



Maintaining out of tree patches over the long term

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Overview

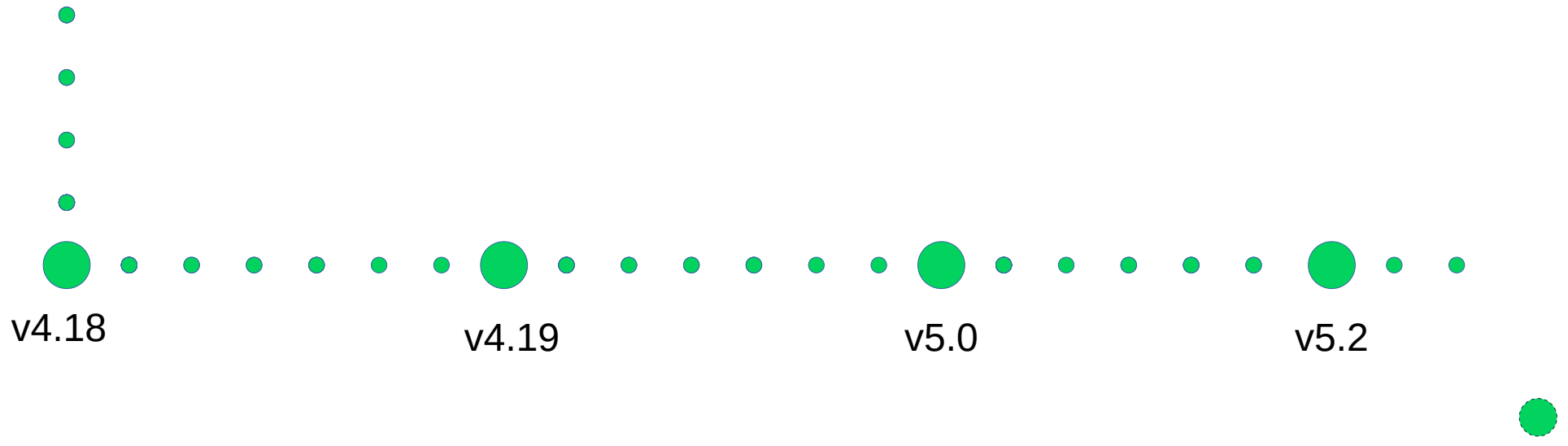
- Understand the patch flow
- Development process
- Git trees, branches and tags
- Tooling

