

# GKI Adoption Experience

Elliot Berman <[quic\\_eberman@quicinc.com](mailto:quic_eberman@quicinc.com)>

Qualcomm Innovation Center, Inc.



1. GKI 1.0 Comments
2. Full GKI Commercialization Comments
3. Future of GKI @ Qualcomm Innovation Center
4. Out-of-Tree Module Challenges

# Agenda

# GKI 1.0 Comments

v5.4 - 2020 Development Cycle

- Compliance testing with a GKI image
- Shipping devices with a diverged vendor kernel

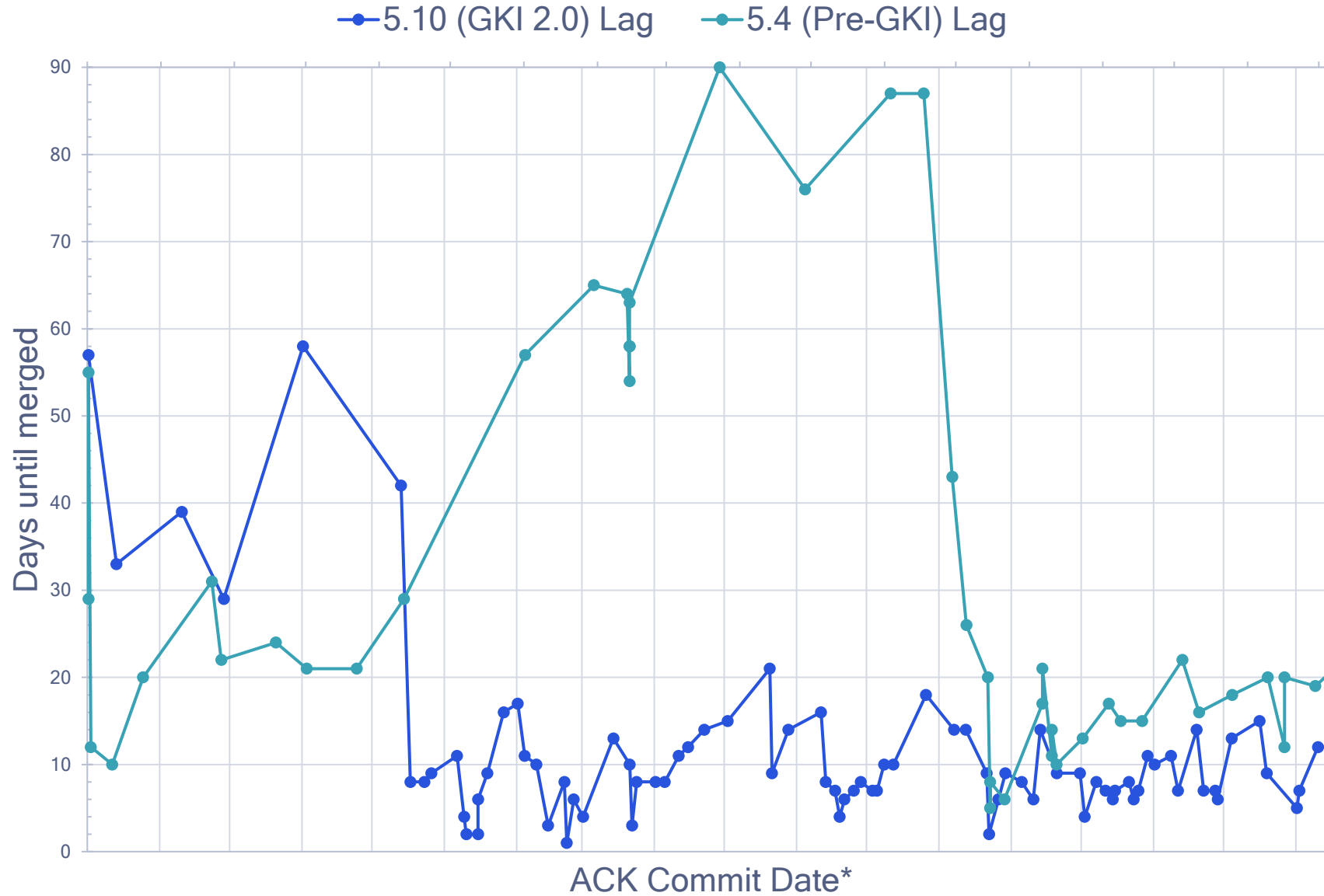
# GKI 2.0 Comments

v5.10 - 2021

- Still using full kernel tree for vendor contributions
  - “Mixed build” - two full kernel trees: vmlinux from ACK; KOs from msm-kernel
- Embargoed changes challenges
  - Diverged kernel for approx. 3 months after launch which contain embargoed changes that we couldn't release until device launches
  - Currently shipping Android Common Kernel GKI kernels for 5.10 and using public download boot.img\*
- Security patches integrated quickly without any issues (e.g. Spectre-BHB)

