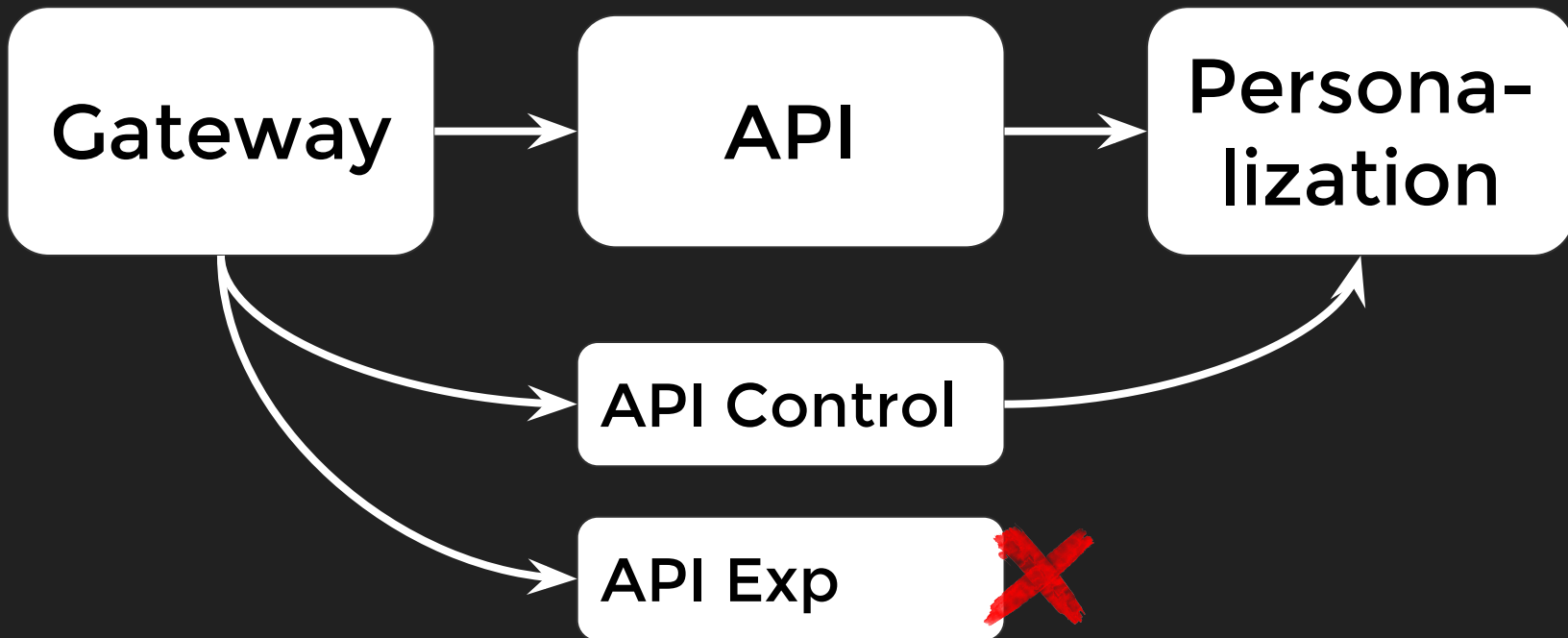
Gateway

```
graph LR; Gateway[Gateway] --> API[API]; API --> Personalization[Personalization];
```

