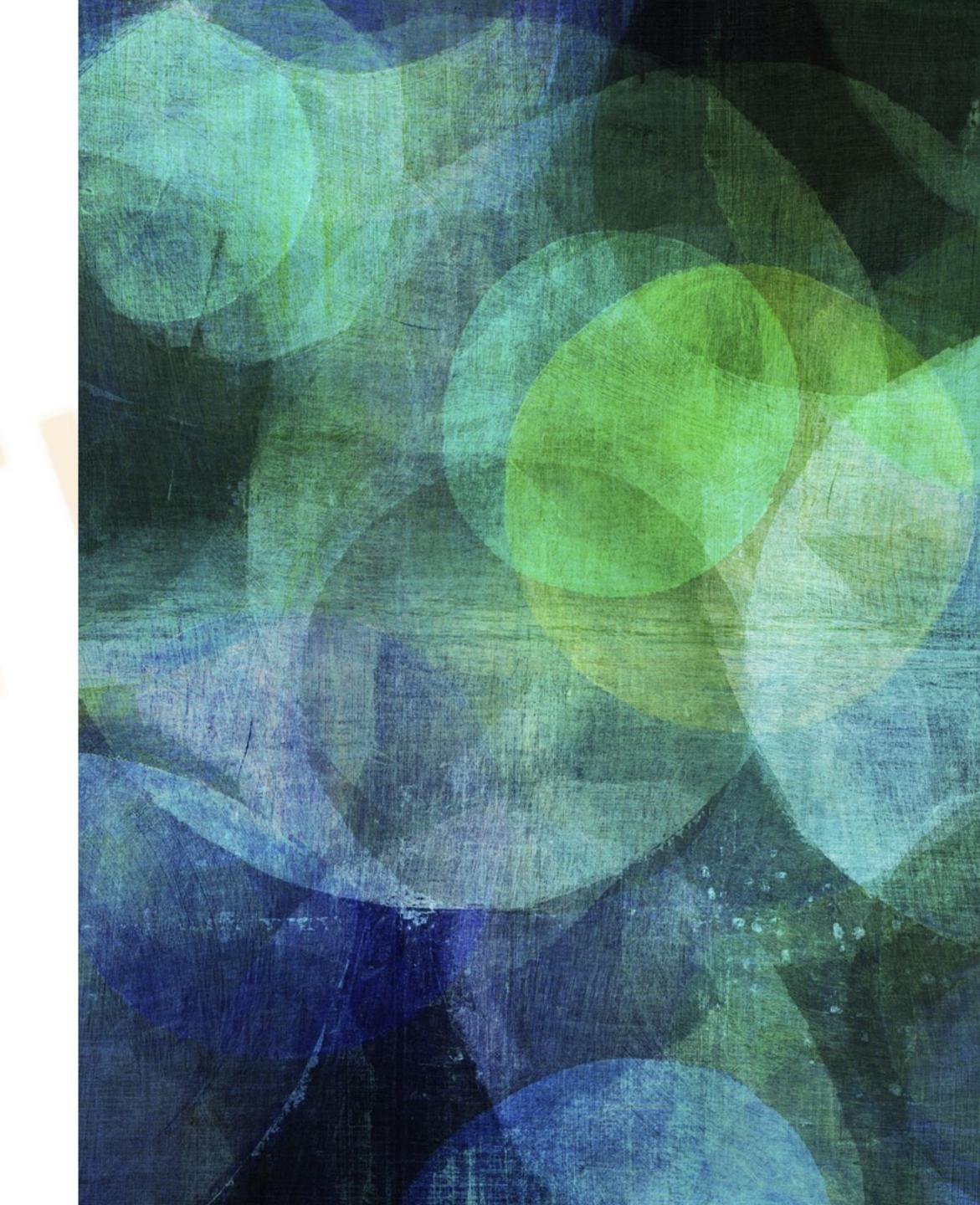
AWS DATA PROCESSING INFRASTRUCTURE 1B

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TODAY'S TOPIC

Applications boingo ticketmaster® Aol. 3M Science.
Applied to Life.™ **Third Party** Mobile Artificial Intelligence Business Game Mobile Hub, Lex, Polly, Rekognition, Lumberyard WorkDocs, WorkMail Machine Learning Pinpoint, Device Monitoring & Debugging **Automation & Provisioning** CloudWatch, CloudTrail, X-Ray CloudFormation, OpsWorks **APIs** nterface Web Python Console, Parallel Processing Java, Database Messaging, CLI C++ Athena, EMR, CloudSearch, Aurora, RDS, DynamoDB, ANSIBLE SQS, SNS, SES ElasticCache Kinesis, Redshift Security Networking Storage Compute S3, EBS, Glacier, VPC, Subnet, Availability Zone, EC2, Auto-scaling Snowball, Snowmobile Route 53 IAM SALTSTACK AWS Global Physical Infrastructure

ENVIRONMENT SETUP

- Python > 2.7.9
 - Use brew or macports to install Python
