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squash the flakes!

FOSDEM 2024

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agenda

- about me
- about flakes
- impact of flakes
- flake process
- tools
- the future
- Q&A
- want to help?

about me

- Software Engineer @ Red Hat OpenShift Virtualization team
- KubeVirt CI, automation in general

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about flakes

a question:

who can explain what a flake is?

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about flakes

a ***flake***

...

...

...

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about flakes

a ***flake***

is a **test** that

without any code change

will either **fail** or **pass** in successive runs

about flakes

another question:

who thinks handling flakes is important?

about flakes

another question:

who has had to deal with flakes?

about flakes

another question:

who has to deal with flakes on a regular basis?

about flakes

flakes are caused

either by production code (a bug)

or flaky test code (also a bug, but handled differently)

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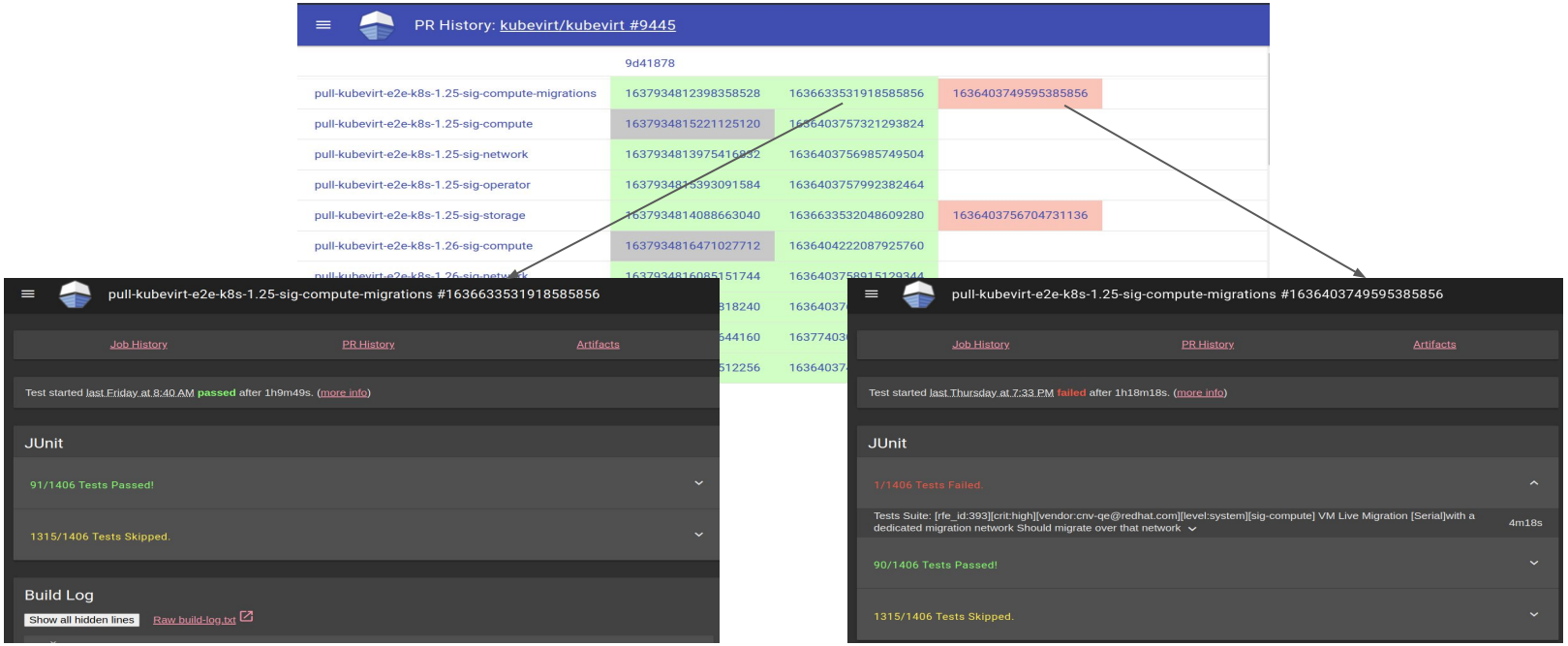
about flakes



source: https://prow.ci.kubevirt.io/pr-history/?org=kubevirt&repo=kubevirt&pr=9445

impact of flakes

from “a survey of flaky tests”:

