



From 0 to 100M+ Emails Per Day: Scaling Your Email Sending with Amazon SES

Amazon SES, Blue Shell Games, and Amazon.com

November 13, 2013





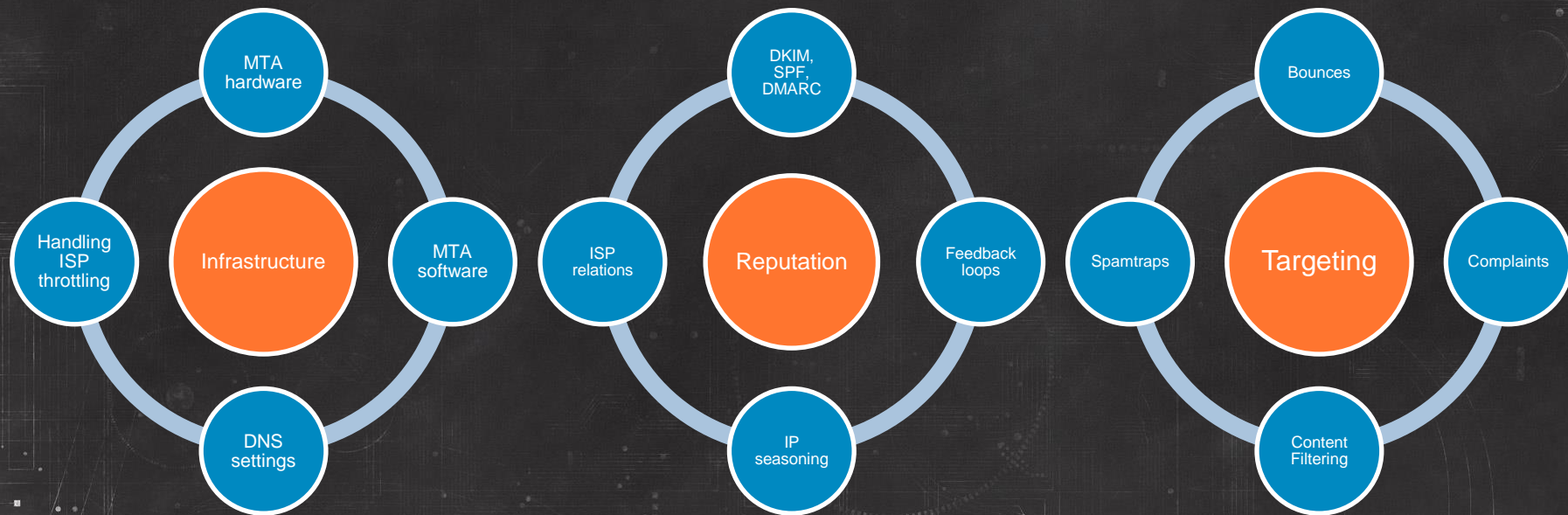
Getting Started with Amazon SES

Abhishek Mishra, Software Development Manager, Amazon SES

November 13, 2013



Why is sending email hard?





Getting Started with Amazon Simple Email Service

Getting Started (1/4)

- Verify an email Address...
- ...or verify a domain

Verify a New Email Address

To verify a new email address, enter it below and click the **Verify This Email Address** button. A verification email will be sent to the email address you entered.

Email Address:

[Cancel](#) [Verify This Email Address](#)

Verify a New Domain

To verify a new domain, enter the domain name below and choose whether you'd like to generate DKIM settings. Once done, click the **Verify This Domain** button.

Domain:

DomainKeys Identified Mail (DKIM) provides proof that the email you send originates from your domain and is authentic. DKIM signatures are stored in your domain's DNS system. You can generate DNS records for DKIM now, or do it later by going to the DKIM tab for this domain. [Learn more about DKIM.](#)

☐ **Generate DKIM Settings**

[Cancel](#) [Verify This Domain](#)

Getting Started (2/4)

- Send a test email through the Amazon SES console

Send Test Email

✕

Complete the details below to send a test email to the selected email address. [More options...](#)

Email Format: ☒ Formatted ☐ Raw

From* user@example.com

To*:

Subject*:

Body:

* Required

[Cancel](#) [Send Test Email](#)

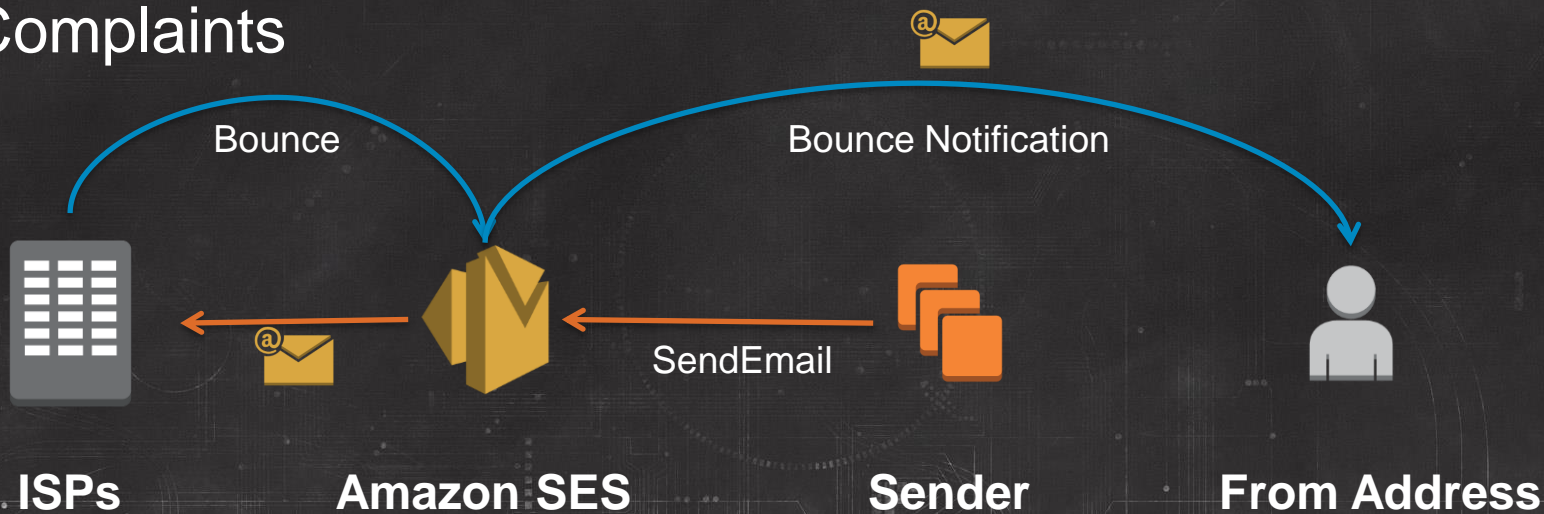
Getting Started (3/4)

- Integrate your application with Amazon SES
 - Point existing mail server (MTAs) to the Amazon SES SMTP endpoint
 - Or use the Amazon SES Query interface (HTTPS)



Getting Started (4/4)

- Expect feedback notifications over email
 - Bounces
 - Complaints



Scaling with Amazon SES

The Fundamentals of Scaling Up

- Set up email authentication



DomainKeys Identified Mail (DKIM)

- Proves to recipient that sender of email is allowed to send from that domain
- Proves to recipient that email contents have not been tampered with during transit
- Helps ISPs associate email reputation with your domain
- Check out our blog series!

DKIM with Amazon SES (1/2)

- Set up DKIM for your domain with EasyDKIM

▼ DKIM

DKIM settings for your domain have been generated. The information below must be added to your domain's DNS records. How you update the DNS settings depends on who provides your DNS service; if your DNS service is provided by a domain name registrar, please contact that registrar to update your DNS records. [Learn more](#)

DKIM: waiting on sender verification...

DKIM Verification Status: pending verification

To enable DKIM signing for your domain, the records below must be entered in your DNS settings. AWS will automatically detect the presence of these records, and allow DKIM signing at that time. Note that verification of these settings may take up to 72 hours.

