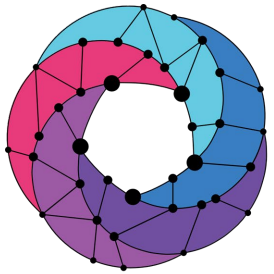

Open Source MANO by ETSI

Cloud-Native Orchestration in Multicloud Environment

Francisco-Javier Ramón Salguero
(ETSI OSM Chair, Telefónica)

04/02/2026

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Manage Infrastructure, Platforms and Applications across Cloud Platforms in the easiest way

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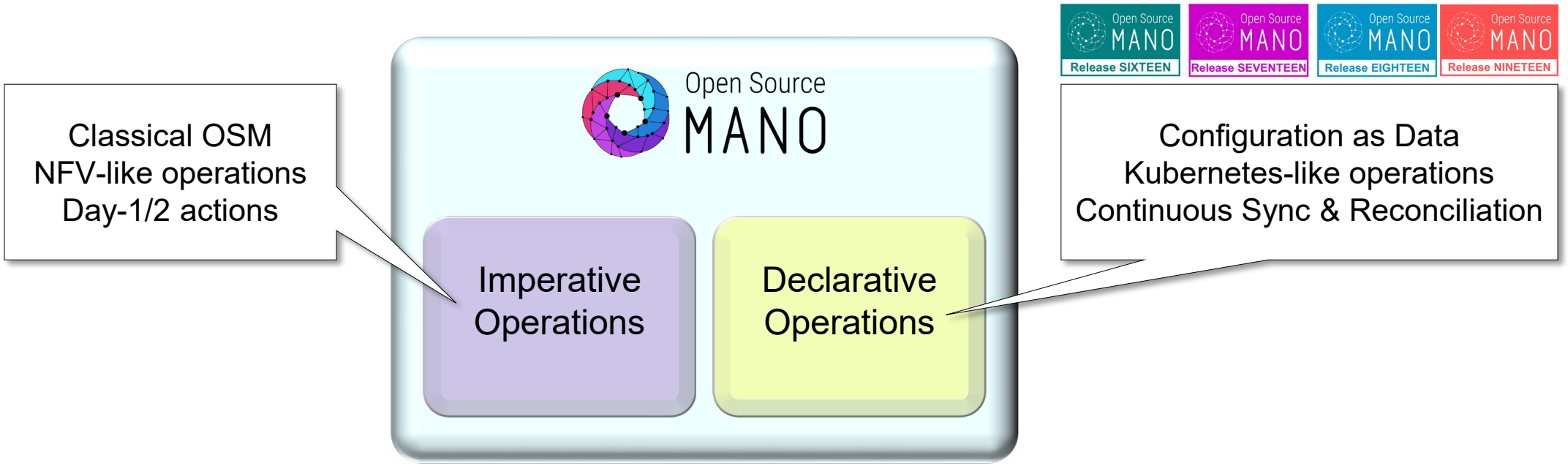
OSM architecture includes engines for imperative and declarative operations



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Declarative operations with continuous reconciliation are a big step forward for cloud-native deployments…

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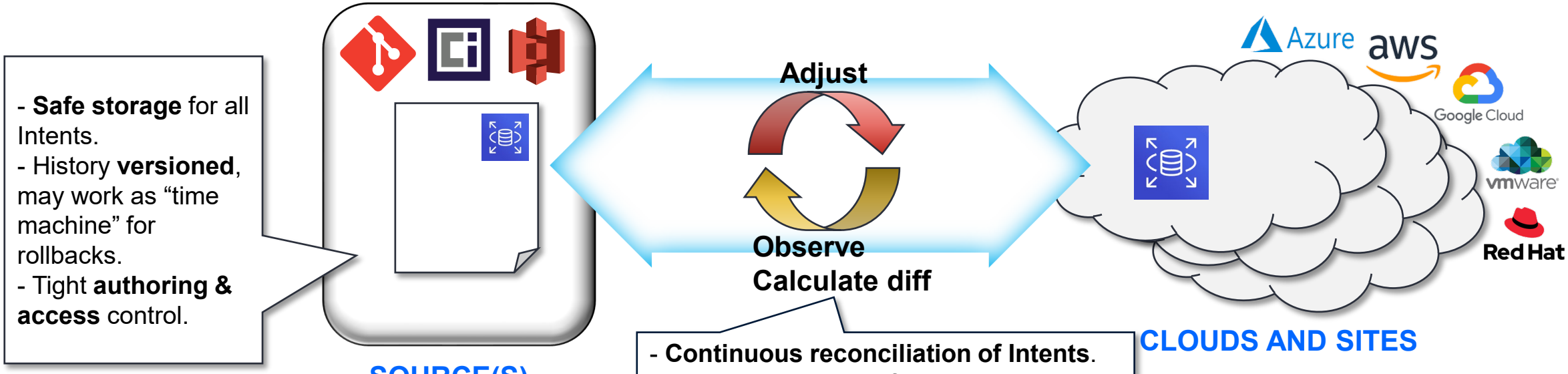
- Full control of desired configurations (even historical ones!)
- **No direct access to cloud or cluster APIs** is given to users.
- Cloud management becomes a specialized kind of data management.



