Multi Cloud Kubernetes with Nodeless

CNCF Webinar 6/10/20

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Agenda

- Multi Cloud Kubernetes definition
- Usecases
- Nodeless Kubernetes
- Demo!
- Caveats
- Takeaways
- References
- Acknowledgements

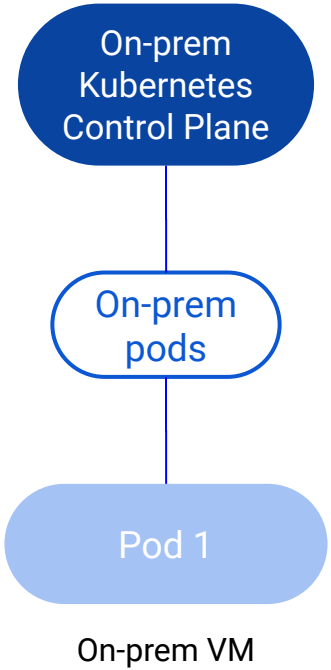
Multi Cloud Kubernetes

Control Plane runs on Cloud Provider A

Subset of Pods run on Cloud Provider B

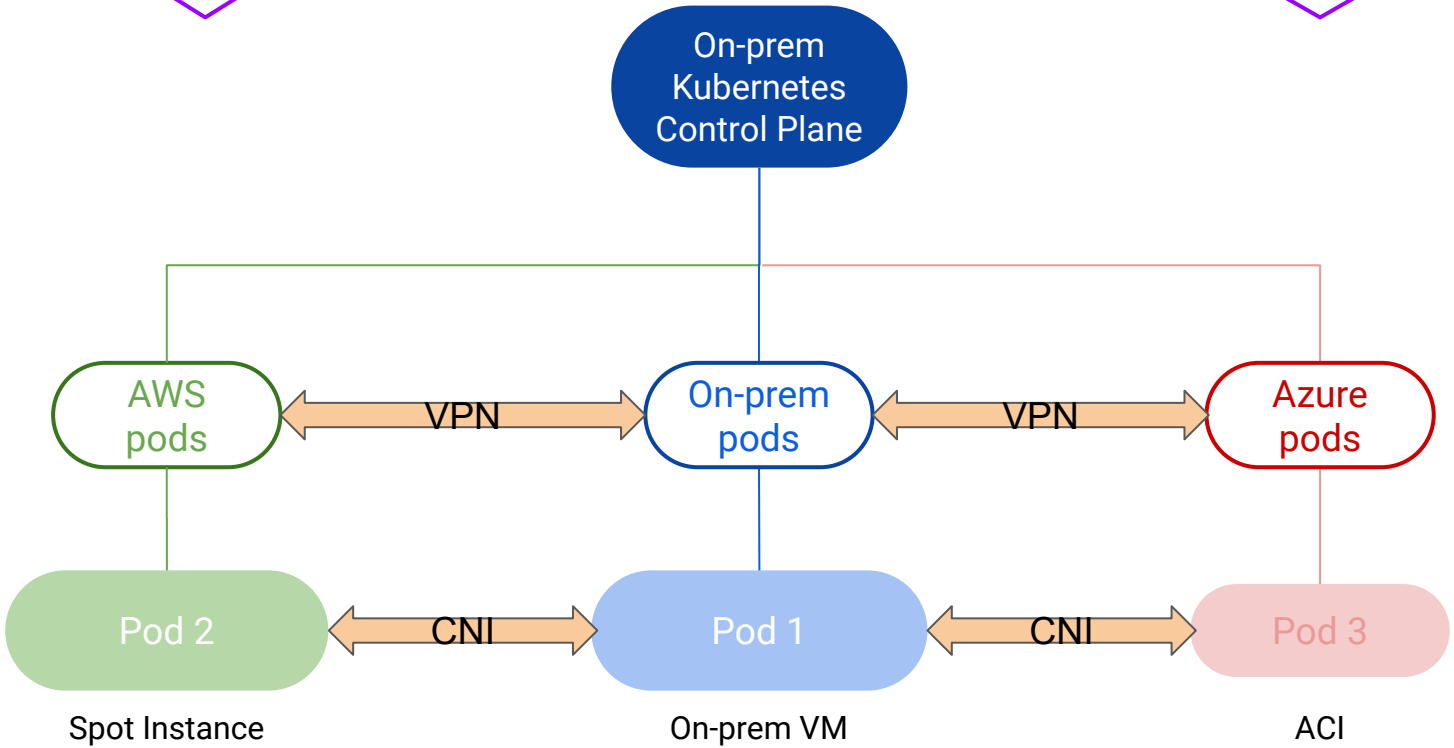
Motivation

Stretch k8s cluster compute across cloud providers

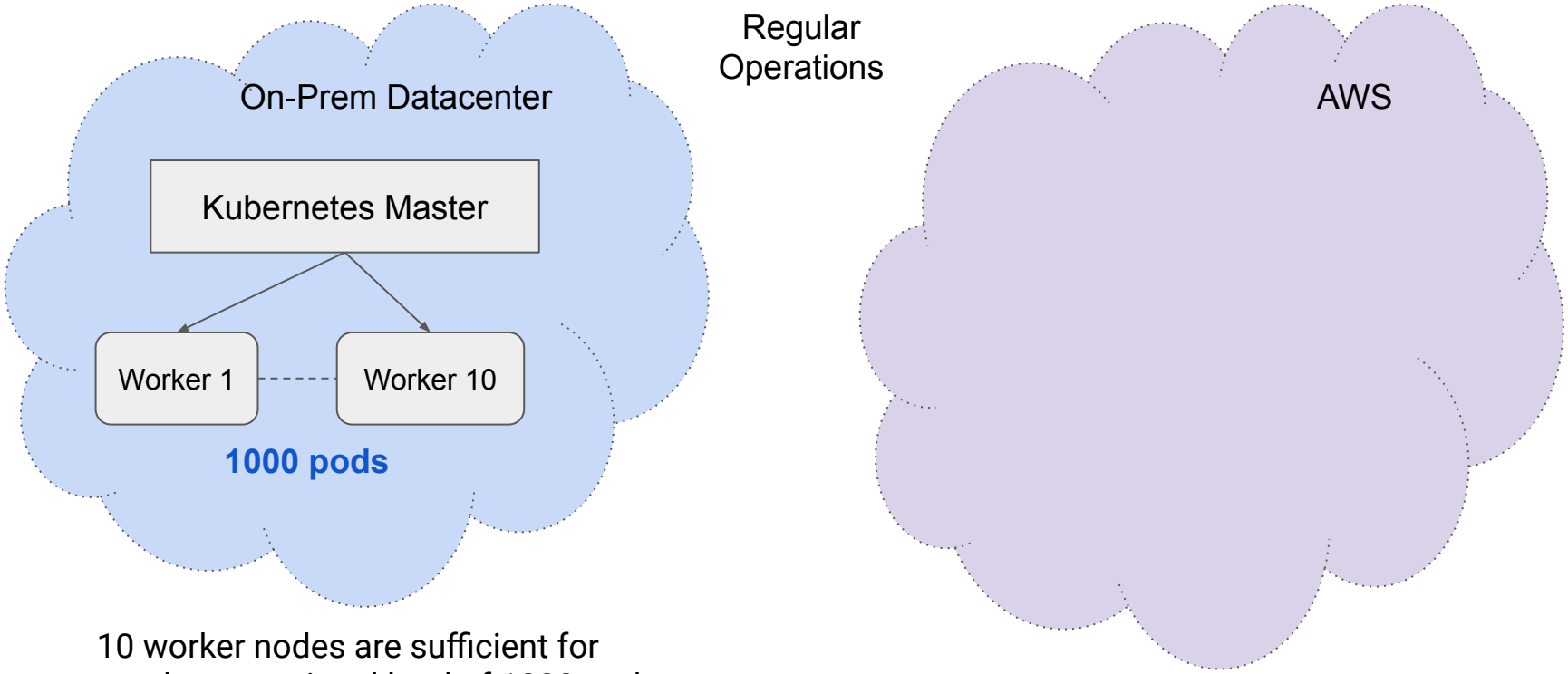


Avoid proliferation of control planes across cloud providers

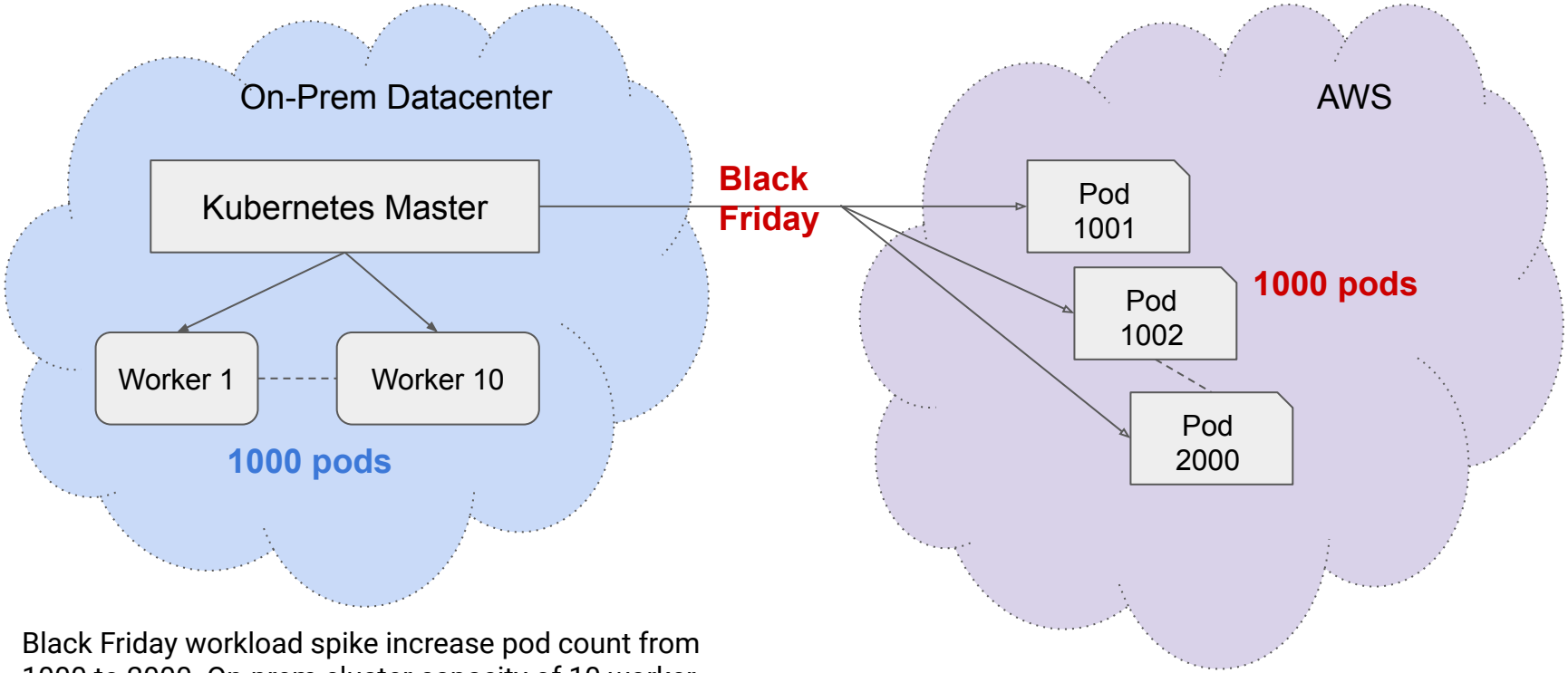
Focus on business instead of curating pet compute on each cloud provider