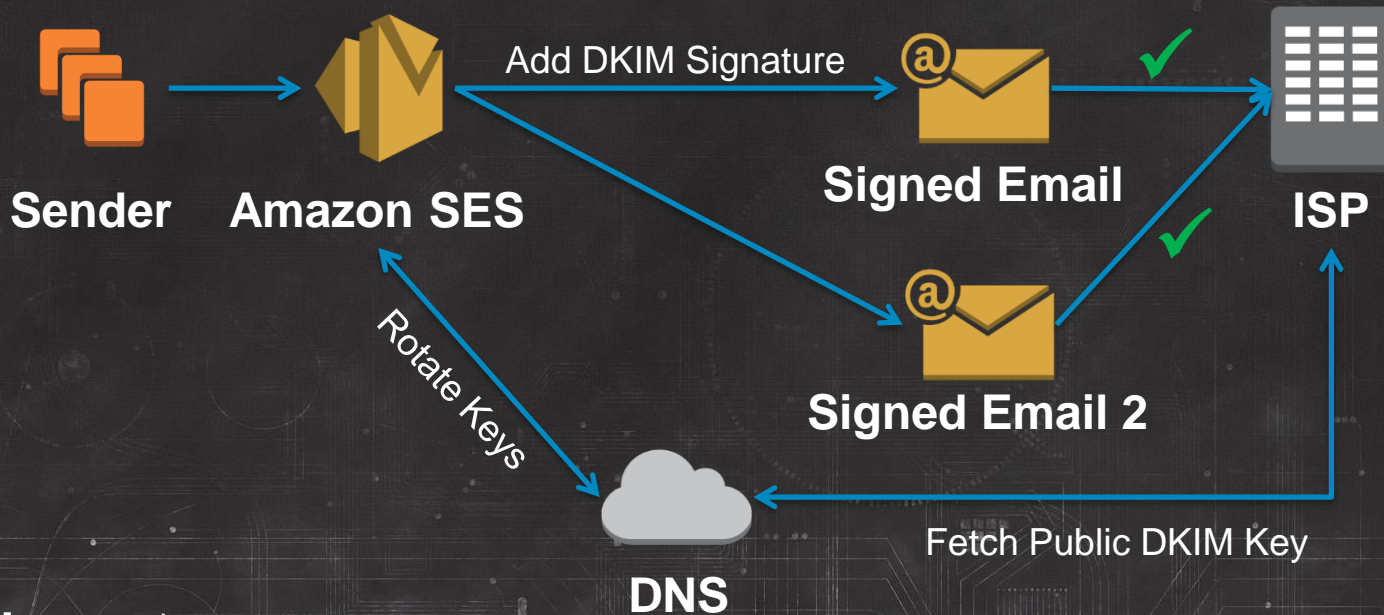
Name	Type	Value
53l9inx7oo3tqn4a54uu4chkleakifdb._domainkey.example.com	CNAME	53l9inx7oo3tqn4a54uu4chkleakifdb.dkim.amazonses.com
bo6tnfcvdsxkxc4sltn2dxvob7ao66qf._domainkey.example.com	CNAME	bo6tnfcvdsxkxc4sltn2dxvob7ao66qf.dkim.amazonses.com
5v7v5vqhyak4nznsfambdlqwr3d5pp._domainkey.example.com	CNAME	5v7v5vqhyak4nznsfambdlqwr3d5pp.dkim.amazonses.com

[Download Record Set as CSV >>](#)

- Amazon SES integrates with Amazon Route 53

DKIM with Amazon SES (2/2)

- Automatic key rotation



Sender Policy Framework (SPF)

- Authenticates sending mail server IPs
 - Are these IP addresses allowed to send on behalf of the sending identity (domain)?
- See Amazon SES documentation for DNS record to publish

The Fundamentals of Scaling Up

- Set up email authentication ✓
 - Set up a reliable feedback processing system
- 

Set Up Feedback Processing over Amazon SNS

- Bounces and complaints
 - Treat as opt-outs
- Email or Amazon SNS notifications
- Test with the mailbox simulator
 - Success, bounce, complaint, OOTO, etc.

Edit Notification Configuration

Select how you would like to receive bounce and complaint notifications below. Note: we require you to receive bounce and complaint notifications via either Amazon SNS or email feedback forwarding. Additionally, changes made on this page may take a few minutes to take effect.

Using Amazon SES
If you would like to receive feedback using Amazon SNS, please select from a list of your existing topics or create a new topic. You can use the same topic for both bounce and complaint notifications. Amazon SNS charges apply; see [pricing information](#) for details.

[Click here to create a new Amazon SNS topic.](#)

SNS Configuration

Bounces: ExampleTopic

Complaints: ExampleTopic

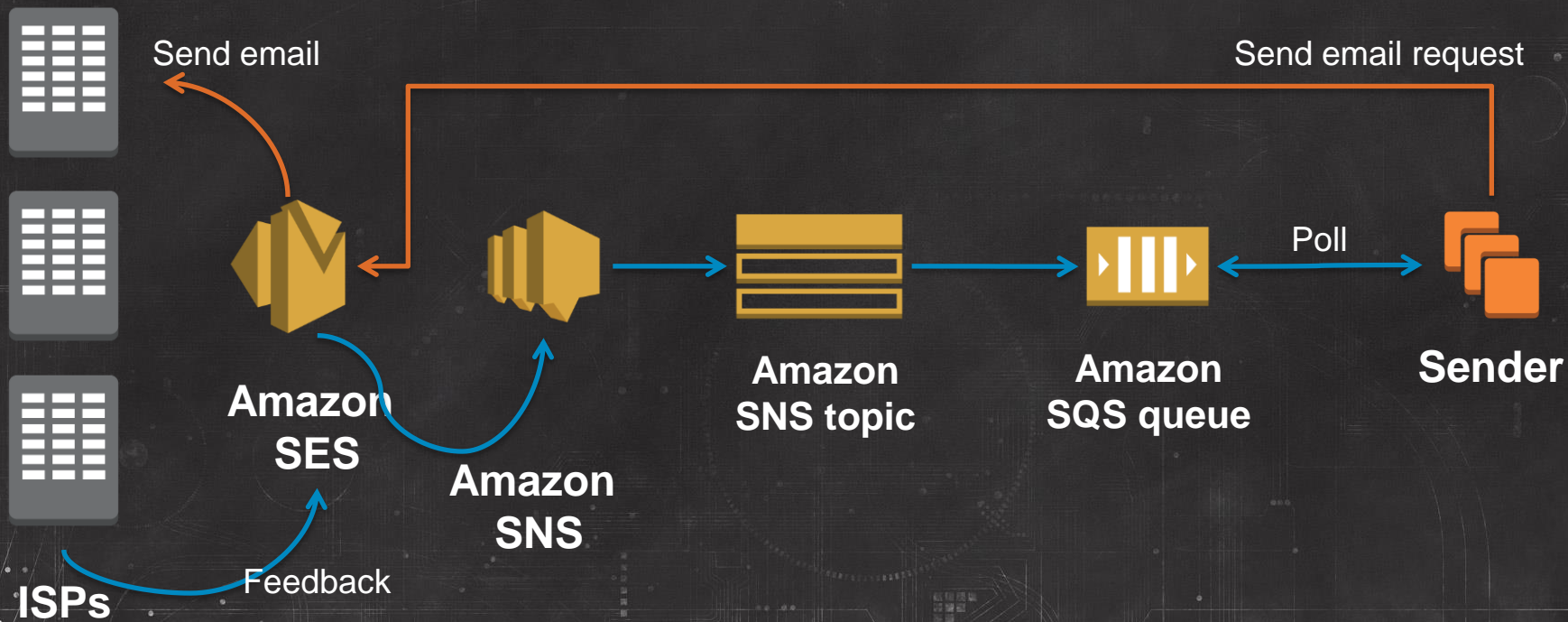
Email Feedback Forwarding

Receiving feedback via email can only be disabled if you have selected Amazon SNS topics for both bounce and complaint notifications.

☒ Enabled ☐ Disabled

[Cancel](#) [Save Config](#)

More on Feedback Processing



The Fundamentals of Scaling Up

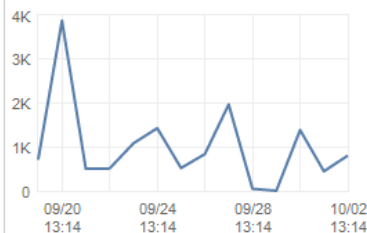
- Set up email authentication ✓
 - Set up a reliable feedback processing system ✓
 - Plan ahead for sending limit increases
- 

Monitor Your Sending

- Deliveries, bounces, complaints, and rejected emails
- Console or API

▼ Your Amazon SES Metrics

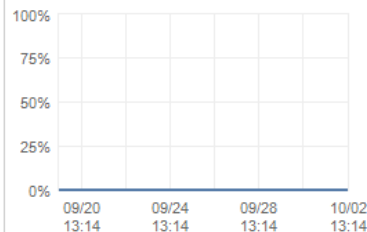
Deliveries (number)



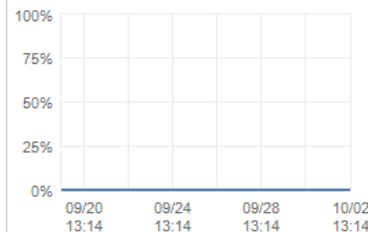
Bounces (percent)



Complaints (percent)



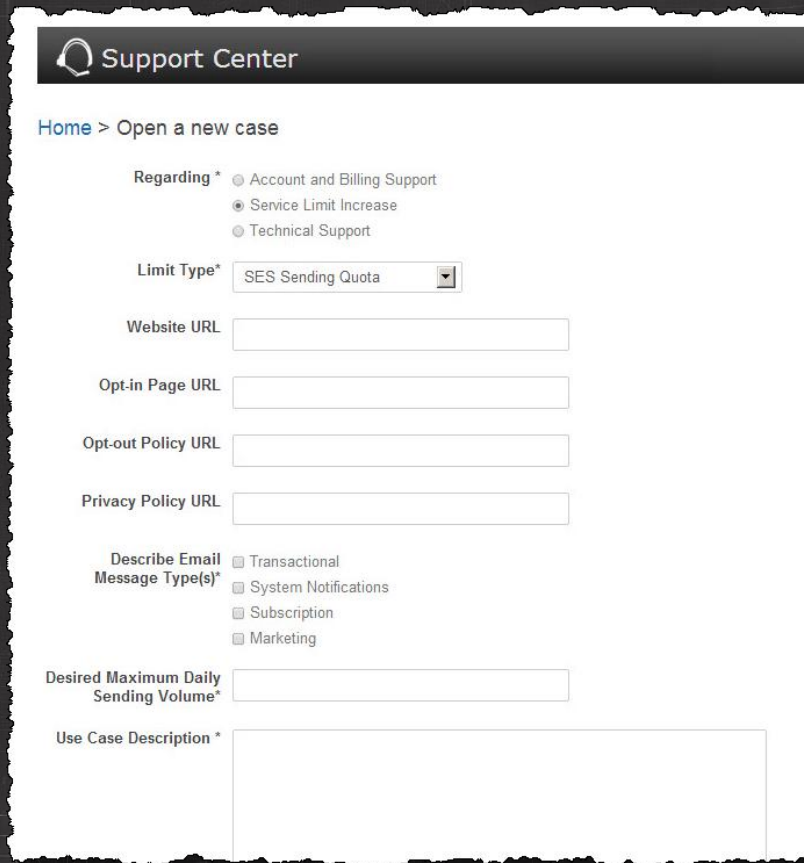
Rejects (percent)



