What I Wish I Knew Before Going On-call

SRECon 2019

Survey

http://bit.ly/survey-srecon19

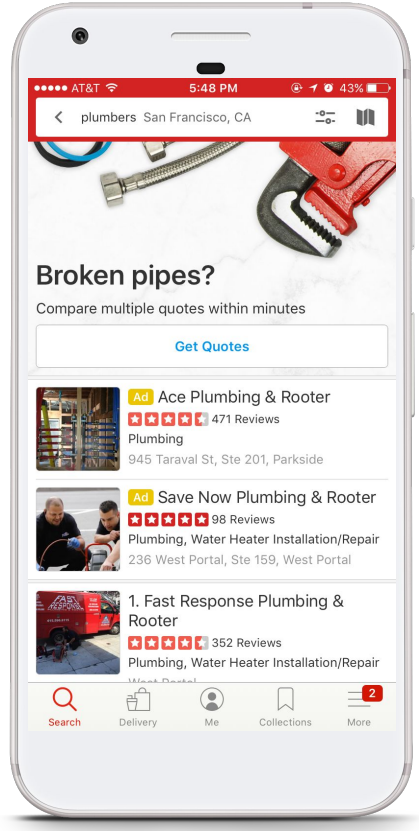
WHO WE ARE

Chie Shu
Software Engineer
chie@yelp.com

Wenting Wang
Software Engineer
wwang@yelp.com

Yelp Local Ads

- Connect people with great local businesses
- Advertiser billing and analytics



Our team's challenges

1. Financially critical systems

~90% of company revenue is from ads

2. Wears many hats 🎩

On-call + Feature + Infra

3. Owns systems with many different tech stacks

Makes being on-call more challenging

4. Majority of the team is new grad hires

Makes onboarding even more important

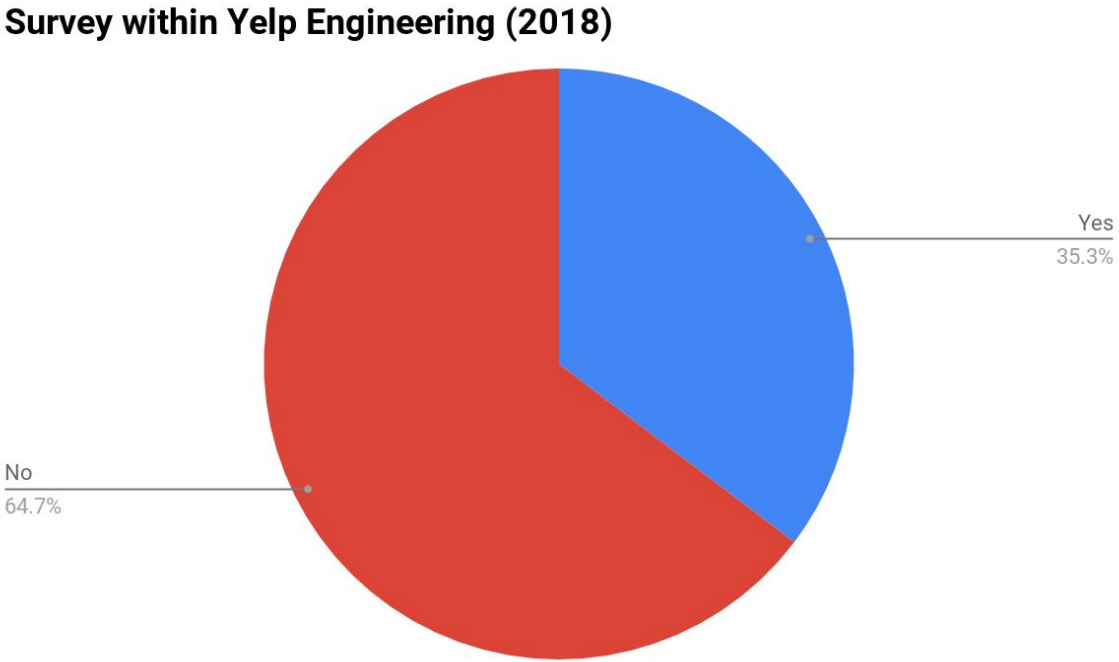
Our story

- Joined the team as new grad hires
- Learned how to be on-call the hard way...
- Now mentoring other engineers

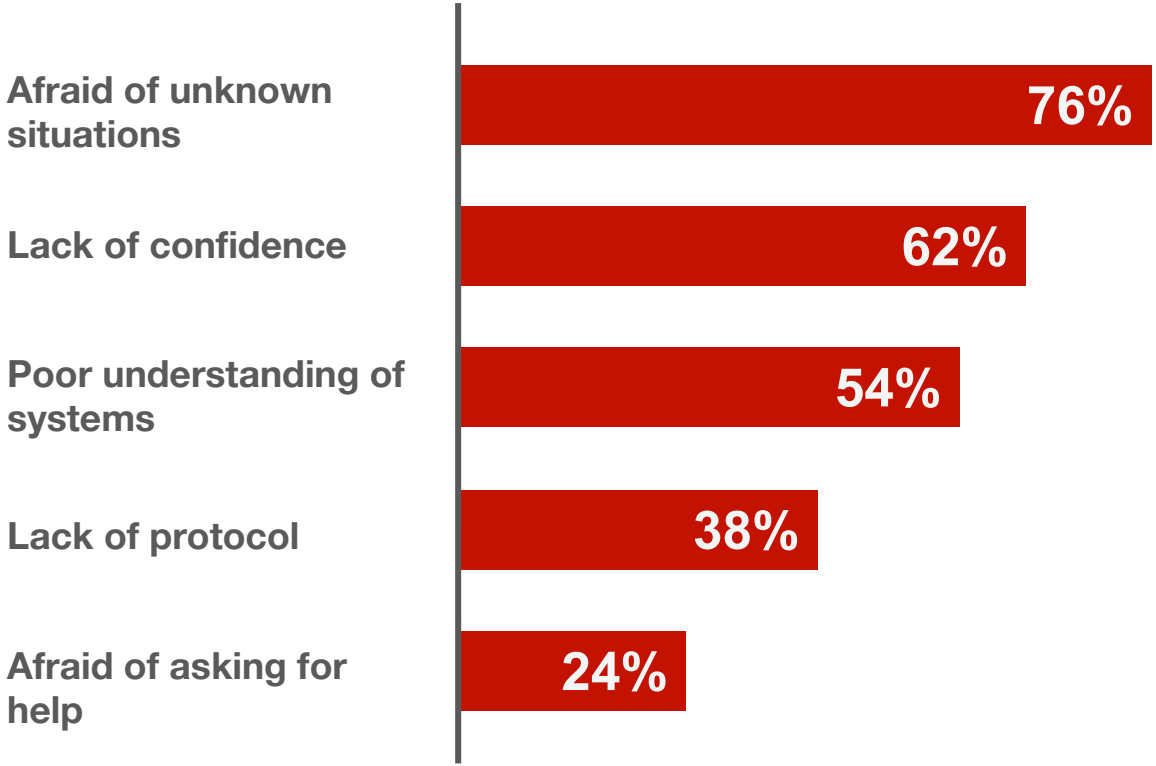
Newbie on-call struggles

- No established training process
- Decentralized + Outdated documentations
- So much financial impact/pressure

Did you feel **ready** before going on-call for the first time?



Why didn't you feel ready?



Survey within Yelp Engineering (2018)

Why care about good onboarding?

Win 1: Makes your team scalable!

Win 2: Improve incident response

Win 3: Teaching is the best way to learn

Win 4: Confident new hires

Workshop Goal

Build an efficient oncall onboarding system for your organization

Agenda

1. **Common Myths about On-Call**
2. **How to Create Training Program**
3. **Runbook for Effective Incident Response**

4 Common Myths About On-calls

Myth #1

“I need to know everything”

You are not supposed to know everything

Myth #2

“I need to solve everything by myself”

You are supposed to ask for help

Myth #3

“I need to find the root cause”

Root cause finding is a non-goal

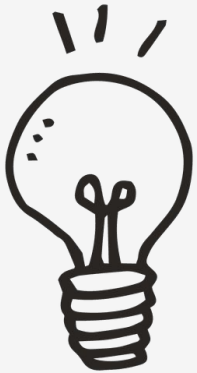
Myth #4

“I need to make the best/long-term fix”

You are supposed to mitigate the issue

Setting the right expectations

1. **Reduce (unnecessary) fear**
2. **More productive + efficient on-call**



Set the right expectations during training!

