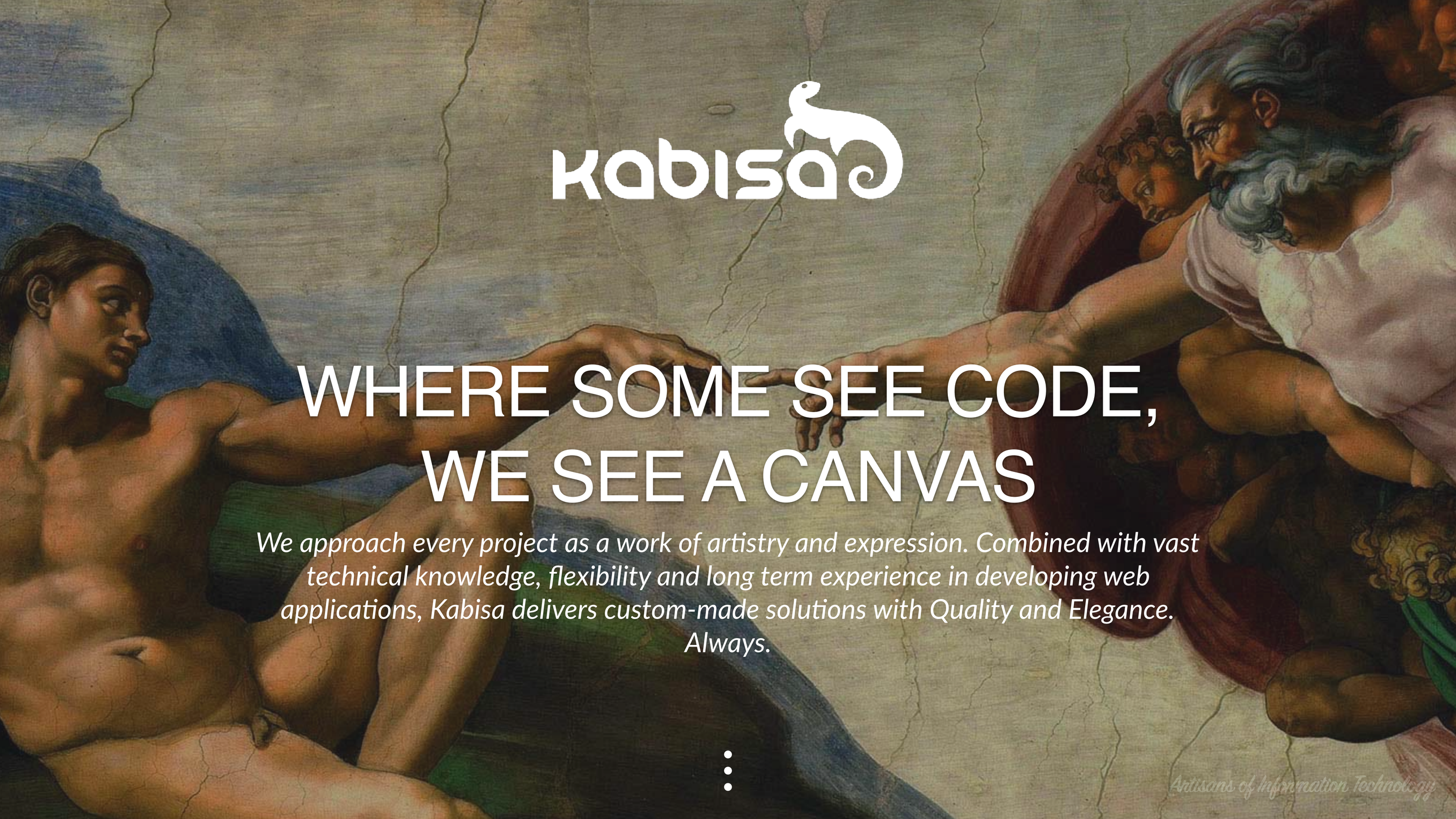

Kabisa
Artisans of Information Technology

Agenda

- About us
- About you
- Introduction into Infrastructure as Code (IaC), AWS and Terraform
- Getting started
- Pizza!
- Terraform
- The workshop
- Drinks!



