Node.js Microservices on Autopilot

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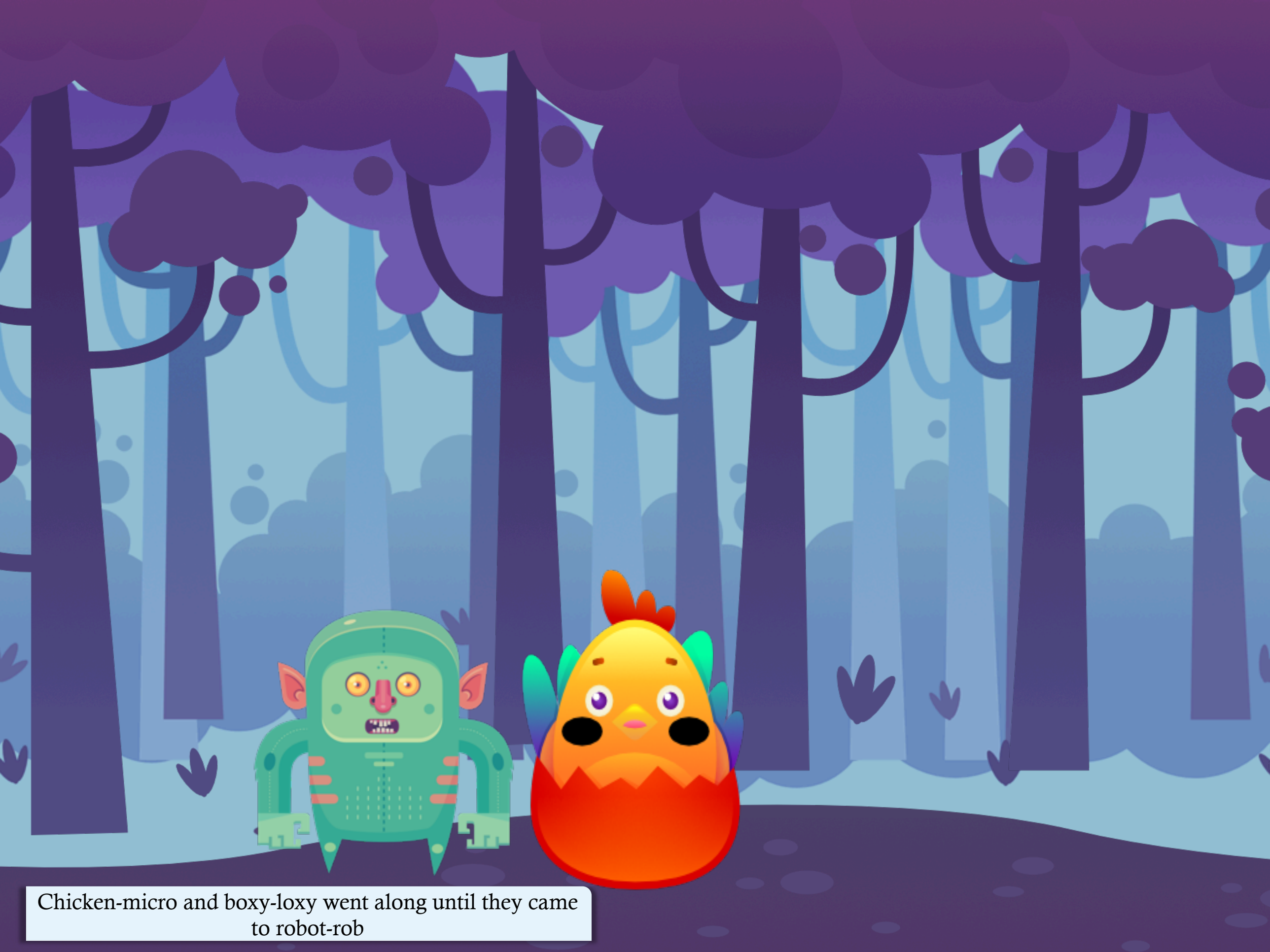
One day Chicken-micro was making a request to the corn server when—boom! The request timed out.

Goodness gracious, the servers must be down. I must go and tell the System Operator.

Chicken-micro went along until she came to boxy-loxy.



Chicken-micro and boxy-loxy went along until they came to robot-rob

Chicken-micro, boxy-loxy, and robot-rob made it to the System Operator.

Chicken-micro Postmortem

- Overloaded server should have returned 503
- Load-balancer should have taken slow server out of rotation
- How would chicken-micro know that there are other healthy servers and that the next request will succeed?

Do microservices help?

- Hypothetical Steps
  - Decompose the corn service into many smaller services
  - Each microservice is independently deployable
  - New microservices are each located behind load balancers
- When microservices are architected the same as the services they replace, they will face the same challenges as the previous services.

What is a Microservice?

