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INFRASTRUCTURE AS CODE: TERRAFORM

29/09/2021

AGENDA

- Intro into Infrastructure as Code
- Intro into declarative configuration
- Intro into Terraform
- Remote state
- Hands-on: Deploy Azure Keyvault
- Hands-on: Create TF module
- Hands-on: using remote state

INTRO INTO INFRASTRUCTURE AS CODE

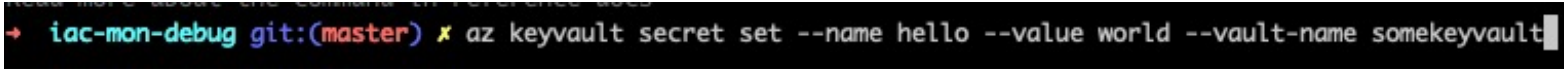
- Define infrastructure as programming code
- Describe what hardware or supporting systems are needed
- Should improve repeatability of infrastructure setup
  - No more manual clicking to setup something
- As it's code -> it's testable
- Different flavours
  - Pulumi
  - AWS CloudFormation
  - ARM Templates (Azure)
  - Terraform
  - Cloud provider CLIs (aka bash / powershell scripting)

INTRO INTO DECLARATIVE CONFIGURATION

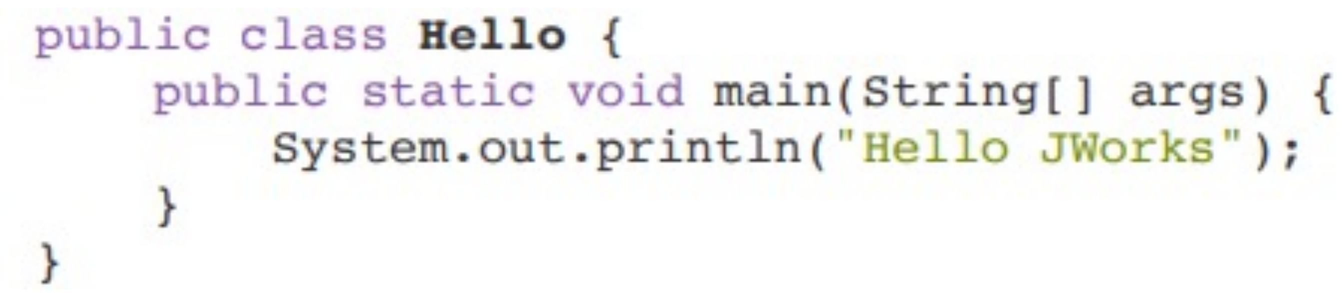
- Imperative programming
  - Define the action to execute
  - Tell it what and how to do it
  - Executes steps in order of definition (first line 1 then 2, …)
- Declarative programming
  - Define the end state
  - Intelligent system figures out what the delta is
  - Executes the action to “reconsile” to the desired state

INTRO INTO DECLARATIVE CONFIGURATION

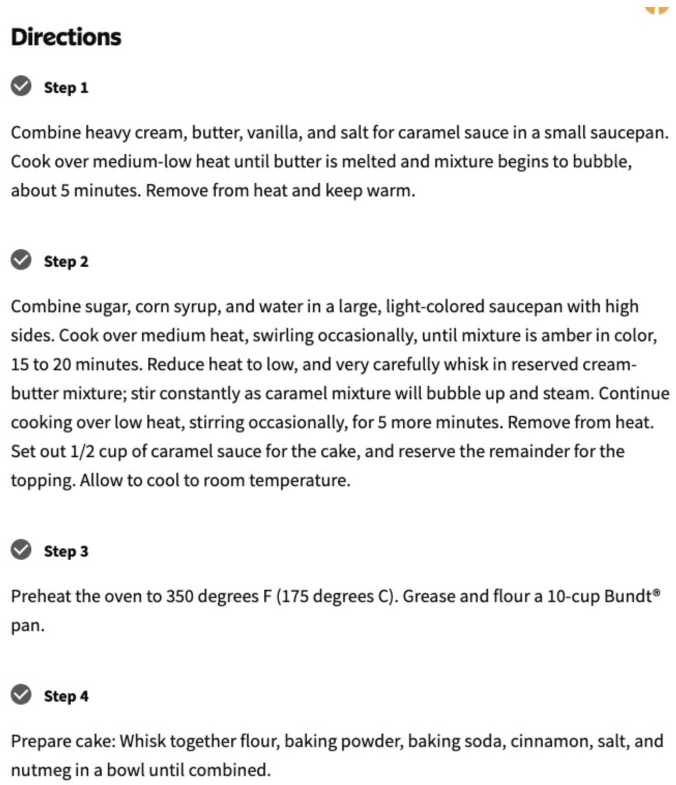
Examples: Imperative



```
➜  iac-mon-debug git:(master) ✗ az keyvault secret set --name hello --value world --vault-name somekeyvault
```



```
public class Hello {
    public static void main(String[] args) {
        System.out.println("Hello JWorks");
    }
}
```



Directions

✓ **Step 1**

Combine heavy cream, butter, vanilla, and salt for caramel sauce in a small saucepan. Cook over medium-low heat until butter is melted and mixture begins to bubble, about 5 minutes. Remove from heat and keep warm.

