34 Truths About Kubernetes and Edge

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Outline

Outline: (35 mins)

(2 min) Speaker Intros

(3 min) Introduction to kubernetes and Edge computing (Karthik)

(5 mins) Problems faced with Edge devices involving kubernetes (Karthik-transition to Saiyam)

(5 mins) Kubernetes solutions for the Edge (k3s/kube edge) (Saiyam)

(10 mins): Running kubernetes on Raspberry Pi's using k3s (Saiyam)

(3 mins) Challenges using k3s on edge devices (Karthik)

(2 mins) Speaker Recommendations for kubernetes on edge (Joint)

Saiyam Pathak

KubeCon CloudNativeCon Europe 2020 Virtual

Software Engineer at Walmart Labs
Twitter - @saiyampathak
CKA/CKAD
CNCF Ambassador
Docker Community Leader
Rancher and Influx Bangalore Meetup Organizer
Influx ACE

Youtube - https://youtube.com/saiyam911

Hands on K3s Kubernetes concepts

98 views • 5 days ago

Helm3 cncf graduated 2020 and Arkade for Kubernetes

328 views •
Streamed 2 weeks ago

Rancher 2.4 | CIS scanning | new dashboard | k3s upgrad...

58 views • 3 weeks ago

Influx, Go and Okteto

276 views •
Streamed 1 month ago

CKA/CKAD, GO Discussion

612 views •
Streamed 1 month ago

Karthik

- Head of Cloud Native Engineering at Verica.
- Authored Learning Kubernetes and a many other cloudnative courses on LinkedIn learning.
- Built Oracle Managed Kubernetes Engine and Principal Developer Advocate for Oracle Cloud.
- Organizes: Devopsdays Austin, Cloud Austin, All Day Devops, Container Days.
- Been in industry...for a while.
- @iteration1 on twitter