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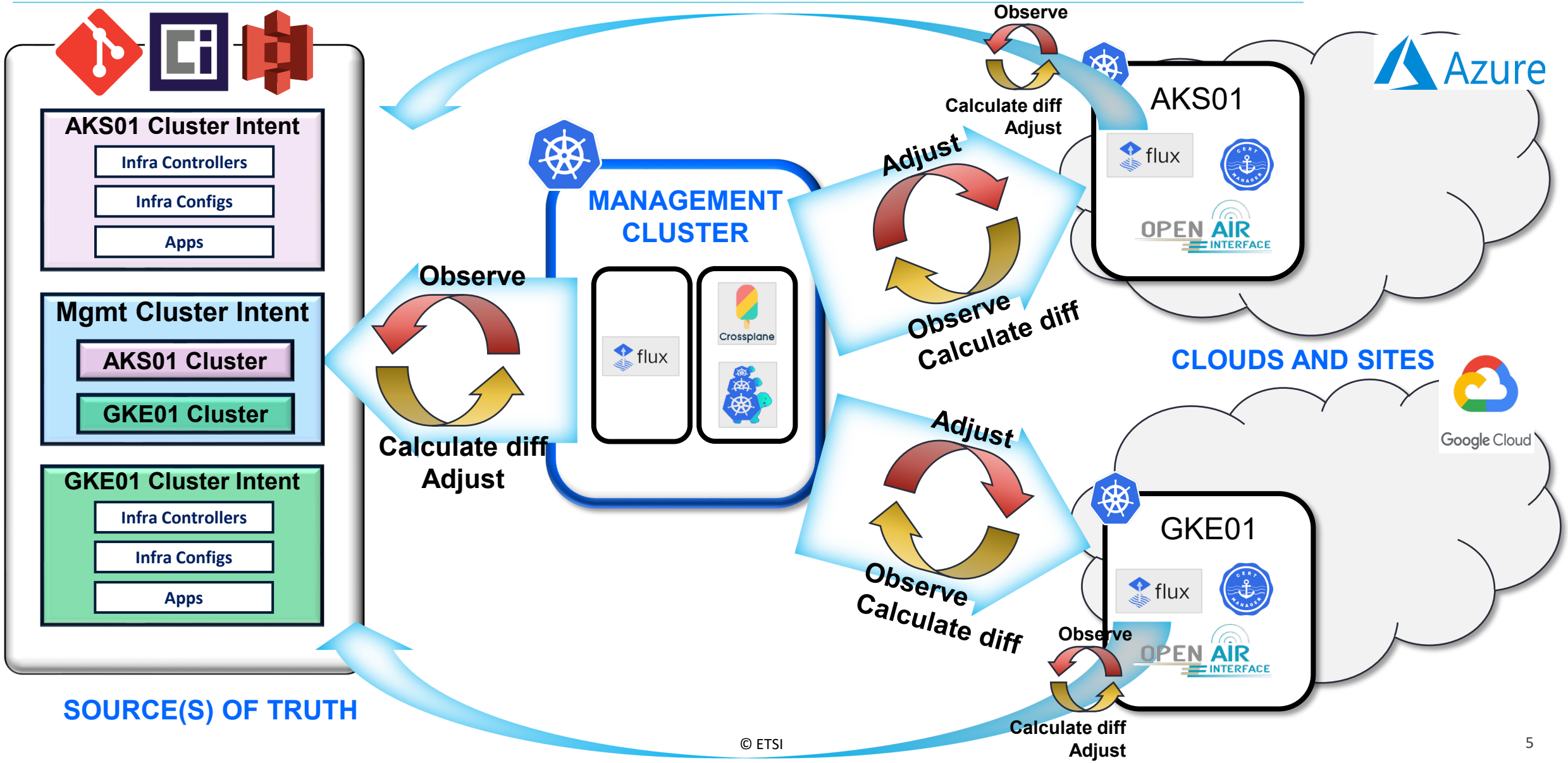
… bringing significant resilience to complex multi-cloud scenarios



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Why naïve GitOps is not enough?

Under these premises, complexity grows wildly with size!

Need of granting synchronization order

- A new K8s cluster needs to be ready before attempting to deploy an App.
- CRDs & Operators need to be ready before using them.
- Database layer often needs to be ready before the frontend is deployed.
- Etc.

