Lesson 6

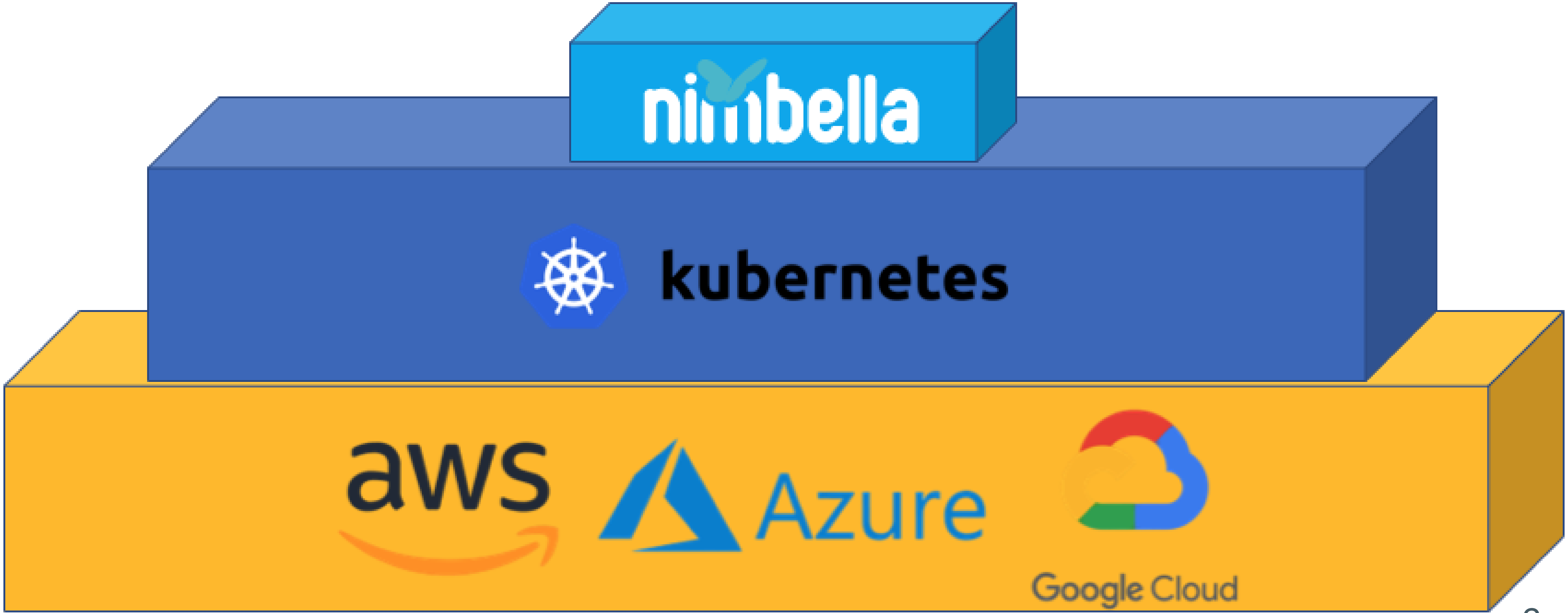
Using Typescript with Nimbella

https://www.nimbella.com

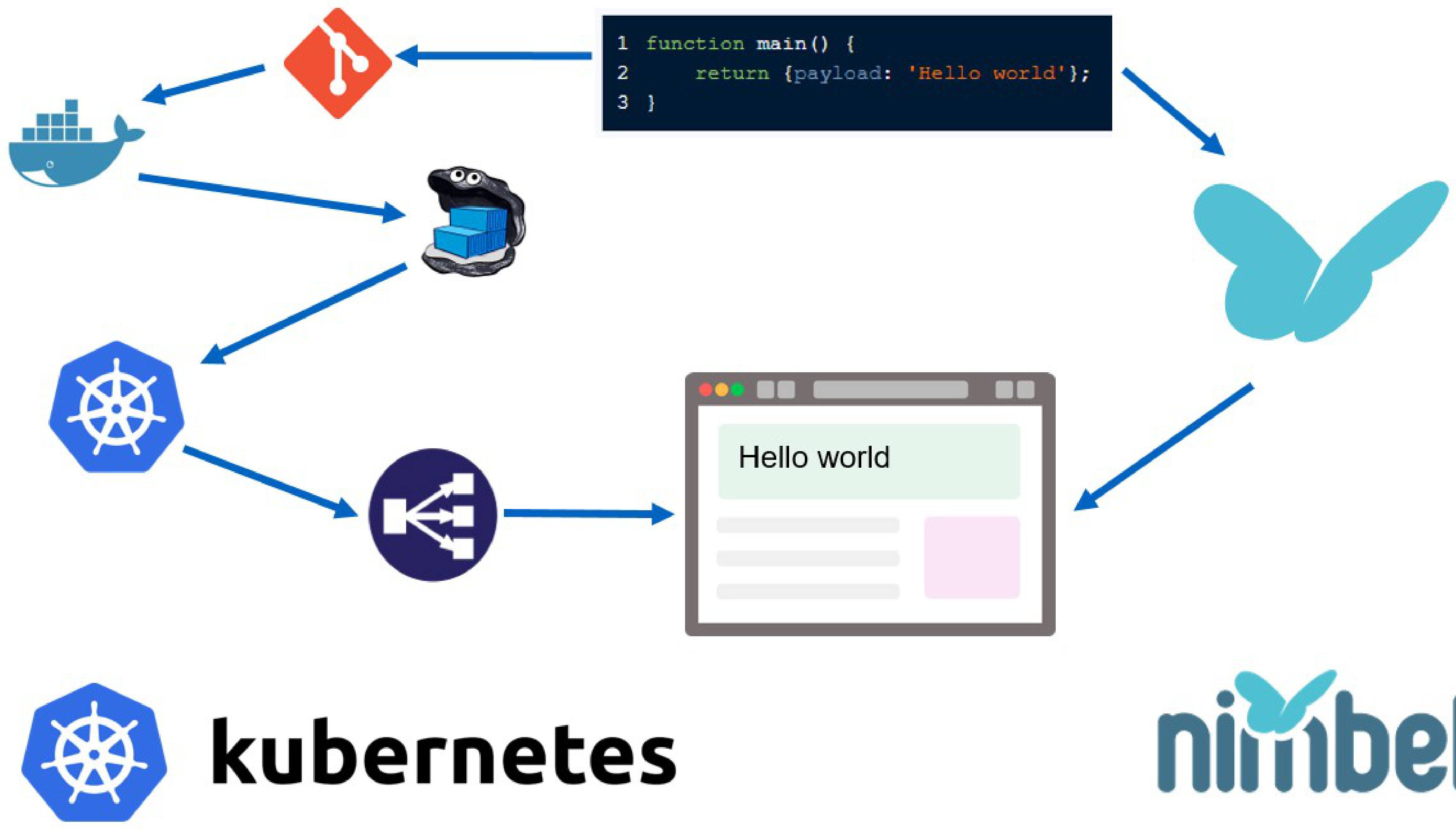
Plan

- Introducing Nimbella
- Sample: a "crud" back-end in javascript
- Adding types: migrating to typescript
- A front-end in Svelte/Typescript

