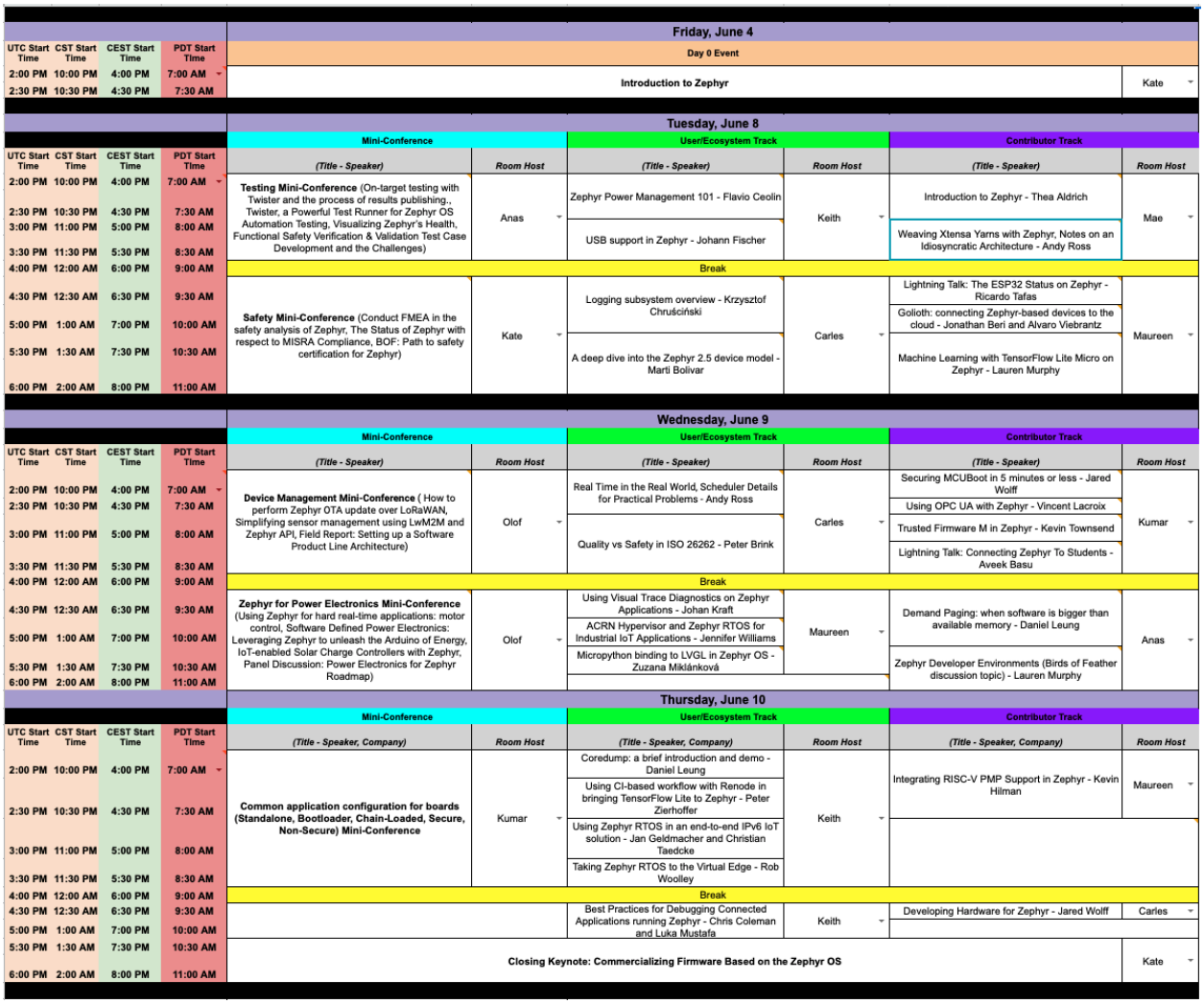
Zephyr Developer Summit 2021: Docs

Schedule:



UTC Start Time	CST Start Time	CEST Start Time	PDT Start Time	Mini-Conference (Title - Speaker)	Room Host	User/Ecosystem Track (Title - Speaker)	Room Host	Contributor Track (Title - Speaker)	Room Host
Friday, June 4									
				Day 0 Event					
2:00 PM	10:00 PM	4:00 PM	7:00 AM	Introduction to Zephyr					Kate
2:30 PM	10:30 PM	4:30 PM	7:30 AM						
Tuesday, June 8									
2:00 PM	10:00 PM	4:00 PM	7:00 AM	**Testing Mini-Conference** (On-target testing with Twister and the process of results publishing., Twister, a Powerful Test Runner for Zephyr OS Automation Testing, Visualizing Zephyr's Health, Functional Safety Verification & Validation Test Case Development and the Challenges)	Anas	Zephyr Power Management 101 - Flavio Ceolin	Keith	Introduction to Zephyr - Thea Aldrich	Mae
2:30 PM	10:30 PM	4:30 PM	7:30 AM						
3:00 PM	11:00 PM	5:00 PM	8:00 AM			USB support in Zephyr - Johann Fischer		Weaving Xtensa Yarns with Zephyr, Notes on an Idiosyncratic Architecture - Andy Ross	
3:30 PM	11:30 PM	5:30 PM	8:30 AM						
4:00 PM	12:00 AM	6:00 PM	9:00 AM	Break					
4:30 PM	12:30 AM	6:30 PM	9:30 AM	**Safety Mini-Conference** (Conduct FMEA in the safety analysis of Zephyr, The Status of Zephyr with respect to MISRA Compliance, BOF: Path to safety certification for Zephyr)	Kate	Logging subsystem overview - Krzysztof Chruściński	Carles	Lightning Talk: The ESP32 Status on Zephyr - Ricardo Tafas	Maureen
5:00 PM	1:00 AM	7:00 PM	10:00 AM					Golioth: connecting Zephyr-based devices to the cloud - Jonathan Beri and Alvaro Viebrantz	
5:30 PM	1:30 AM	7:30 PM	10:30 AM			A deep dive into the Zephyr 2.5 device model - Martí Bolívar		Machine Learning with TensorFlow Lite Micro on Zephyr - Lauren Murphy	
6:00 PM	2:00 AM	8:00 PM	11:00 AM						
Wednesday, June 9									
2:00 PM	10:00 PM	4:00 PM	7:00 AM	**Device Management Mini-Conference** (How to perform Zephyr OTA update over LoRaWAN, Simplifying sensor management using LwM2M and Zephyr API, Field Report: Setting up a Software Product Line Architecture)	Olof	Real Time in the Real World, Scheduler Details for Practical Problems - Andy Ross	Carles	Securing MCUBoot in 5 minutes or less - Jared Wolff	Kumar
2:30 PM	10:30 PM	4:30 PM	7:30 AM					Using OPC UA with Zephyr - Vincent Lacroix	
3:00 PM	11:00 PM	5:00 PM	8:00 AM			Quality vs Safety in ISO 26262 - Peter Brink		Trusted Firmware M in Zephyr - Kevin Townsend	
3:30 PM	11:30 PM	5:30 PM	8:30 AM					Lightning Talk: Connecting Zephyr To Students - Aveek Basu	
4:00 PM	12:00 AM	6:00 PM	9:00 AM	Break					
4:30 PM	12:30 AM	6:30 PM	9:30 AM	**Zephyr for Power Electronics Mini-Conference** (Using Zephyr for hard real-time applications: motor control, Software Defined Power Electronics: Leveraging Zephyr to unleash the Arduino of Energy, IoT-enabled Solar Charge Controllers with Zephyr, Panel Discussion: Power Electronics for Zephyr Roadmap)	Olof	Using Visual Trace Diagnostics on Zephyr Applications - Johan Kraft	Maureen	Demand Paging: when software is bigger than available memory - Daniel Leung	Anas
5:00 PM	1:00 AM	7:00 PM	10:00 AM			ACRN Hypervisor and Zephyr RTOS for Industrial IoT Applications - Jennifer Williams			
5:30 PM	1:30 AM	7:30 PM	10:30 AM			Micropython binding to LVGL in Zephyr OS - Zuzana Miklánková		Zephyr Developer Environments (Birds of Feather discussion topic) - Lauren Murphy	
6:00 PM	2:00 AM	8:00 PM	11:00 AM						
Thursday, June 10									
2:00 PM	10:00 PM	4:00 PM	7:00 AM	**Common application configuration for boards (Standalone, Bootloader, Chain-Loaded, Secure, Non-Secure) Mini-Conference**	Kumar	Coredump: a brief introduction and demo - Daniel Leung	Keith	Integrating RISC-V PMP Support in Zephyr - Kevin Hilman	Maureen
2:30 PM	10:30 PM	4:30 PM	7:30 AM			Using CI-based workflow with Renode in bringing TensorFlow Lite to Zephyr - Peter Zierhoffer			
3:00 PM	11:00 PM	5:00 PM	8:00 AM			Using Zephyr RTOS in an end-to-end IPv6 IoT solution - Jan Geldmacher and Christian Taedcke			
3:30 PM	11:30 PM	5:30 PM	8:30 AM			Taking Zephyr RTOS to the Virtual Edge - Rob Woolley			
4:00 PM	12:00 AM	6:00 PM	9:00 AM	Break					
4:30 PM	12:30 AM	6:30 PM	9:30 AM			Best Practices for Debugging Connected Applications running Zephyr - Chris Coleman and Luka Mustafa	Keith	Developing Hardware for Zephyr - Jared Wolff	Carles
5:00 PM	1:00 AM	7:00 PM	10:00 AM						
5:30 PM	1:30 AM	7:30 PM	10:30 AM						
6:00 PM	2:00 AM	8:00 PM	11:00 AM	**Closing Keynote: Commercializing Firmware Based on the Zephyr OS**					Kate

