

# Zephyr Retro-and-Propective

Project Growth, Long Term Support, and Linux Interoperability

Chris Friedt  
Embedded SWE, Meta



# Agenda

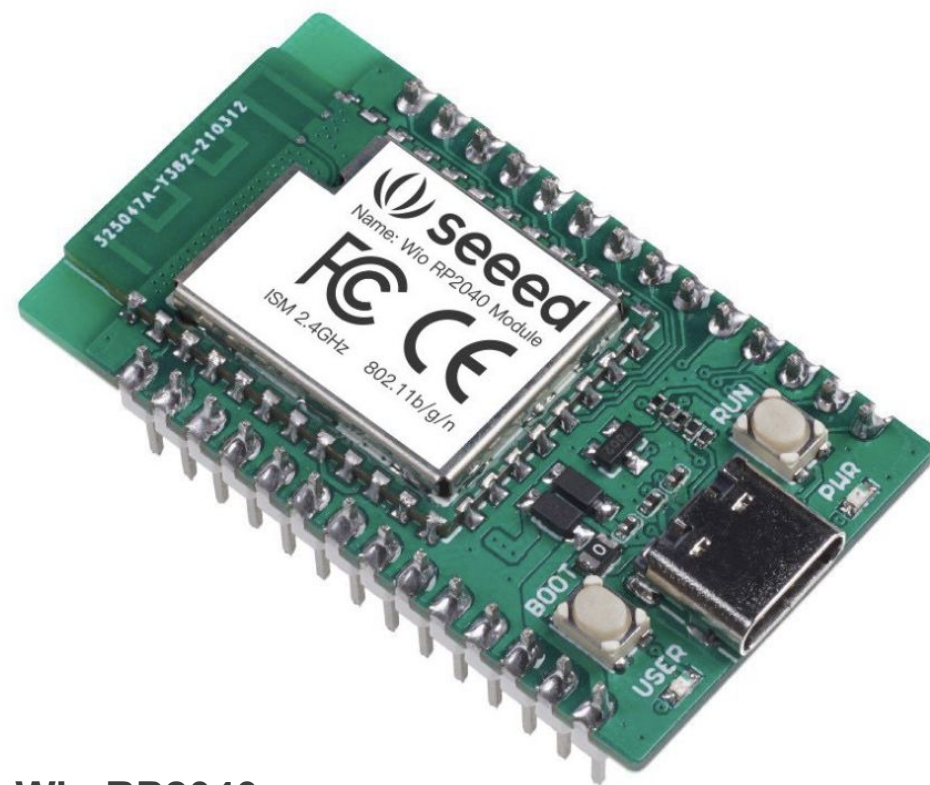
01 Zephyr Highlights 2019-2023

02 Devices, Members, Growth

03 LTSv2 to LTSv3 Transition

04 Looking forward

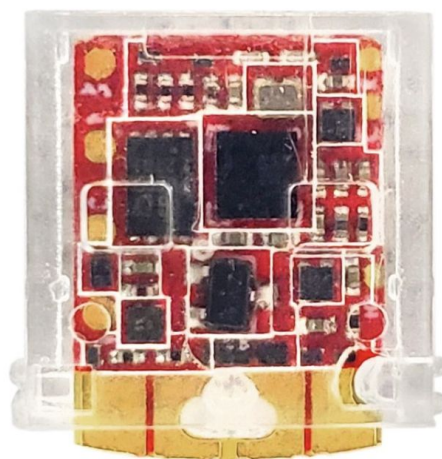




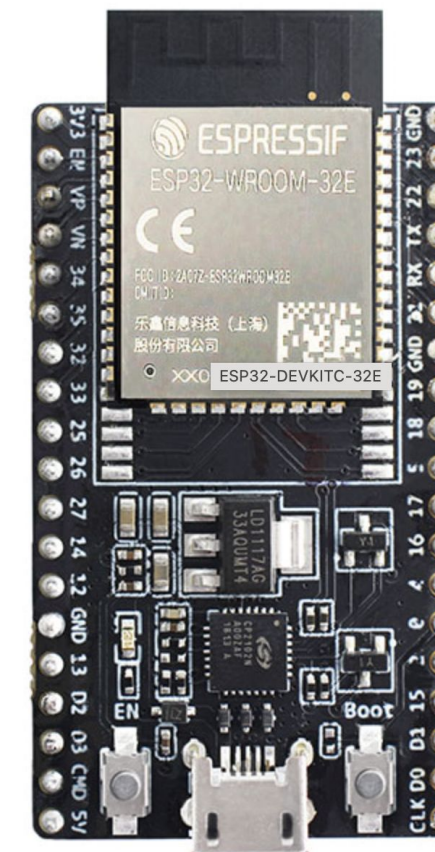
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<https://bit.ly/3ugAWN1>



Fomu  
<https://bit.ly/49DEOYM>  
<https://bit.ly/3MIDEBq>



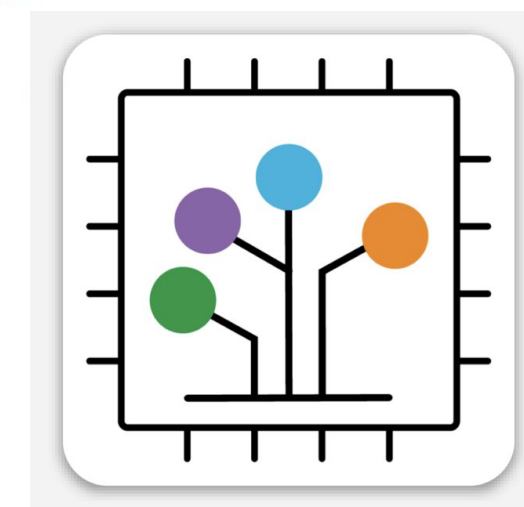
Qomu  
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ESP32 WROOM 32E  
<https://bit.ly/3sBiUod>



Raspberry Pi Pico  
<https://bit.ly/3sIZWfk>



# 01 Zephyr Highlights 2019-2023



## Between v2.0.0 and v3.5.0

- 64-bit arch support 🎉
- ARM Cortex-R 💪, RISC-V-64 added 🖐️
- PPP, 6LoCAN 🌐
- ARMv6-M added 💪
- New TCP stack (tcp2) 🌐
- BLE stack support for Vega Board
- ARMv8-A added 💪
- CANOpen, LoRa, GPIO API rewrite
- Hierarchical Devicetree API 🌳
- k\_heap / sys\_heap allocator 🍿
- TF-M Framework integration 🗝️
- BLE Advertising extensions 🎧
- CMSIS-DSP library added 💪
- Virtual Memory 🍿
- BLE periodic and isochronous advertising 🎧
- tcp2 stack by default 🌐
- LLVM Toolchain Support 🛠️
- ISO C99 integer types 

1	2
3	4
- SPARC arch added ✨
- TLS Support 🍿
- Per-thread runtime stats 📊
- Condition Variables added 🍿
- Demand Paging added 🍿
- 64-bit ARCv3 added ⚡
- Aarch64 split from ARM 💪
- ARMv8.1-M, Cortex-M55 💪
- Tracing overhaul 🍿
- Power Management 🔋
- Example application (module) 🧩

