

# **Opening the RHEL Build System**

by Troy Dawson

April 2024

# Disclaimer

**A best effort was made for past event accuracy.  
Current events are just that, current events.  
They are a snapshot of where we are**

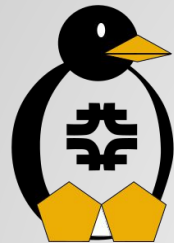
**Things May Change!**

**I, Troy Dawson, believe what I am presenting will not  
change in the near future ...**

**but I could be wrong**

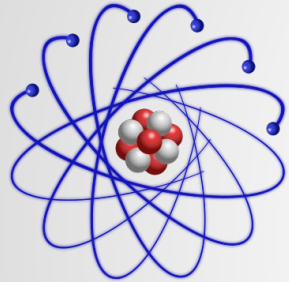
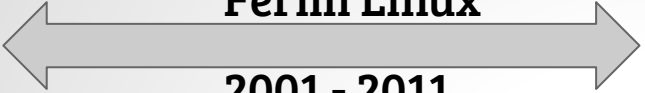
# Who Am I?

## What makes me an expert?



Fermi Linux

2001 - 2011



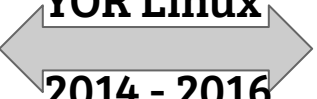
Scientific Linux

2003 - 2011



YOR Linux

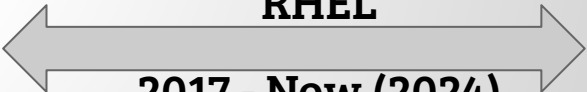
2014 - 2016



**Red Hat**  
Enterprise Linux

RHEL

2017 - Now (2024)



CentOS Stream

2020 - Now (2024)



# RHEL 3 (2003)

## Disrupting the environment

- Did not have the binaries downloadable for free
- The first clones
  - White Box, Scientific Linux, Tao Linux, CentOS and others
- The build environment was completely closed.
  - It was a fairly easy rebuild. We started with Red Hat Linux 9, and built all the RHEL 3 sources on top of it.
  - Was that how RHEL 3 was really built? I have no idea.

# RHEL 4 and 5 (2005 - 2007)

## Setting the new standards

- Fedora is established.
- RHEL 5 is based off Fedora Core 6
- The Koji build environment is started
- The build environment is still completely closed.
  - RHEL day to day security updates and announcements are becoming more standardized.
  - Each RHEL Clone creates their own build environment software
  - Clone build environments are also closed.

# RHEL 6 and 7 (2010 - 2014)

## **Locking in the standard pipeline**

- RHEL 6 is based off Fedora 10 (plus 11 and 12)
- RHEL 7 is based off Fedora 18 and 19
- Brew, the Red Hat internal version of Koji, is used.
- CentOS is "acquired" by Red Hat (2014)
- The build environment is still completely closed.
  - Clone build environments are still closed.

# RHEL 8 (2019)

## More of the same

- RHEL 8 is based off Fedora 28
- I became part of the Emerging RHEL team for RHEL8
- Even stating that we were working on RHEL 8 was not allowed.
  - I had to fix Fedora packages (which are public) with things like
    - `%if 0%{?rhel} > 7`
  - At conferences we couldn't say '8' at all
    - That may or may not have been exactly what we were told
    - We had alot of fun inventing ways to not say '8'