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[Important Links](#)
- [Location](#)
- [Slack](#)
- [Mail Lists](#)
- [Getting Started](#)
- [Make some noise](#)

- Videos
- Pop-up Store

Day 0 Event: Introduction to Zephyr

Mini-Conferences: Topics/Speakers/Slides/Recordings
- Navigation
- Testing Mini-Conference
- Safety Mini-Conference
- Device Management Mini-Conference
- Zephyr for Power Electronics Mini-Conference
- Common application configuration for boards (Standalone, Bootloader, Chain-Loaded, Secure, Non-Secure) Mini-Conference
- Closing Keynote Panel: Commercializing Firmware Based on the Zephyr RTOS

User/Ecosystem Track: Topics/Speakers/Slides/Recordings
- Navigation
- Zephyr Power Management 101
- USB support in Zephyr
- Logging subsystem overview
- A deep dive into the Zephyr 2.5 device model
- Real Time in the Real World, Scheduler Details for Practical Problems
- Quality vs Safety in ISO 26262
- Using Visual Trace Diagnostics on Zephyr Applications
- ACRN Hypervisor and Zephyr RTOS for Industrial IoT Applications
- Micropython binding to LVGL in Zephyr OS
- Coredump: a brief introduction and demo
- Using CI-based workflow with Renode in bringing TensorFlow Lite to Zephyr
- Using Zephyr RTOS in an end-to-end IPv6 IoT solution
- Taking Zephyr RTOS to the Virtual Edge
- Best Practices for Debugging Connected Applications running Zephyr

Contributor Track: Topics/Speakers/Slides/Recordings
- Navigation
- Introduction to Zephyr
- Weaving Xtensa Yarns with Zephyr, Notes on an Idiosyncratic Architecture
- Lightning Talk: The ESP32 Status on Zephyr
- Golioth: connecting Zephyr-based devices to the cloud
- Machine Learning with TensorFlow Lite Micro on Zephyr
- Securing MCUBoot in 5 minutes or less
- Using OPC UA with Zephyr

Trusted Firmware M in Zephyr
Lightning Talk: Connecting Zephyr To Students
Demand Paging: when software is bigger than available memory
Zephyr Developer Environments (Birds of Feather discussion topic)
Integrating RISC-V PMP Support in Zephyr
Developing Hardware for Zephyr