## Between v2.0.0 and v3.5.0 (continued..)

- BLE Audio, Direction Finding, Mesh improvements 🎧
- BLE Advertisement PDU chaining 🎧
- armclang / armlinker toolchain 🛠️
- MWDt C/C++ toolchain 🛠️
- M-Profile Vector Extensions 💪
- Improved thread safety with Newlib for C++ applications ©
- IEEE 802.15.4 address filtering 🌐
- USB Device Chapter 9 Definitions 🚌
- RISC-V Tightly Coupled Memory (TCM) 🖐️
- Improved PCIe / MSI-X support 🖥️
- mDNS Service Discovery 🌐
- Thread awareness for OpenOCD 🧵
- <zephyr/..> header prefix ©
- Many networking improvements
- Support for sysbuild 🏗️
- Support for picolibc ©
- Apache Thrift module (GSoC 2022) 📞
- USB-C Device Stack with PD 🚌
- DSP Subsystem
- Architecture agnostic Barrier API 🍿
- BLE Periodic Adv with Resp 🎧
- RTC API added 🕒
- Dynamic thread stacks 🍿
- Many POSIX API improvements, e.g. dynamic POSIX thread stack support 🐧

2787 🪲 Fixed!!!



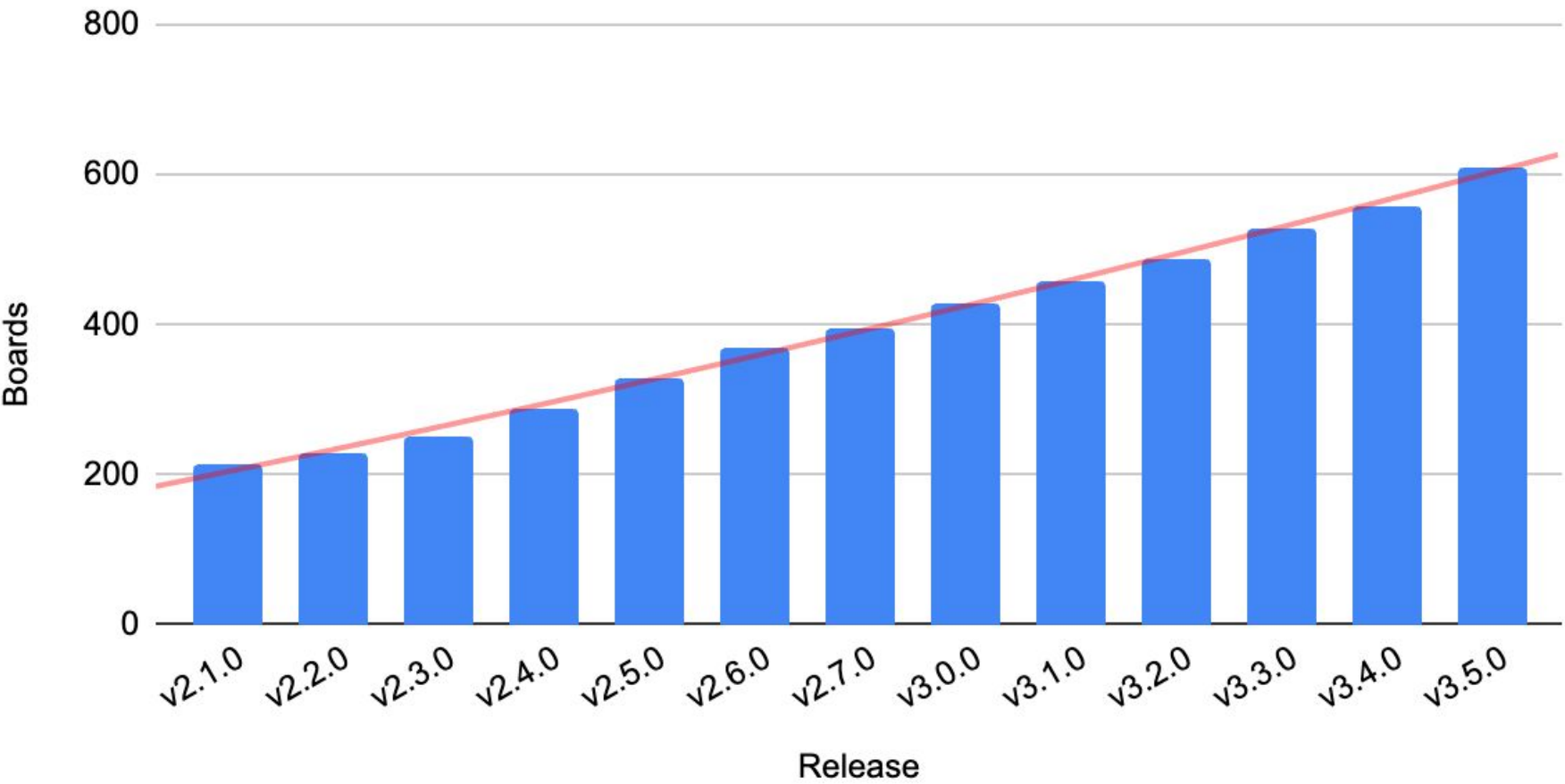
## 02 Project Growth



# Board and Architecture Growth

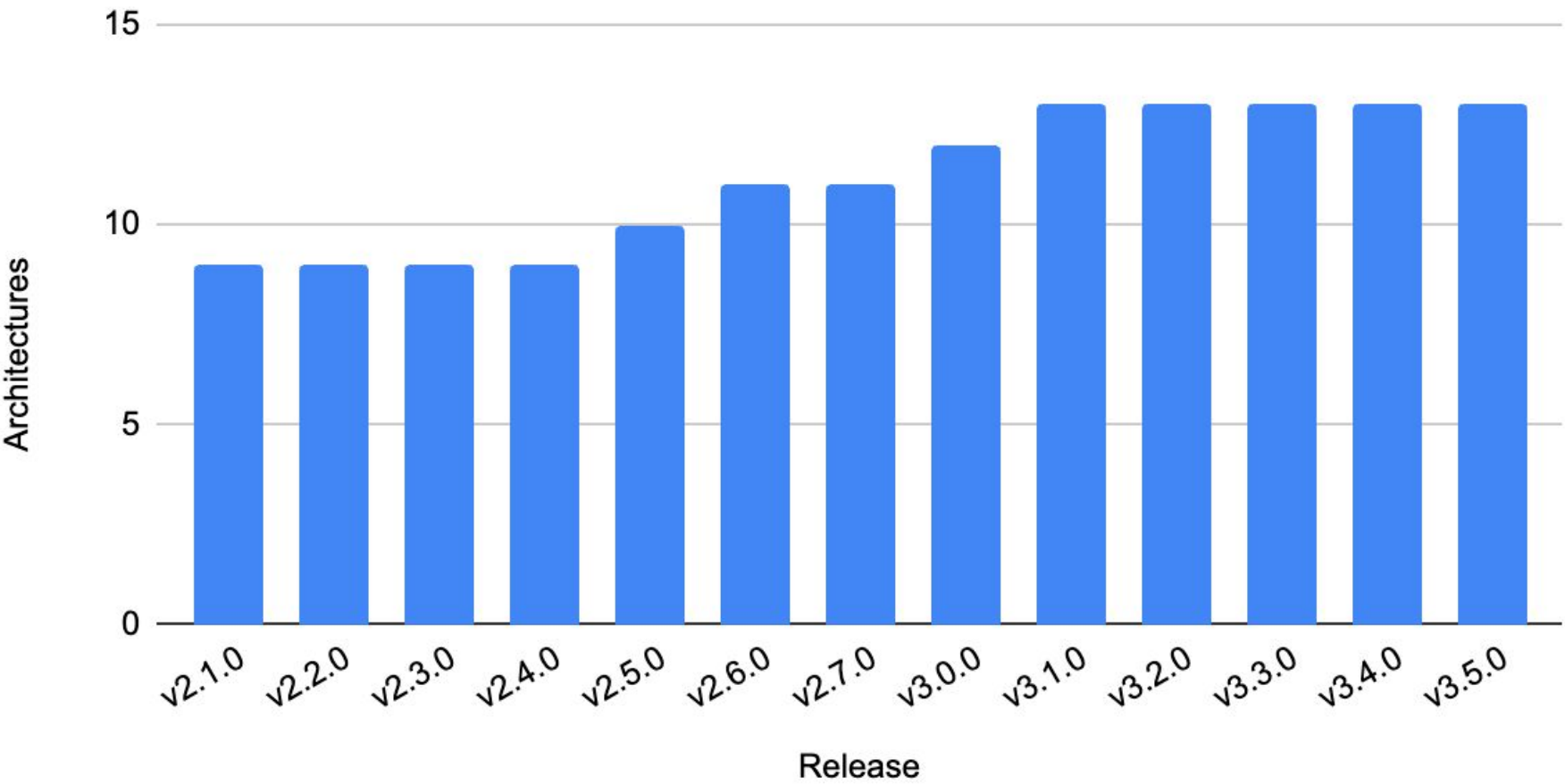
Boards by Release

cumulative



Architectures by Release

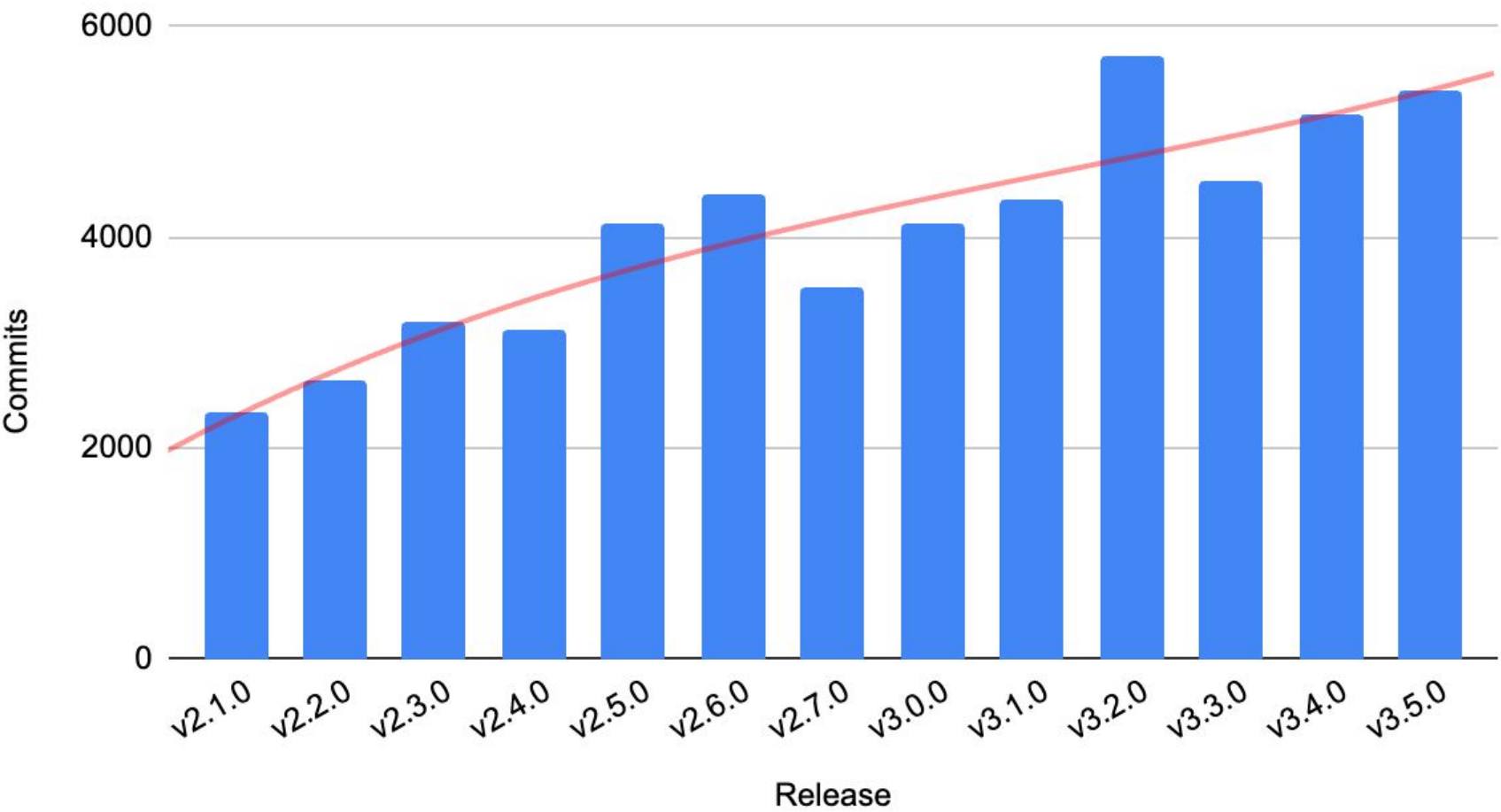
cumulative. does not include sub-architectures