Understand the patch flow

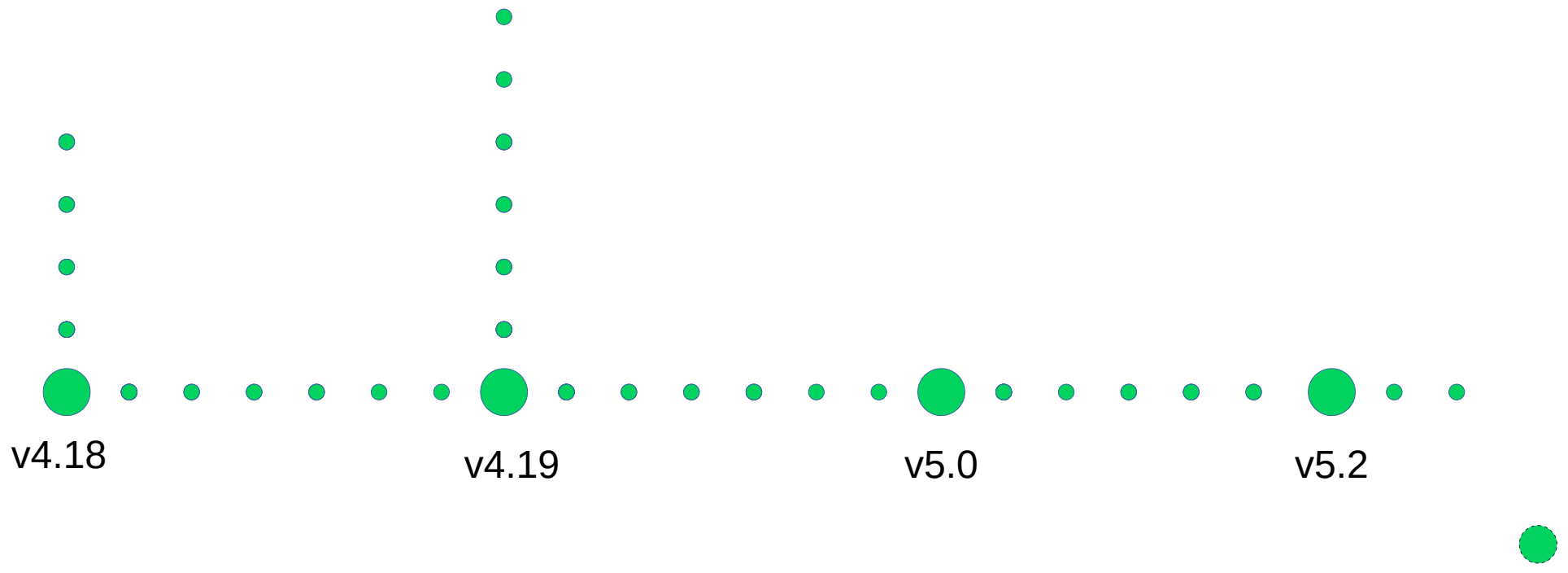
Mainline releases



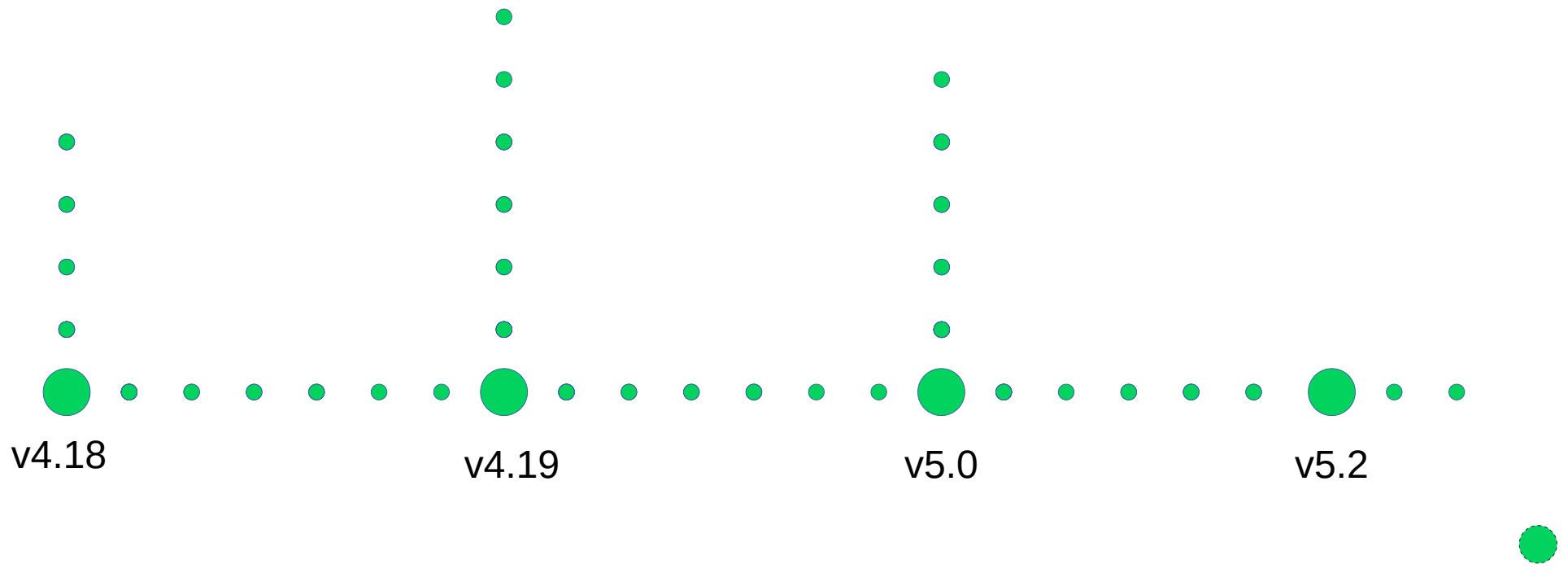
-rt releases



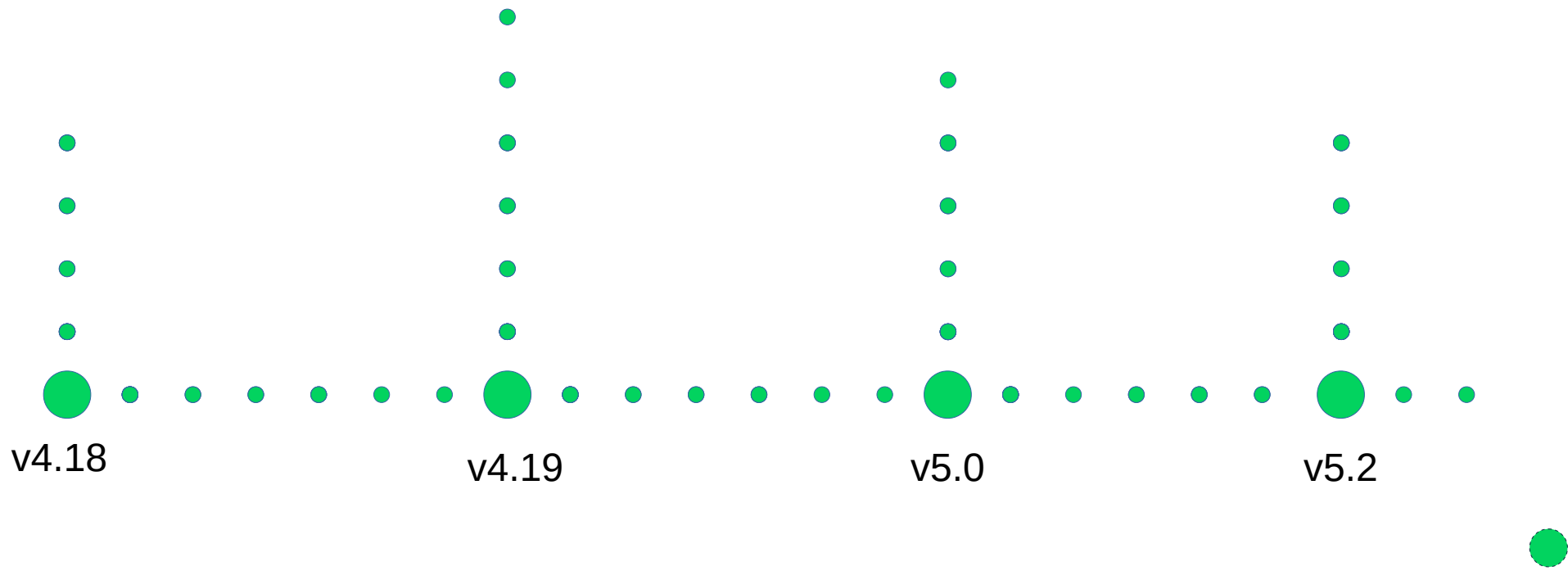
-rt releases



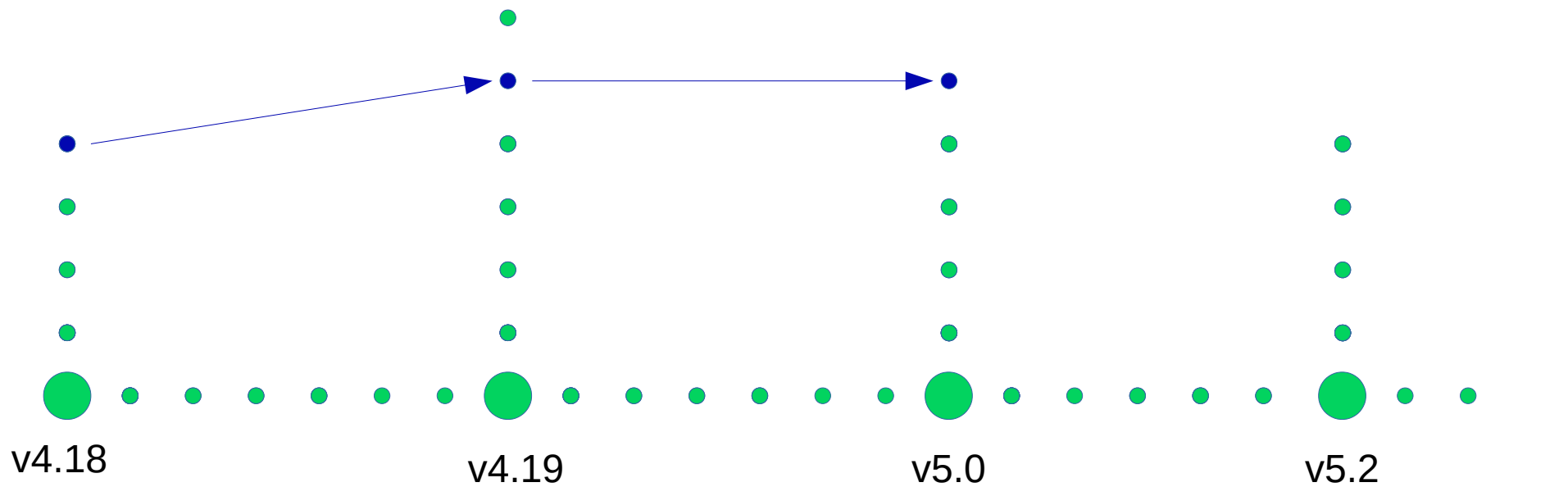
-rt releases



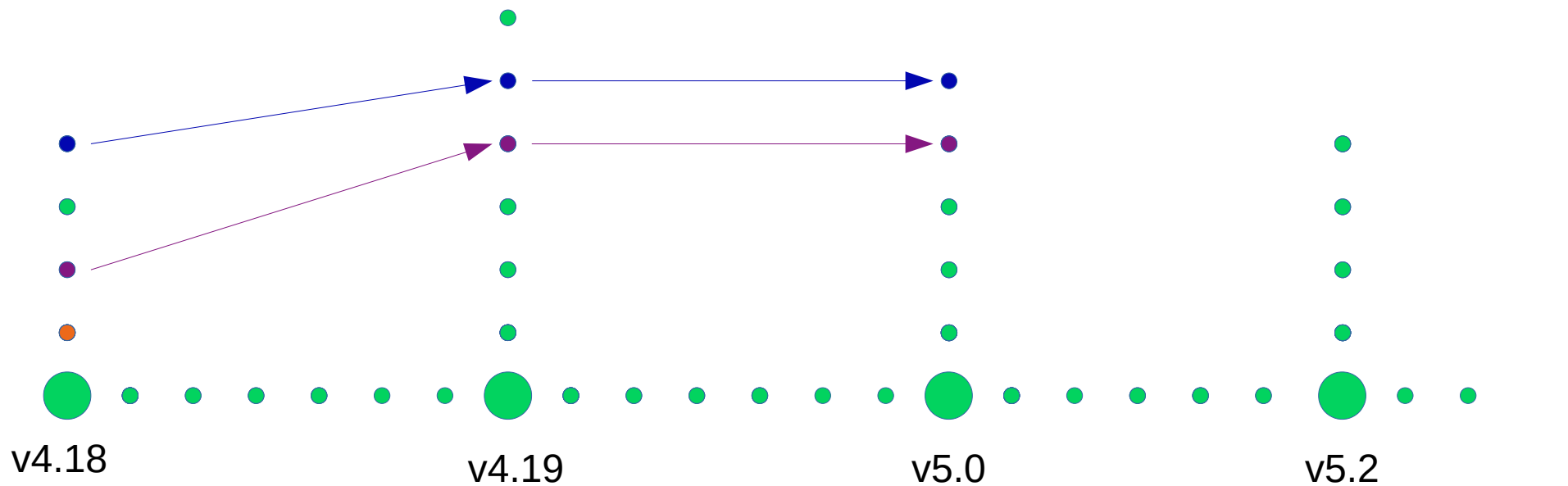
-rt releases



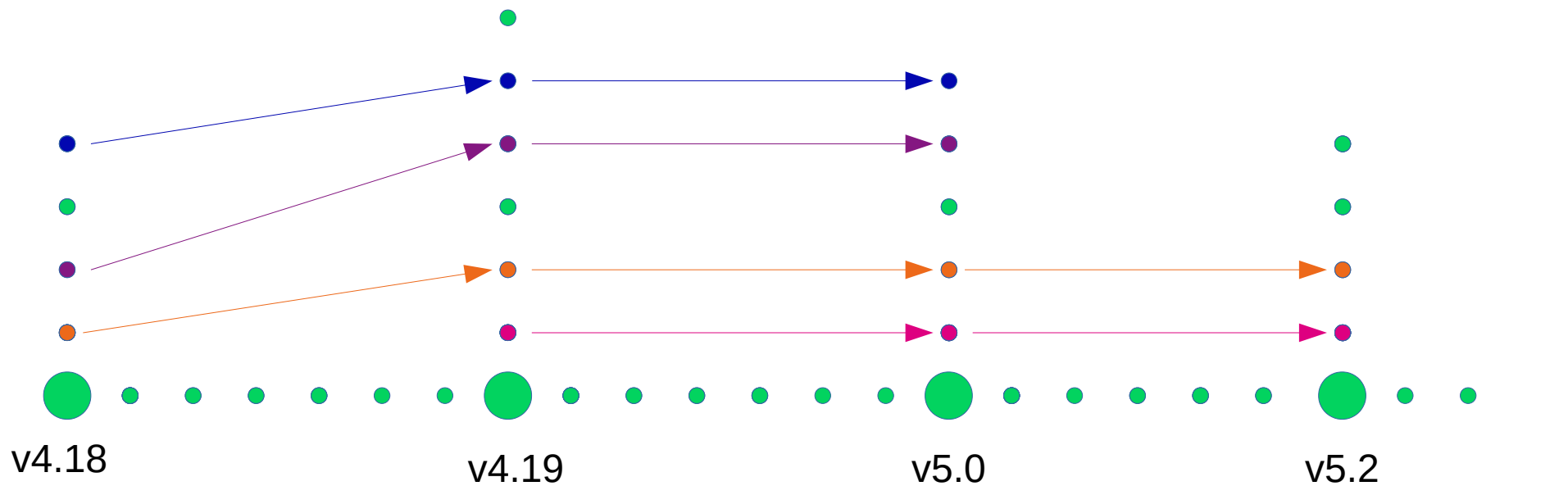
Patch flow



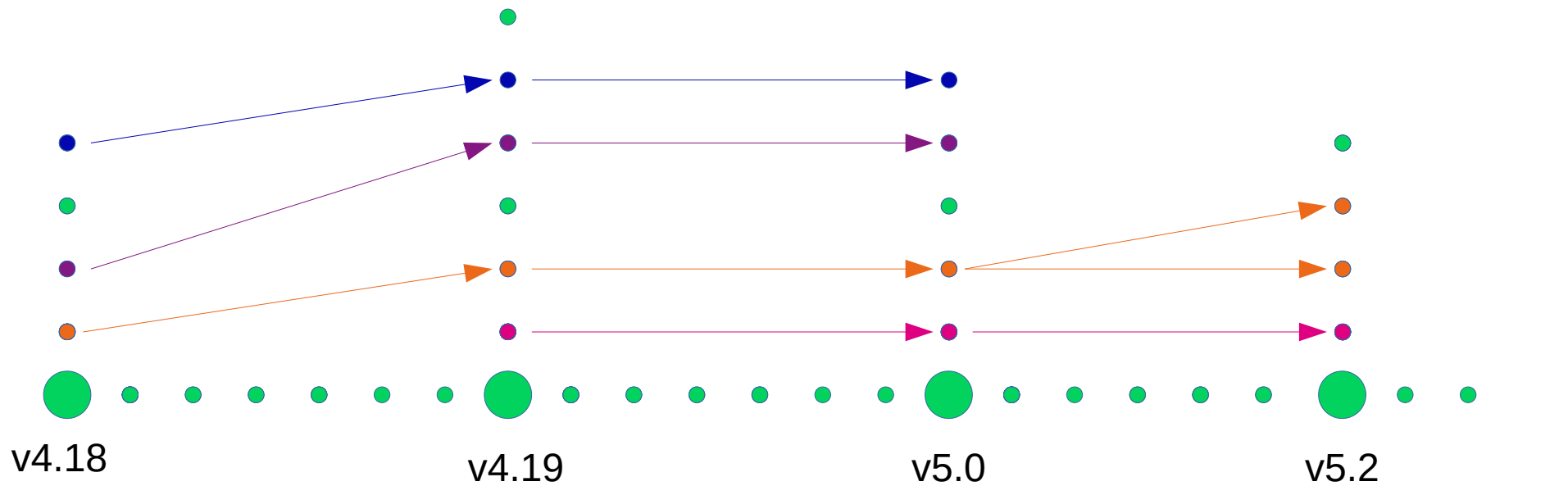
Patch flow



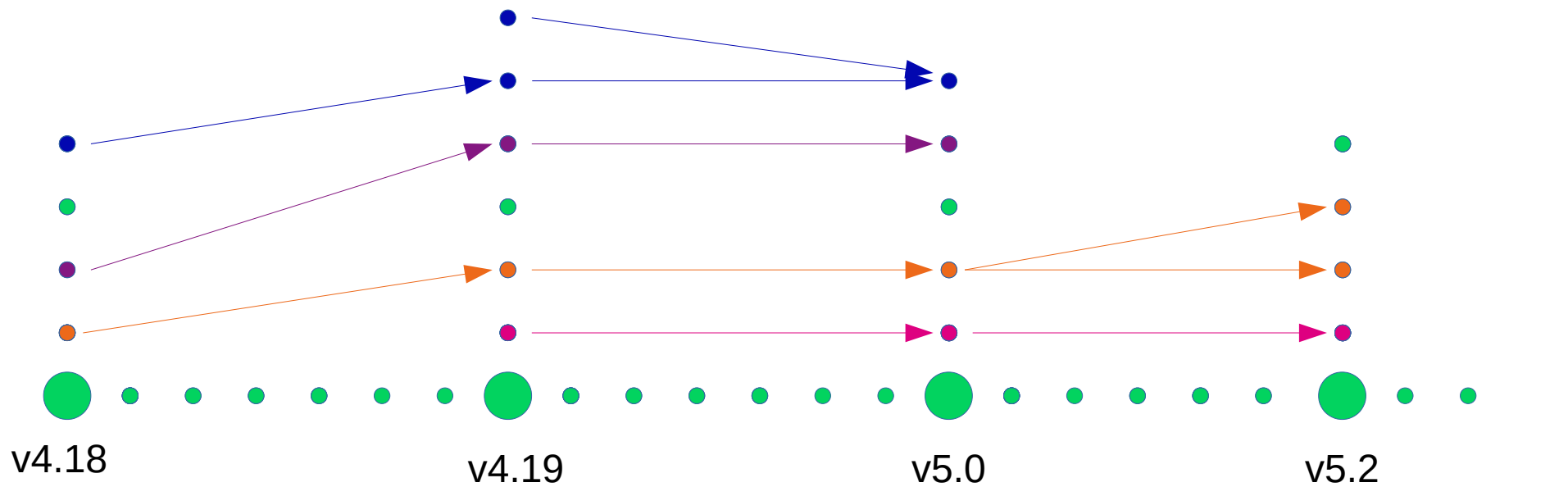
Patch flow



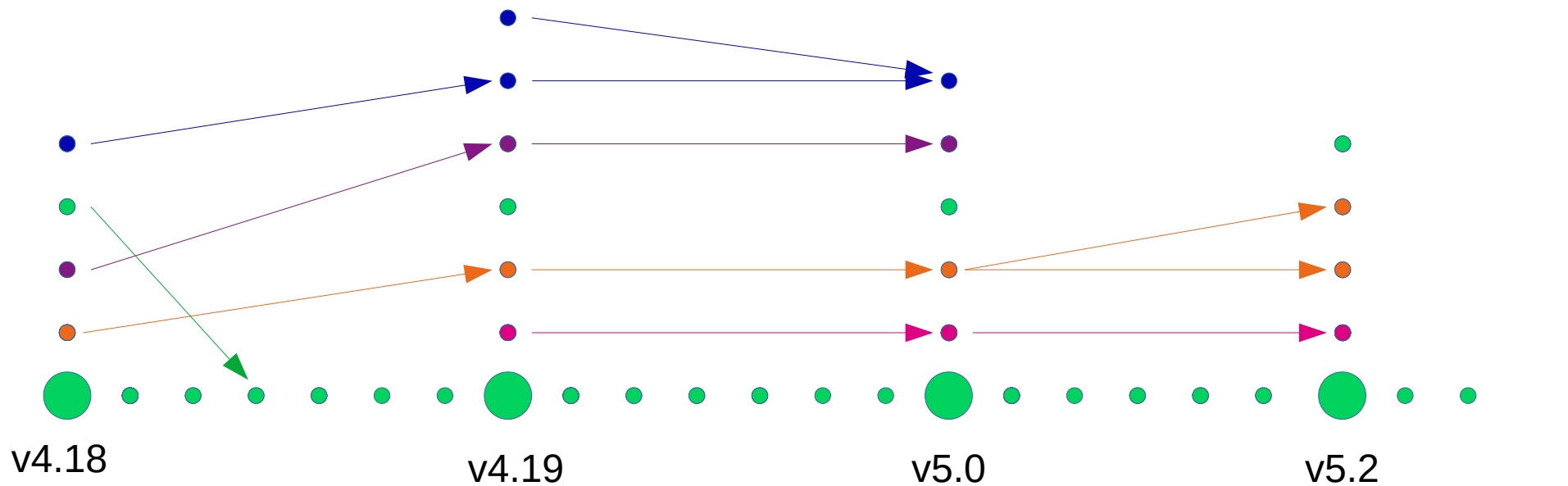
Patch split



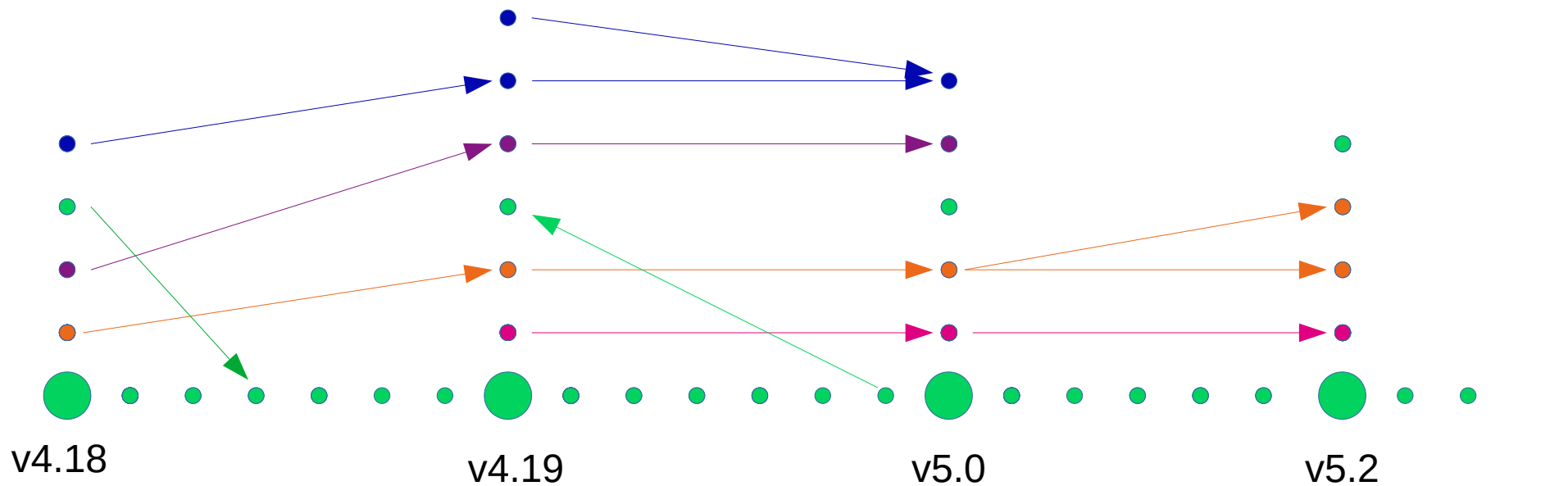
Patch merge



Upstream patch

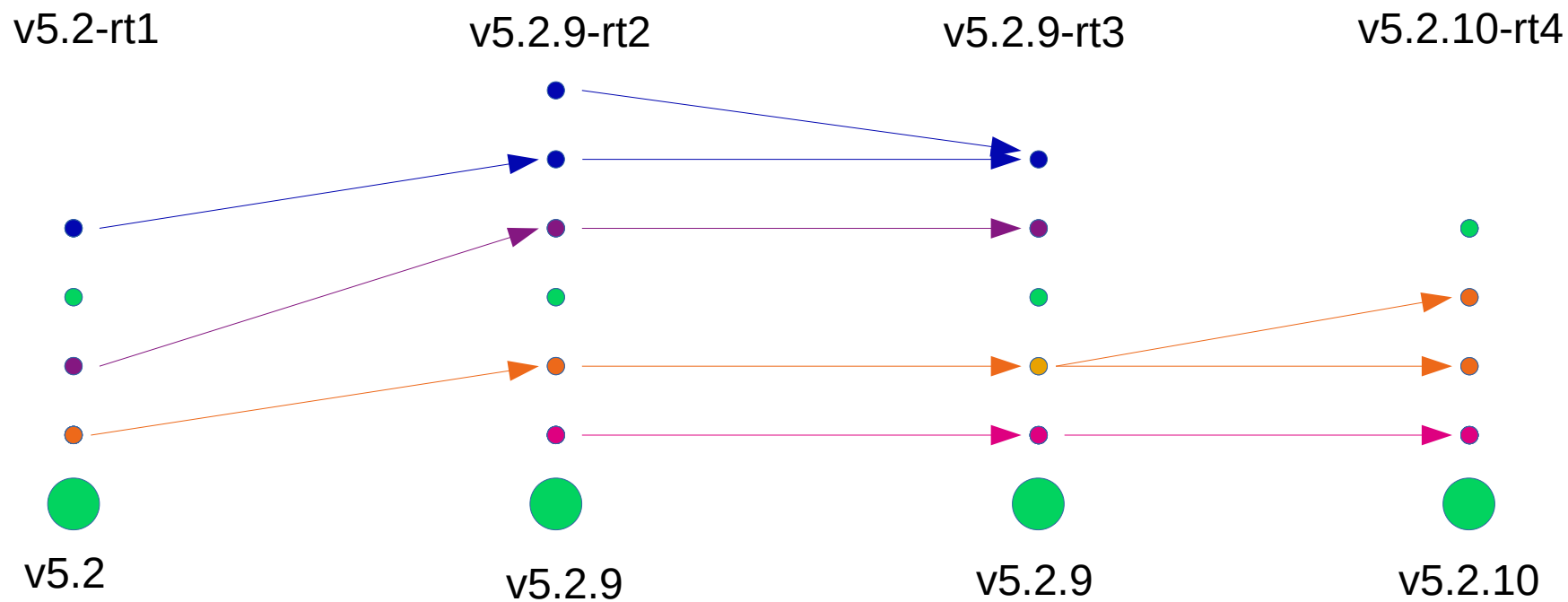


Backport patch



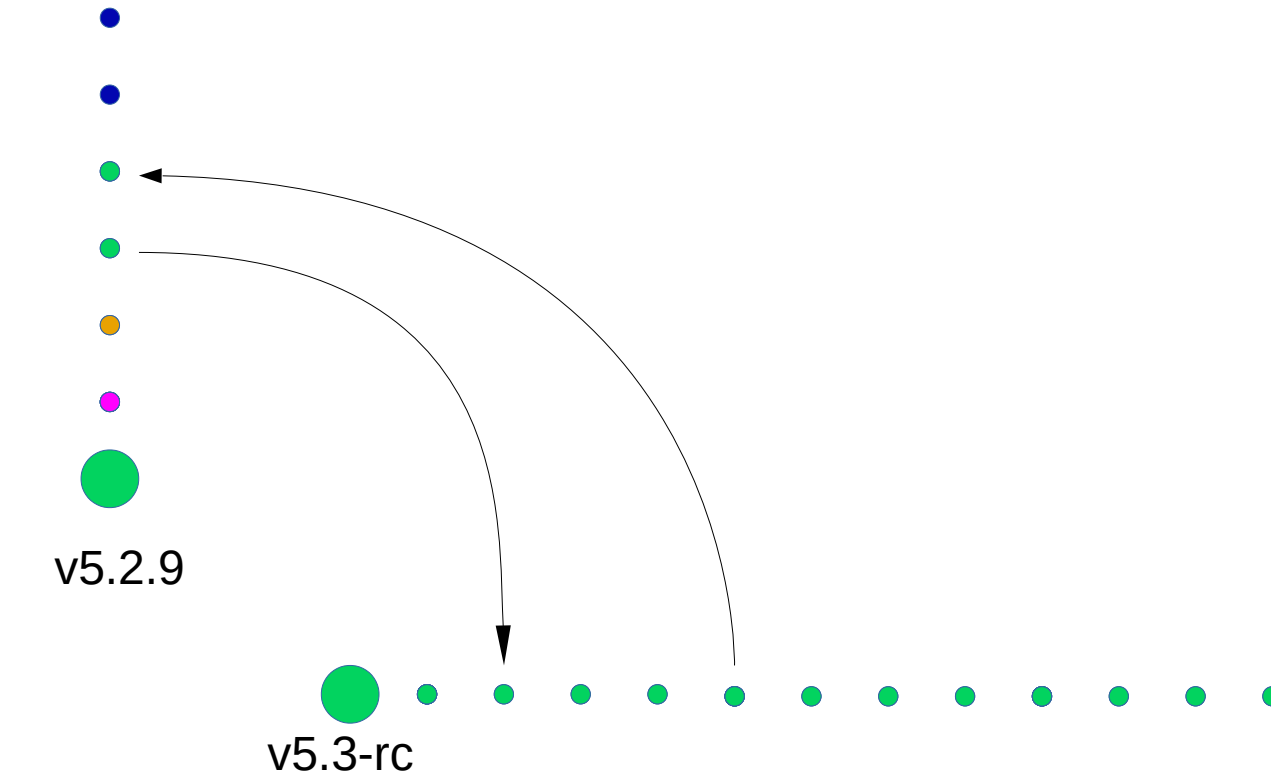
Development process

devel-rt patch flow



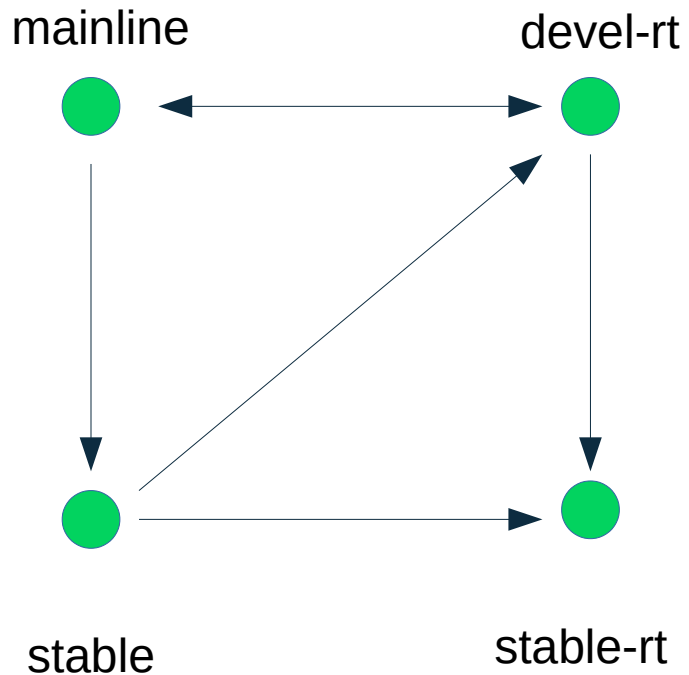
devel-rt interaction with mainline

v5.2.9-rt2



Git trees, branches and tags

Patch flows between trees



Branches

