

Running CentOS Stream in Production



A Case Study in Boring Tech

Who are we??

Robby Callicotte

- DevOps Team Supervisor
- Fedora Package Maintainer
- CentOS Alt Images SIG



Salman Butt

- SysOps Team Supervisor
- Fedora Package Maintainer
- Linux Enthusiast



How did we get here?

Brief history of CentOS

- Started in 2004[1]
- RedHat sponsored in 2014

The change to Stream

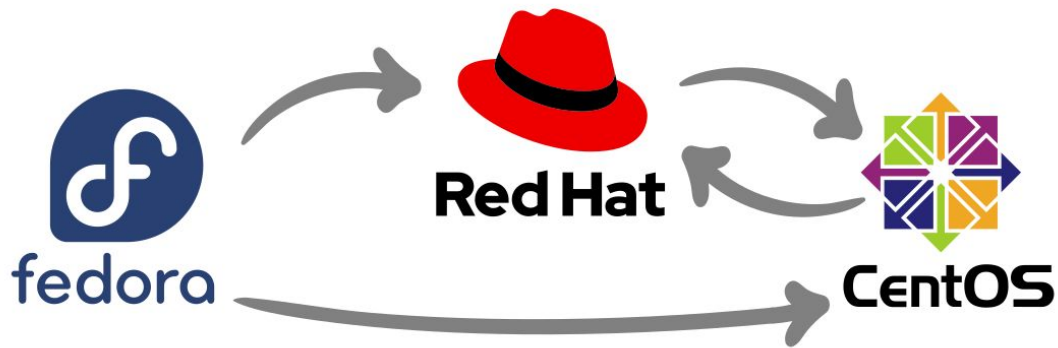
- Announced in 2019 by Chris Wright[2]
- The Future is Stream by Rich Bowen[3]

How did we get here?

The changing ecosystem

- Alma Linux
- Rocky Linux
- Suse
- Oracle
- OpenELA

CentOS relationship to RHEL and Fedora



[4]

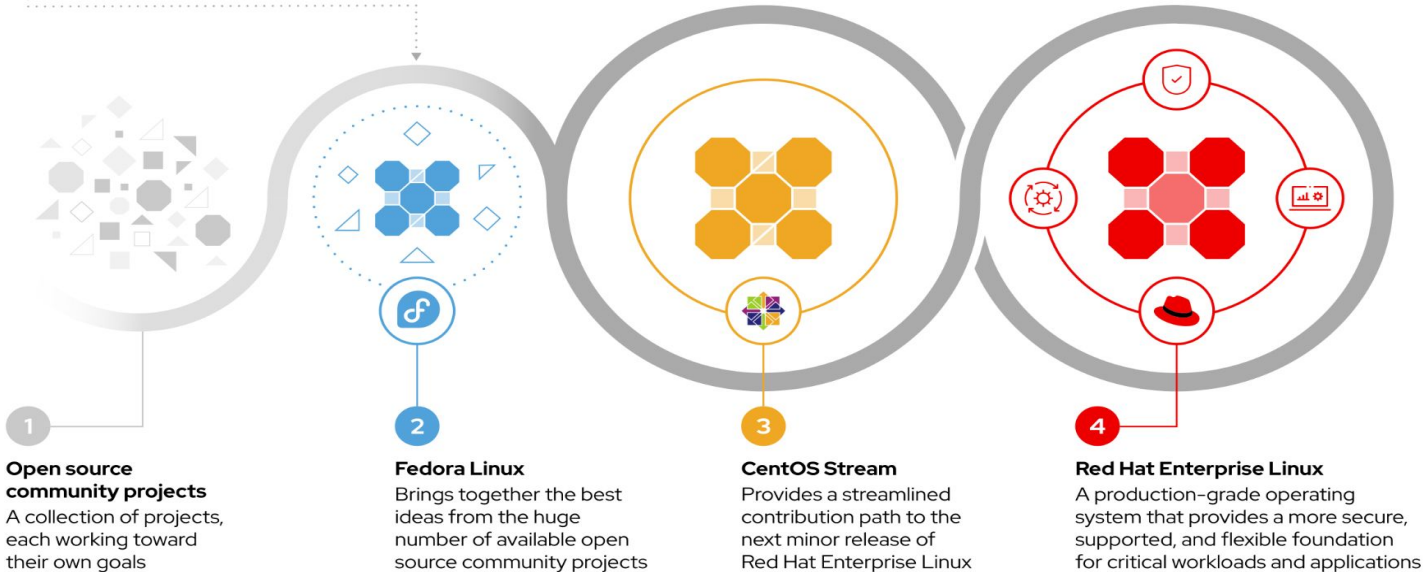
CentOS Stream relationship to RHEL and Fedora