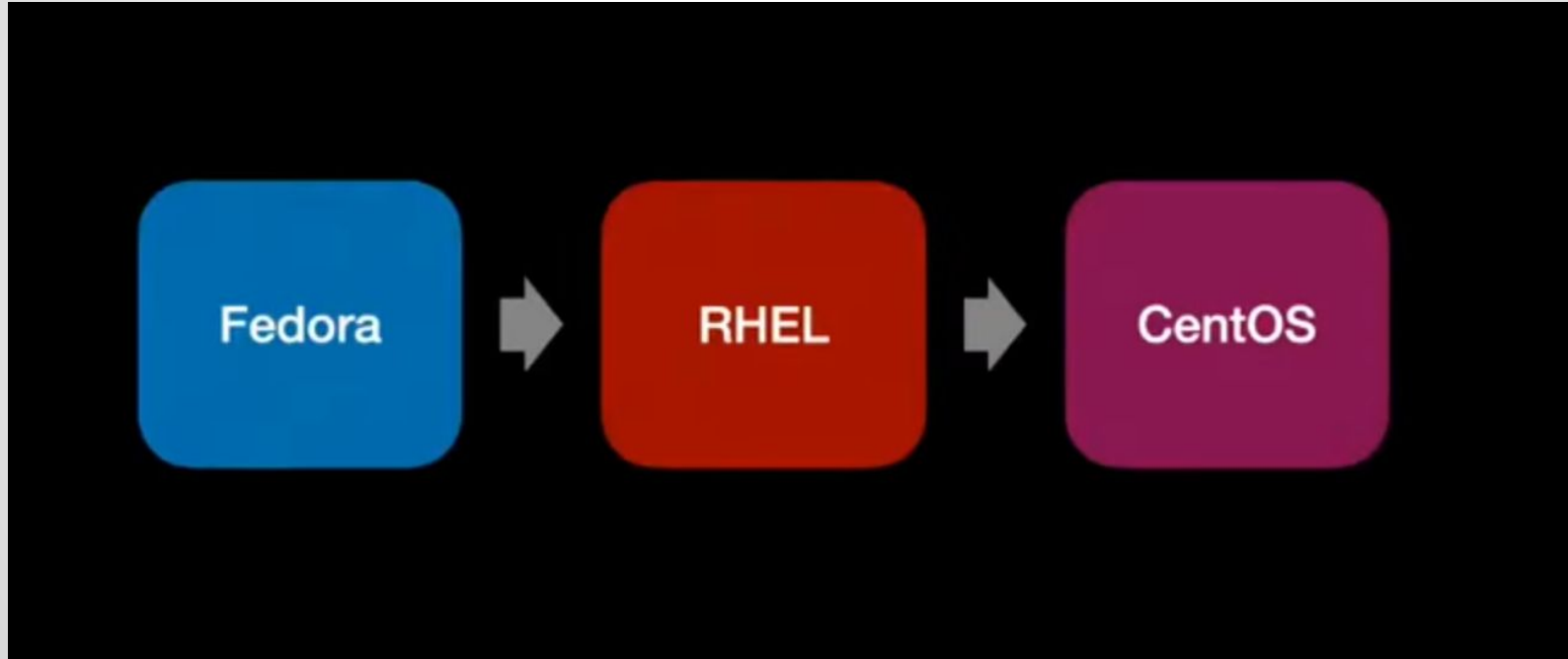
Can you spot the

**8**





# RHEL 8 Pipeline



# RHEL 9 (2022)

## **RHEL Development Turns Inside Out**

- Publicly announced:
  - Major release every 3 years
  - Minor releases every 6 months.
- Fedora ELN is created.
  - Fedora ELN builds Fedora Rawhide packages with RHEL macros
- CentOS Stream is created.
  - CentOS Stream is public RHEL builds.