devel-rt

- origin/linux-5.2.y-rt
- origin/linux-5.2.y-rt-patches
- origin/linux-5.2.y-rt-rebase

stable-rt

- stable-rt/v4.19-rt
- stable-rt/v4.19-rt-rebase



Tag names

Example: v5.1.\$x-rt\$y

New stable release:

\$x + 1

\$y + 1

New stable-rt release:

\$y + 1

Review changes:

-rc\$z

Either update stable

OR

Change -rt patchset



stable-rt

v4.19.31-rt18



v4.19.31

v4.19.37-rt19



v4.19.37

v4.19.37-rt20



v4.19.37

v4.19.37-rt21



v4.19.37





index : kernel/git/rt/linux-rt-devel.git

The current development -RT tree

master

switch

RT group

[about](#) [summary](#) [refs](#) [log](#) [tree](#) [commit](#) [diff](#) [stats](#)

log msg

search

Branch	Commit message	Author	Age
linux-5.2.y-rt	v5.2.10-rt5	Sebastian Andrzej Siewior	7 days
for-kbuild-bot/current-stable	Add localversion for -RT release	Thomas Gleixner	7 days
for-kbuild-bot/prepare-release	Add localversion for -RT release	Thomas Gleixner	7 days
linux-5.2.y-rt-rebase	Add localversion for -RT release	Thomas Gleixner	7 days
linux-5.2.y-rt-patches	[ANNOUNCE] v5.2.10-rt5	Sebastian Andrzej Siewior	7 days
linux-5.2.y	Linux 5.2.10	Sasha Levin	9 days
linux-5.0.y-rt-rebase	Add localversion for -RT release	Thomas Gleixner	8 weeks
linux-5.0.y-rt-patches	[ANNOUNCE] v5.0.21-rt16	Sebastian Andrzej Siewior	8 weeks
linux-5.0.y-rt	v5.0.21-rt16	Sebastian Andrzej Siewior	8 weeks
master	Linux 5.2	Linus Torvalds	8 weeks
[...]			
Tag	Download	Author	Age
v5.2.10-rt5	linux-rt-devel-5.2.10-rt5.tar.gz	Sebastian Andrzej Siewior	7 days
v5.2.10-rt5-rebase	linux-rt-devel-5.2.10-rt5-rebase.tar.gz	Sebastian Andrzej Siewior	7 days
v5.2.10-rt5-patches	linux-rt-devel-5.2.10-rt5-patches.tar.gz	Sebastian Andrzej Siewior	7 days
v5.2.10-rt4	linux-rt-devel-5.2.10-rt4.tar.gz	Sebastian Andrzej Siewior	8 days
v5.2.10-rt4-rebase	linux-rt-devel-5.2.10-rt4-rebase.tar.gz	Sebastian Andrzej Siewior	8 days
