Kubernetes, BUGS and Raspberry Pi, OH MY!!

SUM Global Technology

Introductions

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Introductions

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Introductions

- One more shameless plug for our company which has graciously allowed us to be here and to have the time to work on this talk

SUM Global Technology

http://sumglobal.com

Come check us out, we would welcome the opportunity to work with you and your team

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Agenda

- Why
- The Project
- Tech Stack
- Pitfalls

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Why

- In the IoT world, we see more and more processing power at the edge
- Help our customers move to the modern world with an absurd contradiction

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The Project

- Collect smart meter reads for approximately 200 power meters
- Store the metadata in a document database
- Store the actual sensor (meter) data in a time series database
- Create microservices to get the pieces of data
- Create a web app to visualize the data

All of this is a micro version of the PI-IoT project that is being blogged about on the SUM Global website.

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The Project

- The data for 198 power meters for approximately a year is over 1.2 Million data points, for 1 measurement

SPOILER ALERT!!!!

The Web App LIVE.... The tiny cloud.... IT'S ALIVE!

(hopefully)

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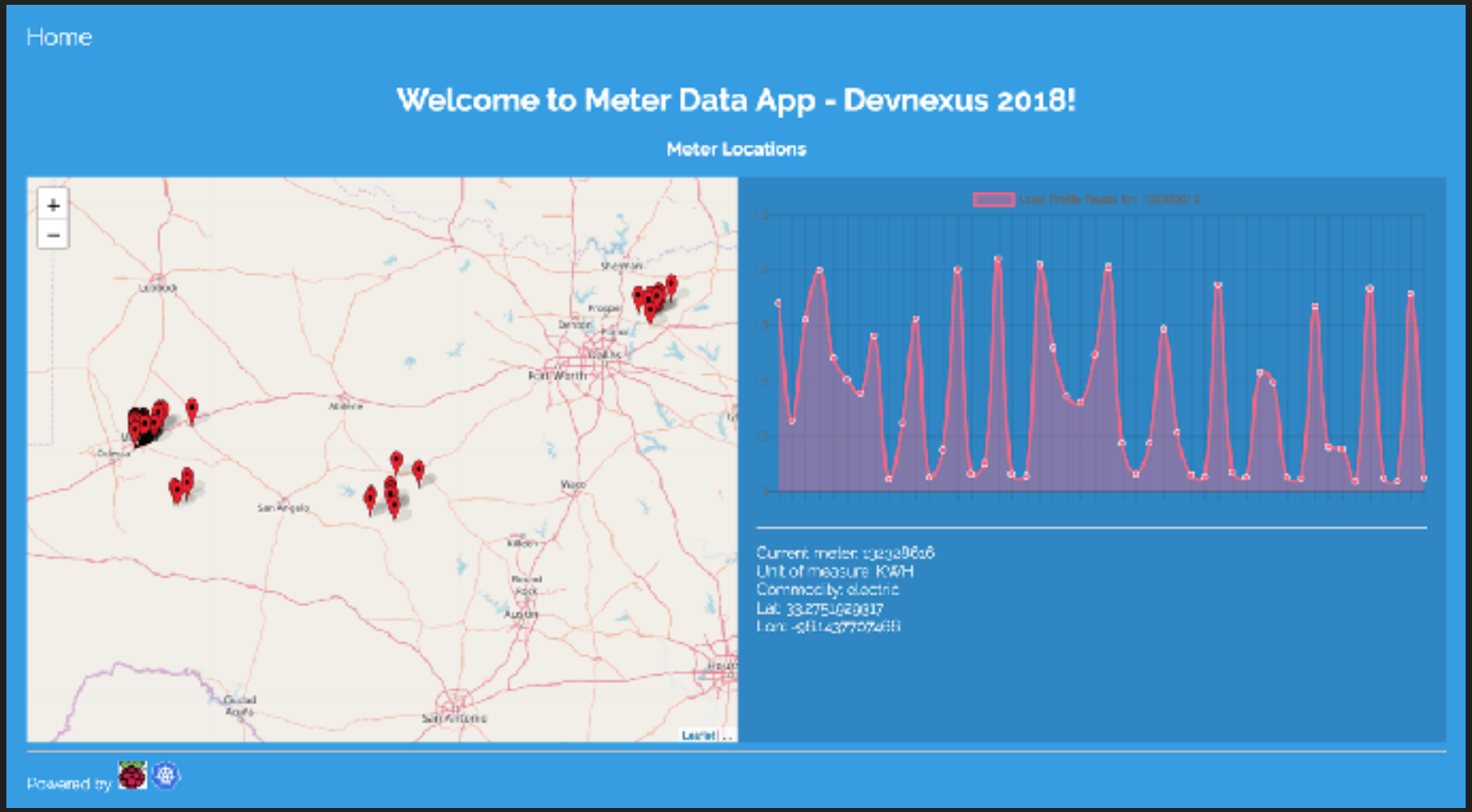
The Project