Now onto the training program...

My On-call “Training”

What was good about my training?

- It existed
- On-point rotation
- Shadowing

What was difficult about my training?

- Information dump
- No emphasis on connections between systems
- No emphasis on investigation/debugging tools

The Goal of Training Program

Goal 1.
Be able to draw a mental picture of your system

Goal 2.
Understand failure modes/alerts for the system

Goal 3.
Know the tools for investigation

Exercise

Let’s make an oncall training program!

Exercise Agenda

Let’s make an oncall training program!

1. Make a Curriculum
2. Create Introduction
3. Cover Failure Modes
4. List Necessary Tools

What you need:

Text editor of your choice

Exercise Agenda

Let’s make an oncall training program!

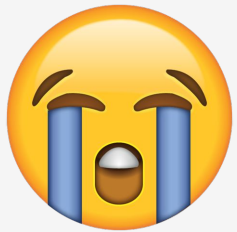
1. Make a Curriculum
2. Create Introduction
3. Cover Failure Modes
4. List Necessary Tools

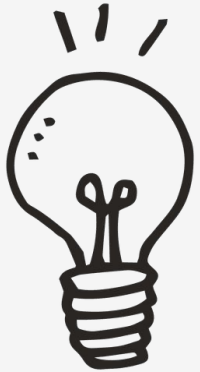
Exercise #1

Let’s make a curriculum!

Anti-example

Lesson	Topic
1	Everything you need to know about ads on-call (2 hours)





Tip: Avoid information overload

Lesson	Topic
1	Oncall Expectation + Overview of Ad systems
2	Billing (Critical)
3	Ad Delivery (Critical)
4	Ad Internal Reports/Metrics (Less Critical)
5	Targeting (Less Critical)

Ask yourself a question:
Is there information-overload happening?

Lesson	Topic
1	Oncall Expectation + Overview of Ad systems ← **Should be super high level**
2	Billing (Critical)
3	Ad Delivery (Critical)
4	Ad Internal Reports/Metrics (Less Critical)
5	Targeting (Less Critical)

Ask yourself a question:
Is there information-overload happening?

Lesson	Topic
1	Oncall Expectation + Overview of Ad systems
2	Billing (Critical) ← **What if this is a complicated data pipeline with many alerts?**
3	Ad Delivery (Critical)
4	Ad Internal Reports/Metrics (Less Critical)
5	Targeting (Less Critical)

Ask yourself a question:
Is there information-overload happening?

Lesson	Topic
1	Oncall Expectation + Overview of Ad systems
2	**Ad Analytics Pipeline (Critical)** **Split it into a reasonable unit!**
3	**Billing Pipeline(Critical)**
4	Ad Delivery (Critical)
5	Ad Internal Reports/Metrics (Less Critical)
6	Targeting (Less Critical)

Lesson	Topic
1	Oncall Expectation + Overview of Ad systems
2	Ad Usage Pipeline (Critical)
3	Billing Pipeline(Critical)
4	Ad Delivery (Critical)
5	Ad Internal Reports/Metrics (Less Critical)
6	Targeting (Less Critical)

Ask yourself a question:
Does the order of the topics make sense?

Lesson	Topic
1	Oncall Expectation + Overview of Ad systems
2	Ad Analytics Pipeline
3	Billing Pipeline(Critical)
4	**Ad Delivery (Critical)** ← This is an upstream of #2 and #3
5	Ad Internal Reports/Metrics (Less Critical)
6	Targeting (Less Critical)

Ask yourself a question:
Does the order of the topics make sense?

Lesson	Topic
1	Oncall Expectation + Overview of Ad systems
2	**Ad Delivery (Critical)**
3	Ad Analytics Pipeline (Critical)
4	Billing Pipeline (Critical)
5	Ad Internal Reports/Metrics (Less Critical)
6	Targeting (Less Critical)

Ask yourself a question:
Does the order of the topics make sense?

Exercise #1

Let’s make an oncall training curriculum!

- Come up with a list of topics
- Chunk it into a “reasonable” size
- Sort them

3 mins

Exercise Agenda

Let’s make an oncall training program!

1. Make a Curriculum
2. Create Introduction
3. Cover Failure Modes
4. List Necessary Tools

Exercise #2

Let’s write a 10000 ft overview of the system!

10000 ft overview	Actual oncall training

Exercise #2

Why give an overview in on-call training?

- Make sure students are on the same page
- Make failure points clearer

10000 ft overview	Actual oncall training

Exercise #2

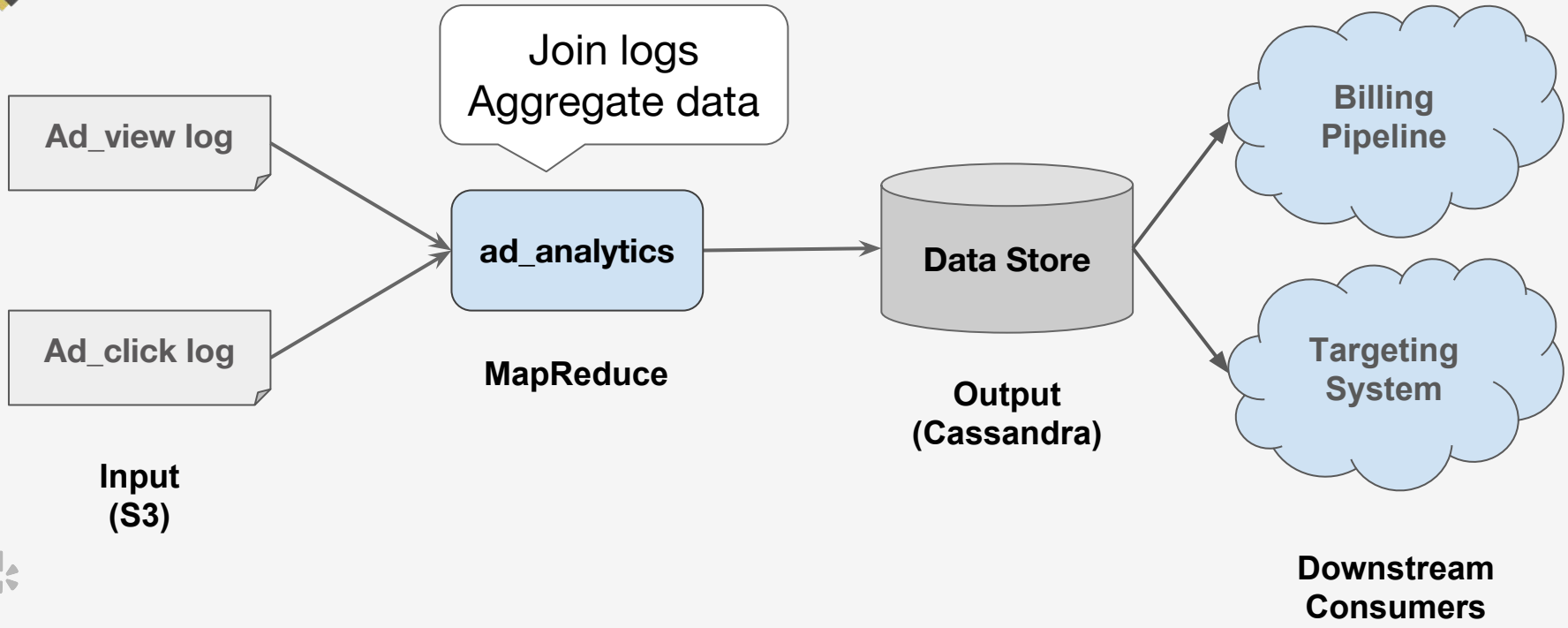
What should a 10000 ft overview include?