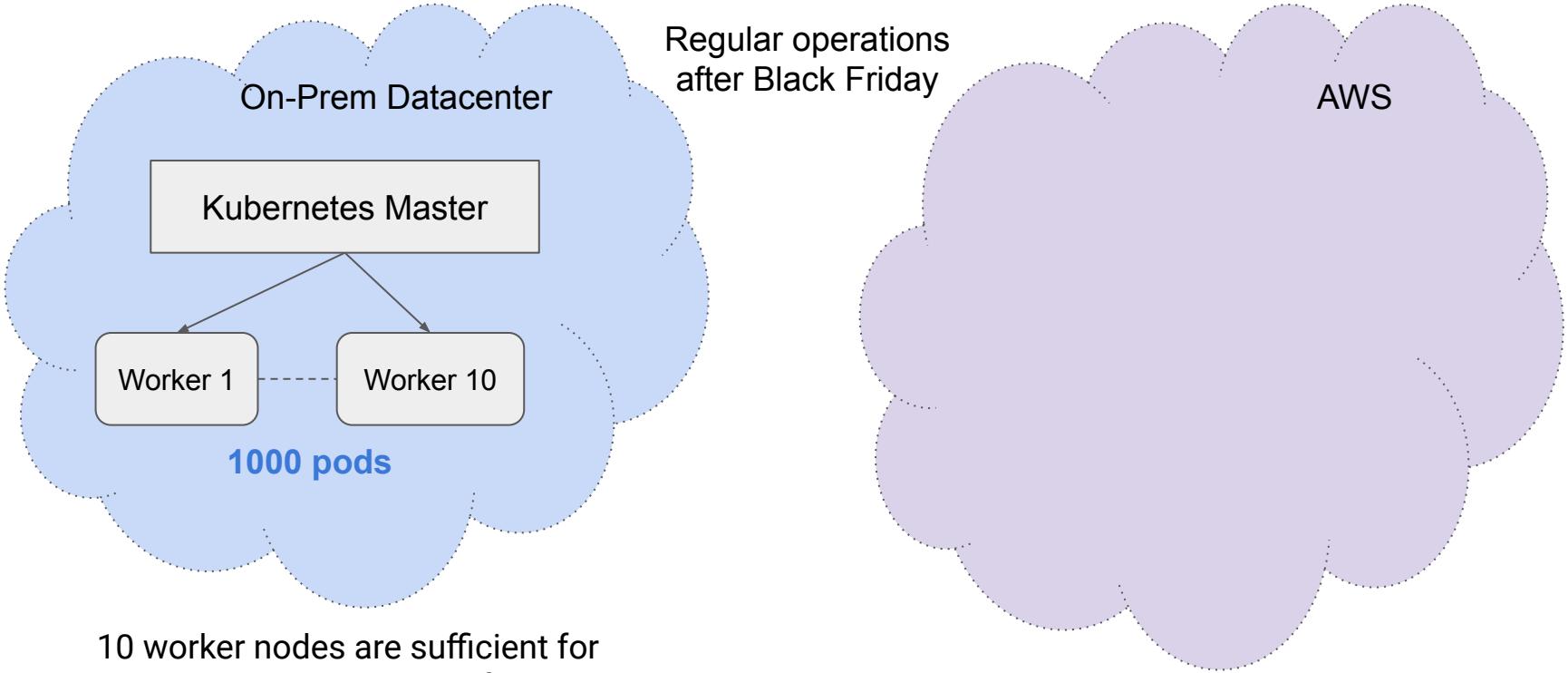
Burst during peak workload



10 worker nodes are sufficient for
regular operational load of 1000 pods



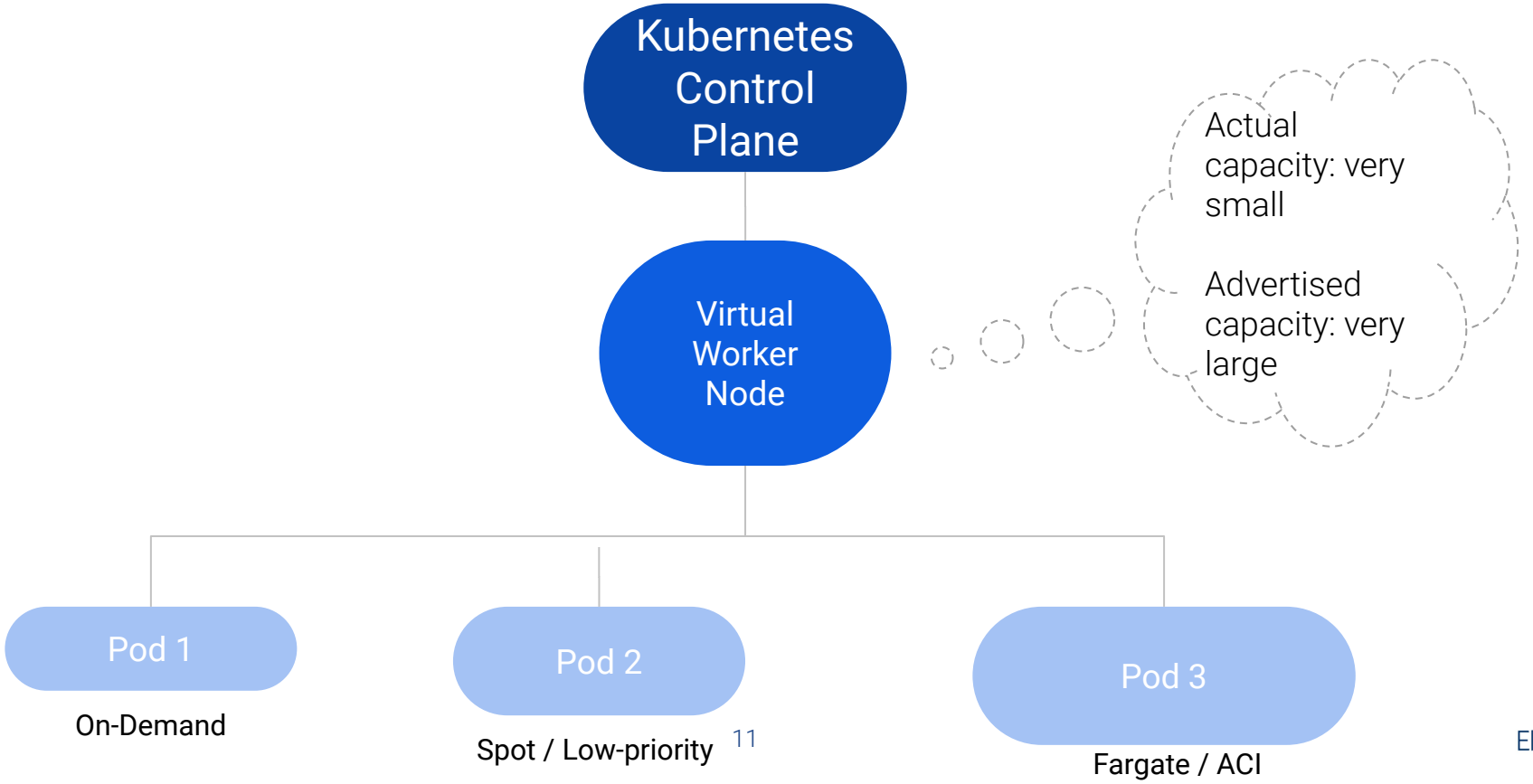
Black Friday workload spike increase pod