CSCI 6910 Qwiklabs Final Project

Lee M. Brunovsky
Graduate School of Computer Science
Georgia Southwestern State University
Americus, Georgia
lbrunovs@gsw.view.usg.edu

***Abstract*—Complete two Qwiklabs Challenge labs from the introductory and fundamental levels and document the completion effort.**

***Index Terms*—Qwiklabs, Terraform, Looker**

I. Labs Attempted

1. Automating Infrastructure on Google Cloud with Terraform: Challenge Lab

2. Exploring Data with Looker: Challenge Lab

II. Methodology of Lab Selection

These two labs were chosen on account of being the most specialized of the five options available, as well as being aligned with DevOps and analytics career pursuits, which are two of the three paths that I am highly interested in (the other is Cyber security for which there was not an option). In the DevOps realm, infrastructure as code (IaC) is commonly used to declaratively provision system resources that are required for applications and services to run such VM instances, networks, subnets, firewall rules and cloud Storage. Additionally, Terraform has long been a topic of interest ever since reading a few LinkedIn posts and job requisitions that referenced the open source infrastructure's capabilities and suggested a strong desire within the IT industry for the competencies respectively. On the analytics side, the prospects of becoming more efficient at quering, slicing and dicing large cloud based data sets in order to produce Tableau like dashboard views via a more easy to wield user interface (UI) were sureley attactive. Therefore, with big data analytics also being an interesting and highly marketable skill set, Looker was another apparent choice.

III. Interesting Aspects

A. Looker lab

Merging results from different Explores in Looker lets the end user amalgamate data from disparate Explores across models and projects to create visualizations; Specifically, the merged results feature allows users to generate a single table to examine data contained in several different data sets in a similar means to a SQL left join, where it is assumed that at least one of the fields is common across all of the unique data sets[1]. In the challenge lab, this was especially useful when examining the FAA data for delineating facility types across states, while also including cancellations.

B. Terraform lab

Working with backends to manage Terraform state on remote data stores such as Alibaba Cloud OSS, Amazon S3, Azure Blob Storage, and Google Cloud Storage opposed to locally in the Terraform.tfstate file was an interesting concept. Remote state can be configured in the root module to allow users to share output across configurations by decomposing it into smaller read-only segments without relying on configuration stores; For example, it was explained in [2] that a core infrastructure team can work with other teams by revealing limited information for use in running their own infrastructure such as by exposing VPC IDs, subnets, NAT instance IDs, etc. through remote state for other Terraform states to consume. The lab text specifically mentions that backend state offers speed advantages over local state, since users can turn off their machines while Terraform apply is updating the backend.

IV. Challenging Aspects

The Looker lab was fairly straight forward, and I did not find any of the aspects particularly challenging. Perhaps making use of the pivot_offset function in the Table Calculation during the quest in preparation for the lab was the most exotic from a syntax perspective, but again this was not really an issue. On the other hand, I did find some aspects of the Terraform lab somewhat challenging. Specifically, while the tf.JSON IaC files are easy to read, it can be challenging to remember the specific syntax for the various resource configurations possibilities; however, I am sure that this would become more routine with repetition, as well as a OneNote repository of various go-to configurations. This is actually one of the really neat attributes of Terraform, in that the configurations can be easily reproduced, shared, and utilized as a best practice.