v5.2.10-rt4-patches	linux-rt-devel-5.2.10-rt4-patches.tar.gz	Sebastian Andrzej Siewior	8 days



index : kernel/git/rt/linux-stable-rt.git

master

switch

Unnamed repository; edit this file 'description' to name the repository.

RT group

about summary refs log tree commit diff stats

log msg

search

Branch	Commit message	Author	Age
v4.4-rt-rebase	Linux 4.4.190-rt187 REBASE	Daniel Wagner	17 hours
v4.4-rt	Linux 4.4.190-rt187	Daniel Wagner	17 hours
v4.14-rt-rebase	Linux 4.14.139-rt66 REBASE	Tom Zanussi	11 days
v4.14-rt	Linux 4.14.139-rt66	Tom Zanussi	12 days
v4.19-rt-rebase	Linux 4.19.59-rt24 REBASE	Steven Rostedt (VMware)	6 weeks
v4.19-rt	Linux 4.19.59-rt24	Steven Rostedt (VMware)	6 weeks
v4.9-rt-rebase	Linux 4.9.178-rt131 REBASE	Julia Cartwright	3 months
v4.9-rt	Linux 4.9.178-rt131	Steven Rostedt (VMware)	3 months
v3.18-rt-rebase	Linux 3.18.140-rt117 REBASE	Tom Zanussi	3 months
