App Platform

Step by Step

Building a simple but complete application with Node.js

https://www.digitalocean.com

What we are going to do today?

- Develop a **front-end**
  - Deployed in a static site
- Implement a **back-end API**
  - Provisioned as backend service
- Add persistence with a **database**
  - Provisioning a Postgresql Databse
- Develop freely with continuous updates!

Configuration

Preparation

Register for a free account

- You will get access to Atlantis

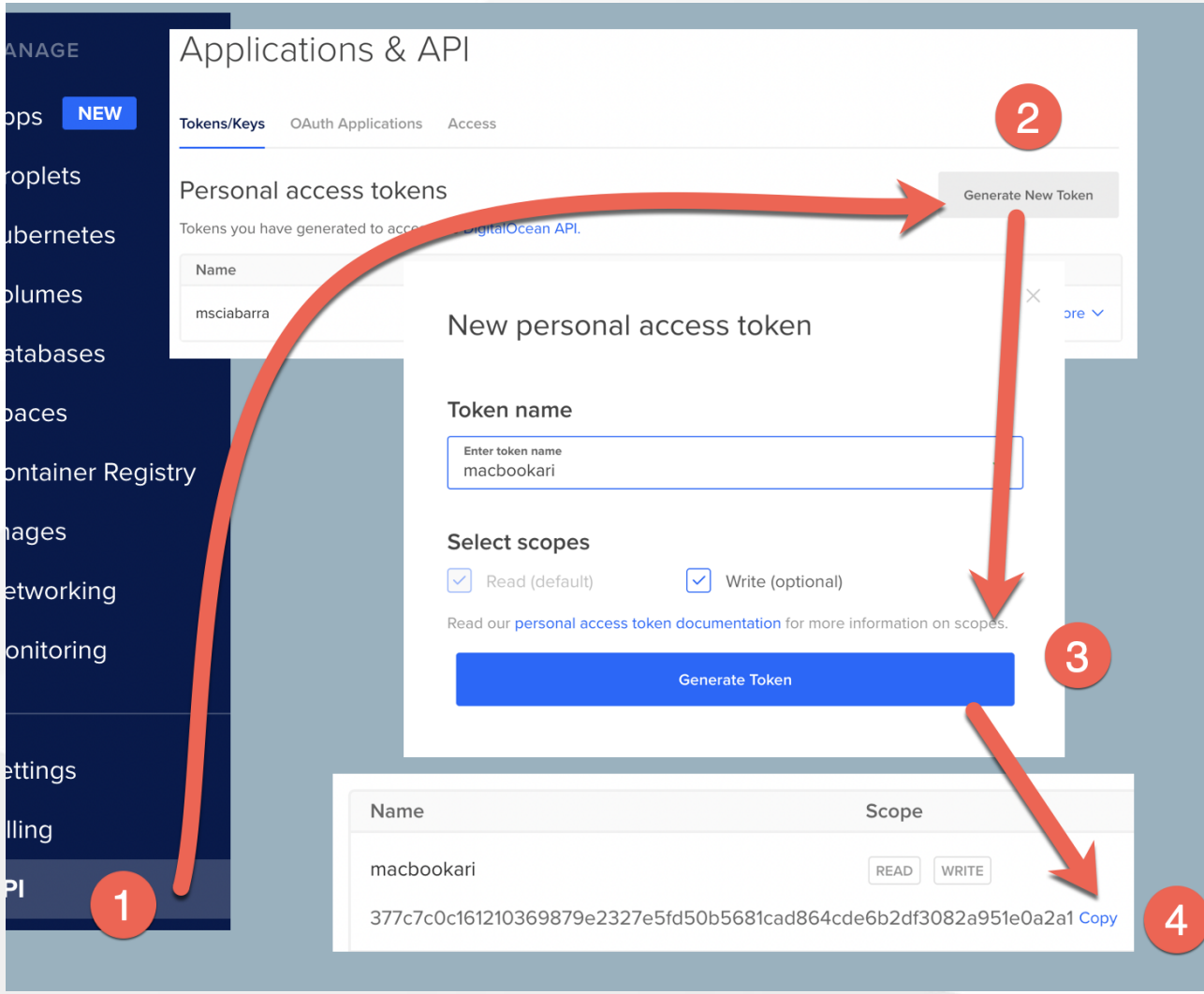
Install the cli `doctl`

https://docs.digitalocean.com/reference/doctl/how-to/install/

- Available for Windows, Mac and Linux

Get your token

- Install the `doctl` cli
- Click on **API** on Menu
- Click onq **Generate New Token**
- Click on **Generate Token**
- Click on **Copy**
- Type `doctl auth init` and paste



Frontend

Creating a frontend

- An example using Svelte

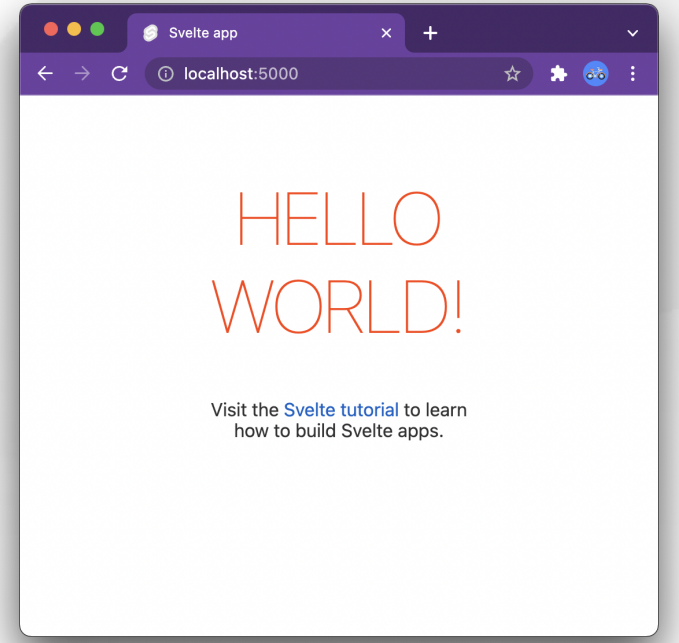
```
npx degit
sveltejs/template frontend
```

- Install it

```
cd frontend && npm install
```

- Run in development mode

```
npm run dev
```



Exercise: create the frontend

```
# creating the frontend
npx degit sveltejs/template frontend
cd frontend
npm install
npm run dev
# interrupt
cd ..
```

Concepts of App Platform / 1

- Your deployment is the `.do/app.yaml`
- It includes lots of components
- We are going to use
  - static sites
  - services
  - databases
  - routes
- But wait: there is much more...

Concepts of App Platform / 2

- The YAML describes the complete cycle to build and deploy:
- **1** Pulling from repositoryes
- **2** Building applications
- **3** Exposing to the internet

Deployment

- Deploy with: `doctl app create --spec .do/app.yaml`

Deployment: `.do/app.yaml`

```yaml
name: tutorial-app-platform
static_sites:
- name: frontend
  # 1 pulling from repositories
  github:
    repo: sciabarrado/tutorial-app-platform
    branch: main
    deploy_on_push: true
  # 2 building applications
  build_command: npm run build
  source_dir: frontend
  # 3 exposing to the internet
  routes:
  - path: /
```

Exercise: deploy frontend

```
# deploying the frontend
mkdir .do
cp src/1-app.yaml .do/app.yaml
git add frontend
git commit -m "frontend" -a
git push origin main
doctl app create --spec .do/app.yaml
# check build logs
```

