

# The Status of the Preempt-RT Patch

## Embedded Linux Conference Europe 2017

**Sebastian A. Siewior**

Linutronix GmbH

**October 24, 2017**

① Overview

② The patchqueue

③ Summary

**1 Overview**

2 The patchqueue

3 Summary

## What is PREEMPT-RT

- ❏ A patchset provided for certain kernels
- ❏ Provides realtime functionality
- ❏ Preempts softirq, spinlocks, IRQ-off regions
- ❏ “Is super deterministic, not super fast”

## PREEMPT-RT

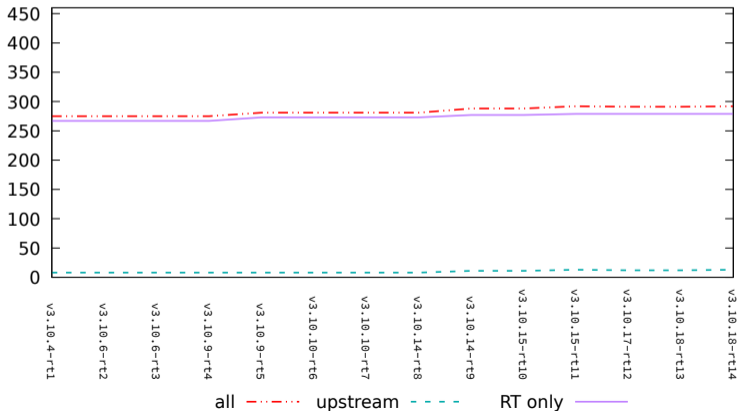
- ❏ **Project was without funds for a few years**
- ❏ **LF announced RTL Collaborative Project in October 2015**
- ❏ **Documentation**  
<https://rt.wiki.kernel.org>  
<https://wiki.linuxfoundation.org/realtime/start>
- ❏ **Testing**  
<https://ci-rt.linutronix.de>