Avoid massive duplication of intents and make integration as simple as possible

- Duplicated intents and hardcoded templates make maintenance and operation too cumbersome.
- Reuse well-known patterns validated in standalone environments and parametrize only what needs to change per instance.
- Intents are often too low level and require coordinating large sets of basic resources.

Is the resource ultimately ready in the target cloud?

- Joint state needs to be compiled, interpreted and monitored.

Grant protection of sensitive data, so that it can never be saved in clear (e.g., secrets)

Bootstrap of remote clusters, which, in turn, become "resource containers"

- One cluster (*Management*) may create others (*Workload*), which, in turn, may host Apps/CNFs.

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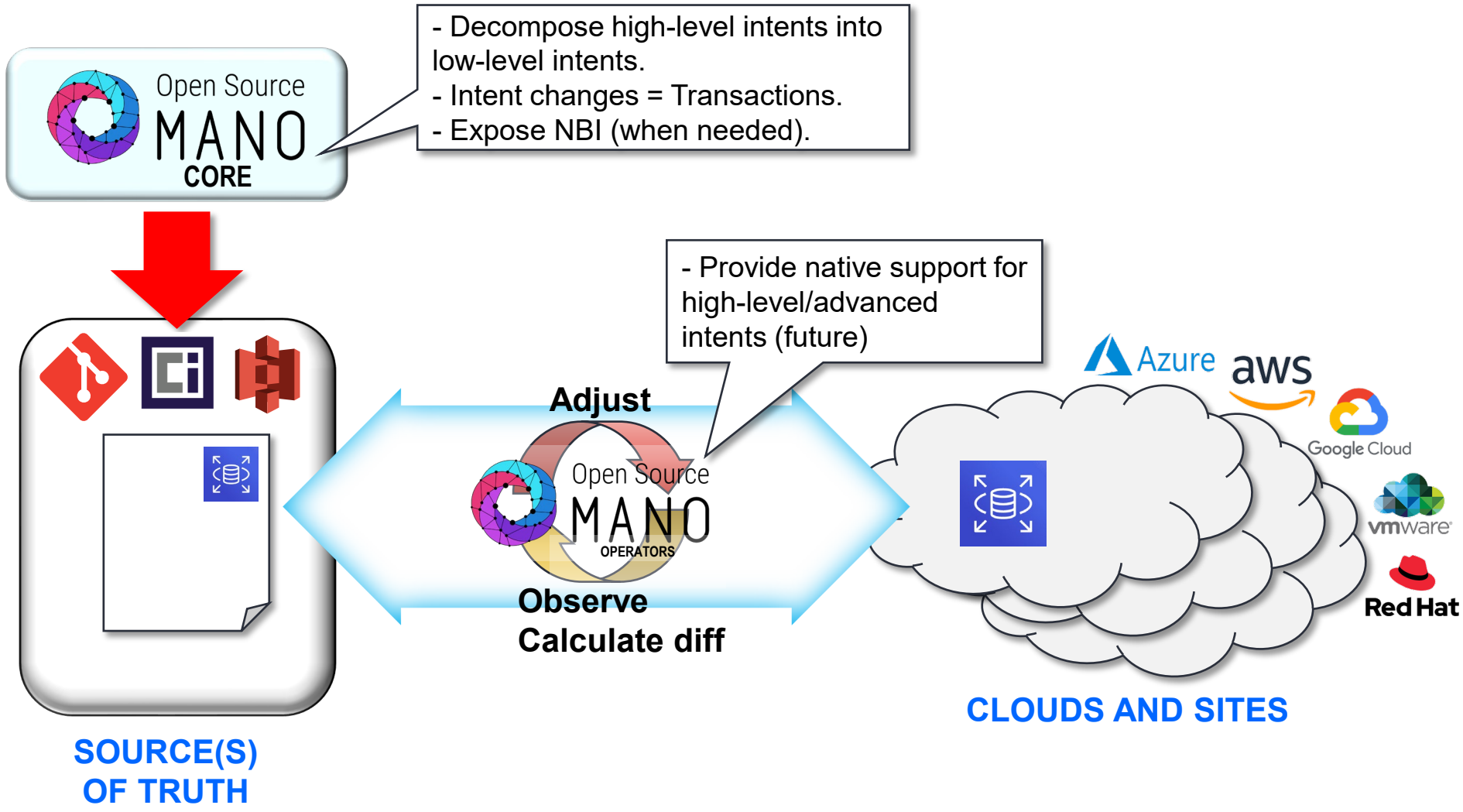
OSM simplifies Declarative Operations…



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… by controlling the intents, the transactions and the progress in resource creation…

