



kubernetes

~~NEXT~~



tRPC

**T3 + K8S = ❤️**

lo stack perfetto per creare dashboard  
kubernetes

@ludusrusso

# Ludovico Russo

Ph.D. in **Robotics** @Politecnico di Torino

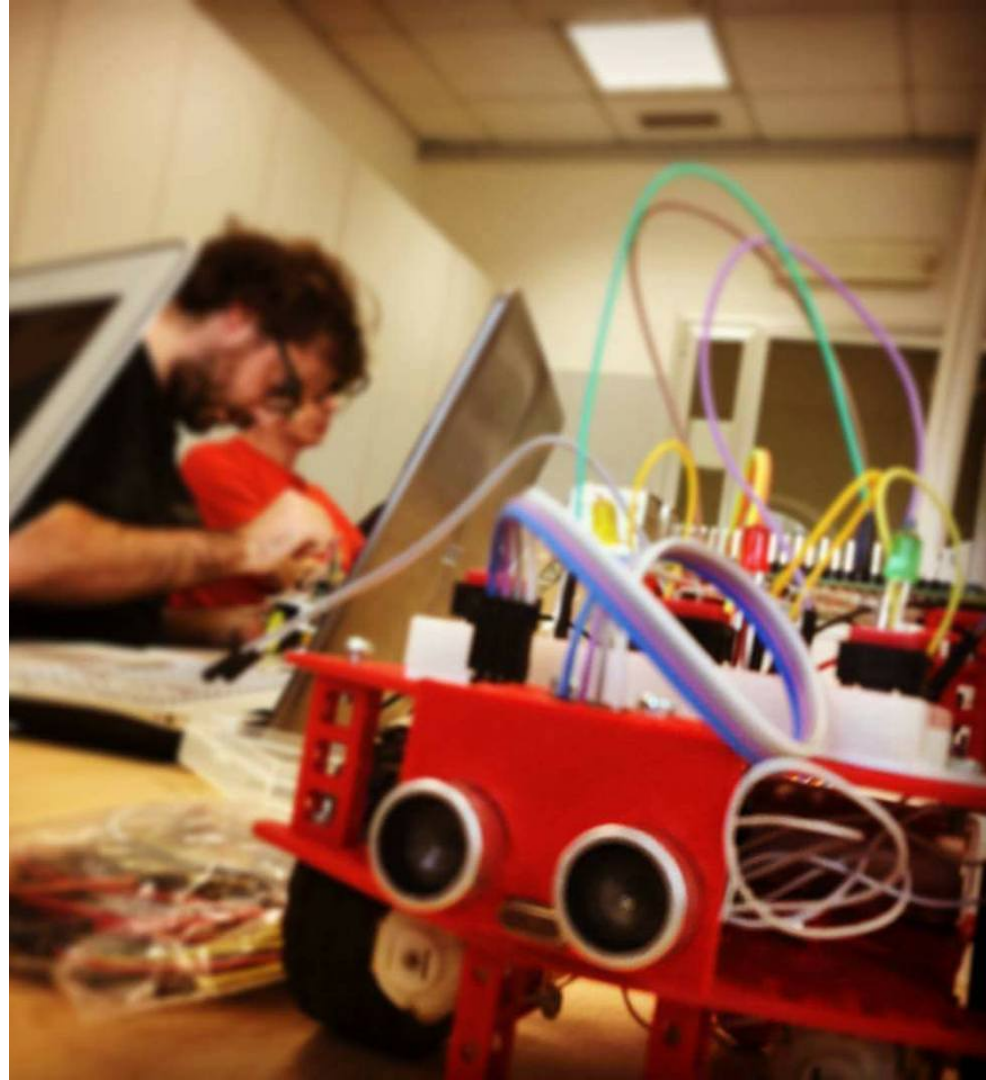
Attualmente **Responsabile Sviluppo**  
@RedCarbon

Stack: goLang, NextJS, kubernetes, etc.

Passionate in **Cloud Computing**, **Web development** and **Robotics**

@ludusrusso

<https://www.ludusrusso.dev/>



# Agenda

- Kubernetes, questo sconosciuto
  - cosa è, architettura, Resources, Operators, CRDs
  - Esempio funzionante di Kubernetes
- Perché sviluppare Dashboard per kubernetes?
- T3 Stack - Typescript, tRPC, Tailwind e NextJS
- Come interagire con Kubernetes da NodeJS
- Live Coding
- Conclusioni