count from 1000 to 2000. On-prem cluster capacity of 10 worker nodes has zero available resources for 1000 new pods.



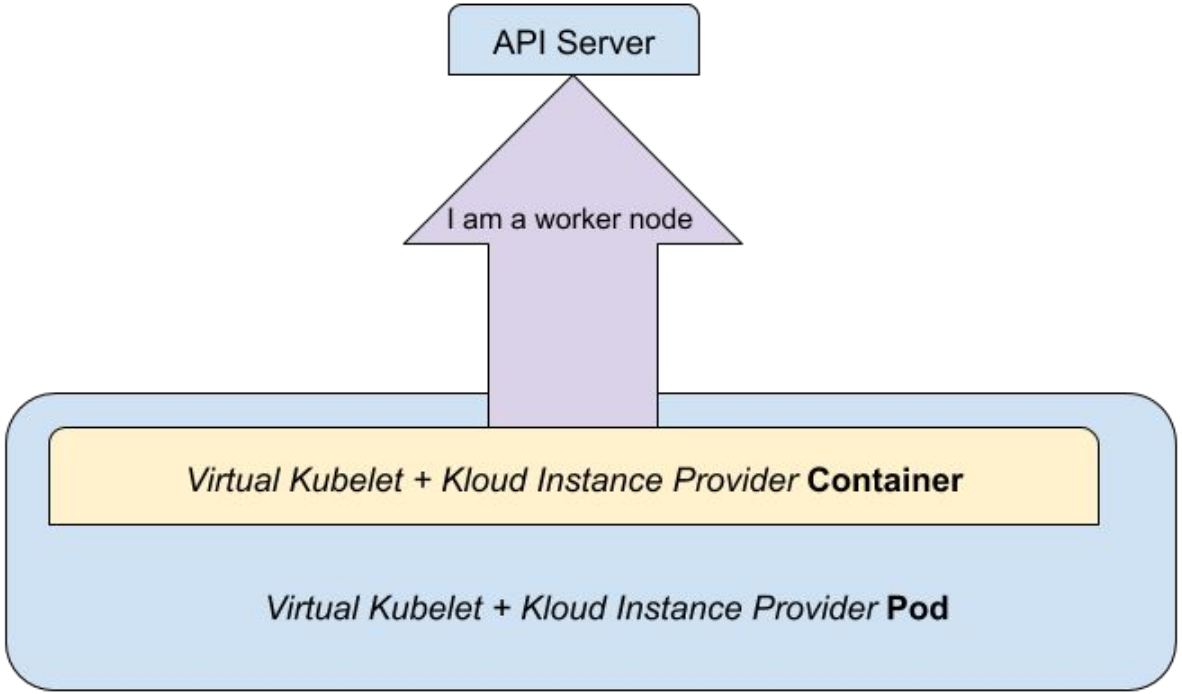
10 worker nodes are sufficient for
regular operational load of 1000 pods

