The Wild West of High Availability in Open edX

OpenCraft_

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Agenda

Choosing Your Stack

Examples

Managing Infrastructure

Fork Management

Choosing your stack

Outline

- Infrastructure Choices
  - On Prem
  - AWS
  - OpenStack
  - Other Cloud Providers

On Premise

- Most Control
- Most expertise required
    - You'll be setting up a lot of it yourself
- You might need this based on your organization or local law requirements

Amazon Web Services

- Most managed services Available
- Used by edX Inc.
    - Our tools can become your tools
    - Con: Our tools are not always built for everyone

OpenStack

- Pro: Used by OpenCraft
    - OpenCraft adding support into existing edX tools where possible
- Con: no two openstack clouds are the same

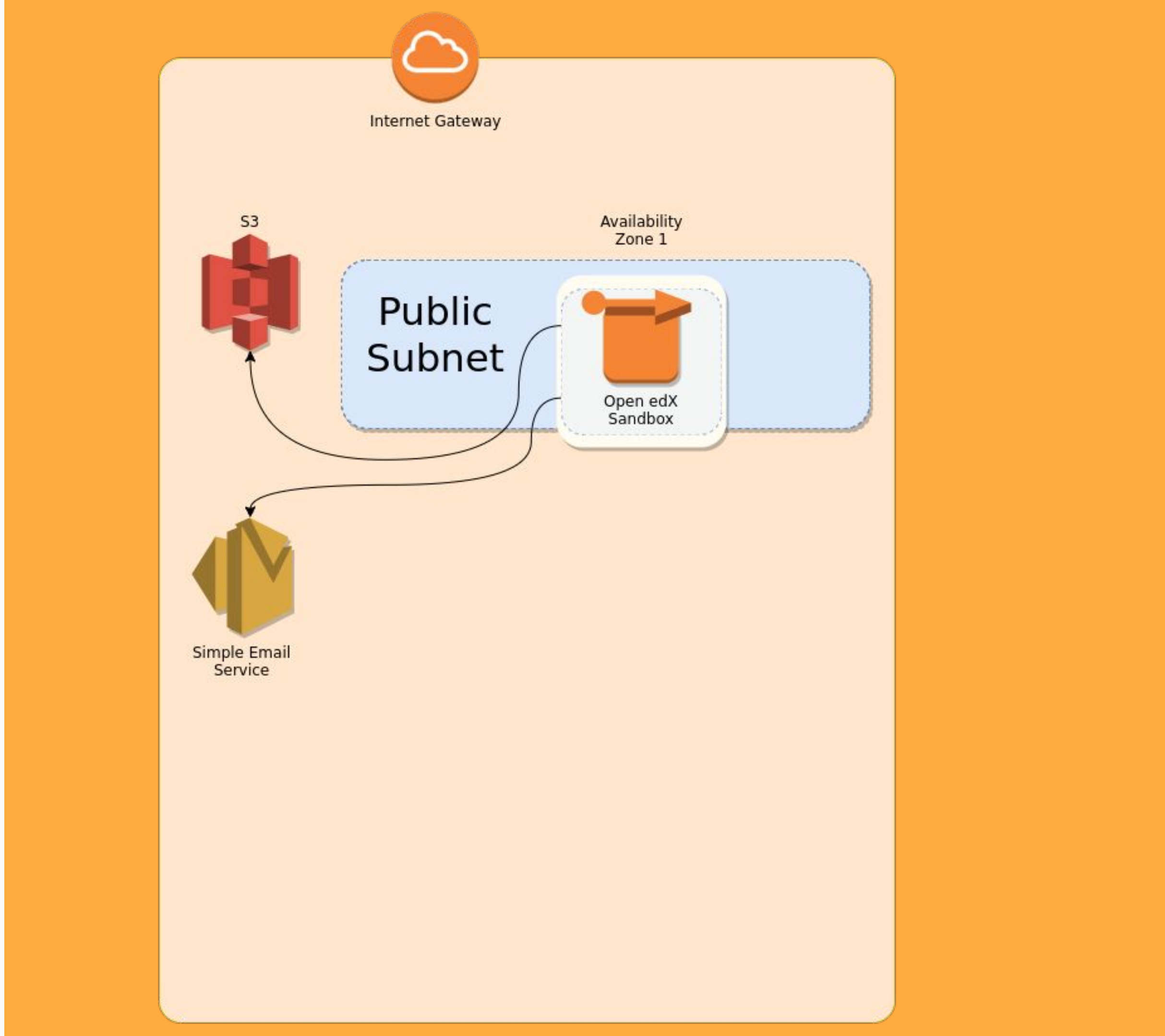
Other Infra Providers

- Usually provide the basic abstractions you need
    - Compute
    - Load Balancers
    - Storage
    - RDBMS as a Services
- Biggest differentiators are usually price, reliability, and tooling availability

Example:
The bare minimum

Sandbox

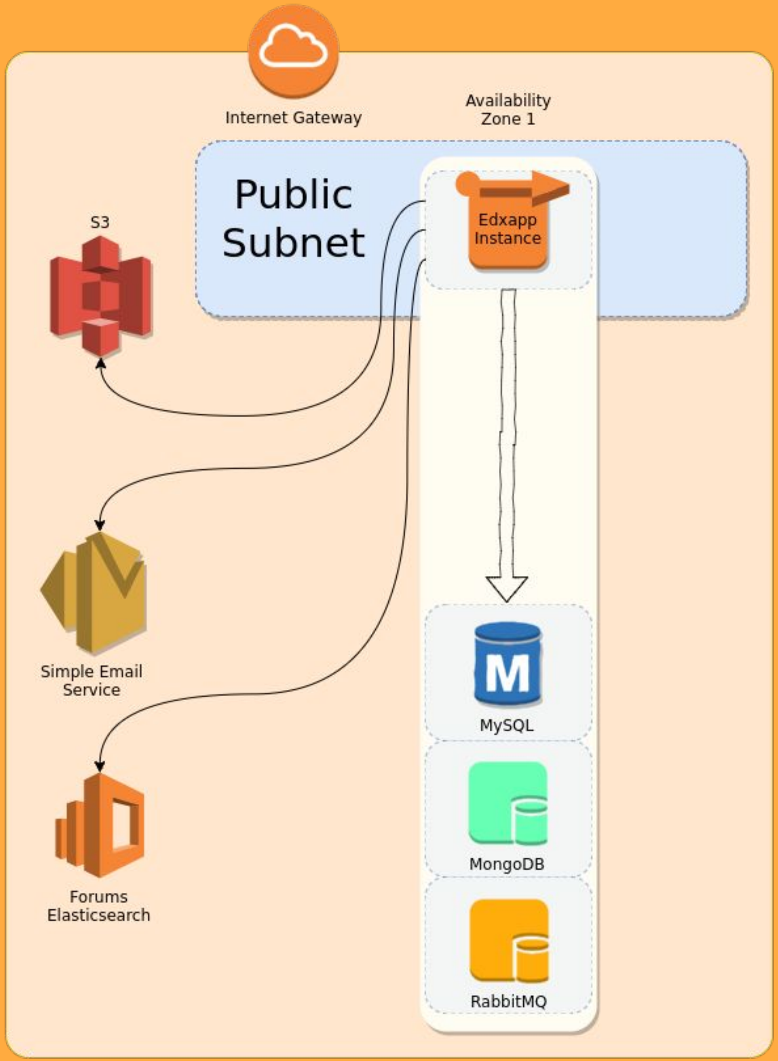
- ❖ Not Stateless
- ❖ Not Scalable
- ❖ Not Highly Available



Sandbox?
… sort of

- ~~Not Stateless~~
- Not Scalable… kind of
- Not Highly Available

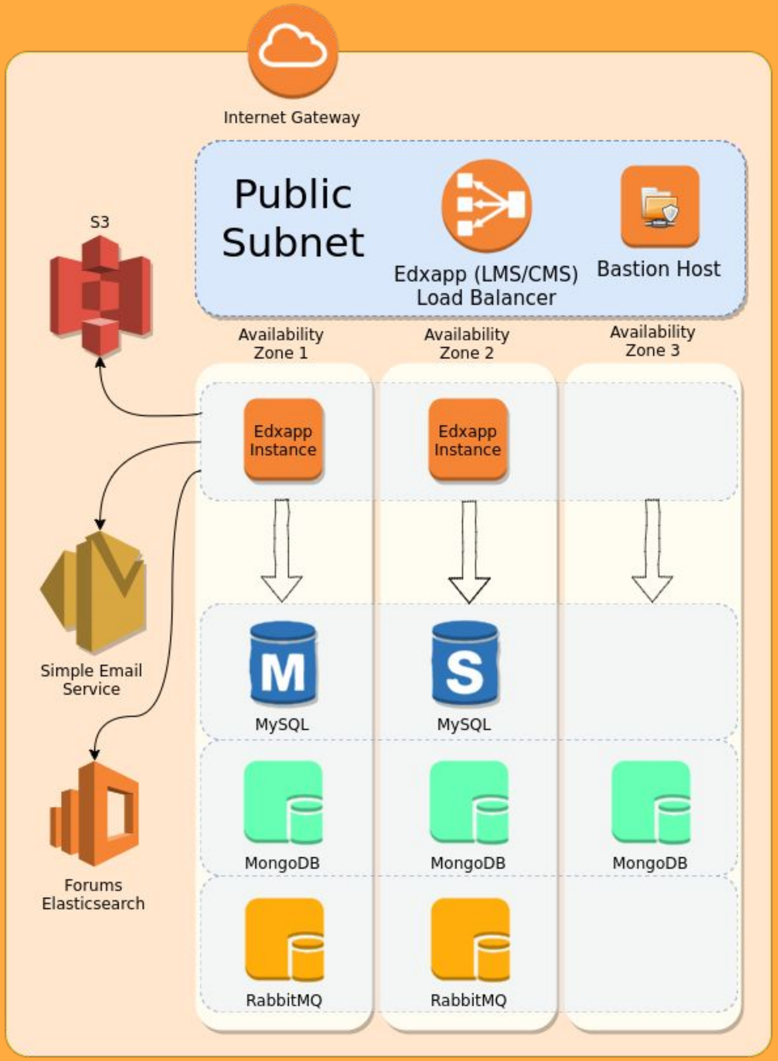
- Can fully monitor services separately
- But, more **single points of failure**



Definitely not a sandbox!

- ~~Not Stateless~~
- ~~Not Scalable~~
- ~~Not Highly Available~~

- Can fully monitor services separately
- ~~But, more single points of failure~~
- No **single points of failure**