\* boot.img still needs to be signed by device vendor for Verified Boot

# LTS Integration Lag



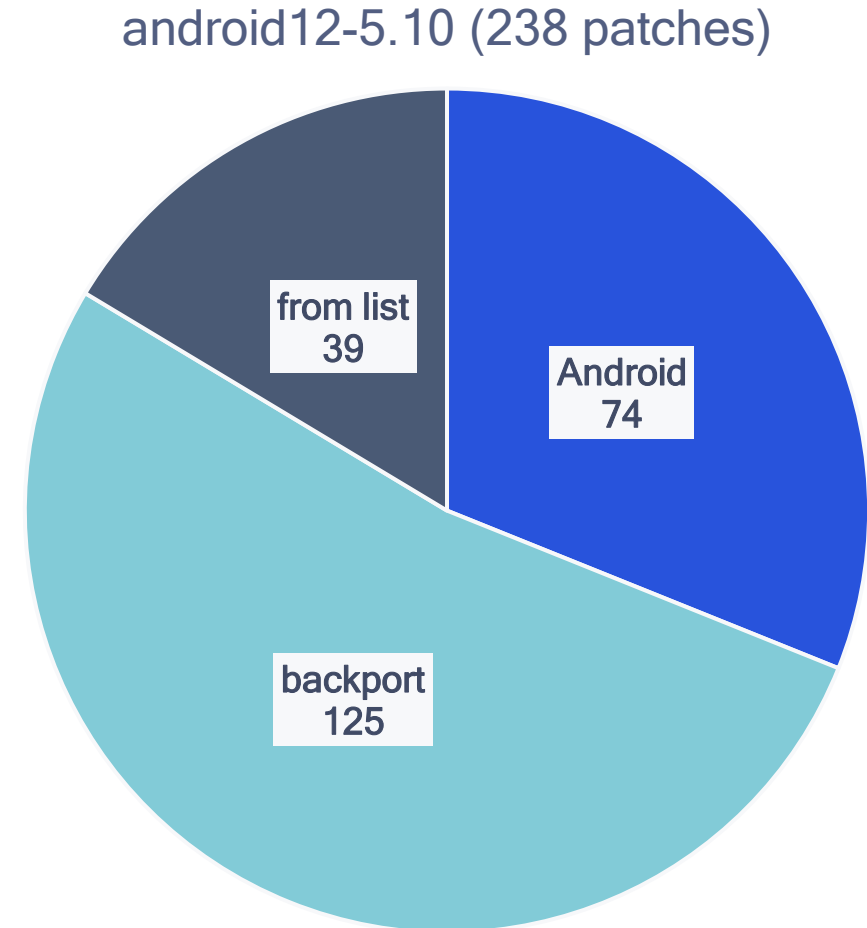
Increased LTS merge frequency!

Smaller lag between ACK and msm-5.10!

- 84 merges in 5.10 kernel
- 46 in similar period for 5.4 kernel
- Average Delay: 8.3 days
- 25.5 days for msm-5.4

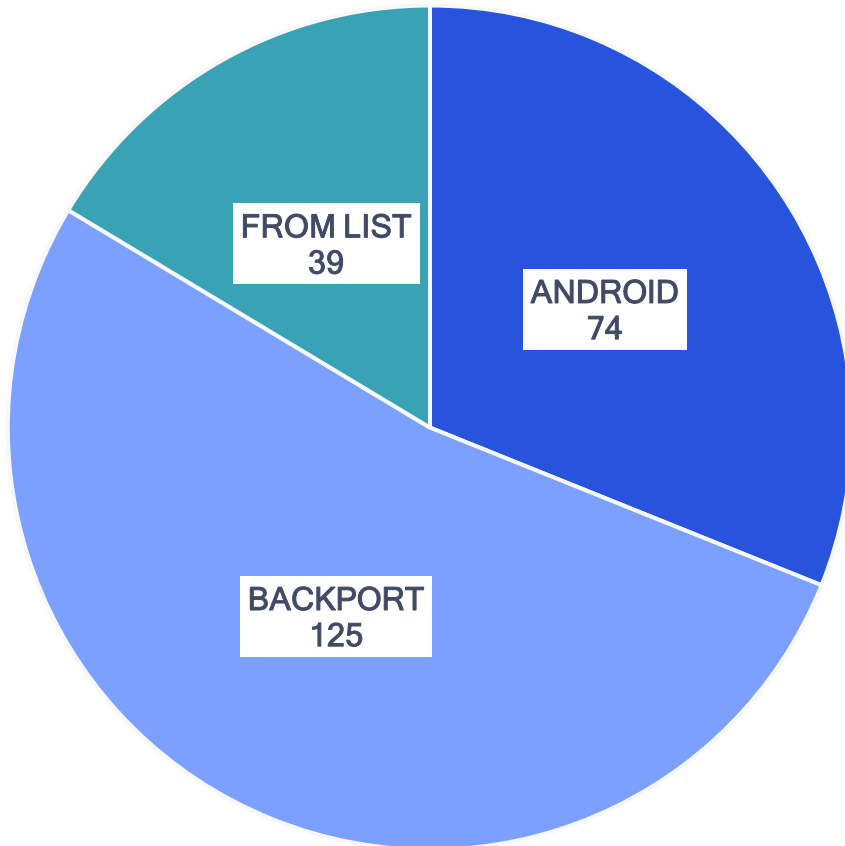
# Our Upstream Contributions to Core Kernel

