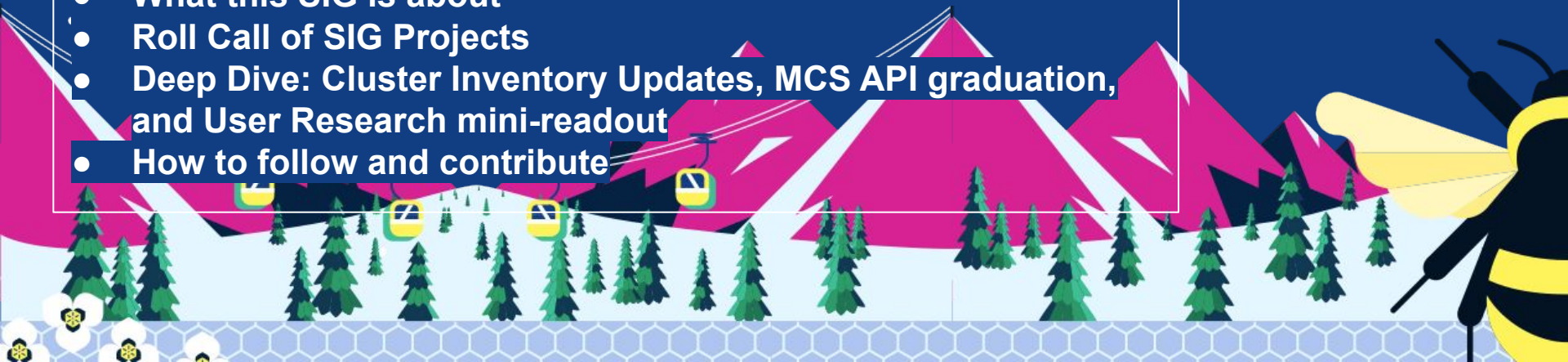
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#KubeCon #CloudNativeCon

SIG-Multicluster Intro & Deep Dive

- What this SIG is about
- Roll Call of SIG Projects
- Deep Dive: Cluster Inventory Updates, MCS API graduation, and User Research mini-readout
- How to follow and contribute