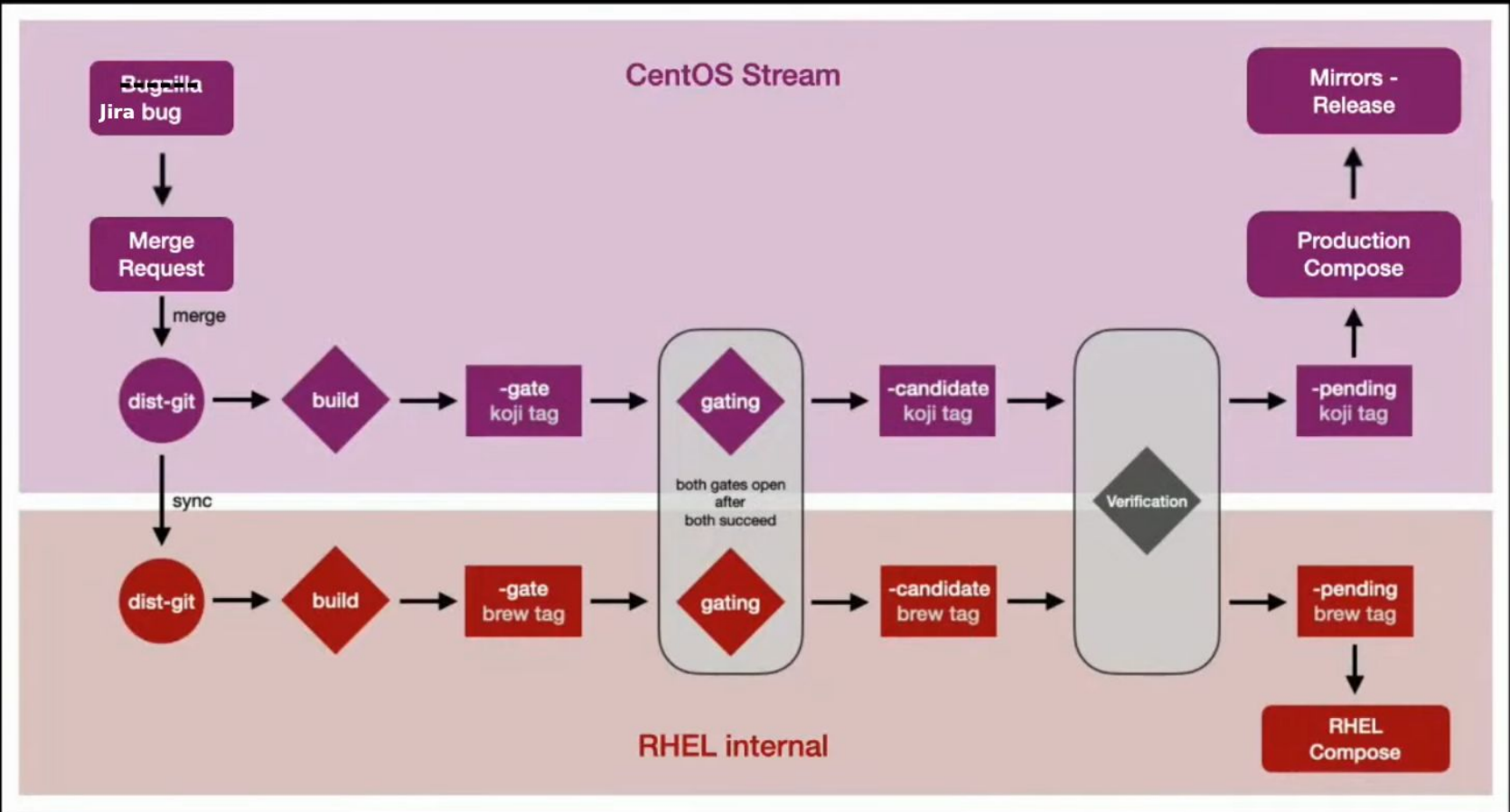
# RHEL 9 Pipeline



# RHEL 9 Pipeline

That still looks like the important bits  
are hidden





## CentOS Stream

# What is this?

Bugzilla  
Jira bug

Merge  
Request

merge

dist-git

build

-gate  
koji tag

gating

-candidate  
koji tag

Verification

-pending  
koji tag

Mirrors -  
Release

Production  
Compose

sync

dist-git

build

-gate  
brew tag

gating

-candidate  
brew tag

Verification

-pending  
brew tag