- Small, decomposed, isolated and independently deployable services
- Stateless and less fragile when changes are introduced

Benefits of Microservices

- Embrace failure, works in spite of external failures
- Iterate quickly - disposable services, independently deployable services

Microservice AntiPatterns

- Load balancer between microservices
- Startup order matters
- Load balancers everywhere
- + many others, Microservices AntiPatterns and Pitfalls by Mark Richards

Load balancer between microservices

```
const getCorn = function (id, cb) {
  const url = `http://corn.prod.site.com/${id}`;
  wreck.get(url, { timeout: 5000 }, (err, res, corn) => {
    if (err && err.message === 'Client request timeout') {
      // retry the request
      return setTimeout(() => getCorn(id, cb), 1000);
    }
    // ... handle err or success
  });
};
```

Load balancer between microservices

```
const getCorn = function (id, cb) {
  const url = `http://corn.prod.site.com/${id}`;
  wreck.get(url, (err, res, corn) => {
    // server is under load, retry
    if (err && err.output.statusCode === 503) {
      return setTimeout(() => getCorn(id, cb), 1000);
    }
    // ... handle err or success
  });
};
```

Startup order matters

```
const mysql = require('mysql');

const connection = mysql.createConnection({
  host: process.env.DB_HOST
});

connection.connect();
// no fallback for db not found
```

Load balancers everywhere

```
const config = {
  prod: {
    motion: 'motion.prod.srv.site.com',
    humidity: 'humidity.prod.srv.site.com',
    temperature: 'temperature.prod.srv.site.com',
    frontend: 'frontend.prod.srv.site.com',
    logs: 'logs.prod.srv.site.com'
  }
}
```

Autopilot Pattern

- Apps that can be deployed and scaled with a single click.
- Apps and workflows that work the same on our laptops as in the cloud (public and private cloud).
- Apps and workflows that aren't married to any specific infrastructure or scheduler.
- Further reading at autopilotpattern.io

Autopilot Applications

- github.com/autopilotpattern - solutions that follow the Autopilot Pattern
- MongoDB, MySQL, InfluxDB, Consul, NATS, Wordpress, Jenkins, …
- Container support through ContainerPilot

Autopilot in Practice

- Applications composed of portable docker containers
- Service discovery through consul or another catalog
- Container local health and services respond to service dependency changes

Node.js Example

- https://github.com/autopilotpattern/nodejs-example
- Modules used:
  - hapi
  - Seneca
  - Piloted
  - Wreck

smartthings

Browser

Docker Container
ContainerPilot
smartthings

Docker Container
ContainerPilot
natsboard

Docker Container
ContainerPilot
Prometheus

Docker Container
ContainerPilot
traefik

Docker Container
Docker Container
Docker Container
ContainerPilot
NATS

Docker Container
Docker Container
Docker Container
ContainerPilot
Consul

Docker Container
Docker Container
ContainerPilot
nodejs
frontend

Docker Container
ContainerPilot
humidity

Docker Container
ContainerPilot
motion

Docker Container
ContainerPilot
temperature

Docker Container
Docker Container
ContainerPilot
nodejs
serializer

Docker Container
ContainerPilot
InfluxDB

Joyent
TRITON

Isolation

```
function setupDb () {
  const influxServer = Piloted.service('influxdb');
  if (!influxServer) {
    internals.db = bufferedDb;
    return;
  }

  internals.db = new Influx.InfluxDB({
    host: influxServer.address,
    port: influxServer.port
  });
}
```