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What this SIG is about



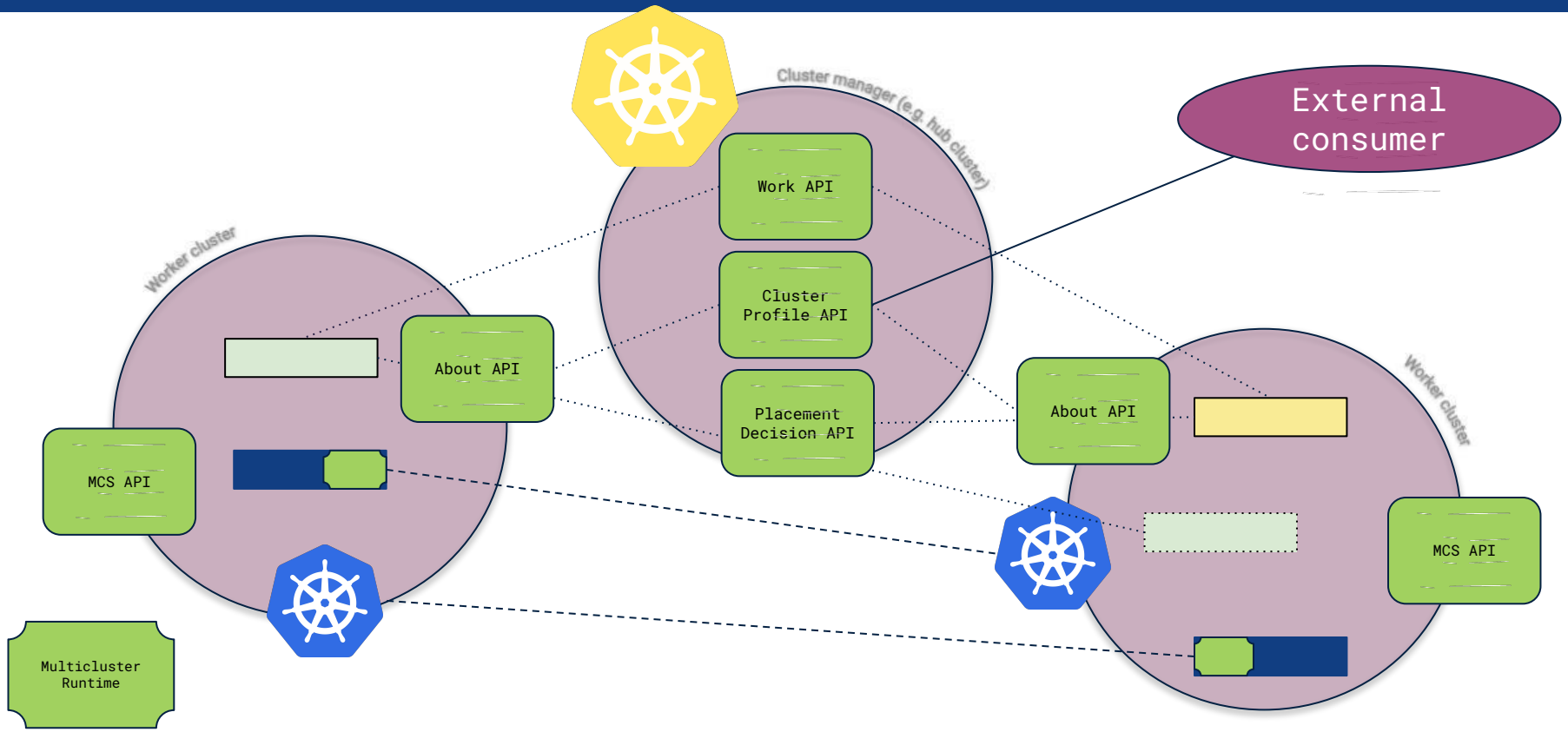
What this SIG is about

- Solving common challenges related to the management of multiple Kubernetes clusters, and applications that exist therein.
- Multi-cluster is everywhere
  - Environment isolation; Tenancy; Multi cloud; Fault tolerance; Data locality; Policy; Capacity; Performance
- Multi cluster applications (split across multiple clusters) can be powerful
- Kubernetes was built with the Cluster as the Universe
  - We've made some progress, but there's a long way to go