V. Process of Lab completion

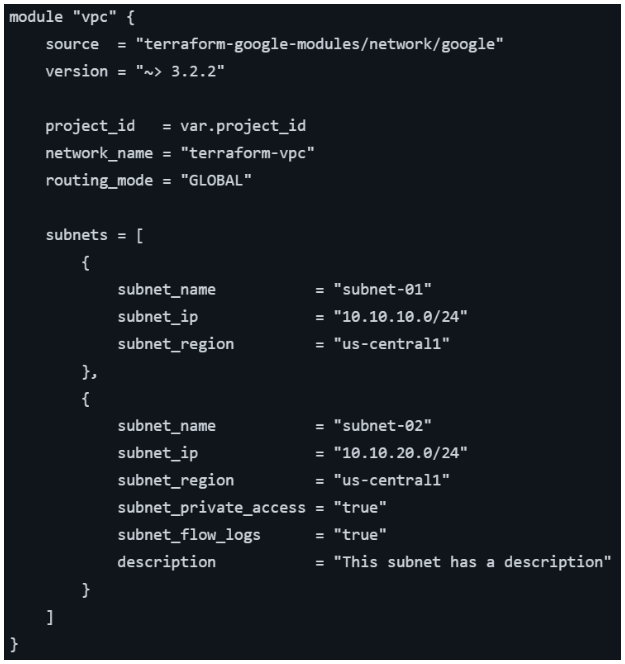
A. Looker lab

This lab only included three main steps. The first of which was to create three looks from the FAA data that showcased the most heliports, facility type breakdown and percentage of canceled flights by state. The second phase tested merge competencies to include state, city, code, and control tower filtered dimensions with the primary query in order to generate a visualization entitled 'Busiest, Major Joint-Use Airports with Control Towers'. The final step was to simply save the three looks into the Plane and Helicopter Rental Hub Data dashboard.

B. Terraform lab

First, configuration files needed to be created across the root, modules/instances and modules/storage directories prior to initializing Terraform. Next, infrastructure was imported into two instances by adding module resource configuration references into the main.tf file and using the Terraform import command. The following step involved configuring a remote backend in a cloud storage bucket, which also requires a module reference in the main.tf file. The lab then tested the ability to modify and update infrastructure by temporarily adding a third instance and changing the machine type of instance one and two. The ensuring step was to taint and destroy the temporary changes from the prior milestone. The second to last task involved using a module from the registry, where two subnets where added to the main.tf file for instances one and two respectively. The final task was to configure a firewall to permit the Terraform-vpc network to allow ingress connections on all IP ranges (0.0.0.0/0) on TCP port 80, and test that the rule was working via a connectivity test.

VI. Screenshots of Important Tasks

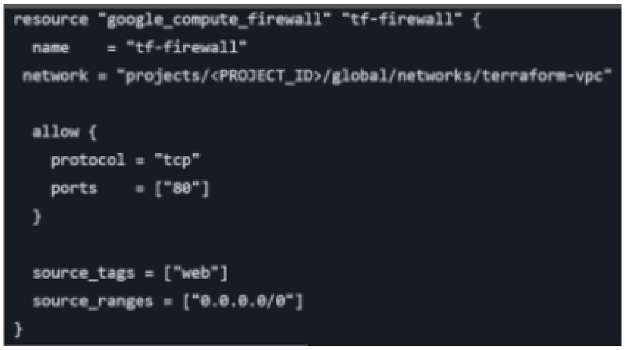


```
module "vpc" {
    source  = "terraform-google-modules/network/google"
    version = "~> 3.2.2"

    project_id   = var.project_id
    network_name = "terraform-vpc"
    routing_mode = "GLOBAL"

    subnets = [
        {
            subnet_name           = "subnet-01"
            subnet_ip             = "10.10.10.0/24"
            subnet_region         = "us-central1"
        },
        {
            subnet_name           = "subnet-02"
            subnet_ip             = "10.10.20.0/24"
            subnet_region         = "us-central1"
            subnet_private_access = "true"
            subnet_flow_logs      = "true"
            description           = "This subnet has a description"
        }
    ]
}
```

Fig. 1. Terraform VPC Configuration Module

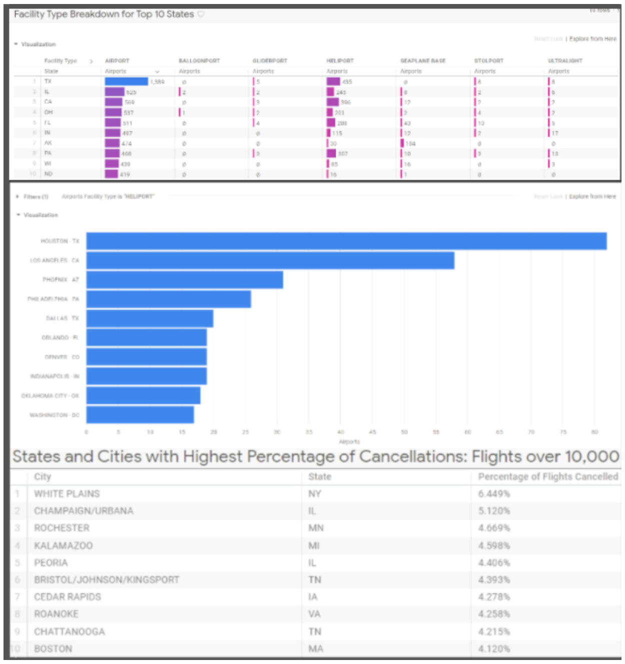


```
resource "google_compute_firewall" "tf-firewall" {
  name    = "tf-firewall"
 network = "projects/<PROJECT_ID>/global/networks/terraform-vpc"

  allow {
    protocol = "tcp"
    ports    = ["80"]
  }

  source_tags = ["web"]
  source_ranges = ["0.0.0.0/0"]
}
```