① Overview

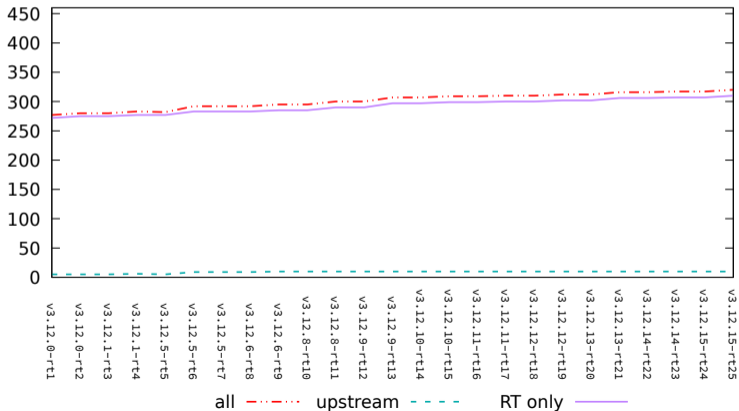
② **The patchqueue**

③ Summary

v3.10

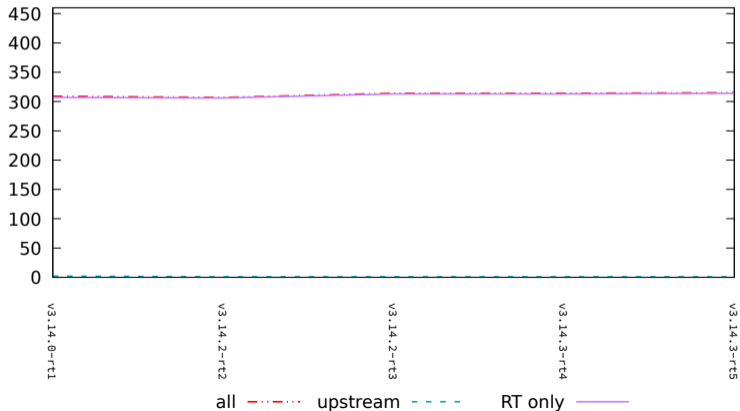


v3.12

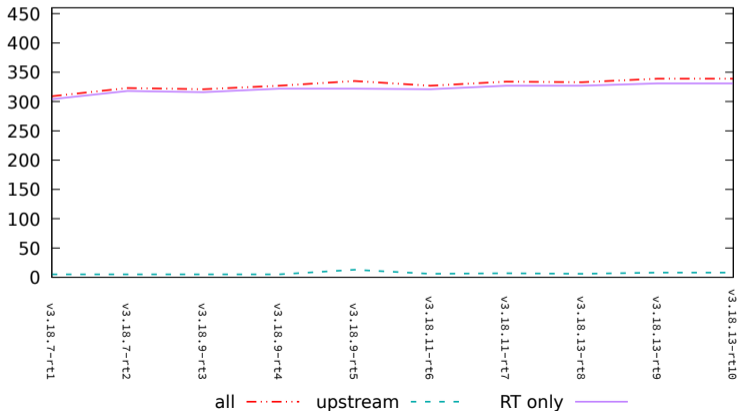




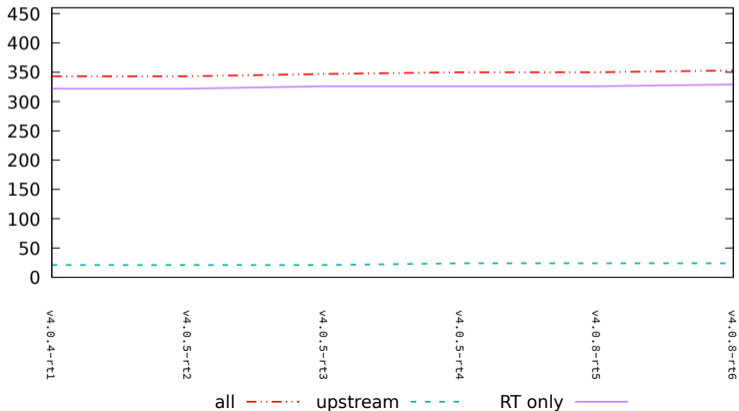
v3.14



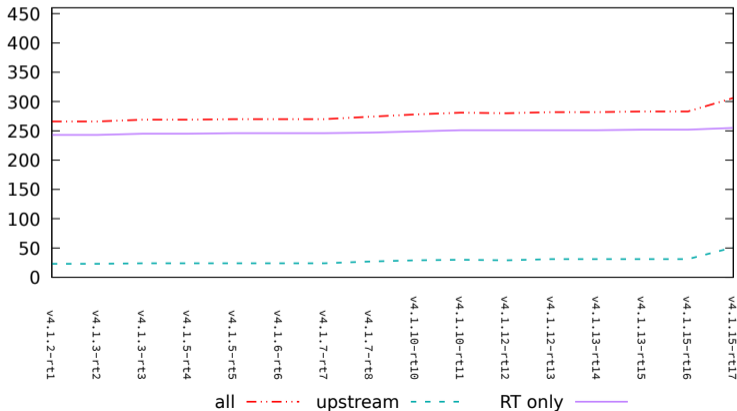
v3.18



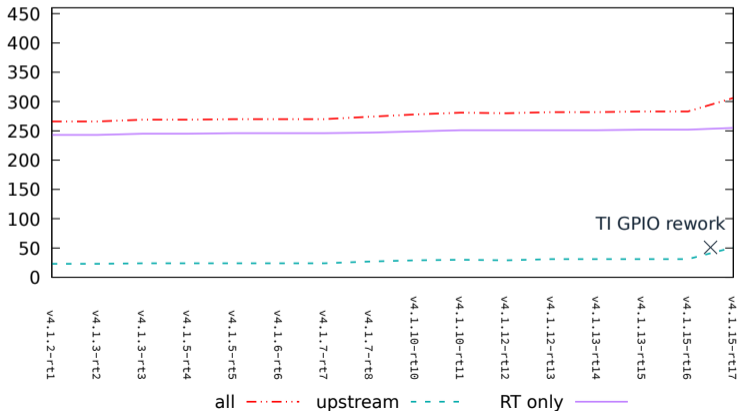
v4.0



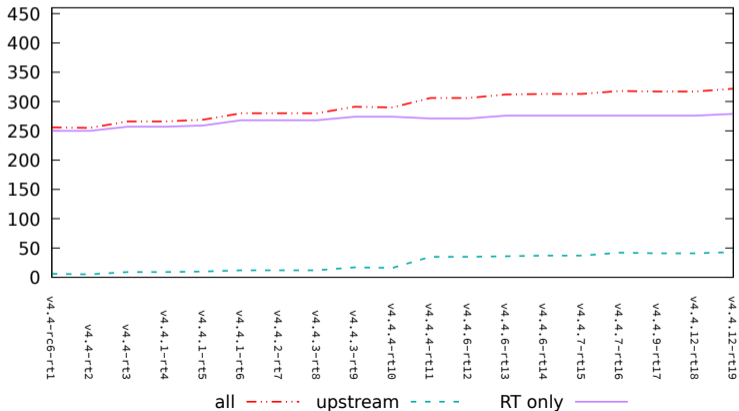
v4.1



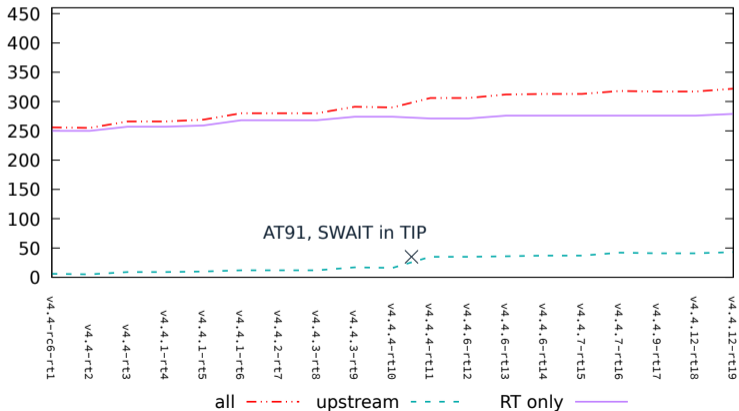
v4.1



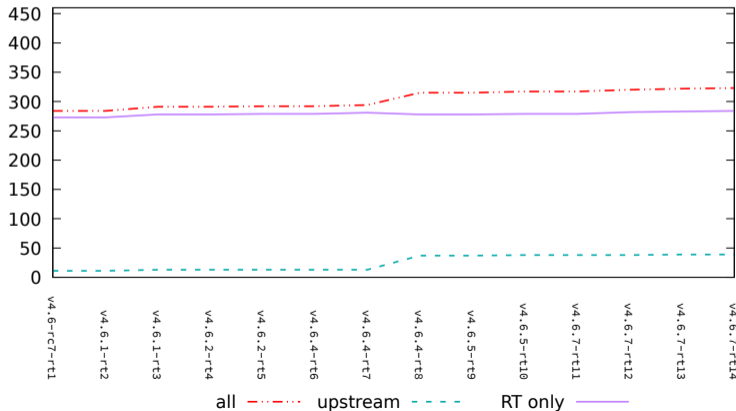
## v4.4



v4.4

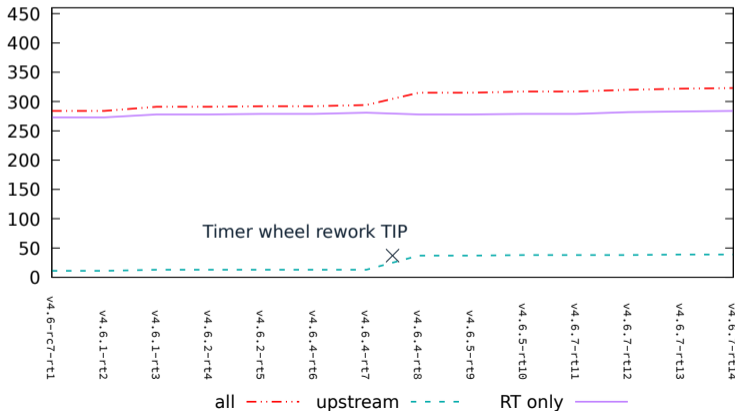


## v4.6

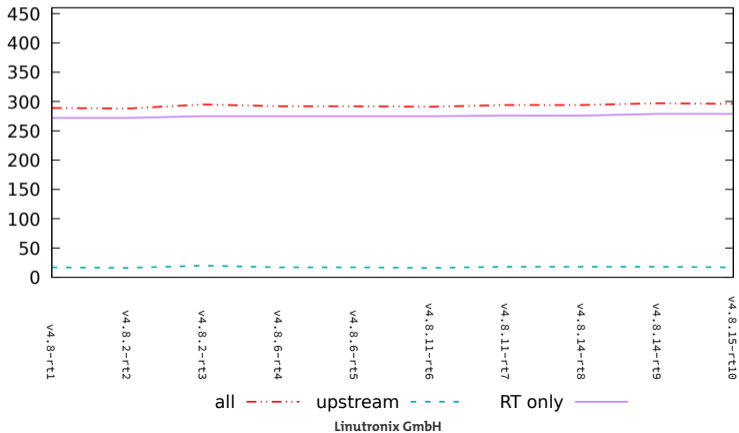




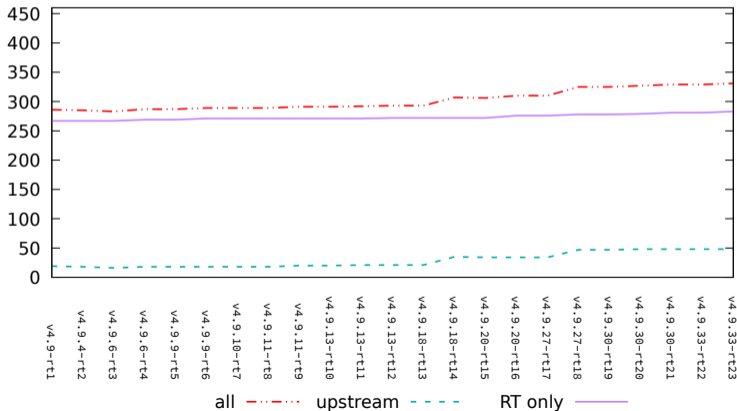