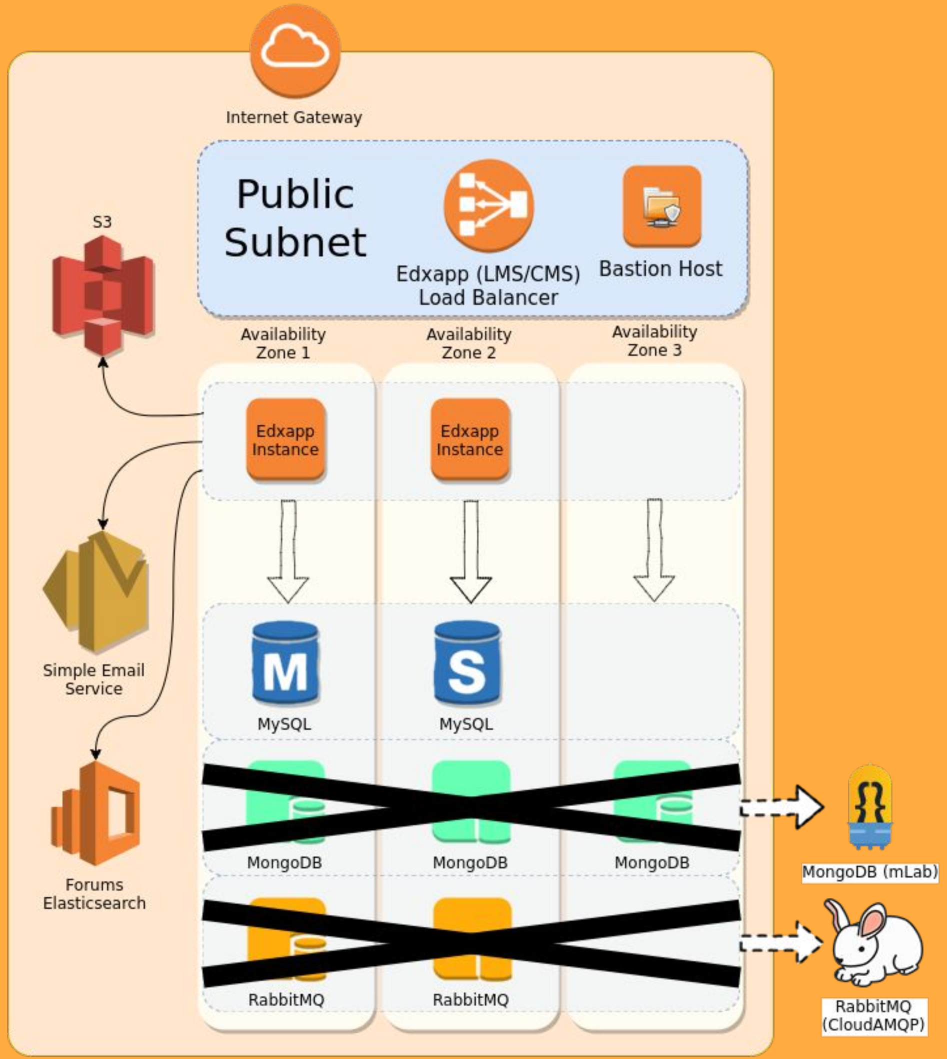


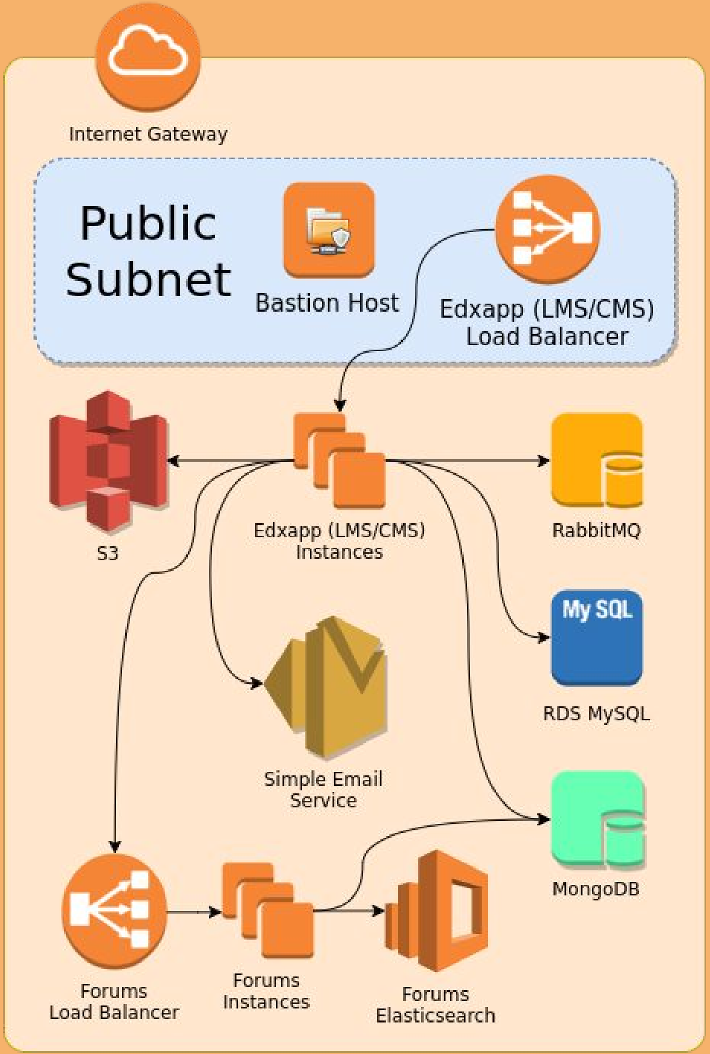
If desired, use managed databases

- ➔ **Less infrastructure** to take care of
- ➔ **Easy to scale**

- ➔ **More expensive** than the bare infrastructure

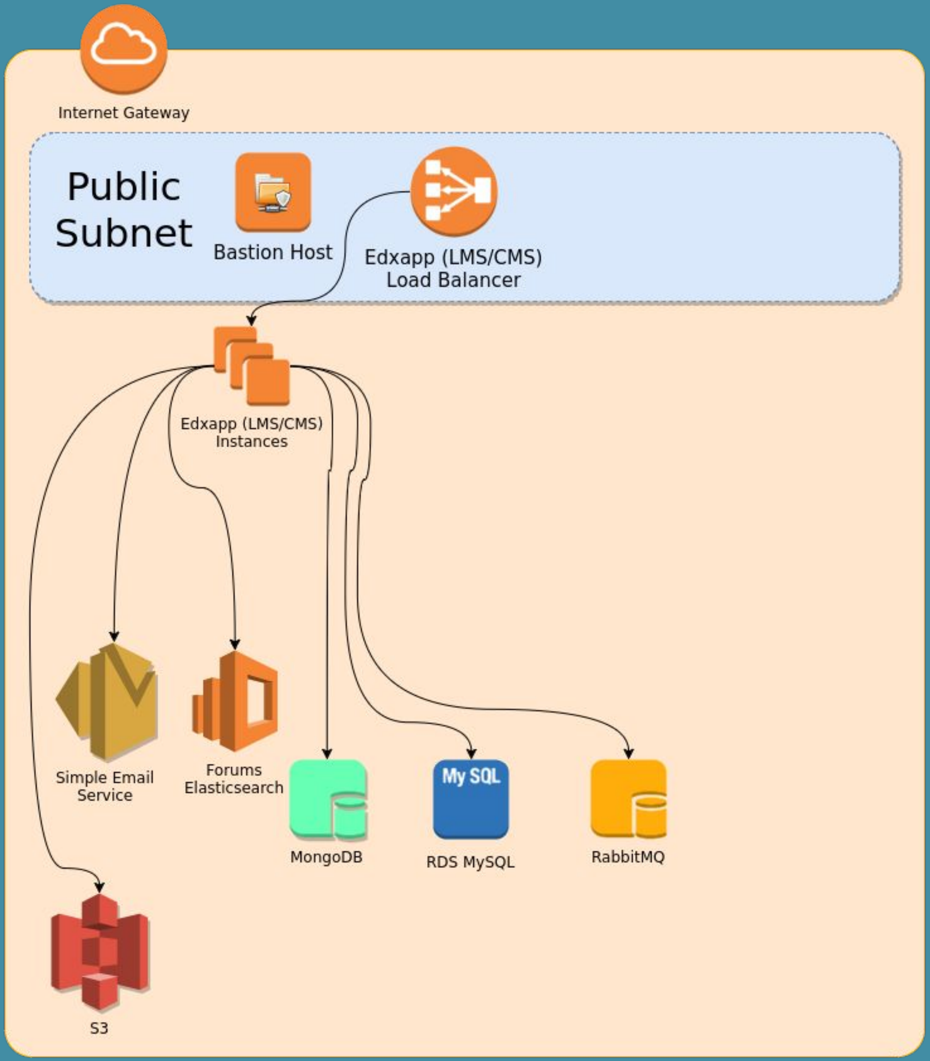
- ➔ Check for education/user privacy **law compliance**



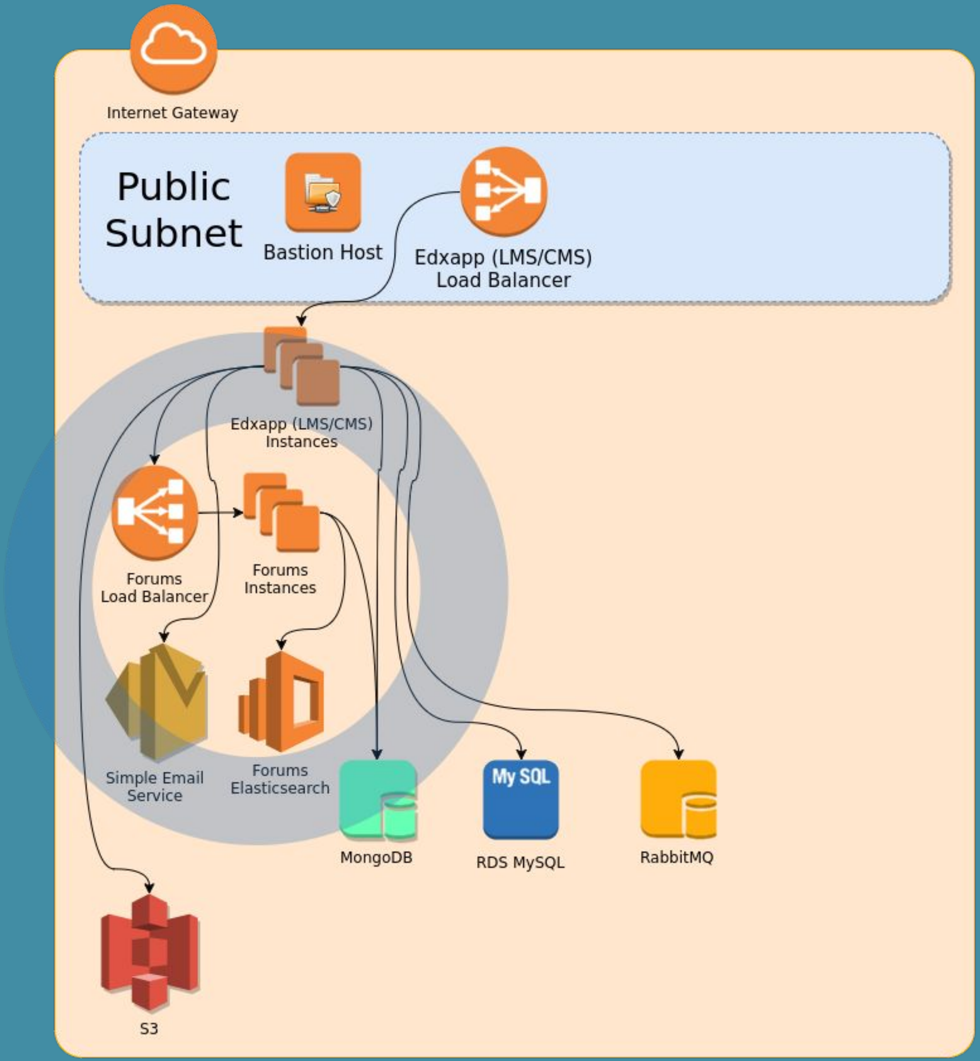

Internet Gateway
Public Subnet
Bastion Host
Edxapp (LMS/CMS) Load Balancer
S3
Edxapp (LMS/CMS) Instances
RabbitMQ
My SQL
RDS MySQL
Simple Email Service
MongoDB
Forums Load Balancer
Forums Instances
Forums Elasticsearch

Example:
A large stack

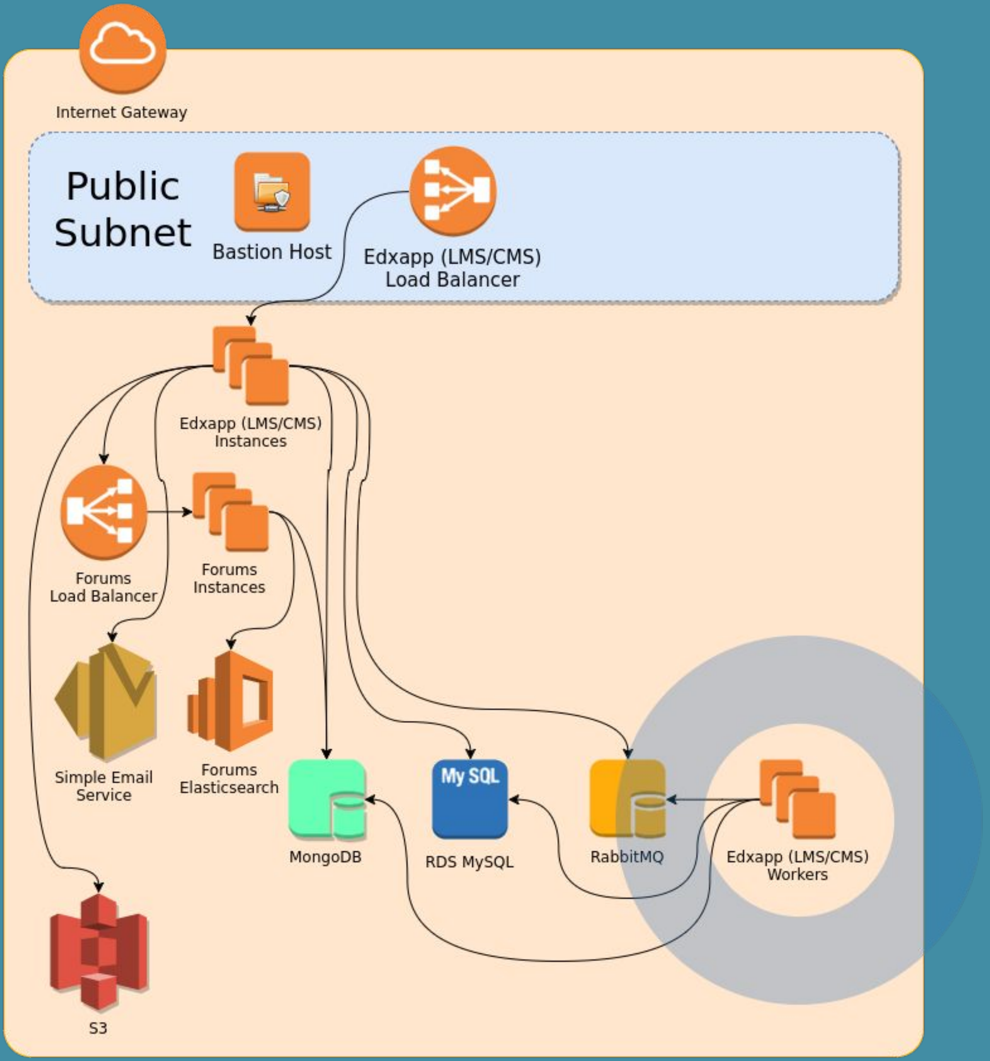
Where we left off:



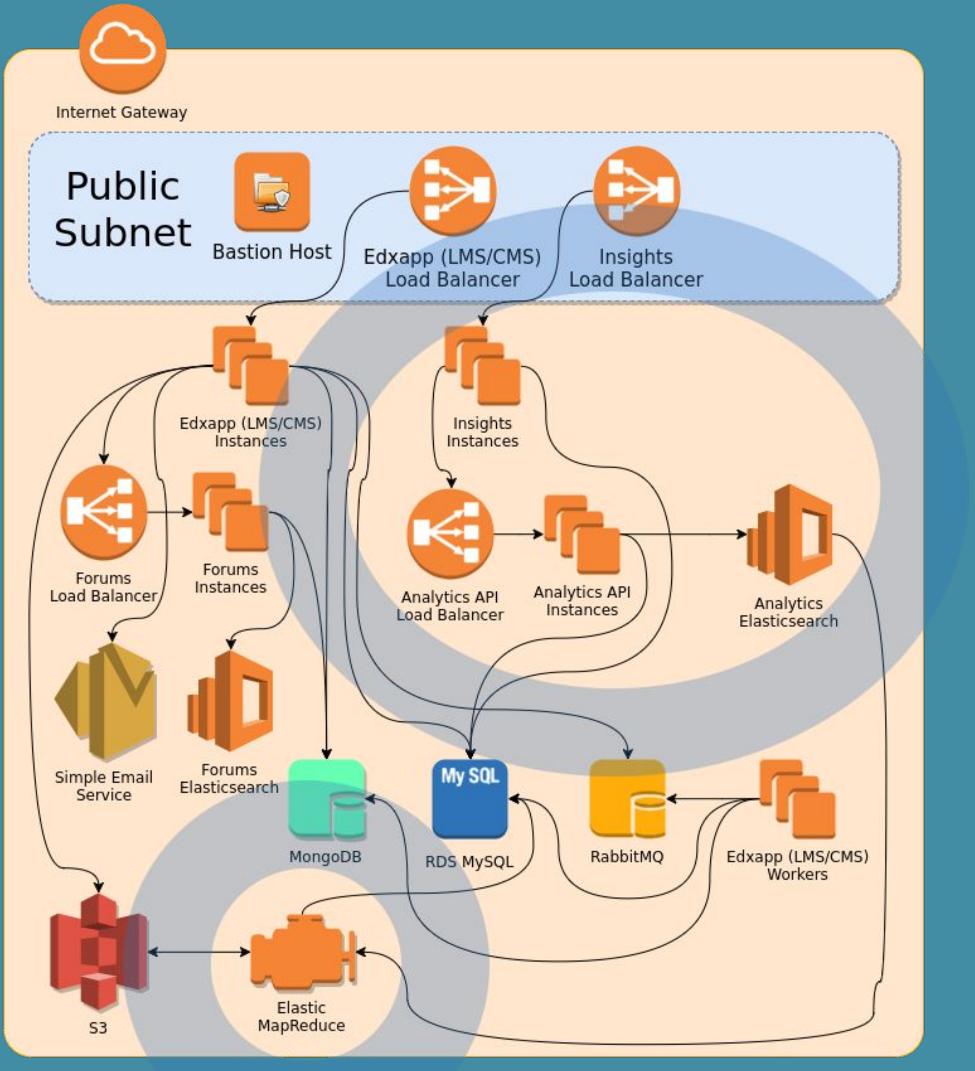
Separate forums...



Separate workers...



Analytics!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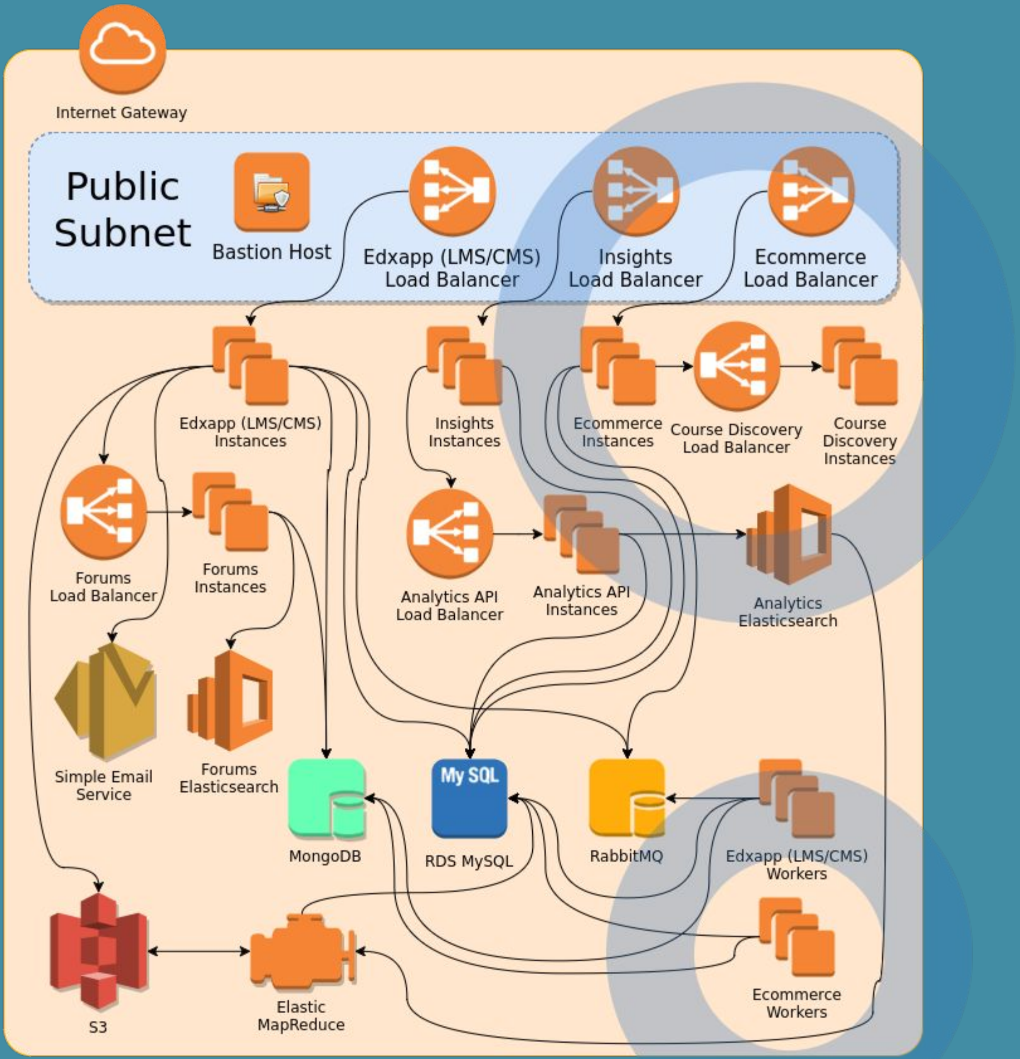
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Course Discovery Load Balancer
Course Discovery Instances
Forums Load Balancer
Forums Instances
Analytics API Load Balancer
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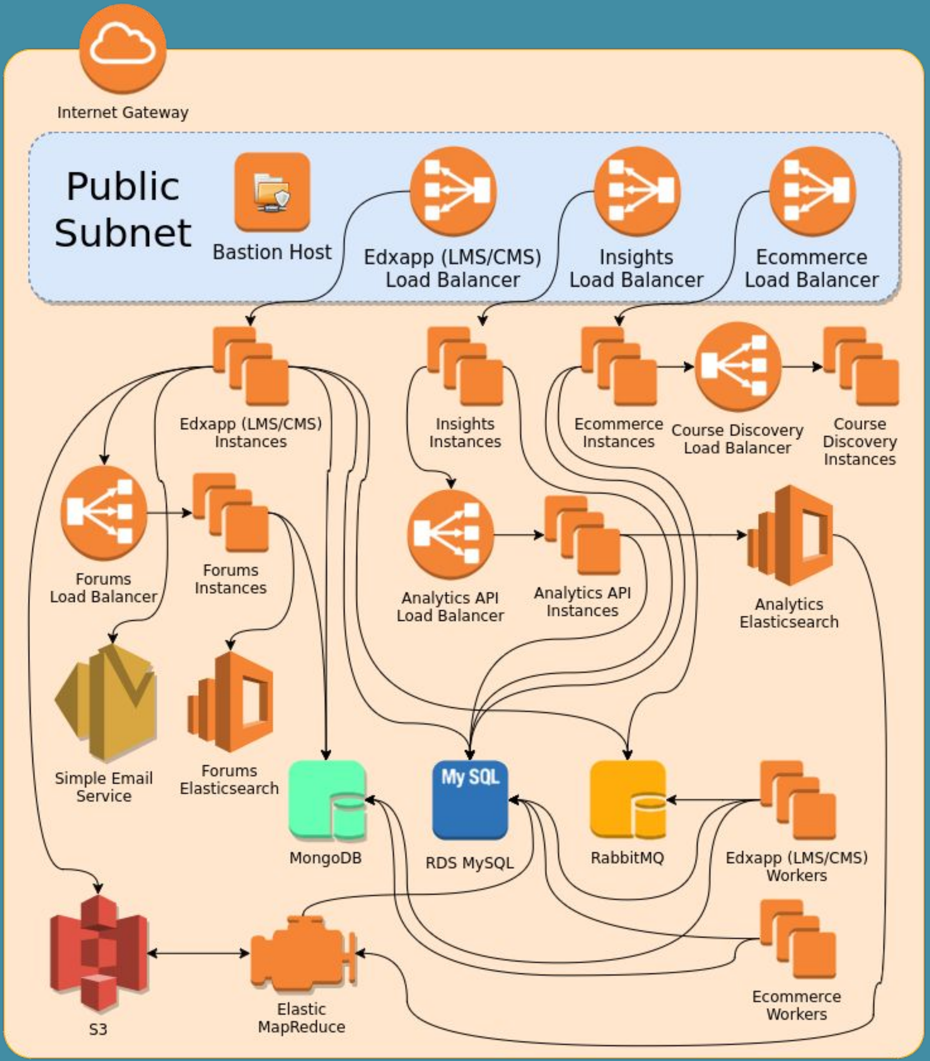
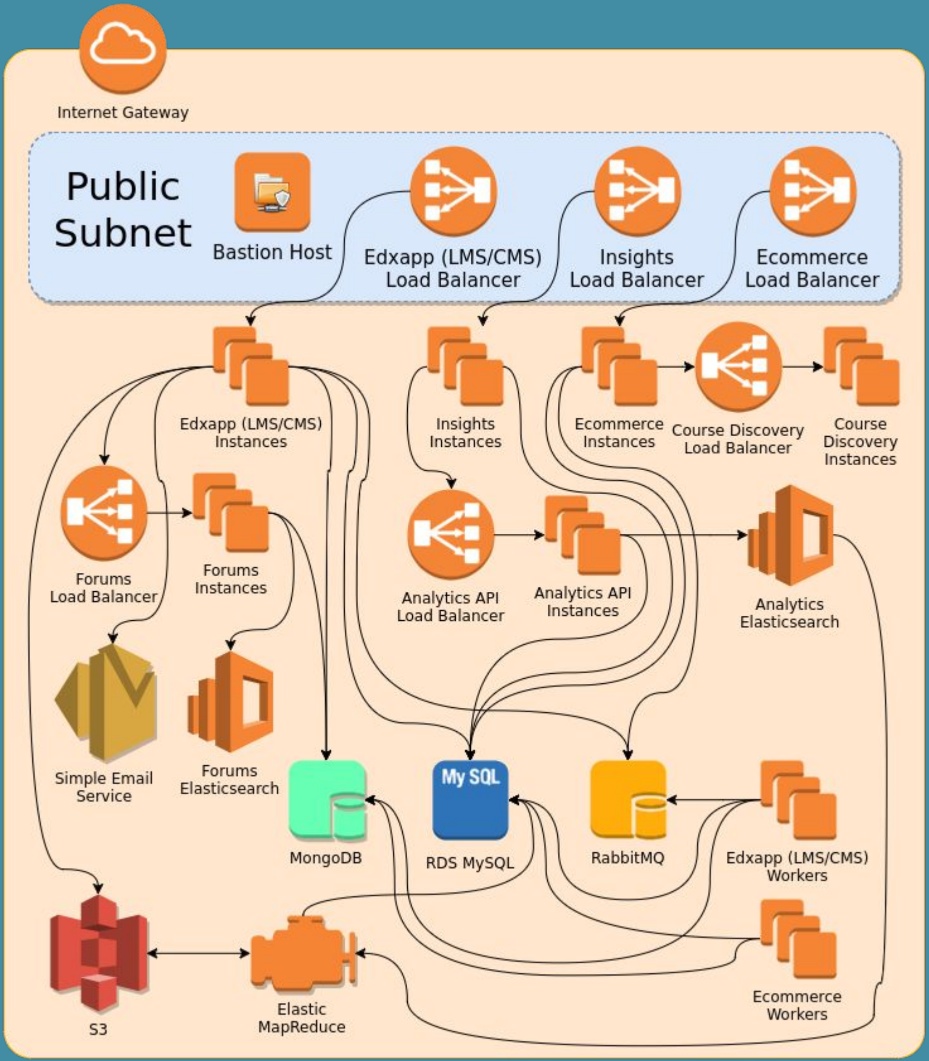
Well...