verica

ORACLE StackEngine

Mentor Graphics NATIONAL INSTRUMENTS SIGNALSCIENCES

Today's Agenda

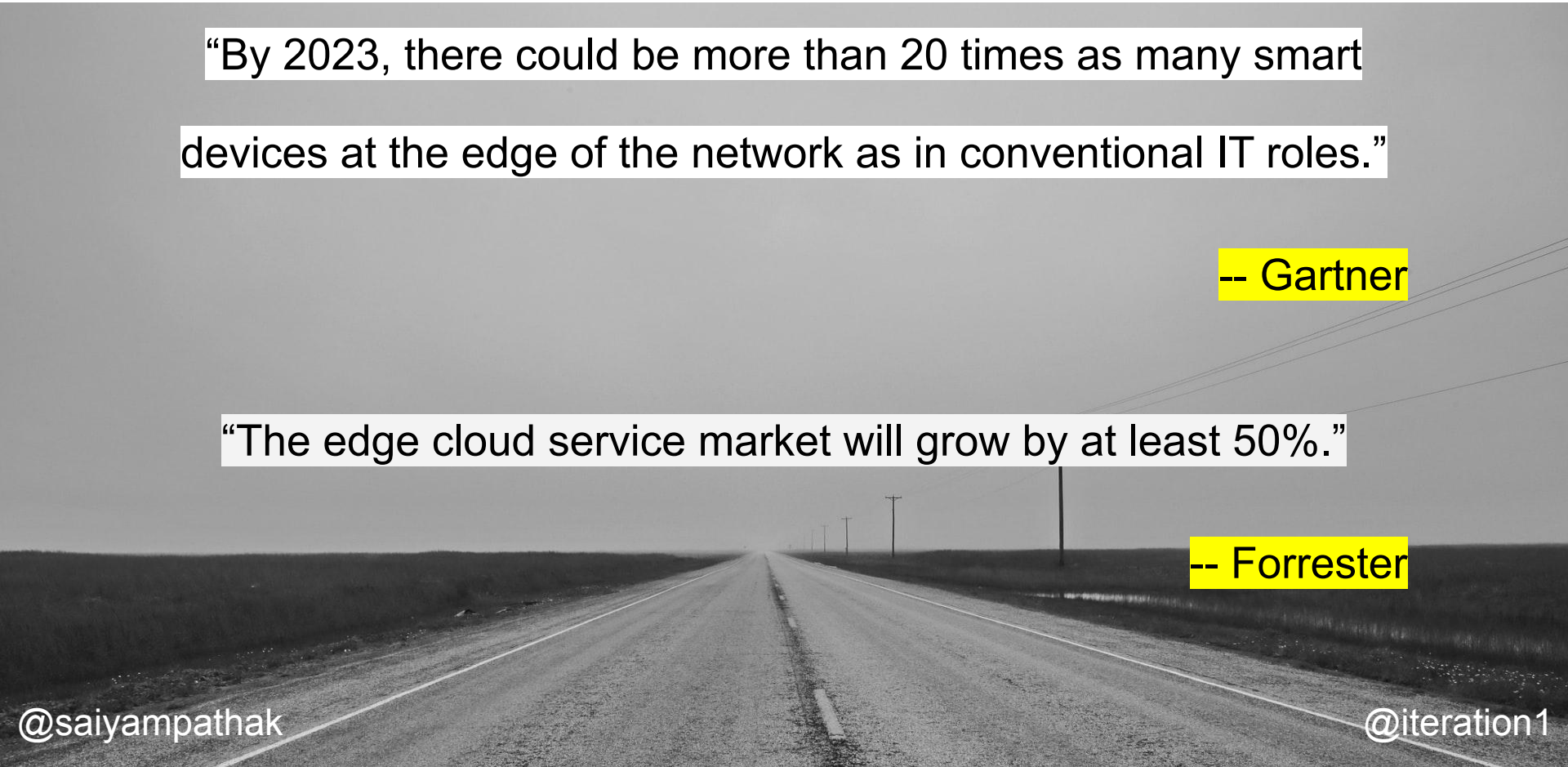
- Introductions to Edge Computing & Kubernetes
- Discuss Complexities at Edge
- Cloud Native @ Edge
- Demo (K3s and Raspberry Pi)
- Complexities at Edge
- Recommendations

Edge Computing

A distributed computing paradigm that brings computation and data storage closer to the location where it is needed, to improve response times and save bandwidth.

-Wikipedia

Tremendous Growth



"By 2023, there could be more than 20 times as many smart devices at the edge of the network as in conventional IT roles."

-- Gartner

"The edge cloud service market will grow by at least 50%."