Note: [22 as of v3.5.0](#), when including sub-architectures

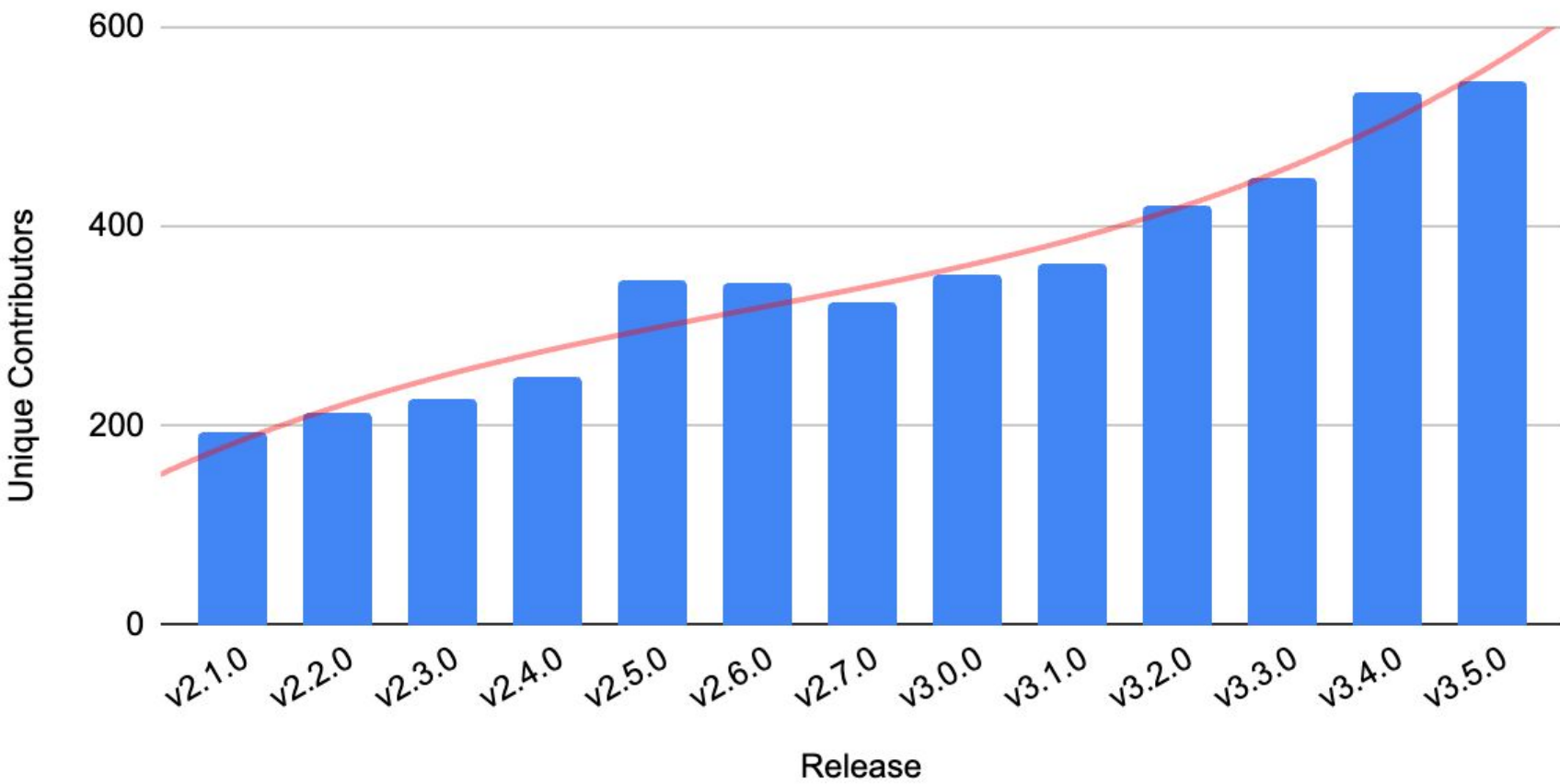
# Commit and Unique Contributor Growth

Commits per Release



52635 commits between v2.0.0 and v3.5.0

Unique Contributors per Release  
by email



# LTSv1 to LTSv2, for Reference

	1.14.0 (LTS V1)	2.7.0 (LTS V2)
Contributors	500	1384
Boards	160	400
Architectures	8	12
Commit Velocity	1.4 [commits / hr]	2.5 [commits / hr]
# of Maintainers	~25	50
# of Collaborators	~30	81
# of Areas	~80	113

## 03 LTSv2 to LTSv3 Transition

- Use macros to check
  - `#if ZEPHYR_VERSION_CODE > ZEPHYR_VERSION(3, 2, 0)`
  - `<zephyr/..>` prefix is only a part of it
  - APIs change, things are deprecated, for continuous integration and test, there will be minor adjustments
- Old ZTest API is gone - long live the new ZTest API 🏰
- Vast improvements to the kernel, in particular in SMP, eliminating race conditions
- VAST improvements to the RISC-V architecture
- VAST improvements to networking, POSIX, C, C++, Logging,



# Tentative LTSv3 (3.7) Release Date

6-months overlap (my job is not done yet)