v3.18-rt	Linux 3.18.140-rt117	Tom Zanussi	3 months
[...]			

Tag	Download	Author	Age
v4.4.190-rt187-rebase	linux-stable-rt-4.4.190-rt187-rebase.tar.gz	Daniel Wagner	17 hours
v4.4.190-rt187	linux-stable-rt-4.4.190-rt187.tar.gz	Daniel Wagner	17 hours
v4.14.139-rt66-rebase	linux-stable-rt-4.14.139-rt66-rebase.tar.gz	Tom Zanussi	11 days
v4.14.139-rt66	linux-stable-rt-4.14.139-rt66.tar.gz	Tom Zanussi	12 days
v4.14.137-rt65-rebase	linux-stable-rt-4.14.137-rt65-rebase.tar.gz	Tom Zanussi	14 days
v4.14.137-rt65	linux-stable-rt-4.14.137-rt65.tar.gz	Tom Zanussi	14 days
v4.4.189-rt186-rebase	linux-stable-rt-4.4.189-rt186-rebase.tar.gz	Daniel Wagner	3 weeks
v4.4.189-rt186	linux-stable-rt-4.4.189-rt186.tar.gz	Daniel Wagner	3 weeks
v4.14.137-rt64-rebase	linux-stable-rt-4.14.137-rt64-rebase.tar.gz	Tom Zanussi	4 weeks
v4.4.188-rt185-rebase	linux-stable-rt-4.4.188-rt185-rebase.tar.gz	Daniel Wagner	4 weeks