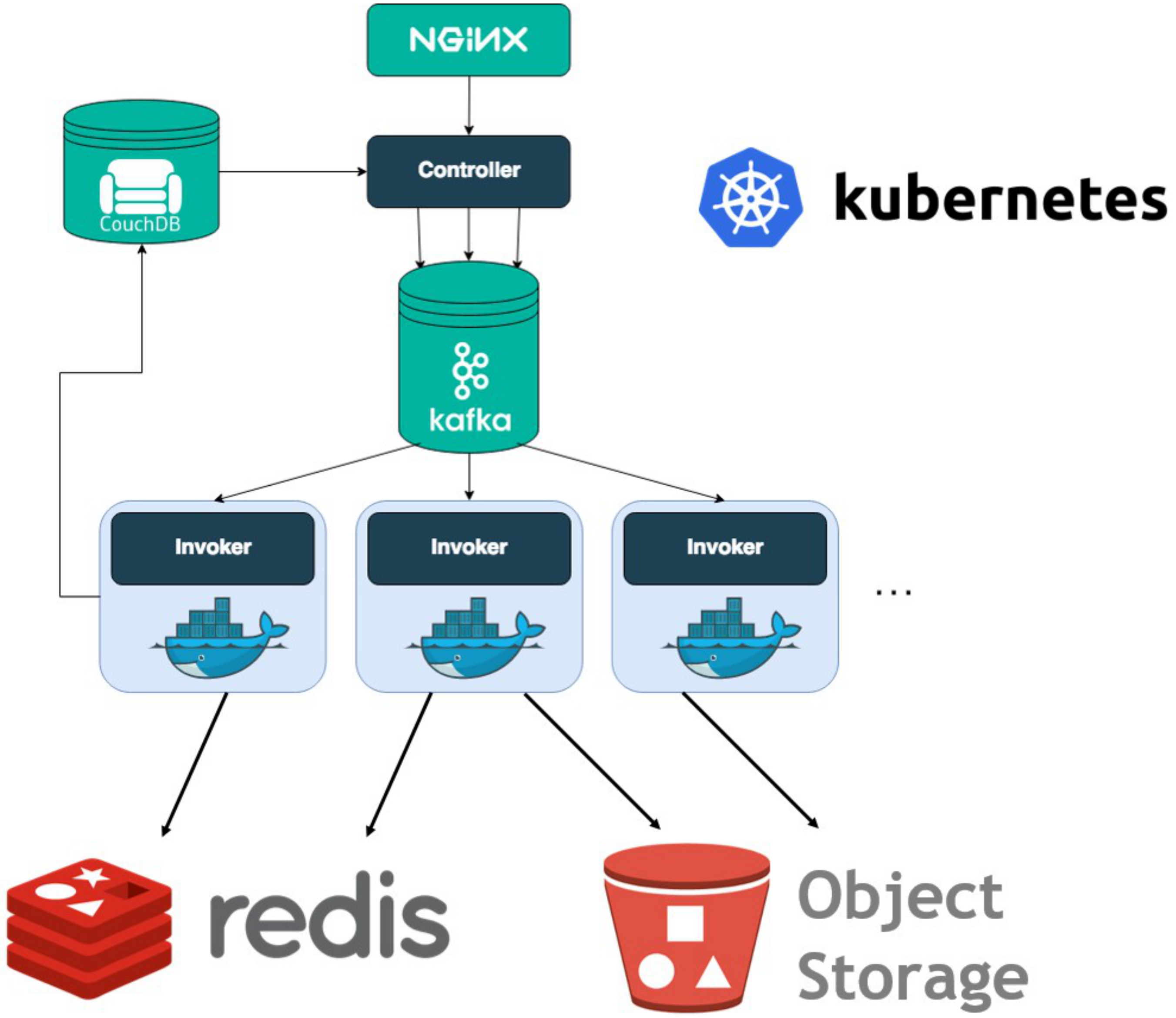
Nimbella vs Kubernetes vs Cloud

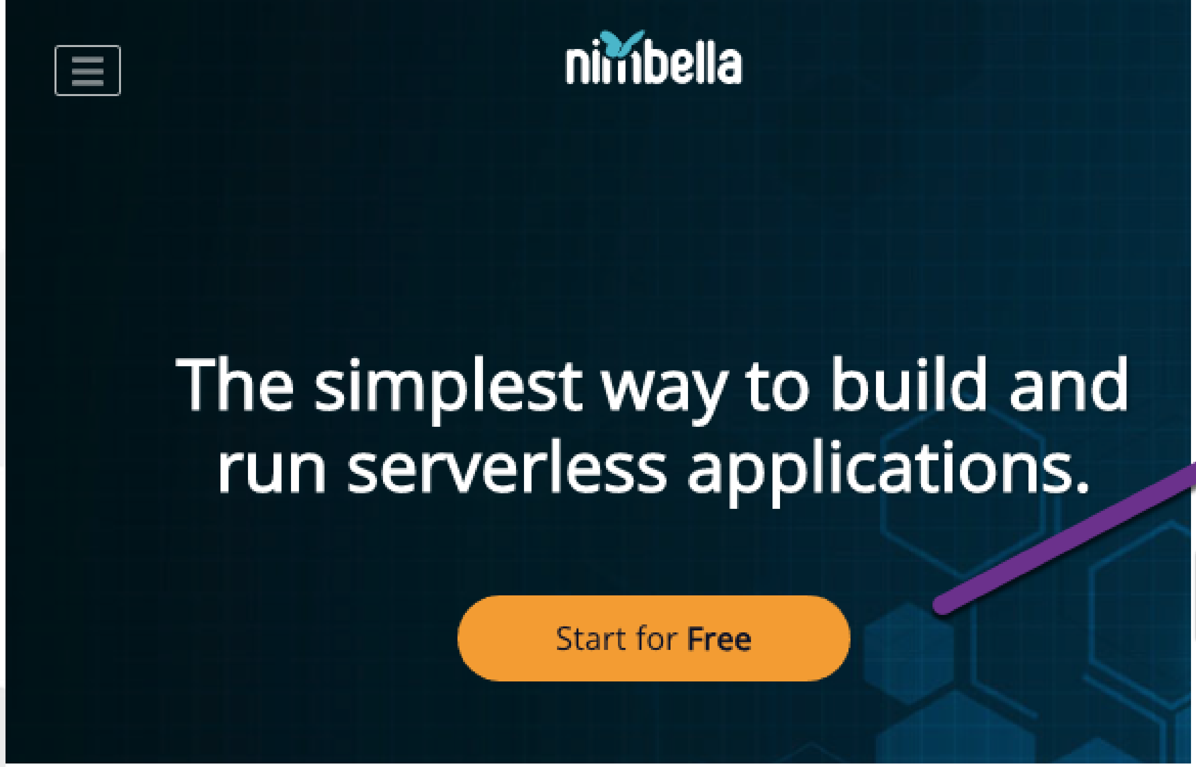


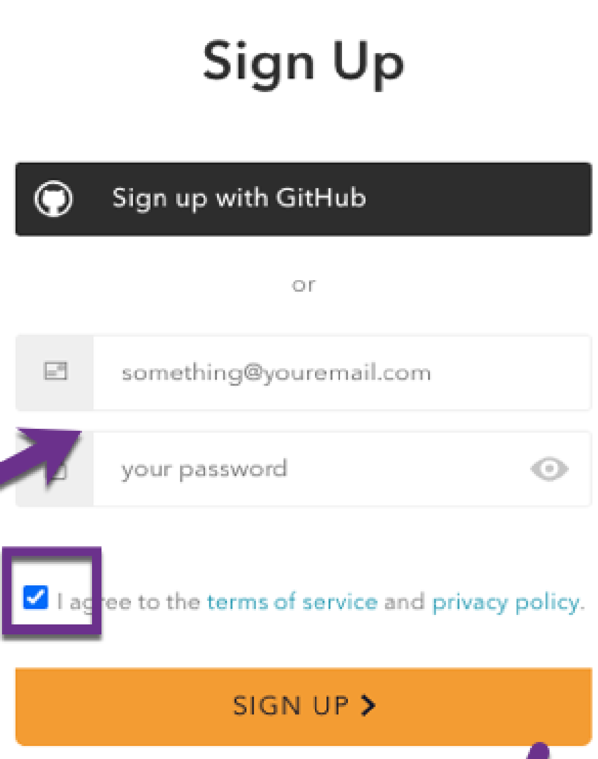
Kubernetes vs Nimbella

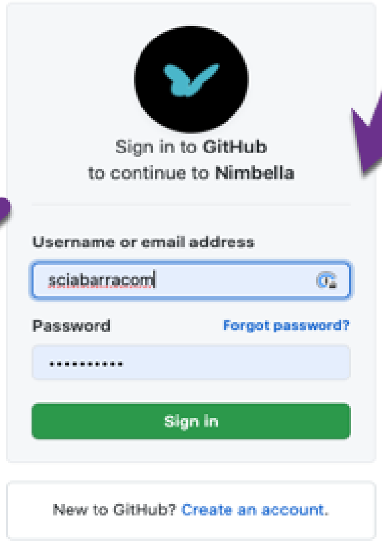

```
function main() {