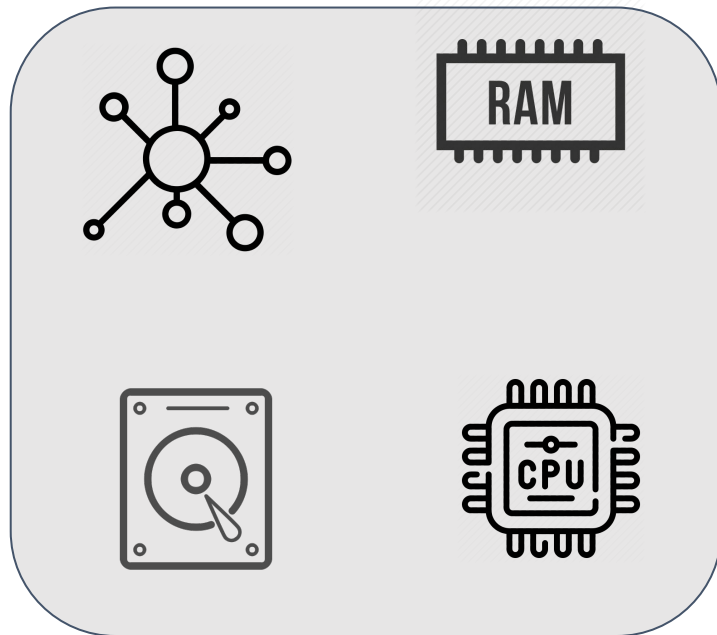
# Kubernetes: Container Orchestrator



# Kubernetes: Container Orchestrator

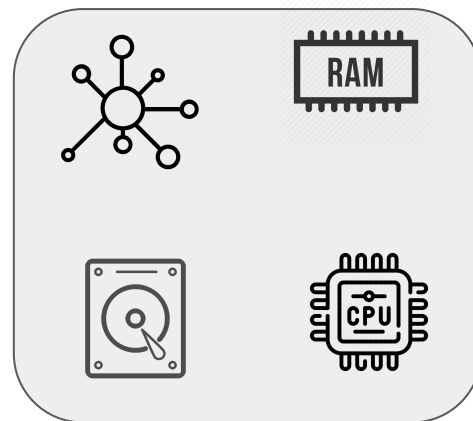
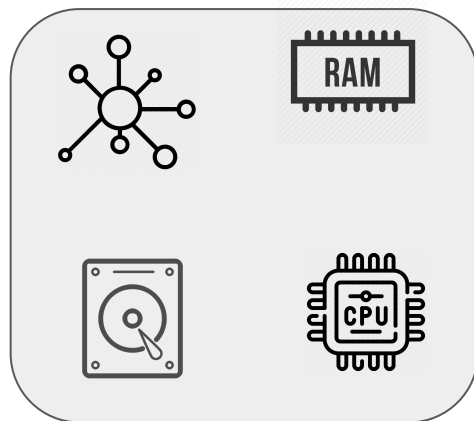
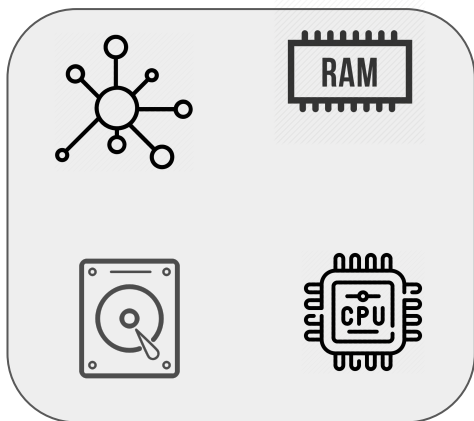