-- Forrester

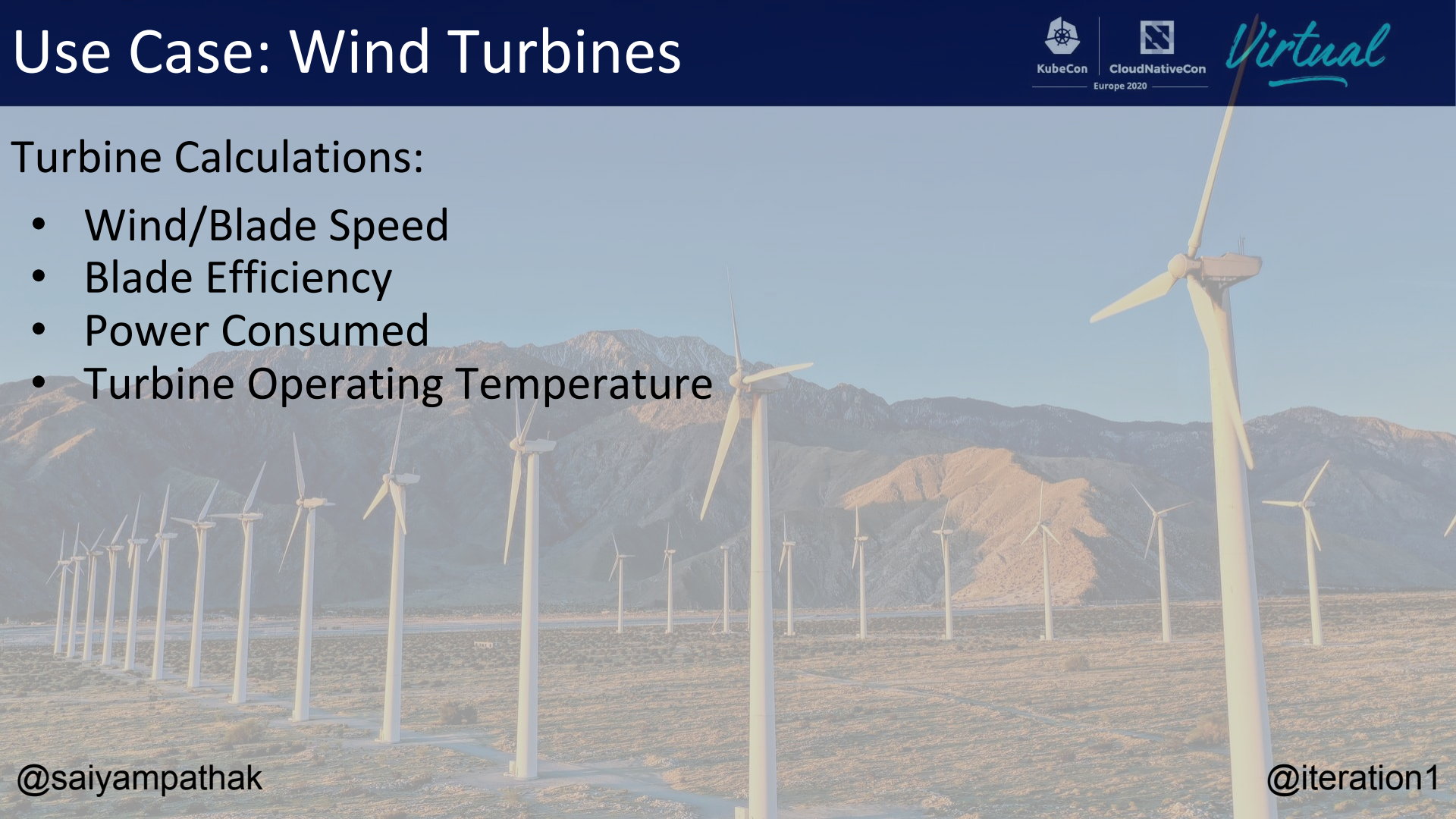

But what does all this mean?

