Cluster-Compare Plugin

An overview

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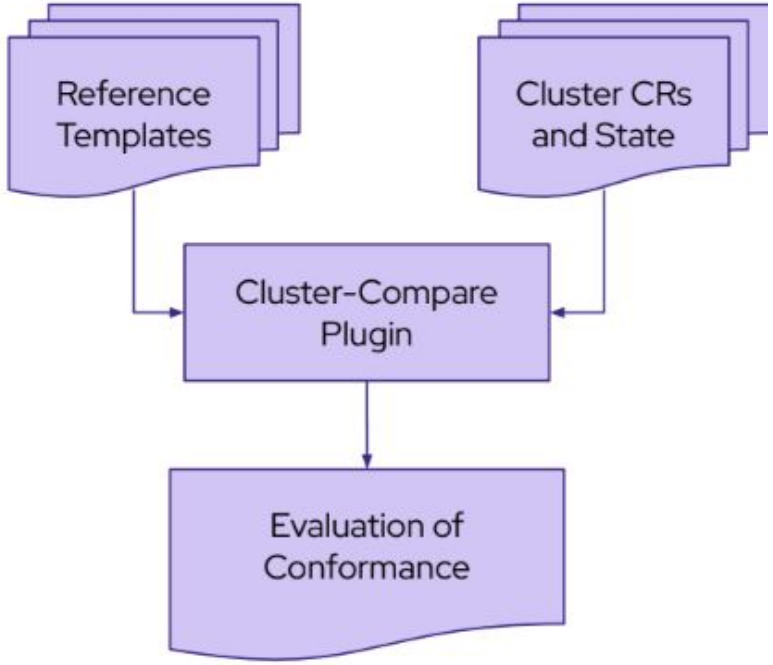
- Cluster-compare plugin overview
- Demo

Feature Use-case

The cluster-compare plugin is an oc (or kubectl) command-line plugin designed to **compare live clusters or cluster must-gather data to a well-defined reference configuration**.

Both blueprints and references generally have:
- Immutable configuration that must be set as reference.
- Configuration options that are intended to be customer- or cluster-specific.

The goal is to **highlight** where an actual cluster's state deviates from the immutable values, while minimizing distractions from expected and allowed customization.



How is this different than “oc diff”?

- Focuses on the differences that require further investigation
- Hides differences in expected user variations
- Hides large set of annotations and labels

Example scenarios:

- Support context – Highlight config differences which may be relevant to case
- Test pipelines – Compare configuration against reference to ensure compliance
- Partner labs – Compare lab systems to ensure consistency

What it can tell us

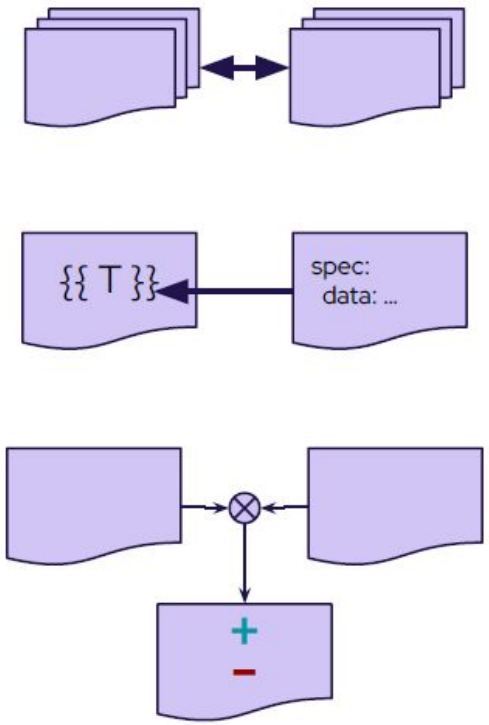
- Missing configuration CRs
- Missing fields in a CR
- Deviations from expected configuration
  - expected variations are not highlighted
- Optional configuration with missing content
  - Eg operator installed but missing config

What it can't tell us

- Workload dimensions outside limits
- Extra operators/components
- Configuration issues outside the scope of the reference
- Analysis of config against a specific hardware platform

Goal is to identify meaningful deviations from reference

Architecture



At a high level, the plugin performs 3 steps:

- Correlation
  - This matches each cluster CR with the corresponding reference Template

- Interpolation
  - This matches templated values with the cluster CR values, in order to ignore expected or allowed variations and customizations

- Differencing
  - Any remaining differences are called out as relevant conformance differences, including differing field values or missing CRs

What's in a reference?

The reference, not the cluster-compare plugin, fully describes which aspects are immutable and which are customizable.