* Charts show previous 2 weeks with 24 hour aggregation

Starting to Scale

- Know your sending limits
 - Daily sending quota
 - Maximum send rate
- Open a sending quota increase case in support center well in advance



The screenshot shows the AWS Support Center interface for opening a new case. The header is 'Support Center'. The breadcrumb trail is 'Home > Open a new case'. The 'Regarding' section has three radio buttons: 'Account and Billing Support', 'Service Limit Increase' (which is selected), and 'Technical Support'. The 'Limit Type' dropdown is set to 'SES Sending Quota'. There are four text input fields: 'Website URL', 'Opt-in Page URL', 'Opt-out Policy URL', and 'Privacy Policy URL'. The 'Describe Email Message Type(s)*' section has four checkboxes: 'Transactional', 'System Notifications', 'Subscription', and 'Marketing'. The 'Desired Maximum Daily Sending Volume*' is a text input field. The 'Use Case Description*' is a large text area.

Support Center

Home > Open a new case

Regarding * ☐ Account and Billing Support ☒ Service Limit Increase ☐ Technical Support

Limit Type* SES Sending Quota

Website URL

Opt-in Page URL

Opt-out Policy URL

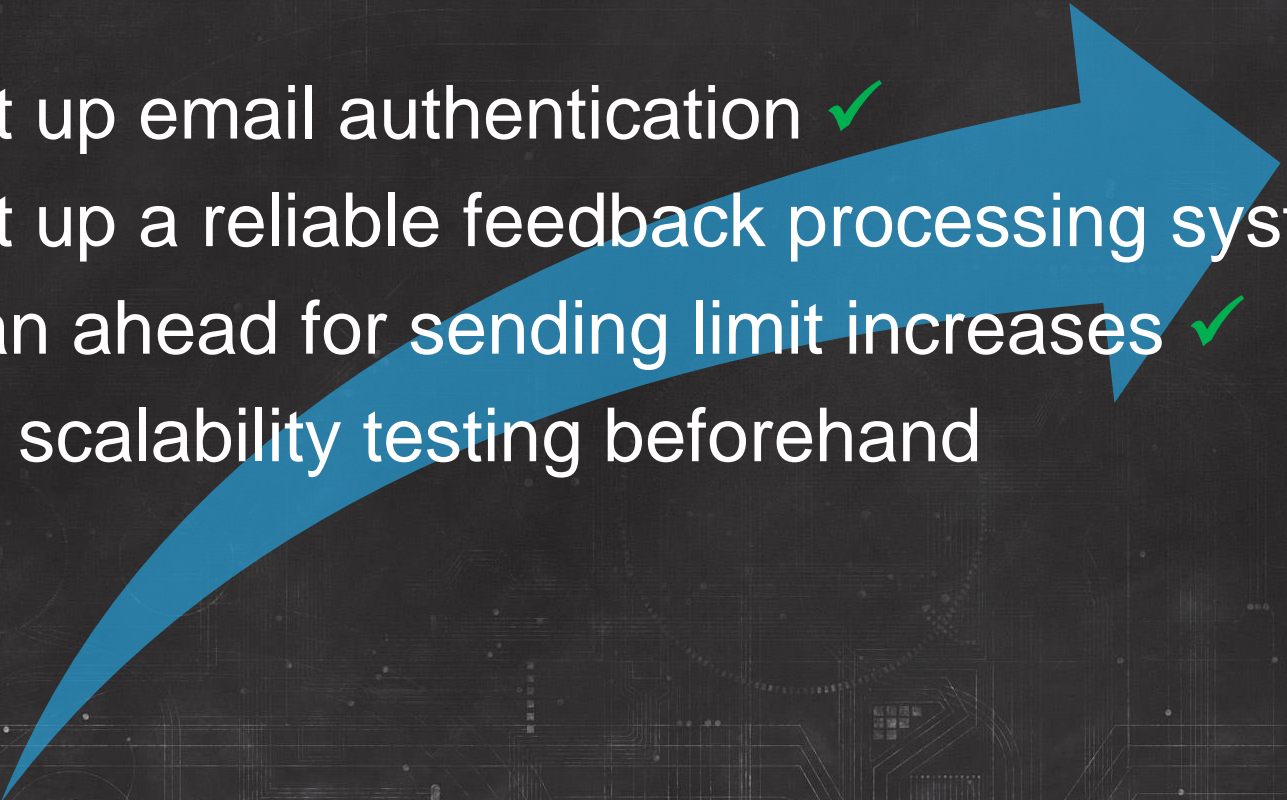
Privacy Policy URL

Describe Email Message Type(s)* ☐ Transactional ☐ System Notifications ☐ Subscription ☐ Marketing

Desired Maximum Daily Sending Volume*

Use Case Description *

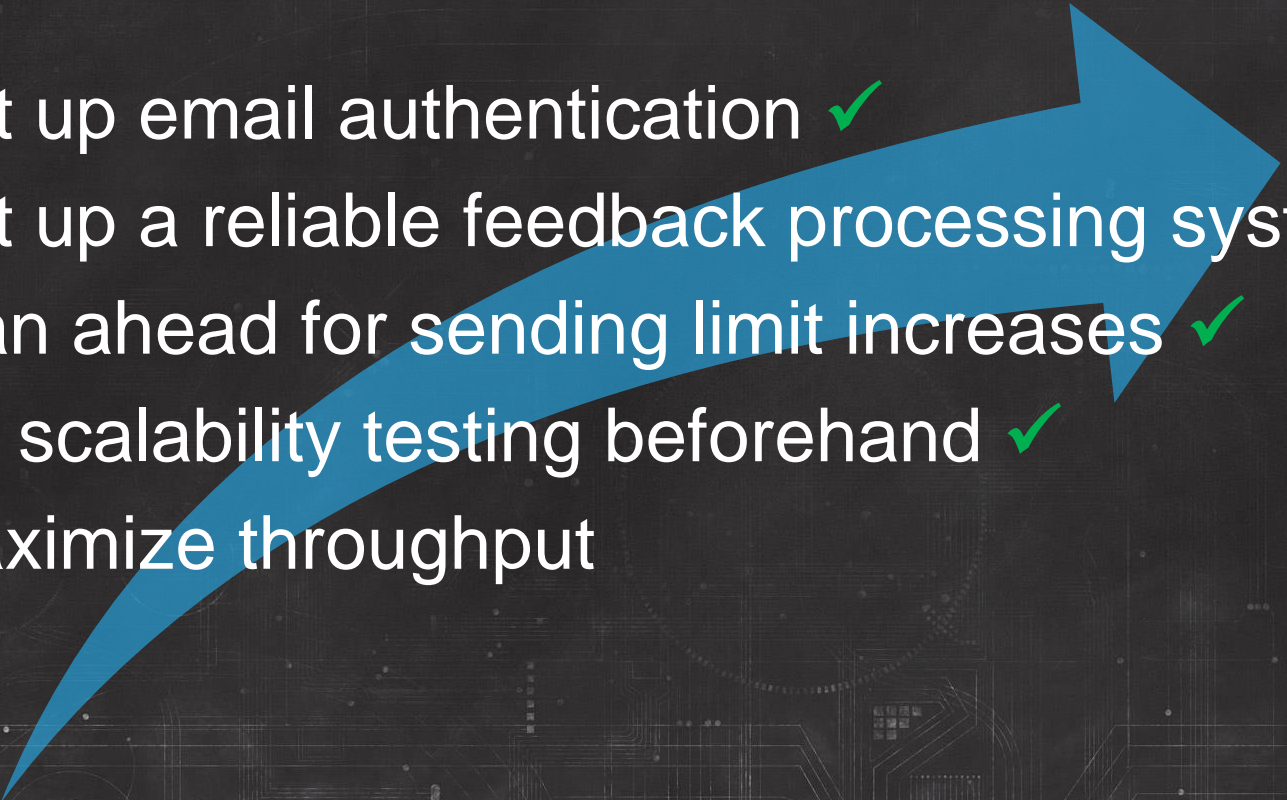
The Fundamentals of Scaling Up

- Set up email authentication ✓
 - Set up a reliable feedback processing system ✓
 - Plan ahead for sending limit increases ✓
 - Do scalability testing beforehand
- 

Scalability Testing

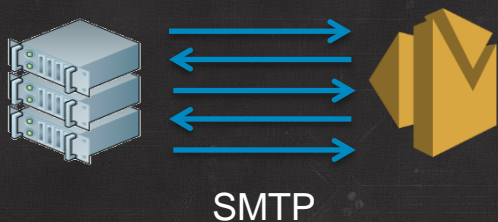
- Use the mailbox simulator for testing
 - Doesn't contribute to sending quota or bounce/complaint metrics
- Test the email sizes appropriate to your use case
- Test at volumes appropriate to your use case
- Test to ensure your feedback processing system can handle the load