RHEL  
Compose

RHEL internal

both gates open  
after  
both succeed

CentOS Stream

git sync immediately after merge

Bugzilla  
Jira bug

Merge Request

merge

dist-git

sync

dist-git

build

build

-gate  
koji tag

-gate  
brew tag

gating

both gates open  
after  
both succeed

RHEL internal

-candidate  
koji tag

-candidate  
brew tag

Verification

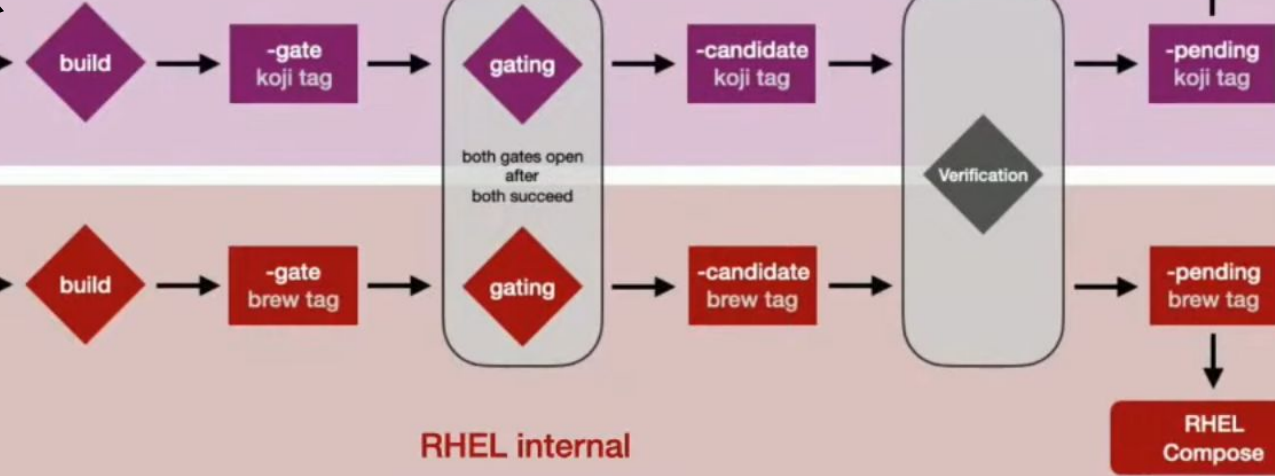
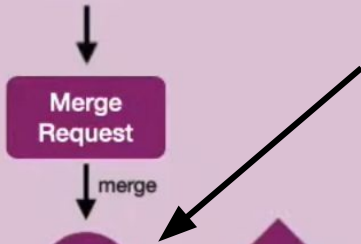
Mirrors -  
Release