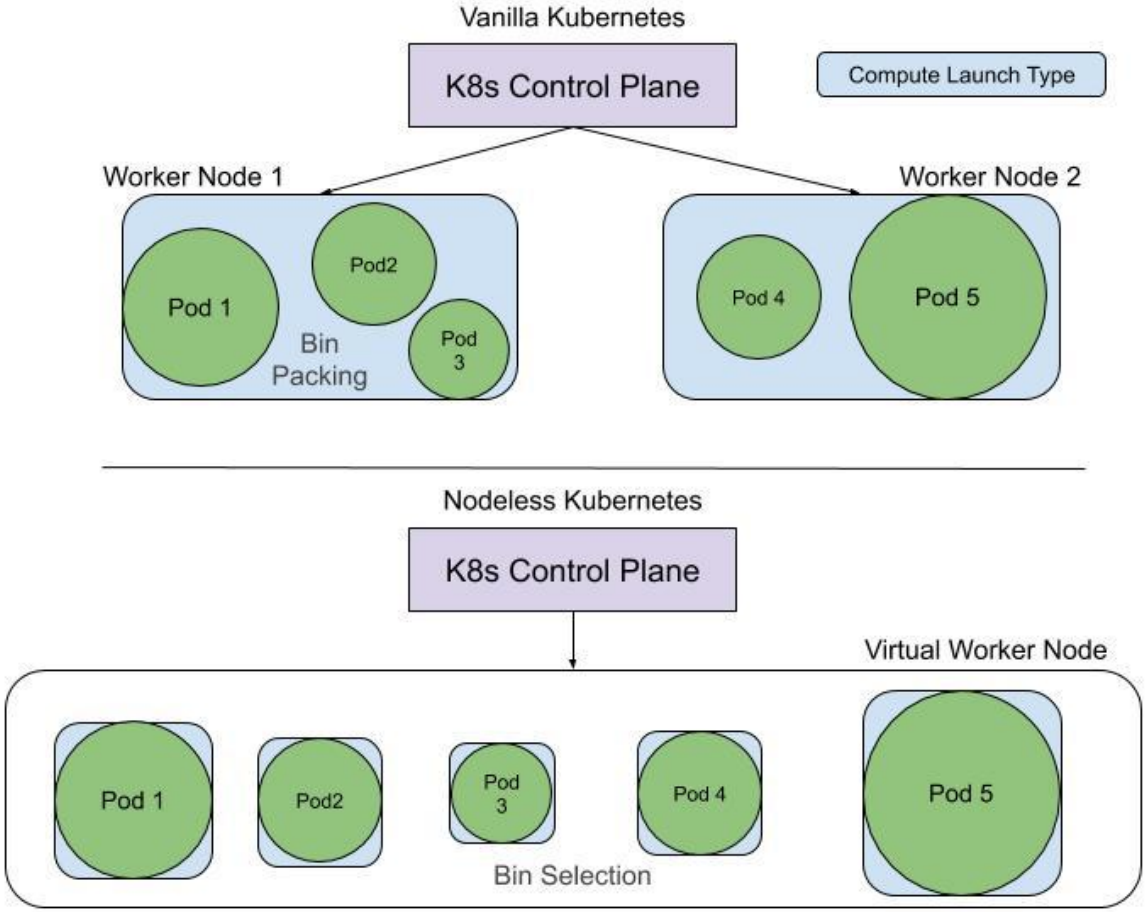
How?

