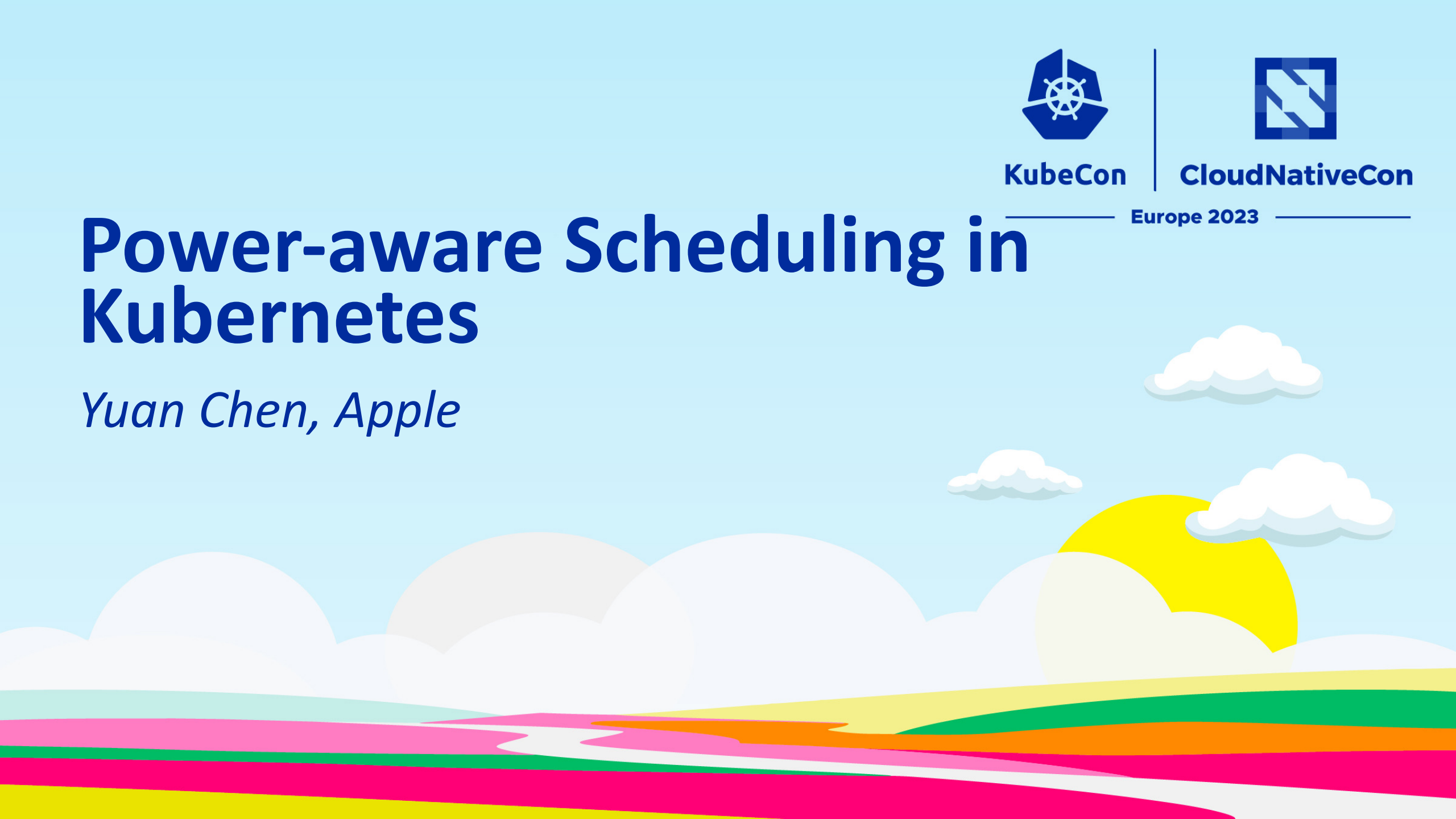

KubeCon
CloudNativeCon
Europe 2023
TiKV

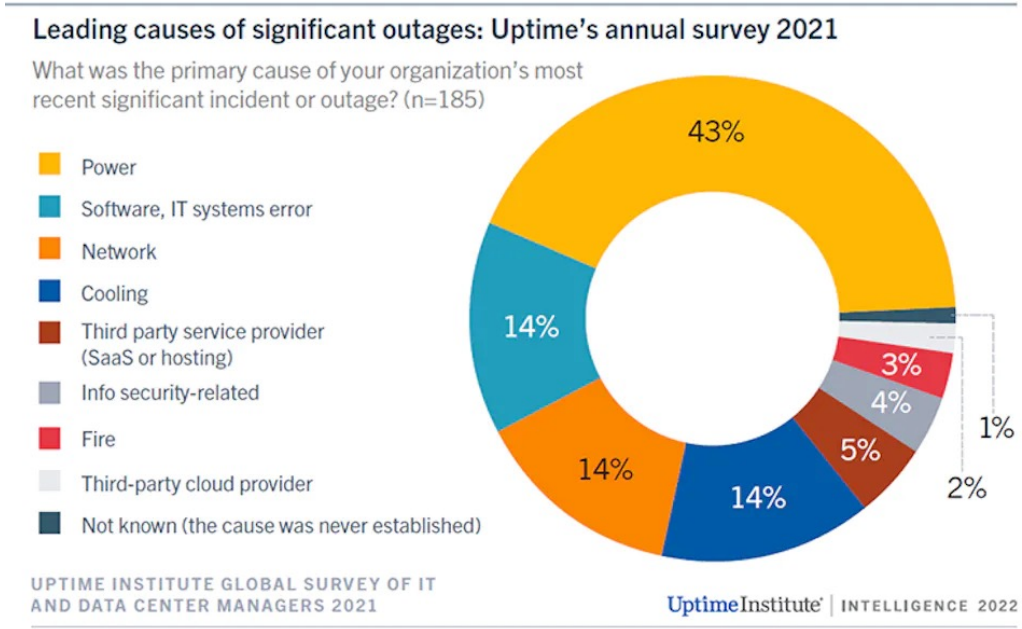


Power-aware Scheduling in Kubernetes

Yuan Chen, Apple

Why?

- Kubernetes scheduling is primarily focused on the allocation of compute resources.
- Server power consumption can exceed the power envelope and lead to outage and costly downtime!