Production  
Compose

-pending  
koji tag

-pending  
brew tag

RHEL  
Compose



CentOS Stream

# Successful Stream build triggers RHEL build

Bugzilla  
Jira bug

Merge Request

merge

dist-git

build

-gate  
koji tag

gating

-candidate  
koji tag

Verification

-pending  
koji tag

Production Compose

Mirrors - Release

sync

dist-git

build

-gate  
brew tag

gating

-candidate  
brew tag

-pending  
brew tag

RHEL Compose

RHEL internal

both gates open  
after  
both succeed



CentOS Stream

# Successful RHEL gating moves both on

Bugzilla  
Jira bug

Merge Request

merge

dist-git

build

-gate  
koji tag

gating

-candidate  
koji tag

Verification

-pending  
koji tag

Mirrors -  
Release

Production  
Compose

sync

dist-git

build

-gate  
brew tag

gating

-candidate  
brew tag

Verification

-pending  
brew tag

RHEL  
Compose

RHEL internal

both gates open  
after  
both succeed

CentOS Stream

# Successful RHEL verification moves both on

Bugzilla  
Jira bug

Merge Request

merge

dist-git

build

-gate  
koji tag

gating

-candidate  
koji tag

Verification

-pending  
koji tag

Mirrors -  
Release

Production  
Compose

sync

dist-git

build

-gate  
brew tag

gating

-candidate  
brew tag

-pending  
brew tag

RHEL  
Compose

RHEL internal

both gates open  
after  
both succeed

CentOS Stream

# Although composes are similar, they have different timelines

Bugzilla  
Jira bug

Merge Request

merge

dist-git

build

-gate  
koji tag

gating

-candidate  
koji tag

Verification

Mirrors -  
Release

Production  
Compose

-pending  
koji tag

sync

dist-git

build

-gate  
brew tag

gating

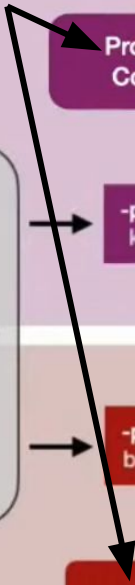
-candidate  
brew tag

Verification

-pending  
brew tag

RHEL  
Compose

RHEL internal



**That's fine and nifty,  
but isn't CentOS Linux infrastructure  
just as closed off as  
RHEL's?**

# **CentOS Stream work moto**

**If possible at all  
MAKE IT PUBLIC**

# CentOS Stream rpm source is in public gitlab

<https://gitlab.com/redhat/centos-stream/rpms>

<https://gitlab.com/redhat/centos-stream/modules>

# CentOS Stream Koji

<https://kojihub.stream.centos.org/koji/>

CentOS Stream Build Service

Mon, 15 Apr 2024 16:45:02 UTC | [login](#)

Packages

Summary Packages Builds Tasks Tags Build Targets Users Hosts Reports Search API

## Welcome to Koji Web


### Recent Builds

ID ▾	NVR	Built by	Finished	State
60620	<a href="#">gjs-1.80.2-1.el10</a>	<a href="#">fmuellne</a>	2024-04-15 16:40:53	✓
60619	<a href="#">yggdrasil-0.4.1-1.el9</a>	<a href="#">ldupont</a>	2024-04-15 16:25:44	✓
60618	<a href="#">selinux-policy-38.1.36-1.el9</a>	<a href="#">zpytela</a>	2024-04-15 16:19:35	✓
60617	<a href="#">gdb-10.2-14.el9</a>	<a href="#">keiths</a>	2024-04-15 16:13:15	✗
60616	<a href="#">openssl-3.2.1-1.el9</a>	<a href="#">dbelyavs</a>	2024-04-15 15:20:14	✓
60615	<a href="#">ibus-typing-booster-2.25.7-1.el10</a>	<a href="#">mfabian</a>	2024-04-15 14:42:51	✓
60614	<a href="#">hunspell-no-2.0.10-23.el10</a>	<a href="#">pnmade</a>	2024-04-15 14:31:14	✓
60613	<a href="#">openoffice-lv-1.4.0-8.el10</a>	<a href="#">pnmade</a>	2024-04-15 14:30:04	✓
60612	<a href="#">kernel-5.14.0-439.el9</a>	<a href="#">lzapmier</a>	2024-04-15 13:54:22	✓
60611	<a href="#">gnome-online-accounts-3.50.1-1.el10</a>	<a href="#">mcrha</a>	2024-04-15 12:34:10	✓

### Recent Tasks

ID ▾	Type	Owner	Arch	Finished	State
3857175	<a href="#">newRepo (c10s-build-side-3146)</a>	<a href="#">centos-stream-kojira</a>	noarch		✓
3857169	<a href="#">newRepo (c10s-build-side-3140-stack-gate)</a>	<a href="#">centos-stream-kojira</a>	noarch		✓
3857168	<a href="#">newRepo (c10s-build-side-3059-stack-gate)</a>	<a href="#">centos-stream-kojira</a>	noarch		✓
3857152	<a href="#">newRepo (java-openjdk-c10s-build)</a>	<a href="#">centos-stream-kojira</a>	noarch		✓
3857151	<a href="#">newRepo (c10s-build-nsplugin)</a>	<a href="#">centos-stream-kojira</a>	noarch		✓
3857150	<a href="#">newRepo (c10s-build-side-3120-stack-gate)</a>	<a href="#">centos-stream-kojira</a>	noarch		✓
3857149	<a href="#">newRepo (c10s-build-side-3091-stack-gate)</a>	<a href="#">centos-stream-kojira</a>	noarch		✓
3857128	<a href="#">newRepo (c10s-build-side-3115)</a>	<a href="#">centos-stream-kojira</a>	noarch	2024-04-15 16:44:32	✓
3857127	<a href="#">newRepo (c10s-pesign-build)</a>	<a href="#">centos-stream-kojira</a>	noarch	2024-04-15 16:44:50	✓
3857126	<a href="#">newRepo (c10s-build)</a>	<a href="#">centos-stream-kojira</a>	noarch	2024-04-15 16:44:28	✓