Our approach

- Recognize diversity of the ecosystem
  - Where workloads run (cloud, on-prem)
  - Environmental constraints
  - Recognize the ecosystem when designing APIs – focus on APIs that work for everyone
  - Lift the standards existing or needed in the ecosystem
- Avoid solving any optional problems
  - “This could be useful” is an engineering fly trap!
- Consistency with existing core and SIG-sponsored Kubernetes APIs
- Composable building blocks

Project roll call!!!



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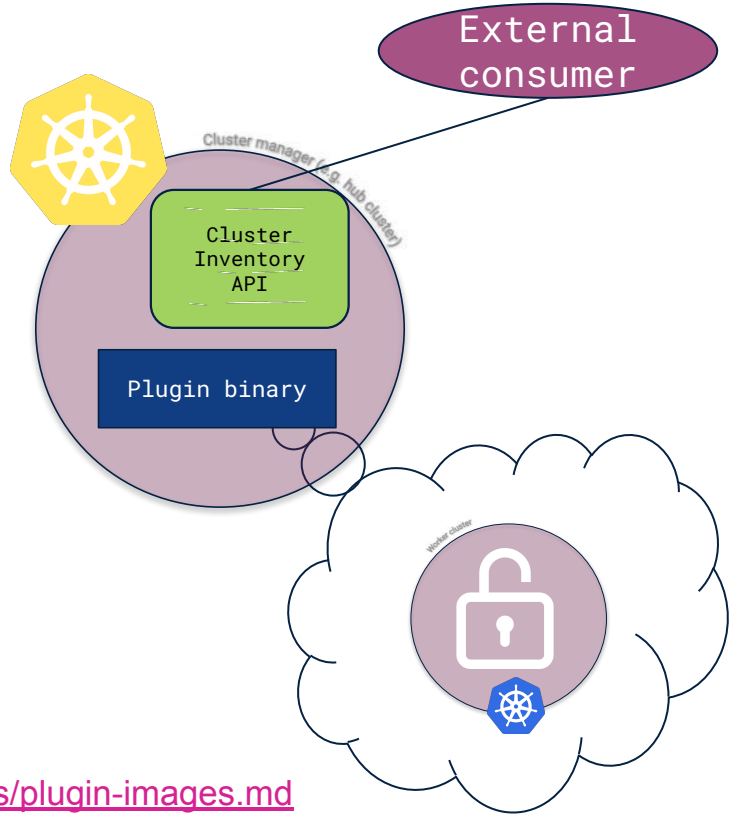
Shout out to @kahirokunn! 👋