    return {payload: 'Hello world'};
}
```

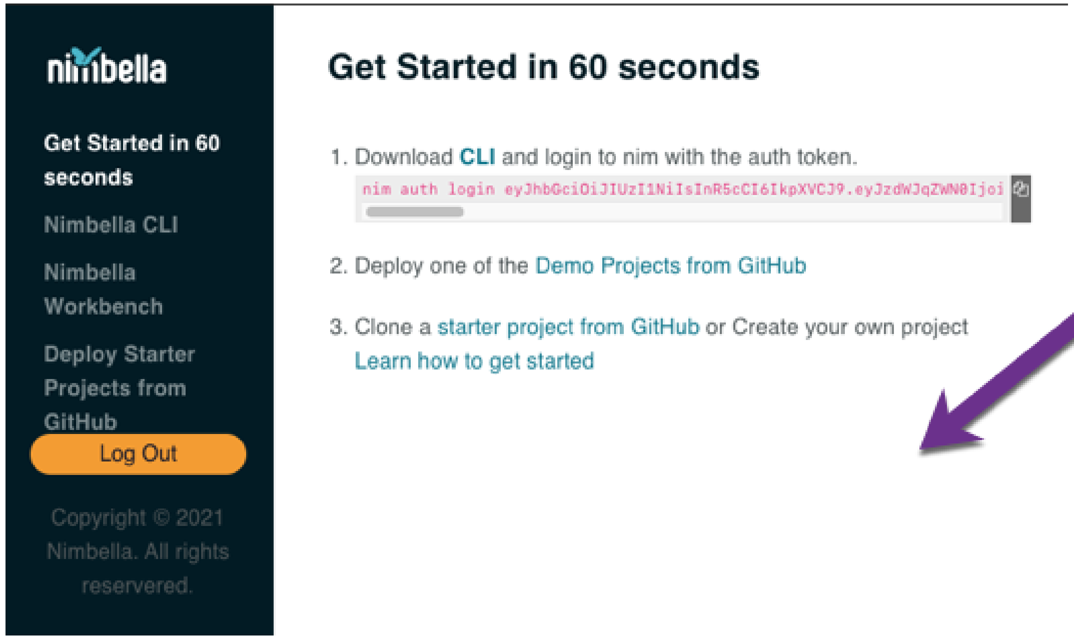
Nimbella Architecture










nimbella
Get Started in 60 seconds
Nimbella CLI
Nimbella Workbench
Deploy Starter Projects from GitHub
Log Out
Copyright © 2021 Nimbella. All rights reserverd.