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# CentOS Stream Release Engineering Code is Public

## Main Project Page

<https://gitlab.com/redhat/centos-stream/release-engineering>

With sub-project repos

[.../release-engineering/releeng-tools](https://gitlab.com/redhat/centos-stream/release-engineering/releeng-tools)

[.../release-engineering/comps](https://gitlab.com/redhat/centos-stream/release-engineering/comps)

[.../release-engineering/kickstarts](https://gitlab.com/redhat/centos-stream/release-engineering/kickstarts)

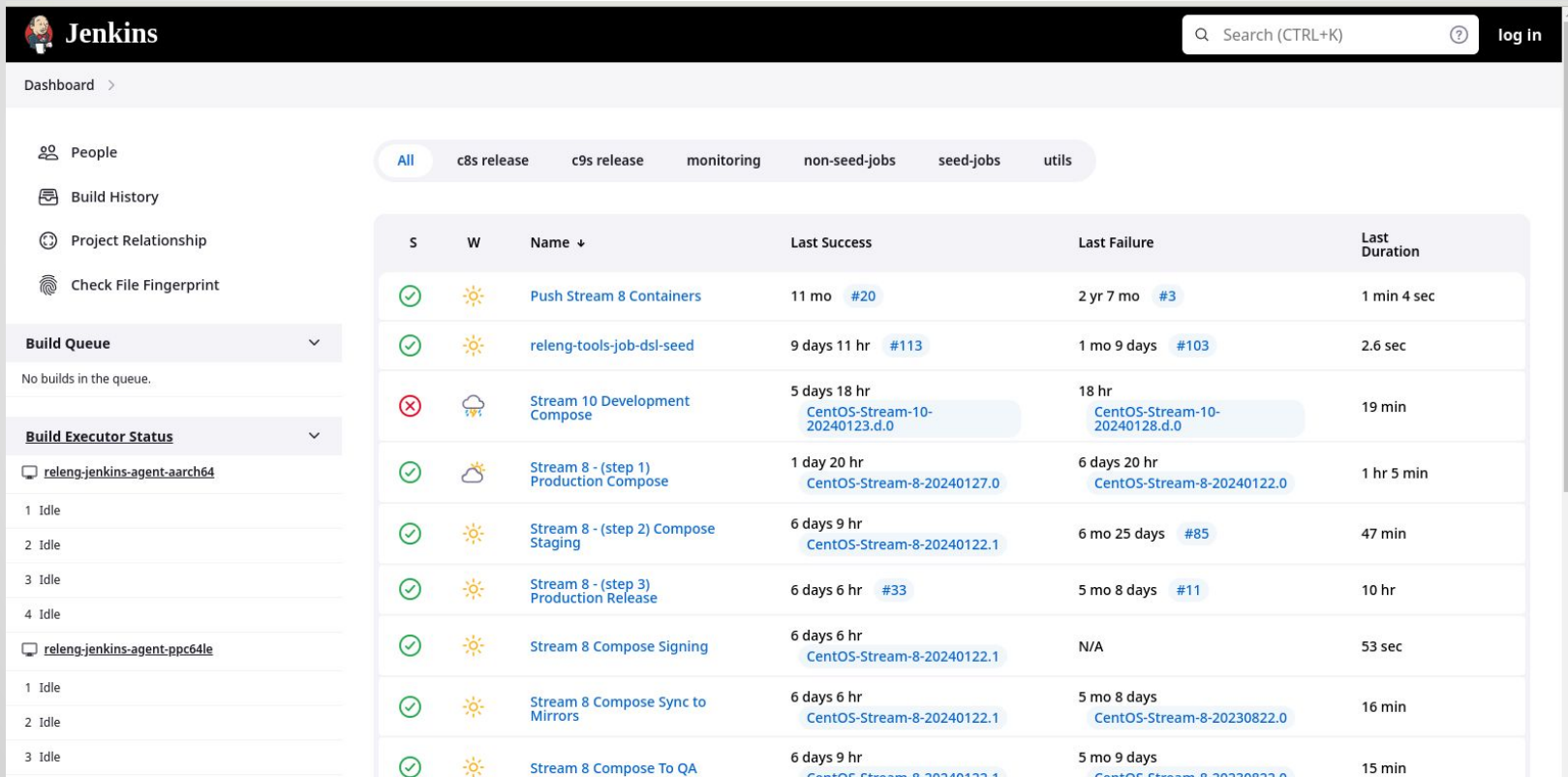
...