Cluster Inventory Updates



Cluster Inventory Credential Plugins

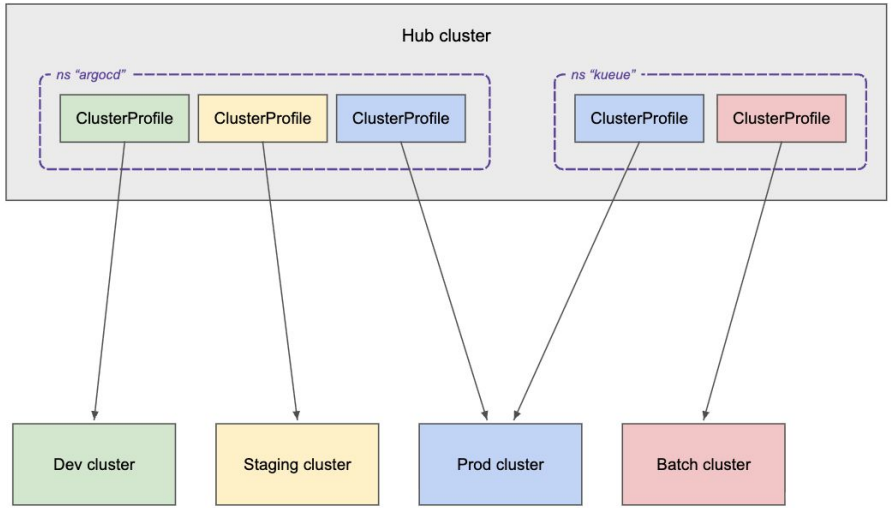
- Provide a modular way for Cluster Inventory hosts to request and lookup spoke cluster credentials
- Two simple plugins are provided as official registry.k8s.io OCI artifacts which required extra work
  - registry.k8s.io/cluster-inventory-api/secretreader
  - registry.k8s.io/cluster-inventory-api/kubeconfig-secretreader
- Bundling two plugins into one image - release numbering/ tracking difficulties?
  - Images are published based on Github Tags
  - Chose to go with ‘Repository Release’ idea



https://github.com/kubernetes-sigs/cluster-inventory-api/blob/main/docs/plugin-images.md

Cluster Inventory as Namespace-scoped

- We now require the ClusterProfile Kind to be namespace-scoped
  - All the ClusterProfile objects in one namespace are one “inventory”
- Supports real-life use cases
  - duplicate cluster names
  - simpler for Cluster Inventory clients to know which “inventory” to watch
- ClusterSet as a uniqueness boundary was too restrictive for cluster inventories
  - ClusterSet is a trust relationship across its clusters, where Cluster Inventory is a trust relationship from the spoke clusters to the hub cluster