✓ **Step 2**

Combine sugar, corn syrup, and water in a large, light-colored saucepan with high sides. Cook over medium heat, swirling occasionally, until mixture is amber in color, 15 to 20 minutes. Reduce heat to low, and very carefully whisk in reserved cream-butter mixture; stir constantly as caramel mixture will bubble up and steam. Continue cooking over low heat, stirring occasionally, for 5 more minutes. Remove from heat. Set out 1/2 cup of caramel sauce for the cake, and reserve the remainder for the topping. Allow to cool to room temperature.

✓ **Step 3**

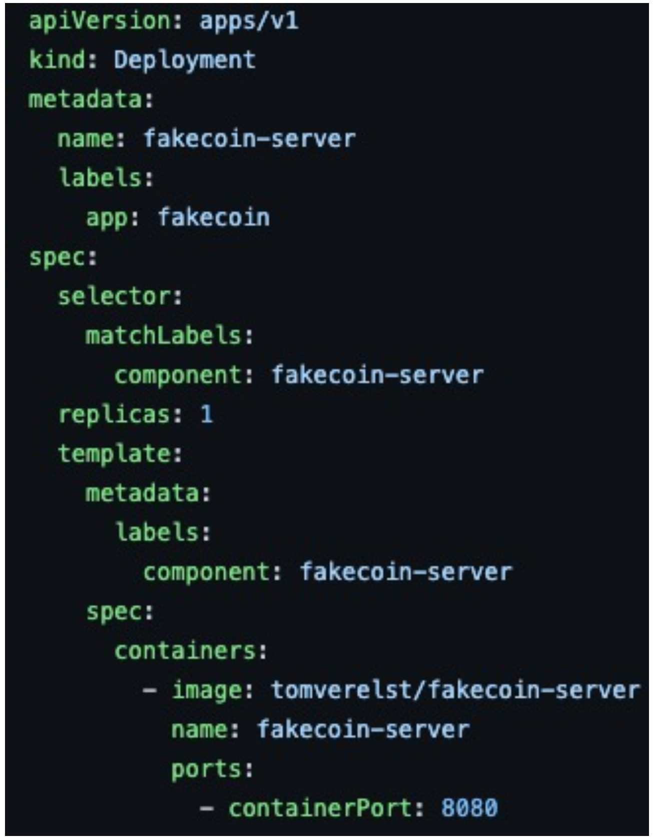
Preheat the oven to 350 degrees F (175 degrees C). Grease and flour a 10-cup Bundt® pan.

✓ **Step 4**

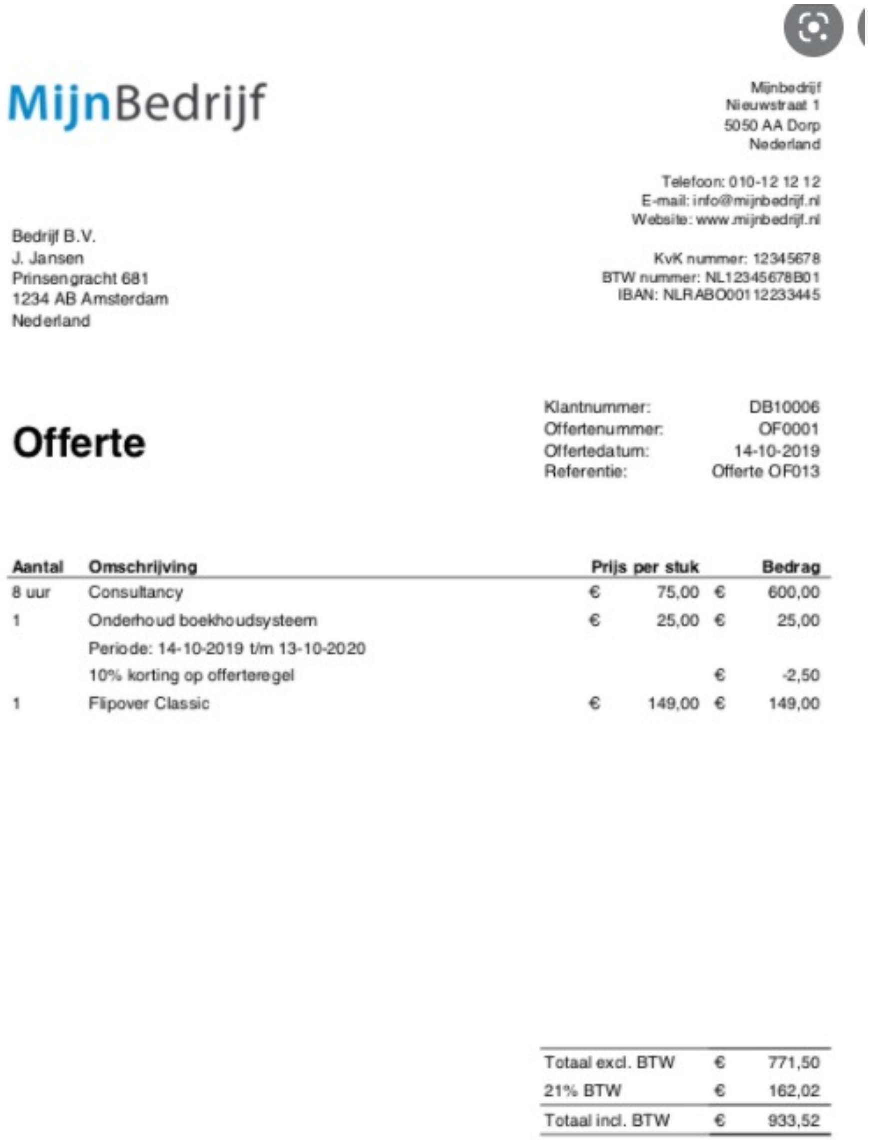
Prepare cake: Whisk together flour, baking powder, baking soda, cinnamon, salt, and nutmeg in a bowl until combined.