Deploying... v-msciabarra@digitalocean.com pushed a deployment at 10:23:32 UTC

Go to Deploy Logs Cancel Build

Overview Insights Activity Runtime Logs Console Settings

← Back to Timeline

Deployment

Logs LIVE

Find

```
[frontend] [2021-10-26 08:24:24]     index.html
[frontend] [2021-10-26 08:24:24]     favicon.png
[frontend] [2021-10-26 08:24:24]     global.css
[frontend] [2021-10-26 08:24:25]
[frontend] [2021-10-26 08:24:25] => Configuring index document: index.html
[frontend] [2021-10-26 08:24:25] => Configuring error document: 404.html
[frontend] [2021-10-26 08:24:25] => Uploaded 7 files
[frontend] [2021-10-26 08:24:25] => Uploading the build cache...
[frontend] [2021-10-26 08:24:32] Adding layer 'heroku/nodejs-engine:nodejs'
[frontend] [2021-10-26 08:24:34] Adding 2/2 app layer(s)
```

Backend

Let's build our backend

- We are going to use **Node.js**
  - you can use also out of the box Python, PHP, Golang, Ruby
  - You can also use "*whatever*" thanks to Dockerfile
    - you need a bit more knowledge here
- Builds are automated thanks to "buildpack"
  - they can build your code *automagicallly* in many common cases

Simple Backend Code `node.js`

```
const express = require('express')
const app = express()
const port = 8080

app.get('/', (req, res) => {
  res.send('Hello World!')
})

app.listen(port, () => {
  console.log(`App listening at http://localhost:${port}`)
})
```

Creating the backend

```
# a new directory for backend
mkdir backend
cd backend
# mandatory initializations
npm -y init
npm install --save express
# using our examples here
cp ../src/2-index.js index.js
node index.js
# interrupt
cd ..
```

Deploying the backed with `app.yaml`

- Adding a `services` section
- same steps as before:
  - **1** pull
  - **2** build (automated)
  - **3** expose to internet
- Additional step:
  - **4** run your code

Backend deployment

```
services:
- name: backend
  # 1 pull
  github:
    repo: sciabarrado/tutorial-app-platform
    branch: main
    deploy_on_push: true
  source_dir: backend
  # 2 build is autodetected
  # 3 expose to internet
  routes:
  - path: /api
  # 4 run your code
  run_command: node index.js
```

Exercise: deploy backend

```
# new configuration
cp src/2-app.yaml .do/app.yaml
git add backend
git commit -m "backend" -a
git push origin main
# update
ID=$(doctl app list | awk '/tutorial-app-platform/ { print $1}')
echo $ID
doctl app update $ID --spec .do/app.yaml
# check deployment
```

Database

What you need to know about the database

- A development database can be automated provisioned:
  - just add it to the `app.yaml`
- Available as DBaaS:
  - SQL: `postgresql`, `mysql`
  - NoSQL: `redis`, `mongodb`
- You need to use environment variables to connect to it

Environment variables for PostgreSQL

- `PGHOST`, `PGPORT`
  - hostname and port of the database
- `PGUSER`, `PGPASSWORD`
  - username and password
- `PGDATABASE`, `PGSSLMODE`
  - database name
  - **important** you may need `PGSSLMODE=no-verify`

Exercise: create database locally

```
# create the user
psql postgres -U postgres
create user demo with password 'demo';
create database localdb with owner = 'demo';
quit
# configure the environment variables
export PGHOST=localhost
export PGPORT=5432
export PGDATABASE=localdb
export PGUSER=demo
export PGPASSWORD=demo
# check the connection
psql -h $PGHOST -p $PGPORT -U $PGUSER $PGDATABASE
```

Connect to database with node

```
# install driver
cd backend
npm install pg --save
node --experimental-repl-await
# test database connection
const { Client } = require('pg')
const client = new Client()
await client.connect()
let create = `CREATE TABLE IF NOT EXISTS
  guestbook( id SERIAL PRIMARY KEY,
             message TEXT)`
const res = await client.query(create)
# exit and check if the table is there
psql -h $PGHOST -p $PGPORT -U $PGUSER $PGDATABASE
\dt
```

Connecting to the database

```
// prereq
const { Client } = require('pg')
let client = undefined

// database table
const createTable = `
CREATE TABLE IF NOT EXISTS guestbook(
   id SERIAL PRIMARY KEY,
   message TEXT
)`
```

```
// connectAndInitialize to be described
app.listen(port, connectAndInitialize)
```