Kubernetes POD

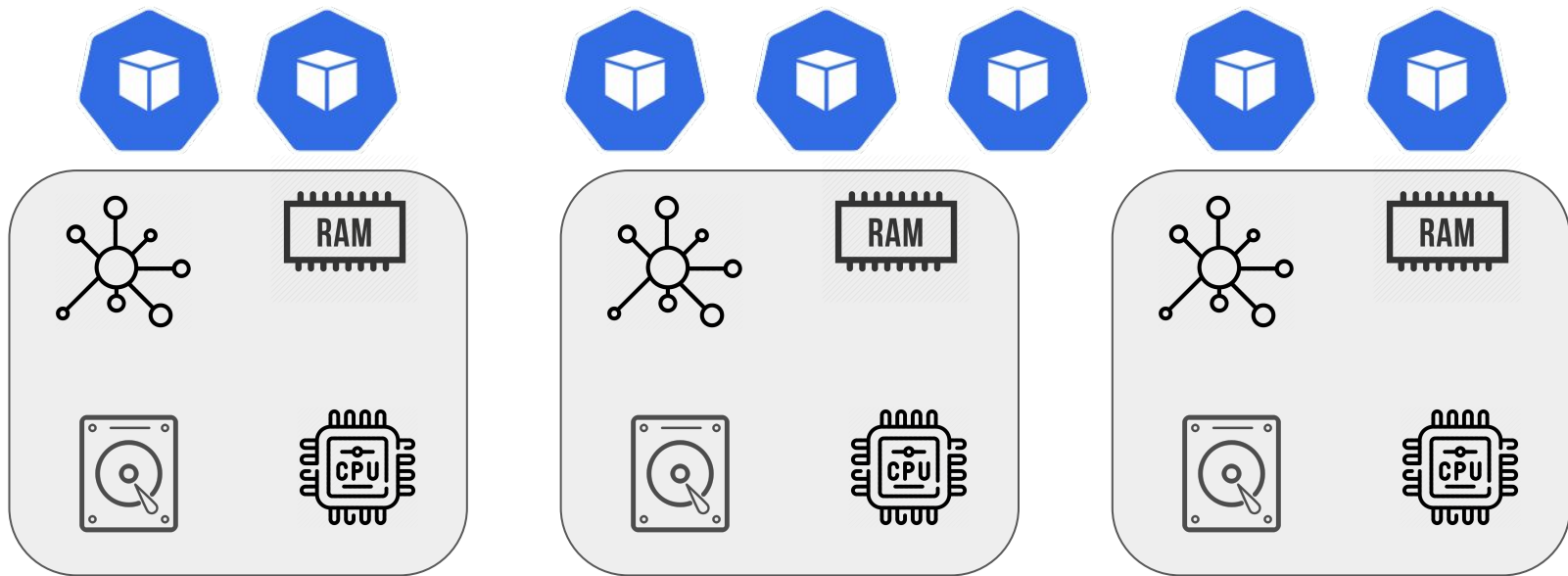


Kubernetes Node

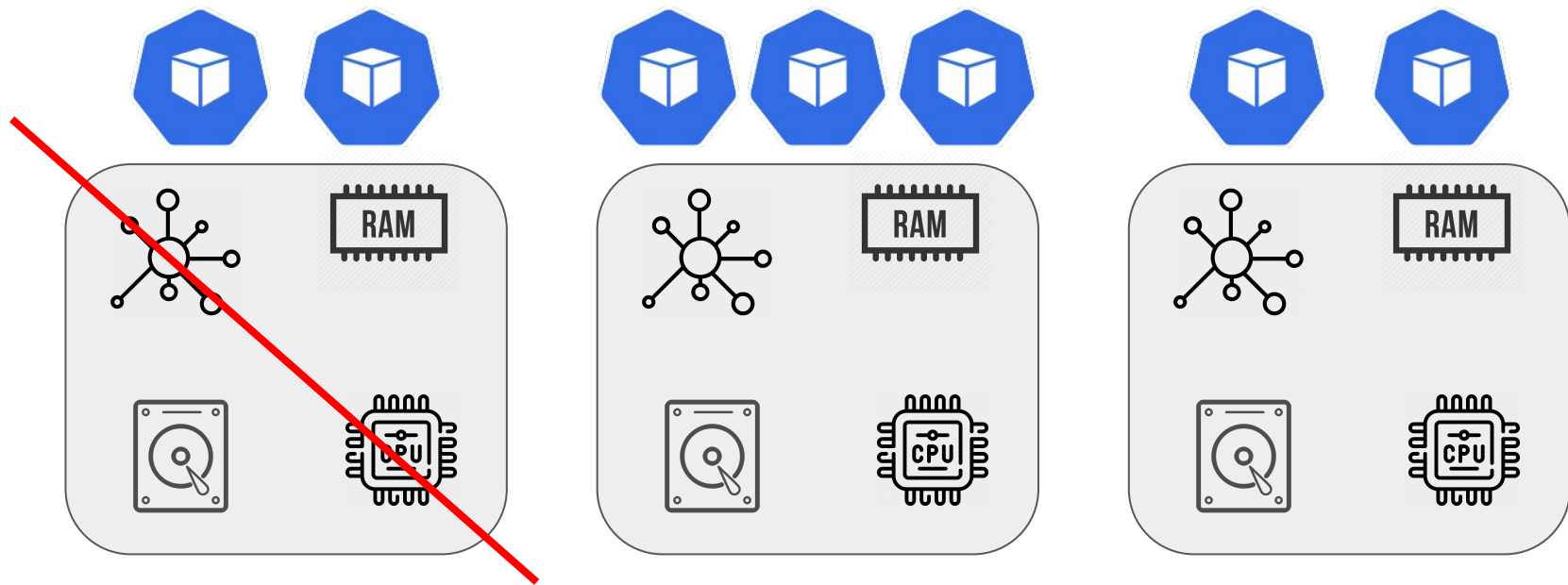
# Kubernetes: Container Orchestrator



# Kubernetes: Container Orchestrator

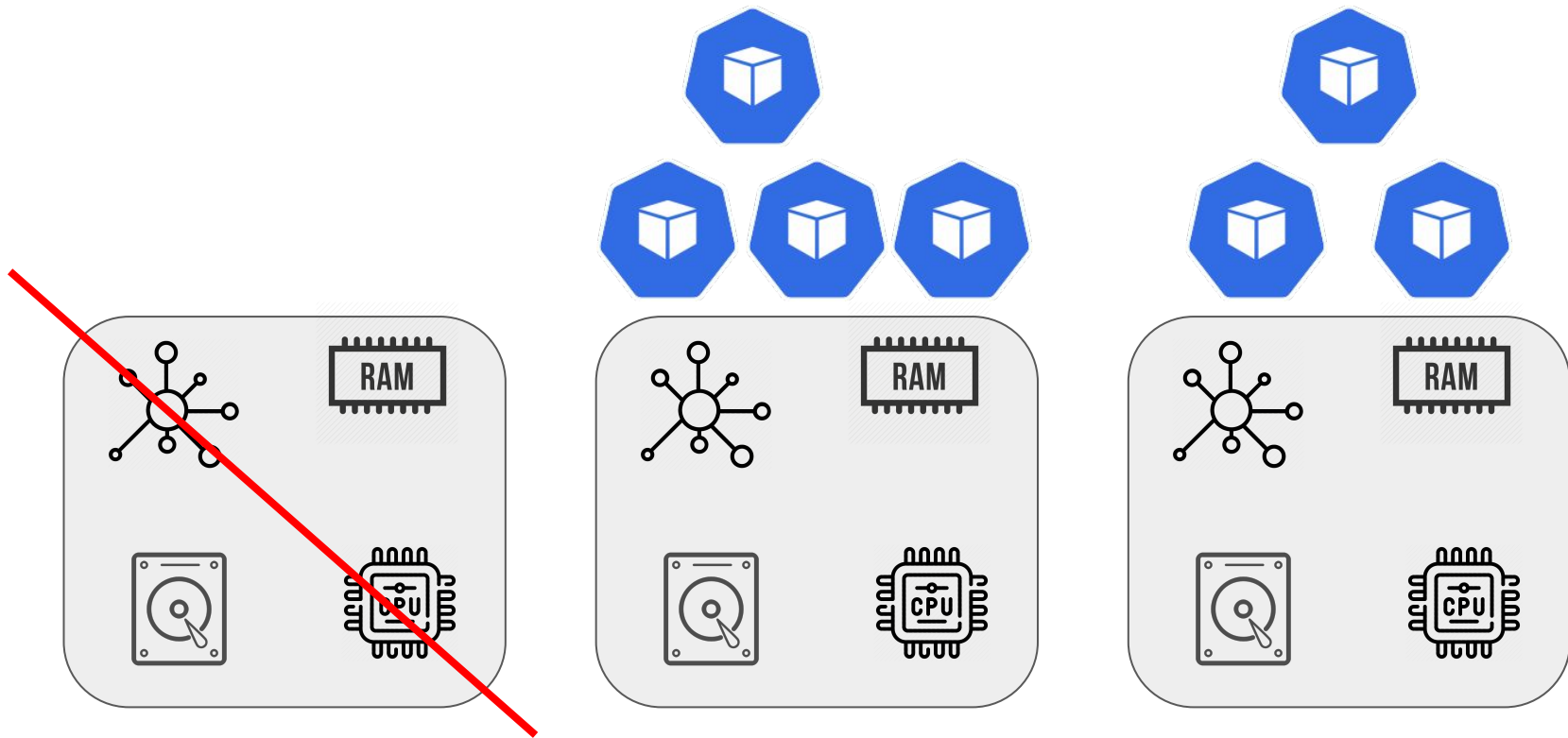


