End-to-End Tests in OpenShift

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Introduction

Test types

Releases

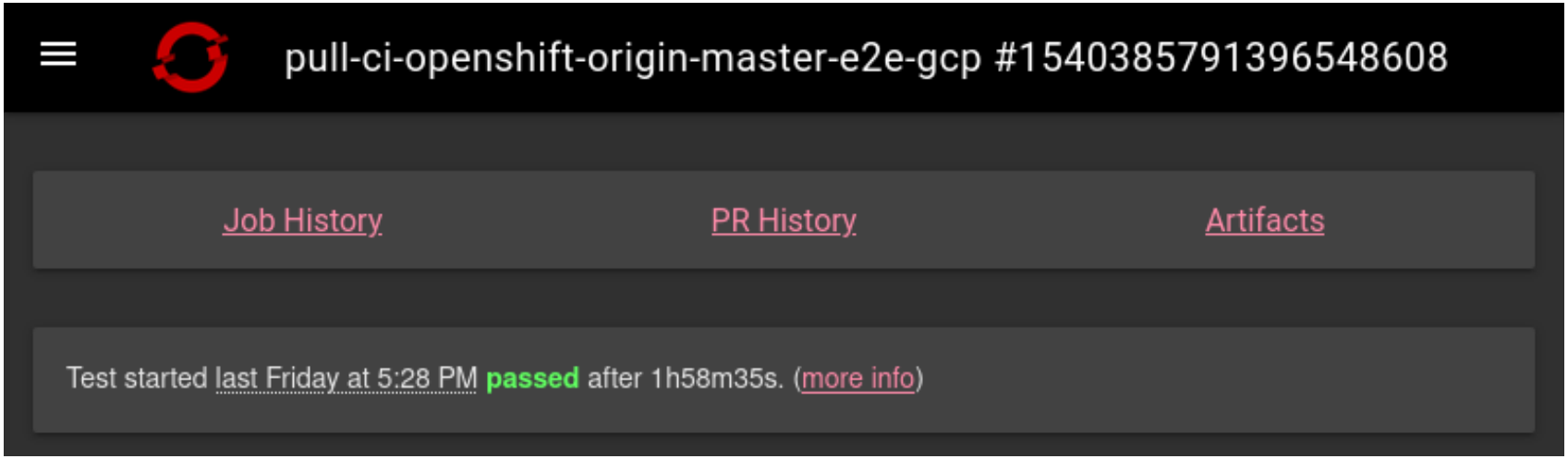
Input images

Image pipeline

Red Hat

Ravioli code

Isolated bits of code that resemble ravioli. These are easy to understand individually but—taken as a group—add to the app's call stack and complexity.



https://prow.ci.openshift.org/view/gs/origin-ci-test/pr-logs/pull/27275/pull-ci-openshift-origin-master-e2e-gcp/1540385791396548608