and others



# CentOS Stream Release Automation is Public

<https://jenkins.stream.centos.org/>



The screenshot shows the Jenkins dashboard interface. At the top, there is a search bar and a 'log in' link. The main content area is divided into a left sidebar with navigation options and a main table of build jobs.

**Build Queue**

No builds in the queue.

**Build Executor Status**

- releng-jenkins-agent-aarch64
  - 1 Idle
  - 2 Idle
  - 3 Idle
  - 4 Idle
- releng-jenkins-agent-ppc64le
  - 1 Idle
  - 2 Idle
  - 3 Idle

**Build Jobs Table**

S	W	Name ↓	Last Success	Last Failure	Last Duration
✓	☀️	Push Stream 8 Containers	11 mo #20	2 yr 7 mo #3	1 min 4 sec
✓	☀️	releng-tools-job-dsl-seed	9 days 11 hr #113	1 mo 9 days #103	2.6 sec
✗	☁️	Stream 10 Development Compose	5 days 18 hr CentOS-Stream-10-20240123.d.0	18 hr CentOS-Stream-10-20240128.d.0	19 min
✓	☁️	Stream 8 - (step 1) Production Compose	1 day 20 hr CentOS-Stream-8-20240127.0	6 days 20 hr CentOS-Stream-8-20240122.0	1 hr 5 min
✓	☀️	Stream 8 - (step 2) Compose Staging	6 days 9 hr CentOS-Stream-8-20240122.1	6 mo 25 days #85	47 min
✓	☀️	Stream 8 - (step 3) Production Release	6 days 6 hr #33	5 mo 8 days #11	10 hr
✓	☀️	Stream 8 Compose Signing	6 days 6 hr CentOS-Stream-8-20240122.1	N/A	53 sec
✓	☀️	Stream 8 Compose Sync to Mirrors	6 days 6 hr CentOS-Stream-8-20240122.1	5 mo 8 days CentOS-Stream-8-20230822.0	16 min
✓	☀️	Stream 8 Compose To QA	6 days 9 hr CentOS-Stream-8-20240122.1	5 mo 9 days CentOS-Stream-8-20230822.0	15 min

# CentOS Stream Release Automation more

<https://jenkins.stream.centos.org/>

**Jenkins** Search (CTRL+K) log in

Dashboard > c9s release >

**People**

**Build History**

**Project Relationship**

**Check File Fingerprint**

**Build Queue** ▾

No builds in the queue.