How do we make this smaller?

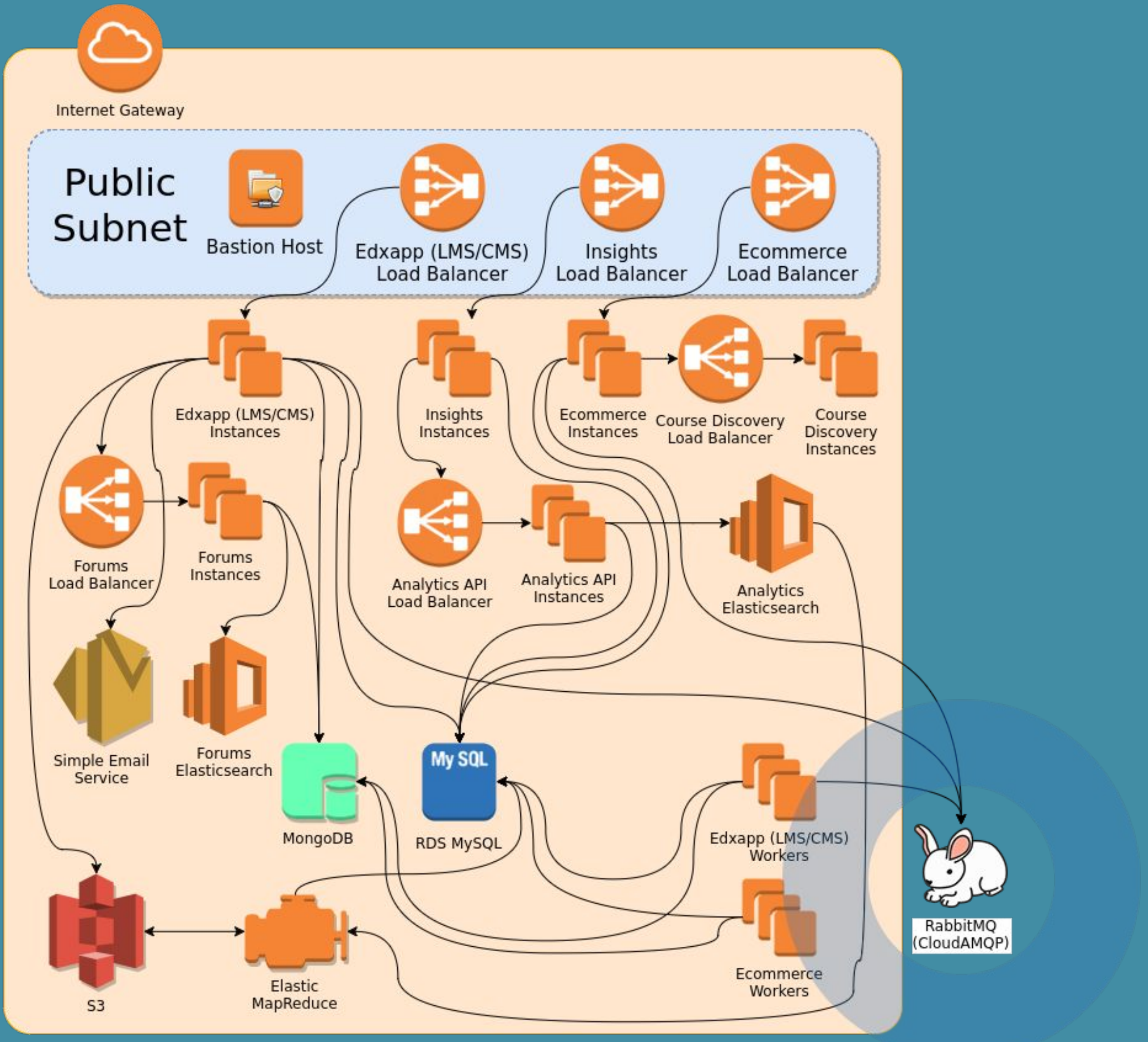
Well...



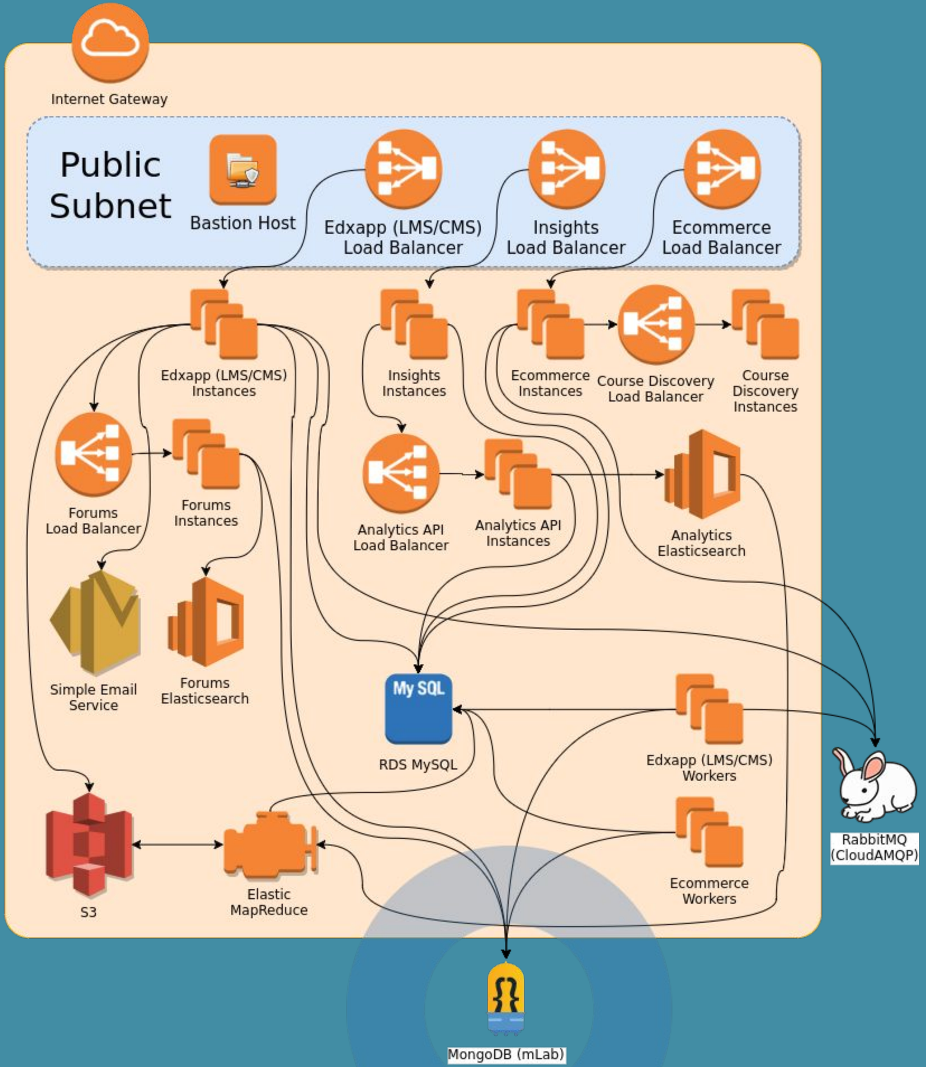
How do we make this smaller?

Maybe try the managed services again…?

External RabbitMQ...

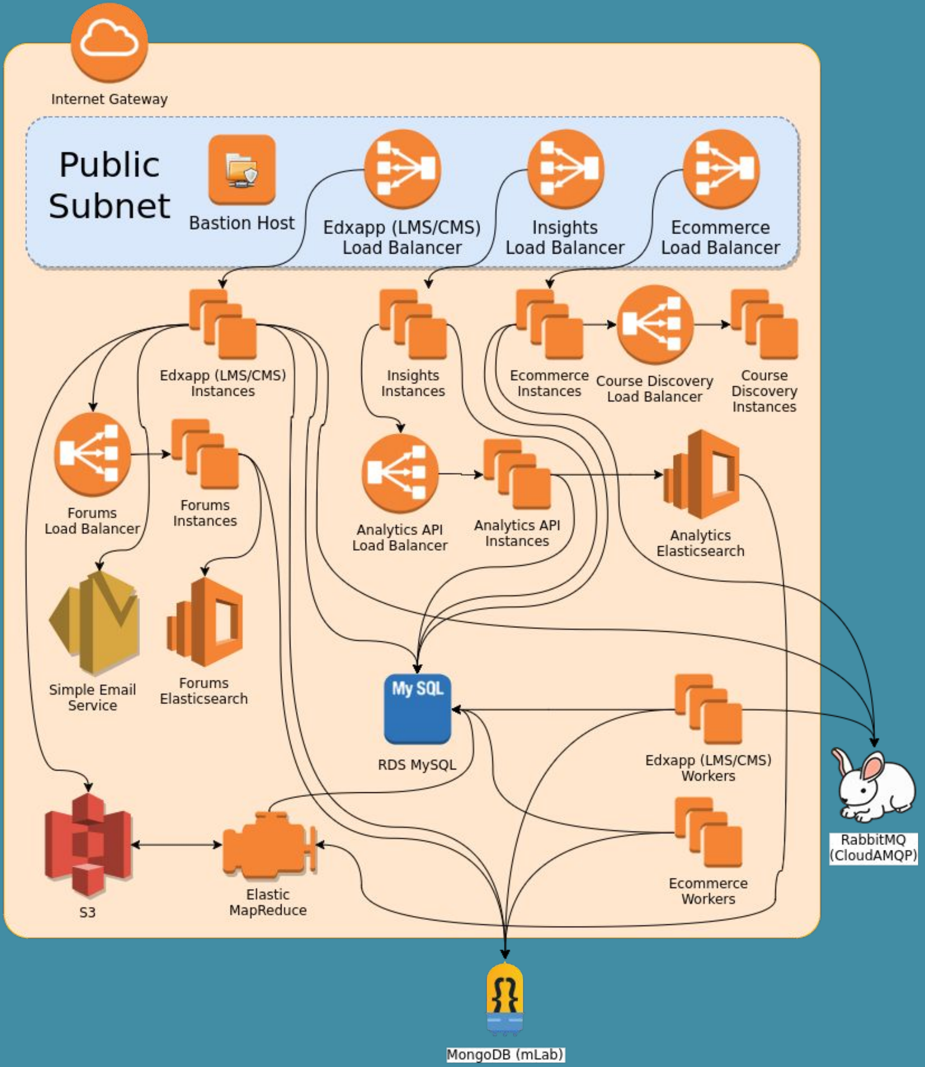


External MongoDB...



Hmm…

That didn't do very much….