- Git > 2.10
 - If you are using Mac, it should come with Xcode
- Unix/Linux Command Line Tools
 - http://osxdaily.com/2014/02/12/install-command-line-tools-mac-os-x/
- Checkout the repository
 - Bitbucket account
 - Fork the repository
 - \$ make prepare

AWS ACCOUNT SETUP

- Bookmark following URLs
 - http://www.ec2instances.info/
 - http://calculator.s3.amazonaws.com/index.html
 - http://s3speedtest.com
- AWS Account Setup
 - Credit card information
 - Set billing alarm in CloudWatch
 - Inbound SSH rule for default VPC security group
 - Create main user and save your key pair
- Customize your console



AWS CLI CONFIGURATION

- Examples: scripts/configure.sh
- ~/.aws/credentials
- ~/.aws/config
- Profile
 - default
 - dev

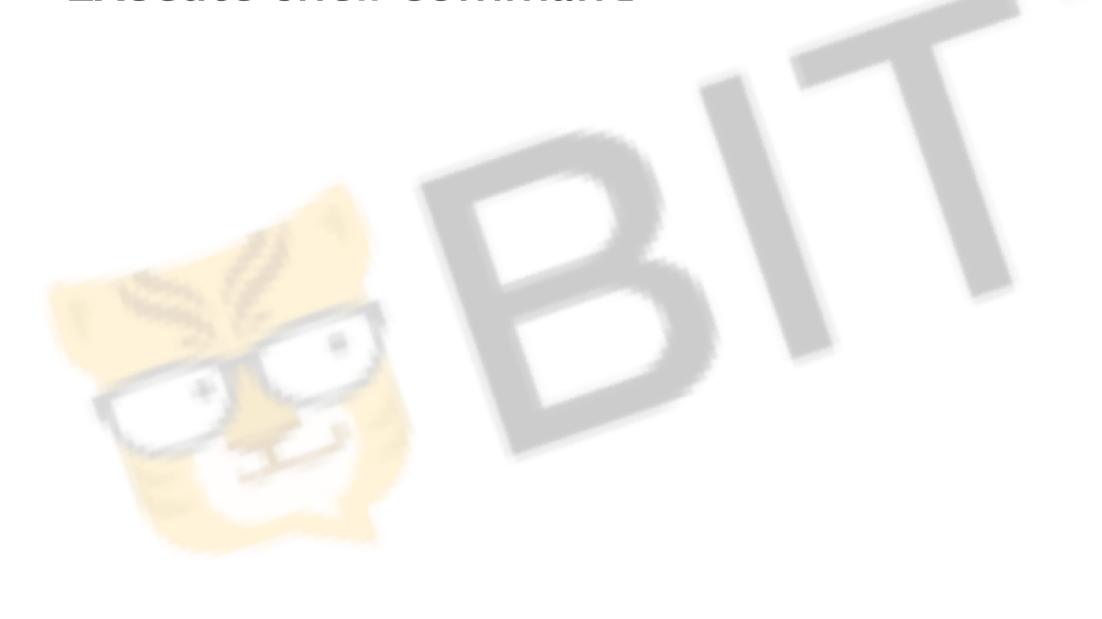
AWS CLI EXAMPLES

- aws COMMAND SUBCOMMAND [OPTIONS]
- Github: https://github.com/aws/aws-cli
- Examples: scripts/awscli.sh



