RSAConference2018
San Francisco | April 16–20 | Moscone Center

SESSION ID: CSV-R12

RED TEAM VS. BLUE TEAM ON AWS

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Zipwhip
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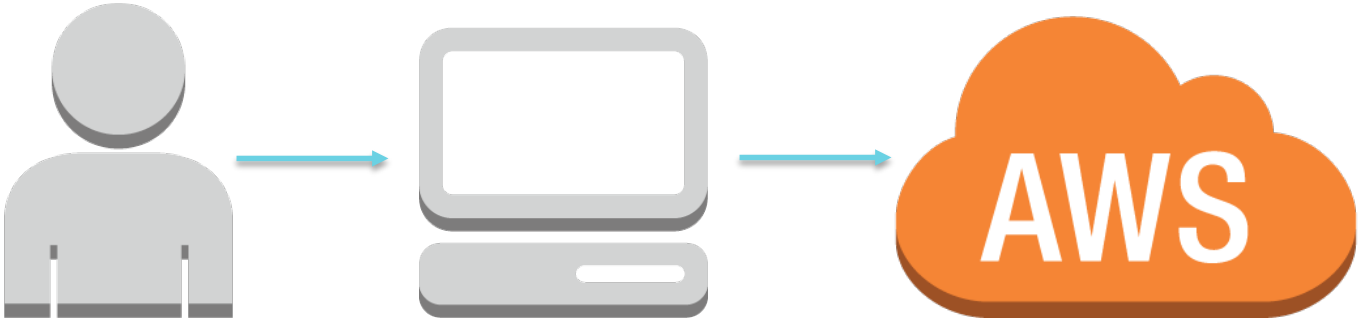
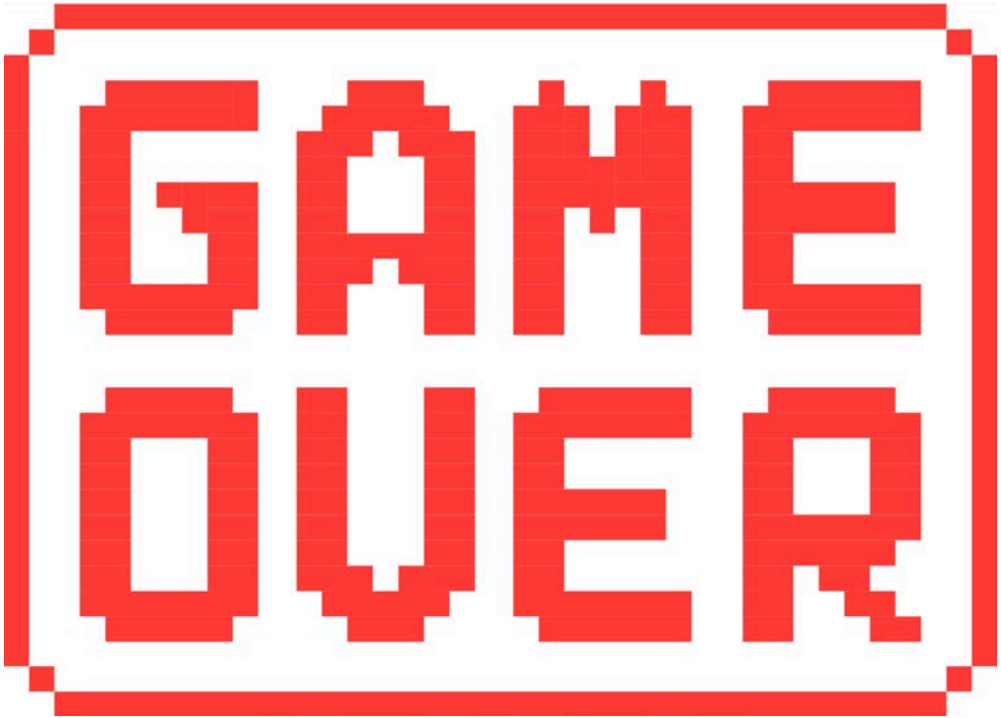
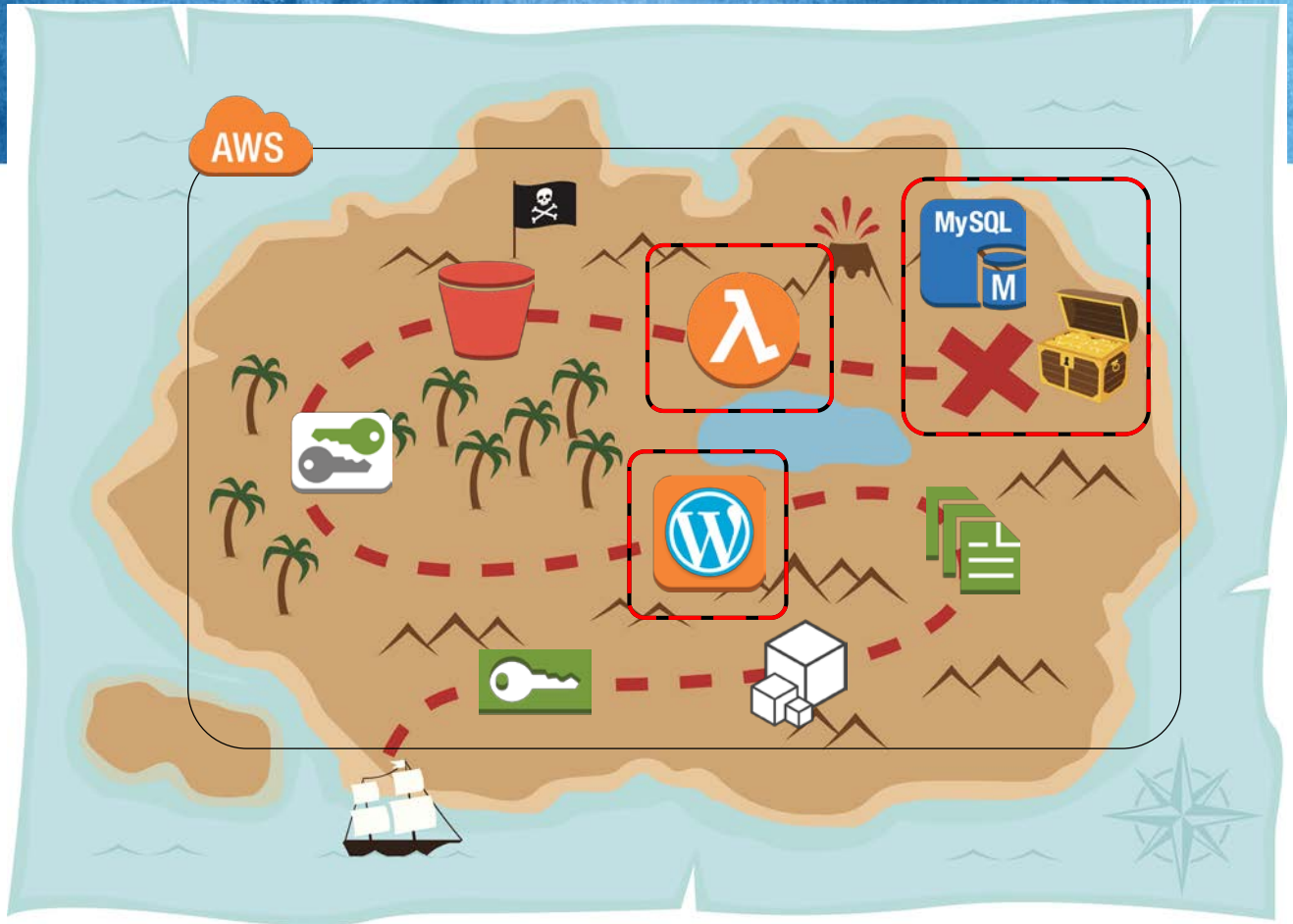
Attacker vs. Defender

Cloud Admin…Duh Duh Duh.



Would Be A Boring Talk…





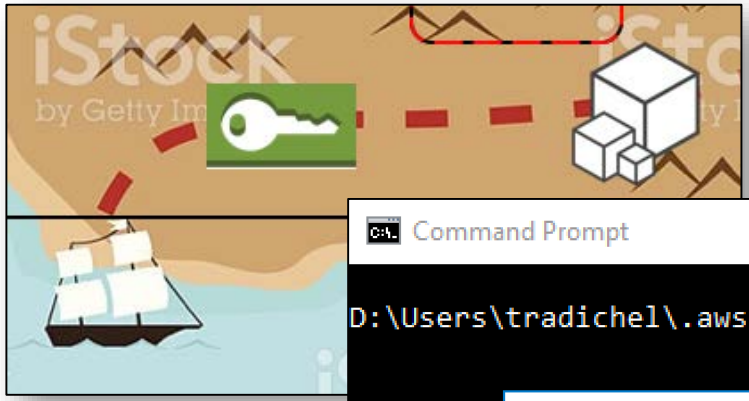
Instead…

Let's search for buried treasure!