  - Increasing cluster & server utilization.
  - Over-subscribing power infrastructure.
  - Miscorrelation between workload resource requests and actual power consumptions.



Source: https://www.velir.com/-/media/files/pdfs/uptime-annualoutageanalysis2021.pdf

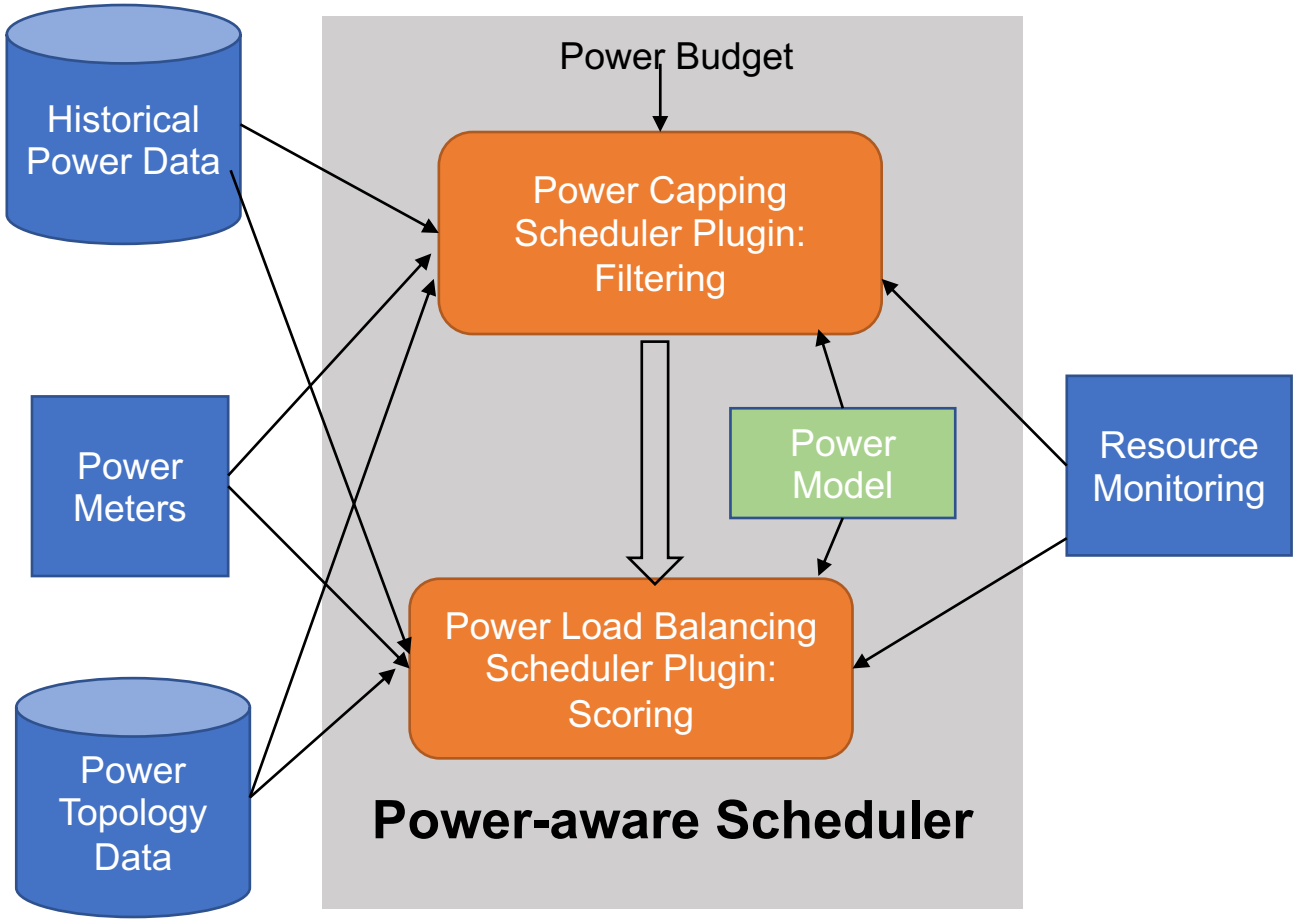
What?