The Fundamentals of Scaling Up

- Set up email authentication ✓
 - Set up a reliable feedback processing system ✓
 - Plan ahead for sending limit increases ✓
 - Do scalability testing beforehand ✓
 - Maximize throughput
- 

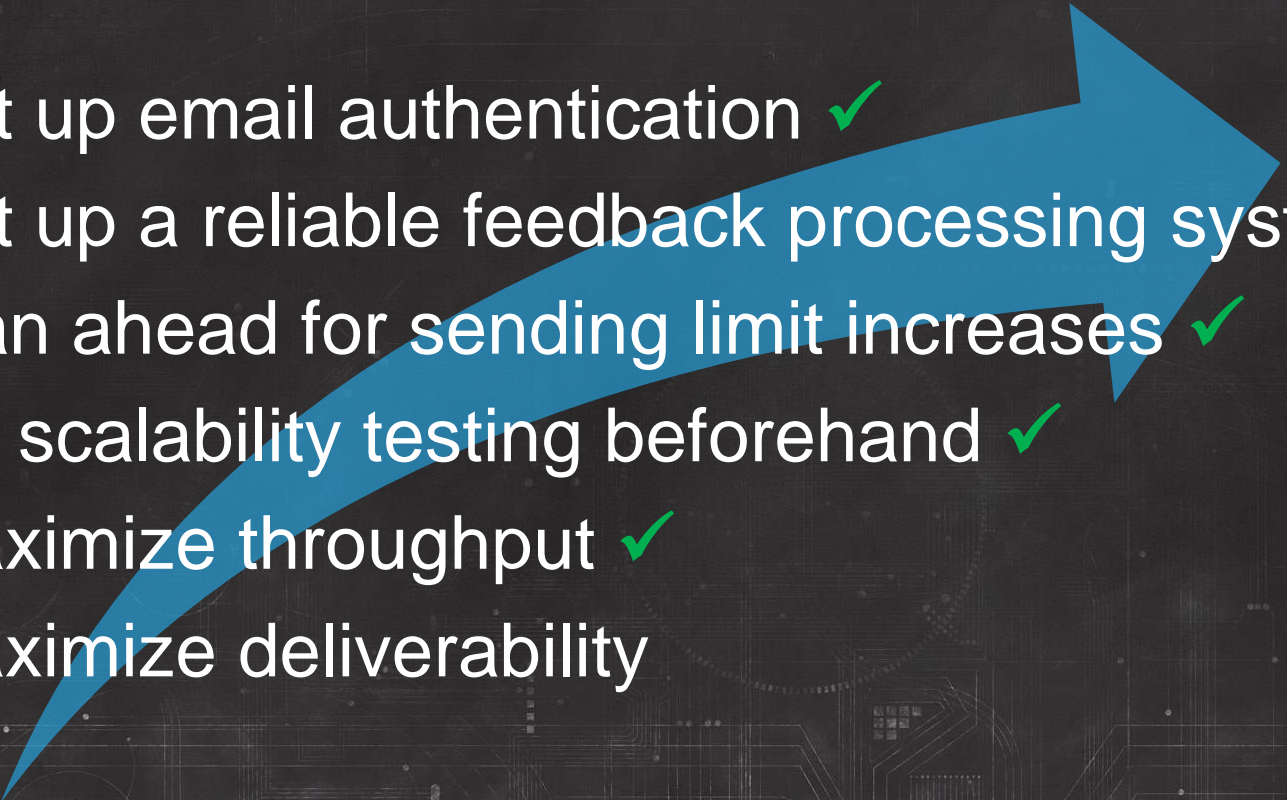
Scaling your Sending

- Use HTTP instead of SMTP



- Use persistent connections
- Send in parallel
 - Use multiple processes/threads
 - Use multiple hosts

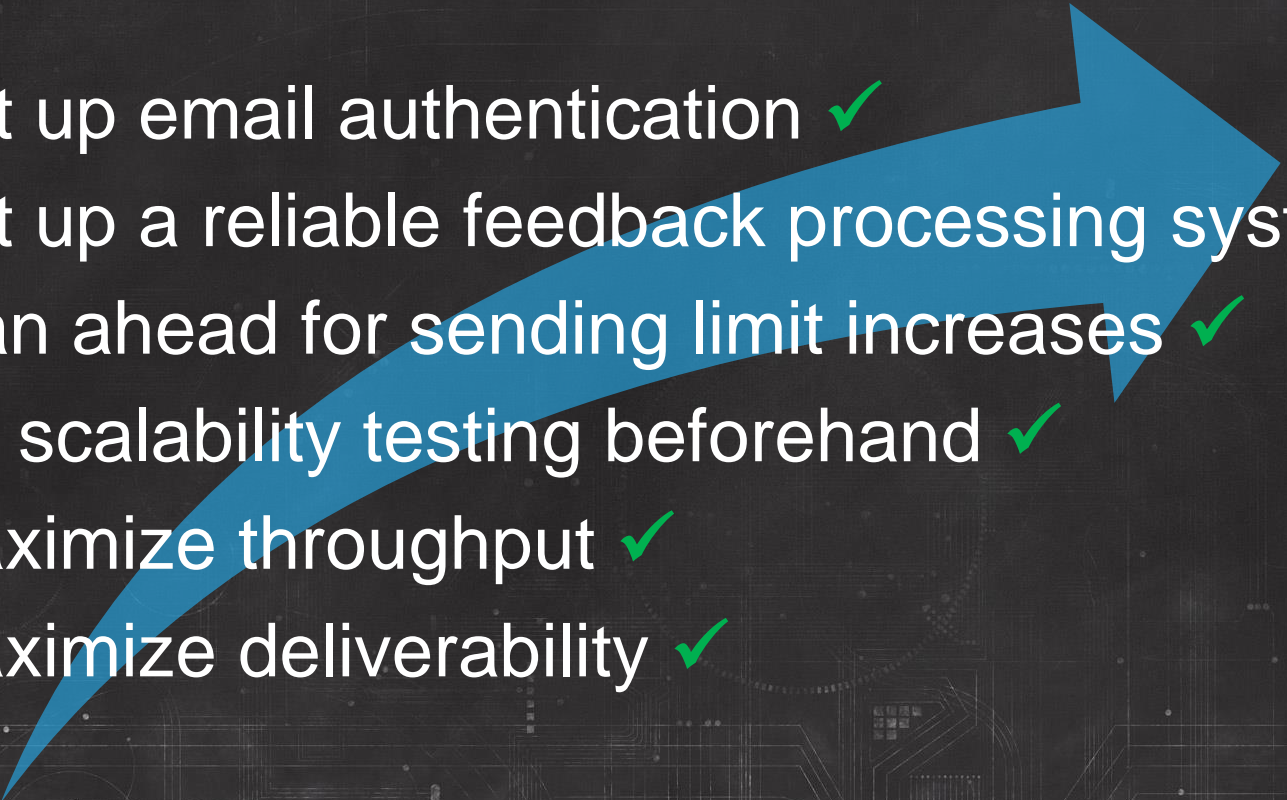
The Fundamentals of Scaling Up

- Set up email authentication ✓
 - Set up a reliable feedback processing system ✓
 - Plan ahead for sending limit increases ✓
 - Do scalability testing beforehand ✓
 - Maximize throughput ✓
 - Maximize deliverability
- 

Deliverability Tips

- Send content that your recipients want
- Only send to those who have signed up for your mail
 - Double opt-in
- Unsubscribe recipients who haven't interacted with your business recently
- Remove bounced/complained addresses from your list
- Check out Email Sending Best Practices white paper

The Fundamentals of Scaling Up

- Set up email authentication ✓
 - Set up a reliable feedback processing system ✓
 - Plan ahead for sending limit increases ✓
 - Do scalability testing beforehand ✓
 - Maximize throughput ✓
 - Maximize deliverability ✓
- 

AWS re:Invent

Blue Shell Games: From Zero to 80M+ Emails Per Week

Dave Young, CTO and Co-Founder, Blue Shell Games

November 13, 2013



Who are we?