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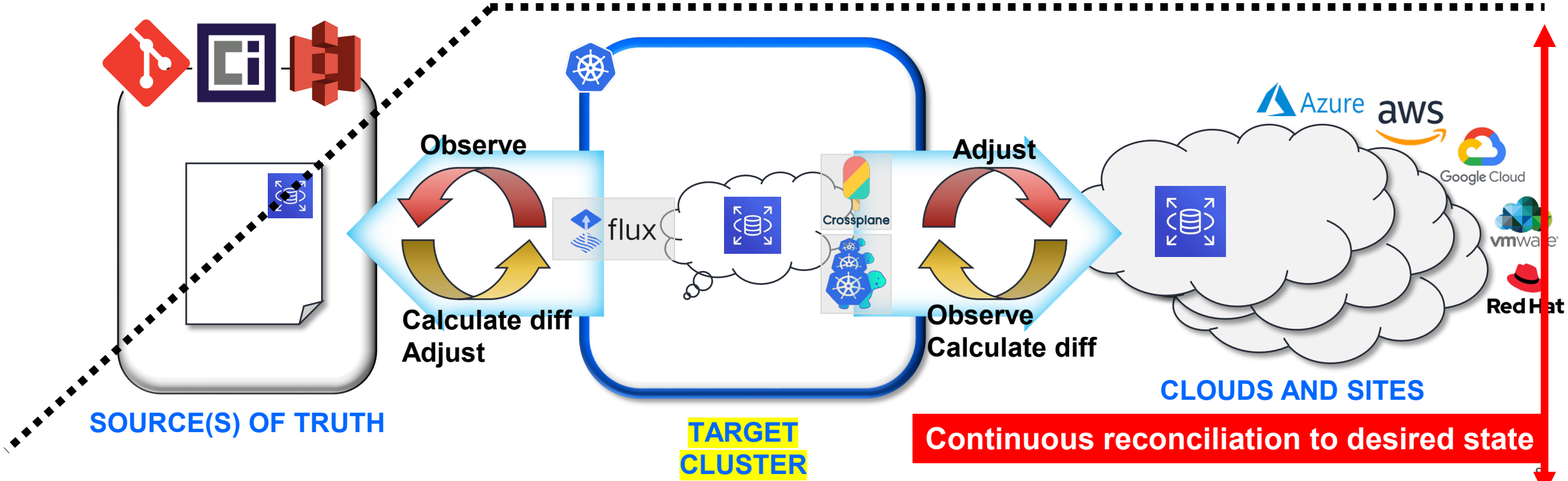
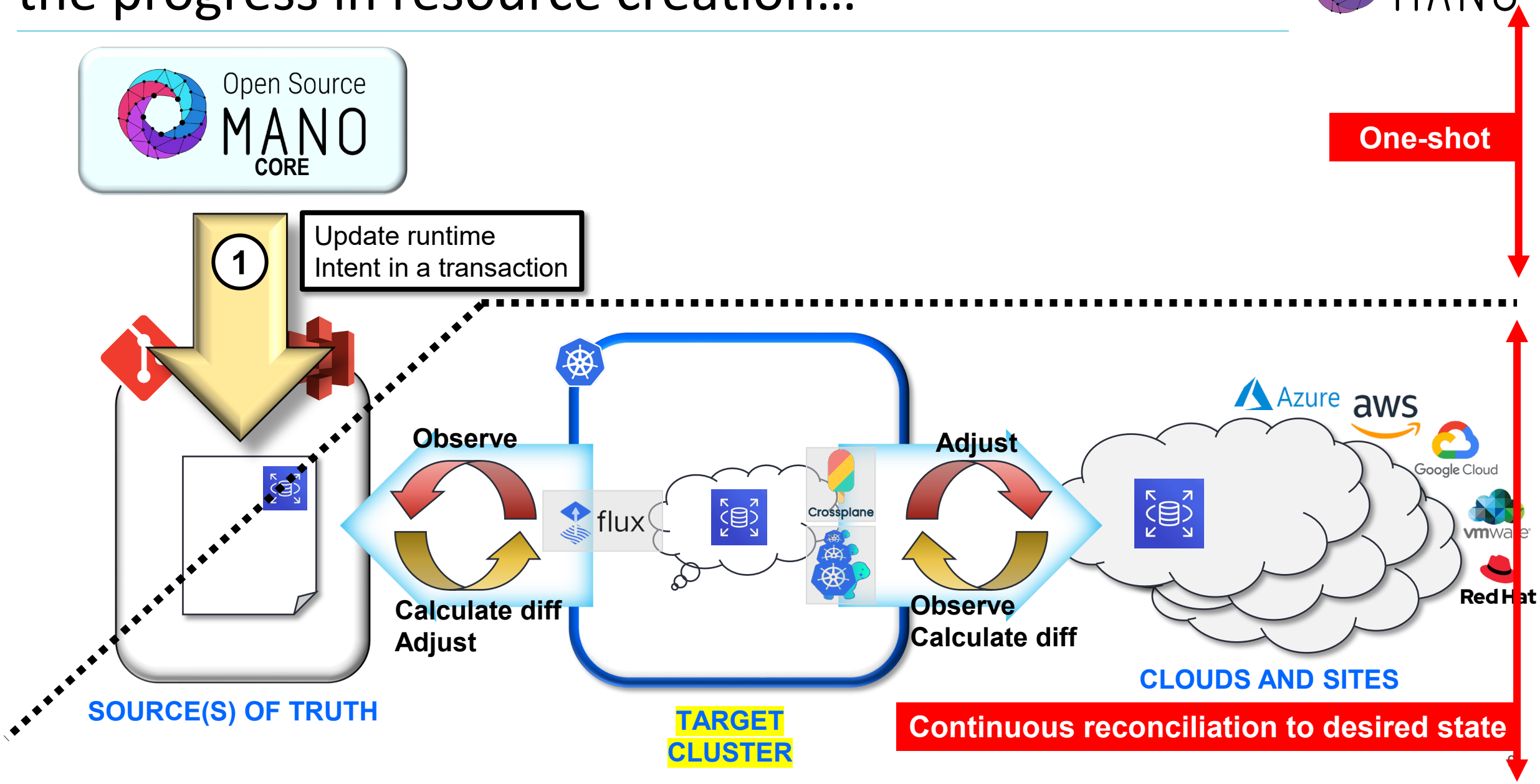
Open Source MANO CORE