WHERE SOME SEE CODE, WE SEE A CANVAS

We approach every project as a work of artistry and expression. Combined with vast technical knowledge, flexibility and long term experience in developing web applications, Kabisa delivers custom-made solutions with Quality and Elegance. Always.

Artisans of Information Technology

Kabisa

Kabisa is a software development agency, specialised in custom web and mobile app development & integration.

12+
years in business

300+
Successful projects

45
team members

3
Offices

Artisans of Information Technology

Kabisa

Kabisa is een maatwerk software ontwikkelaar die zich specialiseert op het gebied van web en mobiele app ontwikkeling & integratie.

Luk van den Borne
DevOps Engineer

Andy Maes
DevOps Engineer

Joost Saanen
DevOps Engineer

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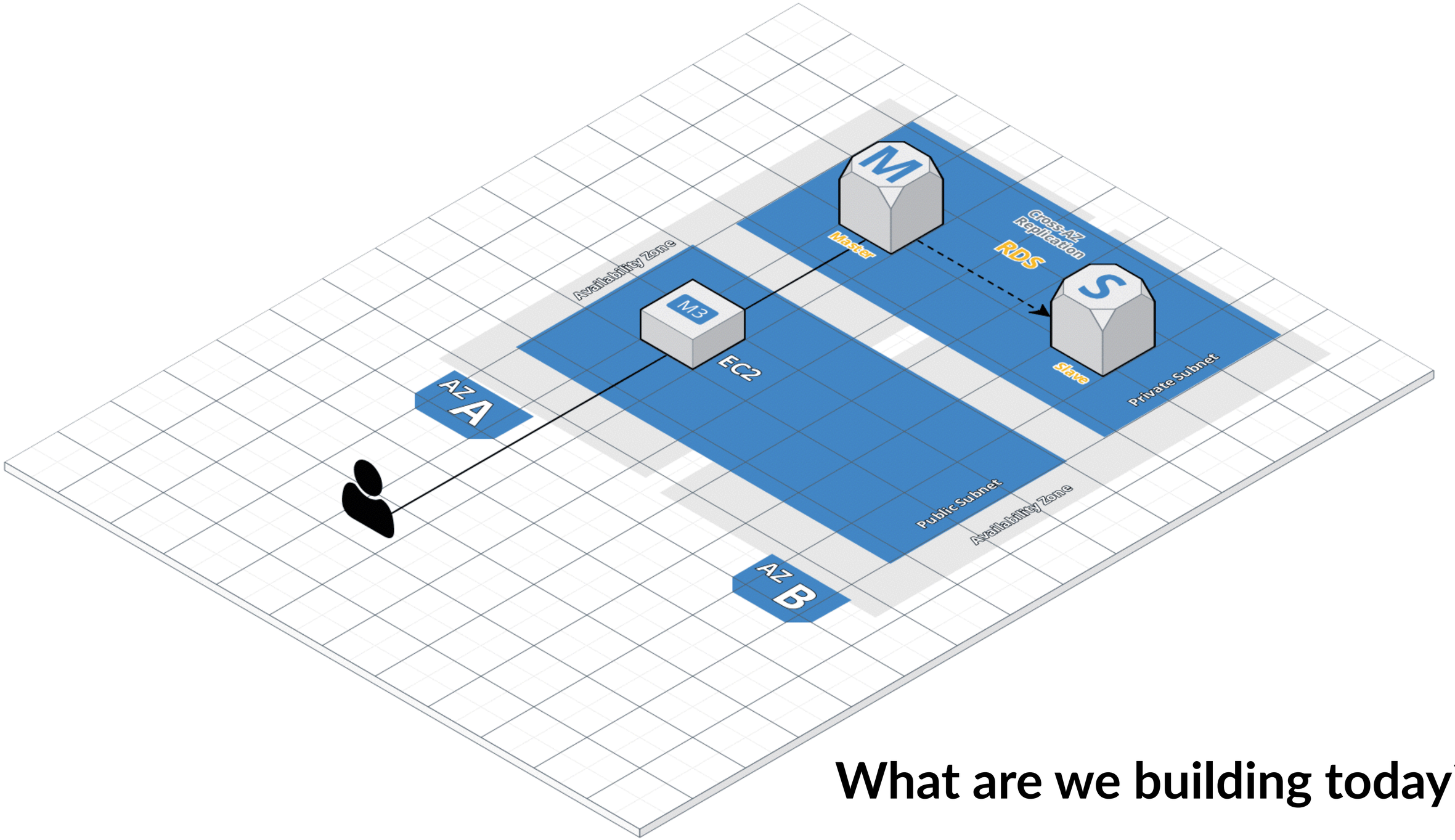
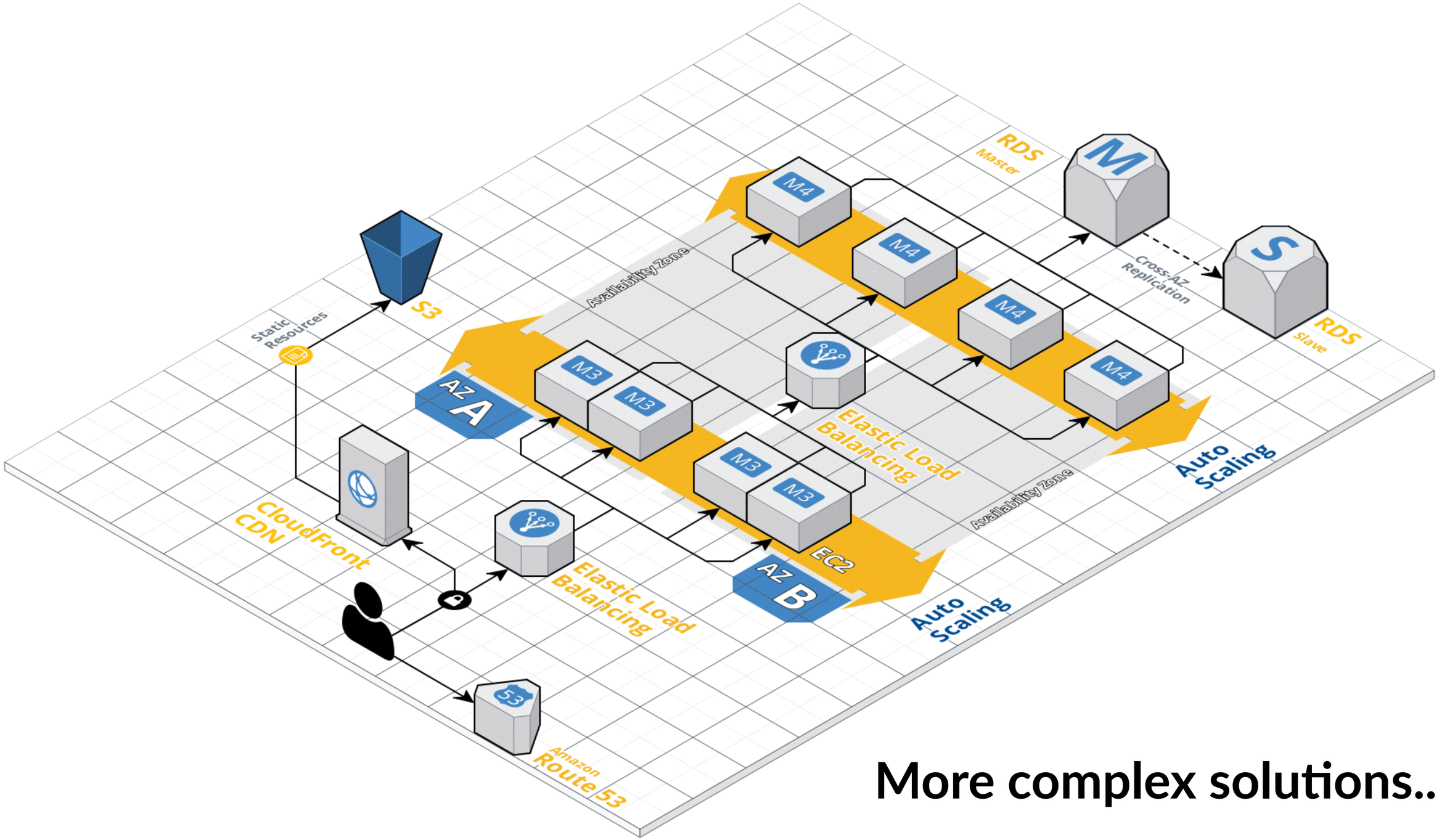
Who are you?