Nodeless Kubernetes: Virtual Worker Node



Virtual Worker Node: Virtual Kubelet + KIP

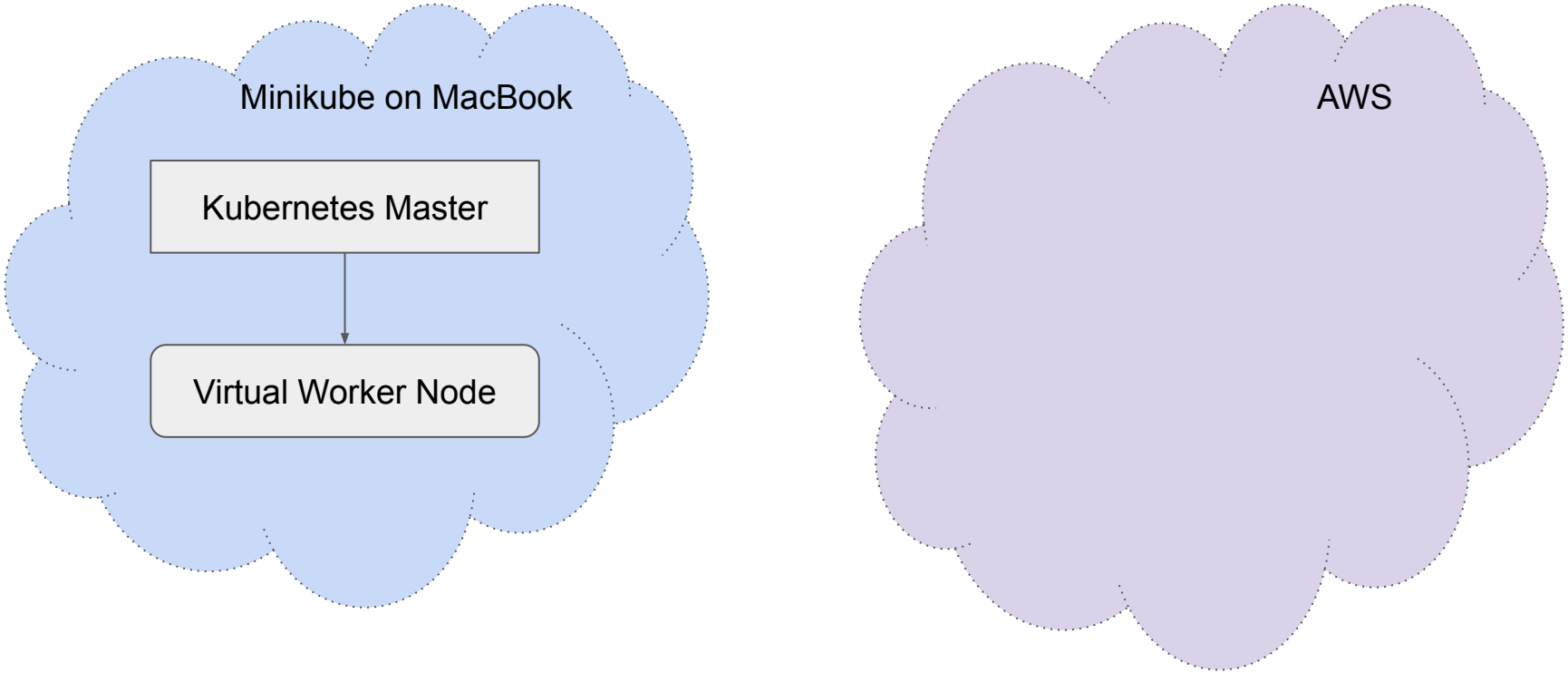



Vanilla Kubernetes
K8s Control Plane
Compute Launch Type
Worker Node 1
Worker Node 2
Pod 1
Pod2
Pod 3
Bin Packing
Pod 4
Pod 5
Nodeless Kubernetes
K8s Control Plane
Virtual Worker Node
Pod 1
Pod2
Pod 3
Pod 4
Pod 5
Bin Selection