- We make free-to-play casino games
- Founded in 2010
- Cash-flow positive in 9 months
- We're hiring, talk to me after 😊

Email in the Social/Mobile Games Industry

- Collaborative play
 - Deliver messages quickly between users on many platforms
 - Email works everywhere
- Loyalty programs/retention
 - Returning players are our best customers
 - Email rewards programs set player cadence
- New product launches
 - Marketing to our existing user base gives us a head start

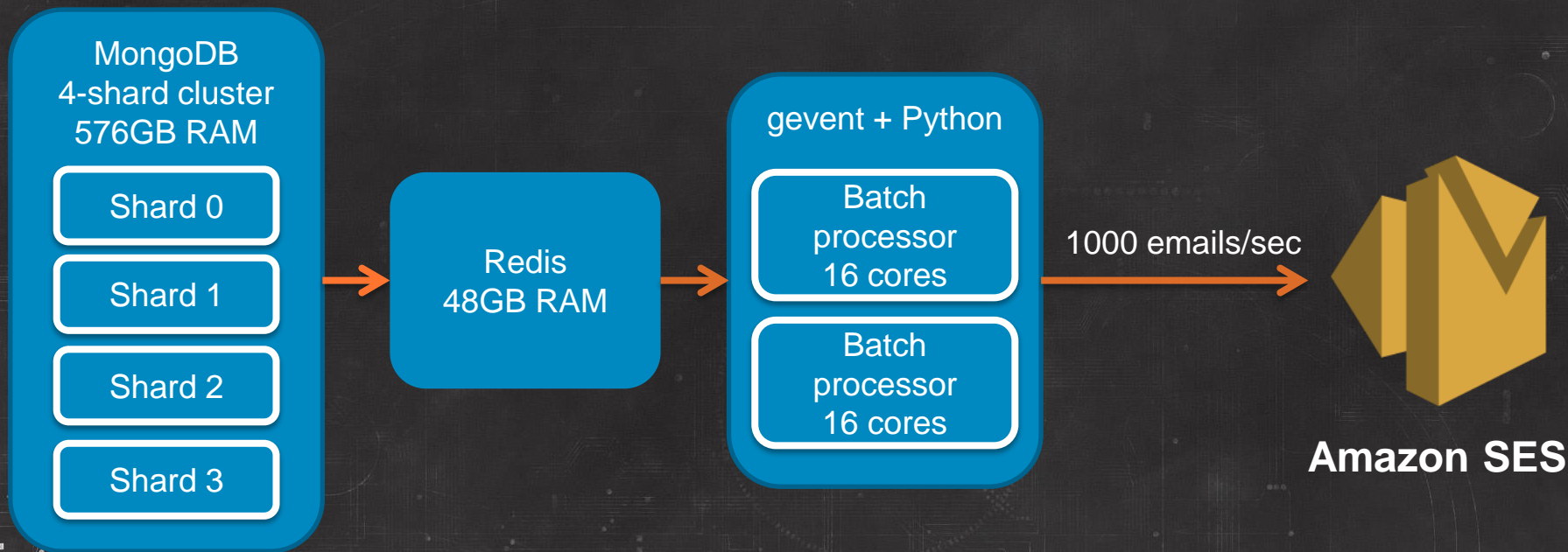
Our Requirements

- Reliable
 - We need a partner who has better uptime than we do
- Quick to integrate
 - Many competing engineering priorities in a growing startup
- Scalable
 - Email needs = $N \text{ users} * C \text{ campaigns} * T \text{ time}$
 - 1200% user growth from 1/2012 to 2/2013
 - 2010: 1 campaign. 2011: 12 campaigns: 2012: micro-targeting

Why Amazon SES?

- Great reliability reputation
 - AWS is the de facto choice for startups
- Open-source driver support (boto)
 - Complete, well-tested Python API wrapper
- Building your own SMTP server is very expensive
 - Tried in 2010, 2011...

Feeding Amazon SES



How We Set Up Amazon SES

- Deferred execution for transactional messages
 - Python + `gevent.spawn(send_mail, ...)`
 - Doesn't block the response
- Batch processes for loyalty programs
 - Redis + `gevent.queue`
 - 1000 messages/sec on just a few cores
- Amazon SNS HTTP callback for bounces
 - Easy for you/your team to integrate

What We Learned When Getting Started

- Using the SES/SNS APIs is easy
 - Any web programmer can implement. We were live in 2 days
- Email marketing is not easy
 - Focus on what to send, when to send it, to whom to send
 - Amazon SES internal suppression list helps here
- Scaling is hard
 - Just increase your Amazon SES quota (your reputation is good)
 - Concentrate on scaling DBs, caches, batches, etc.

Email Challenges As We Grow

- Smarter targeting
 - Segment your users into behavioral cohorts
 - Message them with personalized, relevant content
 - Social content, friends' profile pictures, 1:N graph queries
- Mobile integration
 - Users are on desktop client, webmail, mobile client
 - Rendering, mobile web, app store, and app-url://screen

Our Advice for Senders Growing with Amazon SES

- Maintain list quality
 - Mark inactive @ 90, 120, 180 days (depending on your market)
 - Offer 1-click unsubscribe
- Handle bounces properly
 - Nothing is worse for your brand than dead mailboxes
 - Also wastes \$\$\$/message



Amazon.com: Migrating High-Volume Traffic to Amazon SES

Anderson Imes, Software Development Manager, Amazon Email Marketing Platform

November 13, 2013



Why Am I Here?

- Amazon is a very large email sender!
- We are an Amazon SES user.

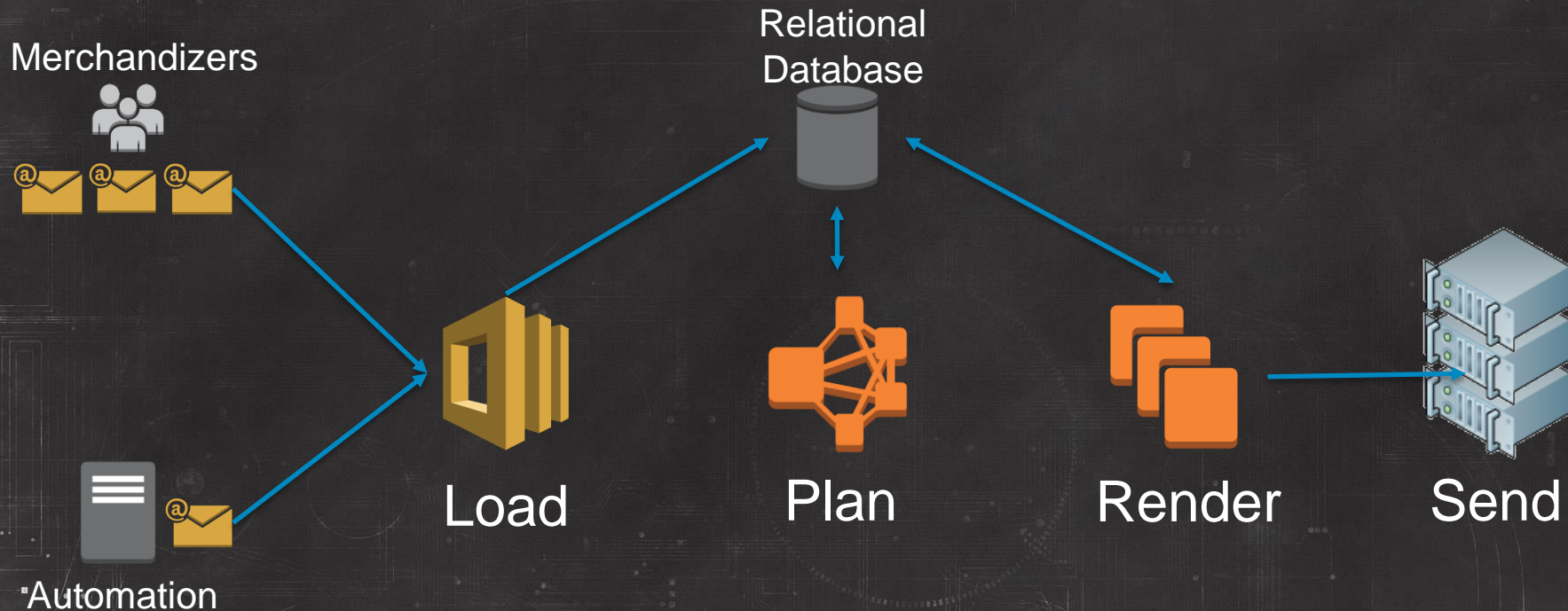
What Do We Send?

