No payment left behind!

Alex Henderson - Pushpay

I work for Pushpay as a Principal Engineer.

Pushpay is a technology company based out of Seattle & Auckland, New Zealand.

We have around 350 staff and serve over 7,000 churches.

We are a SaaS company working in the generosity sector primarily with Churches to provide easy-to-use software to help them grow their ministry.

In the beginning

$1 million USD of payments per year

Multiple gateways, only some via spreedly

Only card payments

Hosted on a single machine

Where are we today?

$3 billion USD per year

Spreedly for all gateway comms

Support Card, ACH, NZ Bank, Checks etc.

Scale to 30-40 nodes

We are a little different

Thousands of merchant facilities

Operate a registered ISO (independent sales org)

Generosity is a little different

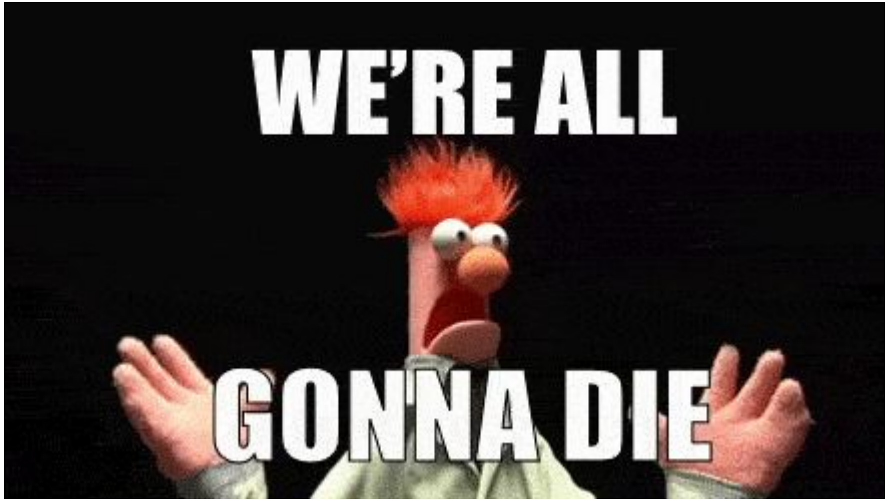
We primarily process gifts (tithes & donations)

Payments are combination of one time and recurring payment

There is a strong up-tick in US sunday period

Trust is the currency of a community

Gateway down!



But wait… do we even know we are down?