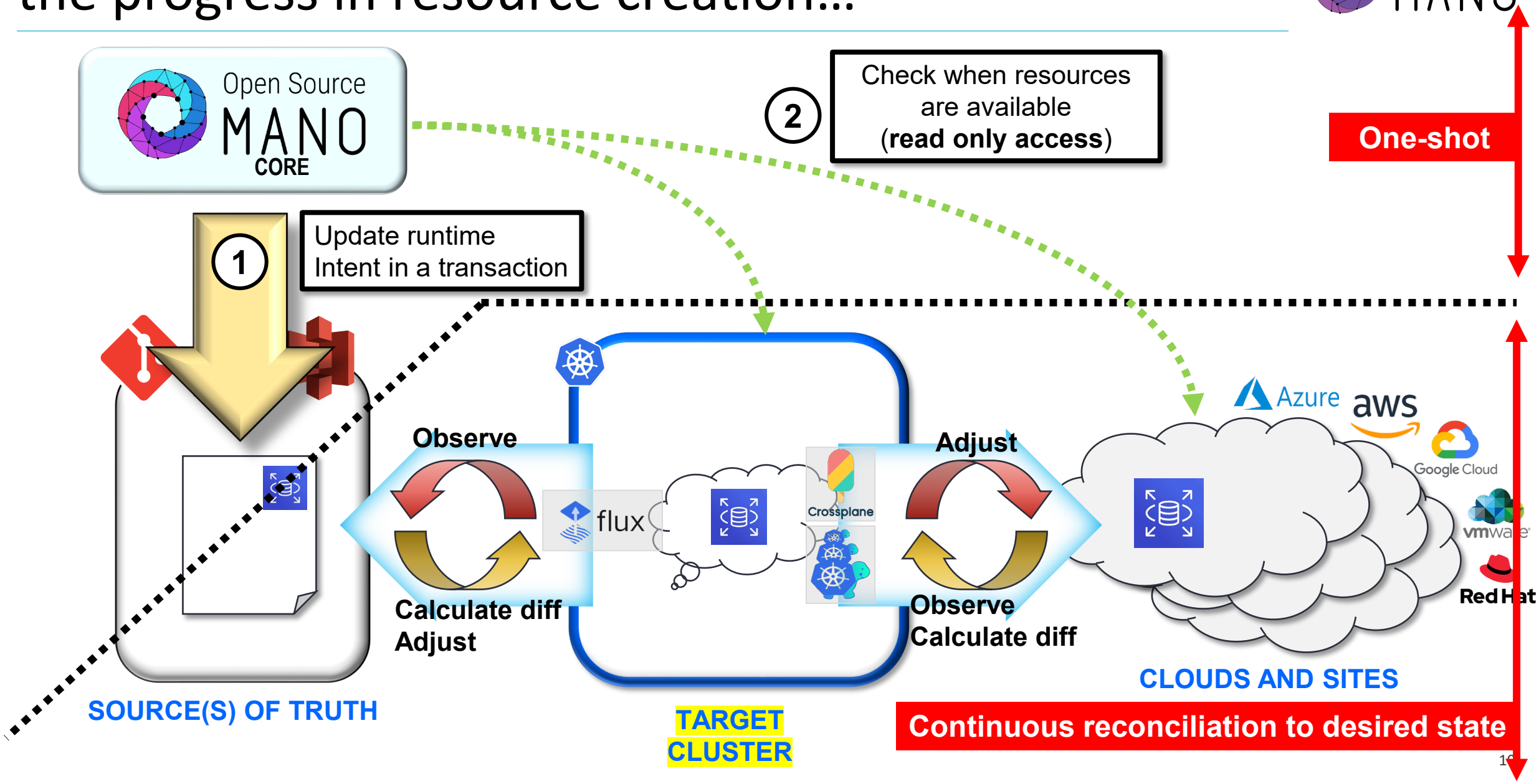
One-shot



… by controlling the intents, the transactions and the progress in resource creation…



… by controlling the intents, the transactions and the progress in resource creation…



… providing many practical benefits…

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Global Intent is updated in a single coherent transaction, specifying together:

- All changes required to achieve a single high-level change (e.g., add a whole new cluster).
- Required synchronization/readiness order of components.
- How to report to other components they are ready.
- How they should self-heal in case of trouble.
- Etc.

Distributed CD operators run continuously in a closed loop based on the global Intent

- Distributed CD operators keep resources in sync, reconciling/healing when appropriate.
- Once the Global Intent has been updated, no further actions in OSM's LCM are needed except checking/monitoring resource readiness (e.g., new cluster is available).

Once resources are ready, **new operations may be triggered to update intents** of related resources

- E.g., add an application to the new cluster.

OSM provides a simplified **user-facing management interface/API** to:

- Simplify common operations.
- Ease cluster management.
- Add Day-1 and Day-2 operations…

In addition, OSM can now easily manage additional types of resources by leveraging on well-known CRDs/Operators

- Kubernetes clusters
- PaaS/IaaS components
- Serverless workflows
- etc.