- Transactional
- Marketing
- For Amazon and subsidiaries

What We Need From an Email System

- Reliability
- Scalability
- Deliverability

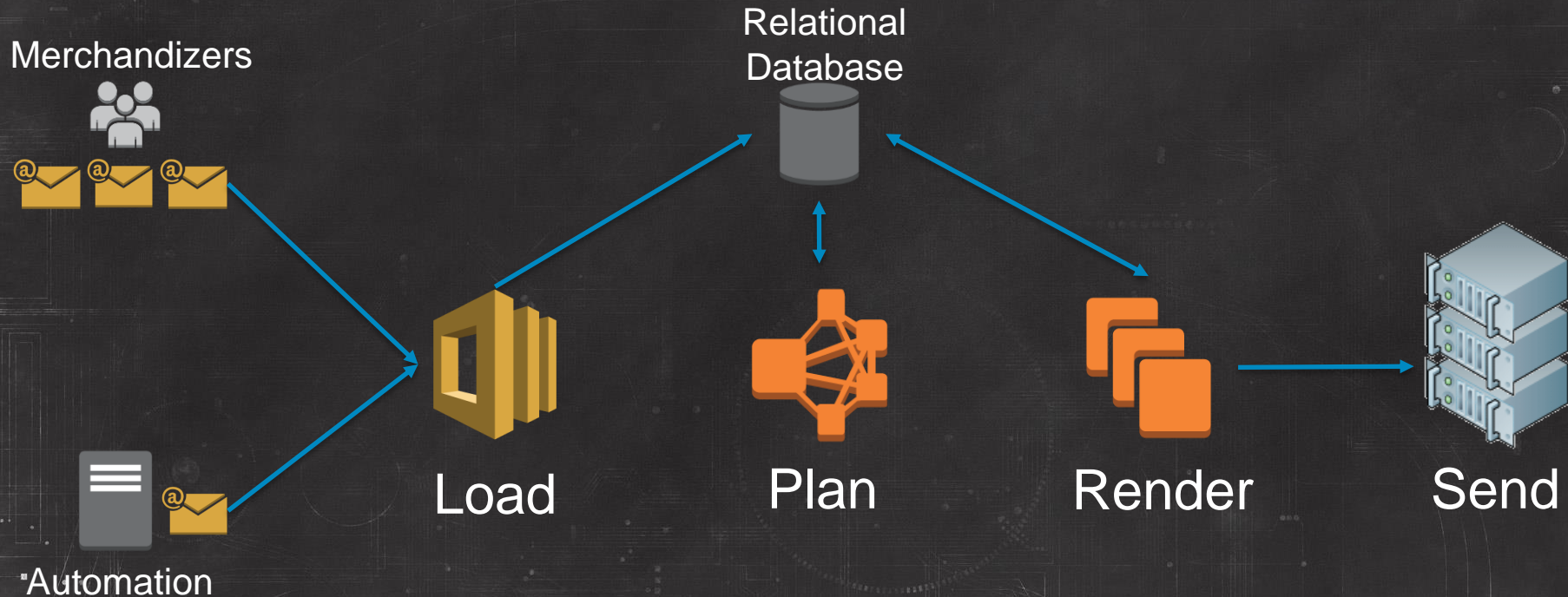
Where We Started



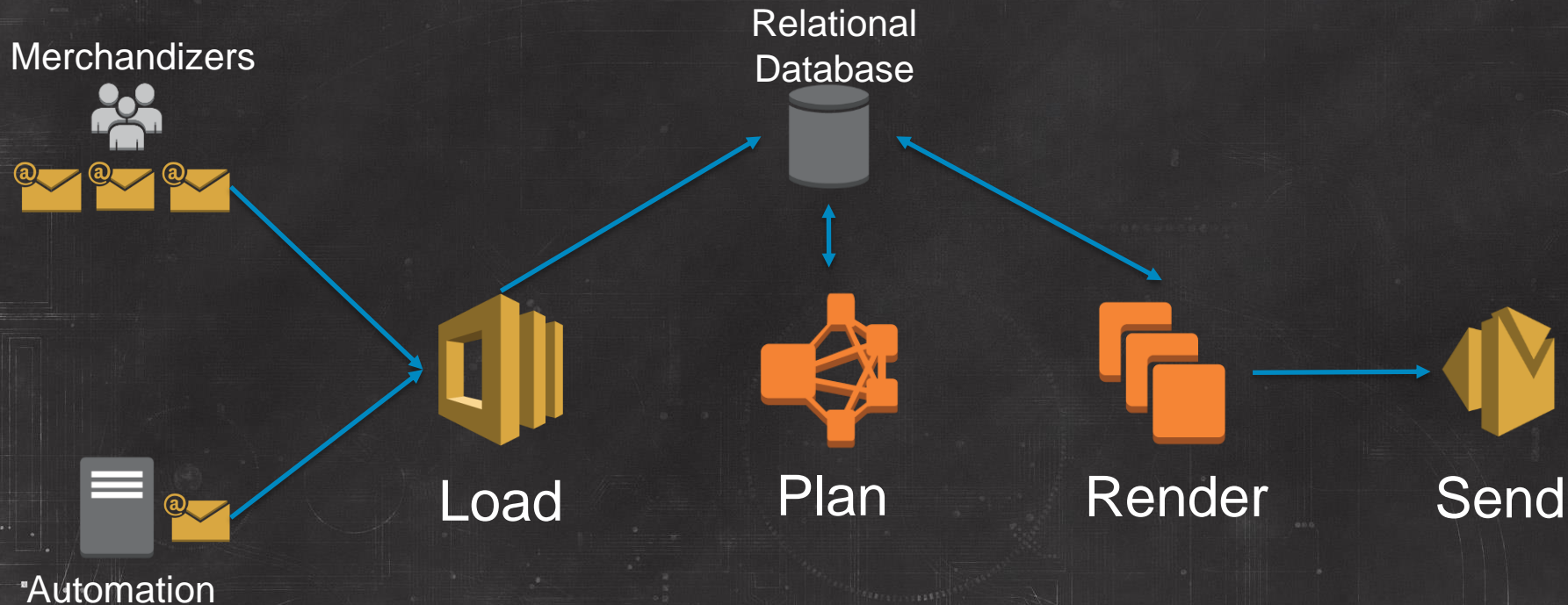
Problems We Wanted to Solve

- Scalability – When asked “When can you scale?”, we wanted to say “now”
- Maintainability – Email sending should “just work”
- Cost – Cost of sending should scale with demand.