- **97%** of flakes were **false alarms**, and
- more than **50%** of flakes could not be **reproduced in isolation**

this leads to the conclusion:
“ignoring flaky tests is ok”

source: “A survey of flaky tests”

impact of flakes

impact of flakes

in CI automated testing must give a **reliable signal of stability**

any failed test run signals that the product is **unstable**

test runs failed due to flakes do not give this reliable signal

they only waste time

impact of flakes

Flaky tests waste everyone’s time - they cause

- longer feedback cycles for developers
- slowdown of merging pull requests - “retest trap”
- reversal of acceleration effects (i.e. batch testing)

impact of flakes

Flaky tests also cause trust issues - they make people

- lose trust in automated testing
- ignore test results

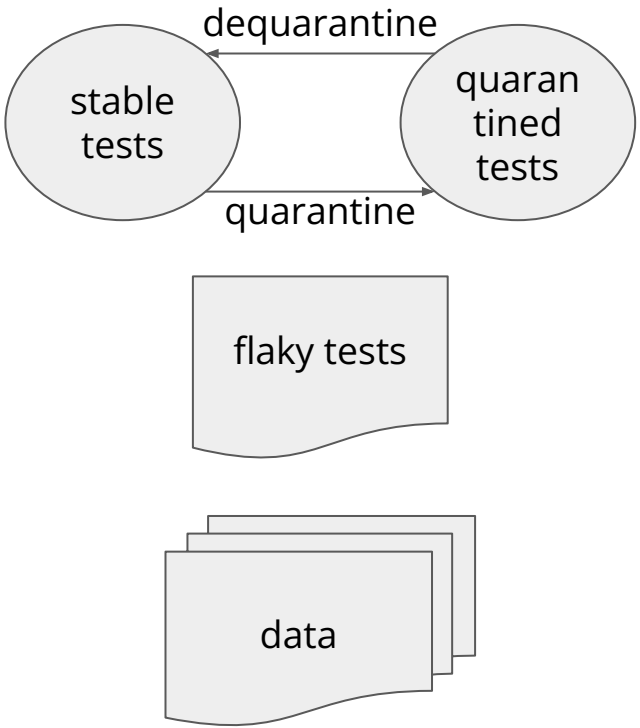
minimizing the impact

tldr; exclude (aka quarantine) a flaky test from test runs **as early as possible**, but **only as long as necessary**

minimizing the impact

what do we need?

- ability to move a test from **set of stable** tests into **set of quarantined** tests and back
- a report over possible flaky tests
- enough runtime data to triage flakes
  - devs decide whether we quarantine right away or they can fix them in time