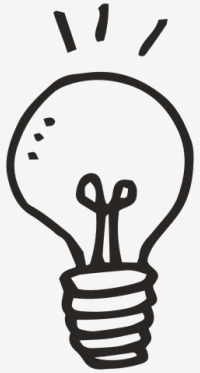
- Simple Diagram
- Summary of the system (What it does, what depends on it etc)

10000 ft overview	Actual oncall training

Lesson	Topic
1	What is oncall? + Overview of Ad systems
2	Ad Delivery (Critical)
3	**Ad Analytics Pipeline (Critical)**
4	Billing Pipeline (Critical)
5	Ad Internal Reports/Metrics (Less Critical)
6	Targeting (Less Critical)

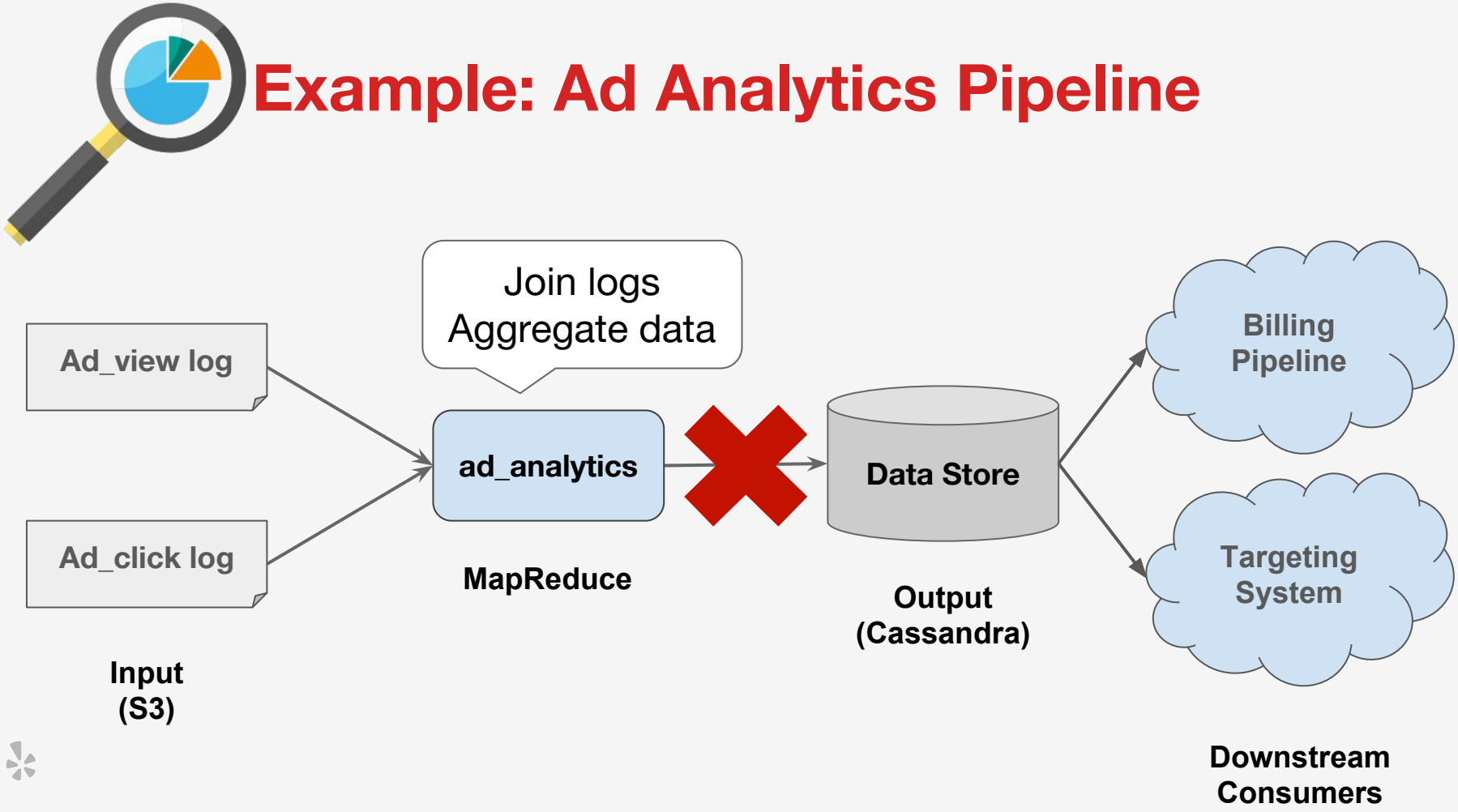
Example: Ad Analytics Pipeline



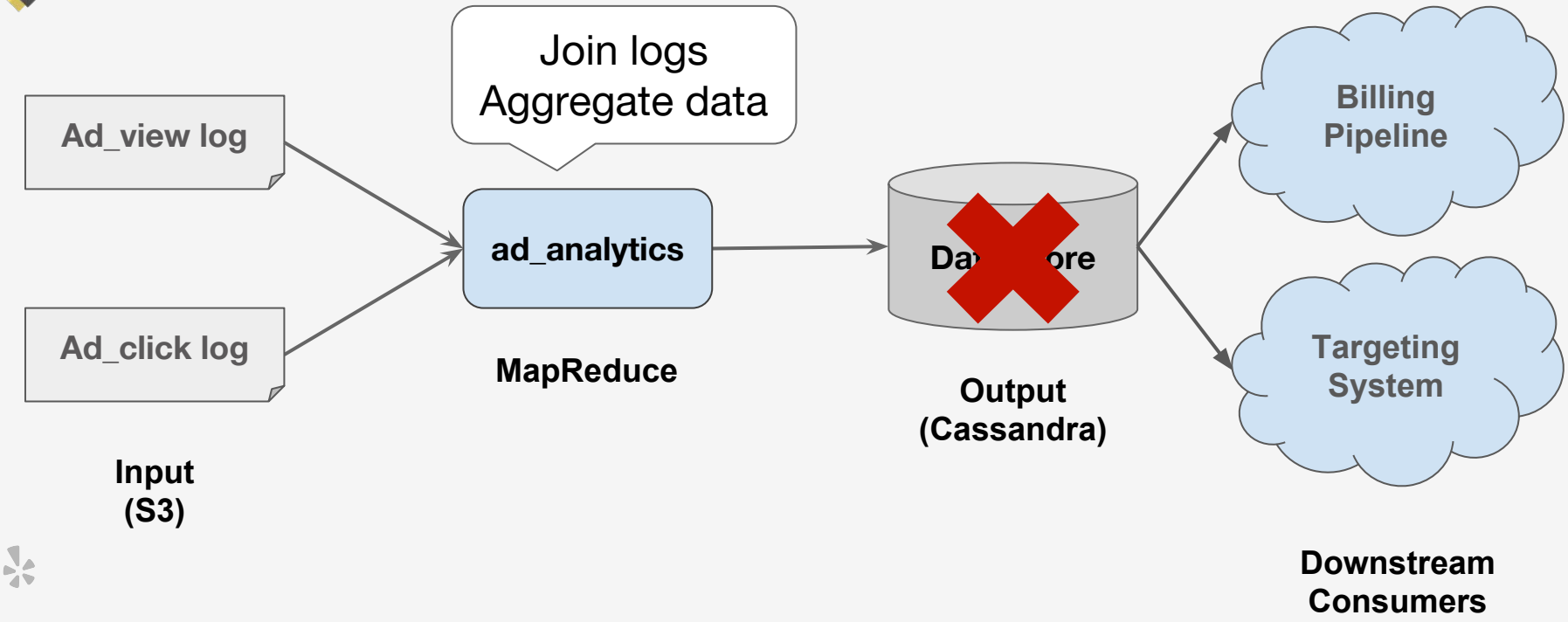


Tip: Use visual aid you can reuse

Example: Ad Analytics Pipeline



Example: Ad Analytics Pipeline



Exercise #2

Let’s write a 10000 ft overview of the system!

1. Pick one topic from the curriculum
2. Summarize the system, techstack, and failure points
3. Add a diagram

3 mins

Exercise Agenda

Let’s make an oncall training program!

1. Make a Curriculum
2. Create Introduction
3. Cover Failure Modes
4. List Necessary Tools

Exercise #3

Let’s write the “actual on-call training”

10000 ft overview	**Actual oncall training**

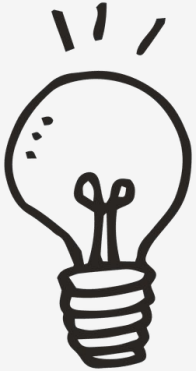
Exercise #3

Let’s write the “actual on-call training”

10000 ft overview	Actual oncall training

↑

Usually talks about failure modes/alerts and how to respond to them



Tip

Use Past Incidents

Exercise #3
Why use past incidents?