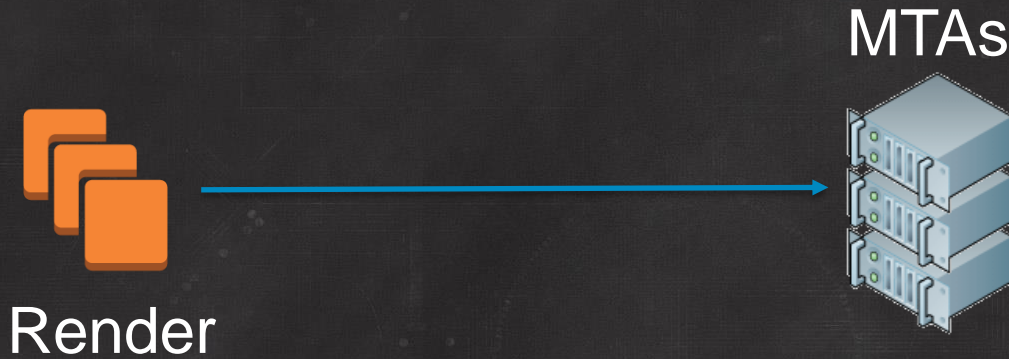
Where We Started



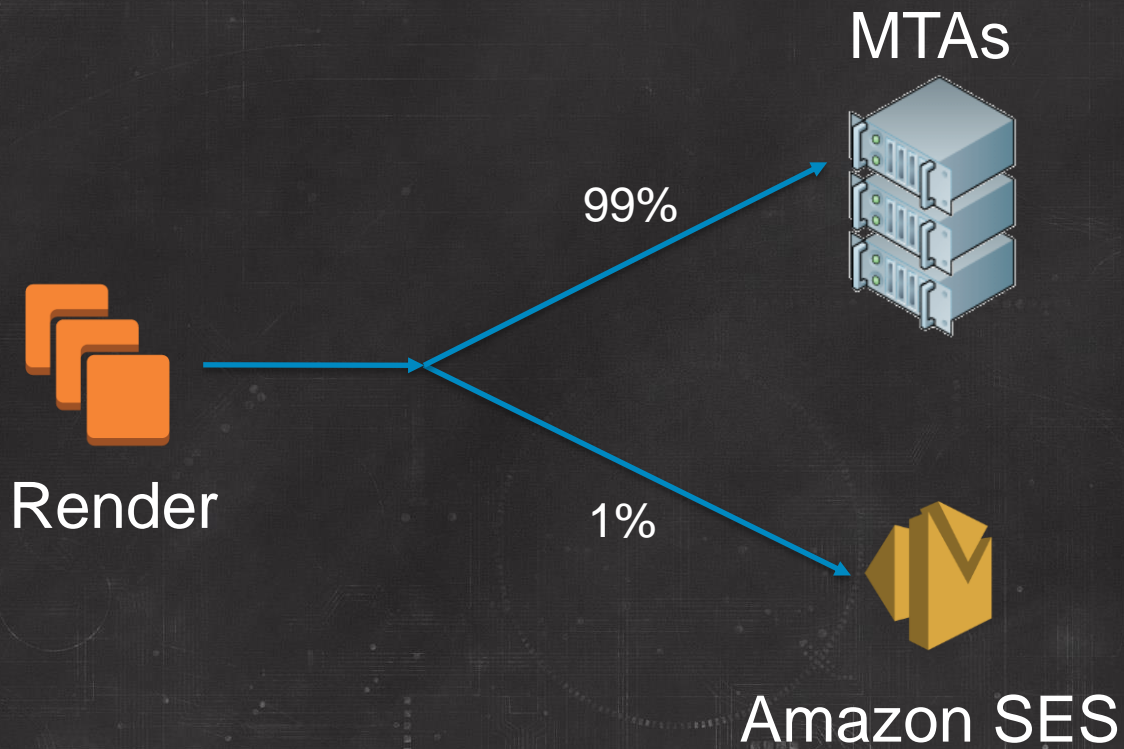
1. Amazon SES



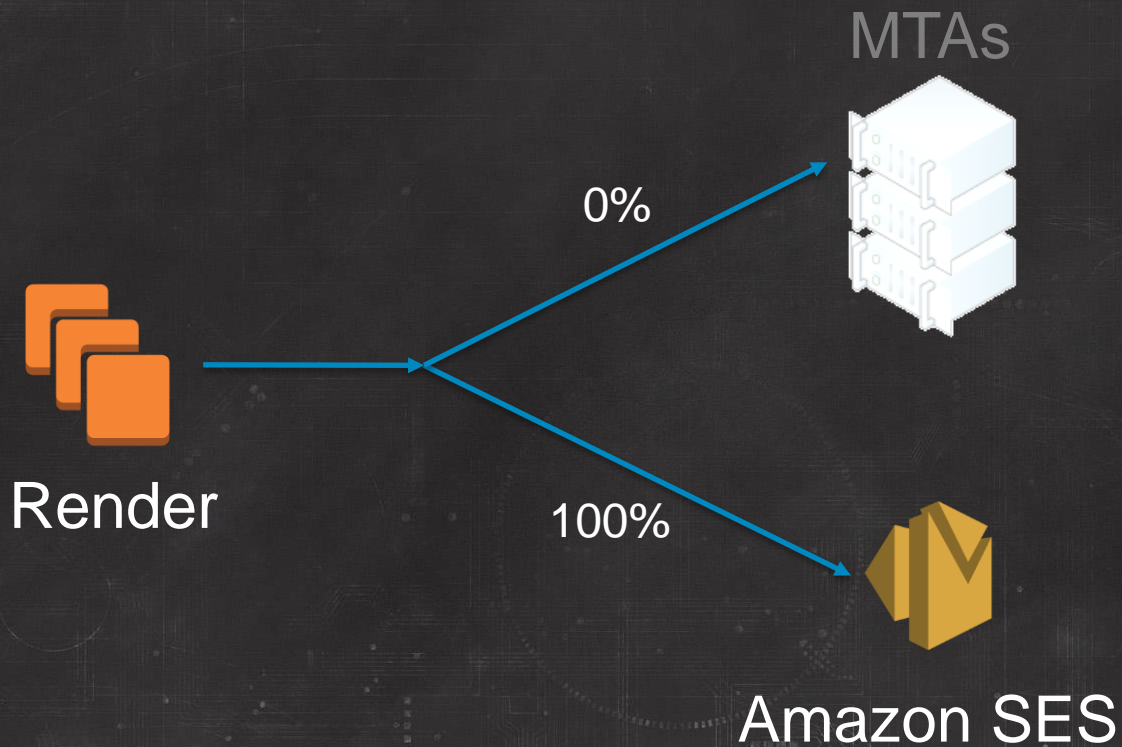
The Switch to Amazon SES



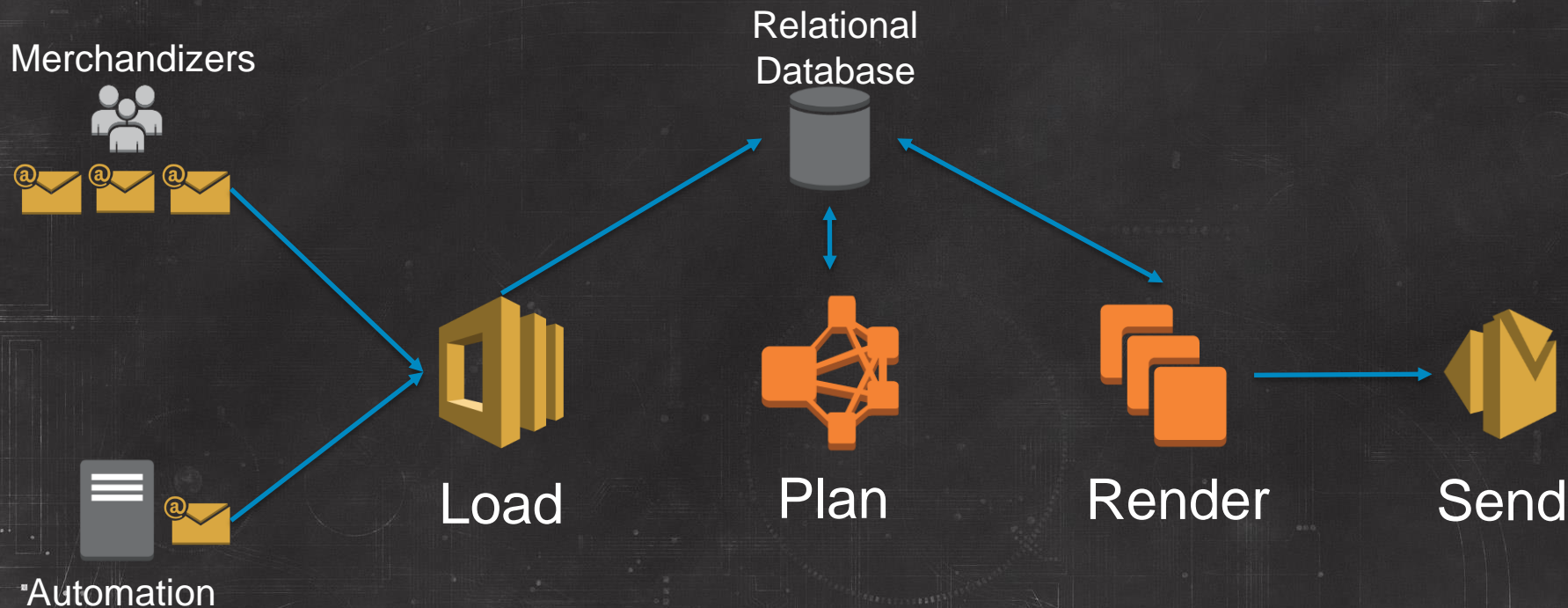
The Switch to Amazon SES



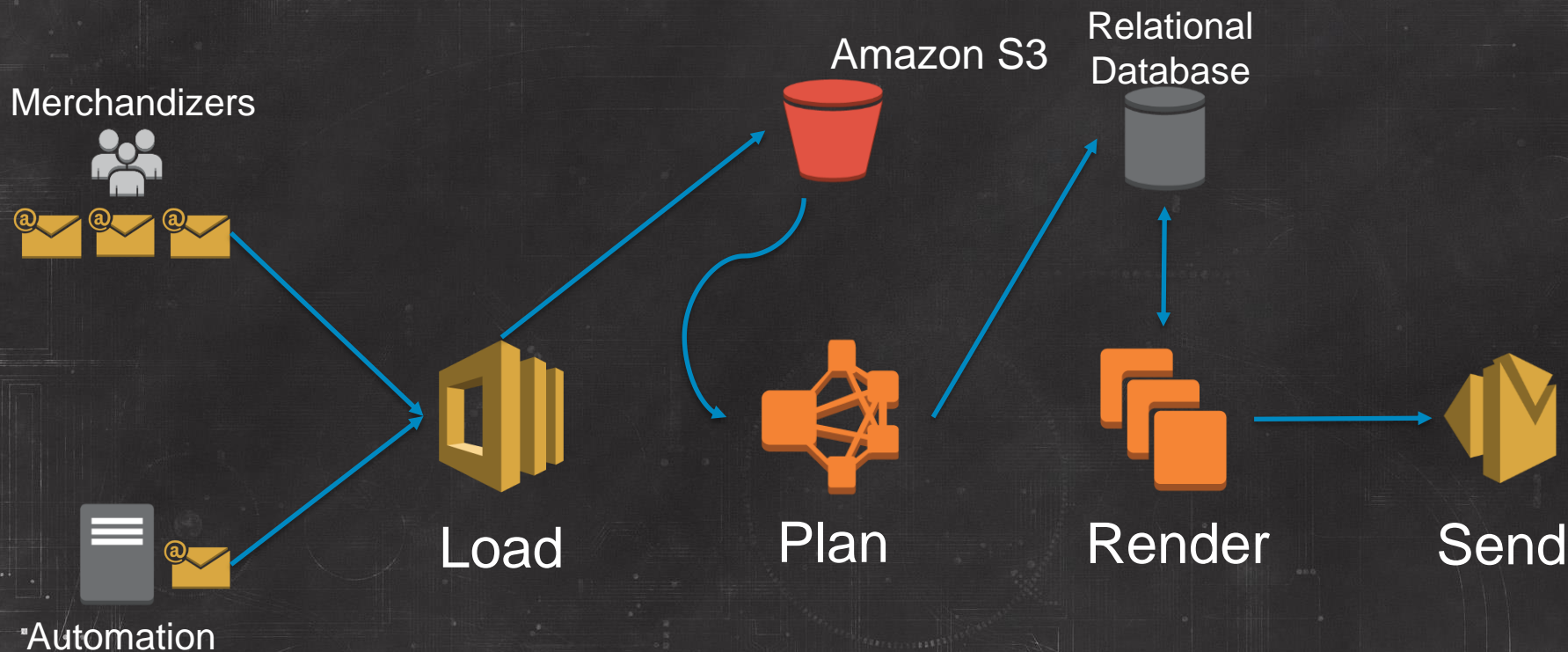
The Switch to Amazon SES



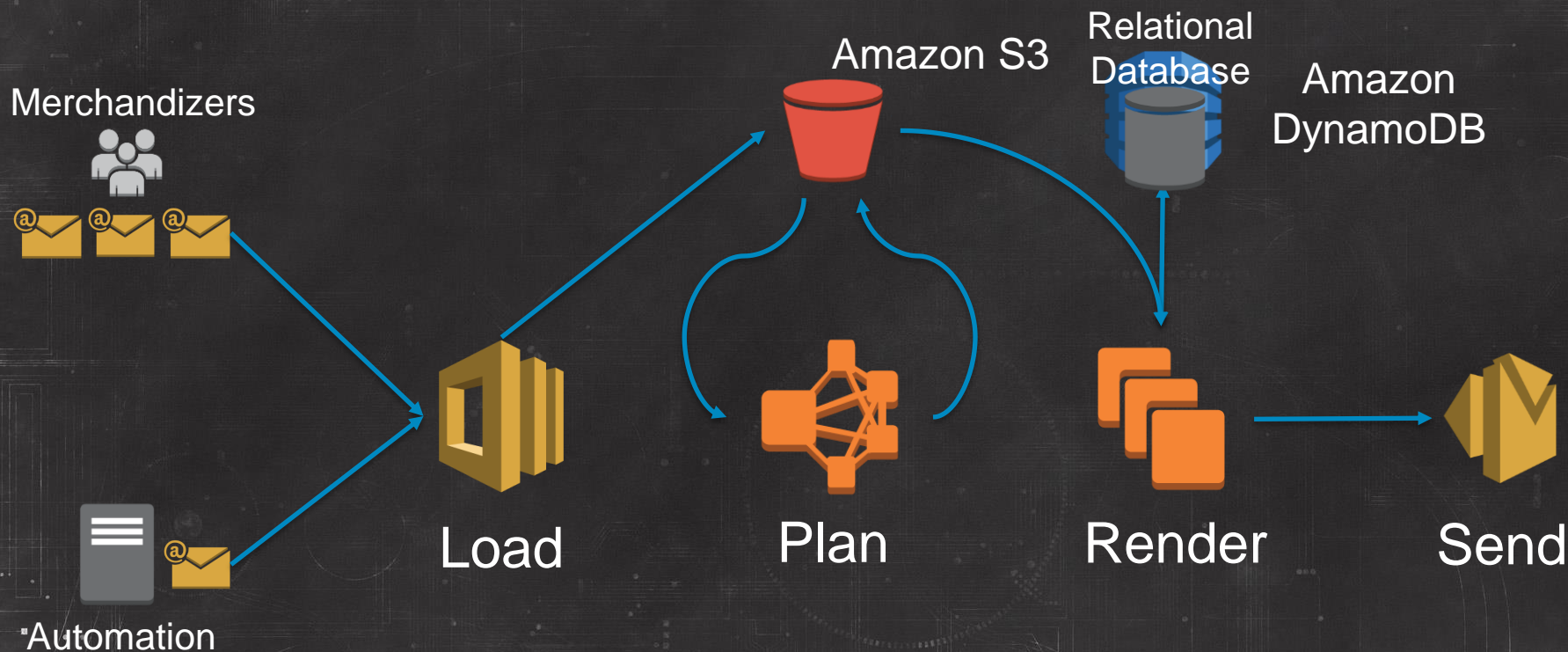
2. Move Away from Relational DB



2. Move Away from Relational DB (Part 1)



2. Move Away from Relational DB (Part 2)



Our Idempotency Needs

- Fast
- Scalable
- **At most once**

Idempotency



(Hash)

(Range)

Recipient

Campaign

```
PUT(  
  recipient=bob@ses-example.com,  
  campaign=1234,  
  CONDITION=DOES_NOT_EXIST)
```


Idempotency



(Hash)

(Range)

Recipient	Campaign
bob@ses-example.com	1234

```
PUT(  
  recipient=bob@ses-example.com,  
  campaign=1234,  
  CONDITION=DOES_NOT_EXIST)