Release milestone dates				
Milestone	3.5	3.6	3.7 (LTS)	4.0
Planning	2023/05/20	2023/09/22	2024/01/12	
Review target milestones	2023/09/08	2024/01/05	2024/05/10	
Release and Timeline Announcement	2023/09/15	2024/01/19	2024/05/31	
Feature Freeze (RC1)	2023/09/29	2024/02/02	2024/06/14	
2nd Release Candidate (RC2)	2023/10/06	2024/02/09	2024/06/28	
Hard Freeze (RC3)	2023/10/13	2024/02/16	2024/07/12	
Release	2023/10/20	2024/02/23	2024/07/26	2024/11/29

# 04 Looking Forward

## Optimistic Predictions

- PSE51, PSE52, PSE53 AEP Support for POSIX 🐧
- Significantly better POSIX Spec Conformance / Features 🐧
- Improved Thrift Support 📞
- Improved Support for standard features of ISO C and C++ ©
- Rust Language Support 🦀
- Minimalistic approach to modules (Lazy Modules) 🧩
- Improved Dynamic ELF loader 🧑🏫
- Multiple Network IF / Autoconfiguration 🌐
- Highly tunable / scalable / performant HTTP Server (GSoC 2023) 🌐
- VAST improvements to IEEE 802.15.4 (SubG, TSCH, FIRA, UWB) 📻
- VAST improvements to the Linux 🐧 <-> Zephyr 🎈 Interface



 Meta



Questions? / Feedback