v4.6



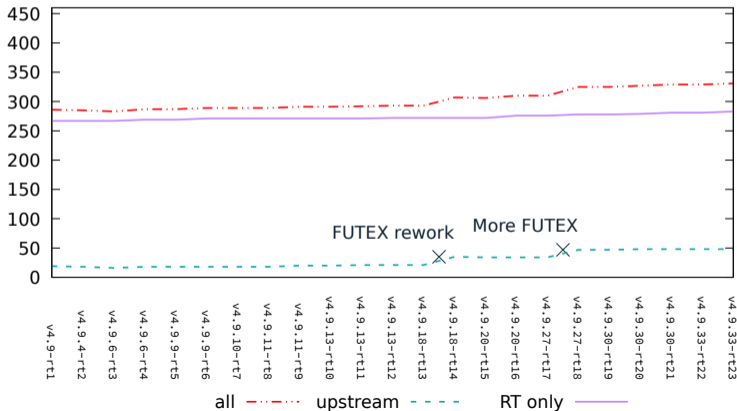
## v4.8



## v4.9



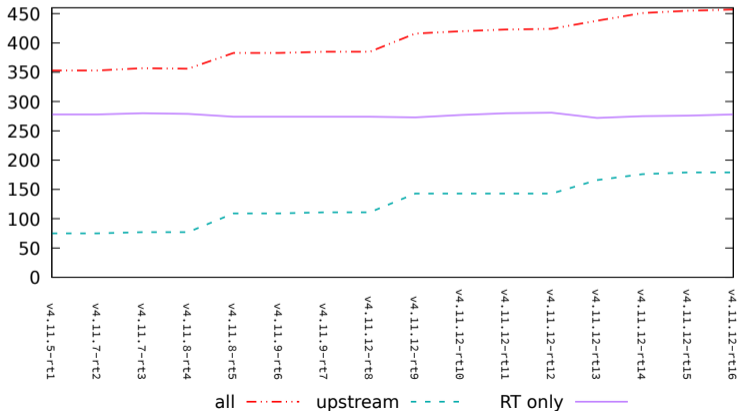
## v4.9



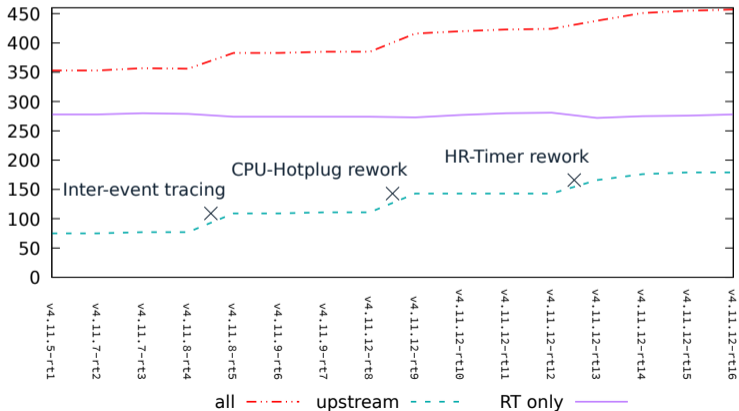
FUTEX rework

More FUTEX

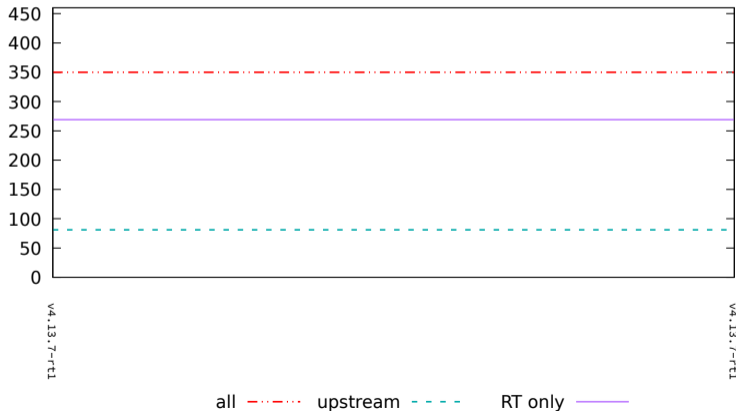
## v4.11



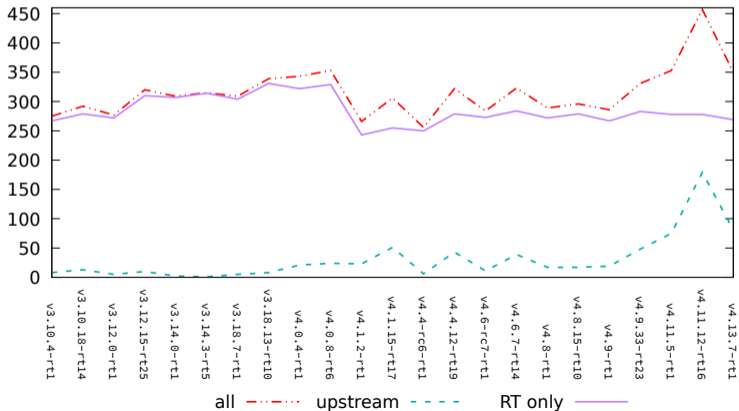
v4.11



v4.13

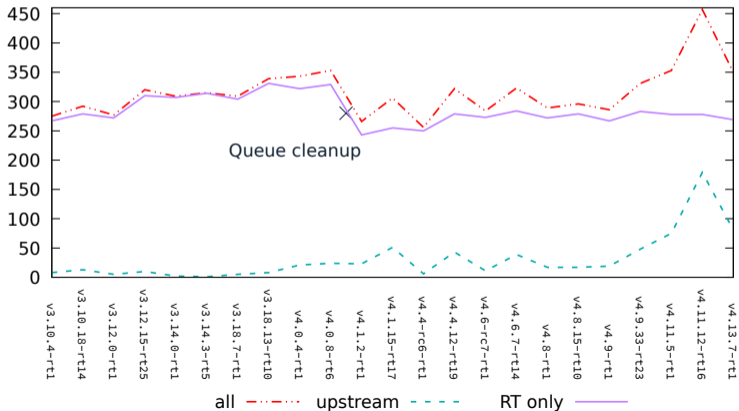


## Summary





## Summary



① Overview

② The patchqueue

③ Summary

## The focus during development

- ❏ v4.4 to v4.9 RT was mostly quiet
- ❏ Focus on upstream and CPU hotplug
- ❏ A few attempts were made in v4.9, finally in v4.11