Some background

- Initial Setup
  - Vanilla Account
    - Single Admin User
    - Base VPC & defaults
  - AWS Tutorial: Elastic Beanstalk with WordPress
    - https://docs.aws.amazon.com/elasticbeanstalk/latest/dg/php-hawordpress-tutorial.html
  - AWS Tutorial: Lambda Accessing RDS in VPC
    - https://docs.aws.amazon.com/lambda/latest/dg/vpc.html

Pilfer Credentials ~ Read Only Access



Command Prompt

```
D:\Users\tradichel\.aws>notepad .credentials
```

credentials - Notepad

File Edit Format View Help

```
[default]
aws_access_key_id = AKIAJRWIVY7NJ6UYCKEQ
aws_secret_access_key = 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
```

Look for RDS Databases

aws rds describe-db-instances --filter --query DBInstances[].[DBInstanceIdentifier,MasterUsername,DBSubnetGroup.VpcId,Endpoint.Address] --output=table --color off

supersecretdb?! That sounds like a good target…

Command Prompt

```
D:\Users\tradichel>aws rds describe-db-instances --filter --query DBInstances[].[DBInstanceIdentifier,MasterUsername,DBS
ubnetGroup.VpcId,Endpoint.Address] --output=table --color off
-------------------------------------------------------------------------------------------------------------
|                                                DescribeDBInstances                                        |
+-----------------+---------------+--------------+-----------------------------------------------------+
|  aa1fe08ildto0z5|  wordpresstest|  vpc-96c34cfe|  aa1fe08ildto0z5.cl5fcy9momq1.us-east-2.rds.amazonaws.com  |
|  supersecretdb  |  kolbyadmin   |  vpc-96c34cfe|  supersecretdb.cl5fcy9momq1.us-east-2.rds.amazonaws.com   |
+-----------------+---------------+--------------+-----------------------------------------------------+
```

Examine Selected Database Subnets

aws rds describe-db-instances --filter "Name=db-instance-id,Values=supersecretdb" --query DBInstances[].DBSubnetGroup.Subnets[].SubnetIdentifier --output table --color off

Hmm… let's check out: subnet-1ae9df57

Command Prompt

```
D:\Users\tradichel>aws rds describe-db-instances --filter "Name=db-instance-id,Values=supersecretdb" --query DB
Instances[].DBSubnetGroup.Subnets[].SubnetIdentifier --output table --color off
---------------------
|DescribeDBInstances|
+-------------------+
|  subnet-1ae9df57  |
|  subnet-d48c0fbc  |
+-------------------+
```

What Traffic Do NACLs Allow?

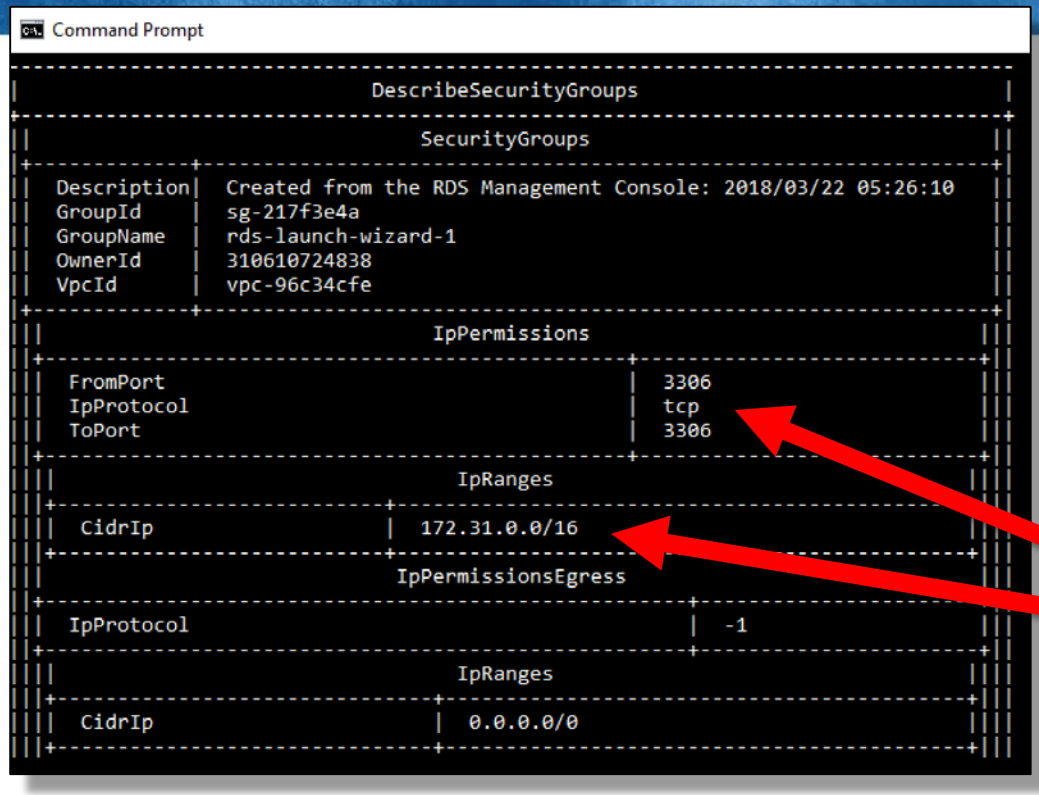
aws ec2 describe-network-acls --filter "Name=association.subnet-id,Values=subnet-1ae9df57" --query NetworkAcls[].Entries --output table --color off

All traffic allowed ~ Sweet.

Command Prompt

```
D:\Users\tradichel>aws ec2 desc e-network-acls --filter "Name=association.subnet-id,Values=subnet-1ae9df57" --query Ne
tworkAcls[].Entries --output tab --color off
-------------------------------------------------------------------
|                       DescribeNetworkAcls                       |
+-----------+---------+-----------+--------------+--------------+
| CidrBlock | Egress  | Protocol  | RuleAction   | RuleNumber   |
+-----------+---------+-----------+--------------+--------------+
|  0.0.0.0/0|  True   |  -1       |  allow       |  100         |
|  0.0.0.0/0|  True   |  -1       |  deny        |  32767       |
|  0.0.0.0/0|  False  |  -1       |  allow       |  100         |
|  0.0.0.0/0|  False  |  -1       |  deny        |  32767       |
+-----------+---------+-----------+--------------+--------------+
```

What Traffic Do DB Security Groups Allow?



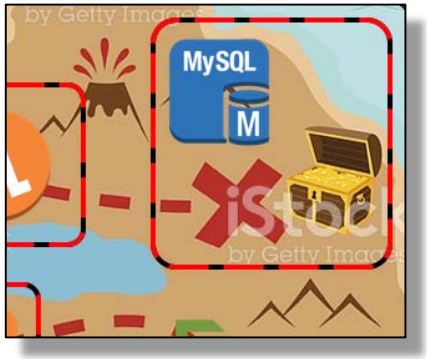
aws ec2 describe-security-groups --filter "Name=group-id,Values=sg-217f3e4a" --output table --color off

Port 3306

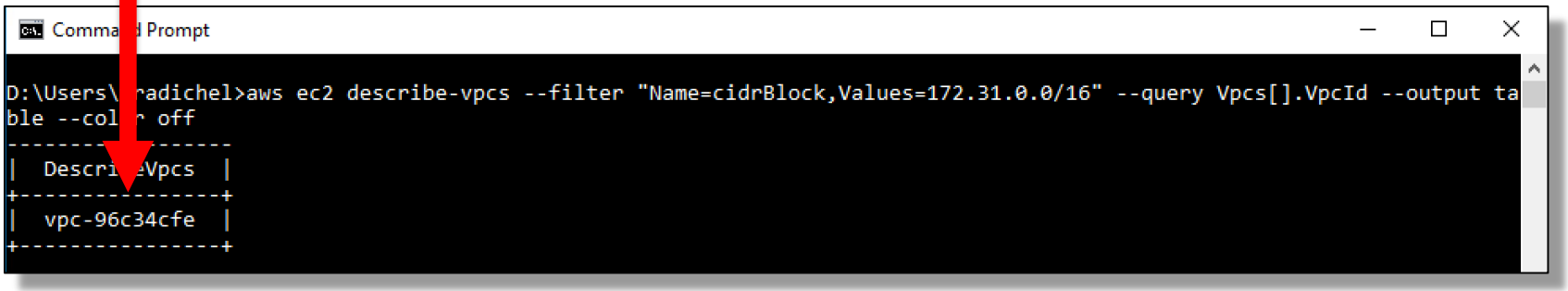
172.31.0.0/16

Find VPC With Access to Database

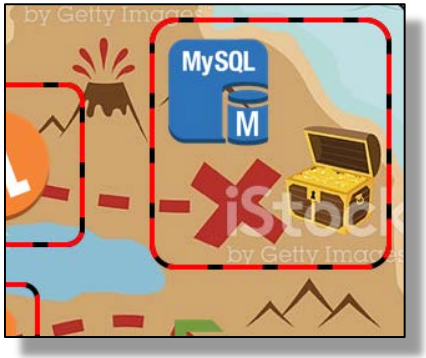
aws ec2 describe-vpcs --filter "Name=cidrBlock,Values=172.31.0.0/16" --query Vpcs[].VpcId --output table --color off