# Kubernetes: Container Orchestrator

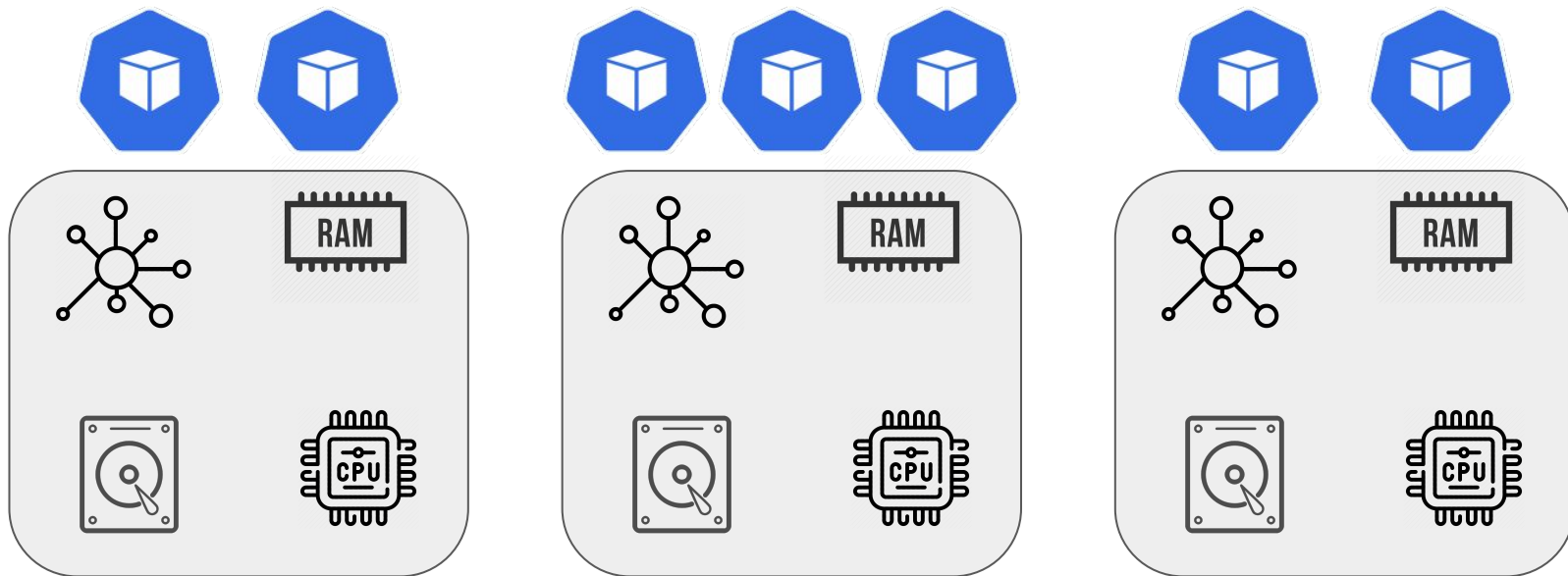




# Kubernetes: Container Orchestrator

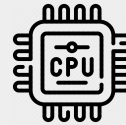
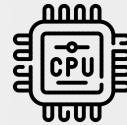
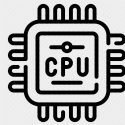