- Examples are the best teachers!
- Opportunity to make it interactive

Example: Ad Analytics Pipeline

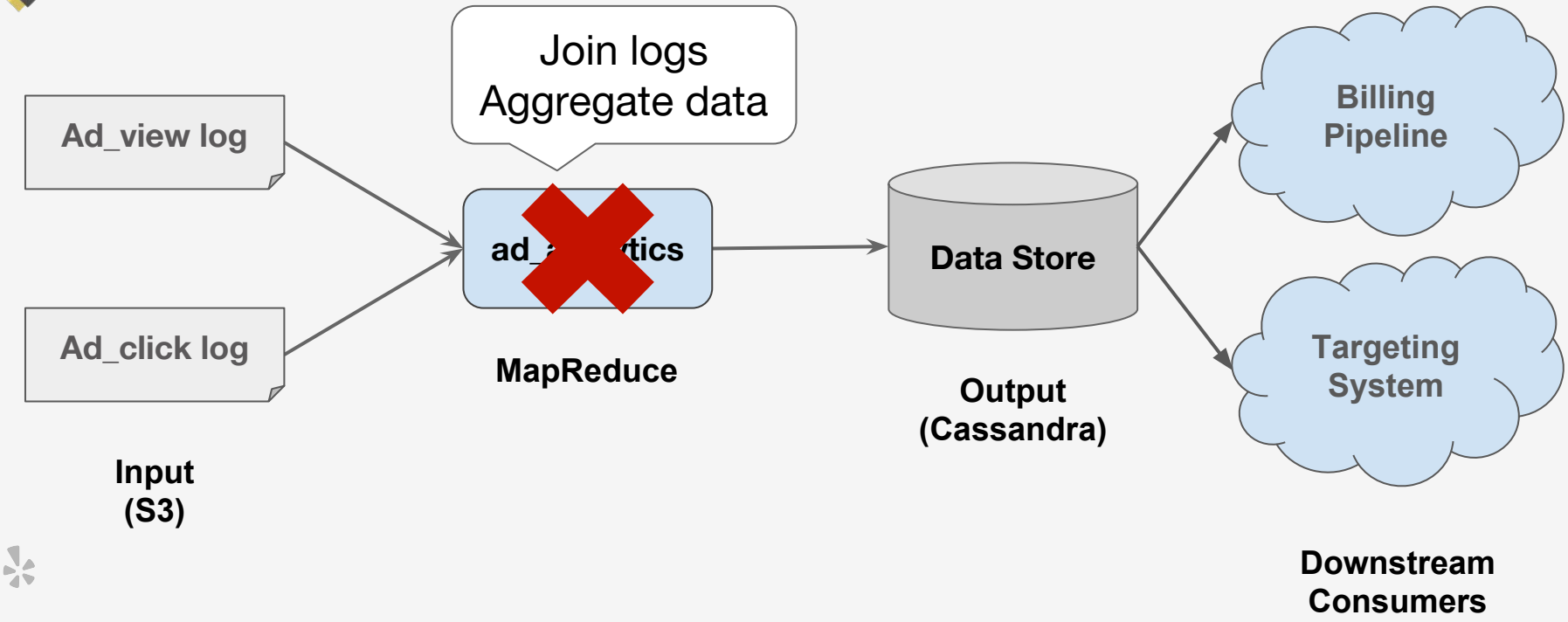
Alert:

Ad Analytics Data Processing Failure

Past Incidents:

- Backward-incompatible input schema change
- MapReduce task timeouts

Example: Ad Analytics Pipeline



Exercise #3

Let’s write the “actual on-call training”

- List alerts/failure modes
- Find at least one past incident for each alert
- Map it in your 10000 ft diagram

3 mins

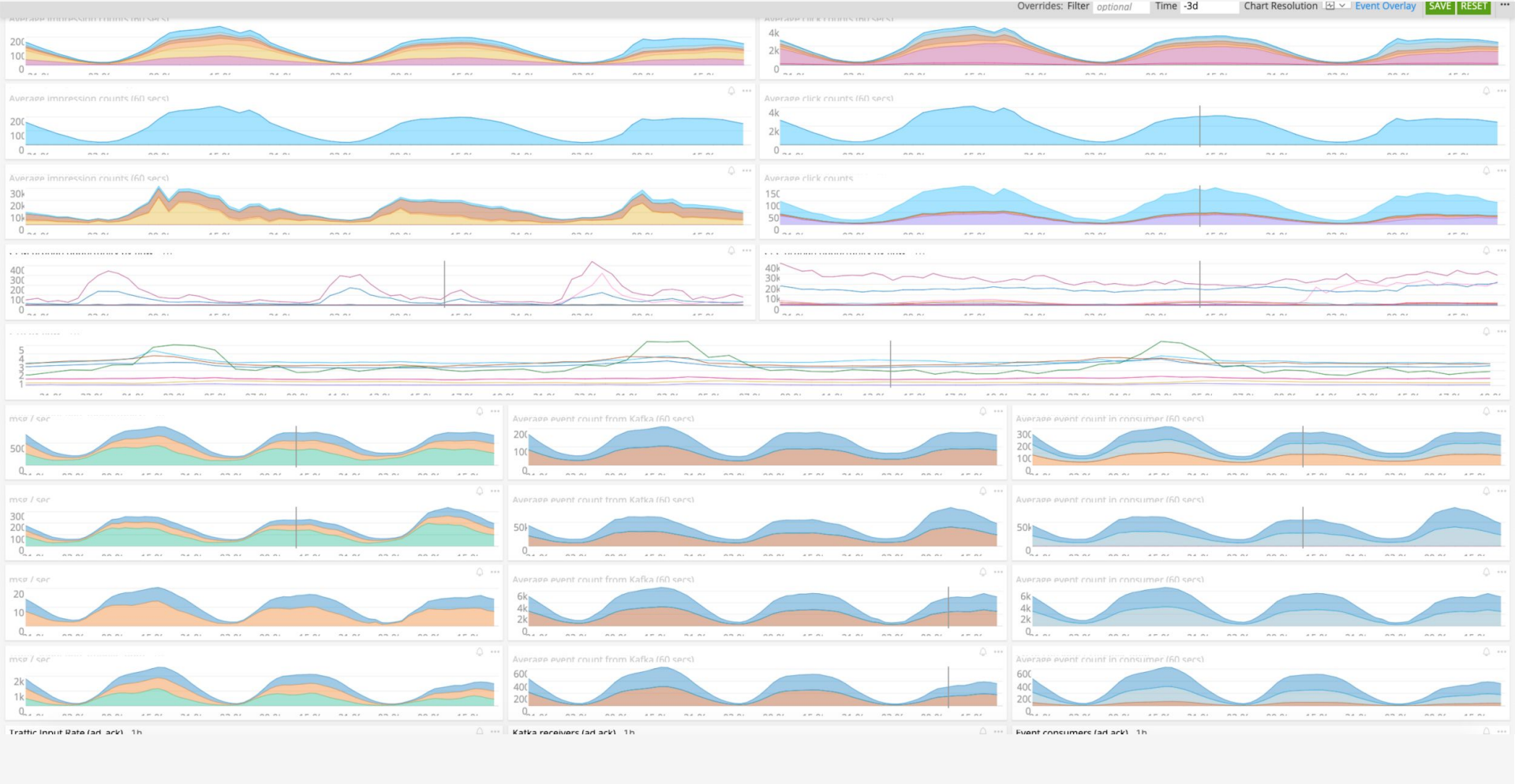
Exercise Agenda

Let’s make an oncall training program!