vpc-96c34cfe is assigned to CIDR 172.31.0.0/16



VPC Security Groups ~ 3306 Egress



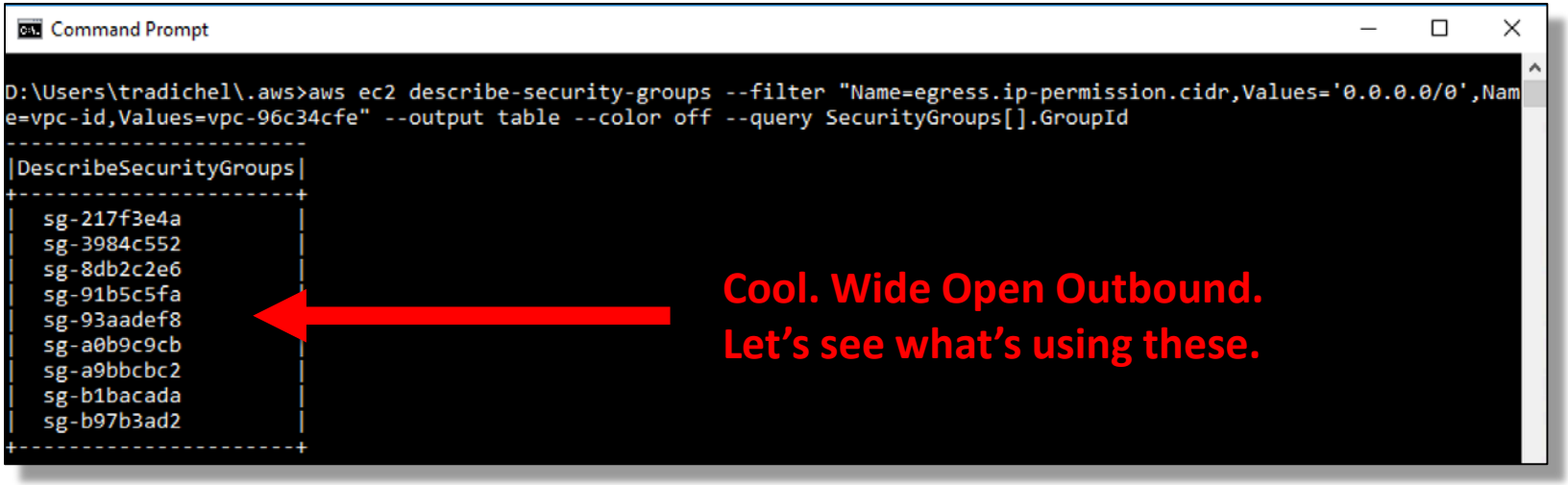
aws ec2 describe-security-groups --filter "Name=egress.ip-permission.to-port,Values=3306 Name=vpc-id,Values=vpc-96c34cfe" --output table --color off

None…hmm…

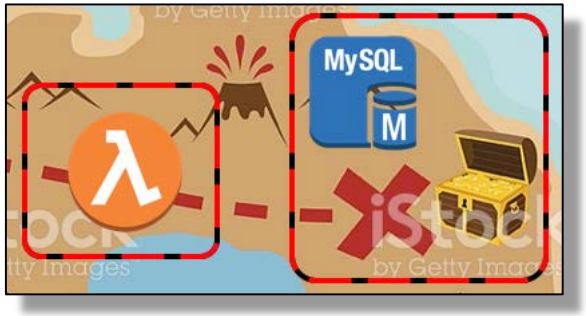
```
Command Prompt

D:\Users\tradichel\.aws>aws ec2 describe-security-groups --filter "Name=egress.ip-permission.to-port,Values=3306 Name=vp
c-id,Values=vpc-96c34cfe" --output table --color off
-----------------------
|DescribeSecurityGroups|
+----------------------+
```

Security Groups ~ No Outbound Restrictions

aws ec2 describe-security-groups --filter "Name=egress.ip-permission.cidr,Values='0.0.0.0/0',Name=vpc-id,Values=vpc-96c34cfe" --output table --color off --query SecurityGroups[].GroupId



Check Lambda Functions



aws lambda list-functions --query Functions[?VpcConfig.SecurityGroupIds==[`sg-93aadef8`]].FunctionName --output table --color off

Command Prompt

```
D:\Users\tradichel\.aws>aws lambda list-functions --query Functions[?VpcConfig.SecurityGroupIds==[`sg-93aadef8`]].Functi
onName --output table --color off
-------------------------------------
|             ListFunctions         |
+-----------------------------------+
|  CreateTableAddRecordsAndRead     |
+-----------------------------------+
```

Query Lambda Code Location

aws lambda get-function --function-name CreateTableAddRecordsAndRead --query Code.Location