Important Links

Location

Sessions/dial-in information has been posted to the 2021 Zephyr Developer Summit calendar: https://lists.zephyrproject.org/g/2021-Developer-Summit/calendar

If you would like to subscribe to the calendar, or join/subscribe additional Zephyr Project lists, please see: https://github.com/zephyrproject-rtos/zephyr/wiki/Zephyr-Committee-and-Working-Group-Meetings

Slack

For those not already subscribed, you may join the Zephyr Project Slack at https://join.slack.com/t/zephyrproject/shared_invite/zt-953wf991-q7qw_houhNJrwT~Ac1TJEg

For pre/in/post-Session chat, we have created Slack channels for the 3 tracks:

- #zds-2021-mini-conf
- #zds-2021-user-ecosystem
- #zds-2021-contributor

Mail Lists

A full list of available Zephyr mailing lists can be found at: https://lists.zephyrproject.org/g/main/subgroups

The primary lists leveraged by developers include:

- https://lists.zephyrproject.org/g/devel (devel@lists.zephyrproject.org) &
- https://lists.zephyrproject.org/g/users (users@lists.zephyrproject.org)

Getting Started

- High-level overview: https://docs.zephyrproject.org/latest/introduction/index.html
- Getting Started Guide (to start developing): https://docs.zephyrproject.org/latest/getting_started/index.html

Make some noise

- Please follow us at @ZephyrIoT (https://twitter.com/zephyriot)
- We will be using #ZephyrDevSummit for event related posts

Videos

- Recorded sessions will be posted to the Zephyr YouTube channel: https://www.youtube.com/c/ZephyrProject

Pop-up Store

- We have spun up a pop-up store celebrating the event, as well as 50,000 Contributors in 5 Years: https://shop.spreadshirt.com/zephyr-project/

Day 0 Event: Introduction to Zephyr

Friday, June 4 (7am - 8am PDT / 4pm - 5pm CEST)

Presentation Slides: Link

Recording: [Link to be added]

Session Abstract:

- In the last 5 years, Zephyr has seen a tremendous amount of growth. This session is in response to those who are new to the Zephyr project and would like an overview of how the project works, and what some of the capabilities are. Questions are welcome.

Speaker:

- Kate Stewart, Linux Foundation (LinkedIn)

Mini-Conferences: Topics/Speakers/Slides/Recordings

Navigation

Posted in order of appearance on the schedule

** Schedule is subject to change. For the latest, please see https://lists.zephyrproject.org/g/2021-Developer-Summit/calendar

Testing Mini-Conference

Tuesday, June 8 (7am - 9am PDT / 4pm - 6pm CEST)

Live Attendees: 90

Presentation Slides:

- On-target testing with Twister and the process of results publishing
- Twister, a Powerful Test Runner for Zephyr OS Automation Testing
- Visualizing Zephyr's Health
- Functional Safety Verification & Validation Test Case Development and the Challenges

Recording: https://youtu.be/aa135Qp6Eak

Topics scheduled to include:

- On-target testing with Twister and the process of results publishing.
    - Speakers: Maciej Perkowski, Nordic Semiconductor (LinkedIn)
    - Abstract:
        - The twister framework is constantly evolving to better serve the testing needs of Zephyr-based projects. During my presentation, I will bring the developers up to date with the current state of testing with Twister. I will present a short introduction on how to use Twister for on-target tests and will show how to use some new or less common features of the framework (e.g. quarantine). Validation of Zephyr performance on real hardware becomes an important part of QA. Contributors' reports allow us to have a wider test scope of actual hardware running Zephyr applications. Therefore, during the presentation, I will also guide the contributors through the process of on-target results publishing.
- Twister, a Powerful Test Runner for Zephyr OS Automation Testing
    - Speakers: Peng Chen, Intel (LinkedIn)