Fig. 2. Terraform Firewall Resource



Facility Type Breakdown for Top 10 States

	Facility Type ›	AIRPORT	BALLOONPORT	GLIDERPORT	HELIPORT	SEAPLANE BASE	STOLPORT	ULTRALIGHT
	State	Airports	Airports	Airports	Airports	Airports	Airports	Airports
1	TX	1,389	0	5	435	0	8	8
2	IL	625	2	2	245	8	2	6
3	CA	569	0	3	396	12	2	2
4	OH	537	1	2	201	2	4	2
5	FL	511	0	4	208	43	13	5
6	IN	497	0	0	115	12	2	17
7	AK	474	0	0	30	104	0	0
8	PA	468	0	3	307	10	3	13
9	WI	439	0	0	85	16	0	3
10	ND	419	0	0	16	1	0	0

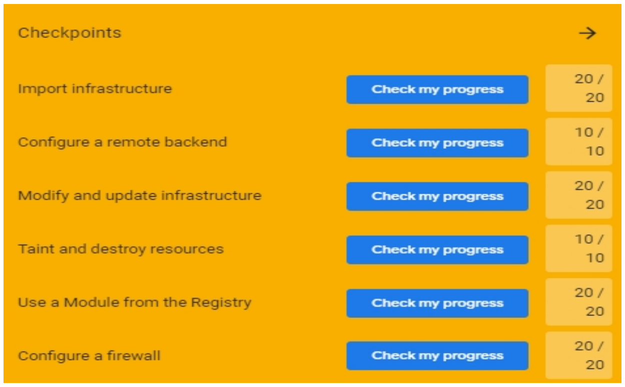
States and Cities with Highest Percentage of Cancellations: Flights over 10,000

	City	State	Percentage of Flights Cancelled
1	WHITE PLAINS	NY	6.449%
2	CHAMPAIGN/URBANA	IL	5.120%
3	ROCHESTER	MN	4.669%
4	KALAMAZOO	MI	4.598%
5	PEORIA	IL	4.406%
6	BRISTOL/JOHNSON/KINGSPORT	TN	4.393%
7	CEDAR RAPIDS	IA	4.278%
8	ROANOKE	VA	4.258%
9	CHATTANOOGA	TN	4.215%
10	BOSTON	MA	4.120%

Fig. 3. Looker Views

VII. Lab Scores and Public Qwiklabs Profile Link

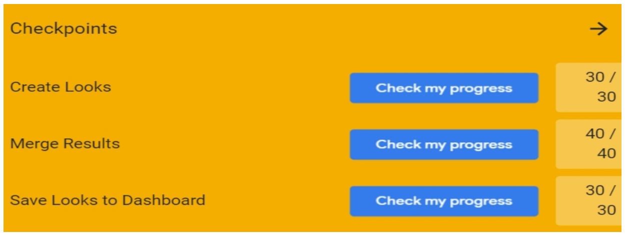
View the full quest completion at the following profile link https://www.qwiklabs.com/public_profiles/09fca5d0-08e8-4073-910d-f88be62bec5b



Checkpoints →

Import infrastructure	Check my progress	20 / 20
Configure a remote backend	Check my progress	10 / 10
Modify and update infrastructure	Check my progress	20 / 20
Taint and destroy resources	Check my progress	10 / 10
Use a Module from the Registry	Check my progress	20 / 20
Configure a firewall	Check my progress	20 / 20

Fig. 4. Terraform Lab Scores



Checkpoints →

Create Looks	Check my progress	30 / 30
Merge Results	Check my progress	40 / 40
Save Looks to Dashboard	Check my progress	30 / 30

Fig. 5. Looker Lab Scores

References

[1] Merging results from different Explores. Looker Documentation. (2021). https://docs.looker.com/exploring-data/exploring-data/merged-resultsunderstanding_merged_results.

[2] State: Remote Storage. Terraform by HashiCorp. (2021). https://www.Terraform.io/docs/language/state/remote.html.