# Kubernetes: Container Orchestrator



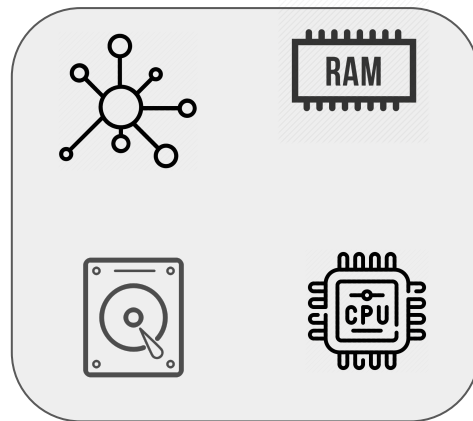
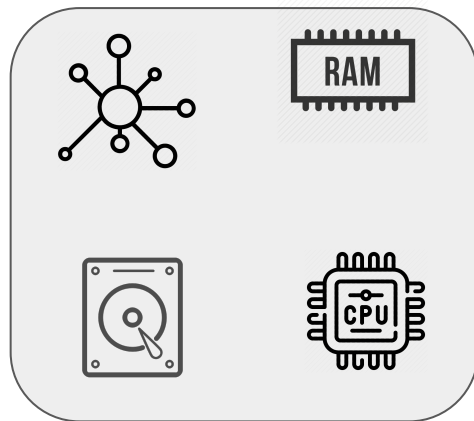
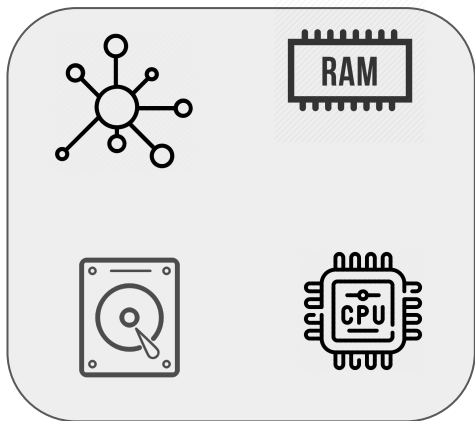


# *Man orchestrator*

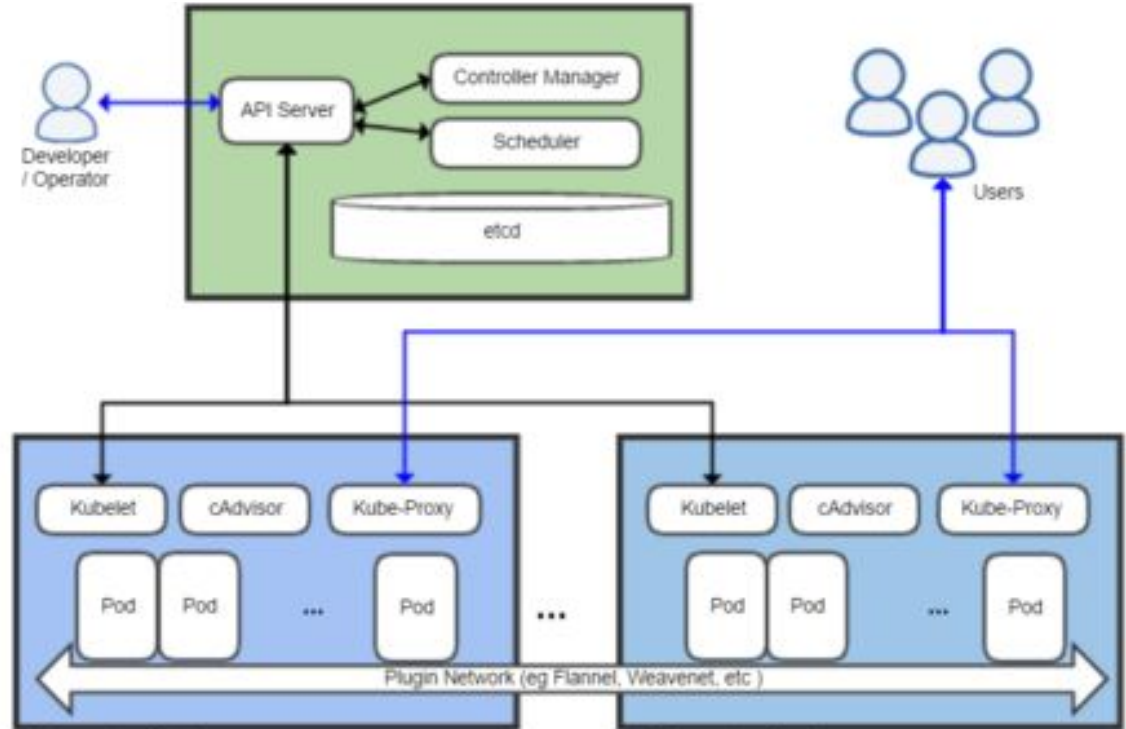
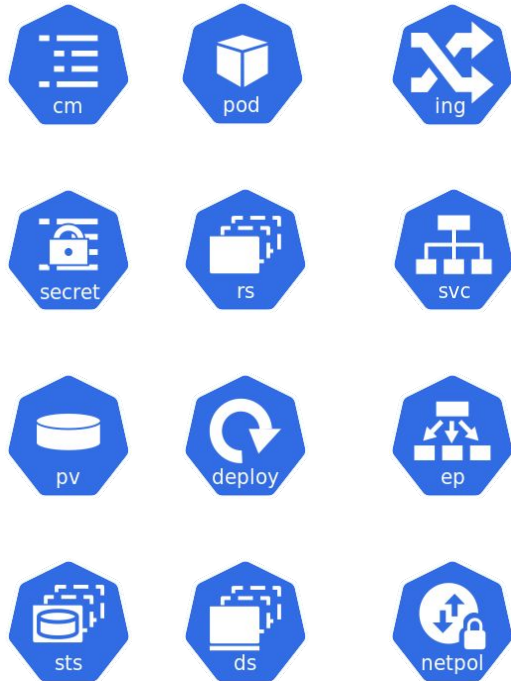