API

Personalization





API Resilience to Personalization Failure

json

Save



Run

General

Test Case Name

Fit Scenario

Duration Minutes

Impact Failure Latency

Service To Clone

Account

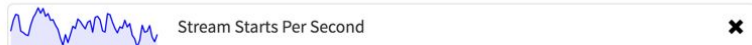
Region

App

Traffic Impacted

Reporting

Metrics Add



API Resilience to Personalization Failure

json

Save



Run

General

Test Case Name

API Resilience to Personalization Failure



Fit Scenario

Personalization Client



Duration

30

Minutes

Impact



Failure



Latency

Service To Clone

Account

prod



Region

us-east-1



App

API

API Resilience to Personalization Failure

json

Save



Run

General

Test Case Name

API Resilience to Personalization Failure



Fit Scenario

Personalization Client



Duration

30

Minutes

Impact



Failure



Latency

Service To Clone

Account

prod



Region

us-east-1



App

API

Duration

30

Minutes

Impact

Failure Latency

Service To Clone

Account

prod

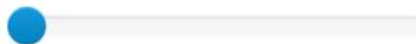
Region

us-east-1

App

API

Traffic Impacted



1.00%

Reporting

Metrics

Atlas url

Add



CPU Utilization

×

Duration

30

Minutes

Impact

Failure Latency

Service To Clone

Account

prod

Region

us-east-1

App

API

Traffic Impacted



1.00%

Reporting

Metrics

Atlas url

Add



CPU Utilization



Duration 30 Minutes

Impact Failure Latency