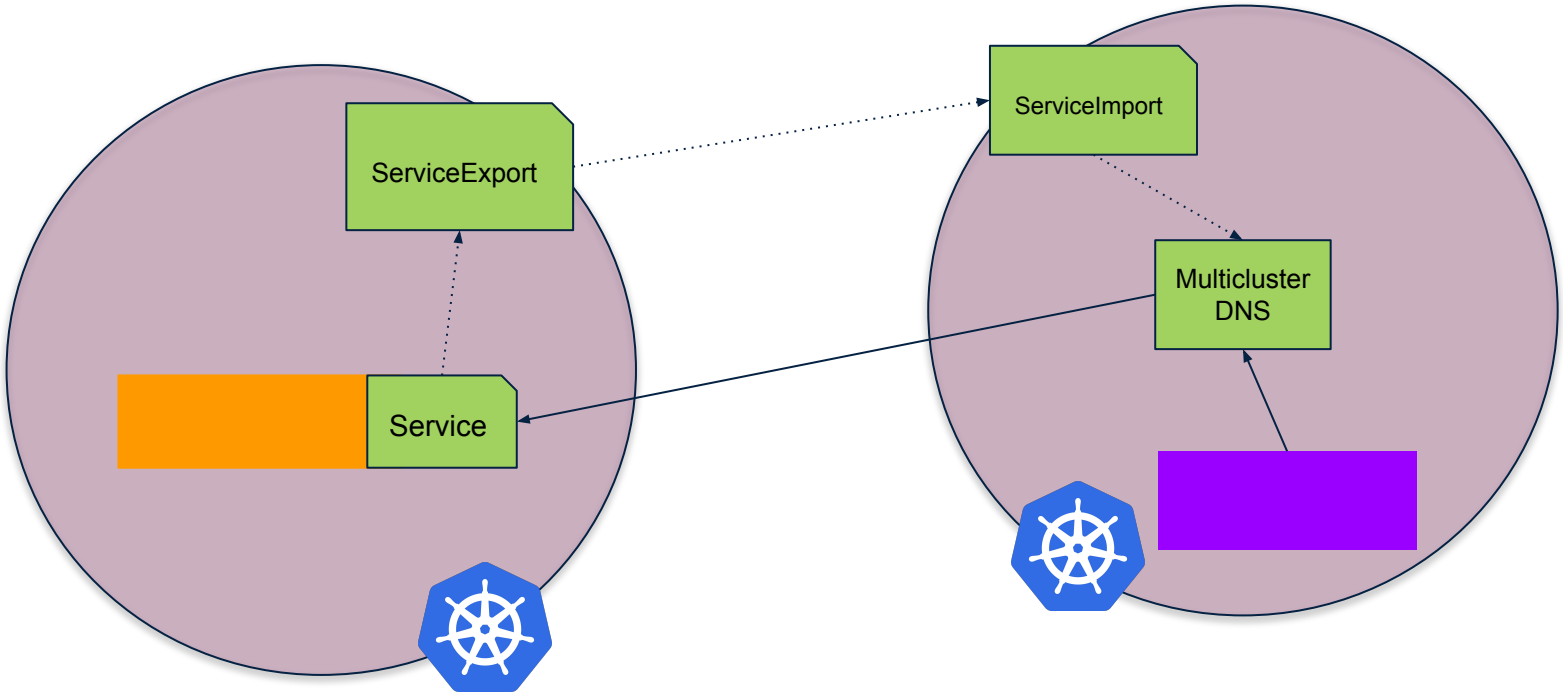
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Shout out to @MrFreezeex! 👋

MCS API graduation



MCS API 101



MCS through the years

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2020

Initial proposal

Alpha API implementation, reference and initial third-party MCS controller implementations