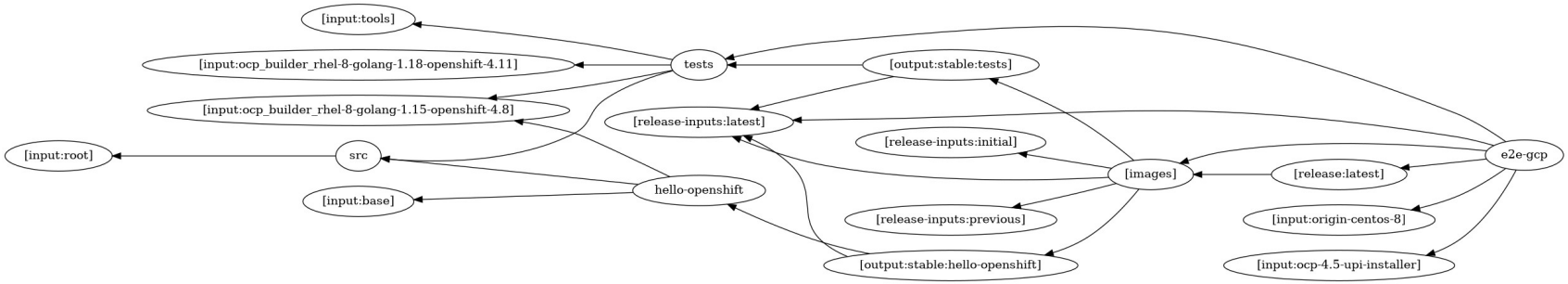
Red Hat

https://gcsweb-ci.apps.ci.l2s4.p1.openshiftapps.com/gcs/origin-ci-test/pr-logs/pull/27275/pull-ci-openshift-origin-master-e2e-gcp/1540385791396548608/prowjob.json*

```
command:
- ci-operator
args:
- --gcs-upload-secret=/secrets/gcs/service-account.json
- --image-import-pull-secret=/etc/pull-secret/.dockerconfigjson
- --lease-server-credentials-file=/etc/boskos/credentials
- --report-credentials-file=/etc/report/credentials
- --secret-dir=/secrets/ci-pull-credentials
- --secret-dir=/usr/local/e2e-gcp-cluster-profile
- --target=e2e-gcp
```

* *how-tos: document artifacts directory* #266 – openshift/ci-docs

Red Hat


[input:tools]
[input:ocp_builder_rhel-8-golang-1.18-openshift-4.11]
tests
[output:stable:tests]
[input:ocp_builder_rhel-8-golang-1.15-openshift-4.8]
[release-inputs:latest]
[release-inputs:initial]
[input:root]
src
[images]
[release:latest]
e2e-gcp
hello-openshift
[input:base]
[release-inputs:previous]
[input:origin-centos-8]
[output:stable:hello-openshift]
[input:ocp-4.5-upi-installer]

Red Hat

https://github.com/openshift/release/blob/master/ci-operator/config/openshift/origin/openshift-origin-master.yaml

```
tests:
- as: e2e-gcp
  steps:
    cluster_profile: gcp-openshift-gce-devel-ci-2
    workflow: openshift-e2e-gcp-loki
```


Red Hat

Test types

Red Hat

ibid

```
- as: verify-deps
  commands: make verify-deps …
  container:
    from: src
```

…/openshift-origin-release-3.11.yaml

```
- as: e2e-gcp
  commands: … run-tests
  openshift_ansible:
    cluster_profile: gcp
```


Red Hat

https://github.com/openshift/ci-tools/blob/master/pkg/api/types.go

```
type TestStepConfiguration struct {
    As string `json:"as"`
    Commands string `json:"commands,omitempty"`
    // …
    // Only one of the following can be not-null.
    ContainerTestConfiguration                          …
    MultiStageTestConfiguration                         …
    MultiStageTestConfigurationLiteral                  …
    OpenshiftAnsibleClusterTestConfiguration            …
    OpenshiftAnsibleSrcClusterTestConfiguration         …
    OpenshiftAnsibleCustomClusterTestConfiguration      …
    OpenshiftInstallerClusterTestConfiguration          …
    OpenshiftInstallerUPIClusterTestConfiguration       …
    OpenshiftInstallerUPISrcClusterTestConfiguration    …
    OpenshiftInstallerCustomTestImageClusterTestConfiguration …
}
```


Red Hat

```
// Only one of the following can be not-null.
ContainerTestConfiguration \
    *ContainerTestConfiguration \
    `json:"container,omitempty"`
// …
```


Red Hat

```
type ContainerTestConfiguration struct {
    From PipelineImageStreamTagReference
    MemoryBackedVolume *MemoryBackedVolume
    Clone *bool
}
```


Red Hat

```
type TestStepConfiguration struct {
    As string
    Commands string
    Cluster Cluster
    Secret *Secret
    Secrets []*Secret
    Cron *string
    Interval *string
    ReleaseController bool
    Postsubmit bool
    ClusterClaim *ClusterClaim
    RunIfChanged string
    Optional bool
    SkipIfOnlyChanged string
    Timeout *prowv1.Duration
    // …
```