Post-mortems

Process to inform improvements

Learnings

Mitigations

Connectivity

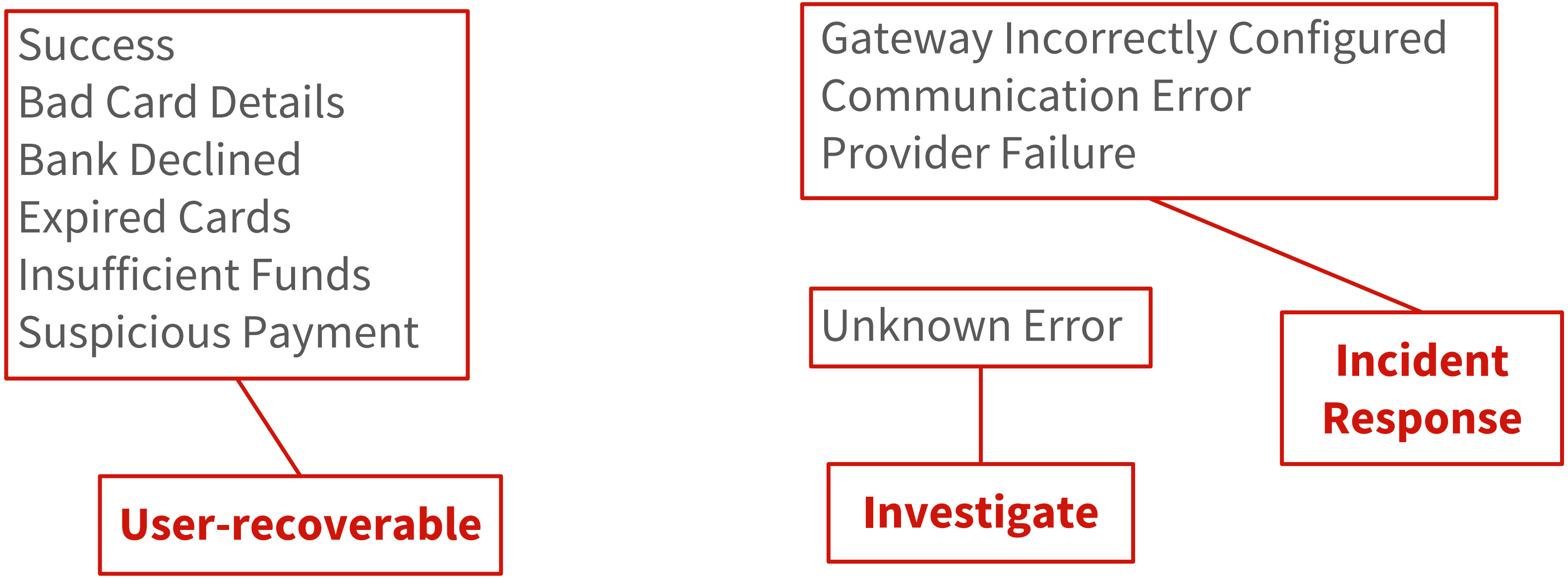
Classifying Responses

Success
Bad Card Details
Bank Declined
Expired Cards
Insufficient Funds
Suspicious Payment

Gateway Incorrectly Configured
Communication Error
Provider Failure

Unknown Error

Classifying Responses



Success
Bad Card Details
Bank Declined
Expired Cards
Insufficient Funds
Suspicious Payment

User-recoverable

Gateway Incorrectly Configured
Communication Error
Provider Failure

Incident Response

Unknown Error

Investigate

Classifying responses

Gateways return structured responses

Errors and codes are a leaky abstraction

Just parse the response as text!

Classifying responses

```
TranslationRule.Make("An upstream error occurred",
    ResponseCode.DeclineForCommsError,
    SpreedlyUnderlyingGateway.Pin)
```

Classifying responses

Ordering of rules is important

Evaluate most specific first

- Length of text to find
- Specificity of rule (specific gateway, card brand etc.)

If no rule matched - It’s an Unknown Error

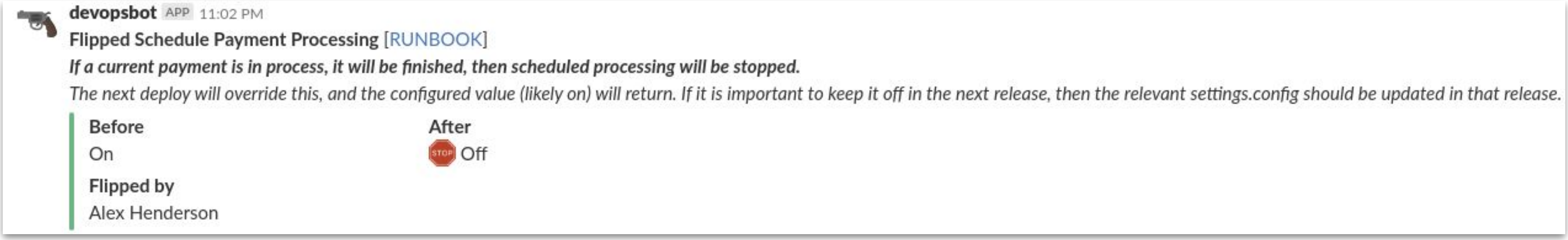
Scheduled payments

Ensure you can stop processing schedules - low hanging fruit

Start with a manual command… but

- Do you know who executed the command?
- How do you know its off?
- How do you remember to turn it back on?

Engine off...



devopsbot APP 11:02 PM

Flipped Schedule Payment Processing [RUNBOOK]

If a current payment is in process, it will be finished, then scheduled processing will be stopped.