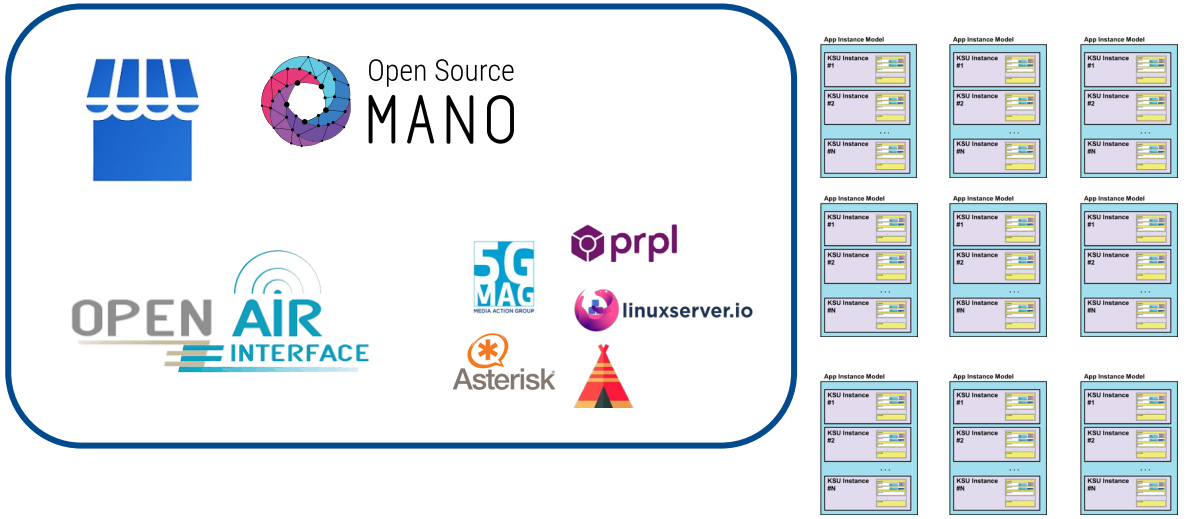
Crossplane

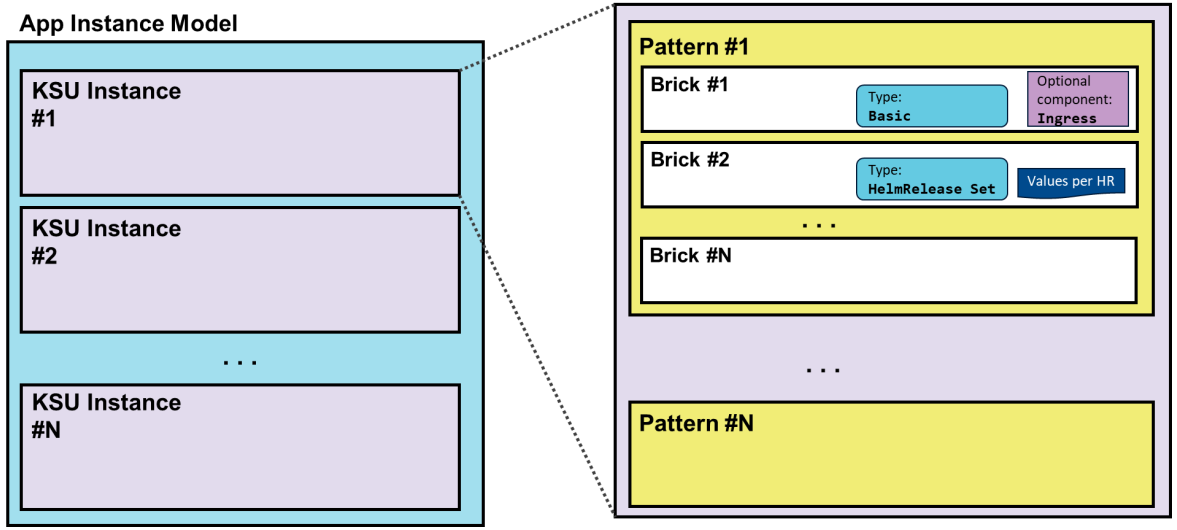
KubeVirt

©

… including a consistent packaging for complex multi-artifact applications at OSM's NF Catalog

- NF Catalog with one-click deployment
  - Marketplace in the UI based on OSM catalog.
  - Declarative blueprints are also available in `sw-catalogs` repo, available from each OSM installation.
    - Synchronization layers.
    - Dependencies.
    - Multi-Chart deployments.
  - Plan is to grow in ready-for-use curated applications/NF available in the OSM catalogs.
    - Consolidate onboarding efforts from multiple fora.
    - Minimize ready-to-use components, following a PaaS-like approach.
    - Reference of best practices.





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Thanks to GitOps + KRM + Open-Source, OSM is also much better prepared for AI

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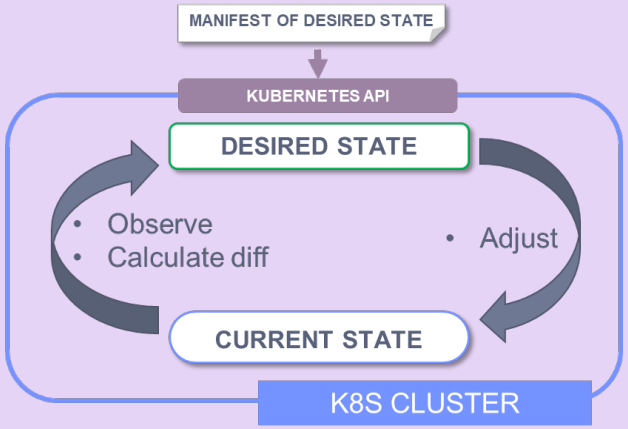
GitOps systems

- You can feed the AI with the history of commits
- Agentic AI can easily act by doing/reverting changes in a Git repo