CentOS Stream Lifecycle

[5]

Contributions flow among all elements of the ecosystem; however, there is a stronger connection between CentOS Stream and Red Hat Enterprise Linux. They each contribute to the other while also ensuring that new code is submitted as far upstream as possible; and, ideally, directly into the relevant open source community projects.

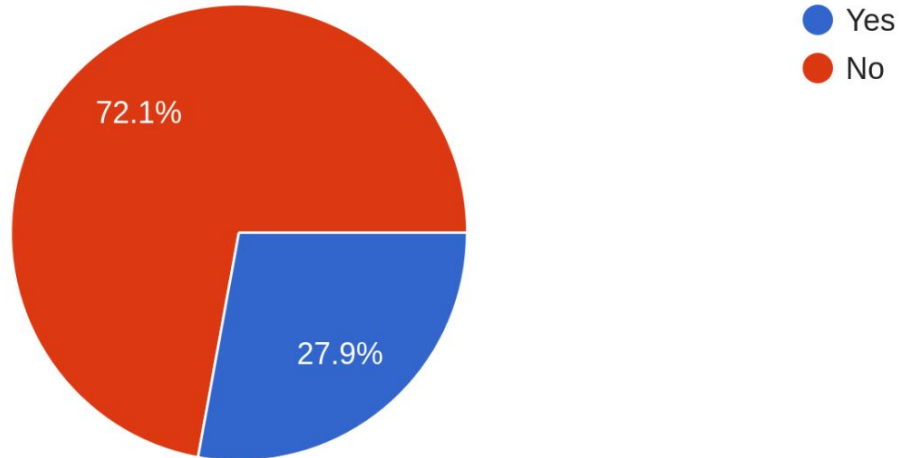


Super scientific usage survey

Do you run CentOS Stream in production?

61 responses

[6]



Our philosophy

- Use internal mirroring as much as possible to pin release versions
- Internal versions only updated after passing tests
- Security team handles critical updates (CVEs)
- Swap-in updates where possible
- Package internal (company) tools as RPMs
- Battle-tested config management

These precepts were in place BEFORE CentOS Stream existed

Scope of environment

- Varies in size from 2000 to 4000 vms
- Over 1000 physical machines
- Tens of thousands of container deployments
- Three datacenters in US
- Multi-cloud presence
- Assist in thousands of OT-realtime deployments

Patching

Quarterly Updates:

- Package repos updated from last good nightly build
- Production VMs patched via “in-swap” method*
 - Physical systems patched “in-place”
- Rancher images rebuilt via Koji
- Lorax isos rebuilt via Jenkins job

Nightly Builds:

- Mirrors updated @ 1:30am
- CICD testing - rebuild environment using Kitchen-CI
- “Sandbox VMs” updated/rebooted in place every 15 days

Vendor support

- Security tools
 - Crowdstrike
 - Rapid7
 - Big Fix
- GeoScience
 - PreStack Pro
 - AASPI
- Open Source (It just works)
 - RabbitMQ
 - Victoria Metrics/Prometheus
 - MemSQL/SingleStore
 - And many, many, many more
- Faux-pen Source
 - Elastic Search
 - Hashicorp Suite

RPM Packaging

- Use upstream tools as much as possible.
- Wrote custom integrations for
 - Koji
 - Distgit[7]
 - Cobbler
 - Fedpkg/Fedora-review

Technologies used

Source Control

- Github
- Dist-git
- Consul

Deployment

- SaltStack
- Docker
- Portainer
- Rancher
- Nspawn
- VMWare
- Cloud

CICD

- Jenkins
- Github Actions
- Kitchen CI
- Cobbler
- Koji
- Lorax
- Harbor
- Netscaler

Monitoring/Observability

- Zabbix
- Victoria Metrics
- Grafana

CentOS Stream Jobs

Dashboard

- People
- Build History
- Project Relationship
- Check File Fingerprint
- Credentials

Build Queue

No builds in the queue.