    - Abstract:
        - As a powerful test runner, Twister is a critical part of zephyr automation testing framework. The Intel Zephyr team is using Twister to do daily testing upon 10+ hardware platforms with multiple architectures, collect test results and build CI testing. This presentation introduces the work process and fancy features of twister script, with the following perspectives:
            - Twister work process, including finding and building test cases, and get test results.
            - How twister judges a test case failure or success, and what the result “passed” “failures” “errors” means.
            - How to run twister command on a qemu or hardware platform.
            - How to enable twister automation testing on a new platform which doesn’t support common “west flash” command to transfer test images.
            - How to add a new test case and build the test case with twister script.
            - Future improvements
- Visualizing Zephyr’s Health
    - Speakers: Shihao Shen, Intel (LinkedIn)
    - Abstract:
        - Performance of the Zephyr OS on different platforms is always what we are concerned with. There are multiple indicators of Zephyr’s “health”, so it’s critical to present them in a coherent, visually immersive way. I would like to introduce two tools, Power BI and Grafana, that Intel Zephyr team have been using to better visualize different data of the Zephyr project.
        - The most useful aspect that comes with Power BI is its ability to integrate multiple tables from our database or local excel sheets into one single but elegant visualization. The usage of Power BI reduces manual input and hence largely improves the efficiency of a team on Zephyr. Before the introduction of Power BI, we spent hours manually filling out tables in PowerPoint, which was now automated by using Power BI to self-generate the same reports every time when data are updated on the database. The time spent has been significantly reduced from 5+ hours to 10 minutes per weekly report.
        - Grafana is another visualization platform. Compared to Power BI, Grafana is more light-weighted, user-friendly, and portable. Using Grafana to present data compensates some drawbacks of Power BI. We have added one more stage in the pipeline of our daily test server which sends the immediate test results to the database that Grafana uses for visualization. In this way, Grafana serves as a dynamic way to monitor the daily test results and parties interested can access it at any time, unlike Power BI as a more static presentation refreshed on a weekly basis.

        - Both visualization tools combined will benefit Zephyr in that it largely improves the team's efficiency as well as successfully visualizes Zephyr's test data.
- Functional Safety Verification & Validation Test Case Development and the Challenges
    - Speakers: Steven Wang, Intel (LinkedIn)
    - Abstract:
        - Functional safety (FuSa) certification for IEC61508 standard is critical for such as automotive industry, industrial section, etc. According to IEC61508, verification and validation test cases are for verifying module/architecture design and validating safety requirements. Intel is working with TuV to get FuSa kernel parts of Zephyr certified.
        - This presentation shows how we develop the test cases for FuSa(Functional Safety) certification with examples. To meet FuSa specification, the test cases are designed and implemented with the techniques and measures defined in IEC61508. It turns out that the test cases help us to identify useless code and potential bugs. Moreover, we are seeing several challenges, such as how to define module and integration test cases, how to improve code coverage, and how traceability is set up between the test cases and the documents. This presentation illustrates the solutions to tackle the challenges.

Safety Mini-Conference

Tuesday, June 8 (9:30am - 11:30am PDT / 6:30pm - 8:30pm CEST)

Live Attendees: 44

Presentation Slides:

- Conduct FMEA in the safety analysis of Zephyr
- The Status of Zephyr with respect to MISRA Compliance

Recording: https://youtu.be/RWxnHaDlLFA

Topics scheduled to include:

- Conduct FMEA in the safety analysis of Zephyr
    - Speakers: Enjia Mai, Intel (LinkedIn)
    - Abstract:
        - Safety Analysis is one of the critical parts of Functional Safety Certification to ensure safety-critical functions and functional threats analyzed for correct behaviors per safety requirements. This presentation is to introduce Failure Mode Effect Analysis (FMEA), which is being applied to Zephyr OS safety analysis. FMEA is one of several effective software architecture safety analysis methods for examining different

levels of software architecture to ensure the currently designed software architecture can cope with the threats of hardware and software issues. In the presentation, an example will be used to illustrate the 6-step process of FMEA implementations which include: ensure and define the scope/architecture and component analysis/identity potential failure mode/identity potential consequences/identity possible causes and add control measures/update documents and requirements. Last but not least, the impacts and challenges with FMEA analysis will be discussed in the presentation.