What are we building today?



More complex solutions..

“A tool for building, changing and versioning infrastructure safely and efficiently”


KEEP
CALM
AND
AUTOMATE
ALL THE THINGS

Terraform

- A way to manage AWS, and other public cloud platforms
- Declarative language
- Easy to read and write
- Open source!
- Free!

Terraform - Getting started

- Install AWS CLI
- Install Terraform
- Create an IAM user and use aws configure to insert the credentials into ~/.aws/credentials
- git clone git@github.com:kabisa/terraform-workshop.git

Terraform - Core Concepts

Core concepts:

- HashiCorp Configuration Language (HCL)
- Providers
- Resources
- Data
- Output
- Variables
- References

Terraform - HCL

- Declarative language

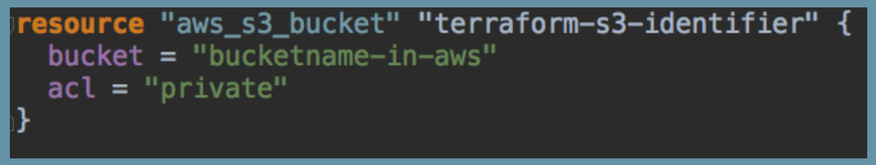
Terraform - providers

- AWS
- Google Cloud
- Azure
- OpenStack
- Many, many more!
- https://www.terraform.io/docs/providers/

```
provider "aws" {
  region                  = "eu-west-1"
  shared_credentials_file = "~/.aws/credentials"
  profile                 = "kabisa-demo-aws"
}
```

```
[kabisa-aws-demo]
aws_access_key_id = AKIAABCDEFERGHDGSDFG
aws_secret_access_key = sdfSDFhrtewgav23wSFSDfsdfsd/sdfSDFSDFSDF
```

Terraform - resources



- https://www.terraform.io/docs/providers/aws/r/s3_bucket.html
- Important sections:
  - Argument Reference
  - Attributes Reference

Terraform - Data

Terraform - output


```
output "cloudfront_domain" {
  value = "${aws_cloudfront_distribution.cf_distro.domain_name}"
}
```

```
output "ip" {
  value = "${aws_eip.elastic_ip.public_ip}"
}
```

Terraform - Variables

- https://www.terraform.io/docs/configuration/variables.html
- Data Types:
  - Scalar: “hello world”, true/false, 0/1/2
  - List: [“a”, “b”, “c”]
  - Map: { var1: “value1:”, var2: “value2” }

Terraform - Variables

- Variable definitions: variables.tf
- Variable values:
  - terraform.tfvars
  - -var-file=secrets.tfvars parameter
  - -var ‘var1=value'
  - Interactively via terraform

```
variable "azs" {
  type = "list"
  default = ["eu-west-3a", "eu-west-3b", "eu-west-3c"]
}

/* EC2 vars */
variable "ec2_type" {}
variable "ec2_ami" {
  description = "The ID of the AMI you want to install"
}
variable "ec2_keypair" {}
```

```
/* General vars */
shared_credentials_file = "~/.aws/credentials"
profile = "kabisa-demo-aws"

/* Customer vars */
customer = "kabisa"
domain = "kabisa.nl"

/* ec2 vars */
ec2_type = "m5.large"
```

Terraform - variables

Original

```
provider "aws" {
  region                  = "eu-west-1"
  shared_credentials_file = "~/.aws/credentials"
  profile                 = "kabisa-demo-aws"
}
```

w/ vars

```
# General AWS data
provider "aws" {
  region                  = "${var.region}"
  shared_credentials_file = "${var.shared_credentials_file}"
  profile                 = "${var.profile}"
}
```

Interactively

```
# General AWS data
provider "aws" {
  region     = "${var.region}"
  access_key = "${var.access_key}"
  secret_key = "${var.secret_key}"
}
```

```
// No default value or value through terraform.tfvars
// so they will be prompted interactively
variable "access_key" {}
variable "secret_key" {}
```