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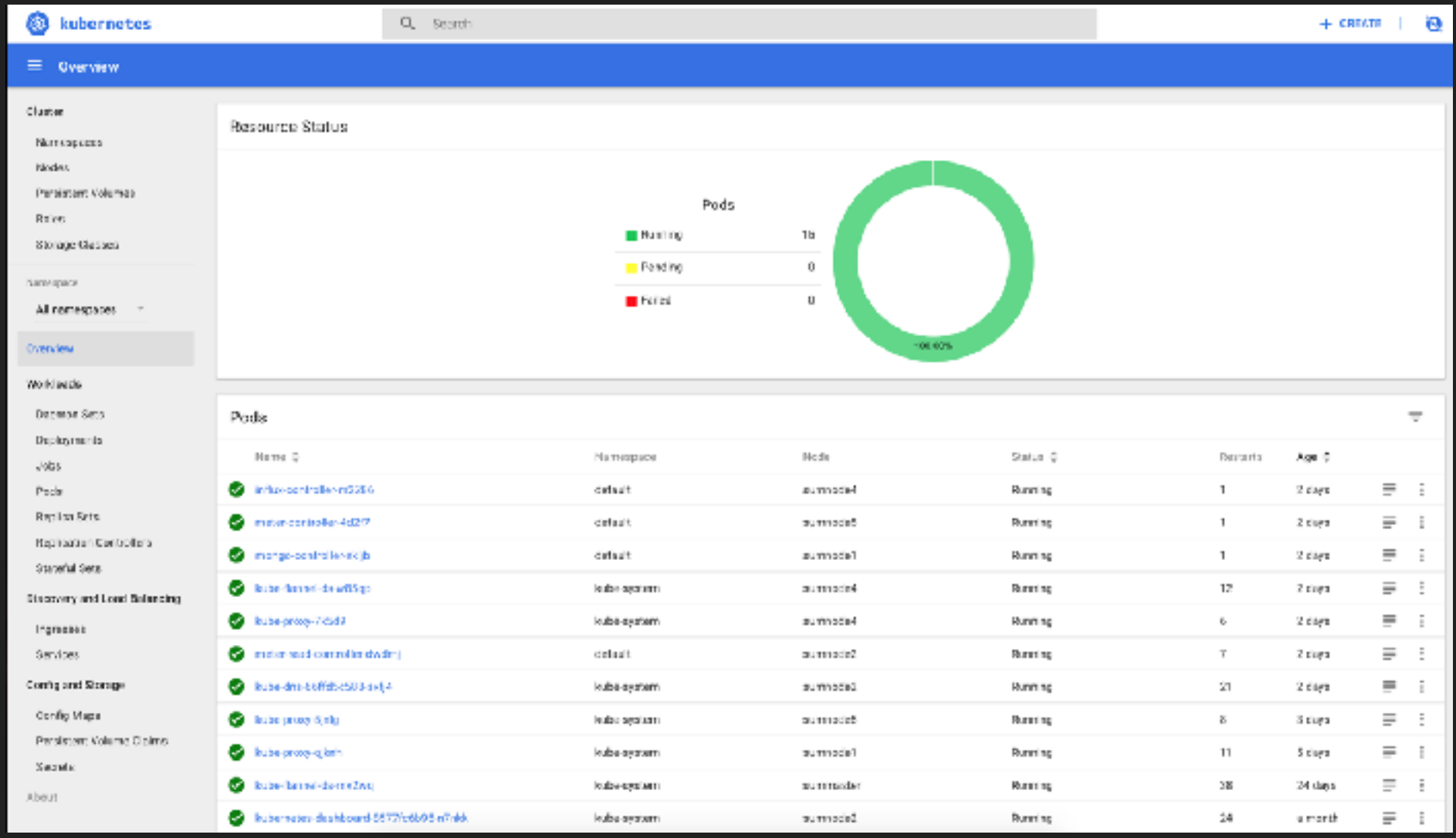
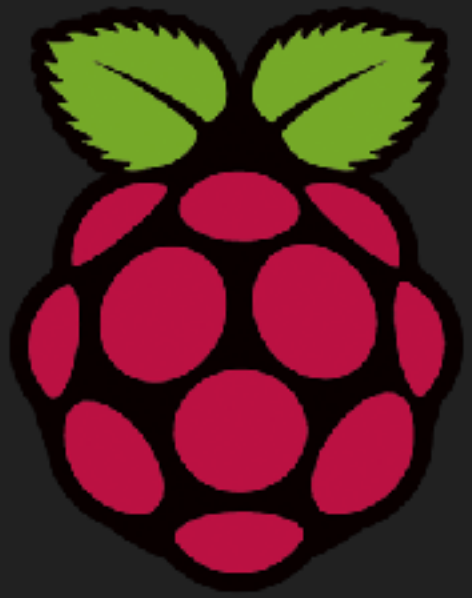
The Project