Red Hat

```
- as: e2e-gcp
  commands: … run-tests
  openshift_ansible:
    cluster_profile: gcp
```

```
args:
- --image-import-pull-secret=/etc/pull-secret/.dockerconfigjson
- --report-credentials-file=/etc/report/credentials
- --secret-dir=/usr/local/e2e-gcp-periodic-cluster-profile
- --target=e2e-gcp-periodic
- --template=/usr/local/e2e-gcp-periodic
- --gcs-upload-secret=/secrets/gcs/service-account.json
command:
- ci-operator
```


Red Hat

```
    volumeMounts:
    - mountPath: /usr/local/e2e-gcp-periodic
      name: job-definition
      subPath: cluster-launch-e2e.yaml
  volumes:
  - configMap:
      name: prow-job-cluster-launch-e2e
    name: job-definition
```


Red Hat

https://github.com/openshift/release/tree/master/ci-operator/templates

```
ci-operator/templates/
    master-sidecar-3.yaml
    master-sidecar-4.4.yaml
    openshift/
        installer/
            cluster-launch-installer-custom-test-image.yaml
            cluster-launch-installer-e2e.yaml
            cluster-launch-installer-libvirt-e2e.yaml
            cluster-launch-installer-metal-e2e.yaml
            cluster-launch-installer-openstack-e2e.yaml
            cluster-launch-installer-openstack-upi-e2e.yaml
            cluster-launch-installer-src.yaml
            cluster-launch-installer-upi-e2e.yaml
        openshift-ansible/
            cluster-launch-e2e-openshift-ansible.yaml
            cluster-launch-e2e.yaml
            cluster-scaleup-e2e-40.yaml
```


Red Hat

.../openshift/installer/cluster-launch-installer-e2e.yaml

```
kind: Template
apiVersion: template.openshift.io/v1

parameters:
- name: JOB_NAME
  required: true
- name: JOB_NAME_SAFE
  required: true
# …
```


Red Hat

```
objects:
# We want the cluster to be able to access
# these images
- kind: RoleBinding
  apiVersion: authorization.openshift.io/v1
  metadata:
    name: ${JOB_NAME_SAFE}-image-puller
    namespace: ${NAMESPACE}
  # …
```


Red Hat

```
# The e2e pod spins up a cluster, runs e2e tests,
# and then cleans up the cluster.
- kind: Pod
  apiVersion: v1
  metadata:
    name: ${JOB_NAME_SAFE}
    namespace: ${NAMESPACE}
  # …
```


Red Hat

```
containers:
# Once the cluster is up, executes shared tests
- name: test
# …
# Runs an install
- name: setup
# …
# Performs cleanup of all created resources
- name: teardown
# …
```


Red Hat

```
parameters:
# …
- name: IMAGE_FORMAT
- name: IMAGE_INSTALLER
  required: true
- name: IMAGE_TESTS
  required: true
# …
- name: RELEASE_IMAGE_LATEST
  required: true
# …
```


Red Hat

- test definition
- test phases
  - pre
  - test
  - post
- step registry
  - references
  - chains
  - workflows
  - observers

- container image
- parameters
- dependencies
- credentials
- leases
- overriding
- ...