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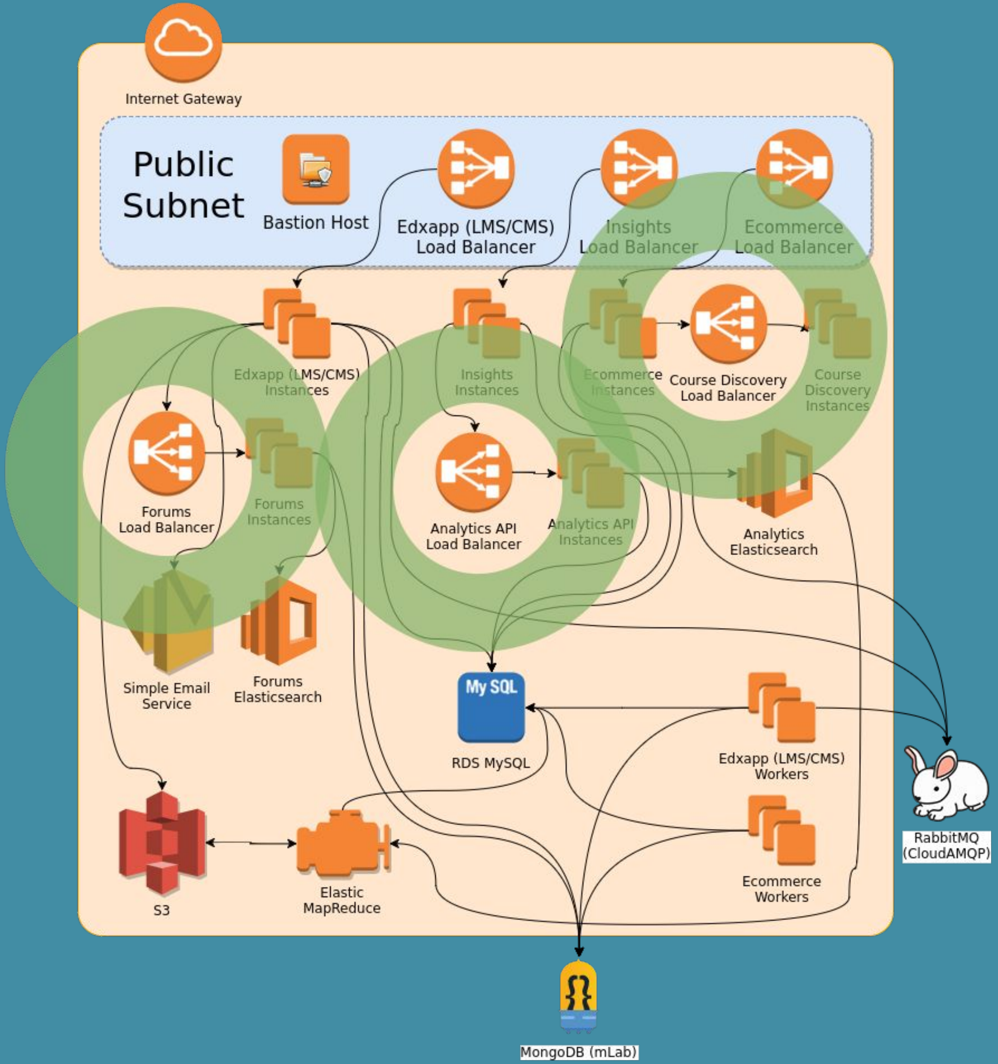
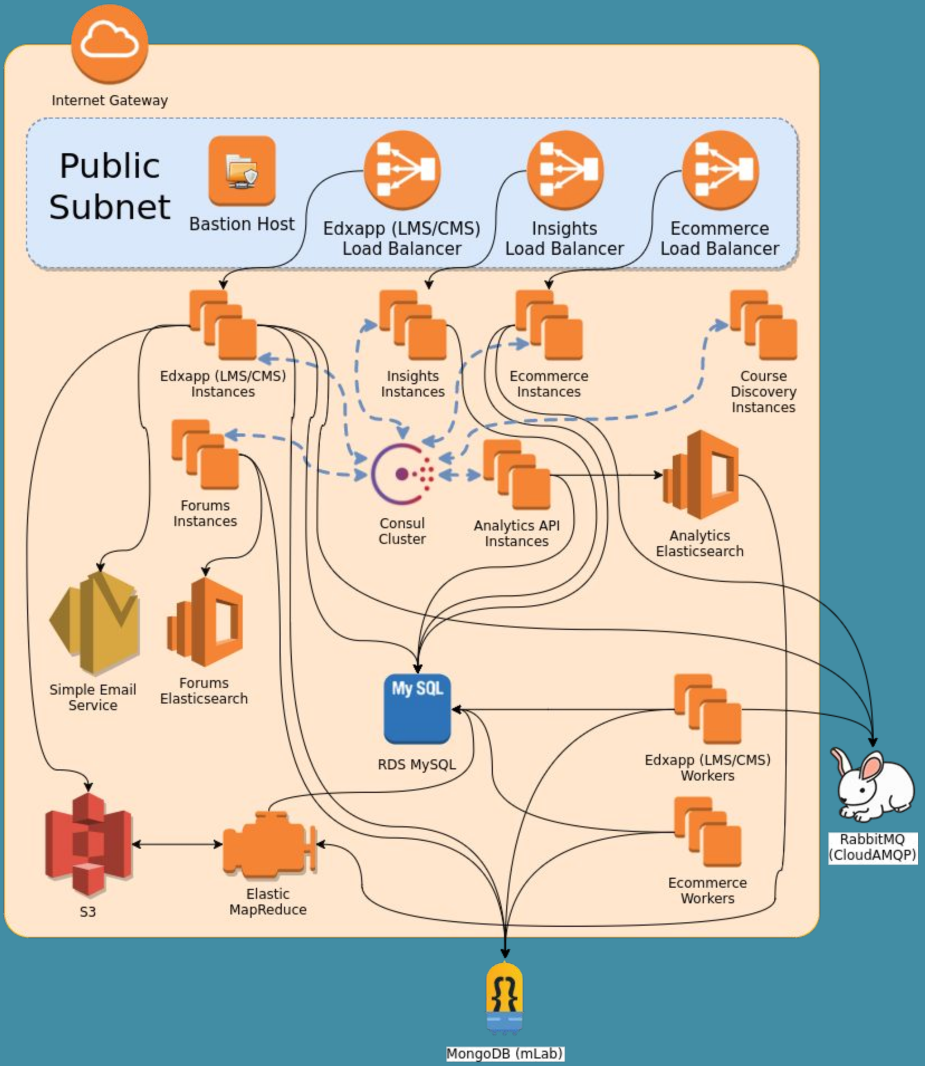


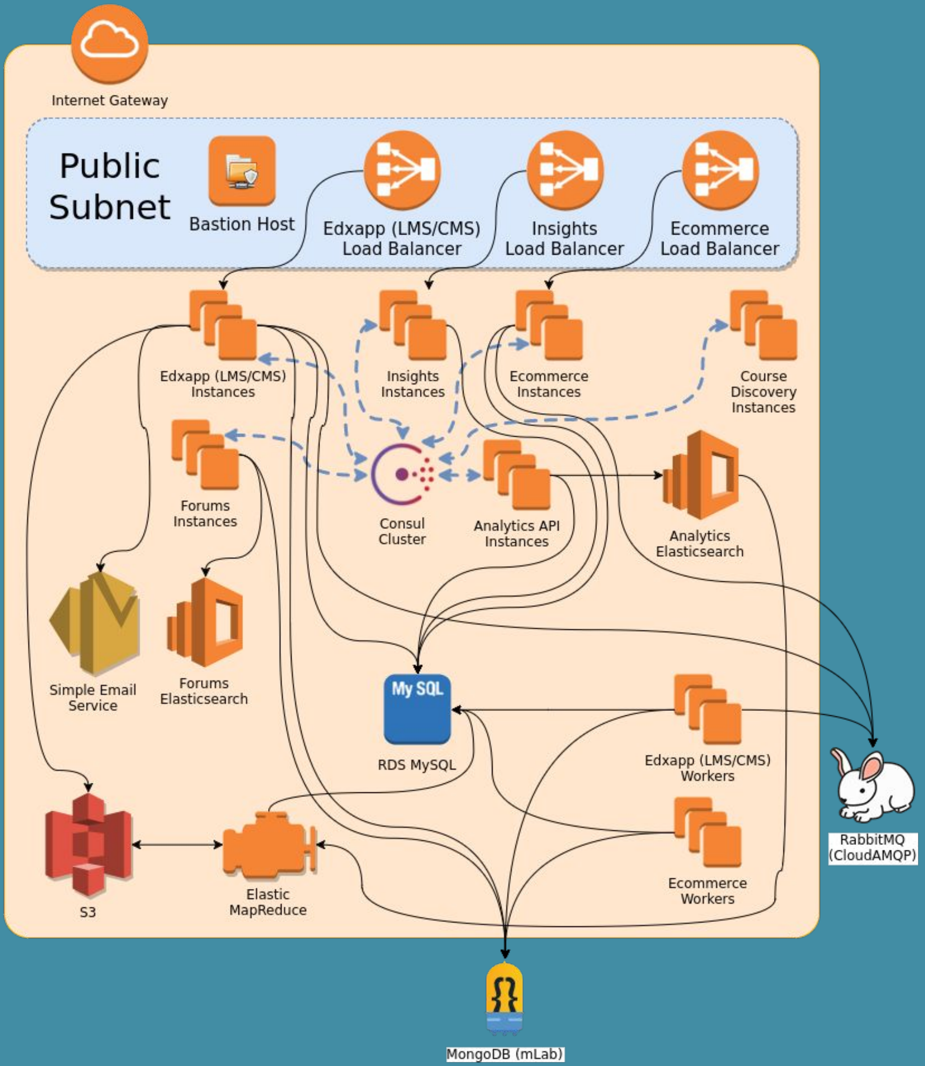
That didn't do very much….

But maybe we can replace all these load balancers…?

Service Discovery!



Service Discovery!



Very little benefit for a small deployment, though...

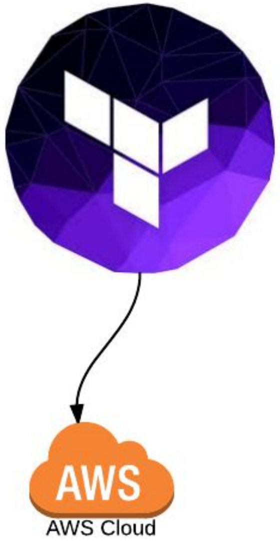
Managing Infrastructure

Tools

- For things that change slowly
  - Ansible Infrastructure Modules
  - Cloudformation
  - Terraform