INTRO INTO DECLARATIVE CONFIGURATION

Examples: declarative



```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: fakecoin-server
  labels:
    app: fakecoin
spec:
  selector:
    matchLabels:
      component: fakecoin-server
  replicas: 1
  template:
    metadata:
      labels:
        component: fakecoin-server
    spec:
      containers:
        - image: tomverelst/fakecoin-server
          name: fakecoin-server
          ports:
            - containerPort: 8080
```



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Offerte

Klantnummer:	DB10006
Offertenummer:	OF0001
Offertedatum:	14-10-2019
Referentie:	Offerte OF013

Aantal	Omschrijving	Prijs per stuk	Bedrag
8 uur	Consultancy	€ 75,00	€ 600,00
1	Onderhoud boekhoudsysteem	€ 25,00	€ 25,00
	Periode: 14-10-2019 t/m 13-10-2020		
	10% korting op offerteregel		€ -2,50
1	Flipover Classic	€ 149,00	€ 149,00

Totaal excl. BTW	€ 771,50
21% BTW	€ 162,02
Totaal incl. BTW	€ 933,52

INTRO INTO TERRAFORM

- Created by HashiCorp
- Hashicorp Configuration Language (HCL)
  - JSON / YAML mix
- Declarative definition of desired state
- Flow
  - Init
  - Plan
  - Apply
  - Destroy
- Plugins aka providers
  - Azure, GCP, AWS, Kubernetes, Postgres, …
- Modular setup
  - Terraform registry: Docker hub for Terraform modules

EXERCISE: EXECUTE TERRAFORM

- `git clone --depth 1 https://github.com/pietervincken/terraform-workshop.git`
- `cd terraform-workshop/exercise-1/`
- `az login`
- `terraform init`
- `terraform plan –out tfplan.out`
- `# Review plan!`
- `terraform apply tfplan.out`

EXERCISE: EXECUTE TERRAFORM

- Explain TF file based on example
  - Provider config
  - Terraform config
  - Resources setup
  - Local setup
- Show terraform registry documentation

EXERCISE: CREATE SECRET IN KEYVAULT

- Add a secret to the keyvault

- Tip: you’ll need more than 1 resource.
- Tip 2: depends_on
- Tip 3: az ad signed-in-user show --query objectId

TERRAFORM: REMOTE STATE

- State is kept in between runs
- Used to calculate delta
  - For cloud resources a refresh is performed
- Local state
- Remote state
  - Azure storage account
  - AKA store the local tfstate file in a storage container
  - Adding a lock

- Demo

EXERCISE: ADDING REMOTE STATE

- Add remote state support to your TF setup

EXERCISE: CREATE ACI SETUP

- Exercise 2: Create TF setup for Azure Container Instance for image
  - `pietervincken/snake-server:0.0.1`
  - Make correct use of local variables to avoid copy pasting a lot.
- Optional exercise 3: Create TF setup for a phppgadmin container connecting to a postgres database on Azure.
  - `bitnami/phppgadmin`
  - Tip: use the terraform documentation to determine what options to use
  - Tip: use the docker hub page to know which variables to set.
  - Tip: allow from 0.0.0.0 until 0.0.0.0 in a firewall rule to enable connectivity between aci and postgres

EXERCISE: DESTROY IT!

Exercise 4

- Perform clean up of all created resources
- `terraform destroy`

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