kubernetes
Search
+ CREATE
Overview
Cluster
Namespaces
Nodes
Persistent Volumes
Roles
Storage Classes
Namespace
All namespaces
Overview
Workloads
Daemon Sets
Deployments
Jobs
Pods
Replica Sets
Replication Controllers
Stateful Sets
Discovery and Load Balancing
Ingresses
Services
Config and Storage
Config Maps
Persistent Volume Claims
Secrets
About
Resource Status
Pods
Running 16
Pending 0
Failed 0
Pods
Name
Namespace
Node
Status
Restarts
Age

The Hardware

- Raspberry PI - a Low cost, credit-card sized computer



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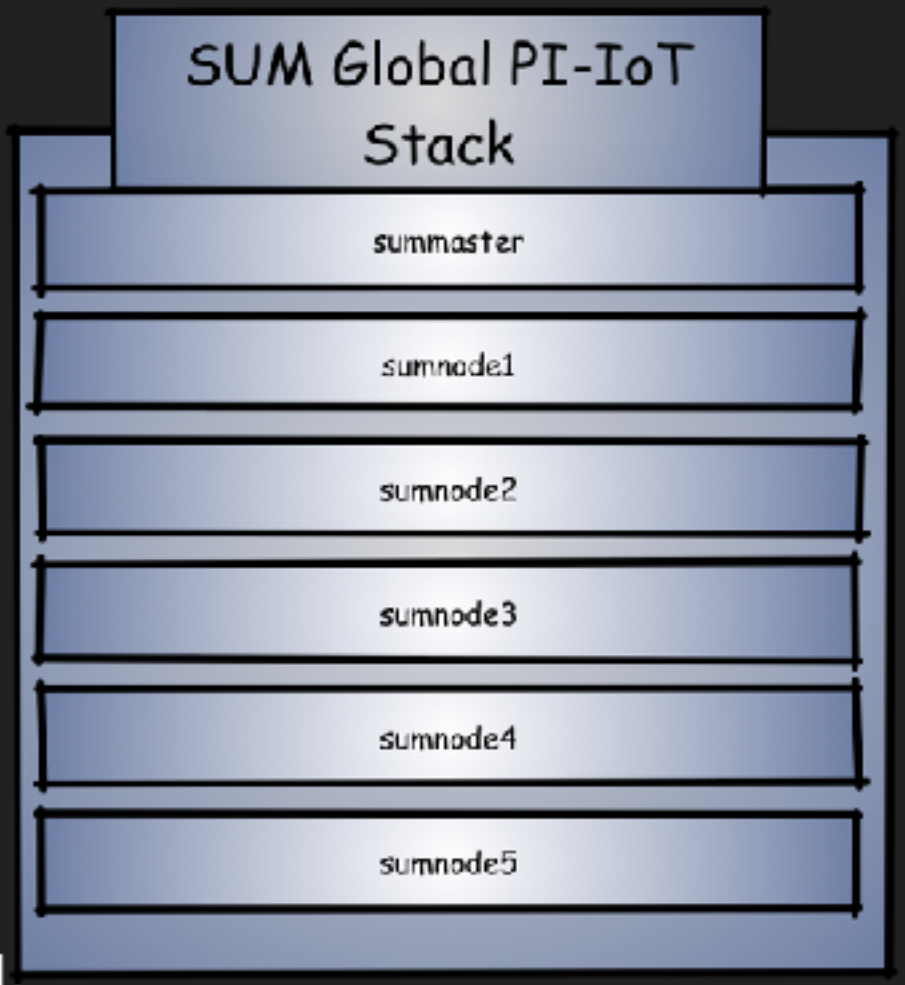
The Hardware