Build Executor Status

_houicddev03

- 1 Idle
- 2 Idle
- 3 Idle

All	DevOps_Infra	Nightly Builds	Quarterly Builds			
S	W	Name	Last Success	Last Failure	Last Duration	
✔	🔧	imgbuilder	2 days 8 hr - #32	9 mo 6 days - #28	16 min	
✔	⚙️	imgcanary	11 hr - #564	8 days 11 hr - #555	17 min	
✔	🔧	isobuilder	2 days 8 hr - #37	6 mo 5 days - #33	13 min	
✔	⚙️	isobuilder-iplc	2 days 8 hr - #28	1 yr 1 mo - #22	18 min	
✔	⚙️	nightly-converge-tests	11 hr - #564	11 hr - #564	N/A	
✔	⚙️	nightly-repo-updates	11 hr - #165	N/A	1 min 24 sec	
✔	🔧	repo-updates	2 days 8 hr - #11	6 mo 7 days - #8	11 min	
✔	⚙️	rpmcanary	12 hr - #743	11 days - #732	7 min 12 sec	
✔	⚙️	rpminspector	11 hr - [redacted]-test-0-833. [redacted] fc41	1 mo 6 days - [redacted] test-0-796. [redacted] fc41	27 sec	

CentOS Stream Jobs - Nightly Repo Updates

The screenshot shows the Jenkins interface for a pipeline named 'nightly-repo-updates'. The pipeline's purpose is to update internal Cobble CentOS Stream repositories for nightly builds. The 'Stage View' section displays a table of stage performance metrics for recent builds, including checkout times, hardware info, update durations, and post-action times. The 'Build History' sidebar on the left lists individual build runs from March 22 to April 3, 2024, all of which are marked as successful.

Pipeline nightly-repo-updates

Updates the internal Cobble CentOS Stream repos for nightly builds

[Recent Changes](#)

Stage View

	Declarative: Checkout SCM	HW Info	Update core-latest repos	Declarative: Post Actions
Average stage times: (Average full run time: ~1min 1s)	443ms	1s	58s	174ms
#165 Apr 03 01:29 No Changes	482ms	1s	1 min 20s	175ms
#164 Apr 02 01:29 No Changes	333ms	919ms	1 min 17s	132ms
#163 Apr 01 01:29 No Changes	452ms	1s	30s	162ms
#162 Mar 31 01:29 No Changes	431ms	1s	35s	173ms








Build History

Filter builds...













- #165 Apr 3, 2024, 1:29 AM
- #164 Apr 2, 2024, 1:29 AM
- #163 Apr 1, 2024, 1:29 AM
- #162 Mar 31, 2024, 1:29 AM
- #161 Mar 30, 2024, 1:29 AM
- #160 Mar 29, 2024, 1:29 AM
- #159 Mar 28, 2024, 1:29 AM
- #158 Mar 27, 2024, 1:29 AM
- #157 Mar 26, 2024, 1:29 AM
- #156 Mar 25, 2024, 1:29 AM
- #155 Mar 24, 2024, 1:29 AM
- #154 Mar 23, 2024, 1:29 AM

CentOS Stream Jobs - Cobbler Repos

Index of /cblr/repo_mirror

<u>Name</u>	<u>Last modified</u>	<u>Size</u>	<u>Description</u>
 Parent Directory		-	
 -adminer7-stable/	2024-04-06 02:12	-	
 -adminer8-stable/	2024-04-06 02:12	-	
 -appstream8-latest/	2024-04-06 02:12	-	
 -base7/	2024-04-06 02:12	-	
 -appstream8/	2024-04-06 02:12	-	
 -appstream9-latest/	2024-04-06 02:12	-	
 -appstream9/	2024-04-06 02:12	-	
 -automotive-9-latest/	2024-04-06 02:12	-	
 -automotive-9-stable/	2024-04-06 02:12	-	
 -base7/	2024-04-06 02:12	-	
 -base8-latest/	2024-04-06 02:12	-	
 -base8/	2024-04-06 02:12	-	
 -base9-latest/	2024-04-06 02:12	-	
 -base9/	2024-04-06 02:12	-	
 -aarch64/	2024-04-06 02:12	-	