Red Hat

```
type MultiStageTestConfiguration struct {
    ClusterProfile ClusterProfile
    Pre []TestStep
    Test []TestStep
    Post []TestStep
    Workflow *string
    Environment TestEnvironment
    Dependencies TestDependencies
    DNSConfig *StepDNSConfig
    Leases []StepLease
    AllowSkipOnSuccess *bool
    AllowBestEffortPostSteps *bool
    Observers *Observers
    DependencyOverrides DependencyOverrides
}
```


Red Hat

```
type MultiStageTestConfigurationLiteral struct {
    ClusterProfile ClusterProfile
    Pre []LiteralTestStep
    Test []LiteralTestStep
    Post []LiteralTestStep
    Environment TestEnvironment
    Dependencies TestDependencies
    DNSConfig *StepDNSConfig
    Leases []StepLease
    AllowSkipOnSuccess *bool
    AllowBestEffortPostSteps *bool
    Observers []Observer
    DependencyOverrides DependencyOverrides
    Timeout *prowv1.Duration
}
```


Red Hat

```
type LiteralTestStep struct {
    As string
    From string
    FromImage *ImageStreamTagReference
    Commands string
    Resources ResourceRequirements
    Timeout *prowv1.Duration
    GracePeriod *prowv1.Duration
    Credentials []CredentialReference
    Environment []StepParameter
    Dependencies []StepDependency
```


Red Hat

```
    DNSConfig *StepDNSConfig
    Leases []StepLease
    OptionalOnSuccess *bool
    BestEffort *bool
    Cli string
    Observers []string
    RunAsScript *bool
}
```


Red Hat

```
type TestStep struct {
    *LiteralTestStep
    Reference *string
    Chain *string
}
```


Red Hat

```
tests:
- as: multi-stage
  steps: # …
- as: multi-stage-literal
  literal_steps: # …

$ JOB_SPEC=… ci-operator
$ ci-operator --config …
$ ci-operator --unresolved-config …
$ CONFIG_SPEC=… ci-operator …
$ UNRESOLVED_CONFIG=… ci-operator …
```


Red Hat

Releases

Red Hat

https://github.com/openshift/ci-tools/blob/master/pkg/api/types.go

```
type ReleaseBuildConfiguration struct {
    Metadata Metadata
    InputConfiguration
    // …
}

type InputConfiguration struct {
    // …
    Releases map[string]UnresolvedRelease
}
```


Red Hat

```
type UnresolvedRelease struct {
    // Integration describes an integration stream
    // which we can create a payload out of
    Integration *Integration
    // Candidate describes a candidate release
    // payload
    Candidate *Candidate
    // Prerelease describes a yet-to-be released
    // payload
    Prerelease *Prerelease
    // Release describes a released payload
    Release *Release
}
```


Red Hat

```
type Candidate struct {
    Product ReleaseProduct
    Architecture ReleaseArchitecture
    Stream ReleaseStream
    Version string
    Relative int
}

type Prerelease struct {
    Product ReleaseProduct
    Architecture ReleaseArchitecture
    VersionBounds VersionBounds
}
```


Red Hat

```
pkg/release/
    candidate/
        client.go
        types.go
    client.go
    config/
        client.go
        config.go
    official/
        client.go
        types.go
    prerelease/
        client.go
```


Red Hat

- `candidate` / `prerelease`
  - `https://amd64.ocp.releases.ci.openshift.org`
  - release controller
- `release`
  - `https://api.openshift.com/api/upgrades_info/v1/graph`
  - cincinnati

Red Hat

```
releases:
  initial:
    integration:
      name: "4.10"
      namespace: ocp
  latest:
    integration:
      include_built_images: \
        true
      name: "4.10"
      namespace: ocp
```

- `ReleaseImagesTagStep`
  - source → destination `ImageStream`
  - `$namespace/$name` → `ci-op-*/stable*`
- `AssembleReleaseStep`
  - `ImageStream` → release payload
  - `stable*` → `release:*`
  - will wait for built images if `include_built_images`

Red Hat

```
tag_specification:
  namespace: ocp
  name: "4.10"
```

- always `initial` and `latest`
- `include_built_images` implicitly for `latest`
- `ReleaseImagesTagStep` (≈ `ReleaseSnapshotStep`)
- `RELEASE_IMAGE_*`