Service To Clone

Account prod

Region us-east-1

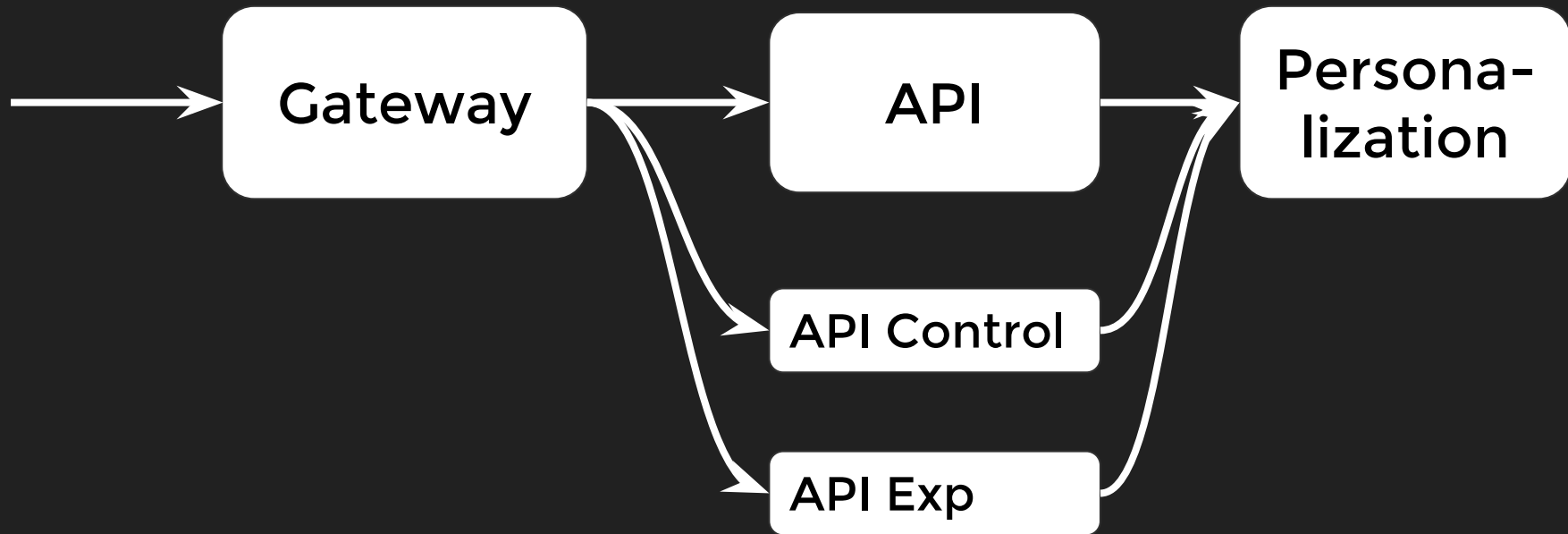
App API

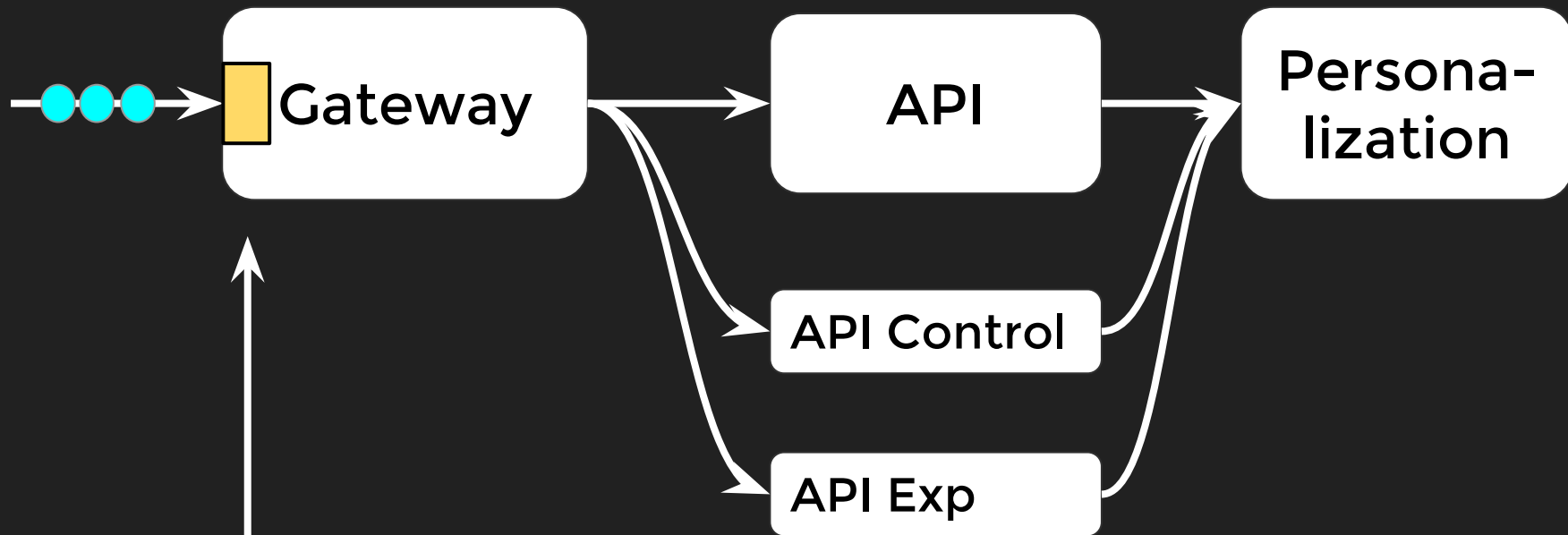
Traffic Impacted 1.00%

Reporting

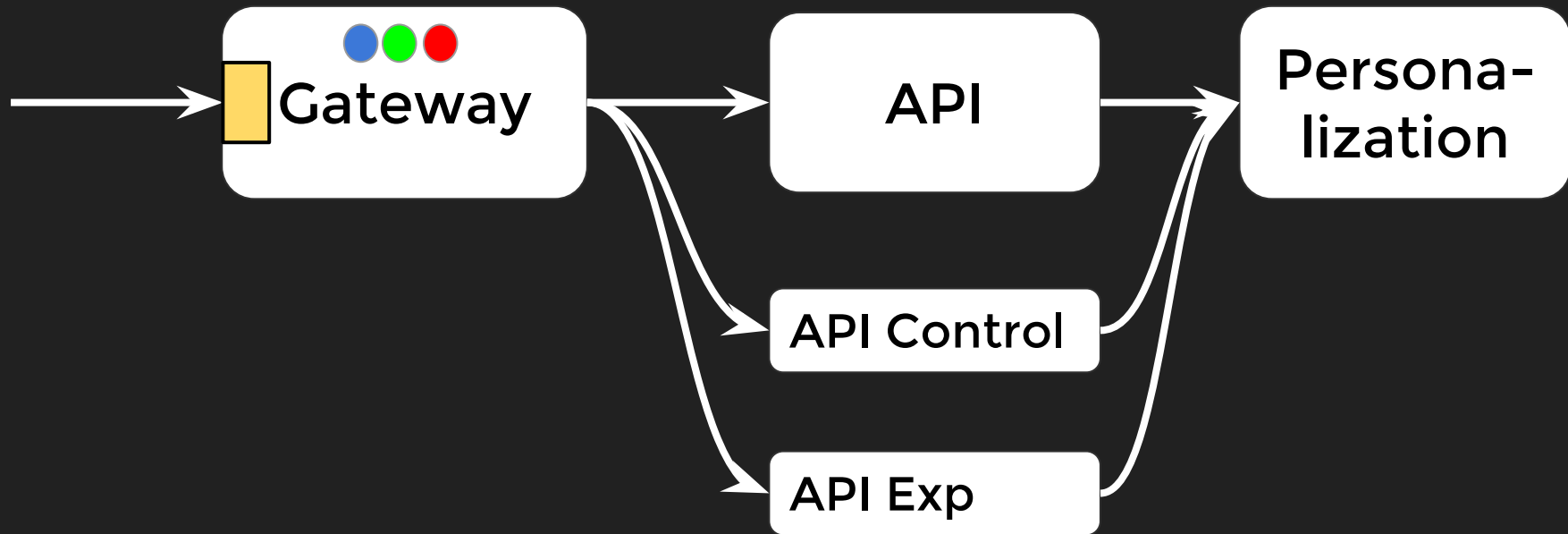
Metrics Atlas url Add

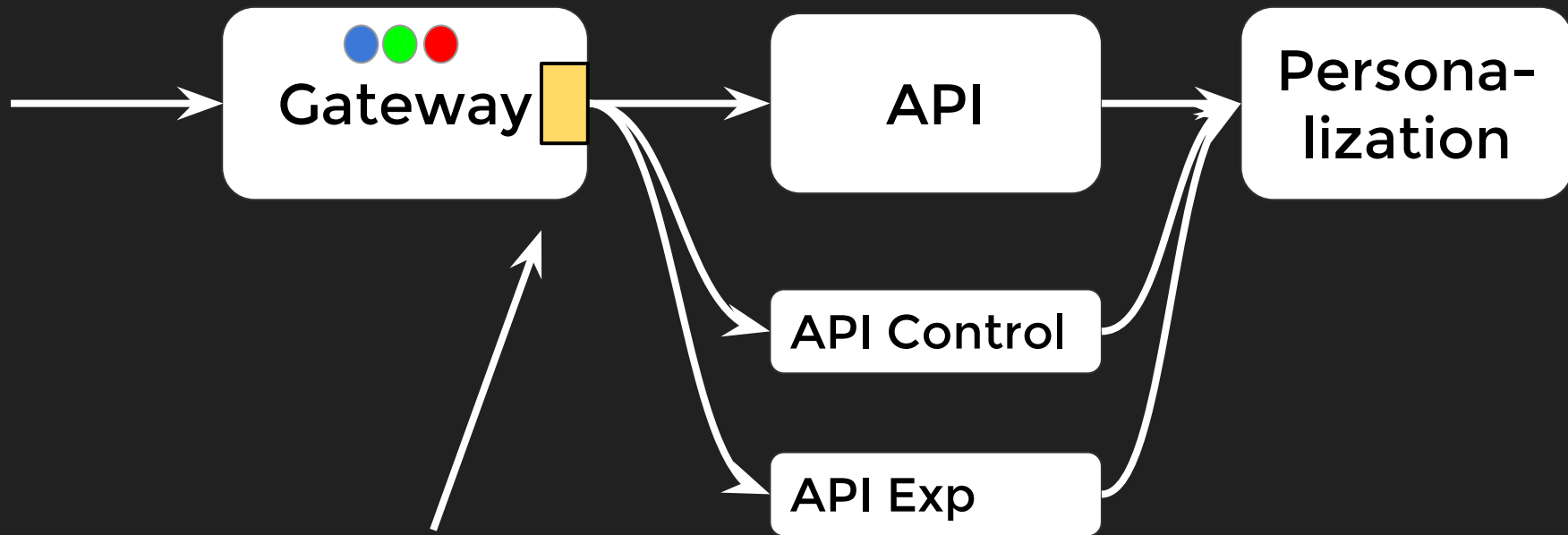




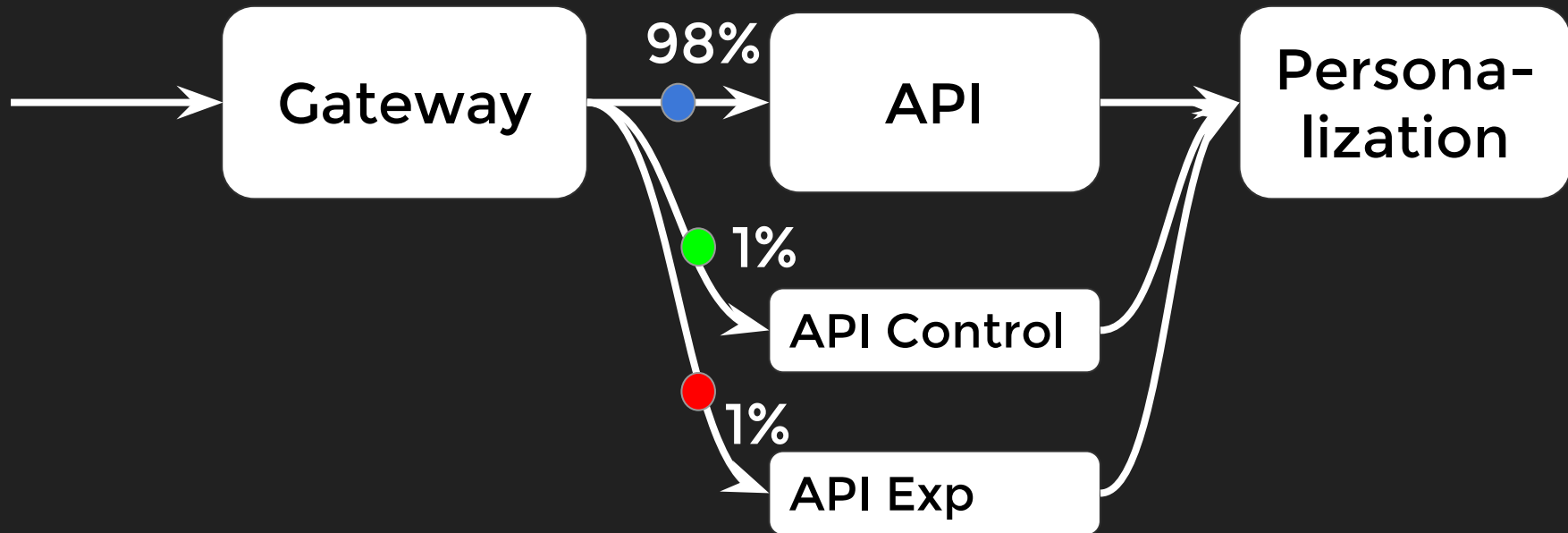


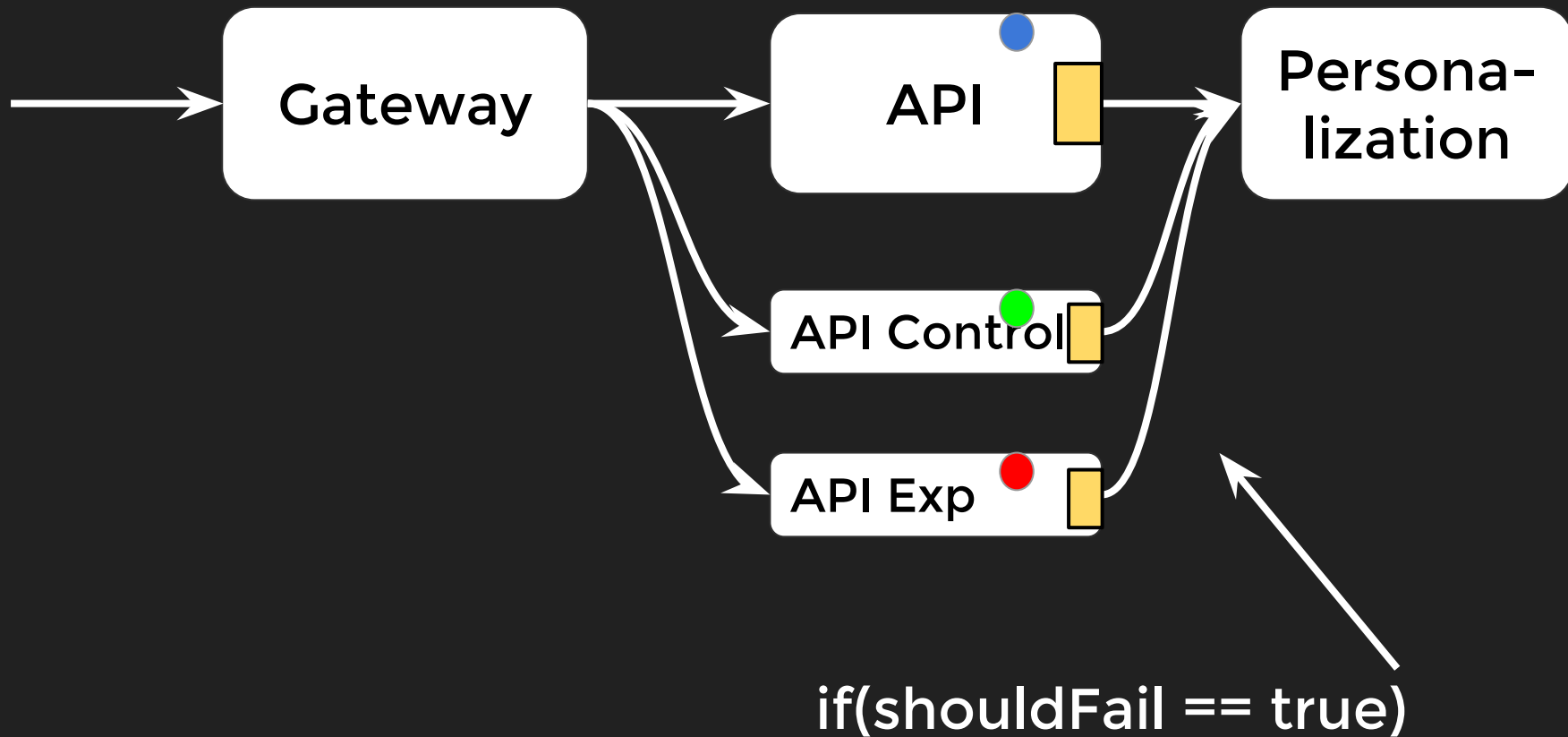
Select 1% of requests for control
Select 1% of requests for experiment