Index of /cblr/[REDACTED]-base9

<u>Name</u>	<u>Last modified</u>	<u>Size</u>	<u>Description</u>
 Parent Directory		-	
 COMPOSE_ID	2024-03-25 11:13	27	
 EFI/	2024-03-24 22:57	-	
 EULA	2024-03-31 22:50	299	
 LICENSE	2024-03-31 22:50	18K	
 Packages/	2024-04-03 16:57	-	
 config.repo	2024-04-01 04:25	120	
 [REDACTED]-base9.repo	2024-04-10 02:13	135	
 extra_files.json	2024-03-31 22:50	745	
 images/	2024-03-25 20:16	-	
 isolinux/	2024-04-03 16:56	-	
 repopdata/	2024-04-03 16:56	-	
 timestamp.txt	2024-04-01 04:25	14	

CentOS Stream Jobs - imgcanary

Jenkins
Dashboard > imgcanary >

[Back to Dashboard](#)

[Status](#)

[Changes](#)

[Full Stage View](#)

[Embeddable Build Status](#)

Build History trend

Filter builds...

- #584 Apr 3, 2024, 1:31 AM
- #563 Apr 2, 2024, 1:31 AM
- #562 Apr 1, 2024, 1:30 AM
- #561 Mar 31, 2024, 1:30 AM
- #560 Mar 30, 2024, 1:30 AM
- #559 Mar 29, 2024, 1:30 AM
- #558 Mar 28, 2024, 9:48 AM
- #557 Mar 28, 2024, 1:30 AM
- #556 Mar 27, 2024, 1:30 AM
- #555 Mar 26, 2024, 1:32 AM
- #554 Mar 25, 2024, 1:30 AM
- #553 Mar 24, 2024, 1:30 AM
- #552 Mar 23, 2024, 1:30 AM
- #551 Mar 22, 2024, 1:30 AM

Pipeline imgcanary

Runs canary tests against the RPM build/deployment infrastructure.

[Recent Changes](#)

Stage View

	Declarative: Checkout SCM	HW Info	Koji Status	Koji Build	Declarative: Post Actions
Average stage times: (Average full run time: ~16min 51s)	456ms	1s	448ms	20min 32s	138ms
#564 Apr 03 01:31 No Changes	410ms	1s	487ms	17min 2s	134ms
#563 Apr 02 01:31 No Changes	334ms	941ms	343ms	17min 1s	77ms
#562 Apr 01 01:30 No Changes	486ms	949ms	379ms	17min 31s	138ms
#561 Mar 31 01:30 No Changes	448ms	1s	434ms	16min 26s	126ms
#560 Mar 30 01:30 No Changes	466ms	1s	469ms	16min 38s	86ms

BUILD SYSTEM Wed, 03 Apr 2024 11:00:54 CDT | login

[Packages](#) [SEARCH](#)

[Summary](#) [Packages](#) [Builds](#) [Tasks](#) [Tags](#) [Build Targets](#) [Users](#) [Hosts](#) [Reports](#) [Search](#) [API](#)

Welcome to Koji Web

Recent Builds

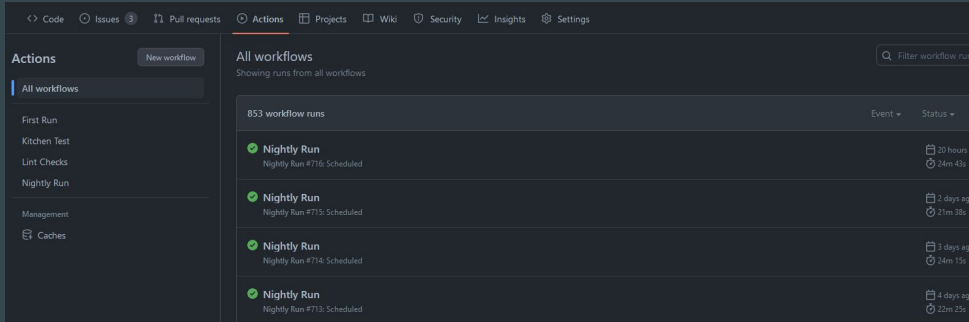
ID	NVR	Built by	Finished	State
1092	rc9s-nightly-20240403-1	buildbot	2024-04-03 01:47:42	✓
1091	c9s-nightly-20240403-1	buildbot	2024-04-02 01:38:55	✓
1090	rc9s-nightly-20240402-1	buildbot	2024-04-02 01:47:52	✓
1089	c9s-nightly-20240402-1	buildbot	2024-04-02 01:38:34	✓
1088	centos-rancher-9.20240401-1	buildbot	2024-04-01 04:47:12	✓
1087	centos-kitchen-9.20240401-1	buildbot	2024-04-01 04:38:55	✓
1086	rc9s-nightly-20240401-1	buildbot	2024-04-01 01:47:23	✓
1085	c9s-nightly-20240401-1	buildbot	2024-04-01 01:38:06	✓
1084	rc9s-nightly-20240331-1	buildbot	2024-03-31 01:46:25	✓
1083	c9s-nightly-20240331-1	buildbot	2024-03-31 01:37:38	✓