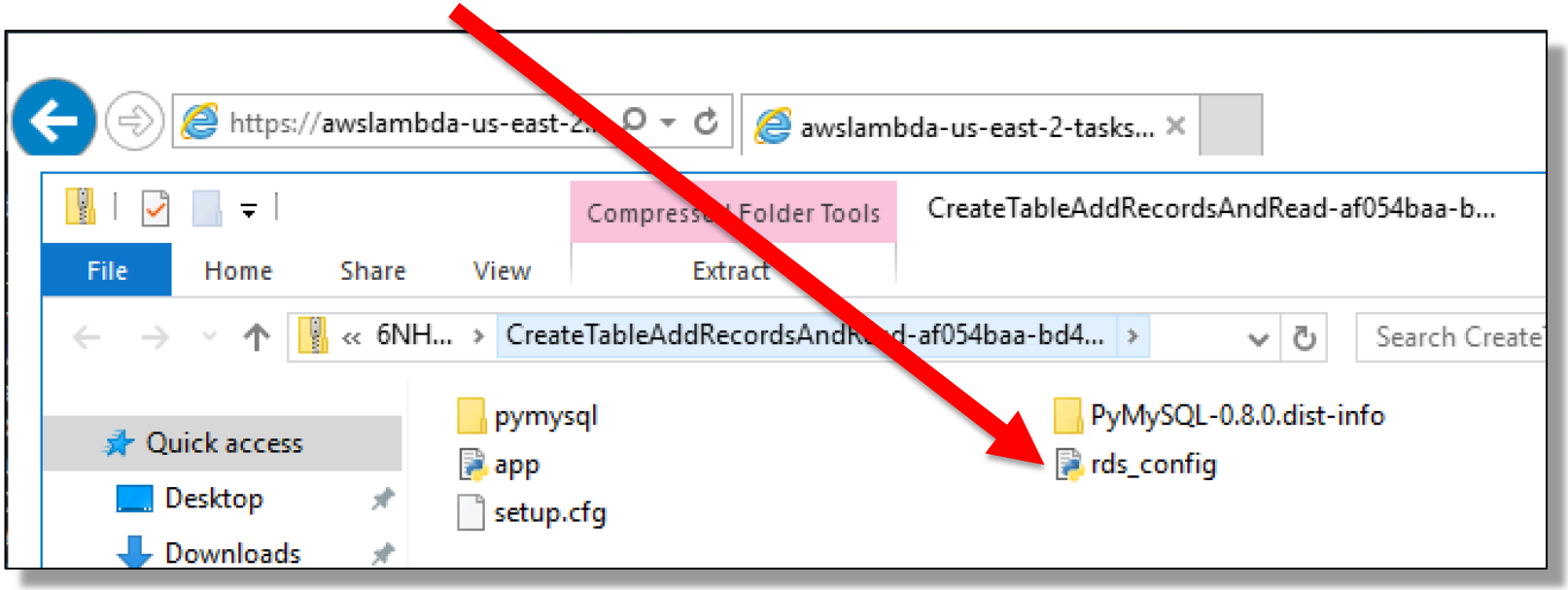
Gives us URL to code location in S3…

Command Prompt

```
D:\Users\tradichel\.aws>aws lambda get-function --function-name CreateTableAddRecordsAndRead --query Code.Location
"https://awslambda-us-east-2-tasks.s3.us-east-2.amazonaws.com/snapshots/310610724838/CreateTableAddRecordsAndRead-af054b
aa-bd47-414d-bd56-54ed119cd6f8?versionId=jBCcttupPkmmceMPTJn_c3RgrsJnGn6r&X-Amz-Security-Token=FQoDYXdzECQaDPOQBfxx1bL3a
fb5mSK3A%2BqmipSSsGqJzxXZwQg1w9DRVrt2bY9GbgxT9D73PydpgXo4GR6uaQjdHRQmxnU%2F27fDQ9KvTjVLKoGPEGoayleVkzgZpPVVevo4OvO4gZ3SS
C8exKeqLFUi5NPSfjuOLID%2BdZJxvE60qoB2XWWs1gM8wuyZgNP26Yb4pdHqObXVxXxbnigZwo0GOmlrVIvQWZH%2FgymxPQN22DG%2F1sY%2FeUA3mhKOE
UqgEzor0iMMMa3vkZFV2bdrWjcSutTt5XtFFmKSNwWAdnO%2Bslj28jp9Sca50D3o58o%2F%2FLpRq8gvP82WxmbzYjnX9yVGwMqjfxQyK%2FDt%2BUiY3J4
VM%2B4B6PF4oXEA0Mkxjhh6SXBqZS8ma2hAmkQUI%2FCSHb21EWbbzS9MYEVLrDvDQBzyhqvWx%2FlR%2B1jZ7TaD3BdO8WWEo8JxR8i%2BDuRCjq2yTkLBL
WCULUzr6ybChufIfRHSTNdl5ikMdEwXRO4CWQuSi1i61QHVYQKhhDMEmeOEFsLAkCMk0ACmf9adrG0Iz5W5L2PWBxQ7DLjcQ3Nu3xpyFxMETVvNuU1%2BrMn
1YTCgvQnQiKwOpbvzgbi%2BLypFjvwo%2F9vR1QU%3D&X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Date=20180323T043812Z&X-Amz-SignedHea
ders=host&X-Amz-Expires=600&X-Amz-Credential=ASIAI6UZQFNPGFJYM4XA%2F20180323%2Fus-east-2%2Fs3%2Faws4_request&X-Amz-Signa
ture=a322f24da64b08be598484198eb75da5b761c3f629e909503d4b03c213aa4ba5"
```

Go To URL…Check out the code

Hmm, what's in this file?



About that rds_config file…

Oops. Database credentials.

rds_config - Notepad

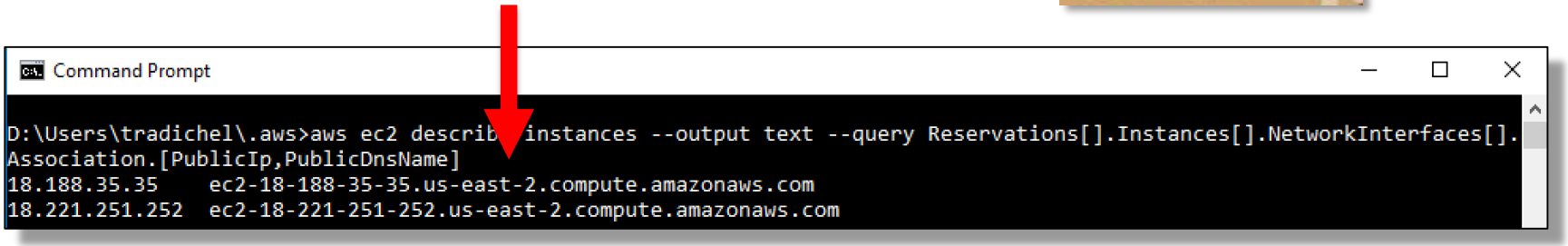
File Edit Format View Help

```
db_username = "lambdauser"db_password = "@ccess!1"db_name = "supersecretdb"
```

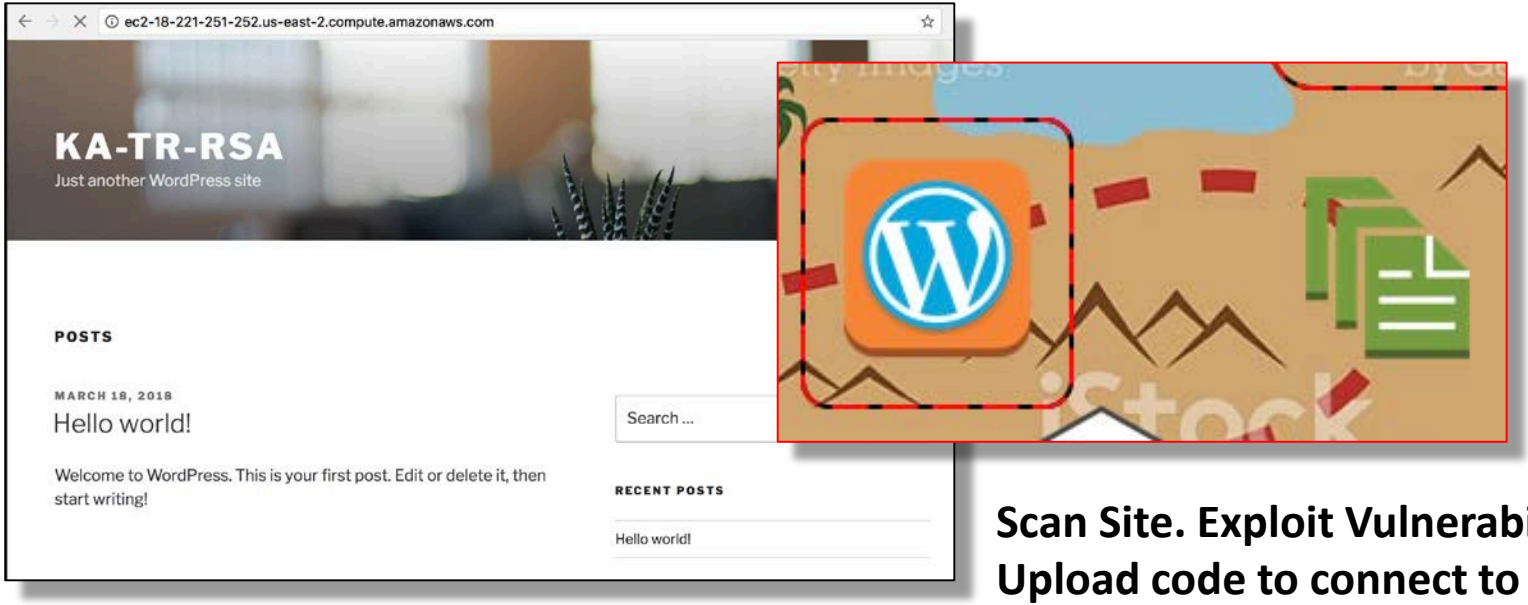
Look for Instances That Can Exfil

aws ec2 describe-instances --output text --query Reservations[].Instances[].NetworkInterfaces[].Association.[PublicIp,PublicDnsName]

Check the domains in a browser to find web sites.



Exploit Web Site and Exfil



Scan Site. Exploit Vulnerability.
Upload code to connect to DB.
Publish to public web site.

IAM Best Practices

- Roles
- Least Privilege
- Segregation of Duties
- IAM Top 10

Protecting Credentials

- User training ~ Phishing and handling of credentials
- Password policies and rotation
- MFA!!
- Require frequent re-auth – especially to sensitive apps
- Prevent deployment of code with embedded credentials
  https://github.com/awslabs/git-secrets

IAM Configuration

WOW THAT IS A LOT OF YAML!!

https://github.com/allenk1/2018rsapresentation/blob/master/Default-IAM-Profile.yaml

IAM Master - Initial Roles

```
Sid: AllowUserstoListAccounts
Effect: Allow
Action:
- "iam:ListAccountAliases"
- "iam:ListUsers"
- "iam:GetAccountPasswordPolicy"
- "iam:GetAccountSummary"
Resource: "*"
```

- Allows users to view enough information to get into IAM
- Can get the PW Policy ←IMPORTANT so it can apply
- List Users – needed in order to find themselves