# ***Kubernetes: un container orchestrator***



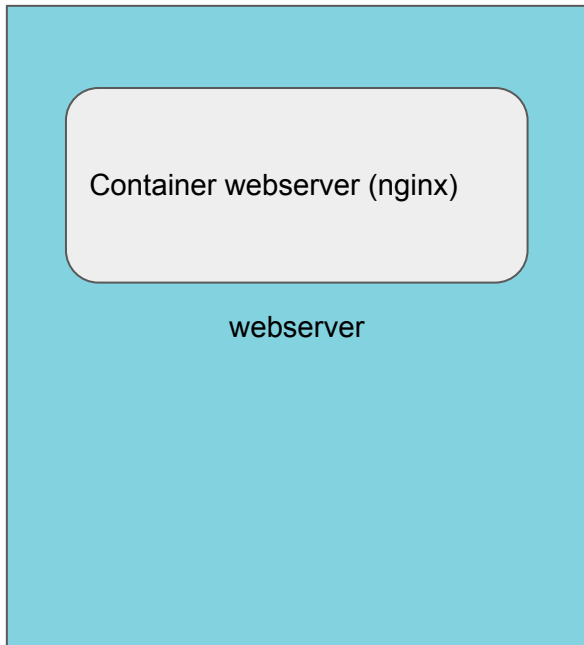
# Kubernetes Architecture



# Interagiamo con kubernetes in modo dichiarativo

- Definiamo lo stato voluto del nostro cluster per mezzo di API
- Definiamo gli oggetti (risorse) all'interno del cluster
- Kubernetes si occupa di fare in modo che lo stato (status) del cluster coincida con le specifiche (spec) che gli forniamo
- Kubernetes è estendibile, possiamo implementare nuove risorse (CRD) e le relative logiche.

# Kubernetes Resources



```
1  apiVersion: v1
2  kind: Pod
3  metadata:
4    labels:
5      app: nginx
6      name: webserver
7      namespace: default
8  spec:
9    containers:
10     - image: nginx
11       name: webserver
12
```

# Kubernetes Resources

Deployment Nginx

replicaset Nginx

Container  
webserver (nginx)

webserver

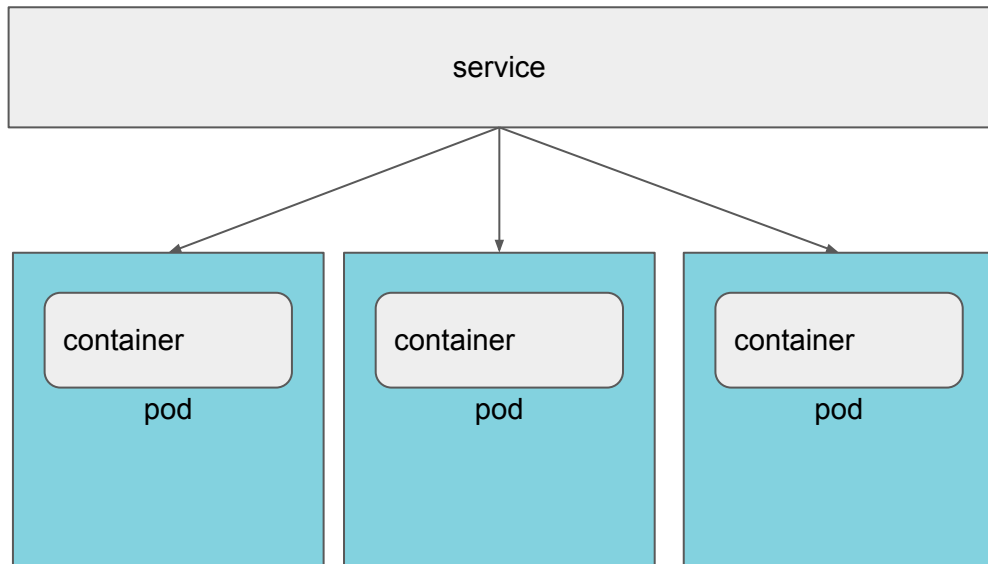
Container  
webserver (nginx)

webserver

```
1  apiVersion: apps/v1
2  kind: Deployment
3  metadata:
4    labels:
5      app: nginx
6    name: nginx
7    namespace: default
8  spec:
9    replicas: 2
10   selector:
11     matchLabels:
12       app: nginx
13   template:
14     metadata:
15       labels:
16         app: nginx
17     spec:
18       containers:
19         - image: nginx
20           imagePullPolicy: Always
21           name: nginx
22
```