```

SUCCESS

Idempotency



(Hash)

(Range)

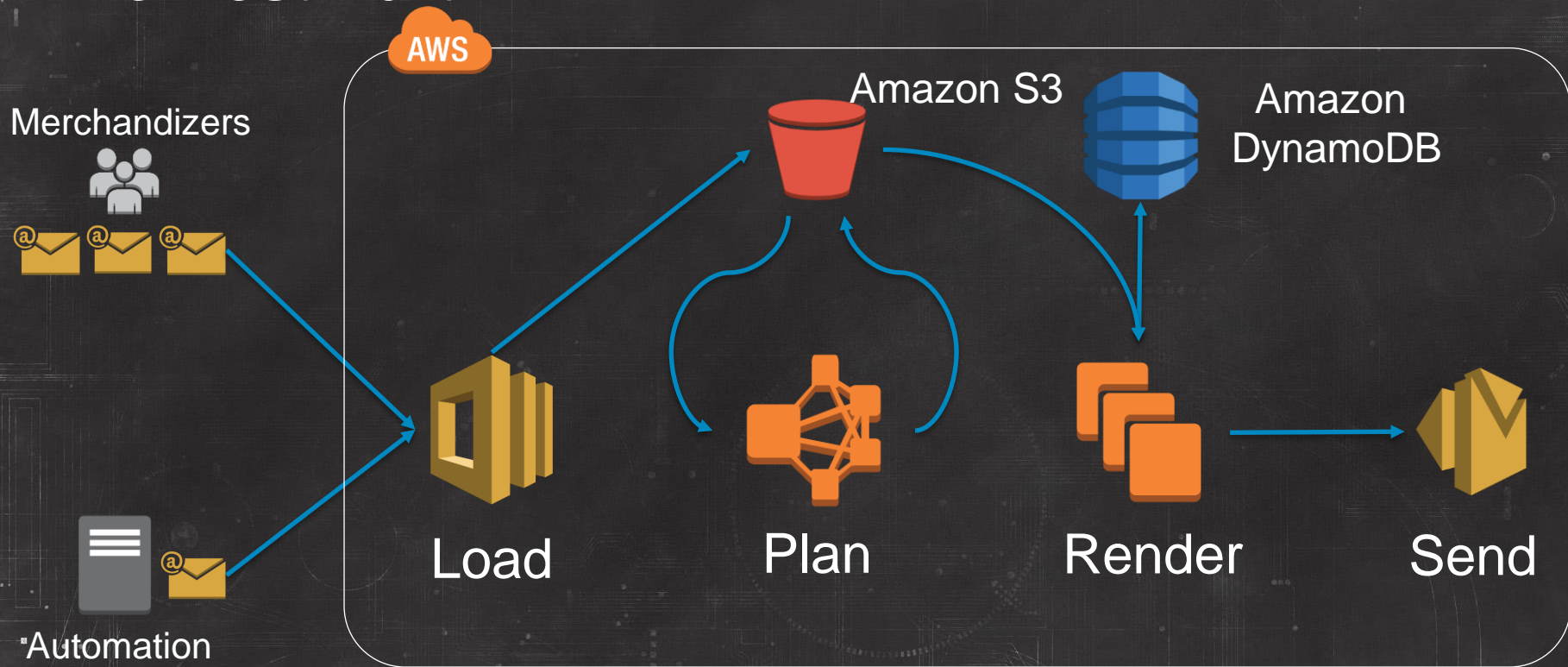
Recipient	Campaign
bob@ses-example.com	1234

PUT(

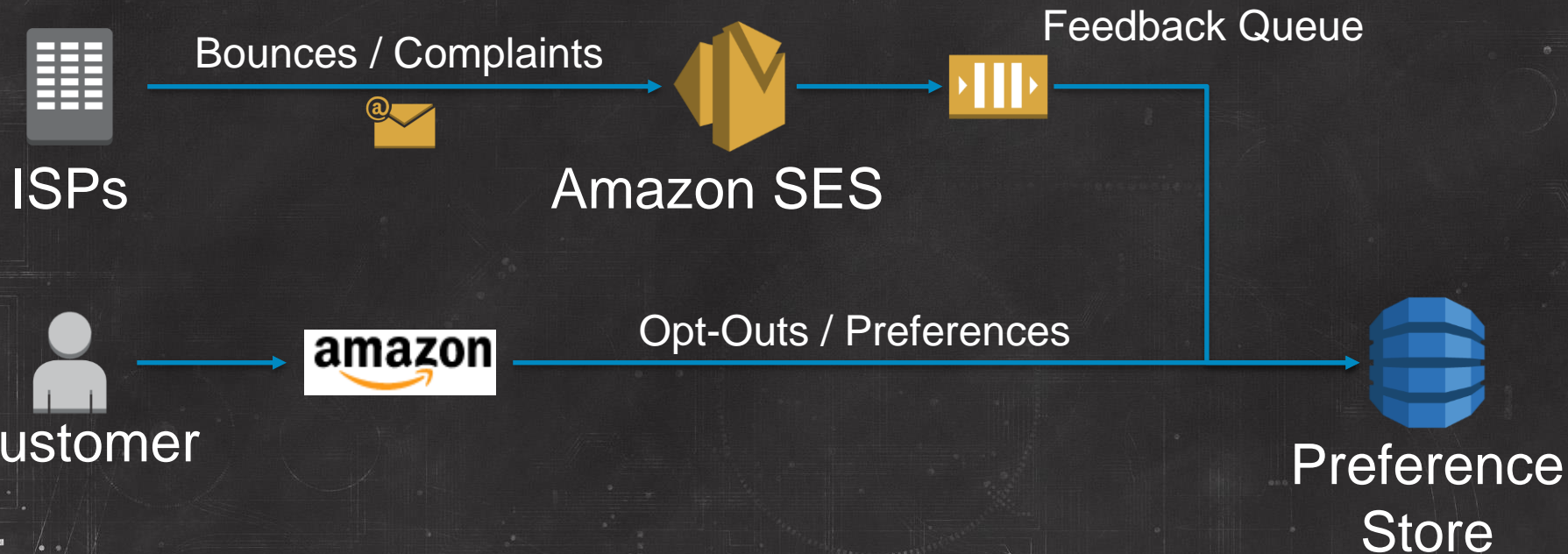
recipient=bob@ses-example.com,
campaign=1234,
CONDITION=DOES_NOT_EXIST)

FAIL

The Best Part?



Our Feedback Processing



Our Advice To Other Large Senders

- Start with your customer
- Think about feedback loops
- Test your throughput early and often

Questions?

Amazon SES Resources

- SES detail page: <http://aws.amazon.com/ses>
- SES documentation:
<http://docs.aws.amazon.com/ses/latest/DeveloperGuide/>
- SES forum:
<https://forums.aws.amazon.com/forum.jspa?forumID=90>
- SES blog: <http://sesblog.amazon.com/>

AWS re:Invent

Please give us your feedback on this presentation

SVC301

As a thank you, we will select prize winners daily for completed surveys!