Terraform - References

- Variables: “${var.varname}”
- Resources: “${resource_type.resource_id.attribute}”
- Data: “${data.data_type.data_id.attribute.format}”

```
resource "aws_route53_zone" "kabisa-nl" {
  name = "kabisa.nl"
}

resource "aws_route53_record" "mx-kabisa-nl" {
  zone_id = "${aws_route53_zone.kabisa-nl.zone_id}"
  name = ""
  type = "MX"
  records = [
    "1 ASPMX.L.GOOGLE.COM.",
    "5 ALT1.ASPMX.L.GOOGLE.COM.",
    "5 ALT2.ASPMX.L.GOOGLE.COM.",
    "10 ASPMX2.GOOGLEMAIL.COM.",
    "10 ASPMX3.GOOGLEMAIL.COM.",
  ]
  ttl = "${var.route53_default_ttl}"
}
```

Terraform - Running terraform

- terraform init
- terraform plan
- terraform apply
- .tfstate files

Terraform - caveats

- Think about secrets management! The tfstate file basically contains everything!
- Carefully check the actions in terraform plan, especially destroy or destroy-and-create operations

Terraform - general remarks

- Keep the documentation and console at hand.
- Think about maintainability, readability and modularity.
- Build immutable infrastructure.

Terraform - workshop part I

- The goal: terraform an EC2 instance with a root volume
- It has to allow incoming SSH access from your current IP and http and https access from the outside world. It should also allow all outgoing traffic
- Make sure it has a reusable (elastic) ip address. This ip address should be outputted at the end of a terraform apply.
- You should be able to login to the node via SSH
- Make sure the code could be reused for other projects
- Free tier: t2.micro

Terraform - workshop part II

- The goal: terraform an RDS instance with a root volume
- The application we're going to host will be Wordpress
- Make sure the database service is redundant across 2 availability zones for the purpose of disaster recovery
- Allow only nodes with the security group you created in the previous part for the EC2 node
- Output the database name, username, password and endpoint
- Free tier eligible: db.t2.micro
- Challenge: instead of creating a single instance, create an Aurora cluster with 2 instances. This isn't covered under the Free Tier

Terraform - workshop part III

- Use the user data in EC2 to bootstrap a Wordpress application to the point that it's ready to be installed out of the box.
- The easiest way to run WP is using apache and mod_php in the default apache DocumentRoot (/var/www/html/)
- Tip: WP can be downloaded via wget https://wordpress.org/latest.tar.gz
- The application in the tar is located in the "wordpress" directory. To strip the first level, you can use --strip 1 in the tar command.
- Don't forget to chown the application to the default webserver user (www-data for Debian/Ubuntu)
- Note that changing the user data will destroy-and-create your ec2 instance. Once again: build immutable infra!

Terraform - cool stuff

- Of course you can use Terraform with many more resources and providers
- You can create reusable TF-modules, includable from a git source
- There's a fairly large repository with pre-made TF-modules: https://registry.terraform.io/

Terraform - caveats and challenges

- Secrets management:
  - remote state storage
  - Use AWS Vault instead of plain-text credentials: https://github.com/99designs/aws-vault
- Some resources have to be created in us-east-1, e.g. TLS certificates for CloudFront
- (Further) provisioning of the infrastructure, e.g. SSH keys, nginx config
- Converting hand-crafted infrastructure into Terraform'ed IaC

Terraform - Remote State


```
terraform {
  backend "s3" {
    region         = "eu-west-1"
    bucket         = "kabisa-tfstates"
    dynamodb_table = "kabisa-tflocks"
    key            = "customer/production/terraform.tfstate"
    encrypt        = true
    profile        = "kabisa-profile"
  }
}
```

Terraform - Different provider


```
provider "aws" {
  alias = "us-east-1"
  region = "us-east-1"
  shared_credentials_file = "${var.shared_credentials_file}"
  profile                 = "${var.profile}"
}
```

```
resource "aws_acm_certificate" "kabisa-nl" {
  domain_name = "${var.domain}"
  validation_method = "DNS"
  subject_alternative_names = ["www.${var.domain}"]
  provider = "aws.us-east-1"
}
```