1. Make a Curriculum
2. Create Introduction
3. Cover Failure Modes
4. List Necessary Tools

Exercise #4

Let’s teach necessary tools and know-hows


Overrides: Filter optional
Time -3d
Chart Resolution
Event Overlay
SAVE
RESET
Average impression counts (60 secs)
Average click counts (60 secs)
Average click counts
msg / sec
Average event count from Kafka (60 secs)
Average event count in consumer (60 secs)
Traffic Input Rate (ad_ack) 1h
Kafka receivers (ad_ack) 1h
Event consumers (ad_ack) 1h

Example

How to read a service SignalFx dashboard

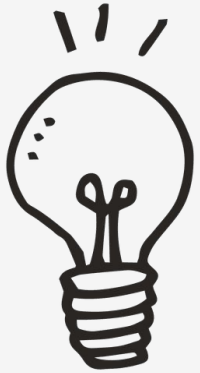
How to find MapReduce job traceback

Example

How to read a service SignalFx dashboard

How to find MapReduce job traceback

(These should ideally be in runbook)



Tip: Let students apply knowledge ASAP

Example

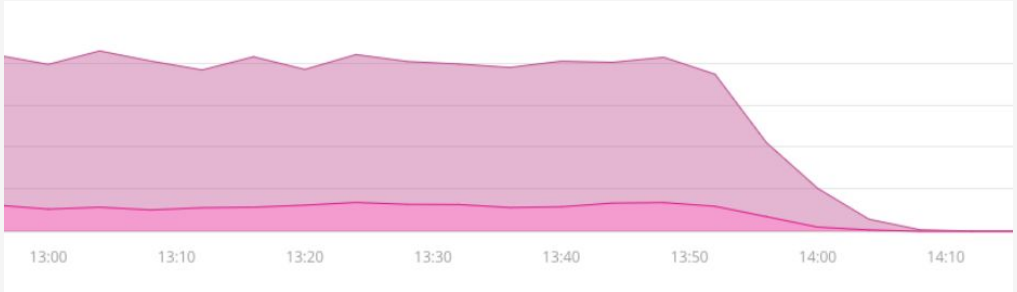
How to read a service SignalFx dashboard

1. Explain
2. Show a dashboard screenshot from a past incident
3. Let students debug + ask questions

Example

How to read a service SignalFx dashboard

1. Explain
2. Show a dashboard screenshot from a past incident
3. Let students debug + ask questions



Example

How to find MapReduce job traceback

1. Explain
2. Give a S3 URL of MapReduce output from past incident
3. Let students debug + ask questions

Exercise #4

Let’s teach necessary tools and know-hows

1. List tools and know-hows
   (Based on your answers from Exercise #3)
2. Make it interactive

3 mins

Congratulations!

You have a (partially complete) oncall training program!

Tips (Recap)

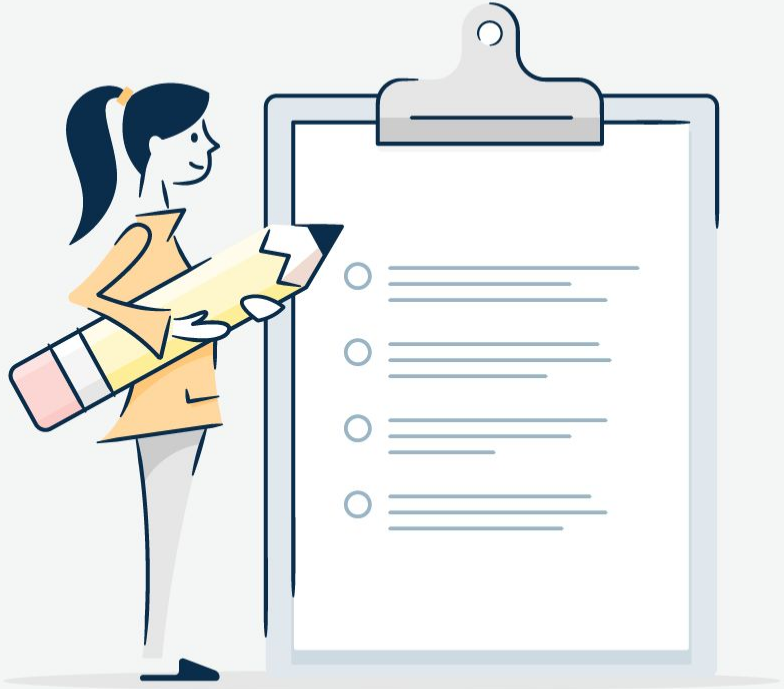
Avoid information overload

Use visual aid you can reuse

Use Past Incidents

Let students apply knowledge ASAP

Beyond Training



Knowledge sharing

Oncall handoff meeting

Show and tell how recent incidents were resolved

Postmortem

Learning from the past incidents

Wargame

Gain experience in a fast and safe way

Wargames

- **Multi-person incident simulation game**
- **Game master**
  - Reproduce the incident
  - Drive conversations
  - Ask questions and give hints
- **Oncall Player(s)**
  - Investigate and mitigate
  - Apply knowledge and practice using tools

3 Steps to start a wargame

Step 1:
Pick a scenario

Examples

Real past incidents

- Seasonal traffic: Black Friday
- Critical System/Database crashed

Imaginary Incidents

- Brainstorm or discuss what could happen and how to handle

Step 2:
Prepare a game

Example

Wargame template

Incident Setup

Interactive

- conduct in safe environment

Static

- dashboards/screenshots/logs/history of code

Example

Wargame template

Incident Setup

Step-by-step instruction of how to trigger incident

- ❏ Prepare bad code <link>
- ❏ Prepare dashboard screenshot
- ❏ Set up an isolated env <config file link>
- ❏ Cmd to run batch in the env
  - ❏ python ./batch.py --config config.yaml
- ❏ Wait for batch to fail

Example

Wargame template

Player roles

- ❏ Investigator --- <name>
- ❏ Communicator --<name>
- ❏ Commander -- <name>

Player checklist

- ❏ Get relevant permissions
- ❏ Join external wifi/set up VPN
- ❏ Use wargame-only communication tools
  - ❏ channel #wargame
  - ❏ email alias wargame
  - ❏ JIRA project WARGAME

Example

Wargame template

Hints

- ❏ Did you read runbook?
- ❏ Did you check batch log?
- ❏ Did you check recent code changes?
- ❏ Did you check dashboard: <screenshot>?

...

Step 3:
Run the game

Tips for running the game

Invite audience

Ask questions

- Ask what makes they take actions
- Make sure player(s) and audience understand the situation

Take notes

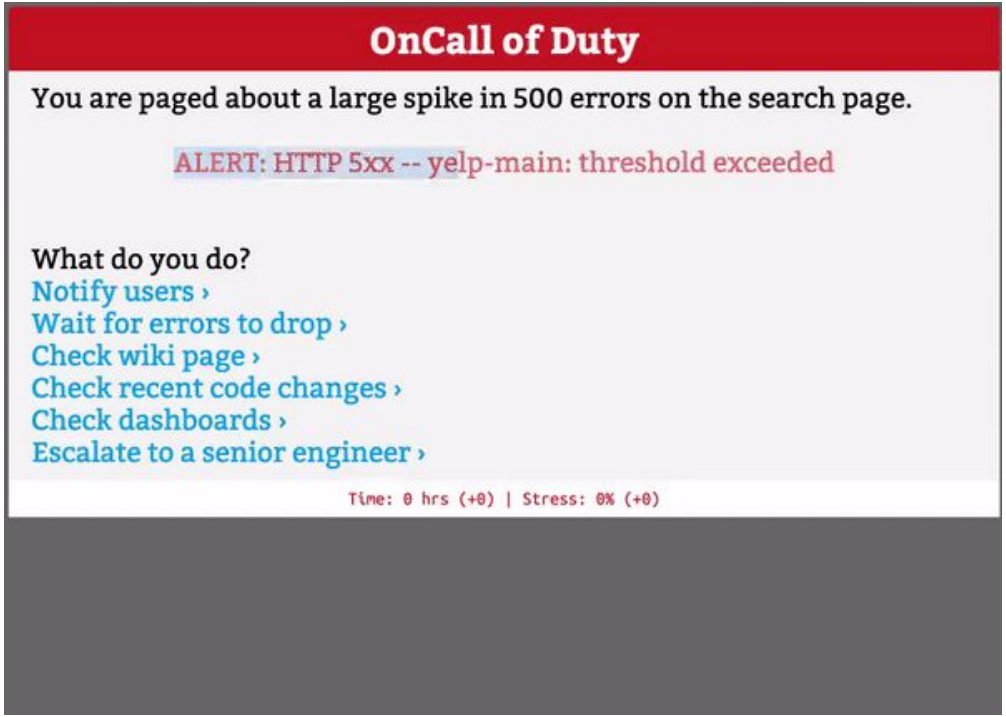
- Runbook/Training/Monitoring/Alerting improvement
- Follow-up learning process