Use Case: Wind Turbines

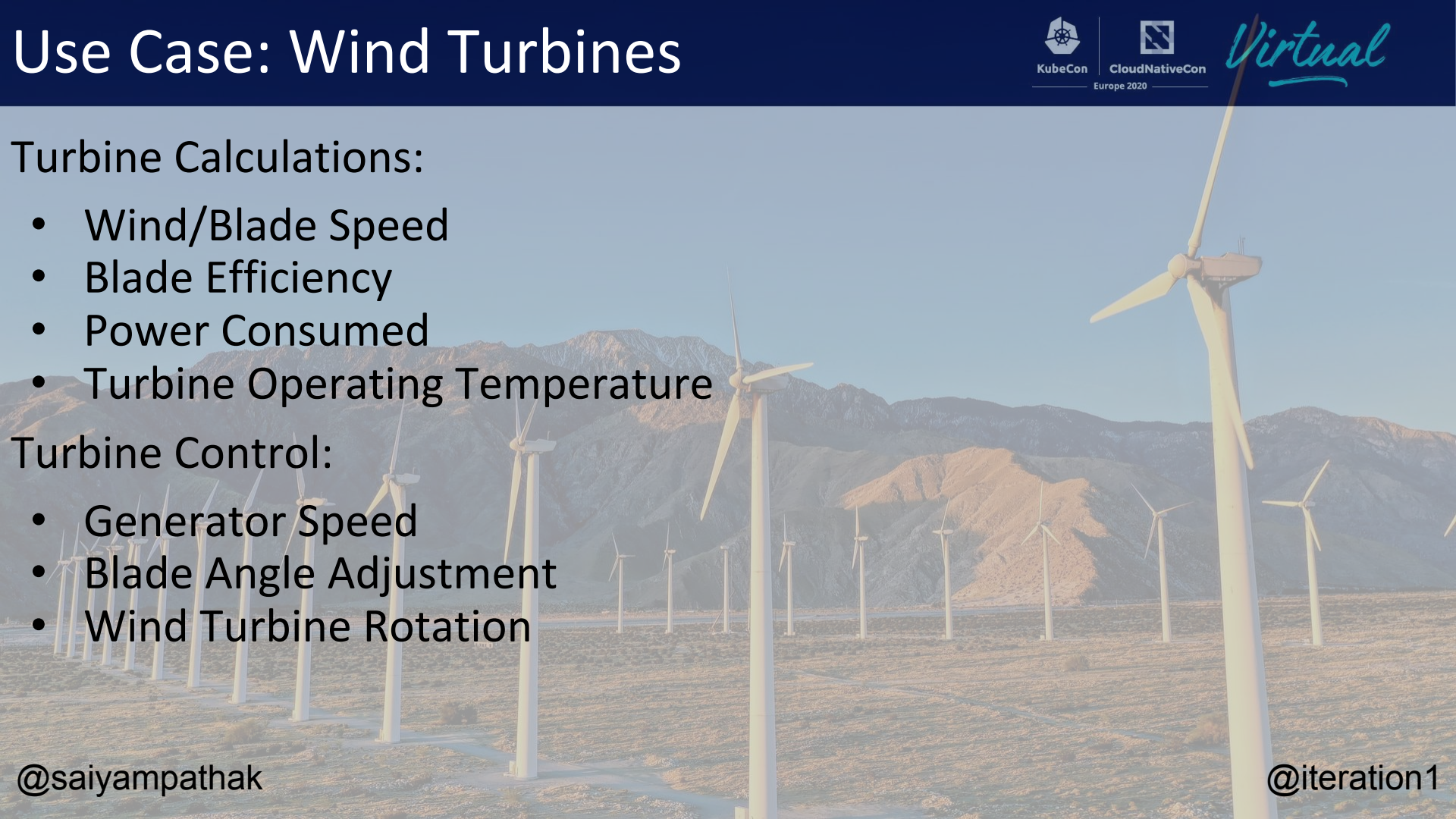
Use Case: Wind Turbines

Turbine Calculations:

- Wind/Blade Speed
- Blade Efficiency
- Power Consumed
- Turbine Operating Temperature



Use Case: Wind Turbines



Turbine Calculations:

- Wind/Blade Speed
- Blade Efficiency
- Power Consumed
- Turbine Operating Temperature

Turbine Control:

- Generator Speed
- Blade Angle Adjustment
- Wind Turbine Rotation

Use Case: Wind Turbines

Wind Farm Control Center

- Collect Average Turbine(s) Speed
- Health Status of Turbine(s)
- Monitor Performance of Turbines
- Monitor Efficiency of Farm
- Generated Electricity (Per Hour/Day)

Iberdrola Renewables Control Room

Typical Architecture

Cloud Level:
Responsible for overall operations, big data processing, data aggregation across farms

Farm Level (Edge):
Responsible for individual farm, turbines in the farm, connected to the internet, and turbines (via ethernet)

Sensor Level (Turbines):
Responsible for electricity generation in a safe manner, efficient operations, data collection at an individual turbine level

Typical Edge Issues

At the device level:

- Battery
- Lack of processing power
- Code deployments need to be tiny
- Embedded devices concerns

At the edge level:

- Connectivity
- Communicate with the cloud
- Have enough processing to be able to run complex calculations
- Maintenance of your sensors/farm

Where does Kubernetes fit?