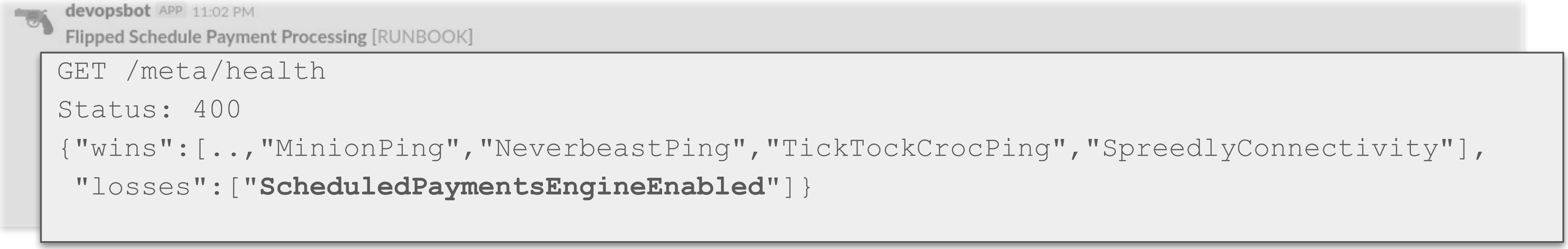
The next deploy will override this, and the configured value (likely on) will return. If it is important to keep it off in the next release, then the relevant settings.config should be updated in that release.

Before
On

After
🛑 Off

Flipped by
Alex Henderson

Engine off...

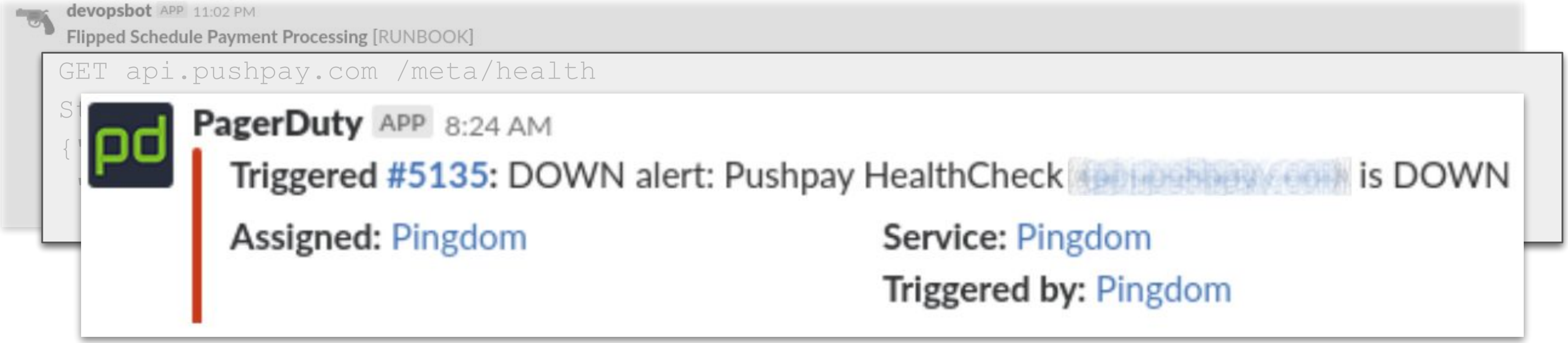


devopsbot APP 11:02 PM

Flipped Schedule Payment Processing [RUNBOOK]

```
GET /meta/health
Status: 400
{"wins":[..,"MinionPing","NeverbeastPing","TickTockCrocPing","SpreedlyConnectivity"],
 "losses":["ScheduledPaymentsEngineEnabled"]}
```

Engine off...



devopsbot APP 11:02 PM

Flipped Schedule Payment Processing [RUNBOOK]

```
GET api.pushpay.com /meta/health
St
{
```