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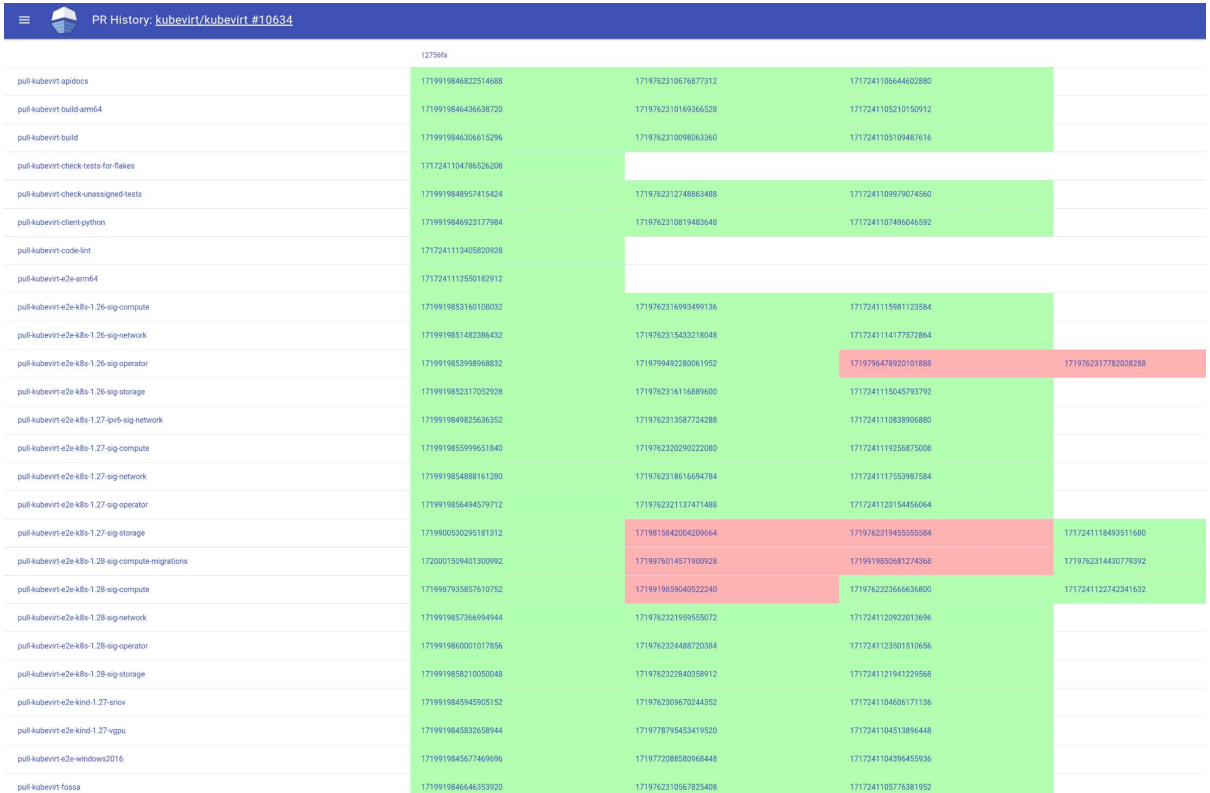
minimizing the impact

how can we find flaky tests?

any merged PR had all tests succeeding in the end,

thus any test run with test failures from that PR *might* contain execution of flaky tests



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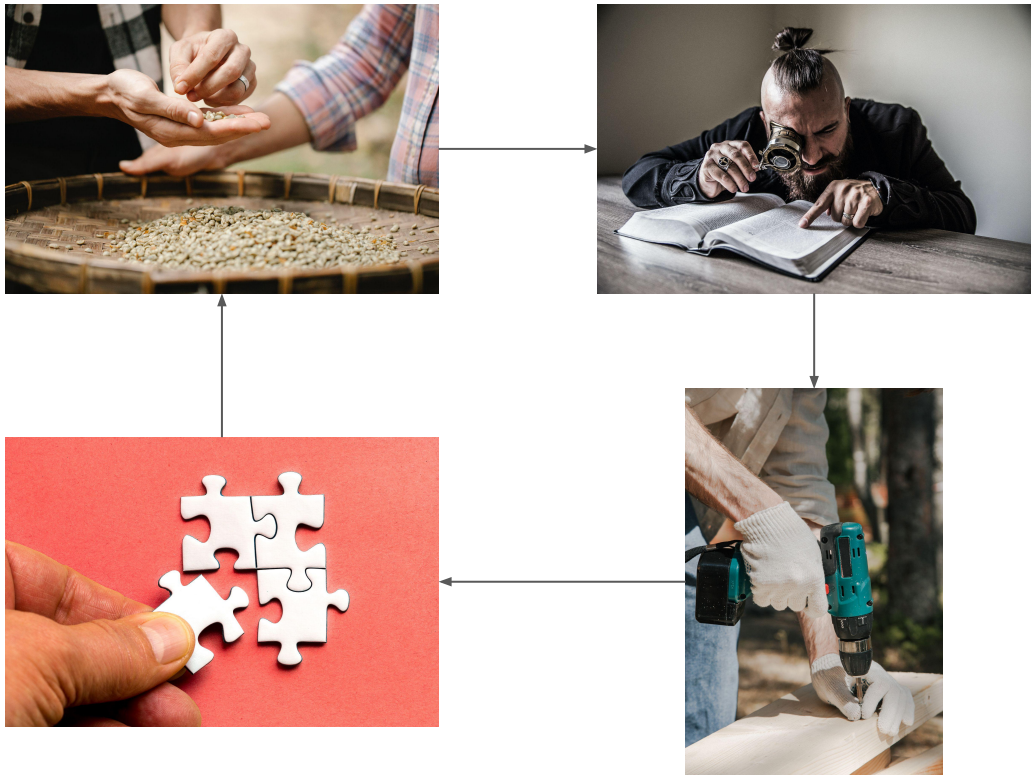
the flake process