- metadata.yaml is the top-level entrypoint, and defines the list of templates and configuration of those templates
  - Can include help text for each template, displayed if any differences are Detected

- The templates themselves which are correlated and interpolated against the cluster CR data
  - Allows per-field specification of allowable modifications

Running the Tool Include Screenshots

- Point at the CRs to compare
  - Run against a live cluster

```
sdambo@sdambo-thinkpadt14gen5:~$ oc cluster-compare -r cluster-compare/ztp/kube-compare-reference/metadata.yaml
W0417 12:28:42.878481  283951 correlator.go:140] The reference contains overlapping object definitions which ma
y result in unexpected correlation results. Re-run with '--verbose' output enabled to view a detailed descripti
on of the issues
W0417 12:28:42.878503  283951 correlator.go:140] The reference contains overlapping object definitions which ma
y result in unexpected correlation results. Re-run with '--verbose' output enabled to view a detailed descripti
on of the issues
W0417 12:28:45.748291  283951 warnings.go:70] nmstate.io/v1beta1 NMState is deprecated; use nmstate.io/v1 NMSta
te
Summary
CRs with diffs: 0/22
CRs in reference missing from the cluster: 1
gpu-operator:
  gpu-operator:
    Missing CRs:
    - required/gpu-operator/gpu-cluster-policy.yaml
      Description:
        The NVIDIA GPU Operator CRs
No CRs are unmatched to reference CRs
Metadata Hash: f8eafa9b358352454832891b8aee5db264285ad63c3f6eab480b728f9c7de791
No patched CRs
```

- Run against a directory or set of directories (including must-gather data)

❖ Bash file was created in order to collect operators data with must-gather, first it runs the basic collection.