PagerDuty APP 8:24 AM

Triggered #5135: DOWN alert: Pushpay HealthCheck [redacted] is DOWN

Assigned: Pingdom

Service: Pingdom

Triggered by: Pingdom

Triggers

Provider Error

Communications Error

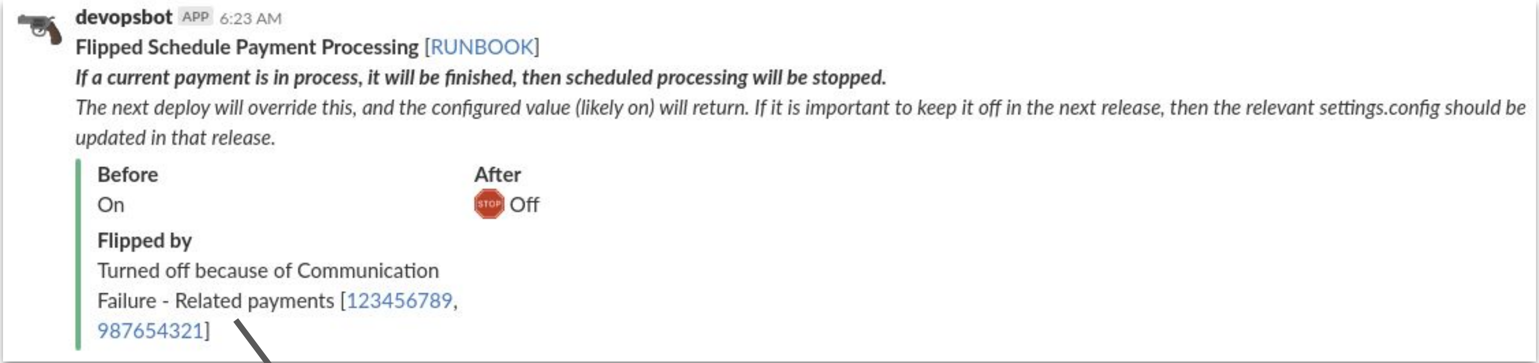
What about Unknown?

- Not if you love your on-call team
- But alert for elevated error rates

Modelling Triggers

```
PaymentFailureReactionRule.Make(
  PaymentFailureReactionType.CommsOrProviderError,
  frequency: 3 ,
  within: TimeSpan.FromMinutes(5),
  dontRepeatWithin: TimeSpan.FromMinutes(10),
  cardMatchingCriteria: (x) => x.Code.In(
    ResponseCode.DeclineForCommsError,
    ResponseCode.DeclineForProviderFailure))
```

Triggers



devopsbot APP 6:23 AM

Flipped Schedule Payment Processing [RUNBOOK]

If a current payment is in process, it will be finished, then scheduled processing will be stopped.

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Before	**After**
On	🛑 Off

Flipped by

Turned off because of Communication Failure - Related payments [123456789, 987654321]

Flipped by

Turned off because of Communication Failure - Related payments [123456789, 987654321]

Delayed Payments

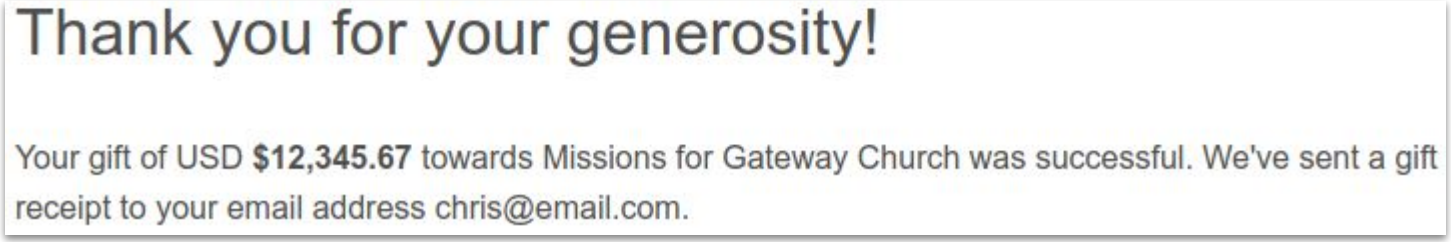
Set a gateway to delayed

Check for delay before processing

Turn off gateway delay

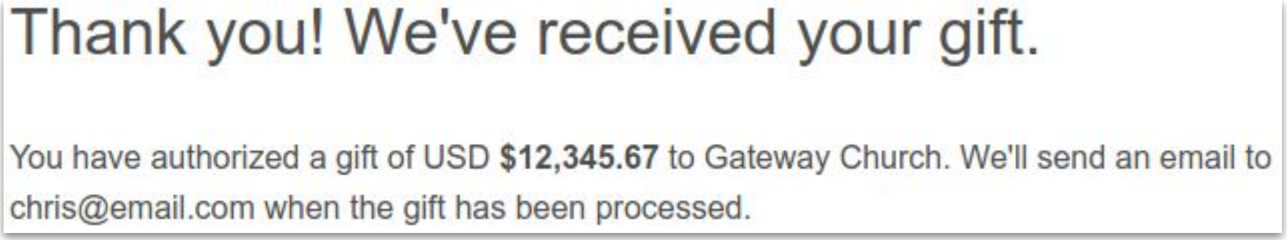
Release delayed payments for processing

Success messages



Thank you for your generosity!