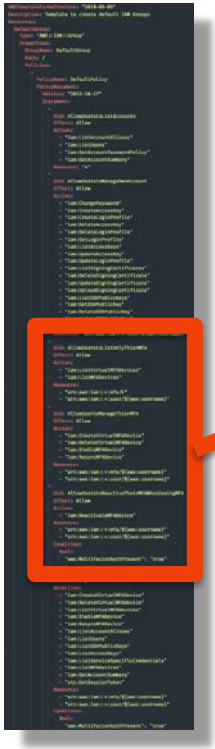
IAM Master - Initial Roles

```
Sid: AllowUserstoManageOwnAccount
Effect: Allow
Action:
- "iam:ChangePassword"
- "iam:CreateAccessKey"
- "iam:CreateLoginProfile"
- "iam:DeleteAccessKey"
- "iam:DeleteLoginProfile"
- "iam:GetLoginProfile"
- "iam:ListAccessKeys"
- "iam:UpdateAccessKey"
- "iam:UpdateLoginProfile"
- "iam:ListSigningCertificates"
- "iam:DeleteSigningCertificate"
- "iam:UpdateSigningCertificate"
- "iam:UploadSigningCertificate"
- "iam:ListSSHPublicKeys"
- "iam:GetSSHPublicKey"
- "iam:DeleteSSHPublicKey"
- "iam:UpdateSSHPublicKey"
- "iam:UploadSSHPublicKey"
Resource: "arn:aws:iam::*:user/${aws:username}"
```

Actions allow users to manage their account – BUT NOT PERMISSIONS

Resource only allows them to perform on their username – can't modify anyone else

IAM ~ User Roles

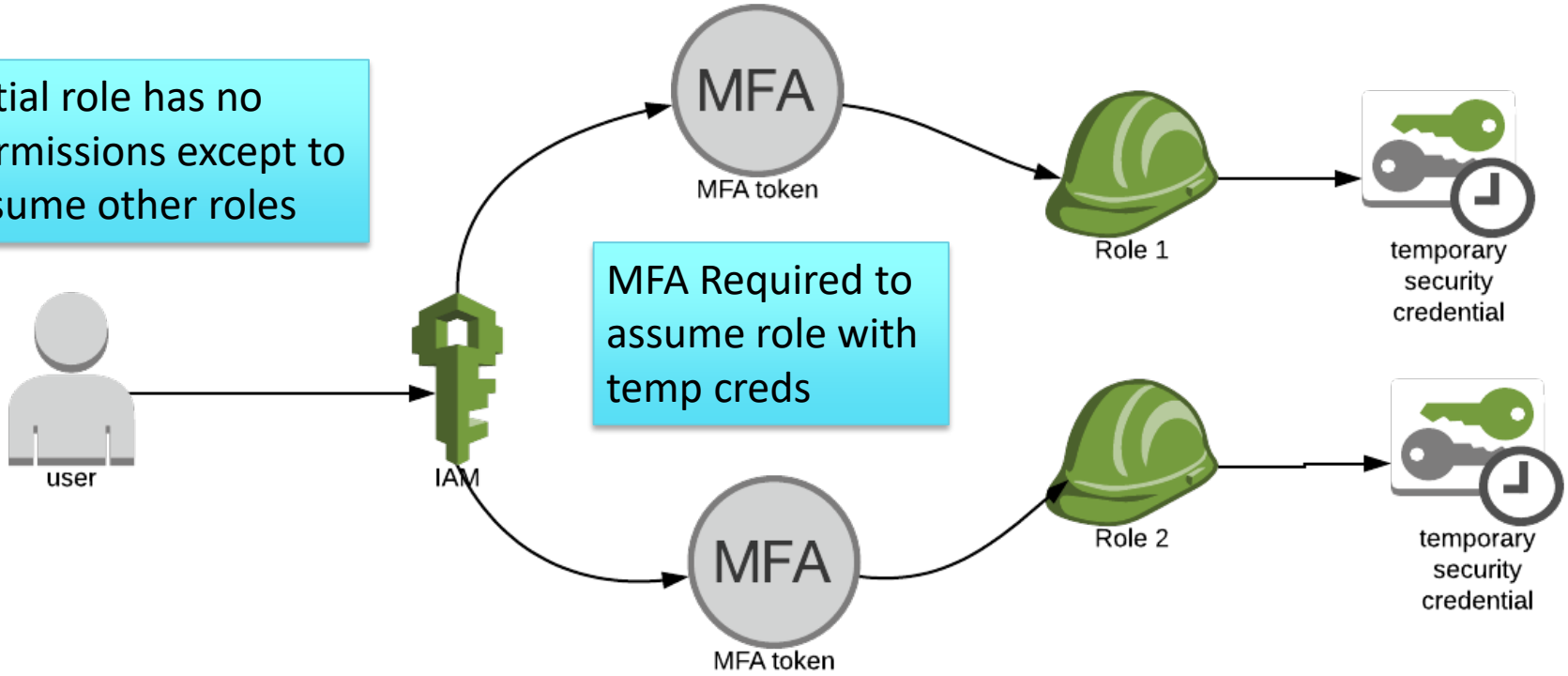


```
Sid: AllowUserstoListOnlyThierMFA
Effect: Allow
Action:
- "iam:ListVirtualMFADevices"
- "iam:ListMFADevices"
Resource:
- "arn:aws:iam::*:mfa/*"
- "arn:aws:iam::*:user/${aws:username}"
-
Sid: AllowUsertoManageThierMFA
Effect: Allow
Action:
- "iam:CreateVirtualMFADevice"
- "iam:DeleteVirtualMFADevice"
- "iam:EnableMFADevice"
- "iam:ResyncMFADevice"
Resource:
- "arn:aws:iam::*:mfa/${aws:username}"
- "arn:aws:iam::*:user/${aws:username}"
-
Sid: AllowUserstoDeactiveTheirMFAWhenUseingMFA
Effect: Allow
Action:
- "iam:DeactivateMFADevice"
Resource:
- "arn:aws:iam::*:mfa/${aws:username}"
- "arn:aws:iam::*:user/${aws:username}"
Condition:
Bool:
"aws:MultiFactorAuthPresent": "true"
```

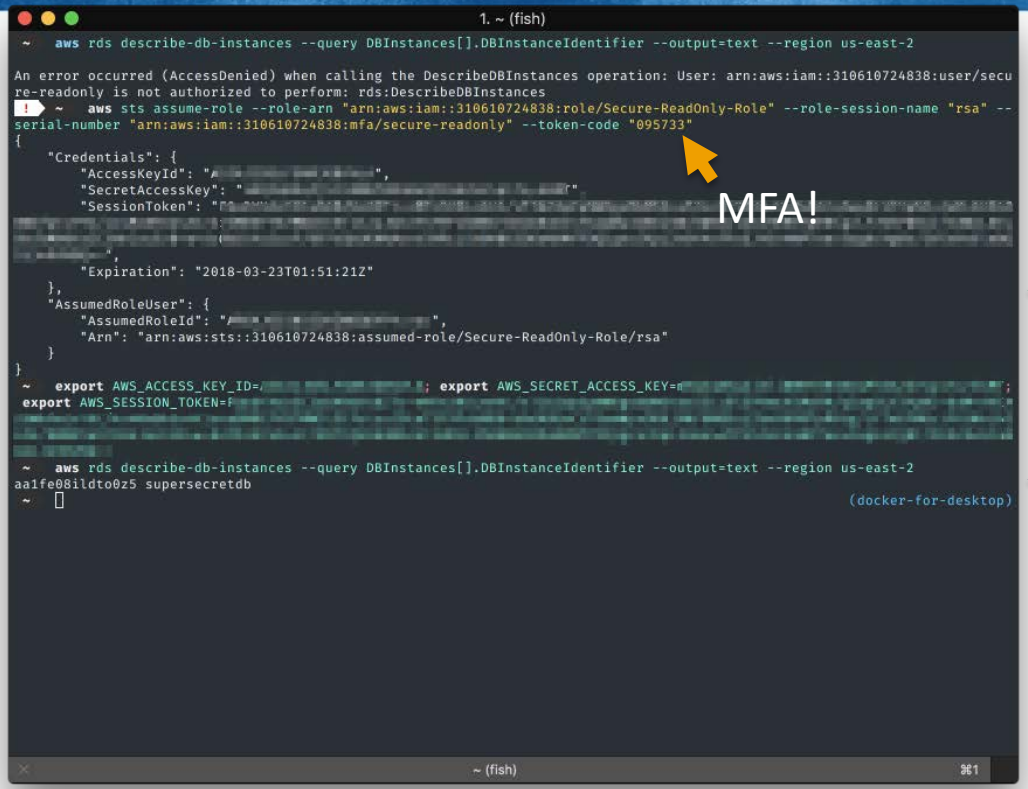
- Allows users to manage this MFA
- Must login with MFA to remove device

IAM ~ Assumed Roles

Initial role has no permissions except to assume other roles



IAM Master



MFA!

Failure due to default policy not having permissions

Temporary credential request & setting at environmental variable

Commands work!

CloudTrail

Event history

Your event history contains the create, modify, and delete activities for supported services taken by people, groups, or AWS services in your AWS account. To view a complete log of your CloudTrail events, create a trail and then go to your Amazon S3 bucket or CloudWatch Logs.