Red Hat

```
$ oc adm release extract \
    --file image-references \
    quay.io/openshift/okd:4.10.0-0.okd-2022-07-09-073606 \
    | yaml
kind: ImageStream
apiVersion: image.openshift.io/v1
metadata:
  name: 4.10.0-0.okd-2022-07-09-073606
  creationTimestamp: 2022-07-10T09:12:53Z
  annotations:
    release.openshift.io/from-image-stream: >
      origin/4.10-2022-07-09-073606
    release.openshift.io/from-release: >
      registry.ci.openshift.org/origin/release:4.10.0-0.…
…
```


Red Hat

```
spec:
  lookupPolicy:
    local: false
  tags:
  - name: alibaba-cloud-controller-manager
    annotations:
      io.openshift.build.commit.id: 0
      io.openshift.build.commit.ref: release-4.10
      io.openshift.build.source-location: >
        https://github.com/openshift/…
    from:
      kind: DockerImage
      name: quay.io/openshift/okd-content@sha256:…
    generation: null
    importPolicy:
    referencePolicy:
      type: 0
…
```


Red Hat

```
releases:
  latest:
    release:
       architecture: amd64
       channel: stable
       version: "4.10"
```

- candidate / prerelease
- ImportReleaseStep
  - release payload → ImageStream
  - $src → release:*
  - tags → ImageStream
  - release:* → oc … extract → stable*

Red Hat

Input images

Red Hat

"CI cycle"

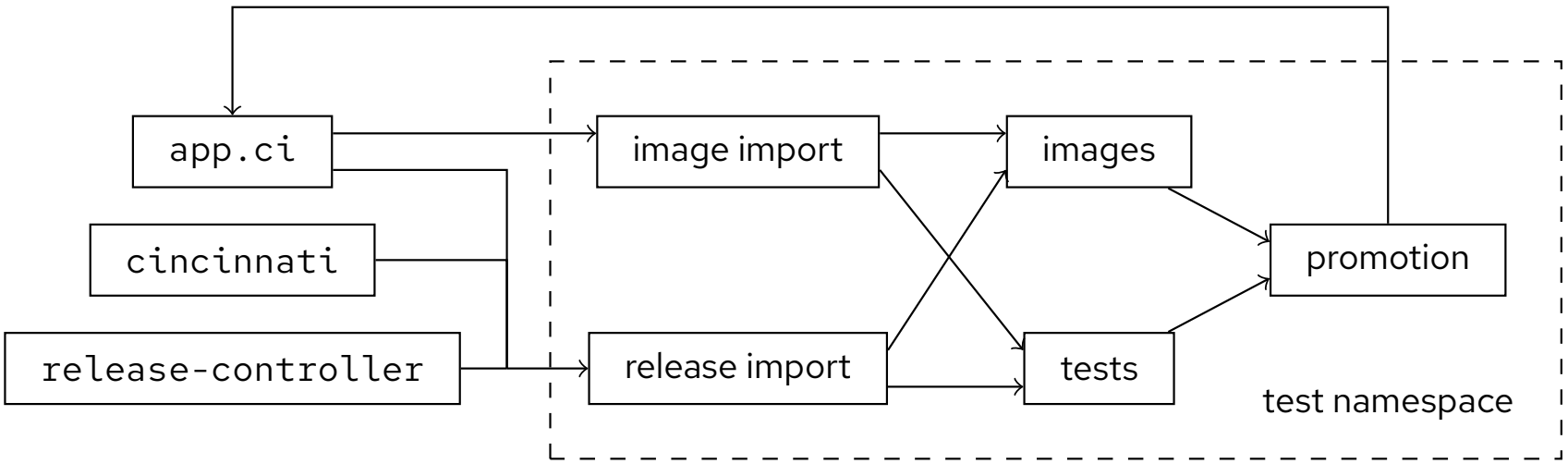
0. import images / releases
1. build images
2. execute tests
3. promote images
4. `goto 0`

Red Hat

"CI cycle"

-1. ?
 0. import images / releases
 1. build images
 2. execute tests
 3. promote images
 4. `goto 0`