**Build Executor Status** ▾

releng-jenkins-agent-aarch64

1 Idle

2 Idle

3 Idle

4 Idle

releng-jenkins-agent-ppc64le

1 Idle

2 Idle

3 Idle

4 Idle

releng-jenkins-agent-x86

**1) Stream 9 - (step 1) Production Compose** (automatic)

Check: [Test results - c9s - compose](#)

**2) Stream 9 - (step 2) Production Release** (manual)

Triggers the following:

- Stream 9 Compose Staging
- Stream 9 Compose Signing
- Stream 9 Compose Sync to Mirrors
- Waits for mirrors to propagate
- Stream 9 Production Images Release
- Stream 9 Containers Prod
- Stream 9 Images AWS
- Stream 9 Images QCOW
- Stream 9 Images Cleanup
- Stream 9 Images Vagrant

All c8s release **c9s release** monitoring non-seed-jobs seed-jobs utils

S	W	Name ↓	Last Success	Last Failure	Last Duration
✓	☀	Stream 9 - (step 1) Production Compose	1 day 20 hr CentOS-Stream-9-20240127.0	2 mo 11 days CentOS-Stream-9-20231118.0	45 min
✓	☀	Stream 9 - (step 2) Production Release	6 days 9 hr #77	6 mo 11 days #48	10 hr
✓	☀	Stream 9 Compose Signing	6 days 9 hr CentOS-Stream-9-20240122.0	1 yr 2 mo CentOS-Stream-9-20221101.0	2 min 23 sec
✓	☀	Stream 9 Compose Staging	6 days 9 hr CentOS-Stream-9-20240122.0	1 yr 10 mo CentOS-Stream-9-20220331.0	27 min

# CentOS Stream

## Release Automation - Testing

<https://testing.stream.centos.org/>

**Jenkins** Search (CTRL+K) log in

Dashboard > c9s - compose >

People

Build History

**Build Queue** ▾

No builds in the queue.

**Build Executor Status** ▾

1 Idle

2 Idle

3 Idle

4 Idle

5 Idle

6 Idle

7 Idle

8 Idle

9 Idle

10 Idle

11 Idle

Tests the latest CentOS Stream 9 production compose:  
<https://composes.stream.centos.org/production/>

Using the t\_functional test suite:  
[https://github.com/CentOS/sig-core-t\\_functional](https://github.com/CentOS/sig-core-t_functional)

(Legacy) CentOS 7 All c8s - compose c8s - staged **c9s - compose**

S	W	Name ↓	Last Success	Last Failure	Last Duration	Built On
✓	☀️	<a href="#">CentOS_9-stream_aarch64_kvm</a>	1 day 20 hr <a href="#">#124</a>	9 days 11 hr <a href="#">#118</a>	33 min	<a href="#">Jenkins</a>
✓	☁️	<a href="#">CentOS_9-stream_all</a>	1 day 20 hr <a href="#">#117</a>	2 days 20 hr <a href="#">#116</a>	33 min	<a href="#">Jenkins</a>
✓	☁️	<a href="#">CentOS_9-stream_ppc64le_kvm</a>	1 day 20 hr <a href="#">#136</a>	2 days 6 hr <a href="#">#134</a>	27 min	<a href="#">Jenkins</a>
✓	☀️	<a href="#">CentOS_9-stream_x86_64_kvm</a>	1 day 20 hr <a href="#">#127</a>	9 days 11 hr <a href="#">#121</a>	25 min	<a href="#">Jenkins</a>
✗	☁️	<a href="#">CentOS_9-stream_x86_64_kvm_Experimental - TMT test suite</a>	2 mo 8 days <a href="#">#5</a>	1 day 19 hr <a href="#">#39</a>	25 min	<a href="#">Jenkins</a>
✓	☀️	<a href="#">CentOS_9-stream_x86_64_metal</a>	1 day 20 hr <a href="#">#122</a>	9 days 11 hr <a href="#">#116</a>	26 min	<a href="#">Jenkins</a>

# CentOS Stream composes are Public

## Main Repo:

<https://composes.stream.centos.org/>

## Sub-Repo for each Release:

<https://composes.stream.centos.org/stream-8/>

<https://composes.stream.centos.org/production/> \*

<https://composes.stream.centos.org/stream-10/>

\* Sorry about stream-9 being unconventional

# **Questions and Answers**