- Hardware



Specs:
- 6 x Raspberry PI model 3B
- 64 GB SD card per PI
- 128 GB USB memory stick per Pi
- Hypriot OS image version v1.4.0

Total Stack compute power:
- 24 CPU cores
- 6 GB RAM
- 1152 GB of storage

Total cost including power supply, stack case and cables: $710.80 US

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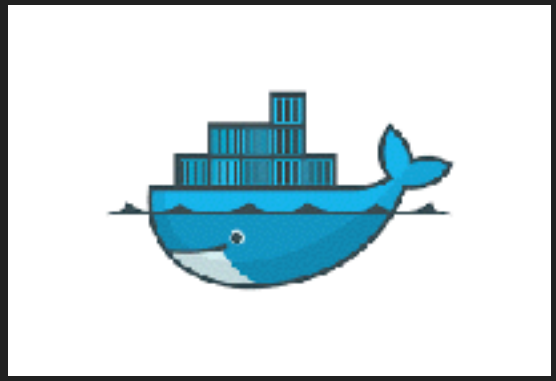
Tech Stack

- Kubernetes - open source system for automating deployment, scaling and management of containerized applications

- Docker - software technology providing virtualization know as containers



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Tech Stack

- InfluxDB - Open Source Time Series Database

- MongoDB - Open Source Cross Platform Document-Oriented Database

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Tech Stack

- Wildfly Swarm - A mechanism for building applications as uber jars, with just enough of the WildFly application server wrapped around it to support each application's use-case