regular meeting

- look at flakes
- decide: fix or quarantine?
- hand to dev
- bring back in

emergency quarantine

source: QUARANTINE.md



tools

ci honoring QUARANTINE label

```
# If KUBEVIRT_QUARANTINE is not set, do not run quarantined tests. When it is
# set the whole suite (quarantined and stable) will be run.
if [ -z "$KUBEVIRT_QUARANTINE" ]; then
    if [ -n "$KUBEVIRT_E2E_SKIP" ]; then
        export KUBEVIRT_E2E_SKIP="${KUBEVIRT_E2E_SKIP}|QUARANTINE"
    else
        export KUBEVIRT_E2E_SKIP="QUARANTINE"
    fi
fi
```

- presubmits **skip** quarantined tests
- periodics **execute** quarantined tests to check their stability

```
176
177         It("[QUARANTINE]should successfully upgrade virt-handler", func() {
178                 var expectedEventsLock sync.Mutex
179                 expectedEvents := []string{
180                         "maxUnavailable=1",
181                         "maxUnavailable=10%",
182                         "virt-handler=ready",
183                         "maxUnavailable=1",
184                 }
185
186                 ds, err := virtCli.AppsV1().DaemonSets(flags.KubeVirtInstall
```

sources:

- https://github.com/kubevirt/kubevirt/blob/38c01c34acecfafc89078b1bbaba8d9cf3cf0d4d/automation/test.sh#L452
- https://github.com/kubevirt/kubevirt/blob/38c01c34acecfafc89078b1bbaba8d9cf3cf0d4d/hack/functests.sh#L69
- https://github.com/kubevirt/kubevirt/blob/38c01c34acecfafc89078b1bbaba8d9cf3cf0d4d/tests/canary_upgrade_test.go#L177

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tools

flake stats report

the high level overview

(source)

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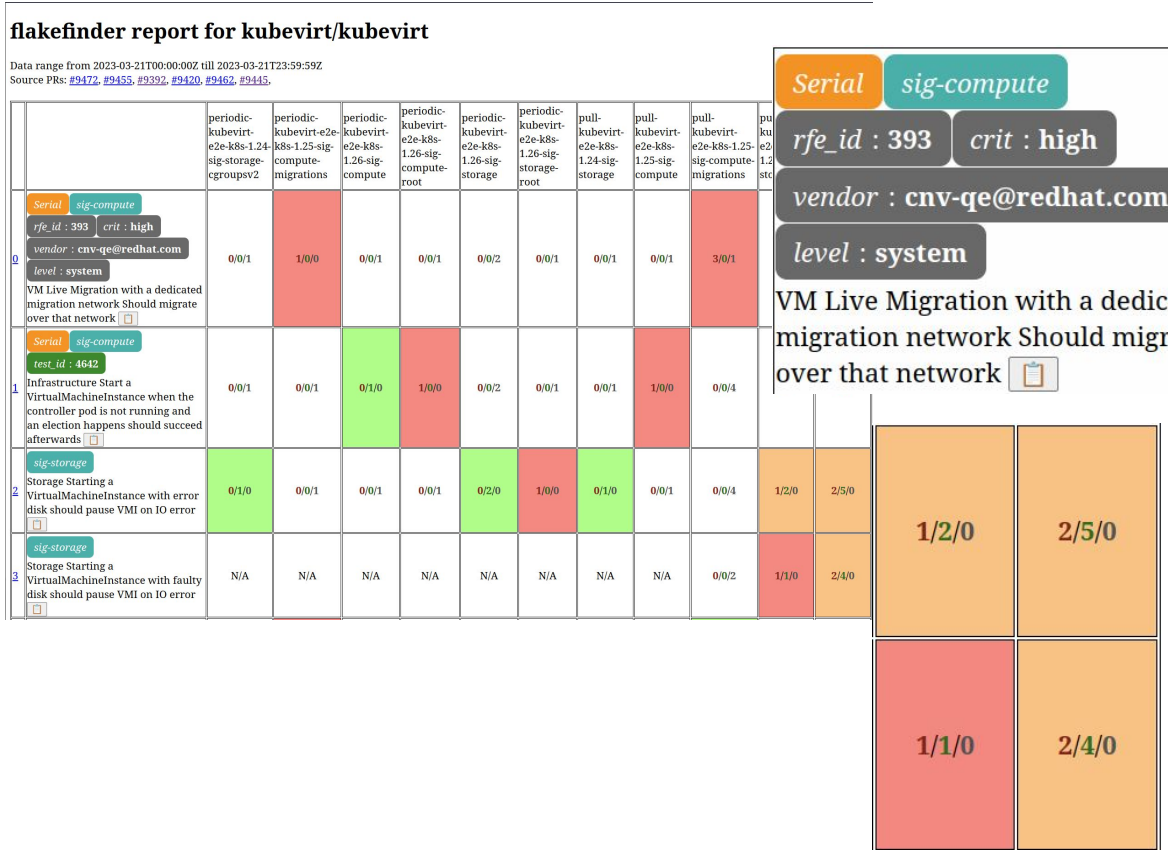
tools