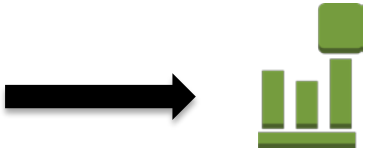
You can view the last 90 days of events. Choose an event to view more information about it. Learn more

Filter: Select attribute | Enter lookup value | Time range: 2018-01-14 12:00 AM – 2018-01-20 12:00 AM

Event time	User name	Event name	Resource type	Resource name
2018-01-19, 05:00:01 PM	I-	CreateTags		I-
2018-01-19, 04:50:21 PM	I-	CreateTags		I-
2018-01-19, 04:50:17 PM	I-	ModifyInstanceAttribute	EC2 Instance	I-
2018-01-19, 04:50:12 PM	I-	DeleteRoute	EC2 RouteTable	rtb-
2018-01-19, 04:50:11 PM	I-	CreateTags		I-
2018-01-19, 04:50:11 PM	I-	DeleteRoute	EC2 RouteTable	rtb-
2018-01-19, 04:50:10 PM	I-	DeleteRoute	EC2 RouteTable	rtb-
2018-01-19, 04:50:09 PM	I-	DeleteRoute	EC2 RouteTable	rtb-
2018-01-19, 04:50:08 PM	I-	ModifyInstanceAttribute	EC2 Instance	I-
2018-01-19, 04:50:07 PM	I-	DeleteRoute	EC2 RouteTable	rtb-
2018-01-19, 04:50:06 PM	I-	DeleteRoute	EC2 RouteTable	rtb-
2018-01-19, 04:50:06 PM	I-	DeleteRoute	EC2 RouteTable	rtb-

Monitor all API Actions

Feed data to events

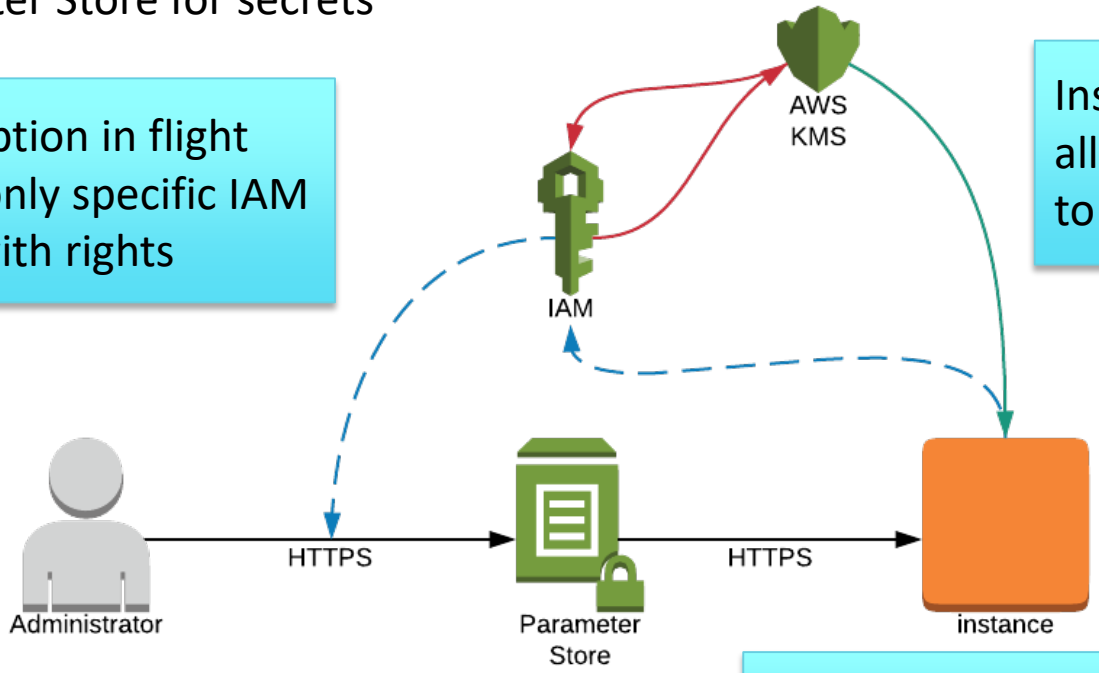


Respond

Scan and Secure

EC2 Parameter Store for secrets

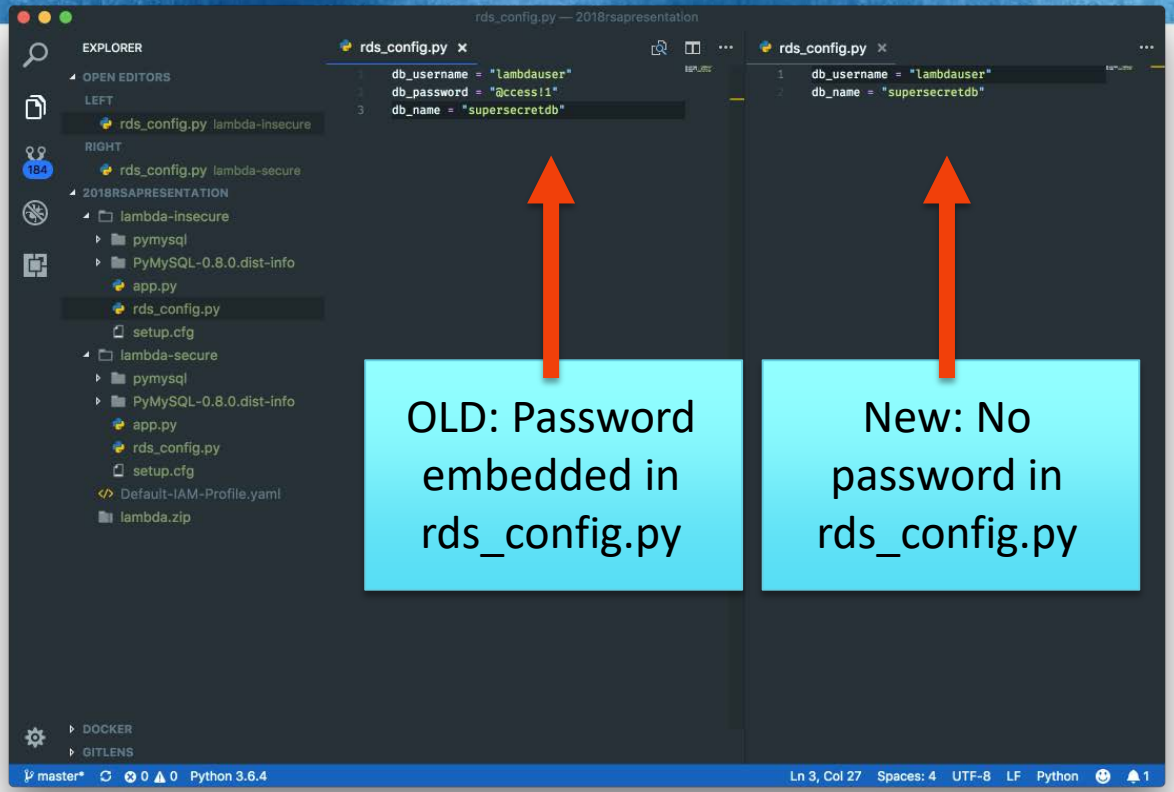
Encryption in flight with only specific IAM role with rights



