SDF 2.0: Towards a Cloud-Native, Scalable, and Fault-Tolerant Platform for Digital Agriculture (DA)

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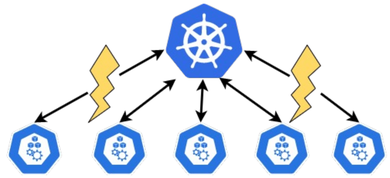
Introduction

The promise of data-driven farming or digital agriculture

- Sustainable intensification of farm yields and efficiency
- Financial, environmental, and societal impacts

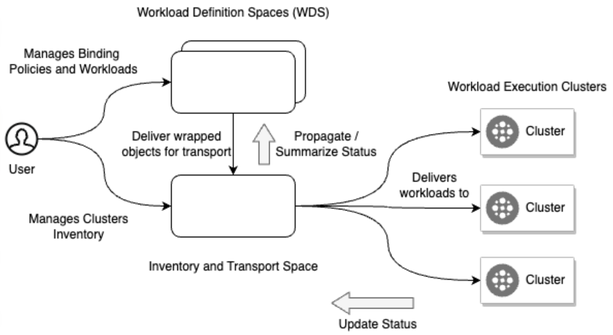


Challenges & Approach



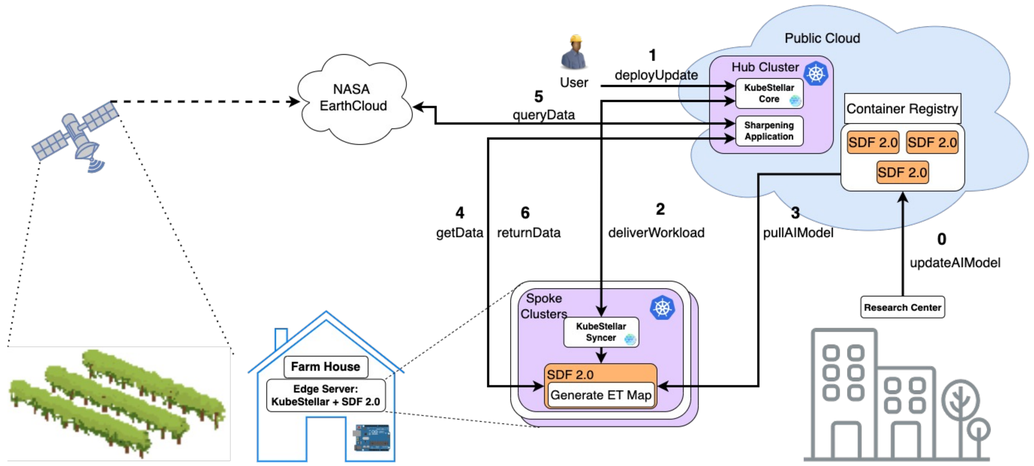
- Managing multiple fields/clusters 👉 Hub-and-spoke architecture
- Intermittent connectivity 👉 Disconnected ops with KubeStellar
- Privacy concerns 👉 Leverage public NASA EarthCloud imagery
- Application: AI disease detection model deployment/management

Disconnected Ops with KubeStellar



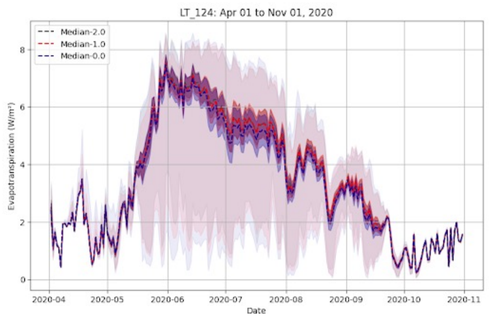
Kubestellar architecture for offline, multi-cluster operations

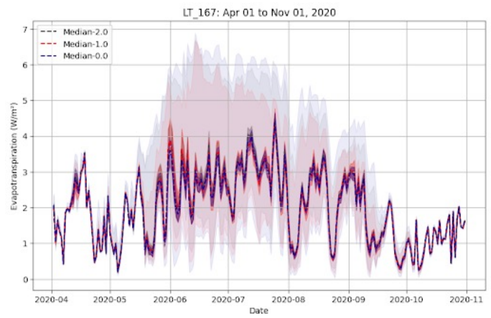
Software-Defined Farm 2.0 – A Cloud-Native Framework for Digital Ag



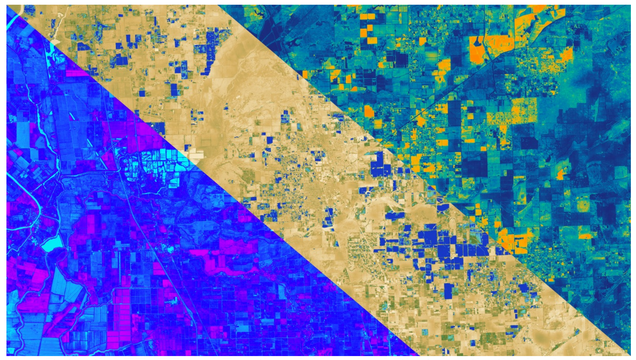
The SDF 2.0 framework leverages KubeStellar to manage workloads across farm clusters

Preliminary Applications & Results



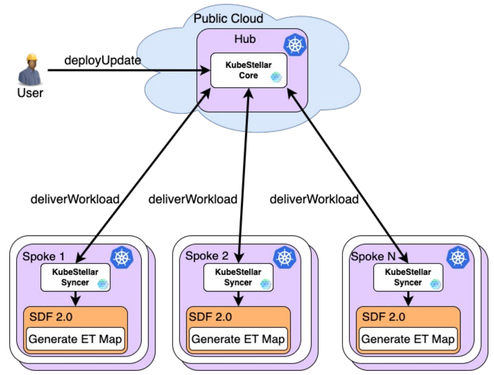


Cumulative evapotranspiration (ET) for the 2020 grape growing season in sampled Northern California vineyards



Productivity measures: Potential ET, ET and Fractional Absorbed Photosynthetically Active Radiation (FAPAR)

Scaling SDF 2.0 Clusters



KubeStellar scales binding policies for workloads

Future Directions


- Field deployment in Northern California
- Emulation across multiple clouds

Acknowledgments

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