linux-5.2.y-rt

● v5.2.10-rt5 —remotes/origin/linux-5.2.y-rt v5.2.10-rt5
● clocksource: tcb_clksrc: Reference 'tc' properly
● hrtimer: Prevent using hrtimer_grab_expiry_lock() on migration_base
● hrtimer: Don't grab the expiry lock for non-soft hrtimer
● hrtimer: Use READ_ONCE to access timer->base in hrimer_grab_expiry_lock()
● v5.2.10-rt4 v5.2.10-rt4
● Merge tag 'v5.2.10' into linux-5.2.y-rt
● v5.2.10 —remotes/origin/linux-5.2.y Linux 5.2.10
● netlink: Fix nlmsg_parse as a wrapper for strict message parsing
● net: phy: consider AN_RESTART status when reading link status
● net/tls: prevent skb_orphan() from leaking TLS plain text with offload
● net/mlx5e: Use flow keys dissector to parse packets for ARFS
● net/mlx5e: Remove redundant check in CQE recovery flow of tx reporter
● net/mlx5e: Fix false negative indication on tx reporter CQE recovery
● net/mlx5e: ethtool, Avoid setting speed to 56GBASE when autoneg off
● netdevsim: Restore per-network namespace accounting for fib entries
● tc-testing: updated skbedit action tests with batch create/delete
● net sched: update skbedit action for batched events operations
● bnxt_en: Fix to include flow direction in L2 key

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Alexandre Belloni <alexandre.belloni@bootlin.com>
Julien Grall <julien.grall@arm.com>
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Somnath Kotur <somnath.kotur@broadcom.com>

2019-08-27 12:43:16
2019-08-21 18:19:34
2019-08-21 11:24:09
2019-08-21 11:24:08
2019-08-21 11:24:07
2019-08-26 13:01:51
2019-08-26 13:01:30
2019-08-25 16:13:54
2019-08-12 22:07:07
2019-08-12 21:20:02
2019-08-08 02:03:59
2019-07-05 16:59:28
2019-08-08 14:55:48
2019-08-07 14:59:06
2019-04-23 20:13:48
2019-08-06 21:15:17
2019-08-07 21:57:29
2019-08-07 21:57:28
2019-08-17 23:04:52

linux-5.2.y-rt-rebase

- tag... remotes/origin/for-kbuild-bot/current-stable remotes/origin/for-kbuild
- signals: Allow rt tasks to cache one sigqueue struct
- apparmor: use a locallock instead preempt_disable()
- cpuset: Convert callback_lock to raw_spinlock_t
- drm/i915: skip DRM_I915_LOW_LEVEL_TRACEPOINTS with NOTRACE
- drm/i915: disable tracing on -RT
- drm,i915: Use local_lock/unlock_irq() in intel_pipe_update_start/end()
- drm,radeon,i915: Use preempt_disable/enable_rt() where recommended
- watchdog: prevent deferral of watchdogd wakeup on RT
- tpm_tis: fix stall after iowrite*()s
- drivers/zram: Don't disable preemption in zcomp_stream_get/put()
- drivers/block/zram: Replace bit spinlocks with rtmutex for -rt

- printk: add ring buffer and kthread
- printk-rb: add functionality required by printk
- printk-rb: add blocking reader support
- printk-rb: add basic non-blocking reading interface
- printk-rb: add writer interface
- printk-rb: define ring buffer struct and initializer
- printk-rb: add prb locking functions
- printk-rb: add printk ring buffer documentation
- v5.2.10 remotes/origin/linux-5.2.y Linux 5.2.10
- netlink: Fix nlmsg_parse as a wrapper for strict message parsing
- net: phy: consider AN_RESTART status when reading link status
- net/tls: prevent skb_orphan() from leaking TLS plain text with offload

Thomas Gleixner <tglx@linutronix.de>	2011-07-08 20:25:16
Thomas Gleixner <tglx@linutronix.de>	2009-07-03 15:44:56
Sebastian Andrzej Siewior <bigeasy@linutronix.de>	2017-10-11 17:43:49
Mike Galbraith <efault@gmx.de>	2017-01-08 09:32:25
Sebastian Andrzej Siewior <bigeasy@linutronix.de>	2018-12-19 10:47:02
Sebastian Andrzej Siewior <bigeasy@linutronix.de>	2018-12-06 09:52:20
Mike Galbraith <umgwanakikbuti@gmail.com>	2016-02-27 09:01:42
Mike Galbraith <umgwanakikbuti@gmail.com>	2016-02-27 08:09:11
Julia Cartwright <julia@ni.com>	2018-09-28 23:03:51
Haris Okanovic <haris.okanovic@ni.com>	2017-08-15 22:13:08
Mike Galbraith <umgwanakikbuti@gmail.com>	2016-10-20 11:15:22
Mike Galbraith <umgwanakikbuti@gmail.com>	2016-03-31 04:08:28

John Ogness <john.ogness@linutronix.de>	2019-02-12 15:29:46
John Ogness <john.ogness@linutronix.de>	2019-02-12 15:29:45
John Ogness <john.ogness@linutronix.de>	2019-02-12 15:29:44
John Ogness <john.ogness@linutronix.de>	2019-02-12 15:29:43
John Ogness <john.ogness@linutronix.de>	2019-02-12 15:29:42
John Ogness <john.ogness@linutronix.de>	2019-02-12 15:29:41
John Ogness <john.ogness@linutronix.de>	2019-02-12 15:29:40
John Ogness <john.ogness@linutronix.de>	2019-02-12 15:29:39
Sasha Levin <sashal@kernel.org>	2019-08-25 16:13:54
David Ahern <dahern@gmail.com>	2019-08-12 22:07:07
Heiner Kallweit <hkallweit1@gmail.com>	2019-08-12 21:20:02
Jakub Kicinski <jakub.kicinski@netronome.com>	2019-08-08 02:03:59

Tools

Limits of tooling

Modifying Patches

- quilt
- Git,
- \$EDITOR
- BRAIN

Managing Releases

- **stable-rt-tools: Based on Steven's initial workflow [1]**
 - <https://github.com/igaw/stable-rt-tools>

[1] https://wiki.linuxfoundation.org/_media/realtime/events/rt-summit2016/how-much-stable-do-we-need_steven-rostedt.pdf

Get stable changes

```
git(v4.4-rt)$ git fetch -all
```

```
[...]
```

From <https://git.kernel.org/pub/scm/linux/kernel/git/stable/linux-stable>

```
[...]
```

```
3904234bd04f..5e9f4d704f86 linux-4.4.y -> stable/linux-4.4.y
```

```
[...]
```

```
* [new tag]                v4.4.190    -> v4.4.190
```

Find out what to merge

```
git(v4.4-rt)$ git tag -l 'v4\4\.*' --sort=v:refname | tail
```

v4.4.187
v4.4.188
v4.4.188-rt185
v4.4.188-rt185-rebase
v4.4.189
v4.4.189-rt186
v4.4.189-rt186-rebase
v4.4.190

Merge

```
git(v4.4-rt)$ git merge v4.4.190
```

```
Auto-merging net/packet/af_packet.c
```

```
Auto-merging mm/vmalloc.c
```

```
[...]
```

```
tools/perf/builtin-probe.c      | 10 ++++++++
```

```
tools/perf/util/header.c        |  9 ++++++-
```

```
tools/perf/util/thread.c        | 12 ++++++++
```

```
78 files changed, 386 insertions(+), 222 deletions(-)
```

Merge with conflict

```
git(v4.4-rt)$ git merge v4.4.190
```

Fix conflicts: Use your brain

Rebase branch

```
git(v4.4-rt-rebase)$ git rebase v4.4.190
```

First, rewinding head to replay your work on top of it...