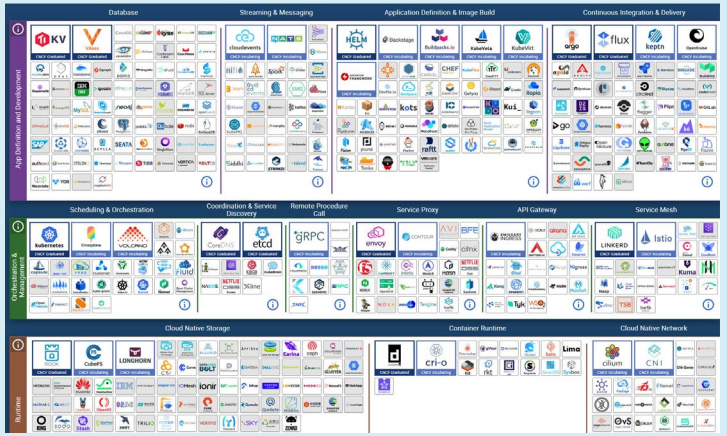
KRM (Kubernetes Resource Modeling)

- Kubernetes Manifests are consistent and predictable



Based on Open-Source projects

- Open-Source means Community, which means more data for the AI



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Some AI areas for upcoming OSM releases

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- Audit of clusters and applications (problem detection)
  - K8SGPT KUBERNETES SUPERPOWERS
  - KoPylot
  -
- Agentic AI
  - kagent
  -
- Security audit
  - aqua trivy
- Helpers
  - ✨ kubectl-ai project
  - ✨ kube-copilot

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Take-aways: Cloud-native Orchestration in Telco Cloud brings numerous practical benefits in field

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1. Standardized Deployment Procedures

- Consistent methodologies for deploying Applications.
- Systematically captures the last-applied instantiation parameters, such as Helm release values, to ensure traceability and repeatability.