- The Status of Zephyr with respect to MISRA Compliance
    - Speakers: Roberto Bagnara, BUGSENG and University of Parma (LinkedIn)
    - Abstract:
        - In this presentation, we will first introduce the MISRA C coding standard and its role in the development of hight-integrity systems. We will then illustrate the findings of an independent assessment of Zephyr with respect to MISRA compliance. We will highlight some of the challenges that have to be faced in order to achieve MISRA compliance for projects based on Zephyr. We will conclude with a gap analysis based on MISRA Compliance:2020, offering insight (and soliciting discussion) on possible courses of action to ensure Zephyr meets the language-subsetting requirements of users operating in safety-critical domains.
- BOF: Path to safety certification for Zephyr
    - Speakers: Amber Hibberd, Intel (LinkedIn), TBA
    - Abstract: TBA

Device Management Mini-Conference

Wednesday, June 9 (7am - 9am PDT / 4pm - 6pm CEST)

Live Attendees: 70

Presentation Slides:

- How to perform Zephyr OTA update over LoRaWAN
- Simplifying sensor management using LwM2M and Zephyr API
- Field Report: Setting up a Software Product Line Architecture

Recording: https://youtu.be/uMwhg07xRRU

Topics scheduled to include:

- How to perform Zephyr OTA update over LoRaWAN
    - Speakers: Piotr Król, LPN Plant (LinkedIn)
    - Abstract:

        - This presentation will elaborate on how to perform an Over-The-Air (OTA) update of the Zephyr OS-based application using LoRaWAN. To achieve this goal, we will propose to use MCUboot open source bootloader. The main limitation of LoRaWAN is the maximum payload length, so the target application has to be fragmented accordingly, sent over the network, and placed by the MCU in a memory bank. There are few possible scenarios, but the one we will present is a dual bank update, which relies on replacing only one copy of 2 available firmware banks. This mechanism lets us revert the changes if anything goes wrong. The presentation will also explain how to maintain the authenticity and integrity of firmware updates. Finally, we will present a demo showing the action using the Yocto-based x86 gateway with RAK833 LoRa module and Chirpstack driving update of multiple STM32-based nodes.
- Simplifying sensor management using LwM2M and Zephyr API
    - Speakers: Marcin Nagy, AVSystem (LinkedIn), Mieszko Mieruński, AVSystem (LinkedIn) & Kamil Panek, AVSystem (LinkedIn)
    - Abstract:
        - The growing number of deployed IoT devices, together with the increasing availability of low-power wide-area networks (LPWAN), sets new challenges for efficient and scalable device management solutions. Lightweight M2M (LwM2M) is a device management and service enablement protocol developed as an open standard by OMA SpecWorks.
        - Device management protocols like MQTT or AMQP are excellent choices for devices with Internet access and powered by electricity. However, for constrained devices operating in cellular LPWA networks (e.g., NB-IoT, LTE-M), where long battery lifetime matters, every byte sent or received on the air interface matters. LwM2M fits perfectly in such deployments by providing very efficient data encoding over CoAP and minimizing TCP transport overhead when working over UDP.
        - In addition to technological advantages in constrained environments, LwM2M defines some IPSO Objects to increase interoperability between devices and servers from different manufacturers. As IPSO objects are openly available and peer-reviewed by OMA SpecWorks members, device developers can use them to model devices, saving their time by taking an already published object instead of reinventing the wheel by creating another custom device model.
        - Unfortunately, many developers fail to understand the value that IPSO objects bring. They find implementing them cumbersome and often decide to go with their own custom device model. In this presentation, we show the integration of Anjay, our open-source LwM2M client, with Zephyr and show how to use Anjay API for efficient device management. Based on this, in the second part of the presentation, we demonstrate how to

use Zephyr API to reduce the development time needed to implement IPSO objects for device sensor management.

- Field Report: Setting up a Software Product Line Architecture
    - Speakers: Gregory Shue, Legrand (LinkedIn)
    - Abstract:
        - Since the 1990s, the Software Engineering Institute (sei.cmu.edu) has been researching best practices and success metrics for setting up, managing and delivering Software Product Line (SPL) architectures to support strategic reuse of software. This report presents the "Good, Bad, and Ugly" discovered from using the Zephyr ecosystem as a foundation for an extensible down-stream SPL framework.