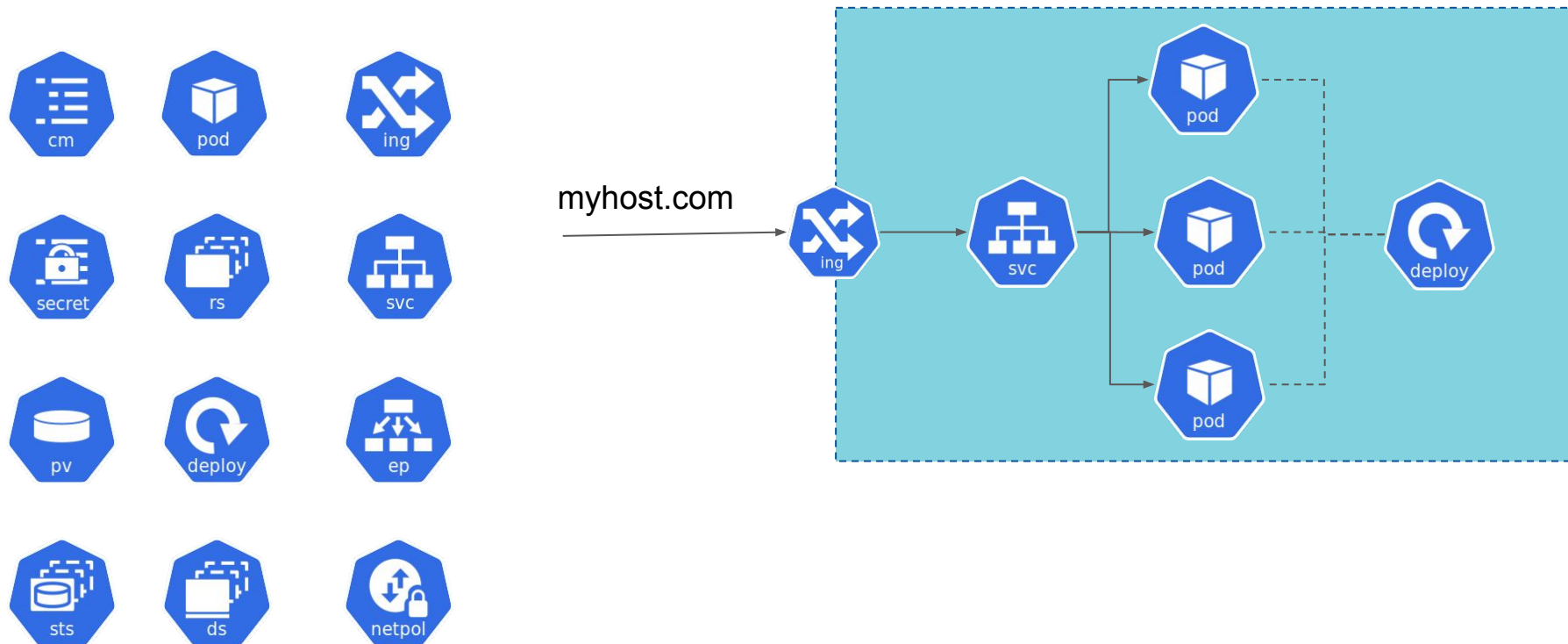


# Kubernetes Resources



```
1  apiVersion: v1
2  kind: Service
3  metadata:
4    labels:
5      app: webserver
6  name: webserver
7  spec:
8    ports:
9      - port: 80
10      protocol: TCP
11        targetPort: 80
12    selector:
13      app: webserver
14    type: ClusterIP
15
```

# Kubernetes e le architetture a Microservizi



# Kubernetes Operator

- Un programma che opera sulle risorse di kubernetes
  - Guarda le spec delle risorse monitorate
  - Agisce sul cluster in modo che lo stato del cluster sia === le specifiche della risorsa

EG: Deployment Operator

# Kubernetes Extensions

- CRD + Custom Operator

CertManager

Knative

Istio

...

# Kubernetes Extensions

- CRD + Custom Operator

CertManager

Knative

Istio

...


# Perchè una Dashboard Kubernetes


- Le modalità che kubernetes mette a disposizioni per interagire con il cluster sono generiche e poco user friendly
- Spesso è necessario sviluppare funzionalità ad hoc per un'estensione kubernetes
- Gli sviluppatori kubernetes, che lavorano principalmente con golang e con tecnologie backend, trovano un po' ostico imparare e usare tecnologie frontend, molti progetti non hanno una GUI dedicata
- Kubernetes è uno standard di fatto, le estensioni di kubernetes crescono in modo esponenziale
- c'è mercato



# The best way to start a full-stack, typesafe Next.js app

[Documentation >](#)

[GitHub](#) 

```
npm create t3-app@latest 
```

# T3 Stack: NextJS



Deploy **Next.js** on Vercel →

NEXT.js

Showcase

Docs

Blog

Analytics

Templates

Enterprise

Feedback

Learn

# The React Framework for the Web

Used by some of the world's largest companies, Next.js enables you to create full-stack web applications by extending the latest React features, and integrating powerful Rust-based JavaScript tooling for the fastest builds.

Start Learning

Documentation



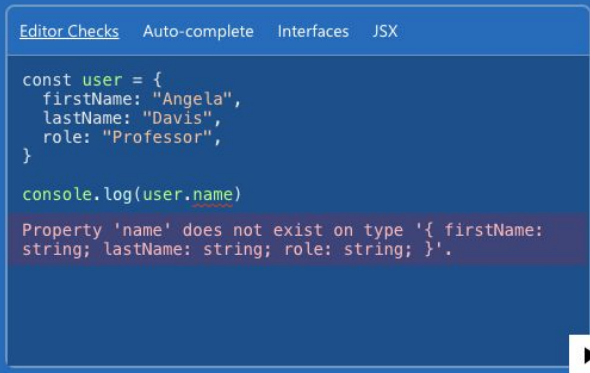
# T3 Stack: Typescript

TypeScript is **JavaScript with syntax for types.**

TypeScript is a strongly typed programming language that builds on JavaScript, giving you better tooling at any scale.

Try TypeScript Now  
Online or via npm

...



The screenshot shows a code editor with tabs for 'Editor Checks', 'Auto-complete', 'Interfaces', and 'JSX'. The code defines a 'user' object with 'firstName', 'lastName', and 'role' properties. A console log attempts to access 'user.name', which triggers a red squiggly line and an error message: 'Property 'name' does not exist on type '{ firstName: string; lastName: string; role: string; }'.

```
const user = {
  firstName: "Angela",
  lastName: "Davis",
  role: "Professor",
}

console.log(user.name)
```

Property 'name' does not exist on type '{ firstName: string; lastName: string; role: string; }'.

[TypeScript 4.9](#) is now available, [5.0](#) is currently in beta.

## What is TypeScript?

### JavaScript and More

TypeScript adds additional syntax to JavaScript to support a **tighter integration with your editor**. Catch errors early in your editor.