AWS SHELL

- Auto completion
- Pop document
- Server side auto completion
- Execute shell command



escribe-instances --instance-ids accept-reserved-instances-exchange-quote accept-vpc-peering-connection allocate-address allocate-hosts assign-ipv6-addresses assign-private-ip-addresses associate-address associate-dhcp-options associate-route-table associate-subnet-cidr-block associate-vpc-cidr-block attach-classic-link-vpc attach-internet-gateway attach-network-interface attach-volume attach-vpn-gateway

Amazon Elastic Compute Cloud (Amazon EC2) provides resizable computing capacity in the Amazon Web Services (AWS) cloud. Using Amazon EC2 eliminates your need to invest in hardware up front, so you can develop and deploy applications faster.

AVAILABLE COMMANDS

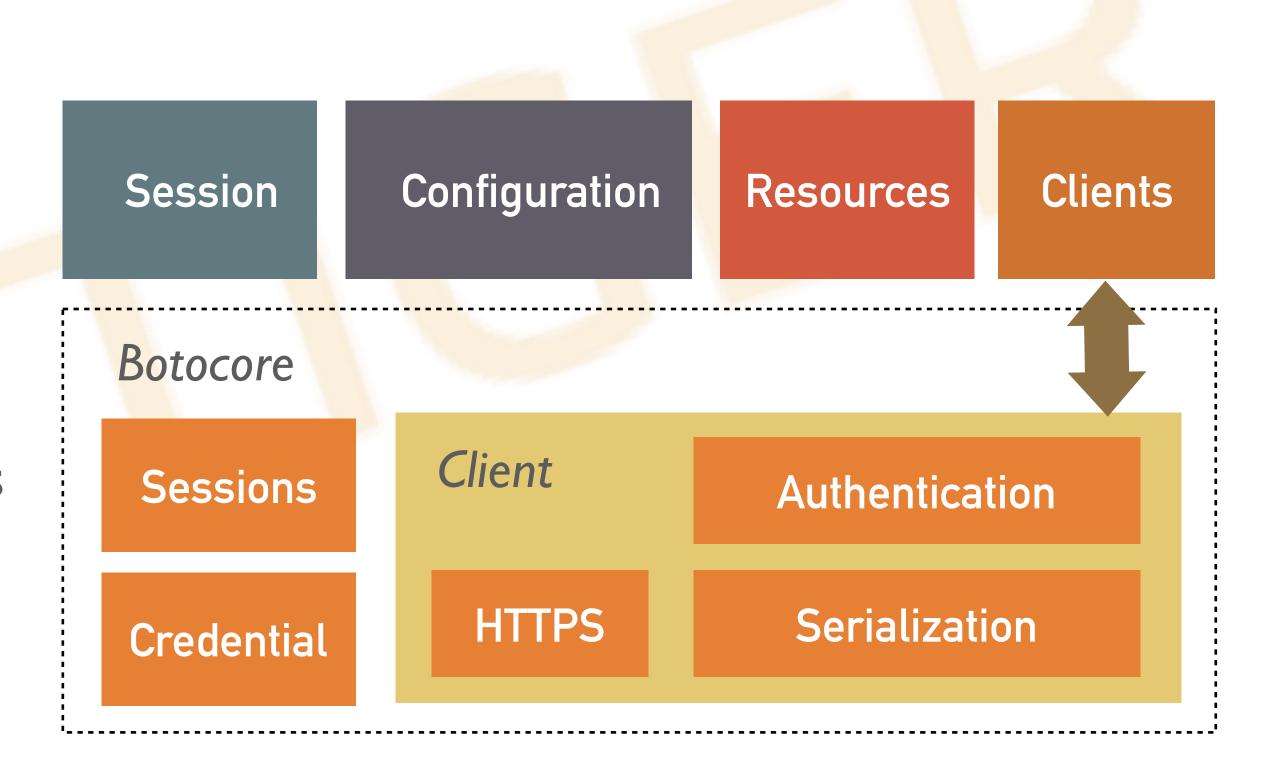
- * accept-reserved-instances-exchange-quote
- * accept-vpc-peering-connection
- * allocate-address