2021

Focus on implementations

Explicit kube-proxy support dropped

2022

Align on DNS

Multicluster DNS proposal and implementation in CoreDNS

MCS through the years

2023

Supporting APIs

About API proposal and alpha

2024

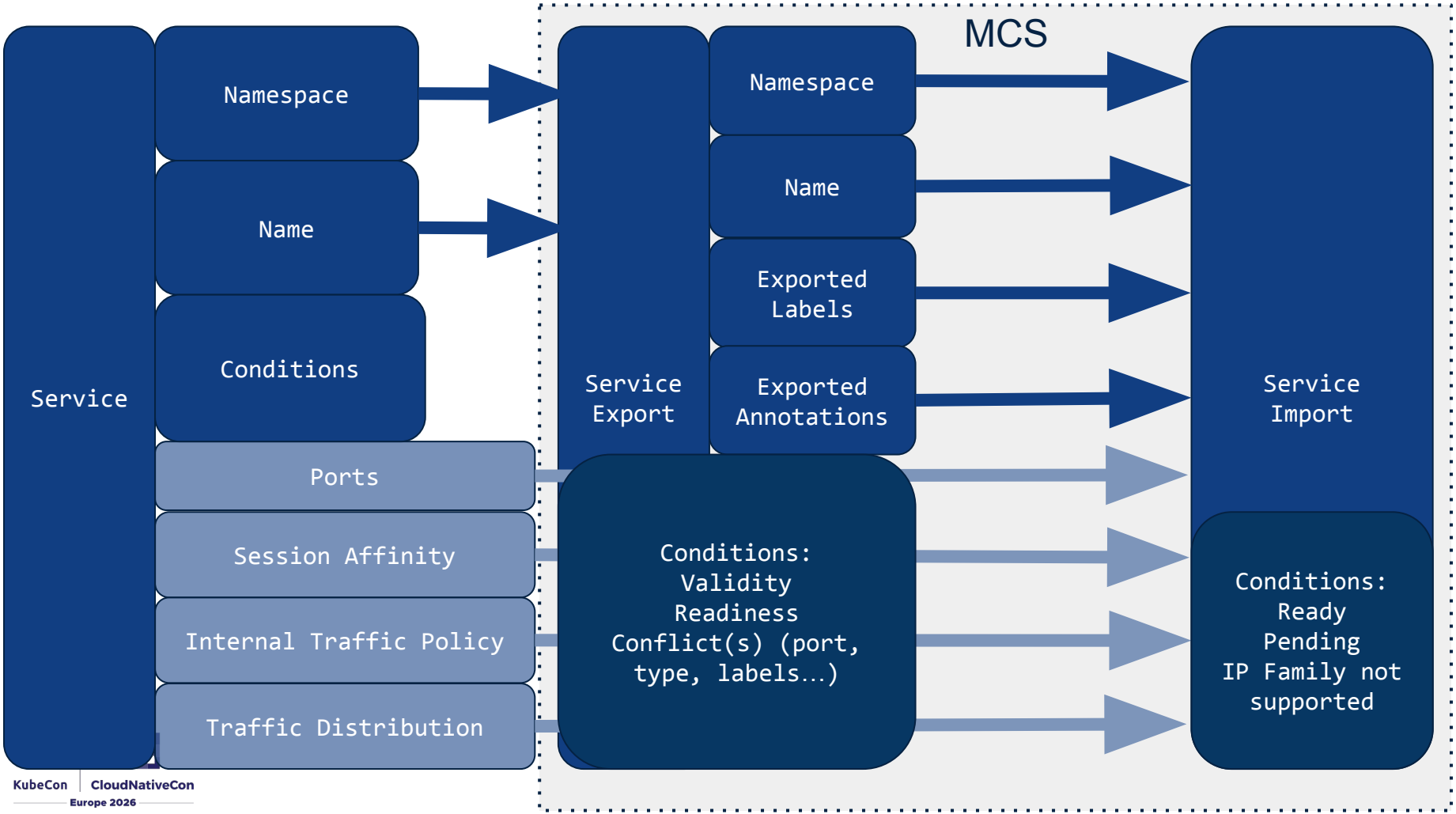
Real world refinements

EndpointSlices optional, added label and annotation export

2025

Resync with `Service`

Conditions refresh, dual stack support added, TrafficDistribution. Also About API beta


MCS
Service
Namespace
Name
Conditions
Ports
Session Affinity
Internal Traffic Policy
Traffic Distribution
Service Export
Namespace
Name
Exported Labels
Exported Annotations
Conditions:
Validity
Readiness
Conflict(s) (port, type, labels...)
Service Import
Conditions:
Ready
Pending
IP Family not supported