[flakefinder](#) report

the detail overview

gives an overview of the current flaky tests



flakefinder report for kubevirt/kubevirt

Data range from 2023-03-21T00:00:00Z till 2023-03-21T23:59:59Z
Source PRs: #9472, #9455, #9392, #9420, #9462, #9445,

		periodic-kubevirt-e2e-k8s-1.24-sig-storage-cgroupsv2	periodic-kubevirt-e2e-k8s-1.25-sig-compute-migrations	periodic-kubevirt-e2e-k8s-1.26-sig-compute	periodic-kubevirt-e2e-k8s-1.26-sig-compute-root	periodic-kubevirt-e2e-k8s-1.26-sig-storage	periodic-kubevirt-e2e-k8s-1.26-sig-storage-root	pull-kubevirt-e2e-k8s-1.24-sig-storage	pull-kubevirt-e2e-k8s-1.25-sig-compute	pull-kubevirt-e2e-k8s-1.25-sig-compute-migrations	pu ku e2 1.2 sto	
0	Serial sig-compute rfe_id : 393 crit : high vendor : cnv-qe@redhat.com level : system VM Live Migration with a dedicated migration network Should migrate over that network	0/0/1	1/0/0	0/0/1	0/0/1	0/0/2	0/0/1	0/0/1	0/0/1	3/0/1		
1	Serial sig-compute test_id : 4642 Infrastructure Start a VirtualMachineInstance when the controller pod is not running and an election happens should succeed afterwards	0/0/1	0/0/1	0/1/0	1/0/0	0/0/2	0/0/1	0/0/1	1/0/0	0/0/4		
2	sig-storage Storage Starting a VirtualMachineInstance with error disk should pause VMI on IO error	0/1/0	0/0/1	0/0/1	0/0/1	0/2/0	1/0/0	0/1/0	0/0/1	0/0/4	1/2/0	2/5/0
3	sig-storage Storage Starting a VirtualMachineInstance with faulty disk should pause VMI on IO error	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0/0/2	1/1/0	2/4/0

Serial sig-compute rfe_id : 393 crit : high vendor : cnv-qe@redhat.com level : system VM Live Migration with a dedicated migration network Should migrate over that network

1/2/0 2/5/0 1/1/0 2/4/0

tools

ci-health

record metrics over merge-queue-length, time-to-merge, retests-to-merge and merges-per-day