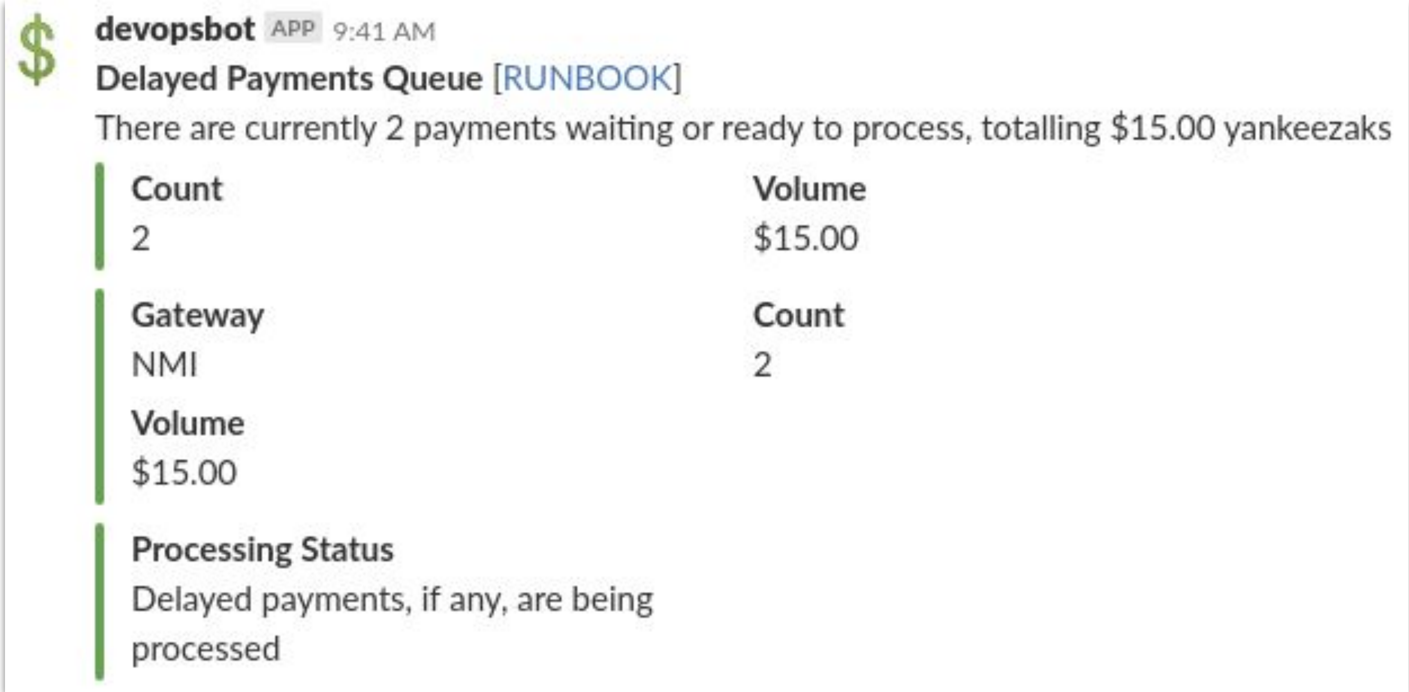
Your gift of USD **$12,345.67** towards Missions for Gateway Church was successful. We've sent a gift receipt to your email address chris@email.com.



Thank you! We've received your gift.

You have authorized a gift of USD **$12,345.67** to Gateway Church. We'll send an email to chris@email.com when the gift has been processed.

Delayed payment management



devopsbot APP 9:41 AM

Delayed Payments Queue [RUNBOOK]

There are currently 2 payments waiting or ready to process, totalling $15.00 yankeezaks

Count
2

Volume
$15.00

Gateway
NMI

Count
2

Volume
$15.00

Processing Status
Delayed payments, if any, are being processed

Processing delayed payments

Test payments

Process after observed period of stability

Released payments in batches - low $ value first

But what if spreedly is down?

All underlying gateways are down

Previously captured payment methods

Alternative payment method types (ACH)

~~Delayed Payments~~… Assured payments!

Name features for duty fulfilled to the customer

Internal engineering features can be marketed

Trust

Wrapping up!

- Payment processing issues are not out of your control
- Establish a process to learn from payment outages
- Manually employ mitigations to learn how to automate them

Alex Henderson

- https://twitter.com/bittercoder
- https://blog.bittercoder.com

Slides at https://blog.bittercoder.com/no-payment-left-behind/