Get Started in 60 seconds

1. Download CLI and login to nim with the auth token.

```
nim auth login eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJzdWJqZWN0Ijoi
```

2. Deploy one of the Demo Projects from GitHub
3. Clone a starter project from GitHub or Create your own project
   Learn how to get started

A Nimbella project

- Collection of
  - actions (backend)
  - web assets (front-end)
  - redis (storage)
  - bucket (uploads)
  - more...
- Managed with `nim`

Conventions over configurations

- Actions are in `packages` folder
  - Subfolders are packages
  - Use "default" for "no package" actions
- A single file with extension determine the actions
  - It can also be a directory
- Deploy with `nim project deploy <project-dir>`

Login

- `nim auth login`
  open the browser and log into your github account
- `nim auth current`
  show your namespace
- `nim namespace get`
  show what you have in the namespace
- `nim namespace clean`
  cleaning your namespace

Simple Action

```
function main(args) {
    let name = args.name || "world"
    console.log(name)
    return { body: "Hello, "+name }
}
```

Create and Updating an Action

- `nim action create <name> <file>`
- create an action with `<name>` using the `<file>`
- `nim action update <name> <file>`
  - works also if the action does not exists
  - some people only uses `update`

Inspecting Actions

- `nim action list`
  list actions
- `nim action get <name>`
  get informations about an action
- `nim action get <name> --url`
  get the public url of an action

Inspecting the action

```
# create
nim action list
nim action create hello src/hello.js
# Inspecting the action
nim action list
nim action get hello
nim action get hello --url
```

Action invocation with nim

with `action invoke`:

- `nim action invoke <action-name> <parameters>`

`<parameters>`:

- `-p <name> <value> ...`
  can be repeated multiple times
- `-P <file>.json`
  you need a file in json format

Invoking an action with parameters

```
# Invoking an action with parameters
nim action invoke hello
nim action invoke hello -p name Mike

# invoking an action with json
echo '{ "name": "Nimble"}' >args.json
nim action invoke hello -P args.json
```

Action invocation with `curl`

only for web actions!

- `--web true`
  - **not** all the actions are web public
  - *must* return a `body`

use url-encoded parameters

- `curl -X GET <url>?event=hit`
- `curl -X POST -d event=hit <url>`

Using `curl` for web actions

```
# updating as a web action
nim action update hello src/hello.js --web=true

# Using Curl  for web actions
URL=$(nim action get hello --url)
echo $URL

# use GET and url parameters

curl "$URL?name=Mike"

## use POST and form data (url-encoded)
curl -X POST -d name=Mike "$URL"
```

Checking Activations

- `nim activation list [--limit <n>]`
  list actions, you can limit them
- `nim activation logs [<id>]`
  show logs of an activation
- `nim activation result [<id>]`
  show logs of an activation

Activations

```
# Listing Activations
nim activation list --limit 3
nim action invoke hello -p name Mike
nim activation list --limit 3

# Displaying logs and results
nim activation logs
nim activation result
```

Using Redis

- A "in-memory" key-value store
- Data is persisted on disk and backed up
  - can be used as data store
- Very fast
  - can be also used as cache
- Works as shared state
  - multiple actions can read and write

Using `nim kv`

```
# nim kv support
nim kv
nim kv list
nim kv get hello
nim kv set hello world
nim kv list
nim kv get hello
nim kv clean
nim kv list
```

Set in Redis

```javascript
// set.js
function main(args) {
    let db = require("@nimbella/sdk").redis()
    let key = "address:"+args.name
    let value = JSON.stringify({
            "name": args.name || "",
            "company":  args.company  || "",
            "phone": args.phone || ""
    })
    return db.setAsync(key, value)
    .then(reply => { return {"body": reply}})
    .catch(err =>  { return {"body": err}})
}
```

Get in Redis

```
// get.js
function main(args) {
    let db = require("@nimbella/sdk").redis()
    let key = "address:"+args.name
    return db.getAsync(key)
    .then(reply => { return JSON.parse(reply||"")})
    .catch(err =>  { return {"body": err}})
}
```

del.js

```
// del.js
function main(args) {
    let db = require("nim").redis()
    let key = "address:"+args.name
    return db.delAsync(key)
    .then(reply => { return {"body": reply}})
    .catch(err =>  { return {"body": err}})
}
```

Deploy record actions

```
# Deploy fixed actions
mkdir -p address/packages/addr
cp src/set.js address/packages/addr/set.js
cp src/get.js address/packages/addr/get.js
cp src/del.js address/packages/addr/del.js
find address
nim project deploy address
```

Test set/get/del

```
# Test the actions set/get/del
nim action invoke addr/set -p name Michele -p company Nimbella -p phone 392
nim action invoke addr/get -p name Michele
nim action invoke addr/del -p name Michele
nim action invoke addr/get -p name Michele
```

List all records

```
// loading all the records
function main() {
    let db = require("@nimbella/sdk").redis()
    return db.keysAsync("address:*")
    .then(reply =>
      reply.length == 0 ? [] : db.mgetAsync(reply))
    .then(reply => ({
        "body": reply.map(JSON.parse)
      }))
    .catch(err => ({ "body": err}))
}
```

Dissecting `all.js`:

- `db.keysAsync("address:*").then(reply => ...)`:
  reply= `[ 'address:Mirella', 'address:Michele' ]`
- `db.mgetAsync(reply).then(reply => ... )`:
  reply =
  ```
  [ '{"name":"Mirella","company":"Sciabarra","phone":328}',
  '{"name":"Michele","company":"Nimbella","phone":392}' ]
  ```
- `reply.map(['{}', '{"a":1}])`
  = `[{},{"a":1}]`