Wargames

http://bit.ly/oncall-game

Use tools to build your game

Oncall simulation text adventure game using **Twine**



Break (5 mins)

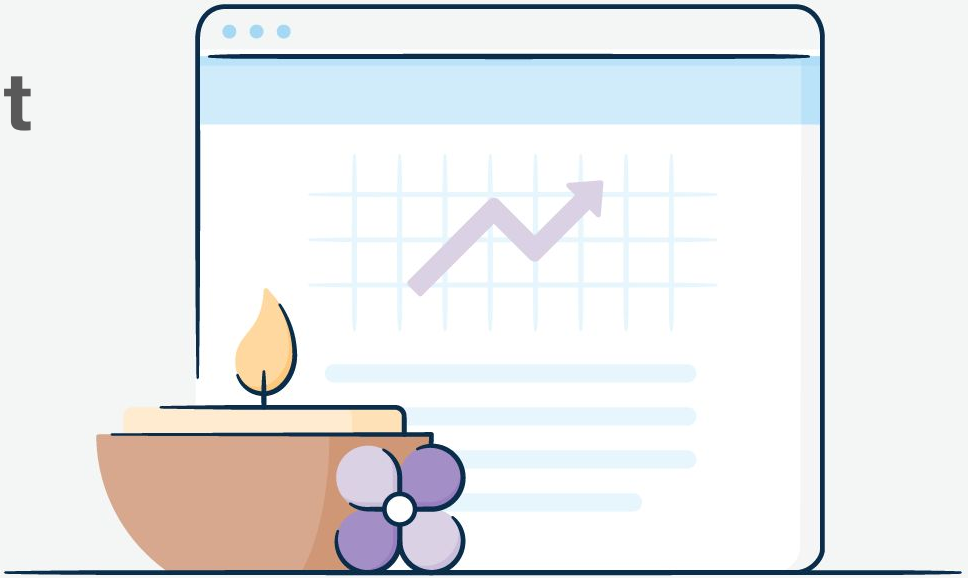
Oncall twine game:

http://bit.ly/oncall-game

Optional Materials:

http://bit.ly/srecon19-oncall

Runbooks for **Effective** Incident Response



Why didn't you feel ready?

40% Didn’t feel ready due to lack of protocol

70% Reviewed the team’s runbooks before going on-call

“Update and improve documentation and runbooks”

“More documentation”

“Better documentation”

“Clear protocol of pages we can get and how to handle them”

“Runbooks should be obvious to find and execute. At 3 AM you need dummy-proof instructions.”

Survey within Yelp Engineering (2018)

Why care about good runbooks?

Win 1: Increase efficiency

Win 2: Reduce nervousness

Win 3: Stand-in for a mentor or back-up

What is a runbook?

Technical runbook

Step-by-step instruction on how to act in an incident

- Impact assessment
- Mitigation
- Disaster recovery

Non Technical Runbook

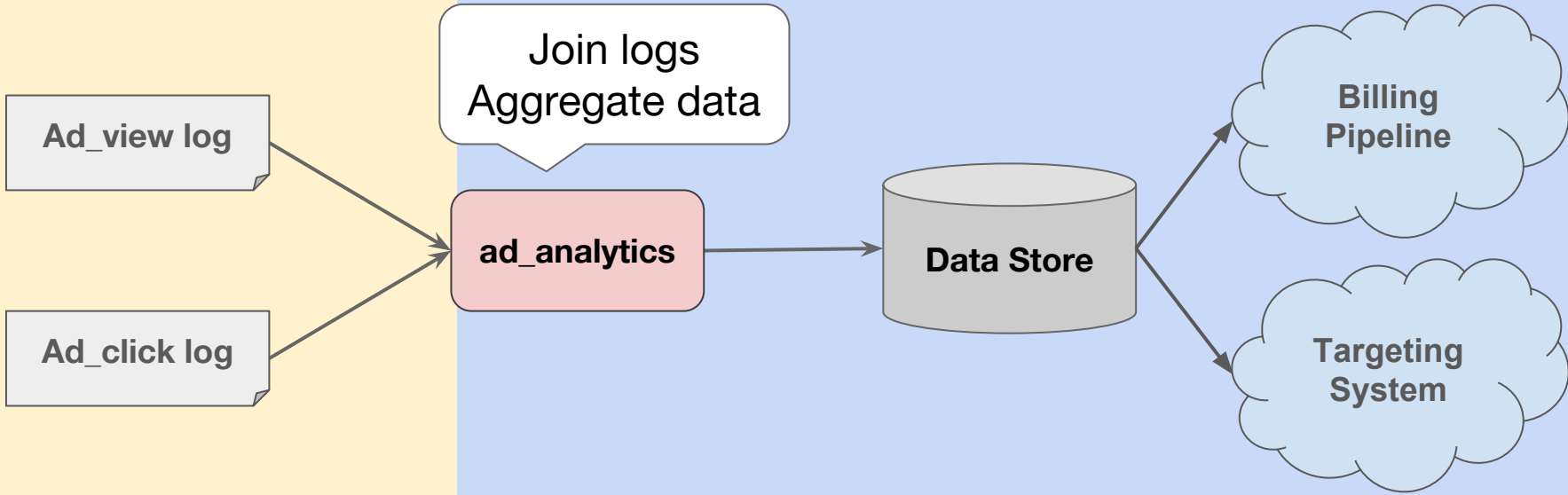
Guidelines for human process

- Human roles
- Communication process
- Escalation policy

Example
Symptoms of bad runbook

http://bit.ly/srecon19-oncall

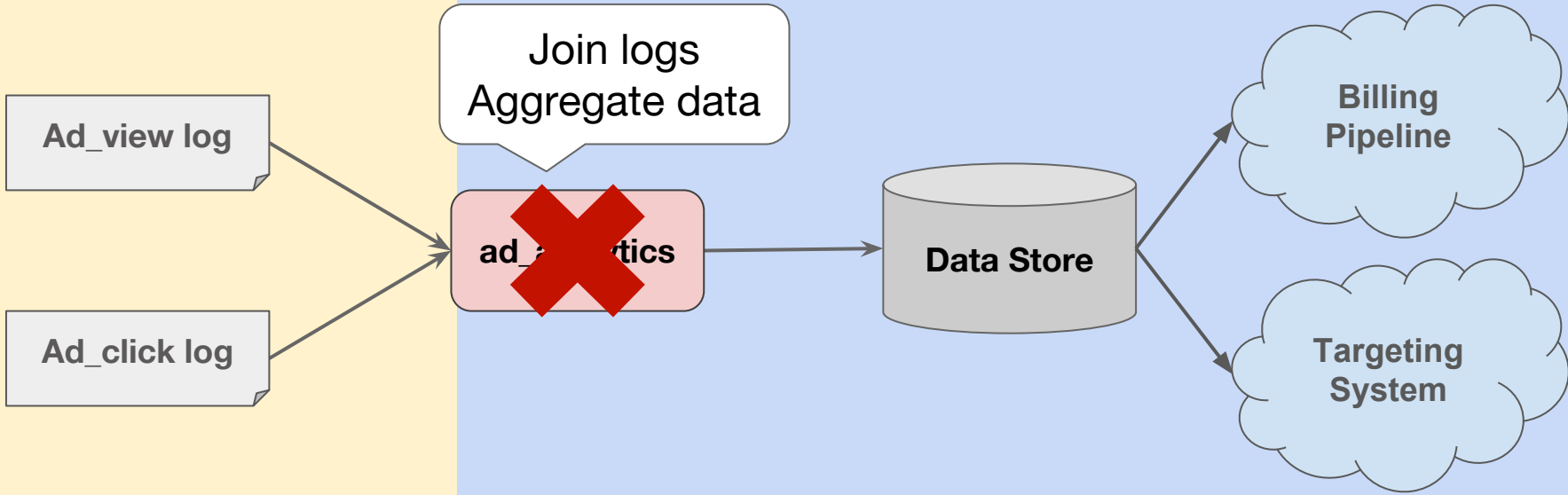
STORY TIME: BATCH RECOVERY



Daytime Web Traffic

Nightly Batch Job

STORY TIME: BATCH RECOVERY



Daytime Web Traffic

Nightly Batch Job

STORY TIME: BATCH RECOVERY

What made this runbook **difficult** to use?

2:00 am
Paged for failed batch job.