README.md

kubevirt/kubevirt

avg merge queue length 1.29 ± std 1.67 | days to merge 0.42 ± std 0.23

retests to merge 0.63 ± std 0.70

Merged PRs with 0 retest vs. Merged PRs 8 / 16

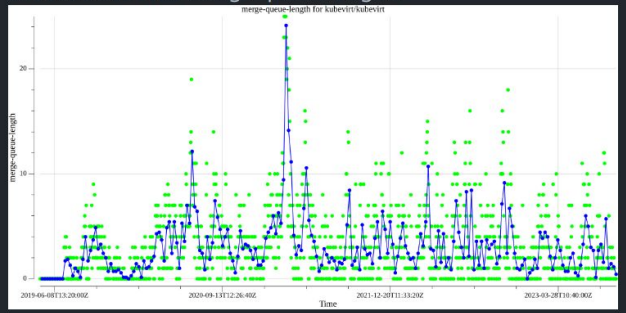
Latest execution data

Latest weeks data

Historical data evolution

These plots will be updated every week.

- kubevirt/kubevirt merge queue length:



Data available here.

tools

quarantine overview

(source)

Overview of Quarantine tests

Total: 1 tests

https://github.com/kubevirt/kubevirt/tree/c35be138d85864b17946ae1fe07f99a75445d501/tests/operator/operator.go

```
var _ = Describe("[Serial][sig-operator]Operator", Serial, decorators.SigOperator, func() {
        Describe("[rfe_id:2897][crit:medium][vendor:cnv-qe@redhat.com][level:component]Dynamic feature detection", func() {
                It("[test_id:3153][QUARANTINE] Ensure infra can handle dynamically detecting DataVolume Support", func() {
```

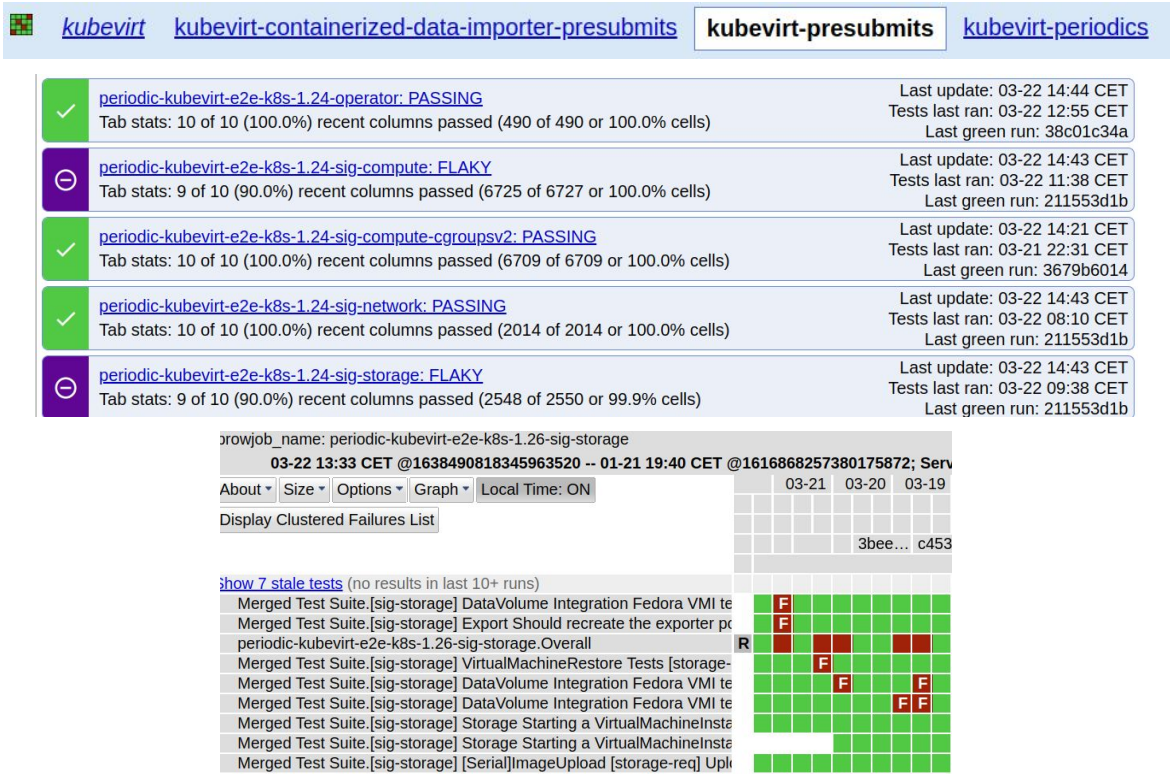
2 months

Last updated: 2023-09-08 10:18:02.458076498 +0000 UTC m=+3.056989100

tools

[testgrid]