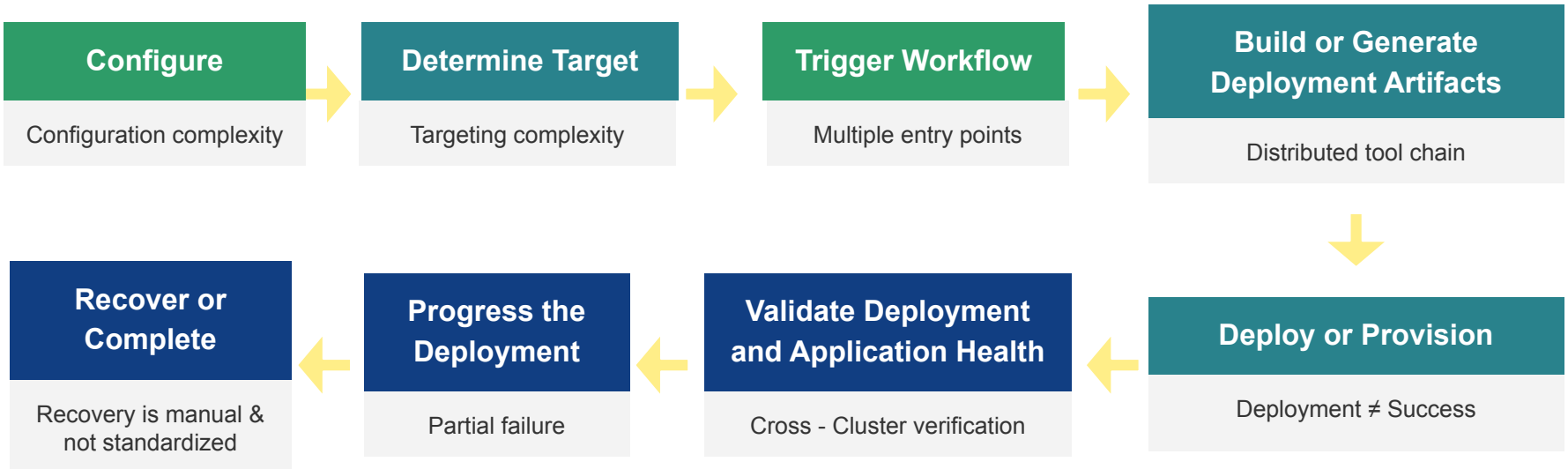
Shout out to @pavanipriyasajja! 👋

Multicluster UXR

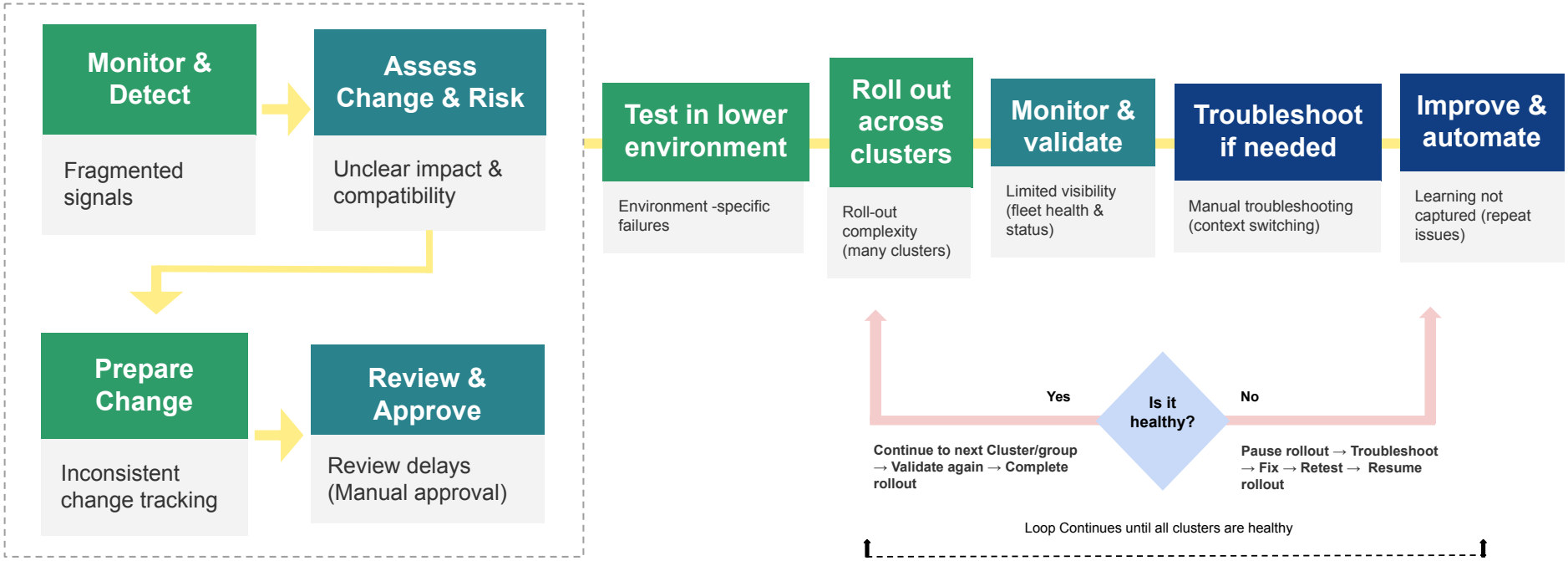
More research information:
https://github.com/pavanipriyasajja/SIG-MC-User-Research