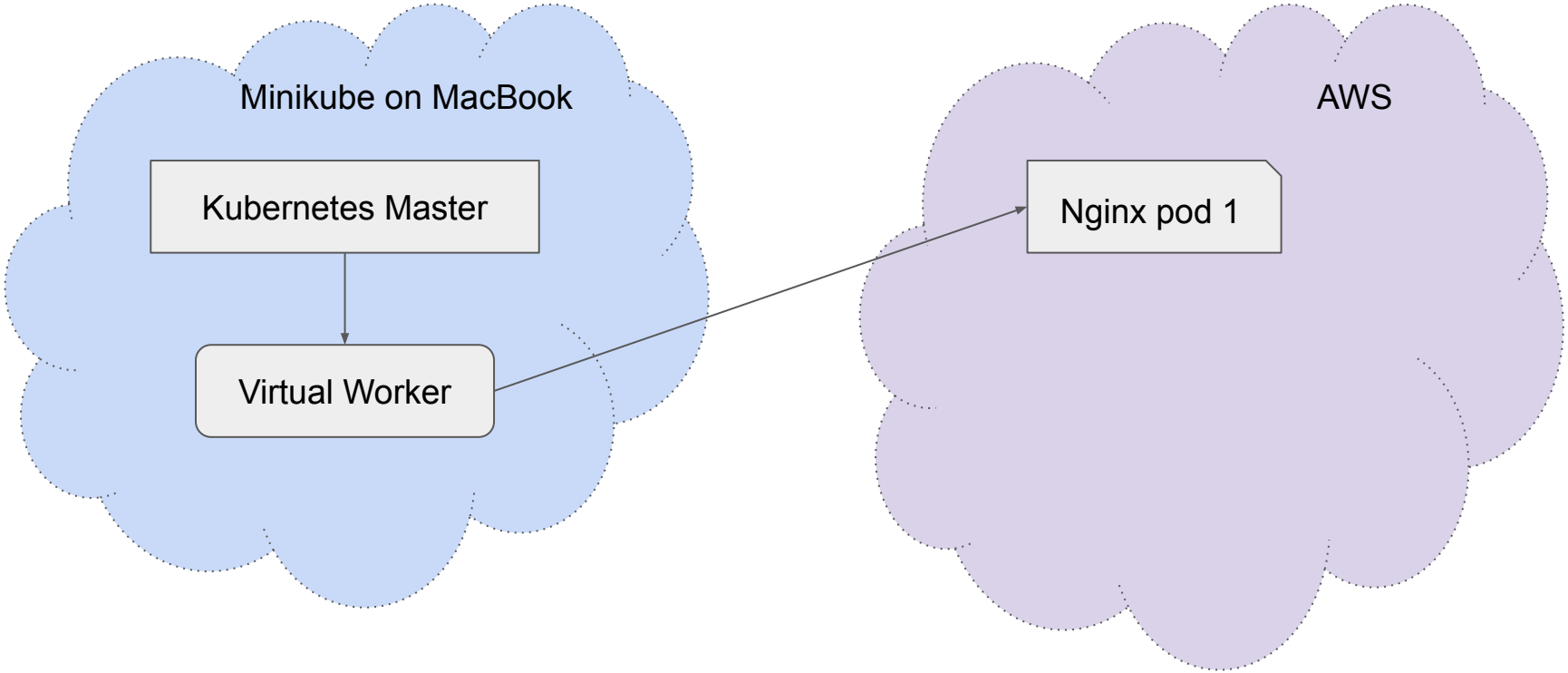
Nodeless gains

- **Simplified operations** where DevOps no longer needs to
  - Hand curate cloud compute
  - Maintain, monitor, update compute catalogue on every cloud vendor
  - Maintain, monitor, upgrade pet worker nodes
  - Maintain, monitor, update cluster autoscaling knobs
- **Stronger multi-tenant security** from
  - Each pod getting its own compute launch type
- **80% cost savings** from
  - Preventing wasted spend
  - Provisioning the most cost-effective compute for each pod

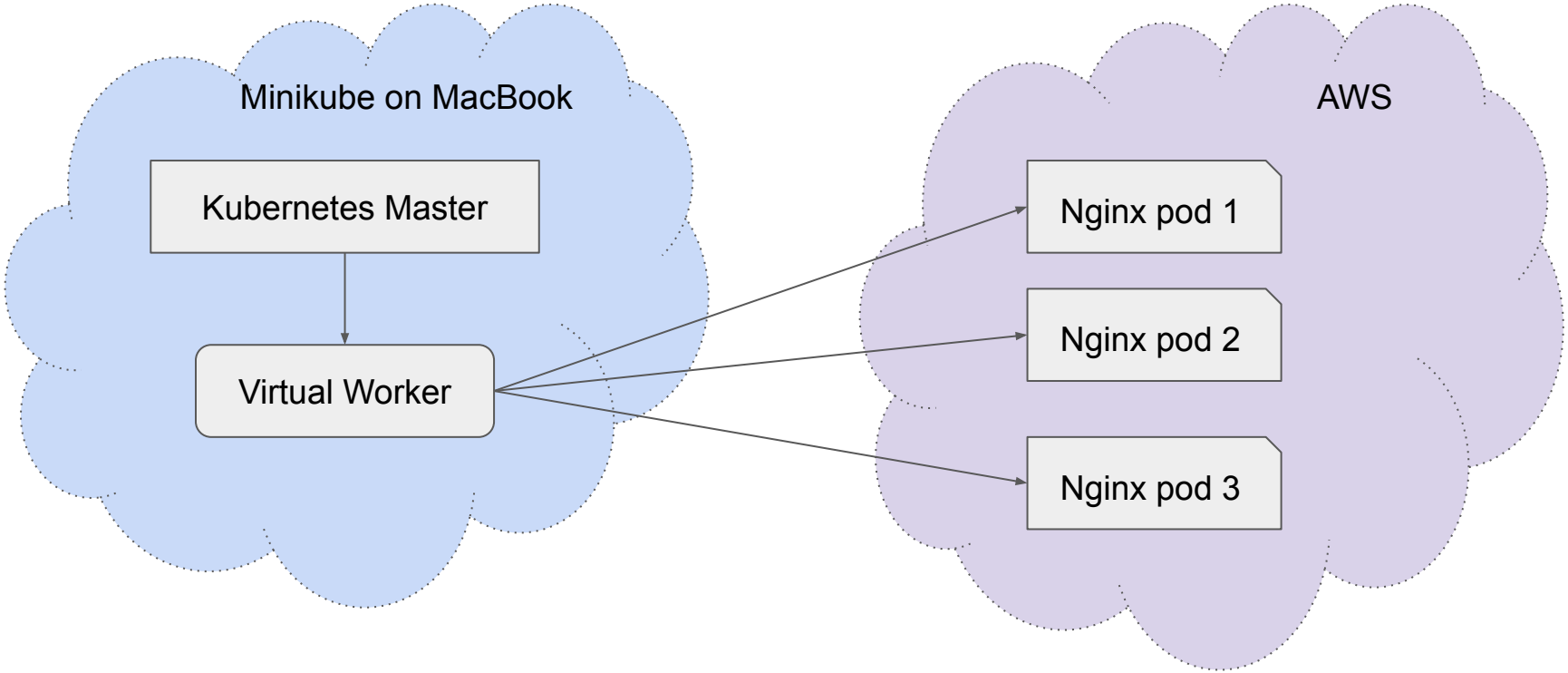
Demo!