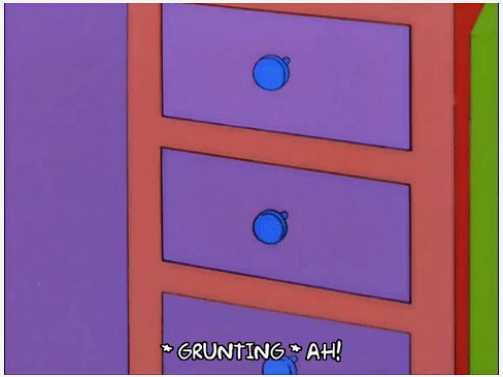
ALERT: ad_analytics failed

2:05 am
How do I rerun? Is it idempotent? Which cmd?

2:10 am
Search internal wiki for batch name.
---
1 result found
[Ads] Runbooks - Operations

RUNBOOK EXAMPLES

What made this runbook **difficult** to use?



Runbooks - Operations

- General recovering tips
  - Campaigns not in ad_store
  - Errors in ad template
- Nagios
  - Background
  - Updating Alerts
  - Alerts
- ad_analytics
  - Man tronview and man tronctl to understand how to use tron
  - 1.Identify which run failed
  - 2.Identify which action failed
  - 3.fix/retry broken actions
  - Specific Batches
    - calculated_ad_analytics
    - clculate_ad_spend
    - Business_ad_control
- Reports
- Rerunning procedures
  - Identify which days need to be rerun
  - Identify which batches need to be rerun
- Gearman
  - View the logging output of the gearman workers
  - View the number of gearman workers and the number of jobs in the queue
  - Adding the removing gearman workers for particular queues
  - Cleaning out a queue

What made this runbook **difficult** to use?

Alerts

TODO: This section would benefit a lot from having our actual alerts listed and detailed here.

What made this runbook difficult to use?

Runbooks - Operations

- General recovering tips
  - Campaigns not in ad_store
  - Errors in ad template
- Nagios
  - Background
  - Updating Alerts
  - Alerts
- ad_analytics
  - Man tronview and man tronctl to understand how to use tron
  - 1.Identify which run failed
  - 2.Identify which action failed
  - 3.fix/retry broken actions
  - Specific Batches
    - calculated_ad_analytics
    - clculate_ad_spend
    - Business_ad_control
- Reports
- Rerunning procedures
  - Identify which days need to be rerun
  - Identify which batches need to be rerun
- Gearman
  - View the logging output of the gearman workers
  - View the number of gearman workers and the number of jobs in the queue
  - Adding the removing gearman workers for particular queues
  - Cleaning out a queue

What made this runbook difficult to use?

3. Fix/retry broken actions

If a batch died due to an EMR, DB, or other intermittent issue, attempt to run the action manually

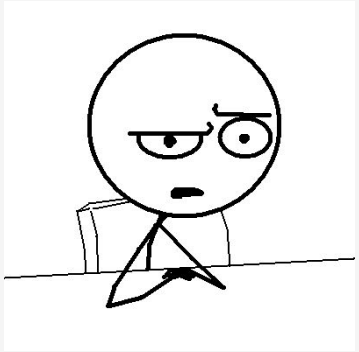
If a batch died due to a logic error, push a fix and run the action manually

To run manually, read the command line printed in this output. It's between the "!Node:" and "Requirements:" lines. You'll have to execute this as batch yourself.

```
$ tronview ad_analytics.XX.the_action_name
```

Once they run successfully manually, resume the rest of the job by skipping the action. **`tronctl skip ad_analytics.XX.the_action_name`**

What made this runbook difficult to use?



3. Fix/retry broken actions

If a batch died due to an EMR, DB, or other intermittent issue, attempt to run the action manually

If a batch died due to a logic error, push a fix and run the action manually

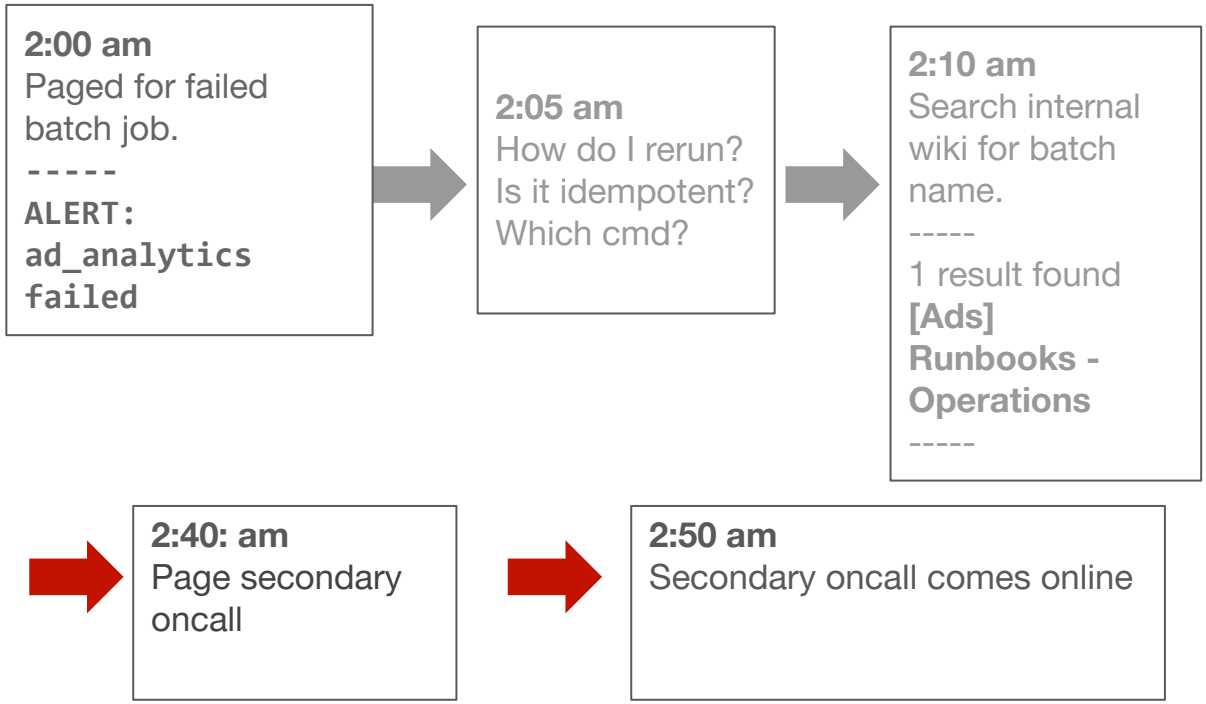
To run manually, read the command line printed in this output. It's between the "!Node:" and "Requirements:" lines. You'll have to execute this as batch yourself.

```
$ tronview ad_analytics.XX.the_action_name
```

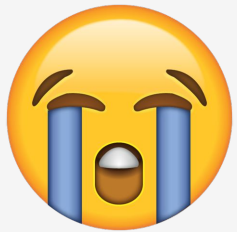
Once they run successfully manually, resume the rest of the job by skipping the action. **`tronctl skip ad_analytics.XX.the_action_name`**

STORY TIME: BATCH RECOVERY

What made this runbook difficult to use?