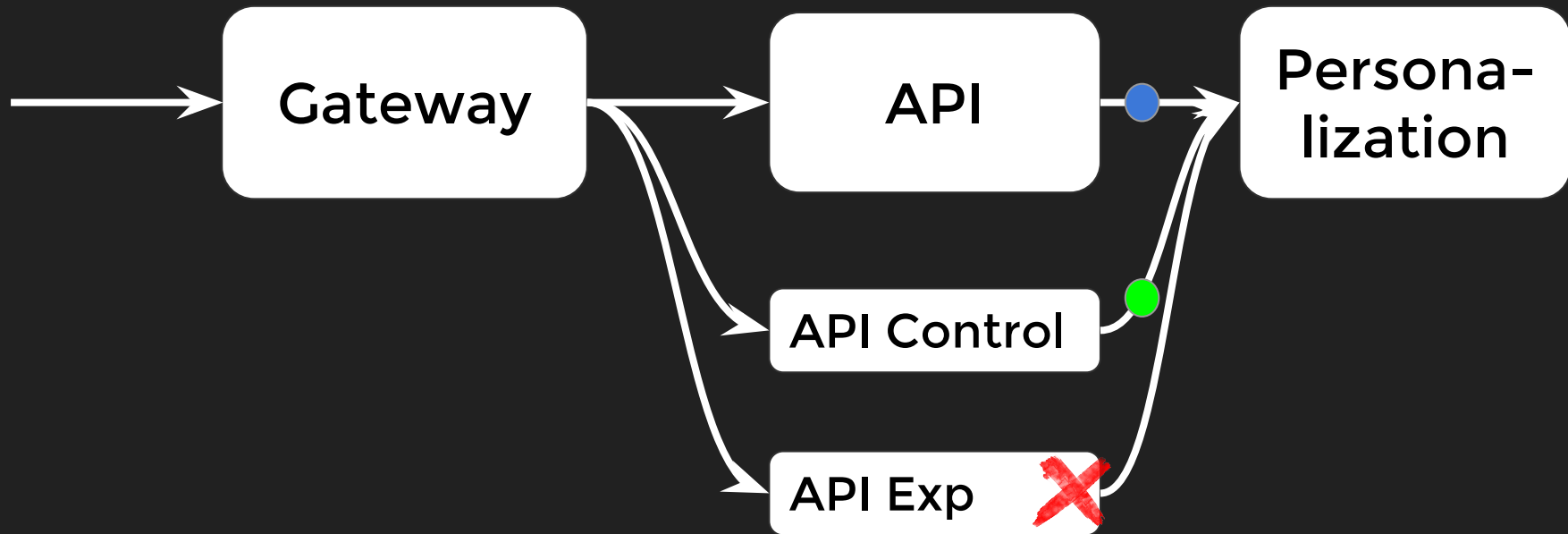




`if(shouldRoute == true)`



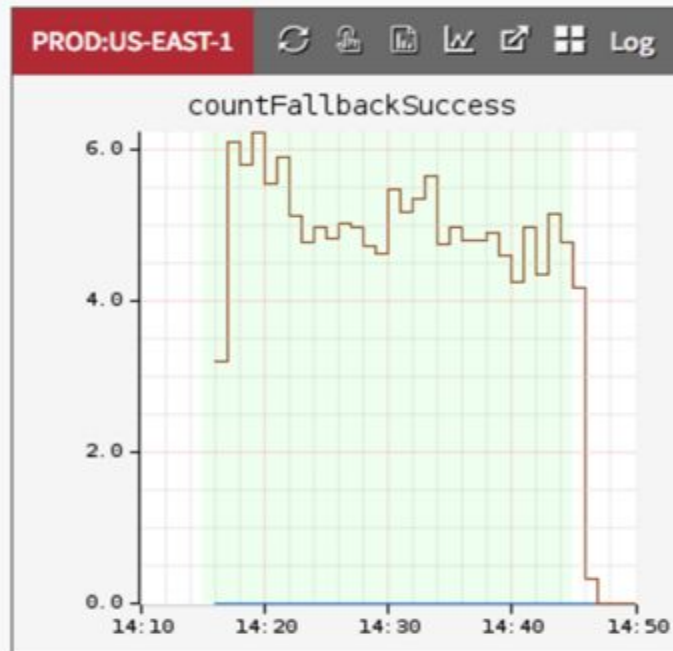
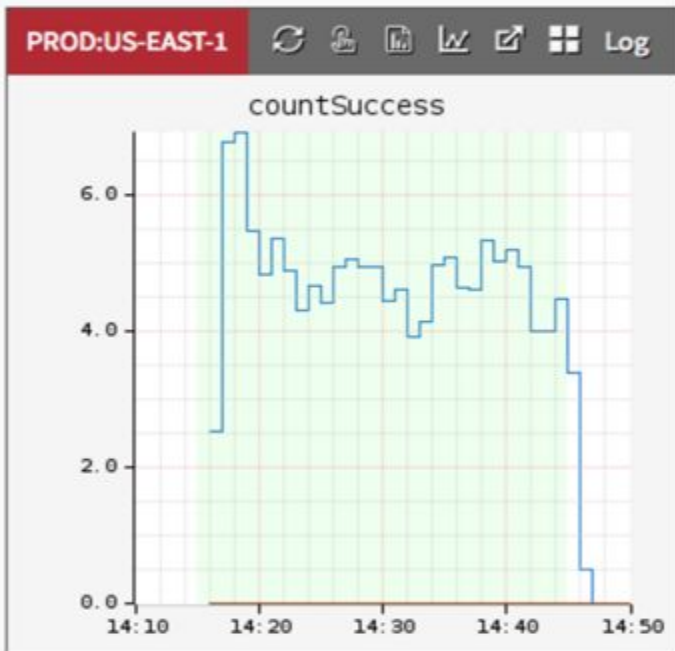