Deploy and test `all.js`

```
# add all
cp src/all.js address/packages/addr/all.js
nim project deploy address
nim action invoke addr/all
nim action invoke addr/set -p name Michele -p company Nimbella -p phone 392
nim action invoke addr/set -p name Mirella -p company Sciabarra -p phone 328
nim action invoke addr/all
curl $(nim action get addr/all --url)
```

Using Typescript

- Different solutions:
  - integrated typescript compiler
  - deno runtime
  - **precompilation**
- Next Steps:
  - adding types to our code
  - compile typed code in untyped one
  - integrate compilation in the deployment

hello.ts

```
// hello.ts
export function main(args: {name:string}): {body:string} {
    let name: string = args.name || 'world'
    let greeting = 'Hello ' + name + '!'
    console.log(greeting)
    return { body: greeting }
}
```

Typescript: Folders and Files

- `address`: project folder
  - `packages`: backend folder
    - `addr`: package folder
      - `hello`: action folder
        - `src`: sources folder
          - `index.ts`: the typescript action
          - `packages.json`: configuration file
          - `tsconfig.ts`: compiler file
          - `.include`: list of included files

Create a typescript

```
# prepare environment
mkdir -p address/packages/addr/hellots/src
cp src/hello.ts address/packages/addr/hellots/src/index.ts
# initializing
cd address/packages/addr/hellots
echo "index.js" >.include
npm -y init
tsc --init
# build and deploy
ls -la
tsc --outDir .
ls -la
cd ../../../..
nim project deploy address
nim action invoke addr/hellots
```

Integrating with `nim`

- `nim` invokes automatically the build
    - `npm run build` if exists `package.json`
- We need:
    - to add `tsc` in `package.json`
    - to configure `tsc` in `tsconfig.json`

`package.json`:

```
{
 ...
 "scripts": {
    "build": "tsc"
  },
  ...
}
```

- add a build script

`tsconfig.js`:

```
{
  "include": ["src/*.ts"],
  "exclude": [],
  "compilerOptions": {
    "outDir": "./",
    "target": "es2015",
    "module": "commonjs",
    ...
  }
}
```

- include and exclude folders
- set output directory to root of the action

Testing the integration

```
# copying configuration and files
cp src/hi.ts address/packages/addr/hellots/src/index.ts
cp src/package.json address/packages/addr/hellots/package.json
cp src/tsconfig.json address/packages/addr/hellots/tsconfig.json
# test and deploy
nim project deploy address
nim action invoke addr/hellots
# expect `hi`
```

From Javascript to TypeScript

- adding types to the previous example
  - declare types for input and output
  - declare types for used libraries

decls.d.ts

```
export interface Record {
    name: string
    company: string
    phone: number
}
export interface Args extends Record {
    op?: string
}
export interface Result {
    data?: Record[]
    record?: Record
    status?: string
    error?: string
}
```

Using Types

```
/// <reference path="index.d.ts" />
import { redis } from "@nimbella/sdk"

import type {Args, Result, Record} from './decl'

function main(args: Args): Promise<{body: Result}>
```

- define `Args`, `Result` and `Record`
- type declarations for `@nimbella/sdk`

Declare module for `@nimbella.sdk`

```
// index.d.ts
declare module "@nimbella/sdk" {
    export function redis(): RedisClient;
    export interface RedisClient extends NodeJS.EventEmitter {
        setAsync(key:string, value:string): Promise<number>;
        getAsync(key:string): Promise<string>;
        delAsync(key:string): Promise<number>;
        keysAsync(pattern:string): Promise<Array<string>>;
        mgetAsync(keys:Array<string>): Promise<Array<string>>;
    }
}
```

`index.ts` structure

```
/// <reference path="index.d.ts" />
import { redis } from "@nimbella/sdk"
import type {Args,Result,Record} from './decls'
```

```
export function main(args: Args): Promise<{body:Result}> {
    let db = redis()
    let key = "address:"+args.name
    switch (args.op) {
        // insert here
        // get/set/del/all
        default:
            return Promise.resolve({ body: { error: "unknown op" } })
    }
}
```

`set`

```
case "set":
    delete args.op
    // save record
    return db.setAsync(key,
           JSON.stringify(args))
        .then(reply =>
           ({ body: { status: reply.toString() } }))
        .catch(err =>
           ({ body: { error: err } }))
    break
```

- `Args extends Record` with `op?: string`

get and del

```
case 'get':
    return db.getAsync(key)
        .then(reply =>
           ({ body: { record: JSON.parse(reply) } }))
        .catch(err => ({ body: { error: err } }))
    break
```

```
case 'del':
    return db.delAsync(key)
        .then(reply =>
           ({ body: { status: reply.toString() } }))
        .catch(err => ({ body: { error: err } }))
    break
```