drill down on all jobs for kubevirt/kubevirt that are running inside KubeVirt Prow



tools

check-tests-for-flakes test lane

tries to catch flakes before they enter the codebase

(source)

a test lane that

- selects the changed e2e test files from the commit set
- runs changed e2e tests five times
- runs in random execution order to catch order-dependent test

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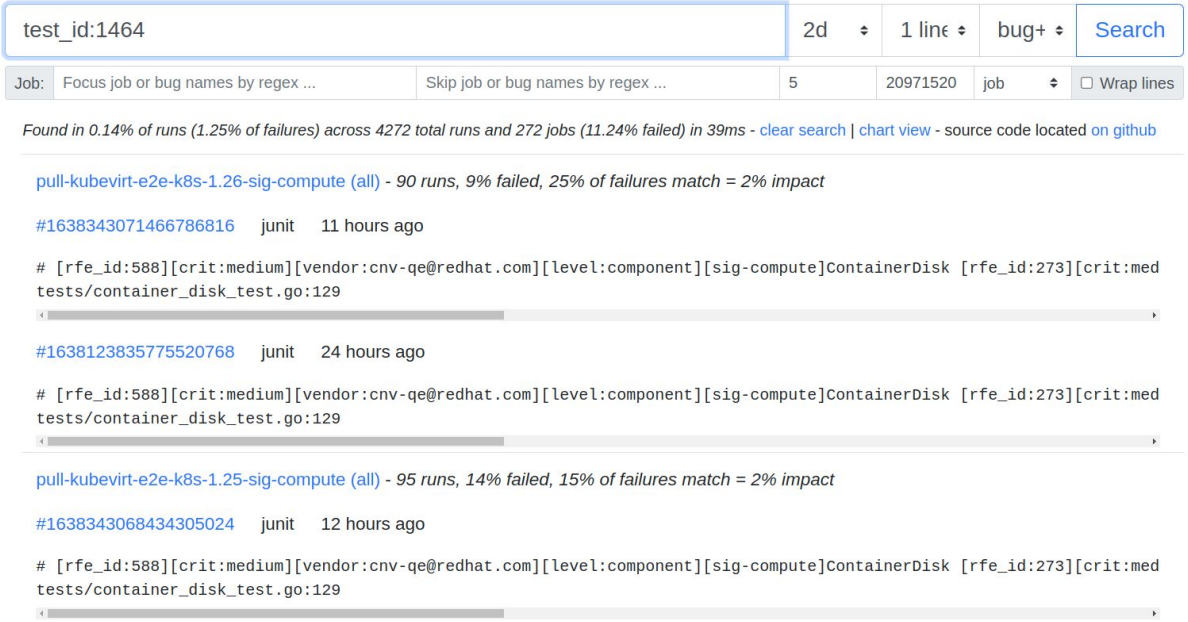
tools

[ci-search]

search for terms in prow job logs (see [openshift ci-search])



in a nutshell

In regular intervals:

- follow up on previous action items
- derive action items from data available
- hand action items over to dev teams
- revisit and dequarantine quarantined tests

the future - more data, more tooling

gaps we want to close:

- collect more data - run the majority of tests frequently
- close the retest gap - stop retesting after a certain threshold
- get better in detecting new flakes
- long term - automatic quarantine PRs when new flakes have entered the codebase

Q&A

Any questions?

Who else is trying to tackle this problem?

What have you done to solve this problem?

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Thank you for your patience!

Feel free to send questions and comments:

mailto:	dhiller@redhat.com
k8s slack:	@dhiller
mastodon:	@dhiller@fosstodon.org
web:	www.dhiller.de

KubeVirt

interested in kubevirt.io? want to help?

- join #kubevirt-dev Slack channel
- join kubevirt-dev Google group
- fix flakes on kubevirt/kubevirt