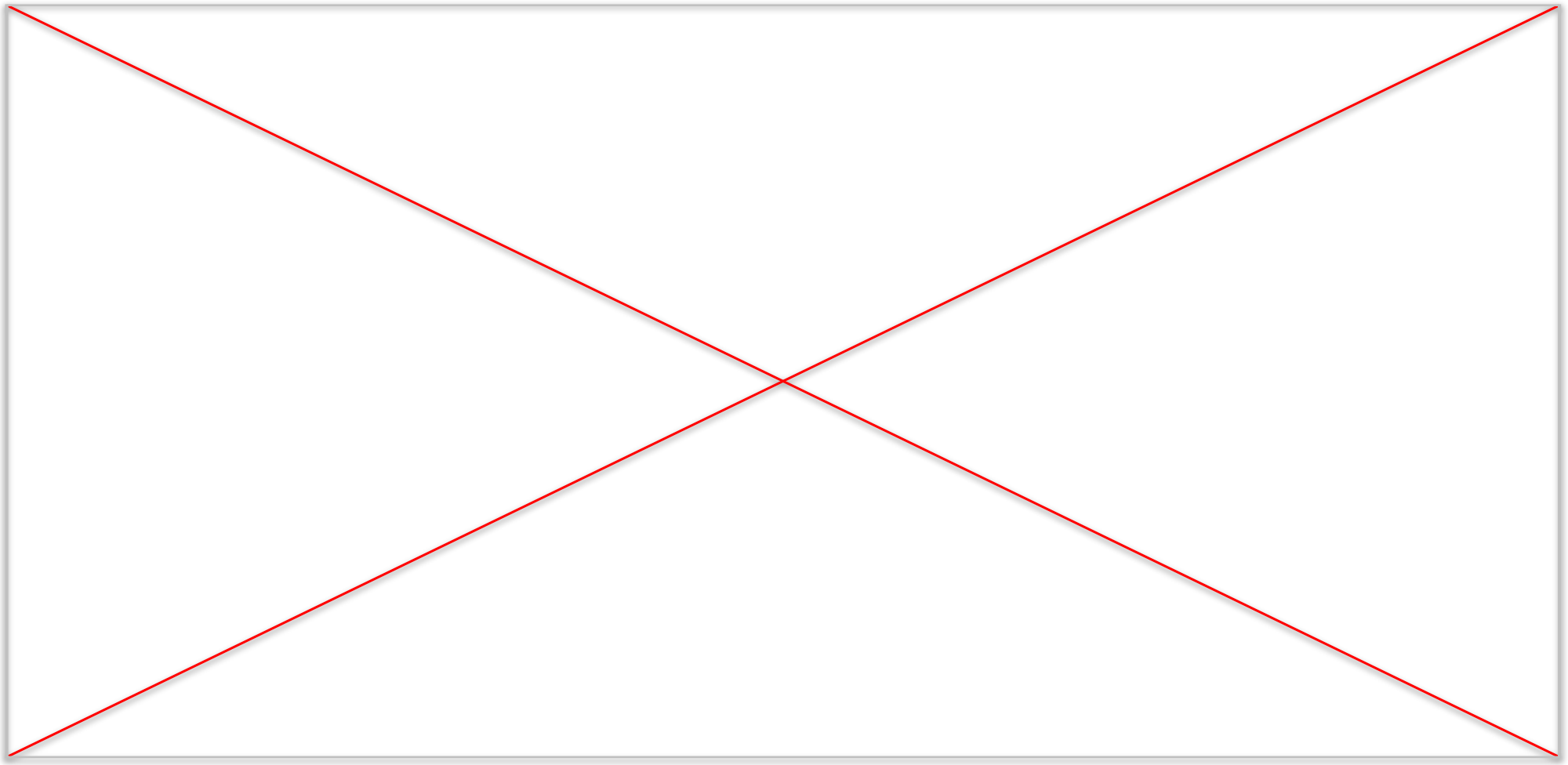
```
sdambo@sdambo-thinkpadt14gen5:~$ ./gather_gpu_nfd_operators.sh
[must-gather      ] OUT 2025-04-17T10:30:31.393501818Z Using must-gather plug-in image: quay.io/openshift-relea
se-dev/ocp-v4.0-art-dev@sha256:d669d52ab37d71be4bc2f29ebdb62a0300dd35a410f583ded2b9c4790164d929
When opening a support case, bugzilla, or issue please include the following summary data along with any other
requested information:
ClusterID: e293b297-ce7d-456d-8a30-82d92e1e58a2
ClientVersion: 4.18.6
ClusterVersion: Stable at "4.16.25"
ClusterOperators:
        All healthy and stable


[must-gather      ] OUT 2025-04-17T10:30:32.130317478Z namespace/openshift-must-gather-lqk5h created
[must-gather      ] OUT 2025-04-17T10:30:32.275845963Z clusterrolebinding.rbac.authorization.k8s.io/must-gather
-dgdwl created
[must-gather      ] OUT 2025-04-17T10:30:32.723855043Z pod for plug-in image quay.io/openshift-release-dev/ocp-
v4.0-art-dev@sha256:d669d52ab37d71be4bc2f29ebdb62a0300dd35a410f583ded2b9c4790164d929 created
[must-gather-72z55] POD 2025-04-17T10:30:33.489721915Z volume percentage checker started.....
[must-gather-72z55] POD 2025-04-17T10:30:33.495851776Z volume usage percentage 0
[must-gather-72z55] POD 2025-04-17T10:30:33.639718546Z Gathering data for ns/openshift-cluster-version...
[must-gather-72z55] POD 2025-04-17T10:30:35.177060454Z Waiting on subprocesses to finish execution.
[must-gather-72z55] POD 2025-04-17T10:30:35.178655691Z INFO: Gathering HAProxy config files
[must-gather-72z55] POD 2025-04-17T10:30:35.178677080Z WARNING: Collecting one or more kube-apiserver related l
ogs on ALL masters in your cluster. This could take a large amount of time.
[must-gather-72z55] POD 2025-04-17T10:30:35.181285806Z INFO: Collecting host service logs for crio
[must-gather-72z55] POD 2025-04-17T10:30:35.181487390Z INFO: Collecting host service logs for kubelet
[must-gather-72z55] POD 2025-04-17T10:30:35.181662572Z INFO: Collecting host service logs for rpm-ostreed
[must-gather-72z55] POD 2025-04-17T10:30:35.181842917Z INFO: Collecting host service logs for ostree-finalize-s
taged
[must-gather-72z55] POD 2025-04-17T10:30:35.182014067Z INFO: Collecting host service logs for machine-config-da
```

- And now we run the cluster-compare against the must-gather and the operators data folders.

```
No patched CRs
sdambo@sdambo-thinkpadt14gen5:~$ oc cluster-compare -r cluster-compare/ztp/kube-compare-reference/metadata.yaml
 -f "must-gather*/*/cluster-scoped-resources","must-gather*/*/namespaces","must-gather*/gpu-operator/*","must-g
ather*/nfd-operator/*" -R 2>/dev/null
Summary
CRs with diffs: 0/16
CRs in reference missing from the cluster: 1
gpu-operator:
  gpu-operator:
    Missing CRs:
    - required/gpu-operator/gpu-cluster-policy.yaml
      Description:
        The NVIDIA GPU Operator CRs
No CRs are unmatched to reference CRs
Metadata Hash: f8eafa9b3583524548328 91b8aee5db264285ad63c3f6eab480b728f9c7de791
No patched CRs
sdambo@sdambo-thinkpadt14gen5:~$
```

Cluster compare Demo



Q&A

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