- Lots of vendor specific lockin for iot/edge
  - Custom Solution Providers, Vendors
- Kubernetes based on opensource ecosystem
- Built for managing many devices
- scaling/deployment etc

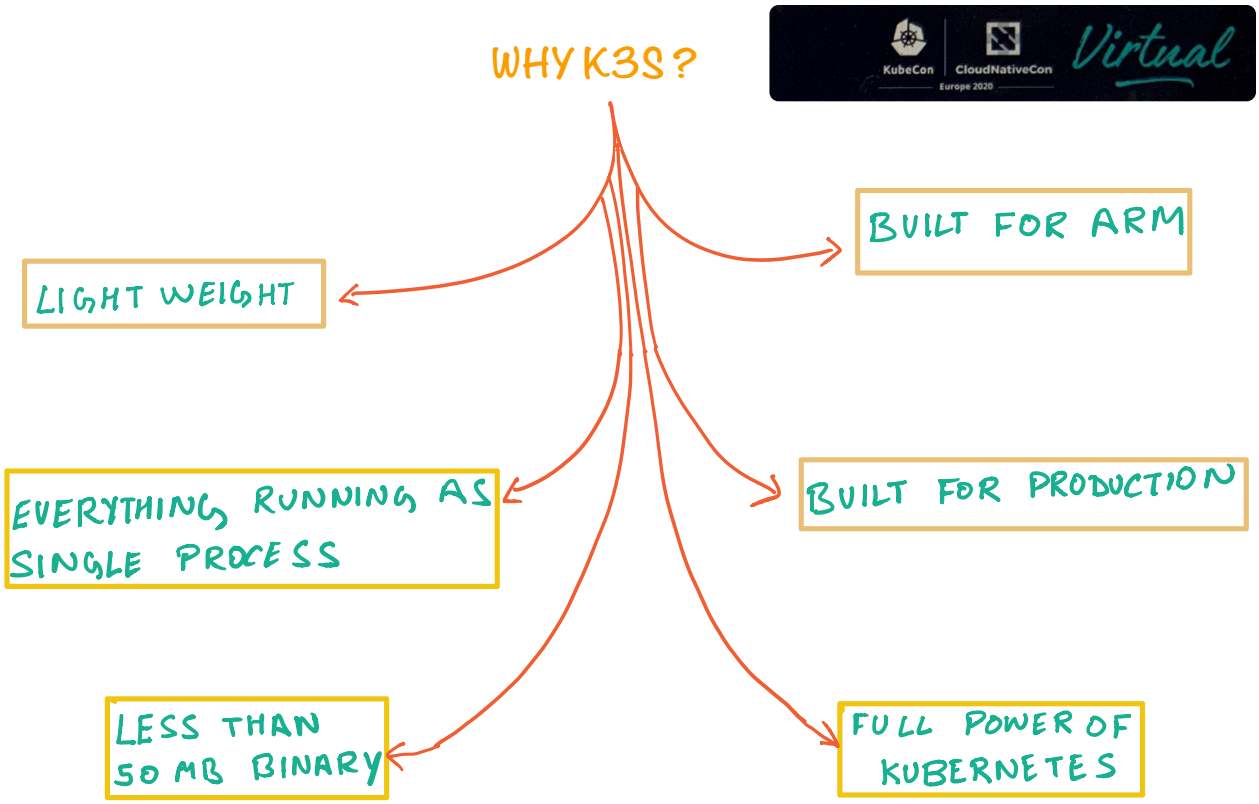
Popular Kubernetes distros for Edge

2 most popular solutions for this:

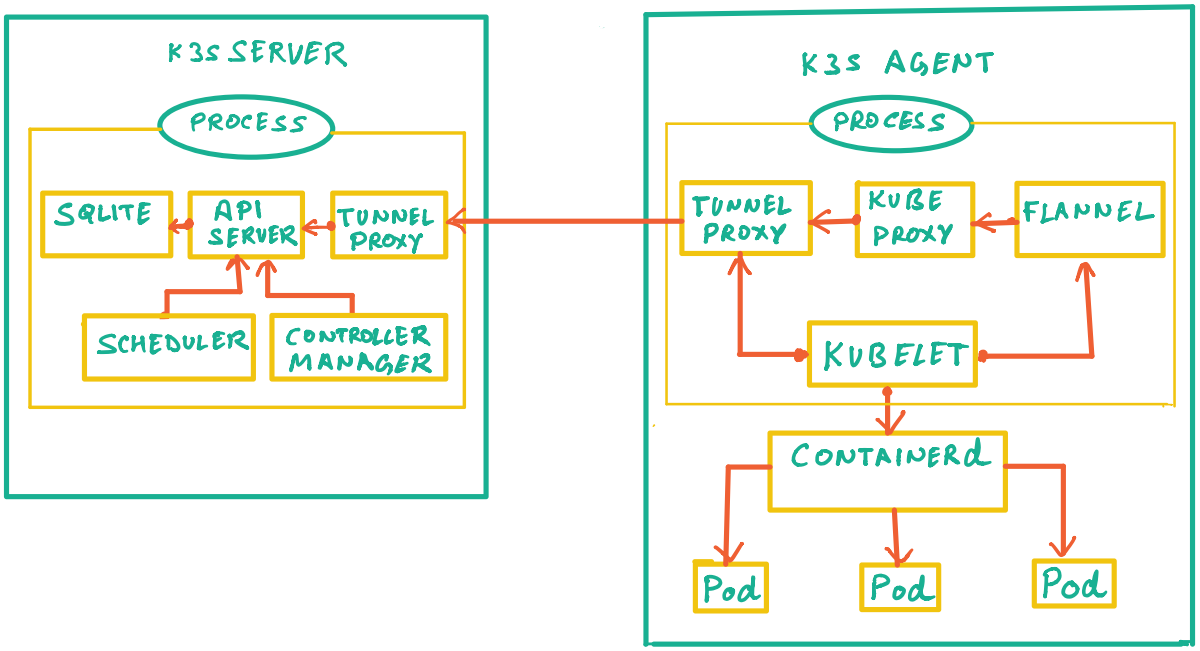
KubeEdge

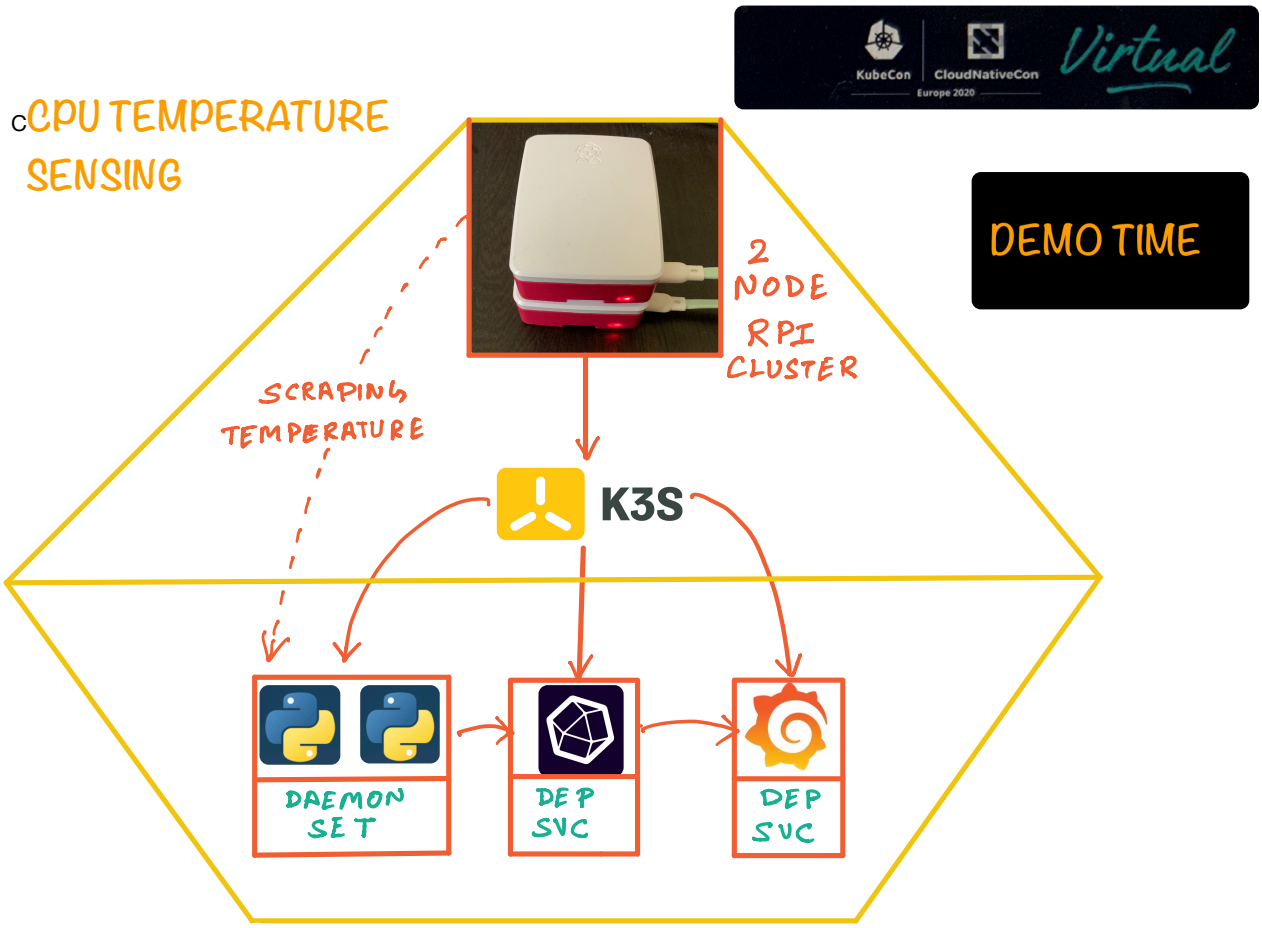
K3S

K3S


WHY K3S?
KubeCon
CloudNativeCon
Europe 2020
Virtual
BUILT FOR ARM
LIGHT WEIGHT
EVERYTHING RUNNING AS SINGLE PROCESS
BUILT FOR PRODUCTION
LESS THAN 50 MB BINARY
FULL POWER OF KUBERNETES

K3S ARCHITECTURE




KubeCon
CloudNativeCon
Europe 2020
Virtual
CPU TEMPERATURE SENSING
DEMO TIME
2 NODE RPI CLUSTER
SCRAPING TEMPERATURE
K3S
DAEMON SET
DEP SVC
DEP SVC

Demo...

https://github.com/saiyam1814/Kubecon2020EU

Challenges of Edge Computing

- Vendor lock-in
  - Look at Kubernetes at Edge solutions
- Hardware Integration for Kubernetes at Edge
  - k3s/KubeEdge for specific embedded device
- Cultural Challenges: Embedded Developers v/s Cloud Native Developers
  - Different Tech stacks (C versus others)
  - Different cultures (CI/CD etc)
- Understand Architectural needs:
  - Kubernetes: Great for cloud/data center compute instances
  - KubeEdge: Great for cloud control plane/disparate edge instances
  - K3s: Great for cloud, edge and airgapped environments

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Future Stuff (Bonus)

- tooling/future stuff
- Ketchup, civo,k3s and kubeedge differences

https://medium.com/@gokulchandrapr/kubeedge-extending-kubernetes-to-edge-dcfedd91f5f9

https://www.youtube.com/watch?v=eM3E5qAm0XM

https://www.youtube.com/watch?v=V1WVjZrx0lY

https://www.youtube.com/watch?v=ctn9v1HbiEs

https://containerjournal.com/topics/container-networking/powering-edge-with-kubernetes-a-primer/

https://redmonk.com/jgovernor/2020/01/31/k3s-edge-kubernetes/

https://info.rancher.com/hubfs/eBooks,%20reports,%20and%20whitepapers/ARM%20White%20Paper,-V3%20(2).pdf?hsCtaTracking=34754c8a-d543-4347-b1b5-38b4f4261192%7C6a6807a2-575e-4aa2-bd70-73c3f3ff518a

https://rancher.com/blog/2019/why-k3s-is-the-future-of-k8s-at-the-edge/