`all`

```
case 'all':
    return db.keysAsync("address:*")
        .then(reply =>
         reply.length == 0
          ? [] as string[]
          : db.mgetAsync(reply))
        .then(reply => ({body: { data:
             reply.map(JSON.parse as (x:string)=> Record) }
         }))
        .catch(err => ({ body: { error: err } }))
```

- `[] as string[]`
- `JSON.parse as (x:string)=> Record`

Deploying crud

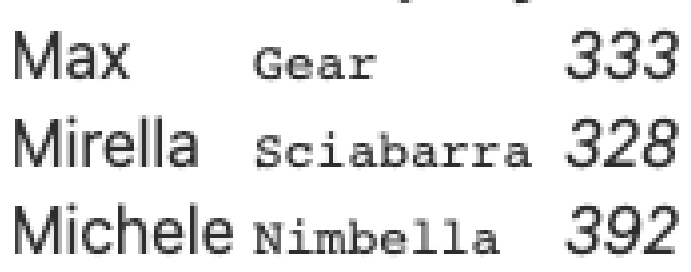
```
## Deploying Crud
# prepare crud typescript
mkdir -p address/packages/addr/crud/src
cp src/package.json  address/packages/addr/crud/package.json
cp src/tsconfig.json address/packages/addr/crud/tsconfig.json
cp src/decl.d.ts      address/packages/addr/crud/src/decl.d.ts
cp src/index.d.ts     address/packages/addr/crud/src/index.d.ts
cp src/index.ts       address/packages/addr/crud/src/index.ts
echo "index.js"     > address/packages/addr/crud/.include

# deploy
find address/packages/addr/crud
nim project deploy address
ls -la address/packages/addr/crud
# note the index.js has been generated
```

Testing crud

```
nim kv clean
nim action invoke addr/crud -p op all
nim action invoke addr/crud -p op set -p name Michele -p company Nimbella -p phone 392
nim action invoke addr/crud -p op get -p name Michele
nim action invoke addr/crud -p op set -p name Mirella -p company Butterfly -p phone 328
nim action invoke addr/crud -p op all
nim action invoke addr/crud -p op del -p name Michele
nim action invoke addr/crud -p op all
```

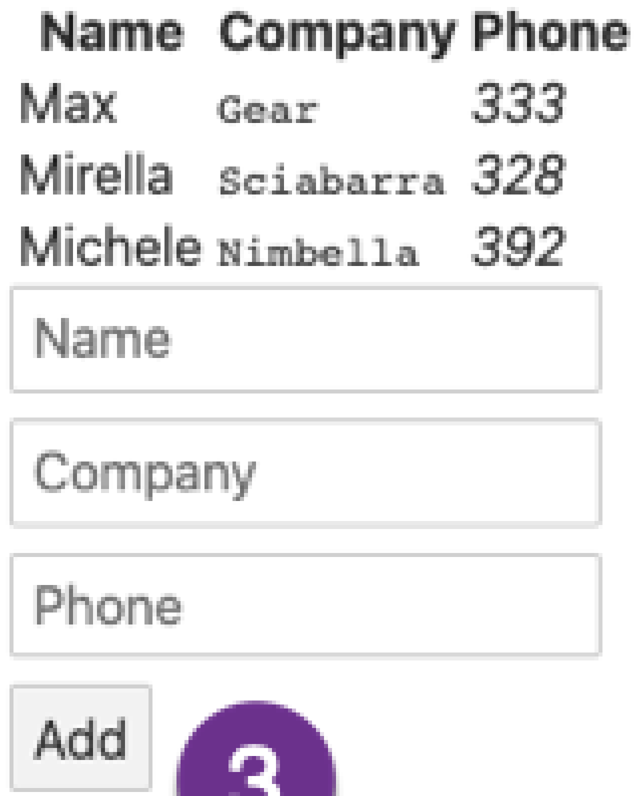
```
[
 {
  "company": "Gear",
  "name": "Max",
  "phone": 333
 },
 {
  "company": "Sciabarra",
  "name": "Mirella",
  "phone": 328
 },
 {
  "company": "Nimbella",
  "name": "Michele",
  "phone": 392
 }
]
```