Incorporate power-awareness into Kubernetes scheduling to protect power supply infrastructure in Kubernetes clusters.

- **Power capping**: enforce power budget for individual servers and racks
- **Power-aware load balancing**: distribute power consumption across servers and racks

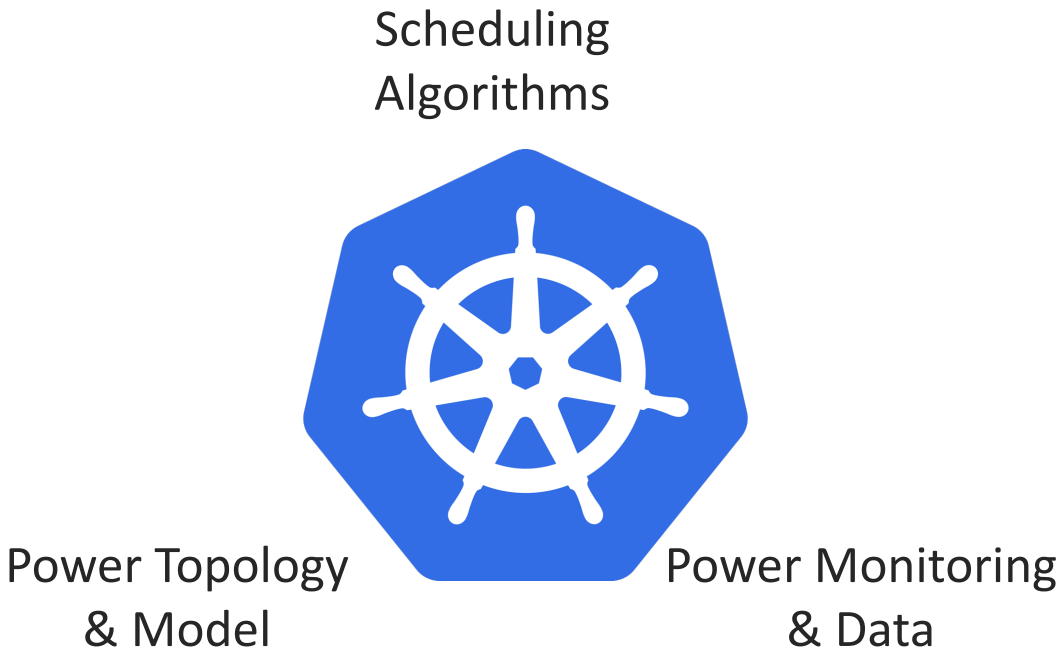
How?

- Power infrastructure topology definition and data
- Power metrics and monitoring
- Power model
- Power-aware scheduling algorithms
  - Power capping: reject nodes that may exceed server or rack power budget
  - Load balancing: preferentially choose nodes & racks with lower power consumption



Summary

- Define and standardize power data in Kubernetes: power topology, monitoring and metrics
- Develop new scheduling algorithms and implement as scheduler plugins
- Leverage the existing work in power management



Collaborations power Kubernetes!

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