Tools

- For things that change more often
    - Configuration Repo
    - Asgard
    - GoCD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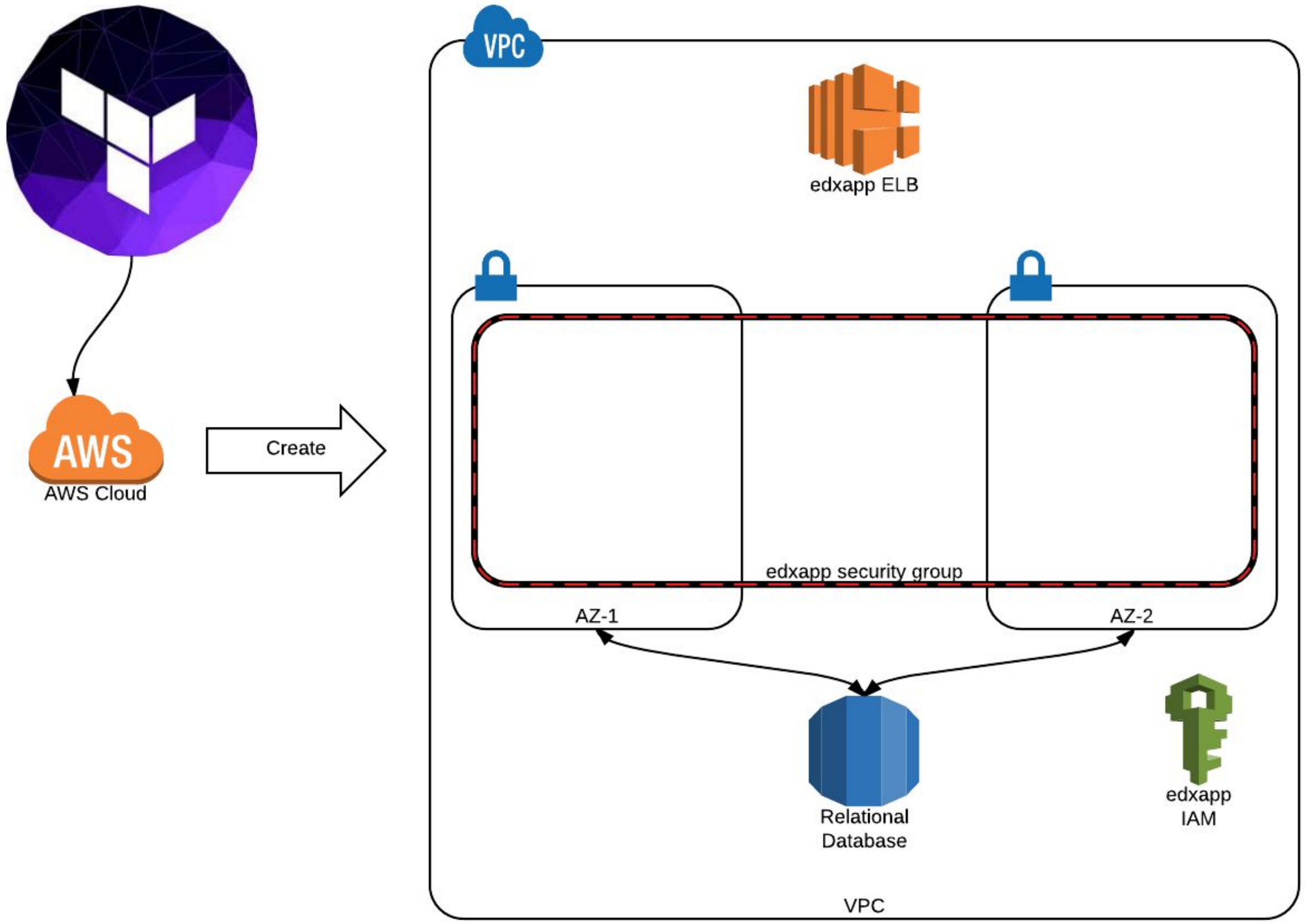
AWS Cloud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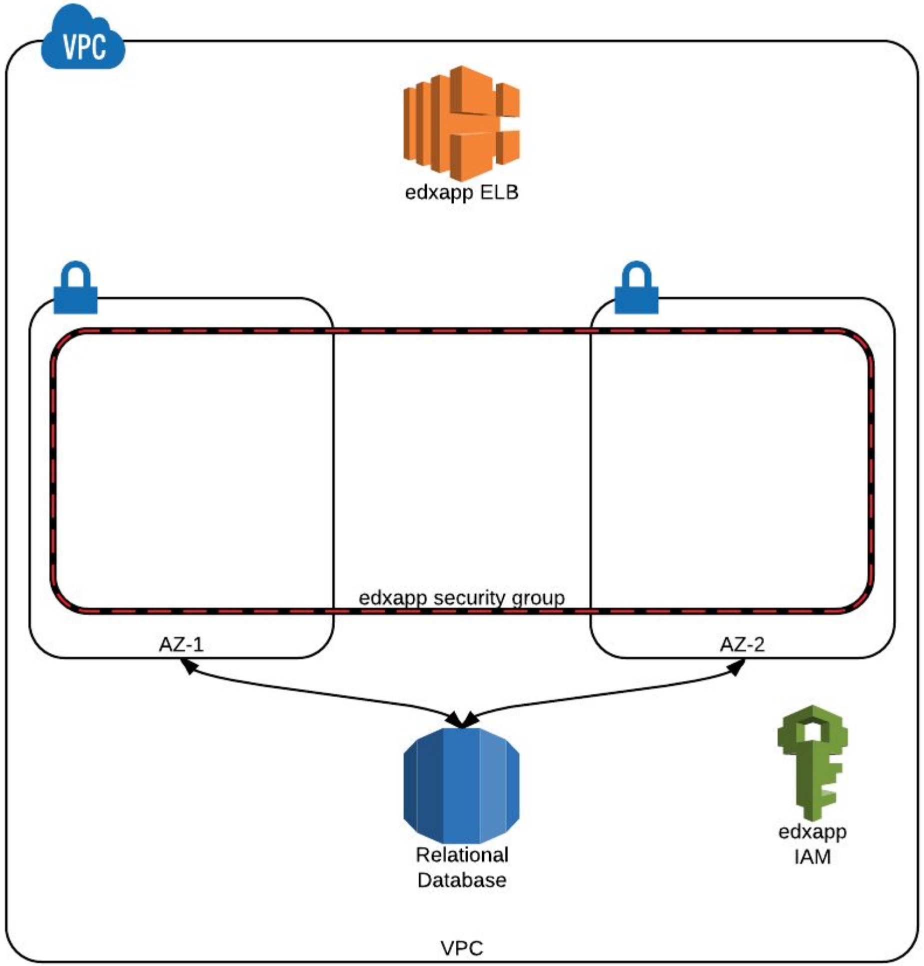
AWS Cloud
Create
VPC
edxapp ELB
edxapp security group
AZ-1
AZ-2
Relational
Database
edxapp
IAM
VPC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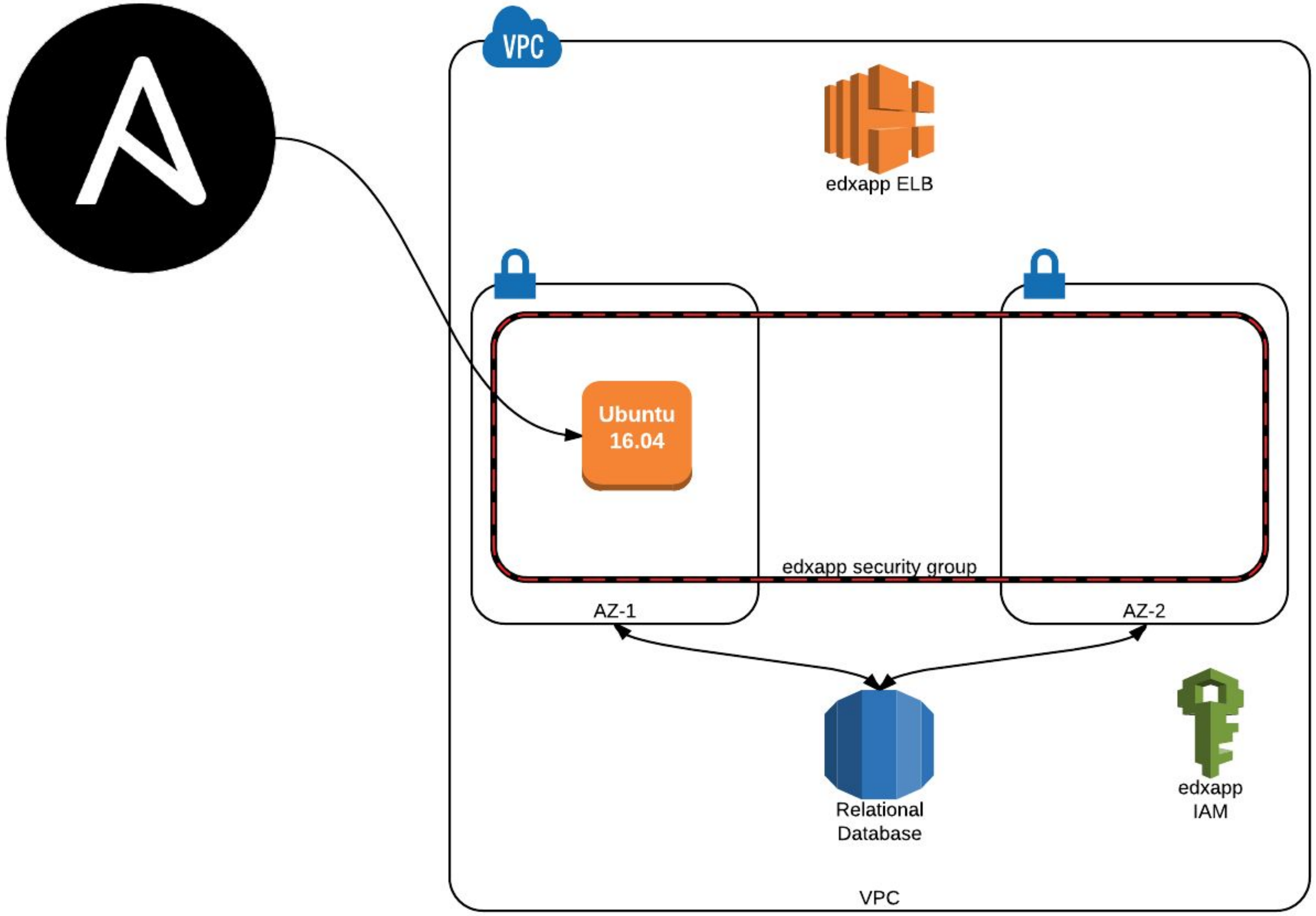
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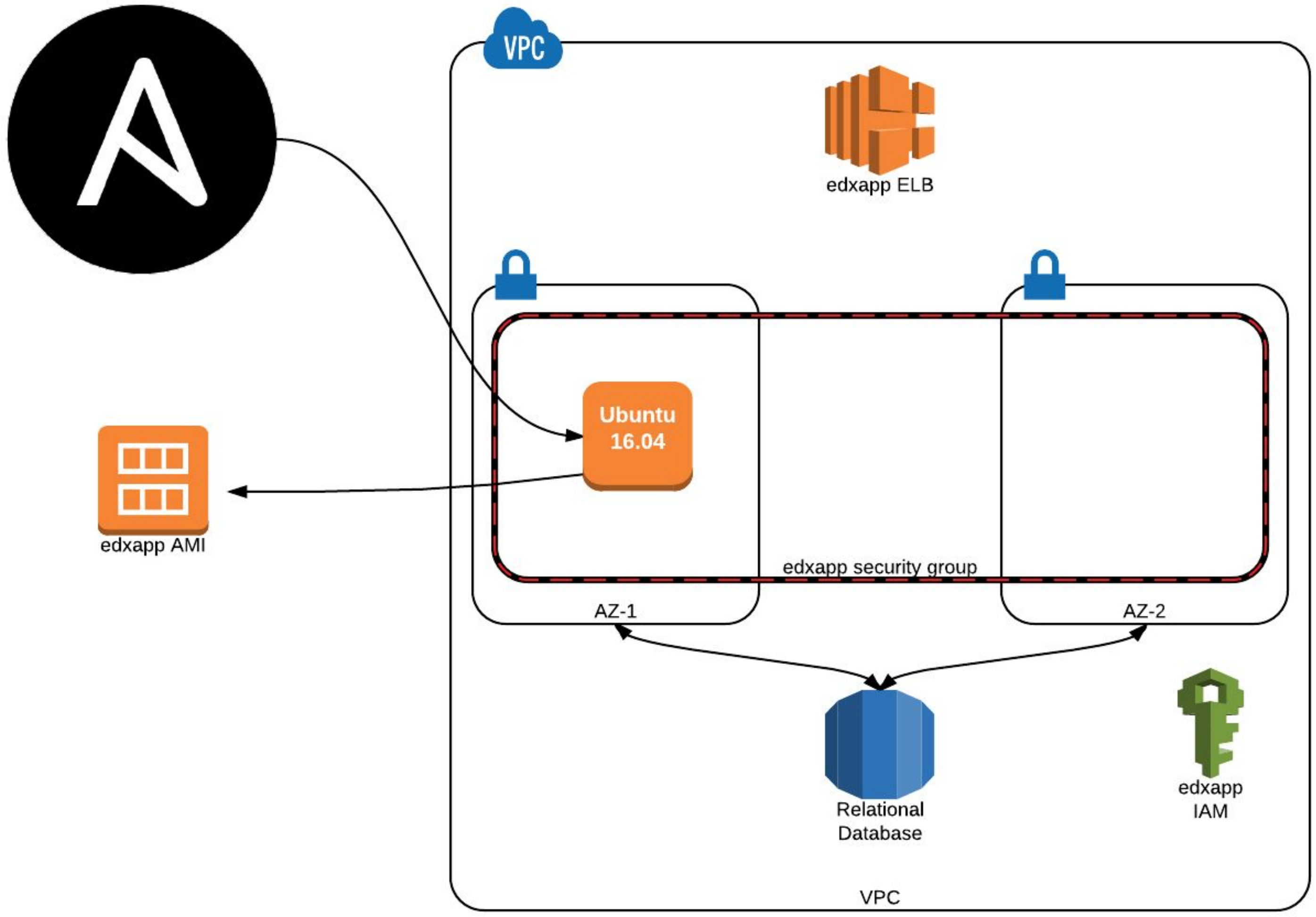
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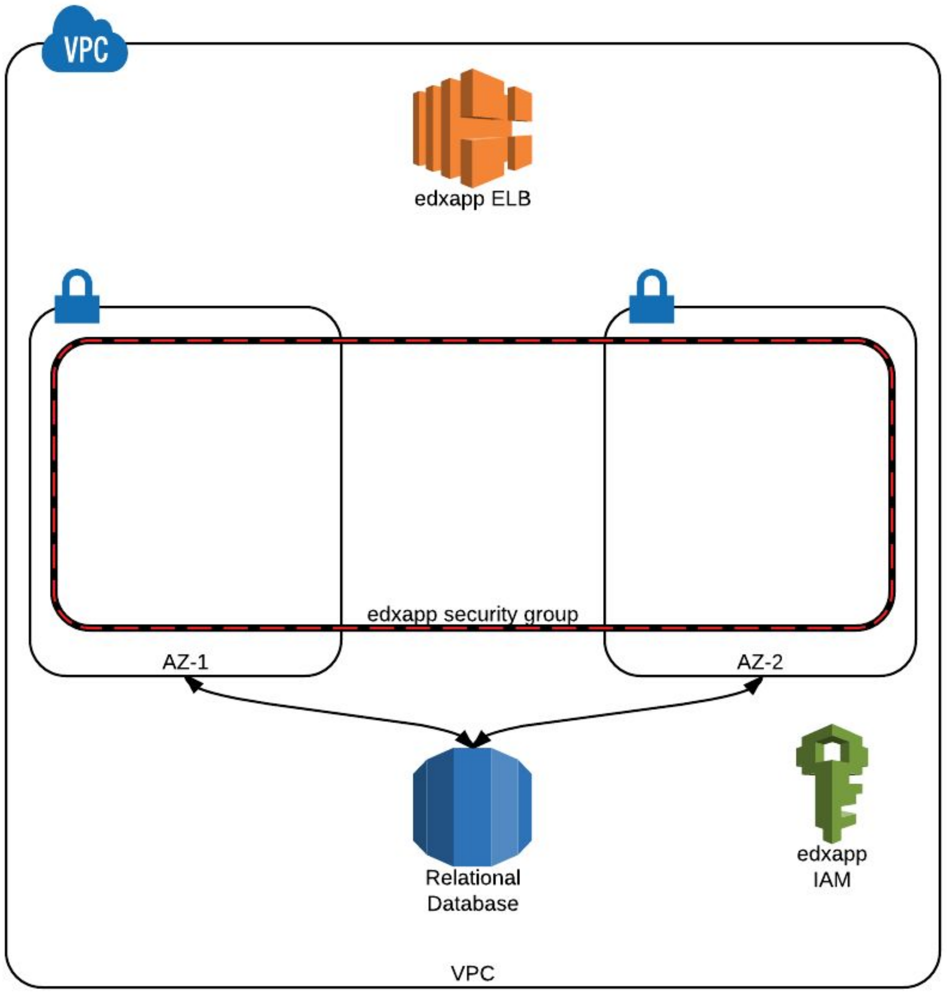
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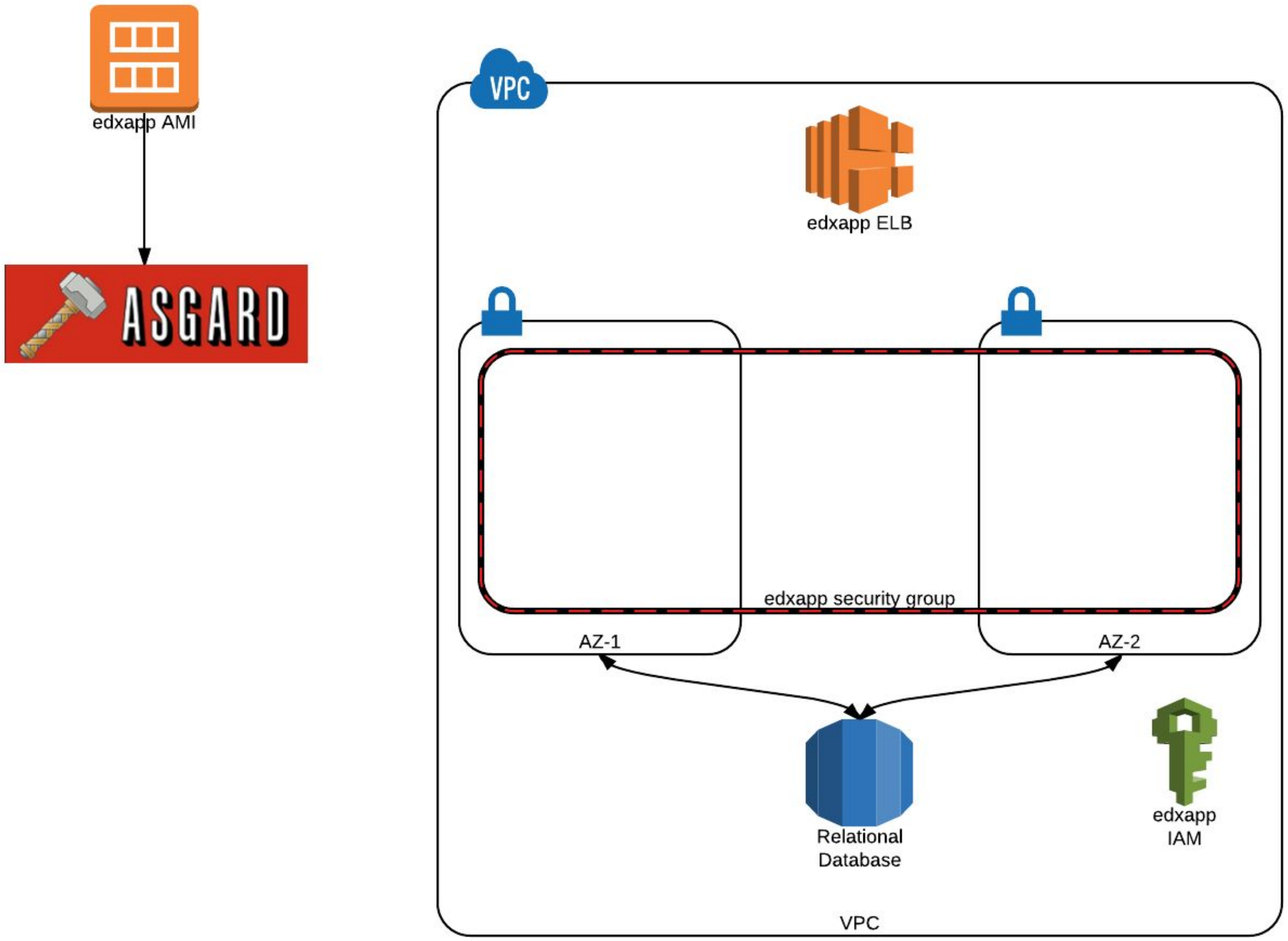
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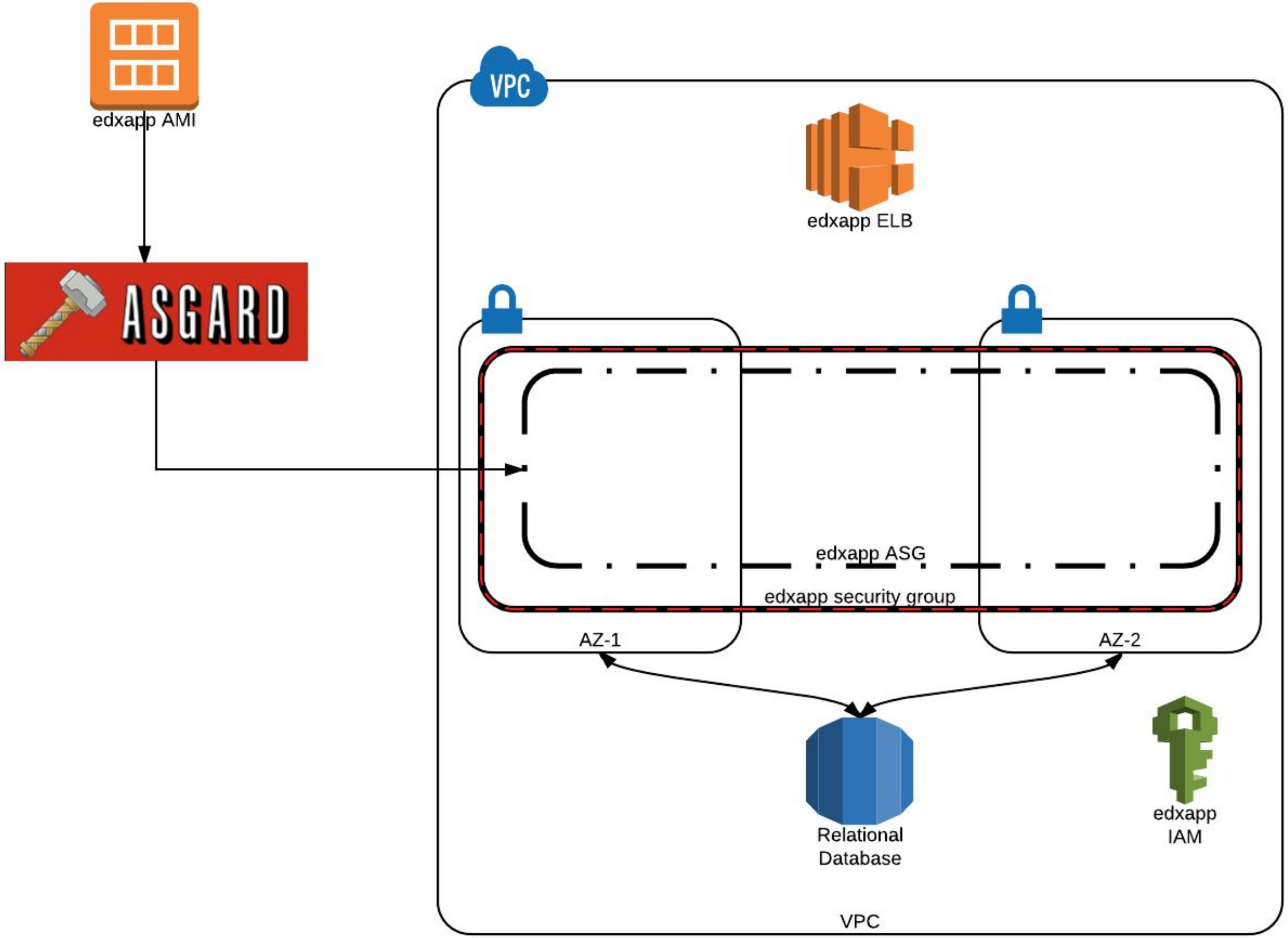