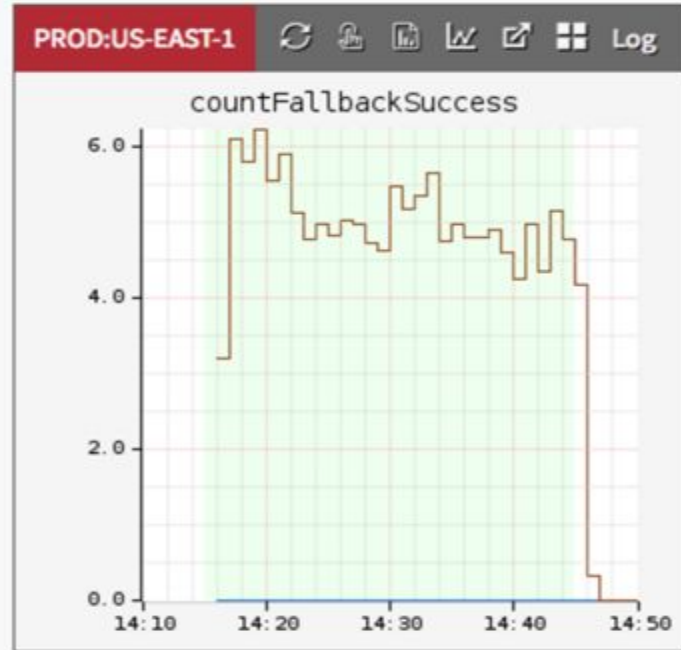
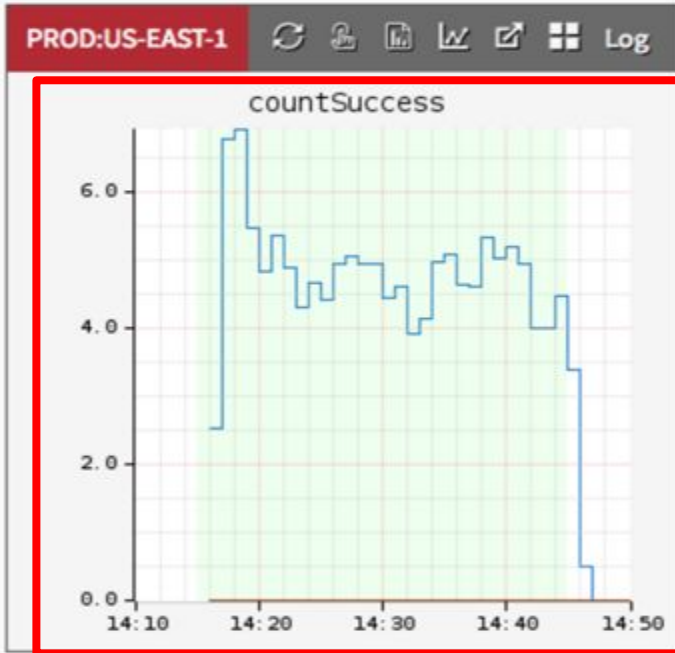
Stream Starts Per Second (SPS)