[F2] Fuzzy: ON [F3] Keys: Vi [F4] Single Column [F5] Help: ON [F10] Exit

BOTO3

BOTO3

- AWS SDK for Python
- boto2
 - Early project
 - Community contributed code
- boto3
 - New version with consistent interfaces and up-to-date API support
- botocore
 - Low-level service and configurations
- https://github.com/boto/boto3
- https://boto3.readthedocs.io/en/latest/





A VPC REVIEW

- Create a VPC
- Create a public subnet
- Create a private subnet
- Create a internet gateway and attach to VPC
- Check ACL and security group
 - Add inbound SSH rule
- Make sure you can login to you instance in public subnet

EC2 - EXAMPLES

- Launch EC2 instance by CLI and Boto3
- Evaluation
 - CPU
 - EBS Bandwidth
 - fio
 - Inter-Instance Bandwidth
 - iPerf
 - Enhanced networking SR-IOV
 - Check if SR-IOV
 - Bandwidth comparison

Whenever you find yourself on the side of majority, it is time to pause and reflect.

-Mark Twain

S3

S3 - EXAMPLES

- Create/empty/delete bucket
- List/upload/download/copy from/to bucket
- Selective copy
- Examples
 - scripts/s3.sh
 - scripts/s3cp.py
 - taxi/raw2s3.py

PROJECT NYC TAXI DATA

- Source: http://www.nyc.gov/html/tlc/html/about/trip_record_data.shtml
 - Stored in S3
 - https://s3.amazonaws.com/nyc-tlc/trip+data/yellow_tripdata_2016-01.csv
- Format
 - vendor_id, tpep_pickup_datetime, tpep_dropoff_datetime, passenger_count, trip_distance, pickup_longitude, pickup_latitude, rate_code_id, store_and_fwd_flag, dropoff_longitude, dropoff_latitude, payment_type, fare_amount, extra, mta_tax, tip_amount, tolls_amount, improvement_surcharge, total_amount
 - Not aligned...

PROJECT - DATA PREPROCESSING

- 1. Clean: remove empty lines and invalid data
- 2. Select interested fields
 - pickup_datetime, dropoff_datetime
 - pickup_longitude, pickup_latitude, dropoff_longitude, dropoff_latitude
 - trip_distance, total_amount
- 3. Compact data (160 bytes/recored vs. 80 byes/record)
 - Change datetime to offset since 2009/1/1, e.g., 2009/1/1 12:01 => 60
 - Round coordinates to 6 digits
 - Round distance and fare to 2 digits
 - Padding to 80 bytes

DATA PIPELINE



vendor_id, tpep_pickup_datetime, tpep_dropoff_datetime, passenger_count, trip_distance, pickup_longitude, pickup_latitude, rate_code_id, store_and_fwd_flag, dropoff_longitude, dropoff_latitude, payment_type, fare_amount, extra, mta_tax, tip_amount, tolls_amount, improvement_surcharge, total_amount



pickup_datetime, dropoff_datetime, pickup_longitude, pickup_latitude, dropoff_longitude, dropoff_latitude, trip_distance, total_amount