Minikube on MacBook
Kubernetes Master
Virtual Worker Node
AWS

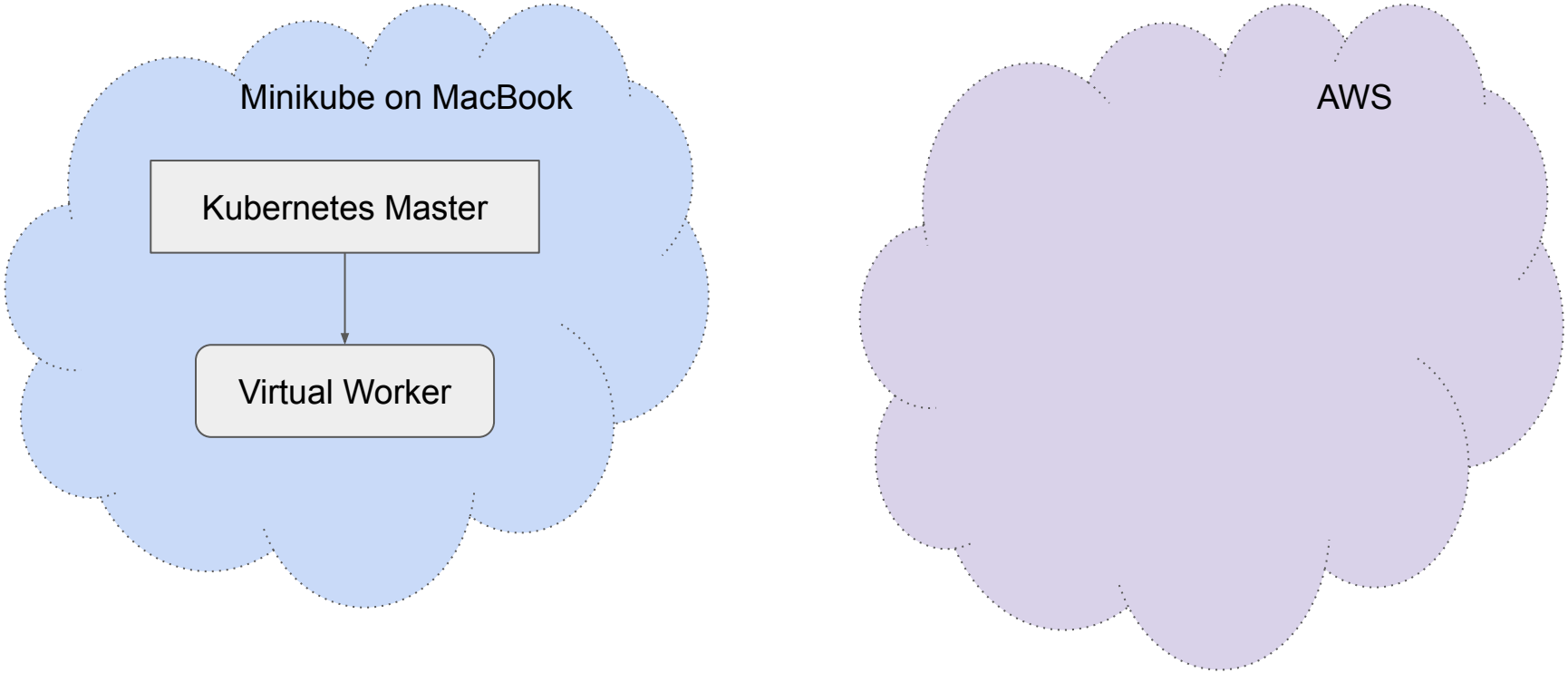
Create nginx deployment with 1 pod



Scale nginx deployment to 3 pods



Delete nginx deployment



Caveats

- Unsupported features (work in progress)
  - Persistent Volumes
  - DaemonSets
  - https://github.com/elotl/kip#limitations
- Supported cloud providers
  - AWS, GCP
  - Beta on Azure

Takeaways

1. Increasing adoption of Kubernetes on multiple cloud platforms leads to proliferation of control planes and heterogeneous clusters spread across multiple cloud platforms leading to operational overhead and wasted spend
2. Multi Cloud Kubernetes **simplifies multi-cloud operations** by reducing proliferation of Control Planes
3. Multi Cloud Kubernetes **simplifies multi-cloud capacity planning**
4. Nodeless Kubernetes via Virtual Kubelet + KIP provide a low friction path towards Multi Cloud Kubernetes

Try Nodeless!

- Create a Nodeless Kubernetes Cluster with one virtual worker node
  - AWS
    - With VPN
      - https://github.com/elotl/kip/tree/master/deploy/terraform-vpn
    - Without VPN
      - https://github.com/elotl/kip/tree/master/deploy/terraform-aws
  - GCP
    - https://github.com/elotl/kip/tree/master/deploy/terraform-gcp

- Deploy virtual worker node onto an existing Kubernetes cluster
  - https://github.com/elotl/kip/tree/master/deploy/manifests/kip

References

- Virtual Kubelet
  - https://github.com/virtual-kubelet/virtual-kubelet
- KIP
  - https://github.com/elotl/kip
- Nodeless reading material
  - https://itnext.io/cloud-bursting-with-virtual-kubelet-and-kip-kloud-instance-provider-4b86a479ce38
  - https://medium.com/elotl-blog

Questions? Comments?

- madhuri@elotl.co
- https://github.com/elotl/kip/issues
- Virtual-kubelet channel on Kubernetes Slack

Acknowledgements

- Elotl Engineering
  - Brendan Cox, Vilmos Nebehaj, John Roman
- Virtual Kubelet team
  - Ria Bhatia, Brian Goff
- CNCF
- Audience - thank you!

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