Recent Tasks

ID	Type	Owner	Arch	Finished	State
8307	newRepo (image9s-build)	kojadmin	noarch	2024-04-03 06:01:03	✓
8305	newRepo (image8s-build)	kojadmin	noarch	2024-04-03 06:01:18	✓
8303	buildNotification (rc9s-nightly-20240403-1)	houingbid01	noarch	2024-04-03 01:47:58	✓
8301	image ([x86_64], 20240403, http://[redacted].com/centos/9-latest/BaseOS/x86_64/os/)	buildbot	noarch	2024-04-03 01:48:13	✓
8299	buildNotification (c9s-nightly-20240403-1)	houingbid01	noarch	2024-04-03 01:39:11	✓
8297	image ([x86_64], 20240403, http://[redacted].com/centos/9-latest/BaseOS/x86_64/os/)	buildbot	noarch	2024-04-03 01:39:25	✓
8295	newRepo (image9s-build)	kojadmin	noarch	2024-04-02 06:01:14	✓


SaltStack - Config Management

- Local Testing
- Github Runner Testing
- Nightly Jobs
 - Alerts via Teams
 - Email Notification
- Uses Kitchen-CI [8]
 - COPR repos available [9][10][11]



Formula	Nightly Build Status	Supported OS
ops-adjoin (B)	Nightly Run passing	version CentOS 7 version CentOS 8 version CentOS 9
ops-gpkgs (B)	Nightly Run passing	version CentOS 7 version CentOS 8 version CentOS 9
ops-mail (B)	Nightly Run passing	version CentOS 7 version CentOS 8 version CentOS 9
ops-minion (B)	Nightly Run failing	version CentOS 7 version CentOS 8 version CentOS 9
ops-monitoring (B)	Nightly Run passing	version CentOS 7 version CentOS 8 version CentOS 9
ops-sectools (B)	Nightly Run failing	version CentOS 7 version CentOS 8 version CentOS 9
ops-ssh (B)	Nightly Run passing	version CentOS 7 version CentOS 8 version CentOS 9
ops-ssl_certs (B)	Nightly Run passing	version CentOS 7 version CentOS 8 version CentOS 9
ops-sudo (B)	Nightly Run passing	version CentOS 7 version CentOS 8 version CentOS 9
ops-syslog (B)	Nightly Run passing	version CentOS 7 version CentOS 8 version CentOS 9
ops-time (B)	Nightly Run passing	version CentOS 7 version CentOS 8 version CentOS 9
ops-yum (B)	Nightly Run passing	version CentOS 7 version CentOS 8 version CentOS 9
ops-vault	Nightly Run passing	version CentOS 8 version CentOS 9
ops-hypr	Nightly Run passing	version CentOS 8 version CentOS 9

CentOS Stream Jobs - ISO Builds

 **Jenkins** Search [?](#) [log in](#)

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[Build History](#) [trend](#) [^](#)

- [#37](#) Apr 1, 2024, 4:31 AM
- [#36](#) Jan 1, 2024, 4:29 AM
- [#35](#) Dec 7, 2023, 3:36 PM
- [#34](#) Oct 1, 2023, 4:59 PM
- [#33](#) Oct 1, 2023, 4:20 AM
- [#32](#) Jul 28, 2023, 11:28 AM

Pipeline isobuilder

Builds for production iso images.