Common Deployment Journey

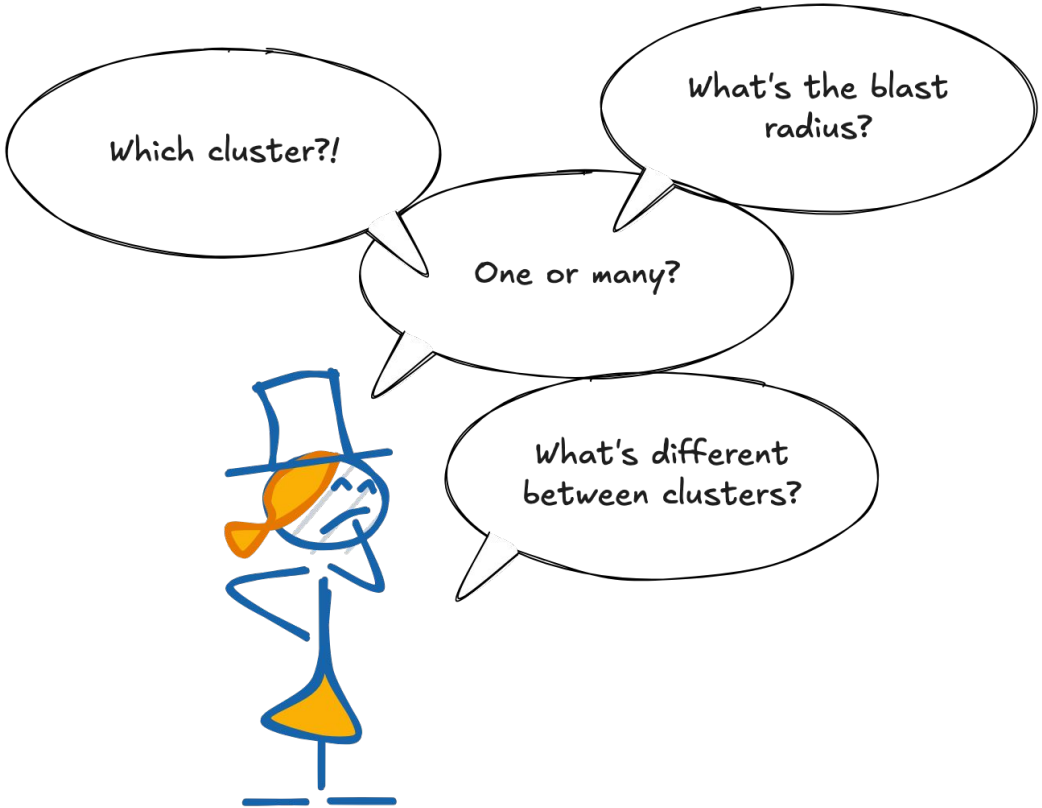


Common Maintenance Journey



Multicluster Factors When Troubleshooting

- In multi-cluster environments, engineers need to assess a number of complex factors that normal troubleshooting tools do not consider
  - Engineers look for differences in:
    - Configuration
    - Networking
    - Dependencies
    - Infrastructure
    - Permissions
    - Certificates
    - Application behavior
    - Recent changes



Key Insights

1. Automation simplifies routine operations, but **manual intervention remains essential**
2. **Fragmented tooling** limits end-to-end visibility across clusters
3. Configuration differences and **lack of standardization** increase operational complexity
4. Changes across multiple clusters require **gradual rollouts, risk assessment, and health validation**
5. Troubleshooting and recovery become **more complex** across multiple clusters

Join us for User Interviews!

We are looking especially for **application developers** to understand how they deploy, manage, and maintain applications across multiple Kubernetes clusters

Why Participate

- Share your **multi-cluster management or development experience**.
- Help identify **gaps and opportunities** for better solutions.

Interview Info

- **45–60 minute interview**, optional screen sharing.
- Participation is **voluntary** and all responses will be **anonymized**.
- More research information: https://github.com/pavanipriyasajja/SIG-MC-User-Research

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Follow and get involved

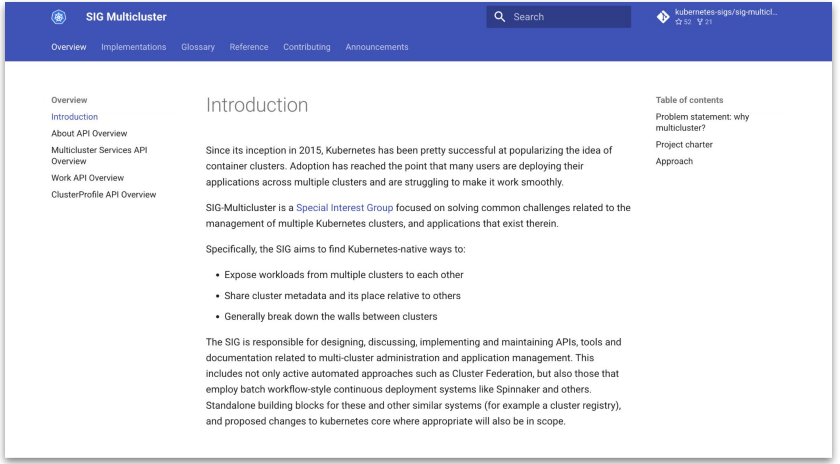


Be part of the SIG

- What are you working on?
  - APIs you're building, concepts you're missing — agenda is always open for demos!
  - What problems do you or your customers have?
  - Do you have unique needs that have been overlooked?
- Do you want to help?
  - Contribute to the test and conformance suites
  - Add information to the web site
  - Join the UX team for more research and analysis
  - Provide stakeholder input on KEPs
  - Try our projects

Be part of the SIG

- **Home page**: https://multicluster.sigs.k8s.io
- **Slack channel**: https://kubernetes.slack.com/messages/sig-multicluster
- **List**: https://groups.google.com/forum/#!forum/kubernetes-sig-multicluster



Meetings are

- weekly **Tuesdays**, 12:30 Eastern, 9:30 Pacific, 16:30 UTC (AMER/EMEA timeslot)
- biweekly **Thursdays** at 7 AM UTC (APAC/EMEA timeslot)

User research QR code again

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Thank you!

SIG-Multicluster Intro and Deep Dive