- Angular 5 - A typescript based open-source front-end web application platform

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Tech Stack

- GlusterFS - An open-source software scalable network attached storage

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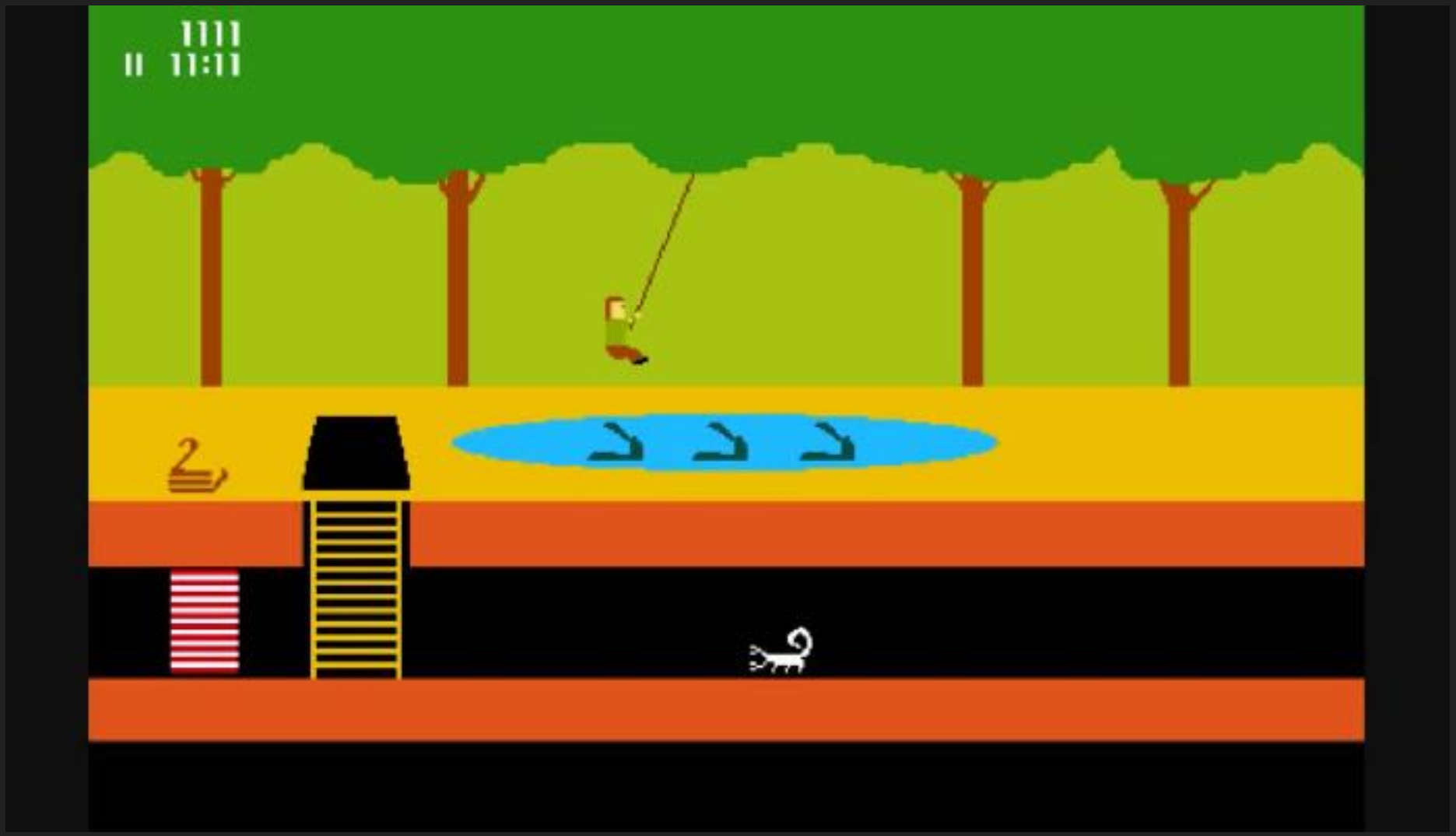
Pitfalls



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Pitfalls

Hardware Attempts

- SD Cards
  - Need to be FAST R/W (96Mbs read and write)
- USB Storage
  - Max USB2 or go USB3 so it runs at max USB2 (our choice)
- Power supplies
  - Need to account for max pull (2.5 Amps) on all 6 at the same time

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Pitfalls

Documentation Becomes Outdated Quickly

- http://blog.hypriot.com/post/setup-kubernetes-raspberry-pi-cluster/
- Even - http://sumglobal.com/the-kubernetes-strikes-back/

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Pitfalls

ARM Images are difficult to find

- https://hub.docker.com/u/arm32v7/

So we built our own:

- https://hub.docker.com/u/sumglobal/

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Pitfalls

Operating System

HypriotOS was our operating system of choice but:

- machineIds were the same across all the nodes

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Pitfalls

Buggy Networking Plugins

- Flannel not working correctly (https://github.com/coreos/flannel/issues/773)
- hostPort directive not working with CNI Plugins (https://github.com/kubernetes/kops/issues/3132)

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The Code

- All of the ARM docker images can be found on Docker Hub
  - https://hub.docker.com/u/sumglobal
- The Docker files can be found on Github
  - https://github.com/sumglobal

- We will get the source code for all the projects, the yaml and JSON files for deployment and the presentation up there as well
- The project will continue on the blog, so look for more features, updates etc. coming soon

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Thank You

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