[Recent Changes](#)

Stage View

Average stage times:
(Average full run time: ~11min 49s)

	Declarative: Checkout SCM	HW Info	Setup Dirs	Build ISO	Deploy ISO files	Cleanup Dirs	Declarative: Post Actions
#37 Apr 01 04:31 No Changes	549ms	1s	484ms	12min 20s	1min 3s	754ms	164ms
#36 Jan 01 04:29 No Changes	439ms	966ms	356ms	10min 13s	57s	726ms	115ms

CentOS Stream Jobs - ISO Builds

```
# Command prompt text
menu color cmdmark 0 #84b8ffff #00000000 none
menu color cmdline 0 #ffffff #00000000 none

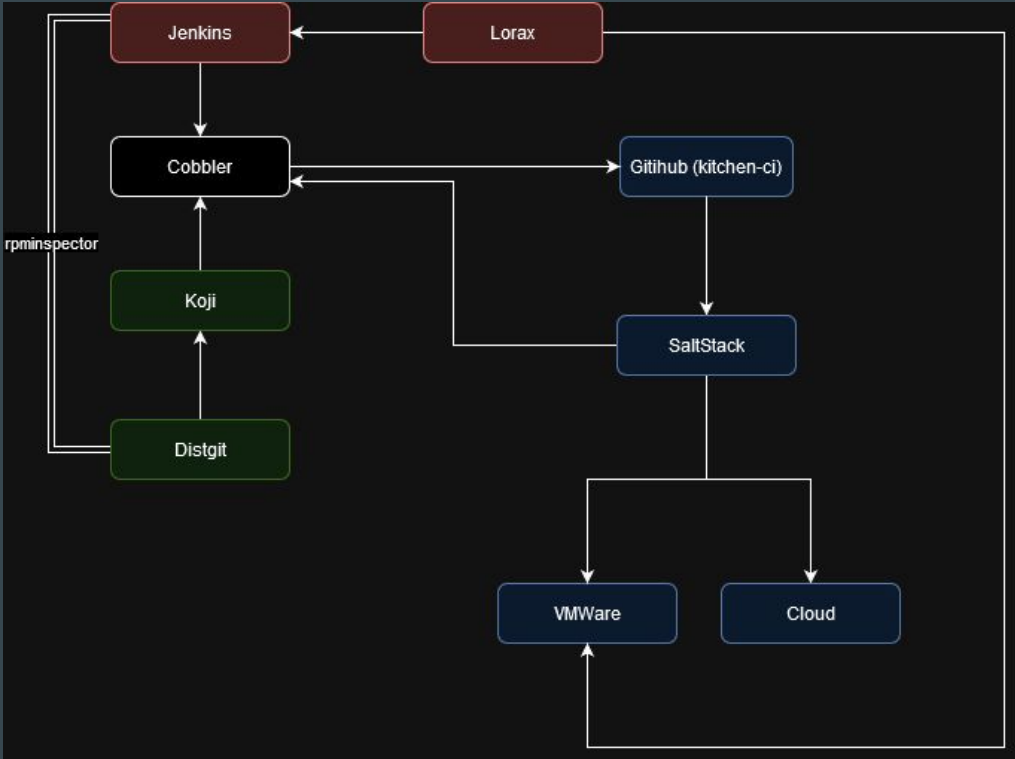
# Do not display the actual menu unless the user presses a key. All that is displayed is a timeout message.

menu tabmsg Press Tab for full configuration options on menu items.

menu separator # insert an empty line
menu separator # insert an empty line

label linux
  menu label ^Install @PRODUCT@ @VERSION@
  menu default
  kernel vmlinuz
  append initrd=initrd.img @ROOT@ quiet inst.ks=http://[REDACTED].com/cblr/svc/op/ks/profile/[REDACTED]-c9s-vmware-x86_64
```

How it all comes together



Future Improvements

- Better way to test cluster install automation
- Possible use of OpenQA to test images
- Upgrade from dist-git to Pagure

Questions?



References

1. <https://en.wikipedia.org/wiki/CentOS>
2. <https://www.redhat.com/en/blog/transforming-development-experience-within-centos>
3. <https://blog.centos.org/2020/12/future-is-centos-stream/>
4. <https://www.redhat.com/rhdc/managed-files/rhel-ecosystem-relationships-diagram-v0.png>
5. <https://linuxiac.b-cdn.net/wp-content/uploads/2021/07/centos-stream-relationship-to-rhel.png>
6. <https://lists.centos.org/pipermail/centos/2023-July/896826.html>
7. <https://github.com/release-engineering/dist-git>
8. <https://kitchen.ci/>
9. <https://copr.fedorainfracloud.org/coprs/rcallicotte/kitchen-salt/>
10. <https://copr.fedorainfracloud.org/coprs/rcallicotte/test-kitchen/>
11. <https://copr.fedorainfracloud.org/coprs/rcallicotte/kitchen-qemu/>