Generating patches: 100% (396/396), done.

Applying: ARM: smp: Move clear_tasks_mm_cpumask() call...

Applying: rtmutex: Handle non enqueued waiters gracefully

Applying: sparc64: use generic rwsem spinlocks rt

[...]

Applying: posix-timers: move the rcu head out of the union

Applying: Linux 4.4.189-rt186 REBASE

Verify both branches are identically

```
git(v4.4-rt-rebase)$ git diff v4.4-rt && echo "no differences"  
no differences
```

Testing (offtopic)

```
git(v4.4-rt)$ srt-build c2d lava
```

```
[...] $ make O=/home/wagi/work/rt/build/c2d x86_64_defconfig
```

```
make[1]: Entering directory '/home/wagi/work/rt/build/c2d'
```

```
[...]
```

LAVA

[LAVA](#) / [Scheduler](#) / [Jobs](#)

All Jobs

 All Jobs

 Active Jobs

 Queued Jobs

 Healthcheck Jobs

 Job Errors

Show entries

Search 

ID ↕	Actions	State	Device ↕	Description ↕	Submitter ↕	Submit Time ↕	End Time ↕	Duration
787	  	Complete	bbb	smoke-tests	wagi	Sept.02, 7:48p.m.	Sept.02, 8:58p.m.	0:01:21
786	  	Complete	bbb	smoke-tests	wagi	Sept.02, 7:44p.m.	Sept.02, 8:56p.m.	0:01:39
785	  	Complete	bbb	smoke-tests	wagi	Sept.02, 7:40p.m.	Sept.02, 8:55p.m.	0:01:31
784	  	Complete	bbb	smoke-tests	wagi	Sept.02, 7:36p.m.	Sept.02, 8:53p.m.	0:01:26
783	  	Complete	bbb	PREEMPT_RT	wagi	Sept.02, 7:32p.m.	Sept.02, 8:51p.m.	0:06:36
782	  	Complete	bbb	PREEMPT_RT	wagi	Sept.02, 7:32p.m.	Sept.02, 8:45p.m.	0:06:36

commit and tag

```
git(v4.4-rt)$ srt commit
```

```
git commit -m Linux 4.4.190-rt187
```

```
OK to commit? (y/n): y
```

```
git(v4.4-rt)$ git tag
```

```
tagging as v4.4.190-rt187 with message 'Linux 4.4.190-rt187'
```

```
OK to tag? (y/n): y
```

commit and tag

```
git(v4.4-rt-rebase)$ srt commit
```

```
git commit -m Linux 4.4.190-rt187 REBASE
```

```
OK to commit? (y/n): y
```

```
git(v4.4-rt-rebase)$ git tag
```

```
tagging as v4.4.190-rt187-rebase with message 'Linux 4.4.190-rt187  
REBASE'
```

```
OK to tag? (y/n): y
```

Create patches

```
git(v4.4-rt)$ srt create v4.4.189-rt186 v4.4.190-rt187
```

Created the following files in [...]v4.4-rt/patches/v4.4.190-rt187

[...]v4.4-rt/patches/v4.4.190-rt187/patch-4.4.190-rt187.patch.xz

[...]/v4.4-rt/patches/v4.4.190-rt187/patches-4.4.190-rt187.tar.xz

Review them

Sign patches

```
git(v4.4-rt)$ srt sign v4.4.189-rt186 v4.4.190-rt187
```

Upload patches

```
git(v4.4-rt)$ srt upload v4.4.189-rt186 v4.4.190-rt187
['kup',
 'put',
 '[...]v4.4-rt/patches/v4.4.190-rt187/patch-4.4.190-
 '--',
 [...],
 'ls',
 '/pub/linux/kernel/projects/rt/4.4']
OK to commit? (y/n):
```

Push git commits

```
git(v4.4-rt)$ srt push v4.4.189-rt186 v4.4.190-rt187
```

Dry run

To gitolite.kernel.org:pub/scm/linux/kernel/git/rt/linux-stable-rt

```
12dd762f155a..fe150dfd33d9 v4.4.190-rt187^{} -> v4.4-rt  
+ 36b591d064b0...c686d20ebe5e v4.4.190-rt187-rebase^{} -> v4.4-rt-  
rebase (forced update)
```

```
* [new tag]          v4.4.190-rt187 -> v4.4.190-rt187
```

```
* [new tag]          v4.4.190-rt187-rebase -> v4.4.190-rt187-rebase
```

OK to push? (y/n):

Announce

```
git(v4.4-rt)$ srt announce v4.4.189-rt186 v4.4.190-rt187 >  
/tmp/announce.txt
```

```
git(v4.4-rt)$ head /tmp/announce.txt
```

From: Daniel Wagner <wagi@monom.org>

Subject: [ANNOUNCE] 4.4.190-rt187

Data: Tue, 03 Sep 2019 07:40:28 -0000

To: LKML <linux-kernel@vger.kernel.org>, linux-rt-users <linux-rt-users@vger.kernel.org>

Hello RT Folks!

I'm pleased to announce the 4.4.190-rt187 stable release.

Summary: Just updates

git(v4.4-rt) \$ **git merge v4.4.190 [fixup conflicts]**

git(v4.4-rt-rebase) \$ **git rebase v4.4.190 [fixup conflicts]**

[testing]

git(v4.4-rt|v4.4-rt-rebase) \$ **srt commit**

git(v4.4-rt|v4.4-rt-rebase) \$ **srt tag**

git(v4.4-rt) \$ **srt create v4.4.189-rt186 v4.4.190-rt187**

git(v4.4-rt) \$ **srt sign v4.4.189-rt186 v4.4.190-rt187**

git(v4.4-rt) \$ **srt upload v4.4.189-rt186 v4.4.190-rt187**

git(v4.4-rt) \$ **srt push v4.4.189-rt186 v4.4.190-rt187**

git(v4.4-rt) \$ **srt announce v4.4.189-rt186 v4.4.190-rt187**

Release candidates

[back port]

[testing]

```
git(v4.4-rt|v4.4-rt-rebase) $ srt commit -r 1
```

```
git(v4.4-rt|v4.4-rt-rebase) $ srt tag
```

```
git(v4.4-rt) $ srt create v4.4.190-rt187 v4.4.190-rt188-rc1
```

```
git(v4.4-rt) $ srt sign v4.4.190-rt187 v4.4.190-rt188-rc1
```

```
git(v4.4-rt) $ srt upload v4.4.190-rt187 v4.4.190-rt188-rc1
```

```
git(v4.4-rt) $ srt push v4.4.190-rt187 v4.4.190-rt188-rc1
```

```
git(v4.4-rt) $ srt announce v4.4.190-rt187 v4.4.190-rt188-rc1
```