Instance IAM Role allows rights to use key to decrypt

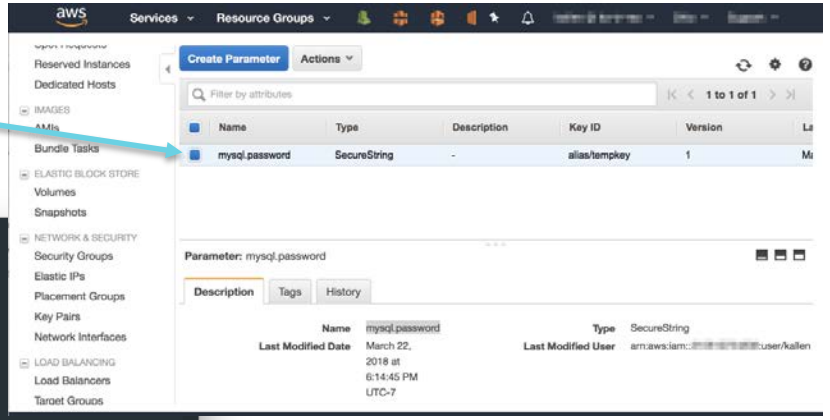
Instance retrieves encrypted value

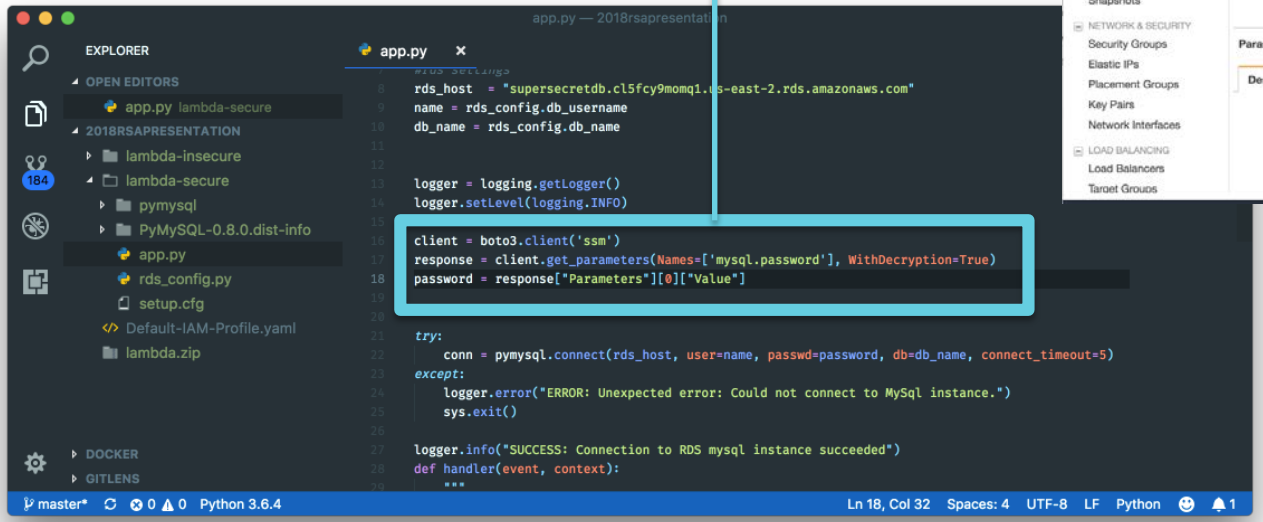
EC2 Parameter Store



EC2 Parameter Store

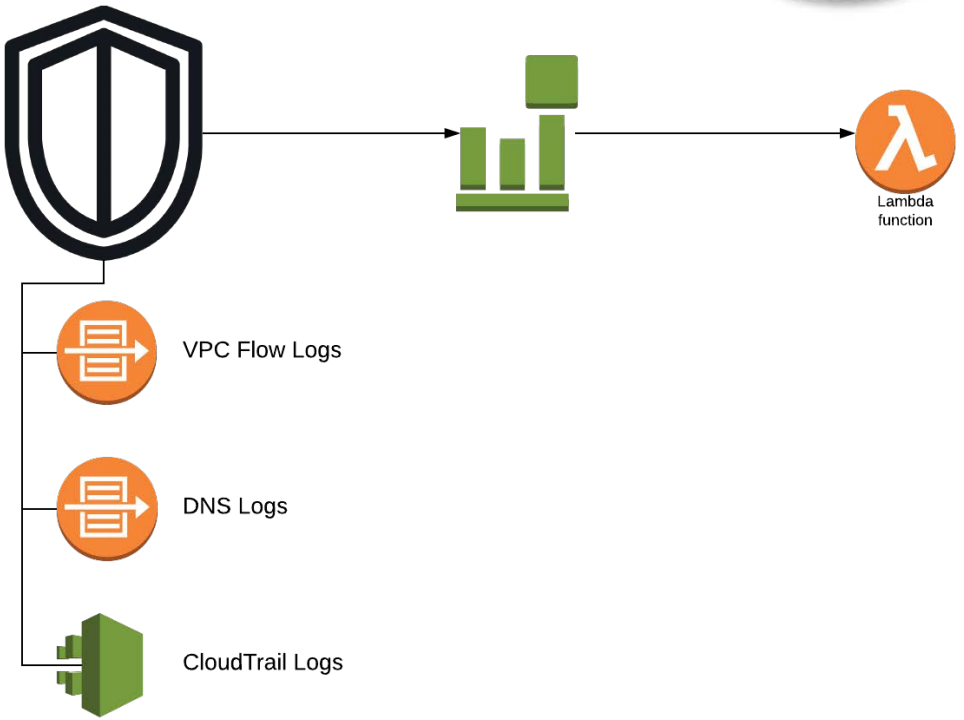
Calls AWS SSM

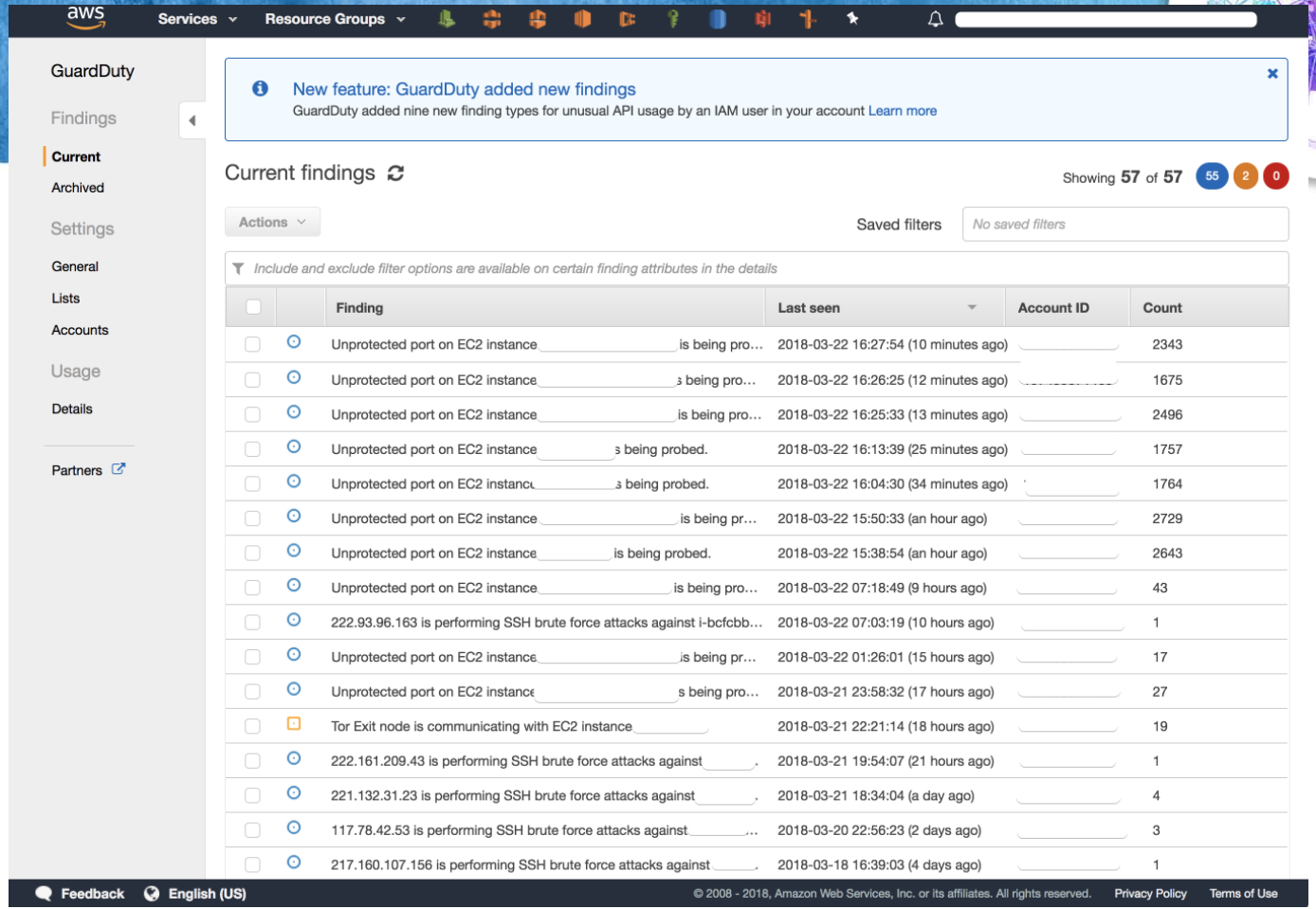




Monitoring

- AWS GuardDuty
- VPC Flow Logs
- CloudTrail
- Config
- Log shipping
- Secure log backups
- Automate Remediation