Red Hat


app.ci
cincinnati
release-controller
image import
release import
images
tests
promotion
test namespace

Red Hat

- supplemental images
  - `https://github.com/openshift/release/tree/master/clusters/app.ci/supplemental-ci-images`
  - `BuildConfigs`
- image mirroring
  - `https://github.com/openshift/release/tree/master/core-services/image-mirroring`
  - Quay/etc. ↔ `app.ci`
- ART / OCP builder images
  - `https://docs.ci.openshift.org/docs/architecture/images/`
  - `https://github.com/openshift/ocp-build-data.git`

Red Hat

- supplemental images
  - `https://github.com/openshift/release/tree/master/clusters/app.ci/supplemental-ci-images`
  - `BuildConfigs`
  - `registry.ci.openshift.org/ci/ci-tools-build-root`
- image mirroring
  - `https://github.com/openshift/release/tree/master/core-services/image-mirroring`
  - Quay/etc. ↔ `app.ci`
  - `registry.ci.openshift.org/coreos/stream9:9`
- ART / OCP builder images
  - `https://docs.ci.openshift.org/docs/architecture/images/`
  - `https://github.com/openshift/ocp-build-data.git`
  - `registry.ci.openshift.org/ocp/builder:…`

Red Hat

dptp-controller-manager

- cmd/dptp-controller-manager/
- pkg/controller/test-images-distributor/

Red Hat

```
args:
…
- --enable-controller=test_images_distributor
- --enable-controller=promotionreconciler
- --enable-controller=serviceaccount_secret_refresher
- --enable-controller=testimagestreamimportcleaner
…
```


Red Hat

```
…
- --release-repo-git-sync-path=/var/repo/release
- --kubeconfig-dir=/var/kubeconfigs
- --registry-cluster-name=app.ci
- --testImagesDistributorOptions \
    .additional-image-stream-tag=ocp/builder:golang-1.10
…
- --testImagesDistributorOptions \
    .additional-image-stream-tag= \
    ocp/builder:rhel-7-golang-1.11
…
- --testImagesDistributorOptions \
    .additional-image-stream-namespace=ci
- --testImagesDistributorOptions \
    .additional-image-stream=rhcos/machine-os-content
…
```


Red Hat

pkg/api/helper/imageextraction.go

- `TestInputImageStreamsFromResolvedConfig`
- `TestInputImageStreamTagsFromResolvedConfig`

Red Hat

```
https://prow.ci.openshift.org/view/gs/origin-ci-test/
logs/branch-ci-openshift-ci-tools-master-images/
1561993456950185984

…
Building src
Build src succeeded after 4m48s
Building bin
Build bin succeeded after 25m54s
Building determinize-peribolos
Building ci-secret-generator
Building ci-operator-config-mirror
…
```