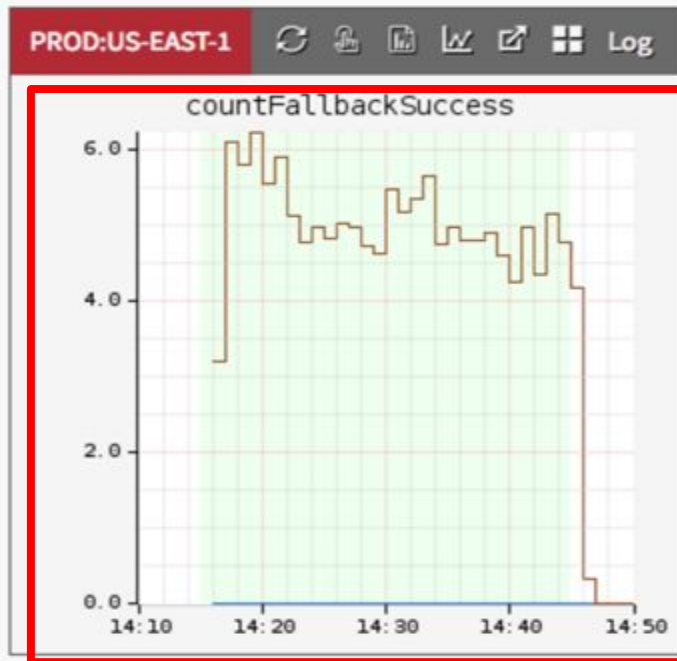
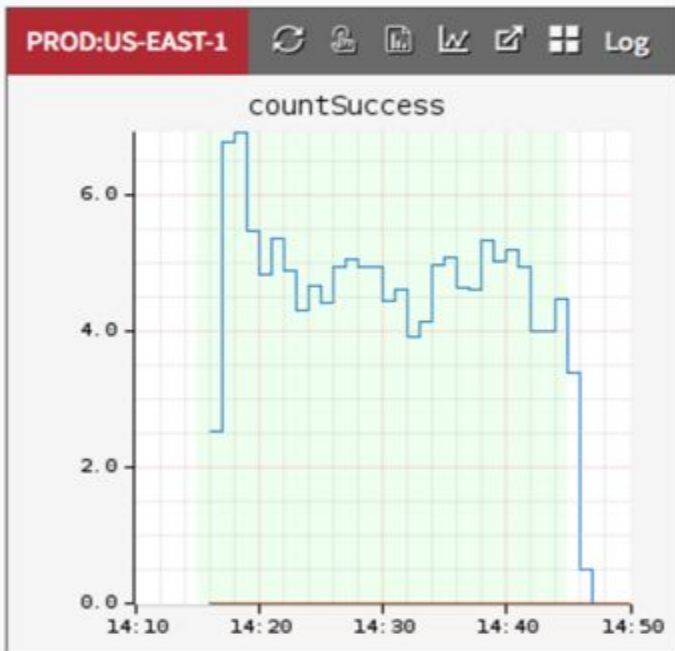
Fallback Metrics



Fallback Metrics



Fallback Metrics



CPU Utilization



Future Work on ChAP

Automated Canary Analysis

CANARY ANALYSIS [About](#) [Help](#)

Canary Score: 61% **FAILED**

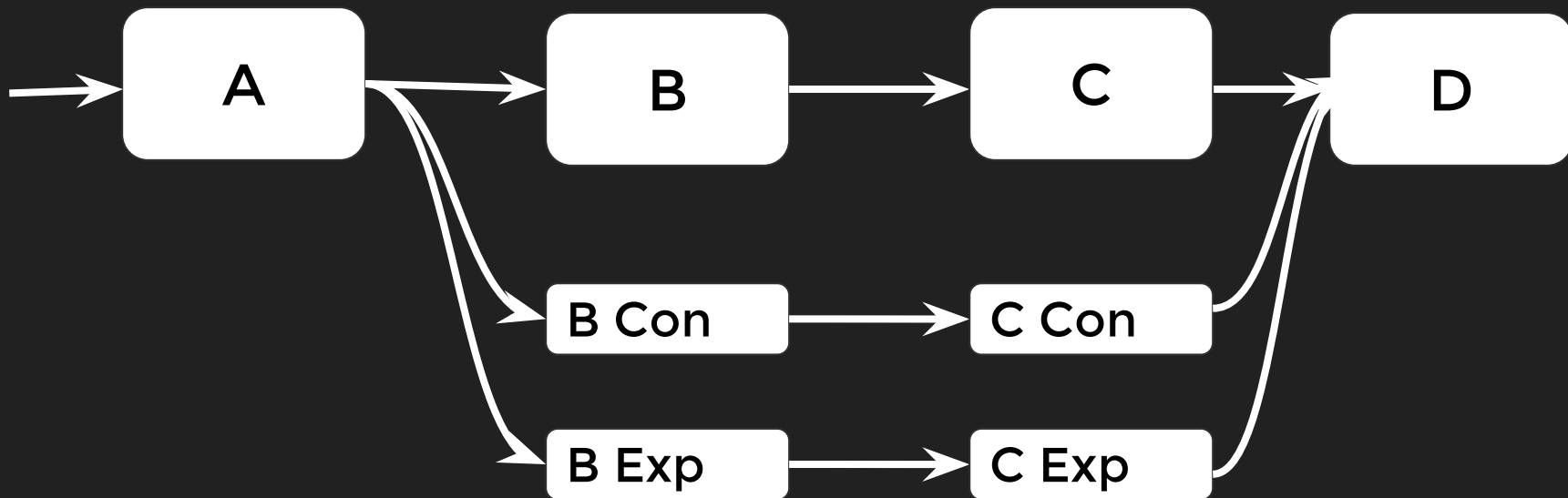
Metric Analysis

| Group Name | metrics | |
|-------------------|---------|---------------|
| ^ Fallbacks | 2 | FAILED |
| ^ SPS | 1 | PASS |
| ^ CPU Utilization | 1 | FAILED |
| ^ Latency | 6 | FAILED |

Detect divergence and stop early

Integrate with continuous delivery system

Clone multiple services to run an experiment



<http://principlesofchaos.org>
<http://chaos.community>

Questions?