#RSAC

zipwhip 2ND SIGHT LAB

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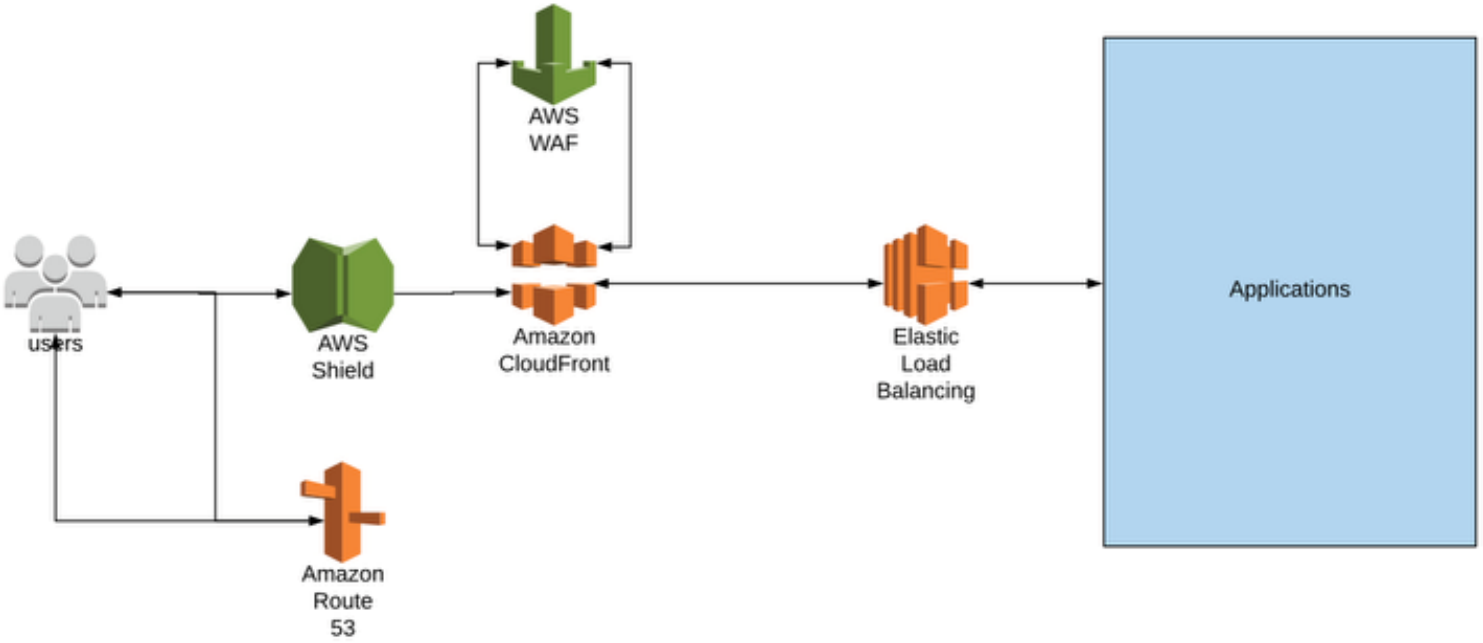
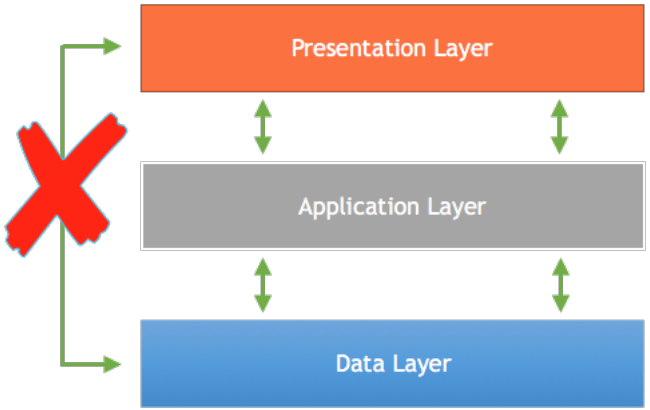
WAF Security



Network Architecture

- Presentation Layer
- Application Layer
- Data Layer

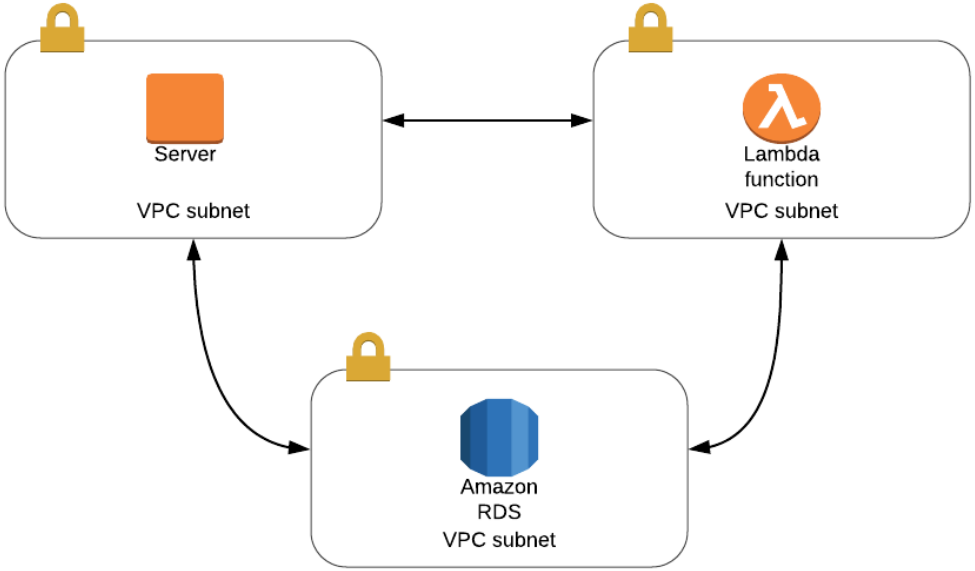


- Limited NACL & Security Groups between subnets
- Limit all outbound traffic

Network Architecture

BAD NETWORK

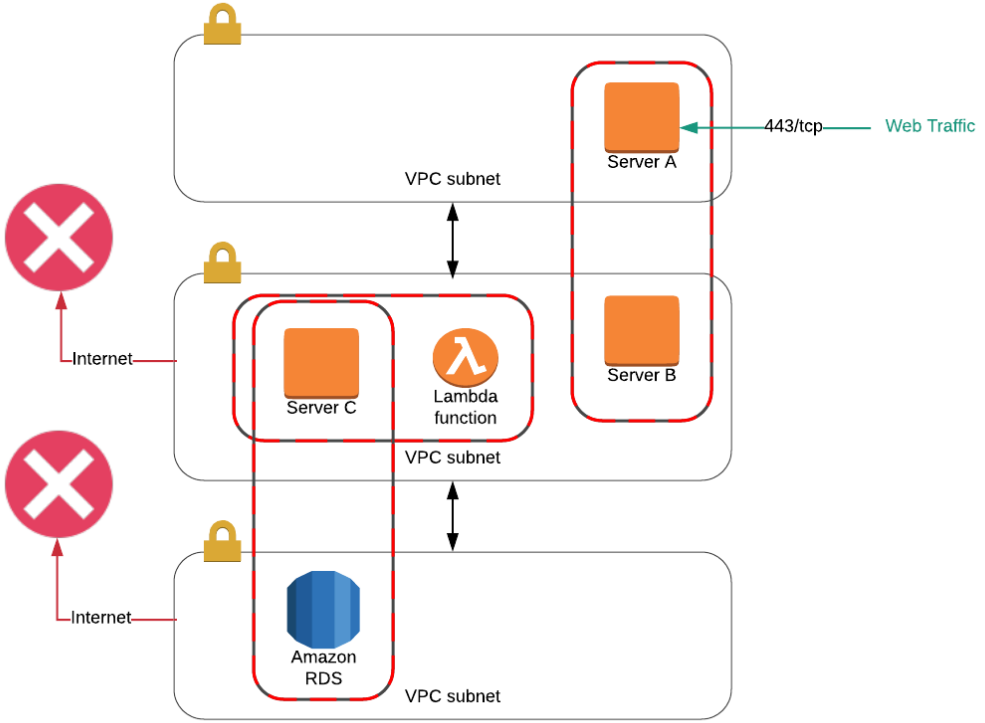
- NACLs are open
- Open outbound rules
- Allowing full CIDR inbound on ports
- No segmentation of network and access



Network Architecture

BETTER NETWORK

- NACLs limit access between subnets
- Security Groups limiting access to specific servers
- Blocking internet where not needed



Conclusion

- Red Team:
  - Attackers can use the same tools used by DevOps teams.
  - Cloud APIs provide a means for mapping out an entire account.
  - Read only access can be powerful.

- Blue Team:
  - Restrict access
  - Automated deployment
  - Architect networks to minimize open ports and pivoting
  - Protect secrets - don't embed in code!
  - Monitor everything

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THANK YOU!

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