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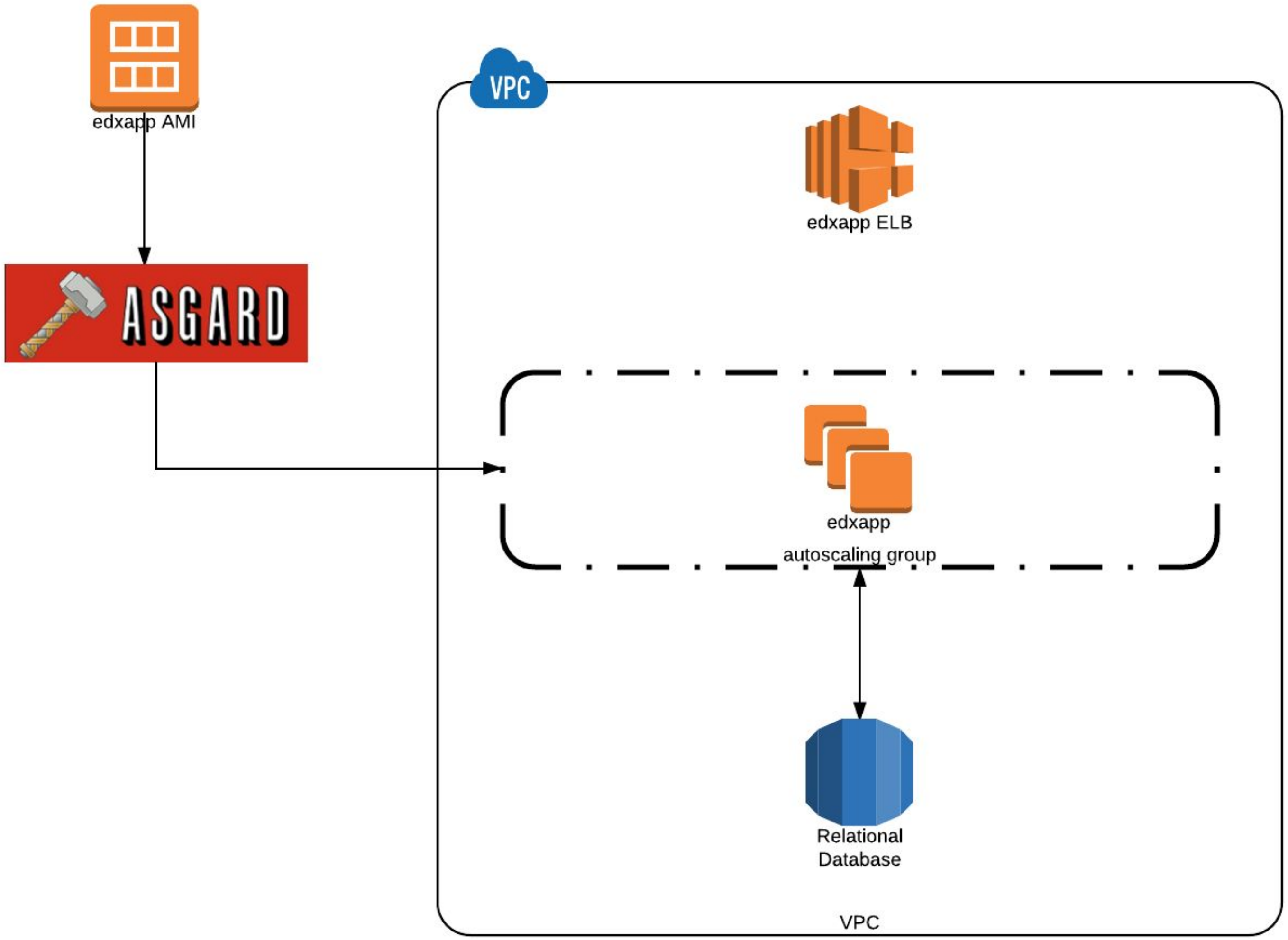
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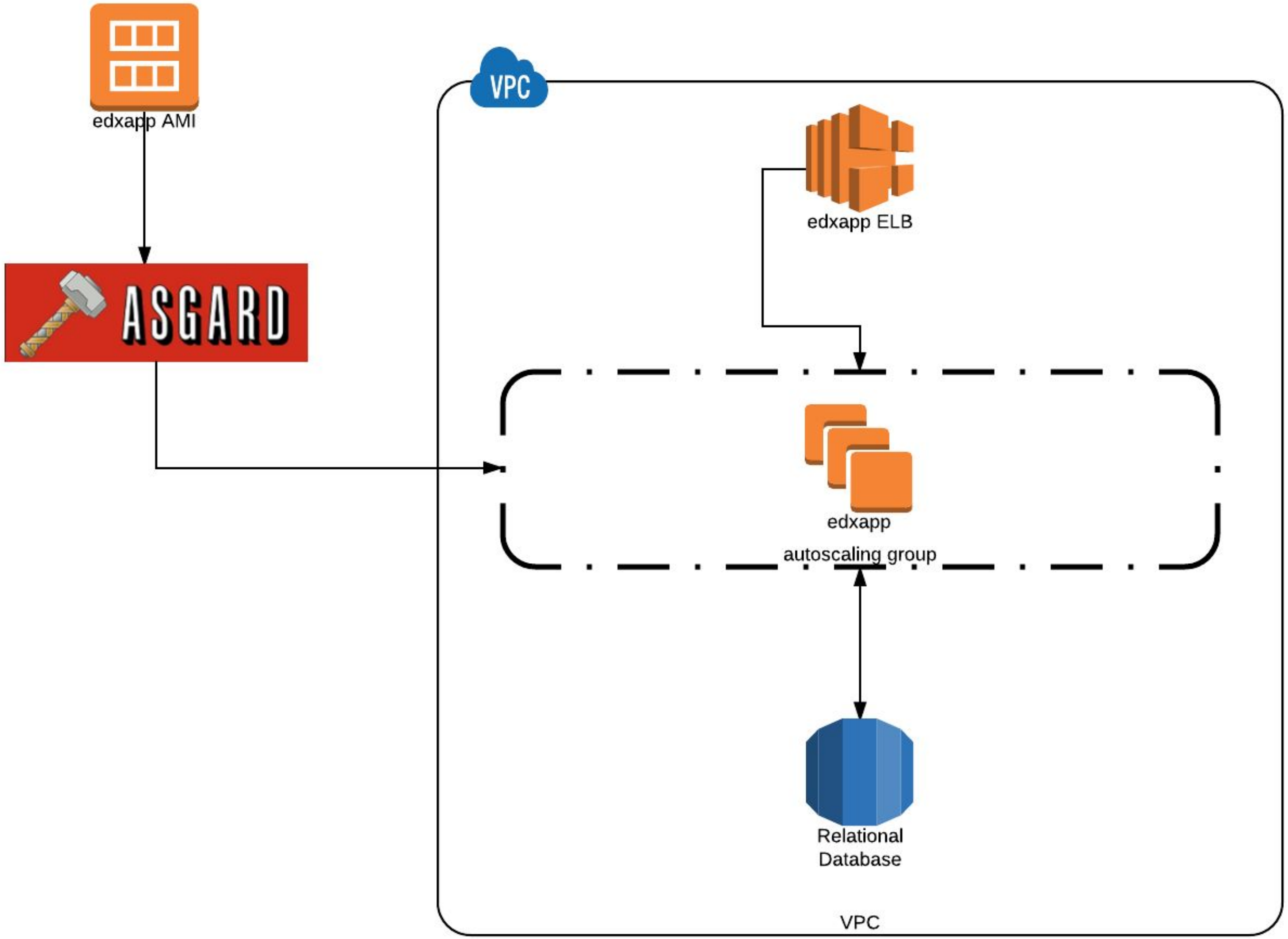
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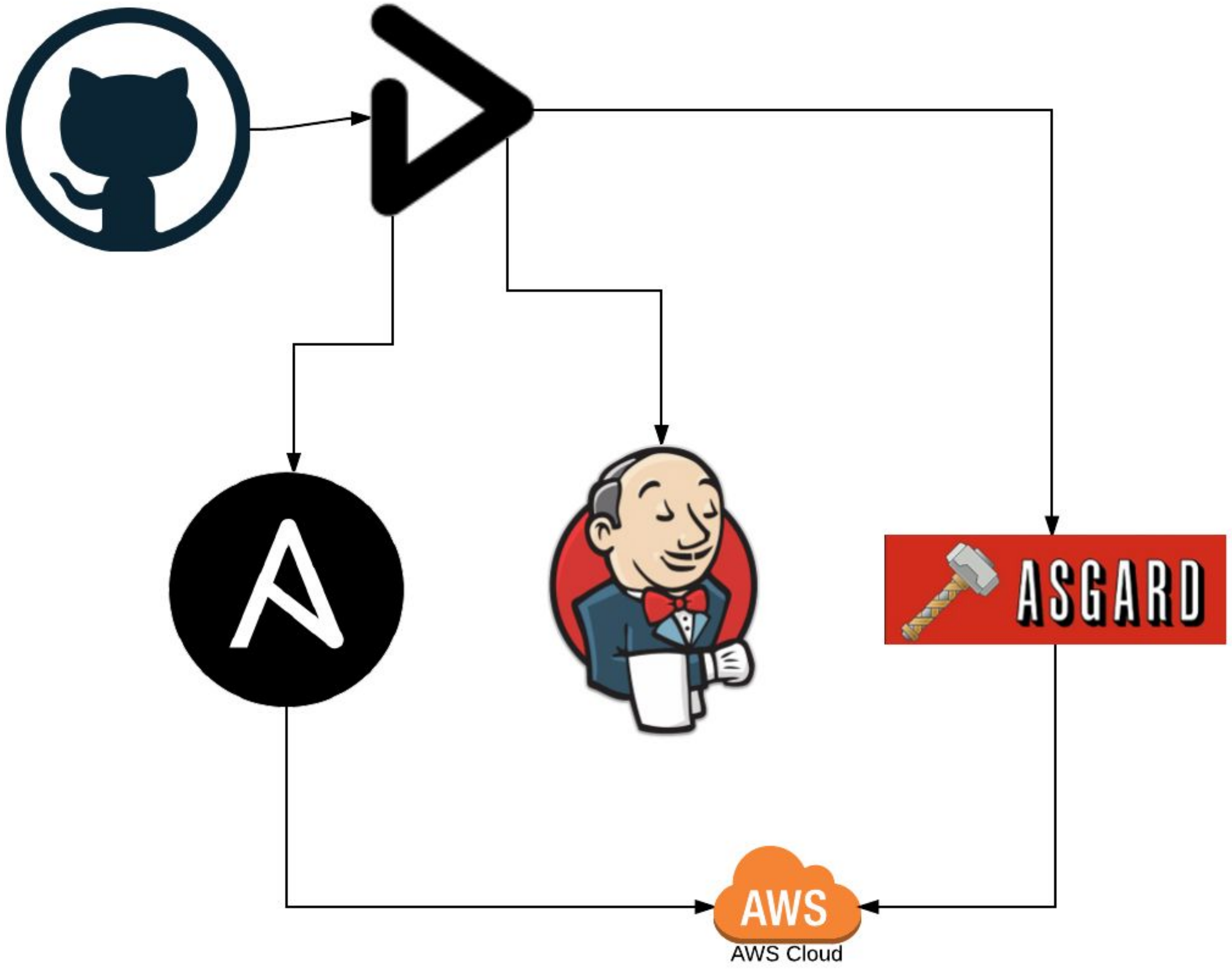
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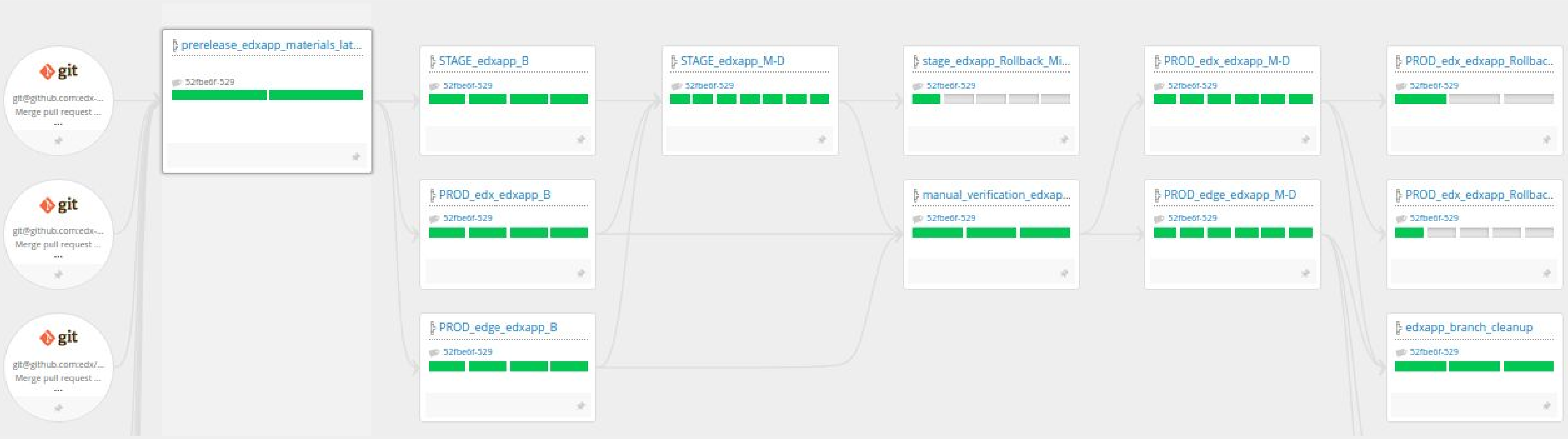
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Merge pull request ...
git
git@github.com:edx-...
Merge pull request ...
git
git@github.com:edx/...
Merge pull request ...
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STAGE_edxapp_B
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PROD_edx_edxapp_B
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PROD_edx_edxapp_Rollbac...
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edxapp_branch_cleanup
52fbe6f-529