2. Streamlined Cluster Management

- Implementing uniform procedures for managing clusters in multi-cloud scenarios by:
  - Consistently **recording the last-applied cluster plugin components**, including controllers, operators, and infrastructure CRDs.
  - Ensuring accurate **recording of the base cluster specifications**.

3. Continuous Reconciliation

- Enabling ongoing alignment of deployed configurations with the desired state to ensure system integrity and reliability.

4. Error Reduction

- Minimizing errors through the adoption of standardized, well-documented procedures and automation where applicable.

5. Improved Disaster Recovery

- Simplifying disaster recovery processes by enhancing the reliability and reproducibility of system states.

6. Time and Effort Savings

- Reducing the time and effort required for routine operations by optimizing workflows and eliminating redundancies.

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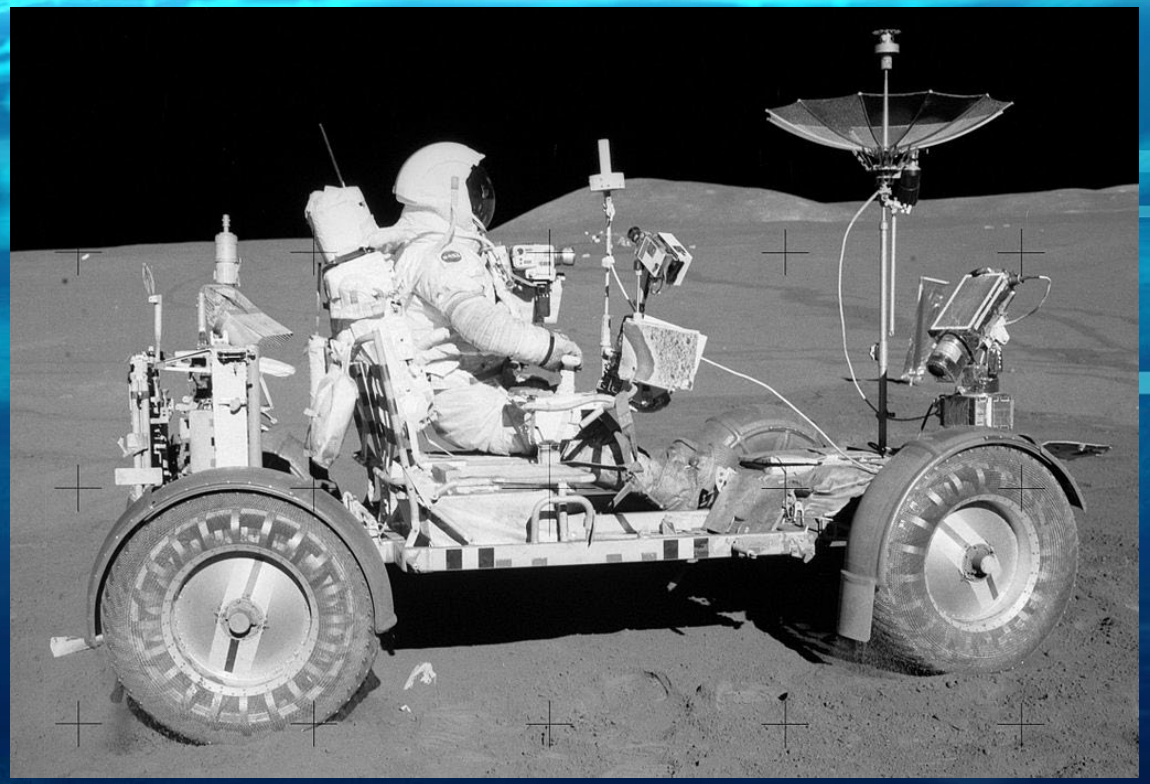

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Thank You!

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Release NINETEEN

Soon available at:
osm.etsi.org

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Release NINETEEN brings a modernization of codebase and dependencies and makes future development easier

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Release NINETEEN
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LTS and code maintenance

- Python 3.13 in all Python-based modules.
- Angular Framework upgrade for NGUI.
- Upgrade Kubernetes version and Helm version in OSM modules.
- Ubuntu 24.04 LTS as new base OS for *community installation* of OSM.
- Upgrade versions of subcharts in OSM helm chart.
- Upgrade client tools in OSM installer to latest versions.

Friendlier OSM development

- Self-contained repos with their own Dockerfile and Jenkinsfile.
- Discontinuation of Debian packages.
- Automated pipeline for point releases.
- Weekly job for stable releases.

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