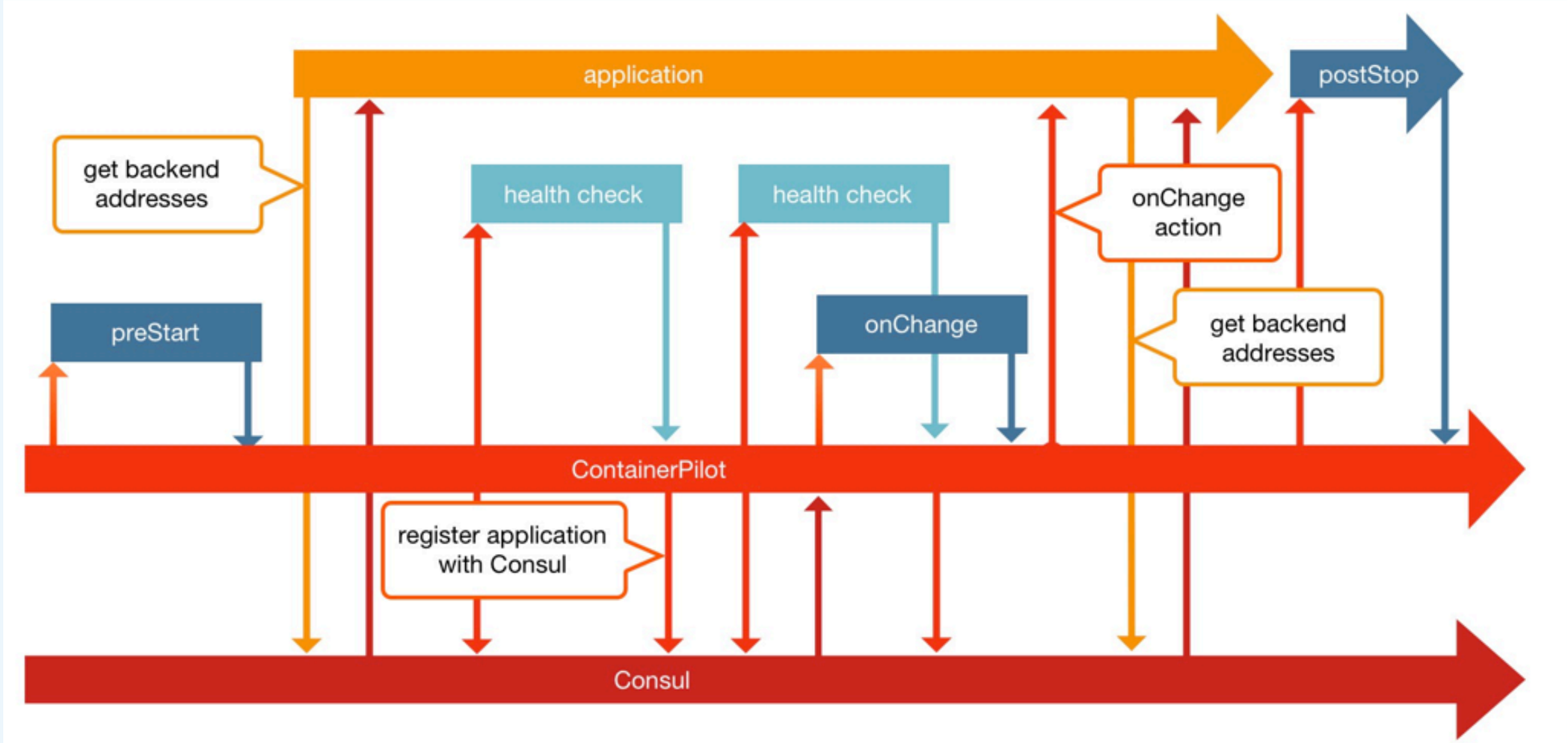
Change

```
Piloted.on('refresh', () => {
  setupDb();
});
```

ContainerPilot

- Automates a container's service discovery, life cycle management, and telemetry reporting
- Capabilities
  - Container-local health checks
  - PID 1 init process
  - Service discovery registration and watchers
  - Telemetry reporting to Prometheus
  - Free & Open Source! github.com/joyent/containerpilot

ContainerPilot Lifecycle



ContainerPilot Watches

```
watches: [
  {
    name: 'influxdb',
    interval: 3
  }
],
jobs: [
  {
    name: 'onchange-influxdb',
    exec: 'pkill -SIGHUP node',
    when: {
      source: 'watch.influxdb',
      each: 'changed'
    }
  }
```

ContainerPilot Services

```
{
  name: 'serializer',
  port: {{.PORT}},
  exec: 'node /opt/app/',
  health: {
    exec: `/usr/bin/curl -o /dev/null --fail
      -s http://localhost:{{.PORT}}/health`,
    interval: 2,
    ttl: 5
  }
}
```

Circuit Breakers

- Prevent requests that will fail from taking place and overburdening a service
- Once a response timeout threshold has been reached block future requests to the service until the service is able to catch-up/recover
- Is this possible to implement with a load balancer?

hapi Circuit Breakers

```
const server = new Hapi.Server({
  load: {
    sampleInterval: 50          // milliseconds
  }
});

server.connection({
  port: process.env.PORT,
  load: {
    maxEventLoopDelay: 20       // milliseconds
  }
});
```

Balancing in the Client

```
// Round-robin
const service = Piloted.service('nats');

// You decide
const services = Piloted.serviceHosts('nats');

// Grab a random healthy service
services[Math.floor(Math.random() * services.length)];
```

Load Balancers at the Edge

- Don’t expose microservices directly outside of your organization
- Setup a load balancer that can use Consul, in our example this is traefik, could be HA Proxy, nginx, or anything else
- API gateways have a place when exposing the business value we created with our microservices

Telemetry Support

```
telemetry: {
  port: 9090,
  tags: ['op'],
  metrics: [
    {
      namespace: 'example',
      subsystem: 'process',
      name: 'event_delay',
      help: 'Node.js event loop delay',
      type: 'gauge'
    }
]
```

hapi Metrics with Toppsy

Further Reading:

- All links can be found at: jsgeek.com/jsconf
- Autopilot Pattern - autopilotpattern.io
- hapi - hapijs.com
- ContainerPilot – joyent.com
- Seneca – senecajs.org