Notes on connecting to the database

- The database is available only when running the applicaton
  - You need to initialize it when you start the application
    - Better is to use:
      - managed database
      - migration libraries
- The database may start after your application
  - you need to waiting and retry until it is available

connectAndInitalize

```
// connect and initialize
function connectAndInitialize() {
  console.log("connecting to database")
  client = new Client()
  client.connect()
    .then(() => {
      client.query(createTable)
      console.log("connected and initialized")
    })
    .catch((err) => {
      console.log(err)
      console.log("cannot connect, retrying")
      setTimeout(connectAndInitialize, 2000)
    })
}
```

Provisioning a database

```
databases:
- name: db
  engine: PG
  version: "12"
```

- Development database
  - Postgresql Only
  - do not use in production
- You can provision a managed, redundant, backed up **DBaaS** database separately

Environment variables for backend

```
# add this to backend service
envs:
  - name: PGHOST
    scope: RUN_TIME # omitted below to fit in the slide
    value: ${db.HOSTNAME}
  - name: PGPORT
    value: ${db.PORT}
  - name: PGDATABASE
    value: ${db.DATABASE}
  - name: PGUSER
    value: ${db.USERNAME}
  - name: PGPASSWORD
    value: ${db.PASSWORD}
  - key: PGSSLMODE
    value: "no-verify"
```

Exercise: deployment database

```
cp src/3-app.yaml .do/app.yaml
cp src/3-index.js backend/index.js
git add backend
git commit -m "database" -a
git push origin main
# update
doctl app update $ID --spec .do/app.yaml
# test the database
```

Testing the database

- Database access is restricted to you app
  - you can expose publicly to access it
  - not recommended to leave this way
  - **remember to re-enable trusted sources**

Trusted Sources

Close

Add app as a trusted source

Warning - your database is open to all incoming connections.
Secure your database by restricting access to trusted sources. Why is this important? ↗

Save Cancel

Connection Details

Connection String

```
postgresql://db:aE6aTdgFq3BII4m5@app-92284f7b-8a22-4f7a-ab31-b62abb975e2c-do-user-9818665-0.b.db.ondigitalocean.com:25060/db?ss
```

Guestbook

Backend code

```
app.get('/', (req, res) => {
  client.query("SELECT id, message FROM guestbook ORDER BY id")
  .then(r =>  res.send(r.rows))
})

app.post('/', (req, res) => {
  const msg = req.body.msg
  client.query("INSERT INTO guestbook(message) VALUES($1)", [msg])
  .then(r => res.send({ "changed": r.rowCount }))
})
```

Frontend Code 1/3: loading data

```
const api = location.hostname == "localhost" ?
   "http://localhost:8080/" : "/api/";

let data = [];
function load() {
  fetch(api)
    .then((r) => r.json())
    .then((d) => (data = d));
}

import { onMount } from "svelte";
onMount(load);
```

`GET /api/` in `data`

Frontend Code 2/3: rendering data

```
<main>
        <h1>Guest Book</h1>
        <ul>
                {#each data as entry}
                        <li>{entry.message}</li>
                {/each}
        </ul>
        <form>
                <input type="text" name="msg" bind:value={msg} />
                <button on:click|preventDefault={save}>Send</button>
        </form>
</main>
```