Zephyr for Power Electronics Mini-Conference

Wednesday, June 9 (9:30am - 11:30am PDT / 6:30pm - 8:30pm CEST)

Live Attendees: 59

Presentation Slides:

- Using Zephyr for hard real-time applications: motor control
- Software Defined Power Electronics: Leveraging Zephyr to unleash the Arduino of Energy
- IoT-enabled Solar Power Converters with Zephyr

Recording: https://youtu.be/9XKQqPuZh9w

Topics scheduled to include:

- Using Zephyr for hard real-time applications: motor control
    - Speaker: Gerard Marull Paretas, Teslabs Engineering S.L. (LinkedIn)
    - Abstract:
        - Zephyr is not only a great RTOS but also a full-featured ecosystem. However, is it ready for hard real-time applications? Advanced motor control techniques such as FOC require fast and deterministic control loops. In this presentation we will show how Zephyr can be successfully integrated into one of such applications.
- Software Defined Power Electronics: Leveraging Zephyr to unleash the Arduino of Energy
    - Speakers: Luiz Villa, LAAS (LinkedIn) and Jean Alinei, LAAS (LinkedIn)
    - Abstract:
        - Software defined systems are based on an abstraction between hardware and function. They go counter to the current practices of power electronics which are mostly function defined hardware. In this presentation the OwnTech team will explain their take on this issue and

how they tap the potential of Zephyr in the hope to create the "Arduino of Energy".

- IoT-enabled Solar Power Converters with Zephyr
    - Speaker: Martin Jäger, Libre Solar (LinkedIn)
    - Abstract:
        - Libre Solar develops charge controllers and battery management systems for off-grid renewable energy systems. The hardware comes with a CAN interface and can be easily extended with wireless communication modules for GSM and LoRa. Zephyr RTOS provides a seamless integration of IoT communication and hard real-time control.
          In this presentation we will share our experience with a digitally controlled DC/DC converter developed to build a 48V DC grid for energy access applications in East Africa.
- Panel Discussion: Power Electronics for Zephyr Roadmap
    - Speakers: All
    - Abstract:
        - During this open panel discussion we want to draft a roadmap for power electronics features that should be added to Zephyr based on the experience of the speakers and the community.

Common application configuration for boards (Standalone, Bootloader, Chain-Loaded, Secure, Non-Secure) Mini-Conference

Live Attendees: 82

Thursday, June 10 (7am - 9am PDT / 4pm - 6pm CEST)

Presentation Slides: Link

Recording: https://youtu.be/XQ0J9l-d38k?t=8

Topics scheduled to include:

- Common application configuration for boards (Standalone, Bootloader, Chain-Loaded, Secure, Non-Secure)
    - Speaker: Jordan Yates, DATA61 / CSIRO (LinkedIn)
    - Abstract:
        - The current Zephyr board abstraction does not well handle different software configurations targeting the same physical hardware. 3 common configurations for any Zephyr board are running a standalone application, a bootloader, and a chain loaded application. Each of these applications can have different requirements for ROM/RAM layouts. Secure and

non-secure applications with ARMv8 TrustZone also have differing requirements.
    - Any solution to these problems must be driven by the linker. The discussion is around how to get from a users desire to build an application of type T for board B, to the correct linker memory regions. Ideally any solution is a step towards multi-image builds in the future.

Closing Keynote Panel: Commercializing Firmware Based on the Zephyr RTOS

Thursday, June 10 (10:30am - 11:30am PDT / 7:30pm - 8:30pm CEST)

Live Attendees: 73

Presentation Slides: Link

Recording: Link

Abstract:

- The Zephyr OS provides a very good basis, and the foundation for building products, but it is not a product itself. Taking the Zephyr OS from upstream and making it part of an existing and well-established firmware development environment is a challenge that many users and members of the project face. Challenges include compiler support, integrating into existing IDEs, BSP porting to the Zephyr OS, and using the Zephyr OS's device model and infrastructure. In this track, we will discuss these challenges and what the Zephyr OS is doing to address them. Additionally, we will discuss the overall benefits of moving to the Zephyr OS for firmware development teams and how the benefits outweigh the challenges, based on firsthand experience from productization companies.