Fork management tips

~~Fork management tips~~

The Four Horsemen Of Technical Debt

1. KEEP YOUR DIFFS SMALL

- Tiny stuff adds up quickly
- Investing upfront pays off here - deal with it *before* it's a problem
- Named release rebasing will start costing you a **fortune** otherwise
- **Huge diffs are simply a nightmare**

2. Upstream **Everything**

- Distribute the burden of Maintenance
  - Someone broke your feature’s tests?
  - They have to fix it before merging
- Build better software
  - Forces your architecture and code to be high quality
- Be a good citizen

3. Don’t edit **Ansible output**

- lms.env.json
- lms.auth.json
- cms.env.json
- cms.auth.json

- Do it like edX: **Use configuration management**
- These files may not always be the config destination
- edX configuration keeps up as the schema changes
- Things are actually much simpler this way

3. Don't edit **Ansible output**

- lms.env.json
- lms.auth.json
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- cms.auth.json

- Do it like edX: **Use configuration management**
- These files may not always be the config destination
- edX configuration keeps up as the schema changes
- Things are actually much simpler this way

3.5. Also, don't edit settings code directly

- lms/envs/common.py
- cms/envs/aws.py
- ...etc.

4. Avoid **template overrides** in themes

- Sometimes you have to do it
- ...but try to make style modifications as much as possible
- **Context changes** in views will have you fixing your templates every release

Questions?

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Not part of presentation: Cloud Agnostic Stack Choices

- The OpenEdx platform uses many off the shelf tools.
- You may want to use SaaS providers
  - Rabbit as a service
  - Mongo as a service
  - Elasticsearch as a service

Infrastructure as Code Options

The next 3 pages talk about different tools for managing infrastructure as code.

Ansible Modules

- Support
  - Number of Modules to manage ec2 resources is growing
  - Interfaces between modules not consistent
  - Modules not available for most other clouds
- Imperative nature
  - Great for orchestration
  - Bad for predicting what's going to happen
- If you're already using ansible, you don't have to learn a new tool

Cloudformation

- Declarative Syntax
  - Declare your resources in a file
  - Provide it to Cloudformation
  - Cloudformation ensures that all declared resources exist
- Con: Only works with AWS
- Con: Works best in one file
  - Can do multi files but is complicated
- Pro: Supports Planning for making changes
  - You update your template and it can show you what it will do to your resources

Terraform

- Similar in capability to current state of cloudformation
  - Declarative
  - Planning Capability
- Differences
  - Can easily span multiple files
  - Can work with multiple cloud providers
    - Provider plugin system is very flexible

GoCD: https://gocd.io

- Gomatic - DSL to make GoCD pipelines
  - https://github.com/edx/edx-gomatic/
  - https://github.com/edx/gomatic/tree/edx
- Tubular - Convenience scripts and utilities
  - Can be used independently of GoCD
  - https://github.com/edx/tubular

Configuration Repo

- Ansible playbooks for building App specific machines
- Optimized for separate machines per application
    - Though roles can be combined flexibly
- https://github.com/edx/configuration

Asgard

- Used to managed deployments at edX
- Allows for Imaged based blue/green deployments
- Con: No longer supported by Netflix
- https://github.com/edx/asgard