render `data` and form to store `msg`

Frontend Code 3/3: saving data

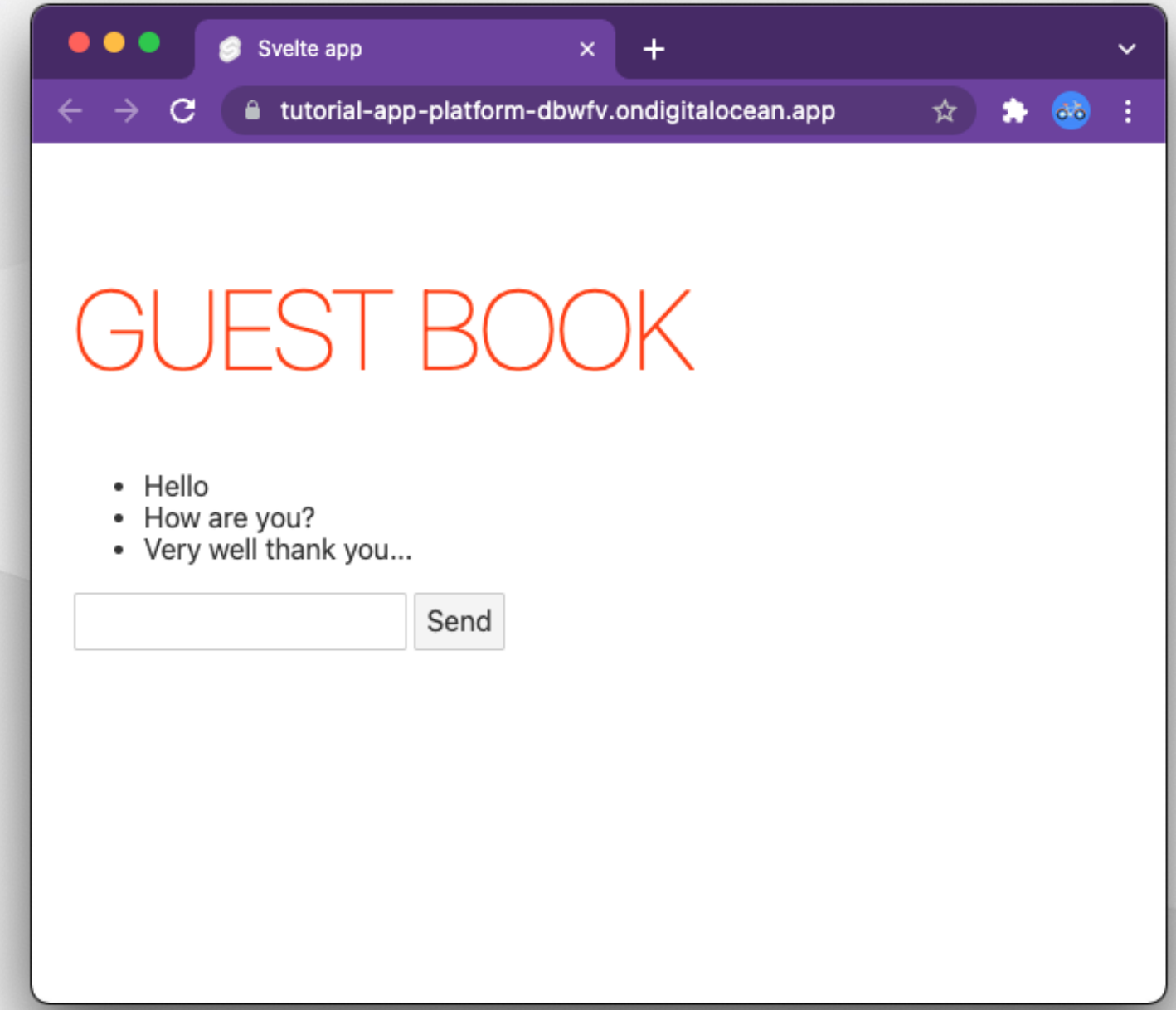
```
let msg = "";
function save() {
  let data = JSON.stringify({msg:msg})
  msg = ""
  fetch(api, {
    method: "POST",
    headers: {
      "Content-Type": "application/json",
    },
    body: data,
  }).then(load);
}
```

`POST /api/` with form data then `load`

Exercise: final deploy

```
## Enable trusted sources before this

# deploy
cp src/4-index.js backend/index.js
cp src/4-App.svelte frontend/src/App.svelte
git add frontend backend
git commit -m "guestbook" -a
git push origin main
# wait for the final build
```


Svelte app
tutorial-app-platform-dbwfv.ondigitalocean.app
GUEST BOOK
Hello
How are you?
Very well thank you...
Send

Source code: bit.ly/msdo001

Thank You