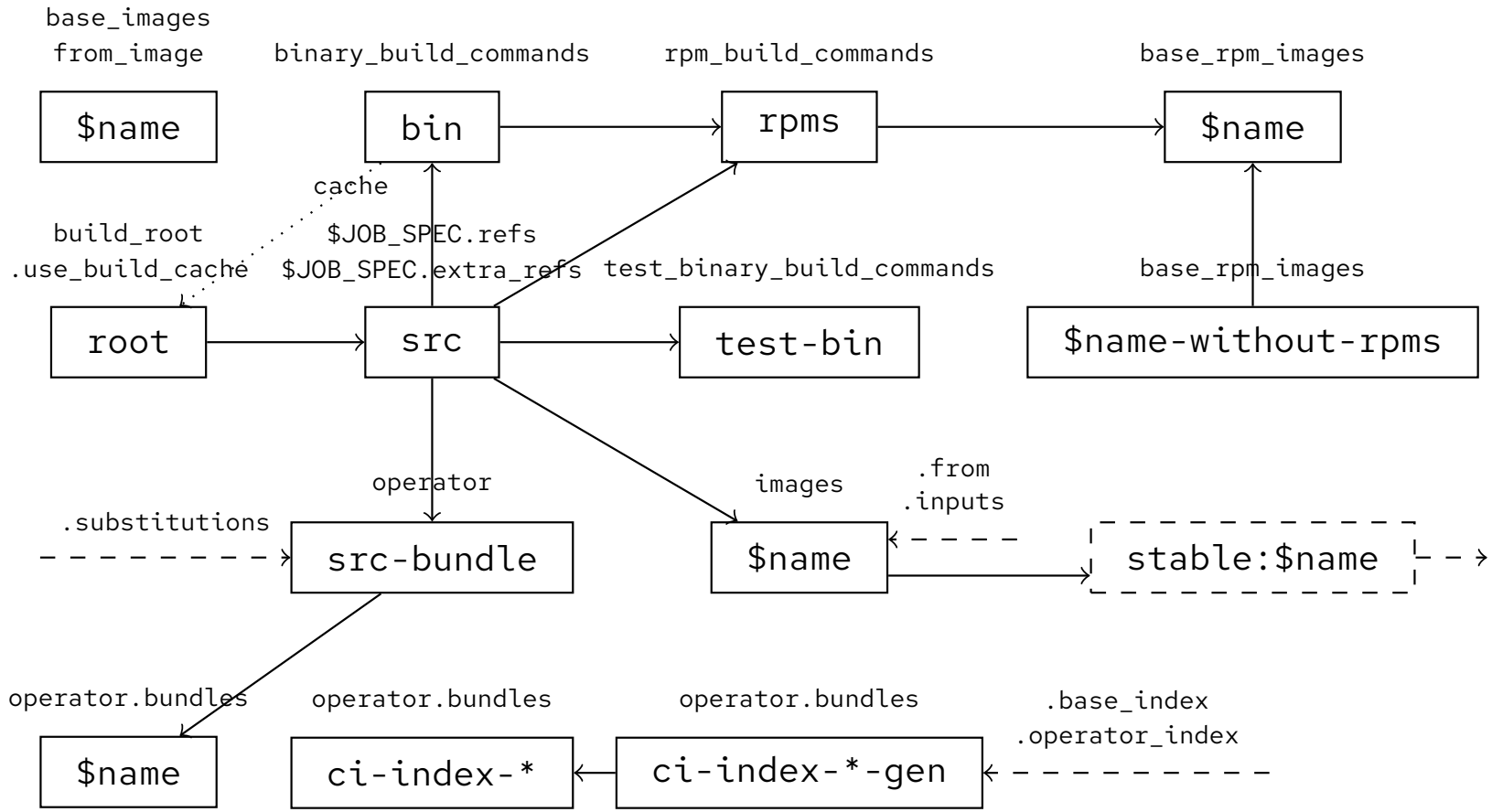

Red Hat

```
…
Build prcreator succeeded after 14m26s
Tagging prcreator into stable
Build private-prow-configs-mirror \
    succeeded after 15m51s
Tagging private-prow-configs-mirror into stable
Promoting tags to ci/${component}:latest: \
    applyconfig, auto-aggregator-job-names, \
    auto-config-brancher, auto-peribolos-sync, \
    auto-sippy-config-generator, …
Ran for 1h7m10s
```


Red Hat

Image pipeline

Red Hat


base_images
from_image
$name
binary_build_commands
bin
rpm_build_commands
rpms
base_rpm_images
$name
cache
build_root
.use_build_cache
$JOB_SPEC.refs
$JOB_SPEC.extra_refs
test_binary_build_commands
base_rpm_images
root
src
test-bin
$name-without-rpms
operator
images
.from
.inputs
.substitutions
src-bundle
$name
stable:$name
operator.bundles
operator.bundles
operator.bundles
.base_index
.operator_index
$name
ci-index-*
ci-index-*-gen

Red Hat

Thank you

Red Hat