### A Result You Can Trust

TypeScript code converts to JavaScript, which **runs anywhere JavaScript runs**: In a browser, on Node.js or Deno and in your apps.

### Safety at Scale

TypeScript understands JavaScript and uses **type inference to give you great tooling** without additional code.

# T3 Stack: Tailwind

## Rapidly build modern websites without ever leaving your HTML.

A utility-first CSS framework packed with classes like `flex`, `pt-4`, `text-center` and `rotate-90` that can be composed to build any design, directly in your markup.

[Get started](#) K

"Tailwind CSS is the only framework that I've seen scale on large teams. It's easy to customize, adapts to any design, and the build

```
1 <figure class="bg-slate-100 rounded-xl p-8 dark:bg-slate-800">
2   
3   <div class="pt-6 space-y-4">
4     <blockquote>
5       <p class="text-lg">
6         "Tailwind CSS is the only framework that I've seen scale
7         on large teams. It's easy to customize, adapts to any
8         and the build size is tiny."
9       </p>
10    </blockquote>
11    <figcaption>
12    </div>
```

# T3 Stack: tRPC

## Move Fast and Break Nothing. End-to-end typesafe APIs made easy.

Experience the full power of TypeScript inference to boost productivity  
for your full-stack application.

☆ Star 22.200

Quickstart →

```
server.ts
...
13 import { initTRPC } from "@trpc/server";
12 import { z } from "zod";
11
10 const t = initTRPC.create();
9
8 export const appRouter = t.router({
7   greeting: t.procedure
6     .input(
5       z.object({
4         name: z.string().optional(),
3       })
2     )
1     .query(({ input }) => {
14       // ^? (parameter) input: { name?: string |
        undefined; }
1       return {
2         msg: `Hello ${input.name ?? "World"}`,
3       };
4     });
5 });
6
7 export type AppRouter = typeof appRouter;
```

```
client.ts 1
You, 36 seconds ago | 1 author (You)
14 import { createTRPCProxyClient, httpBatchLink } from "@trpc/
client";
13 import type { AppRouter } from "../server";
12
11 async function main() {
10   const client = createTRPCProxyClient<AppRouter>({
9     links: [
8       httpBatchLink({
7         url: "http://localhost:3000/api/trpc",
6         maxURLLength: 2083,
5       }),
4     ],
3   });
2
1   const res = await client.greeting.query({
15     name: "John",
1     name? (property) name?: string | undefined
    });
3   console.log(res.msg);
4   // ^? const res: { msg: string; }
5 }
6
```

# T3 Stack

- Tailwind
- Typescript
- NextJS
- tRPC
- NextAuth
- Prisma
- zod
- ...



**Tailwind CSS**

~~NEXT~~.js



**NextAuth.js**

Authentication for Next.js



**Prisma**



**tRPC**

# @kubernetes/client-node

- Connessione con Kubernetes Cluster
- Kubernetes official Resources embedded
- Come gestire le CRDs?

# Generare Kubernetes Client

1. Expose kubernetes api definition with openapi

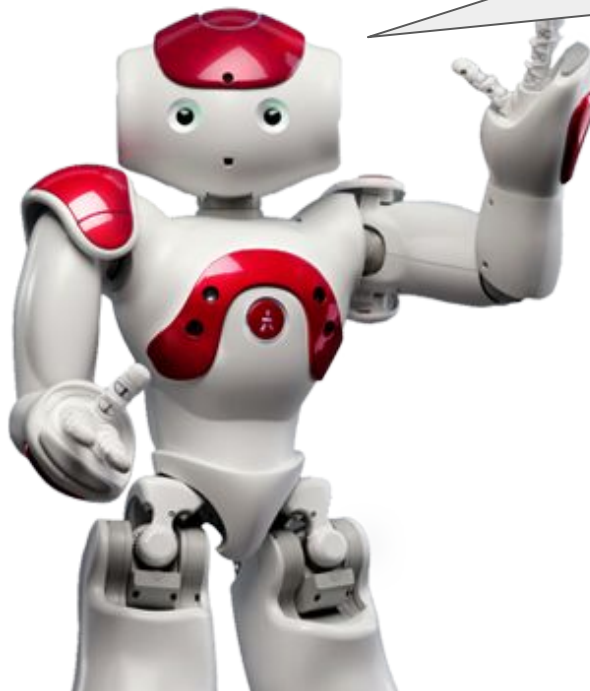
***kubectrl proxy --port=8080***

2. Generate api code with openapi-generator

***openapi-generator generate -g  
typescript-node -i  
http://localhost:8080/openapi/v2 -o src/gen***

api		
TS	accesscontextmanagerCnrmCloudGoogle...	U
TS	acmeCertManagerIoV1Api.ts	U
TS	admissionregistrationApi.ts	U
TS	admissionregistrationV1Api.ts	U
TS	apiextensionsApi.ts	U
TS	apiextensionsV1Api.ts	U
TS	apigeeCnrmCloudGoogleComV1beta1Api.ts	U
TS	apiregistrationApi.ts	U
TS	apiregistrationV1Api.ts	U
TS	apis.ts	U
TS	apisApi.ts	U
TS	appsApi.ts	U
TS	appsV1Api.ts	U
TS	artifactregistryCnrmCloudGoogleComV1be...	U
TS	authenticationApi.ts	U
TS	authenticationV1Api.ts	U
TS	authorizationApi.ts	U
TS	authorizationV1Api.ts	U
TS	autoCkaleV1alpha1Api.ts	U

Grazie per l'attenzione



Domande?