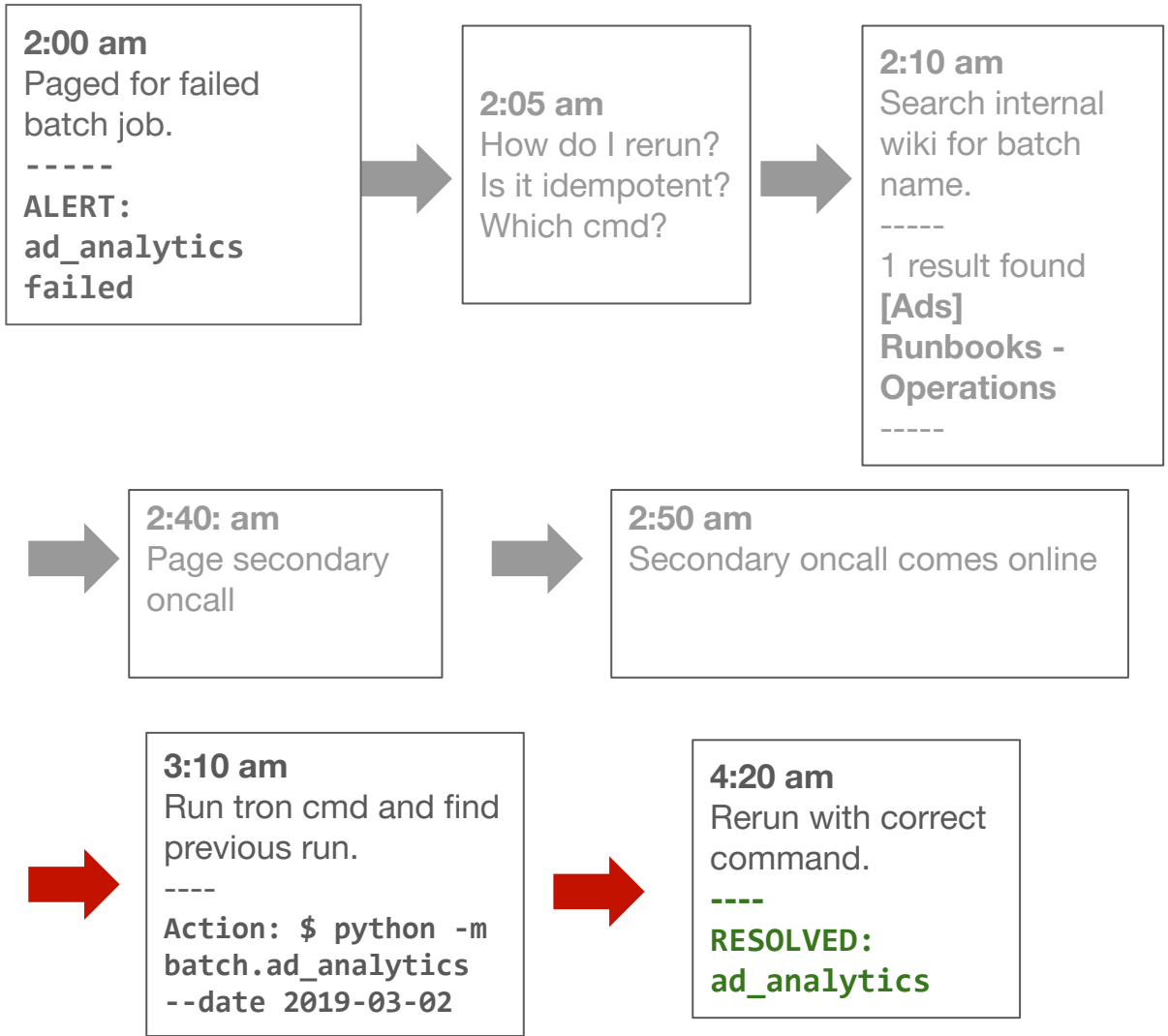


“You can try looking for that in the wiki, or maybe it’s in the Google Docs repo. Oh, and I’ve got some notes in my home directory, and I think I saw some emails about that a while ago”



STORY TIME: BATCH RECOVERY

What made this runbook difficult to use?



STORY TIME: BATCH RECOVERY

What made this runbook difficult to use?

- Information overload
- No clear action items
- Ambiguous wording
- Out of date
- Hard to find/search

What makes a good Technical runbook?

Tips for writing good technical runbooks

- Inverted pyramid
- Map alert to clear action items
- Include actual commands/screenshots
- Keep it up-to-date
- Keep format consistent

Alert Name	<exact alert name>
Description	<1 sentence description>
Stakeholder impact	<1 sentence impact>
Mitigation steps	1. Try restarting: <command> 2. Monitor dashboards. 3. Inspect logs to diagnose issue: <link or See steps below> If things do not recover, follow Escalation steps.
Escalation steps	Contact <team>. Massive ingestion delays should be communicated to <upstream and downstream teams>.
Related services	<upstream and downstream dependencies>
Dashboards	<links>
Related links	<other docs or related runbooks>

http://bit.ly/srecon19-oncall

Exercise

Let’s make your own runbook!

1. List all alerts
2. Customize the template
3. Pick a home for runbooks

Step 1:
List all alerts

2 mins

Step 2:
Customize the template

Tips for writing good technical runbooks

- Inverted pyramid
- Map alert to clear action items
- Include actual commands/screenshots
- Keep it up-to-date
- Keep format consistent

http://bit.ly/srecon19-oncall

Alert Name	<exact alert name>
Description	<1 sentence description>
Stakeholder impact	<1 sentence impact>
Mitigation steps	1. Try restarting: <command> 2. Monitor dashboards. 3. Inspect logs to diagnose issue: <link or See steps below> If things do not recover, follow Escalation steps.
Escalation steps	Contact <team>. Massive ingestion delays should be communicated to <upstream and downstream teams>.
Related services	<upstream and downstream dependencies>
Dashboards	<links>
Related links	<other docs or related runbooks>

http://bit.ly/srecon19-oncall

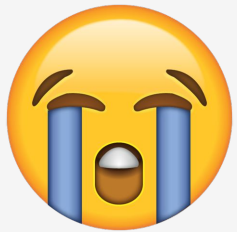
2 mins

Alert Name	<exact alert name>
Description	<1 sentence description>
Stakeholder impact	<1 sentence impact>
Mitigation steps	1. Try restarting: <command> 2. Monitor dashboards. 3. Inspect logs to diagnose issue: <link or See steps below> If things do not recover, follow Escalation steps.
Escalation steps	Contact <team>. Massive ingestion delays should be communicated to <upstream and downstream teams>.
Related services	<upstream and downstream dependencies>
Dashboards	<links>
Related links	<other docs or related runbooks>

Step 3:
Pick a home for runbooks

1 mins

“You can try looking for that in the wiki, or maybe it’s in the Google Docs repo. Oh, and I’ve got some notes in my home directory, and I think I saw some emails about that a while ago”



A good runbook is easy to find

1 mins

Make alerts rich

Put actual commands and/or runbook link in the alert

Centralized “home”

Make runbooks searchable

Example
Non-Technical Runbook

Non-technical runbook

http://bit.ly/oncall-srecon19

Incident Response Checklist

This document is for Ads incident first responders. First assess, escalate until the appropriate team is established, and take on the appropriate role.

Assess

Escalate

Communicate

Investigate and Fix

Clean Up

Non-technical
runbook

Incident Response Checklist

Assess

For example: errors served, % clients impacted, or financial loss to the business.

If it takes more than a few minutes to assess, assume it is very bad and move on to escalation.

- ❑ What is the business-facing impact?
- ❑ What is the consumer-facing impact?

Dashboards to consult:

- ❑ SignalFx - error percentages, latencies
- ❑ Splunk - log lines

Non-technical
runbook

Incident Response Checklist

Escalate

Outages run longer and with worse outcomes when tackled alone. It's better to escalate a false alarm than fail to escalate a serious issue.

Page the following as appropriate:

- ❑ Secondary on-call
- ❑ Manager
- ❑ Database Reliability Team (#dba)
- ❑ AWS Support Liaison

Non-technical
runbook

http://bit.ly/oncall-srecon19

Incident Response Checklist

Communicate

- ❏ Create a ticket in the ADS project with a brief description of the issue.
  - ❏ Add secondary and manager as watchers
- ❏ Consolidate triage communications to #ads-incident.
- ❏ Send email to ads-incident@ to liaise with financial stakeholders and downstream consumers of data: email templates.

Non-technical
runbook

Incident Response Checklist

Investigate and Fix

- ❏ Ads Runbooks List

Clean Up

- ❏ Send all-clear email to ads-incident@
- ❏ File follow-up ticket for postmortem and set yourself as the assignee

Productive and Happy On-call

Oncall Training

Debunk myths

Avoid information overload

Use Visual Aid

Focus on tools

Beyond training

Knowledge share

Wargames

Effective Runbooks

Continuous Improvement

Training materials

http://bit.ly/srecon19-oncall

Additional Resources

Training new on-calls

- Accelerating SREs to On-Call and Beyond
- From Zero to Hero: Recommended Practices for Training your Ever-Evolving SRE Teams

Runbooks

- 7 Deadly Sins of Documentation
- Do Docs Better: Practical Tips

Postmortems/wargames

- Postmortem culture: learning from failure
- The oncall simulator: Building an interactive game for teaching incident response!

Thank you!

Optional Materials:

http://bit.ly/srecon19-oncall