Parallel Processing

pickup_datetime, dropoff_datetime, pickup_district, dropoff_district,
trip_distance, total_amount

district, total_pickup, total_dropoff, total_trip_distance, total_amount

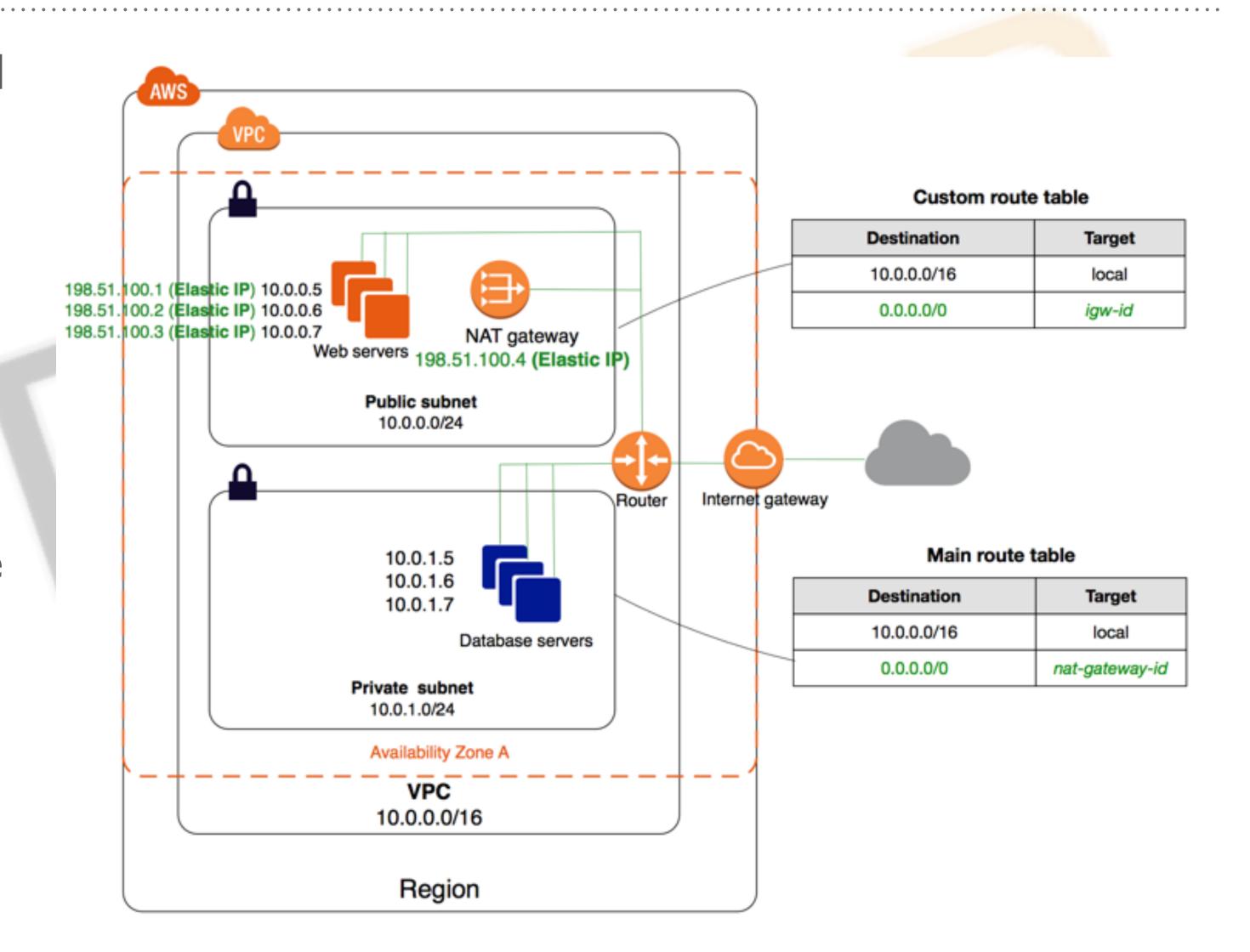


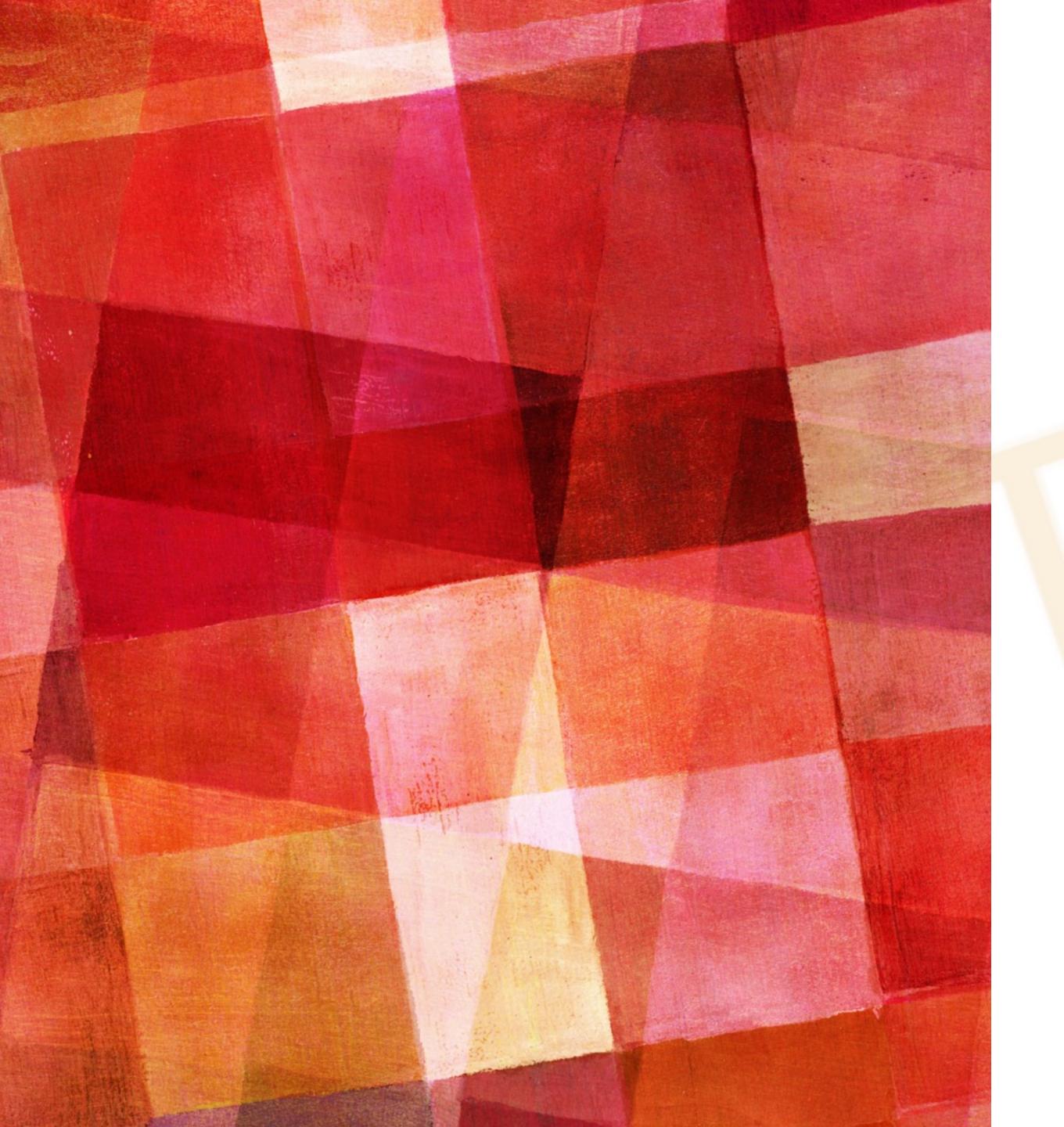
VPN

- Subnet
 - Create public subnet
- Security group
 - Dynamic attach
 - Multiple security group attach
 - Inbound/Outbound rules
 - Rules reasoning

HOMEWORK

- Create a VPC with both public and private subnet
- Write a boto3 program to launch two instances in each subnet
- Verify the one in public subnet can be accessed from internet and another cannot
- Measure the performance of these two instances
- Use taxi/raw2aws.py to upload part of data to s3://aws-nyc-taxidata and explain how you make the transfer efficient (parallel)





QUESTIONS

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