- ❏ The strategy changed a few times within RT

## What RT version gets released

- ☞ Starting with v4.4 every other version
- ☞ Once Greg-KH decides to make a different LTS, we follow that
- ☞ So we got RT for v4.8 and v4.9
- ☞ we continue every other version until Greg-KH ...
- ☞ ...v4.13 and v4.14

## What RT versions are maintained

- ❏ Basically every supported upstream kernel
- ❏ Steven Rostedt maintains most of them
- ❏ Julia Cartwright maintains the v4.1 tree
- ❏ "Features" are hardly backported, mostly fixes

## Major pieces

- ❏ Page fault disable by s/390
- ❏ timer wheel rework, made NO\_HZ\_FULL work
- ❏ CPU hotplug rework, started around v4.1
- ❏ hrtimer rework (pending).
- ❏ Tom Zanussi's "tracing: Inter-event (e.g. latency) support" (pending).

## Tiny pieces

- 📦 FUTEX rework. Closes PI-deboost problems, unbreaks SCHED\_DEADLINE
- 📦 RW-Semaphore rework (unbreaks the radeon driver)
- 📦 RW-Lock rework. Helps CPU hotplug
- 📦 Fix for a bug exploited by GDB
- 📦 A lot driver and subsystem across tree.

## Outstanding pieces

- ❏ MM bits. Shorter atomic sections in buddy / SLUB
- ❏ migrate disable
- ❏ local lock
- ❏ network bits
- ❏ printk, serial drivers
- ❏ signal delivery
- ❏ bit spinlocks / list\_bl
- ❏ RCU



## Outstanding pieces

- ❏ simple wait queues
- ❏ dcache try loops and `cpu_chill()`
- ❏ workqueue locking
- ❏ crypto, FPU sections
- ❏ sleeping spinlocks
- ❏ softirq bits
- ❏ various driver patches

## Required patches vs nice to have

- ☒ **Required features**
  - Sleeping spin locks
- ☒ **Nice to have**
  - lazy preempt support
- ☒ **Should have but...**
  - preempt disabling handling, WARN\_ON

**Thank you for your attention**

## Contact

**Linutronix GmbH**  
**Sebastian A. Siewior**  
**Auf dem Berg 3**  
**88690 Uhltingen**  
**Germany**  
**eMail [bigeasy@linutronix.de](mailto:bigeasy@linutronix.de)**