1



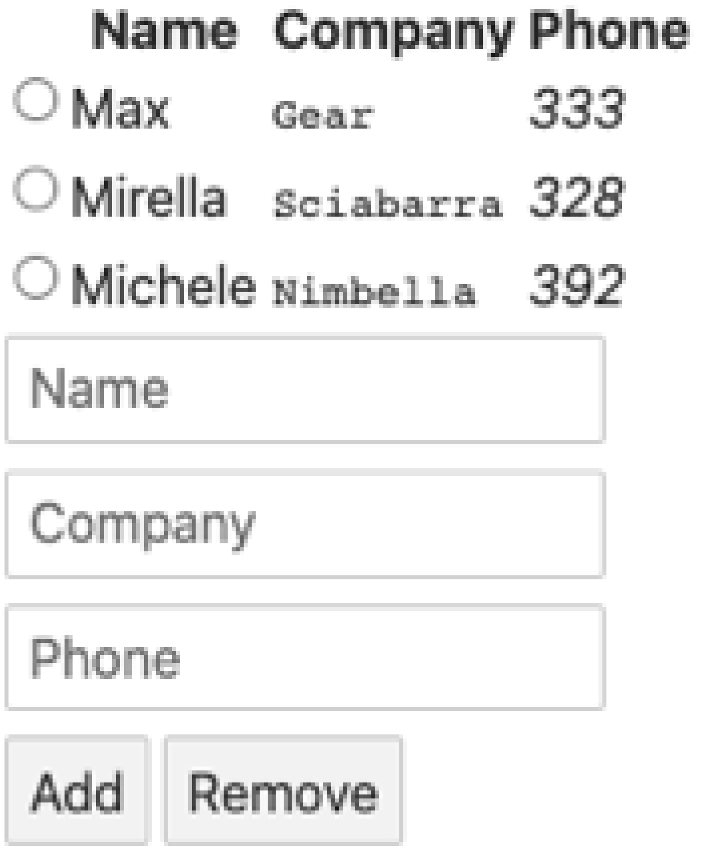
Max	Gear	333
Mirella	Sciabarra	328
Michele	Nimbella	392

2



Name	Company	Phone
Max	Gear	333
Mirella	Sciabarra	328
Michele	Nimbella	392

3



	Name	Company	Phone
○	Max	Gear	333
○	Mirella	Sciabarra	328
○	Michele	Nimbella	392

4

Create a svelte app

- `npx degit sveltejs/template web`
  it uses a template on GitHub
- requires some configuration:
  - `project.yml`
  - `web/.include`

How to use a subfolder

- `project.yml` (strip one level):

```
bucket:
  strip: 1
```

- `web/.include` (pick the subfolder `public`):

```
public
```

Setup Svelte

```
# setup svelte
cd address
# create a template
npx degit sveltejs/template web
# strip one level
echo -e "bucket:\n  strip: 1" >project.yml
cd web
# enable typescript
node scripts/setupTypeScript.js
# include public
echo "public" >.include
cd ../..
nim project deploy address
```

Svelte is "reactive"

- declare: `let data = ""`
- use: `{data}`
- assign: `data = "hello"`
  - triggers view update
- `onMount` executed when view ready

Load all data

```
<script lang="ts">
  import type {Record, Result, Args} from './decl'

  let data: Record[] = []

  function all()  {
      fetch("/api/addr/crud?op=all")
      .then(r => r.json() as Result)
      .then(d => data = d.data ? d.data : [])
  }
  // init
  import { onMount } from 'svelte'
  onMount(all)
</script>
```

Svelte templates

- reactive
  - just update variable
- `{#each data as row}`
  - iterates array assigning to row
- `{row.name}`
  - render value
- `{/each}`
  - closes block

Adding the table

```
<table>
  <tr>
    <th>Name</th>
    <th>Company</th>
    <th>Phone</th>
  </tr>
  {#each data as row}
      <tr>
        <td>{row.name}</td>
        <td><tt>{row.company}</tt></td>
        <td><i>{row.phone}</i></td>
      </tr>
  {/each}
</table>
```

Deploy

```
cp src/decl.d.ts address/web/src/decl.d.ts
cp src/App1.svelte address/web/src/App.svelte
nim project deploy address
```

Form

```
let form = <Record>{};

function add() {
    let args: Args = form
    args.op = "set"
    fetch("/api/addr/set", {
      method: "POST",
      headers: { "Content-Type": "application/json" },
      body: JSON.stringify(args),
    }).then(all);
}
```

Svelte Bindings

- `<input bind:value={form.name}>`
  - value stored into `form.name`

Svelte events

- `<button on:click={add}>Add</button>`
  - event `click` execute function `add`

Form HTML

```
<form>
  <input placeholder="Name"
   bind:value={form.name}>
  <br>
  <input placeholder="Company"
   bind:value={form.company}>
  <br>
  <input placeholder="Phone"
   bind:value={form.phone}>
  <br>
</form>
<button on:click={add}>Add</button>
```

Deploy v3

```
# deploy v3
cp src/App2.svelte address/web/src/App.svelte
nim project deploy address
```

Remove

```
let select: string;
function remove() {
  fetch("/api/addr/crud?op=del&name=" + select).then(all);
}
```

Remove Changes

```
  <table>
     <tr>
+      <th></th
       <th>Name</th>
...
       <tr>
+        <td>
+          <input type="radio"
+           bind:group={select}
+           value={row.name} />
+        </td>
         <td>{row.name}</td>
...
   <button on:click={add}>Add</button>
+  <button on:click={remove}>Remove</button>
```

Final

```
# deploy v4
cp src/App3.svelte address/web/src/App.svelte
nim project deploy address
```