- ~125 contributions copied from kernel.org trees
  - 125 contributions would have otherwise been divergent changes carried in msm-5.10
  - Most active areas: USB, SCSI/UFS, iommu
- 39 contributions copied from mailing lists
  - Many ultimately accepted
  - “FROMLIST” happens when we urgently need change
- ~74 divergent changes
  - Excludes various GKI-specific changes such as vendor hooks, symbol exports, modifications to gki\_defconfig
  - Most active areas: mm, scheduler

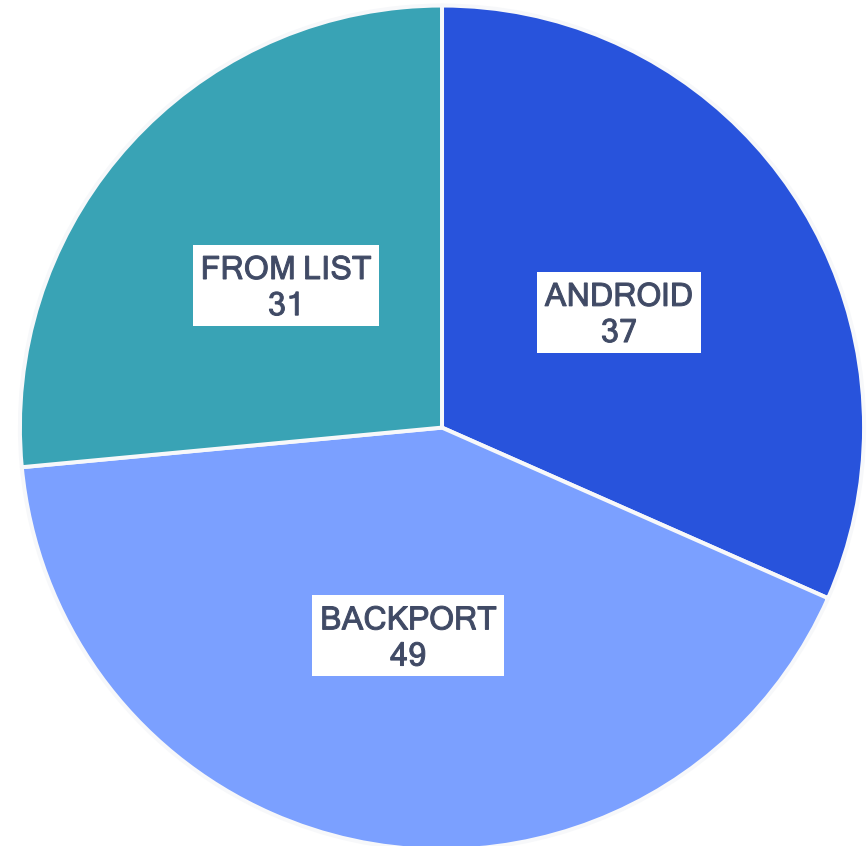


# Our Upstream Contributions to Core Kernel

android12-5.10 (238 commits)



android13-5.15 (117 commits)



# Future of GKI @ Qualcomm Innovation Center

- Exploring outside mobile use cases
- Challenges for those use cases:
  - GKI not yet mandated
  - Optimizing GKI for low memory devices
  - Maintaining boot performance indicators
  - Need to upstream first
- Exploring moving leaf drivers into an entirely out-of-tree project and consume Android Common Kernel without a complete vendor kernel tree



# Out-of-Tree Module Challenges

- Kconfig
  - Working w/Google to solve this in Android Common Kernel
- Devicetree
  - Working w/Google to solve this in Android Common Kernel
- Output control
  - kernel src -> out of tree source  
has to be the same as:  
kernel out -> out of tree output
  - Solved independently by being careful with output trees

# Thank you

**Qualcomm**

Follow us on: [in](#) [twitter](#) [instagram](#) [youtube](#) [facebook](#)

For more information, visit us at:

[qualcomm.com](http://qualcomm.com) & [qualcomm.com/blog](http://qualcomm.com/blog)

Nothing in these materials is an offer to sell any of the components or devices referenced herein.

©2018-2022 Qualcomm Technologies, Inc. and/or its affiliated companies. All Rights Reserved.

Qualcomm is a trademark or registered trademark of Qualcomm Incorporated. Other products and brand names may be trademarks or registered trademarks of their respective owners.

References in this presentation to "Qualcomm" may mean Qualcomm Incorporated, Qualcomm Technologies, Inc., and/or other subsidiaries or business units within the Qualcomm corporate structure, as applicable. Qualcomm Incorporated includes our licensing business, QTL, and the vast majority of our patent portfolio. Qualcomm Technologies, Inc., a subsidiary of Qualcomm Incorporated, operates, along with its subsidiaries, substantially all of our engineering, research and development functions, and substantially all of our products and services businesses, including our QCT semiconductor business.