Panelists:

- Amy Occhialino (Moderator), Intel (LinkedIn)
- Anas Nashif, Intel (LinkedIn)
- Carles Cufi, Nordic Semiconductor (LinkedIn)
- Keith Short, Google (LinkedIn)
- Maureen Helm, NXP (LinkedIn)
- Mazen Gedeon, Intel (LinkedIn)
- Michael Gielda, Antmicro (LinkedIn)

User/Ecosystem Track: Topics/Speakers/Slides/Recordings

Navigation

Posted in order of appearance on the schedule

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Zephyr Power Management 101

Tuesday, June 8 (7am - 8am PDT / 4pm - 5pm CEST)

Live Attendees: 105

Presentation Slides: Link

Recording: https://youtu.be/WXOMIXDRLBU

Session Abstract:

- This talk will discuss recent changes in the Zephyr power management infrastructure that attempts to fully support the capabilities of the various supported platforms. It will cover two major areas of this topic, System Power Management and Device Power Management, exploring how they are implemented, how they interact with each other and other subsystems and Kernel and finally how applications and integrators can change the default behavior.

Speaker:

- Flavio Ceolin, Intel (LinkedIn)

USB support in Zephyr

Tuesday, June 8 (8am - 9am PDT / 5pm - 6pm CEST)

Live Attendees: 90

Presentation Slides: Link

Recording: https://youtu.be/dJ7_aRPM4Os

Session Abstract:

- USB device support overview in Zephyr OS and ongoing/upcoming rework. What limitations do we have with current stack/driver-API and what do we want to improve. USB device controller drivers overview, Zephyr OS developer view on the HAL and controller designs. Host support. Testing. How can device stack and host stack benefit from each other?

Speaker:

- Johann Fischer, Nordic Semiconductor (LinkedIn)

Logging subsystem overview

Tuesday, June 8 (9:30am - 10:30am PDT / 6:30pm - 7:30pm CEST)

Live Attendees: 111

Presentation Slides: Link

Recording: https://youtu.be/zCNzceP2Dzk

Session Abstract:

- Logging takes a crucial part in any application. Not only as a debugging tool during the development phase but also in the field. Embedded systems gives additional challenge with real time requirements and limited resources. Logging subsystem attempts to meet the goals and overcome these challenges. Presentation will be an introduction to the logging subsystem with focus on the recent overhaul. It will go under the hood to explain internals and provide some practical recommendations for efficient logging.

Speaker:

- Krzysztof Chruściński, Nordic Semiconductor (LinkedIn)

A deep dive into the Zephyr 2.5 device model

Tuesday, June 8 (10:30am - 11:30am PDT / 7:30pm - 8:30pm CEST)

Live Attendees: 107

Presentation Slides: Link

Recording: https://youtu.be/sWaxQyIgEBY

Session Abstract:

- Zephyr's device model is the central abstraction underlying all of its drivers and many subsystems, along with core features such as the system clock.
- This talk is intended as an update to previous presentations on the subject, which describes the device model as it exists in Zephyr 2.5, along with a discussion of possible changes for 2.6 and beyond.

Speaker:

- Marti Bolivar, Nordic Semiconductor (LinkedIn)

Real Time in the Real World, Scheduler Details for Practical Problems

Wednesday, June 9 (7am - 8am PDT / 4pm - 5pm CEST)

Live Attendees: 94

Presentation Slides: Link

Recording: https://youtu.be/6PpjYa1kJ1U

Session Abstract:

- An hour-long deep dive into the details of Zephyr's evolving thread scheduling facilities, their interactions with the broader OS and their application (and misapplication) to real systems. Topics include a quick overview of the base priority-based scheduler, what "cooperative" priorities really mean, how MetaIRQ priorities work and what they are for, Earliest-Deadline-First priorities, and the new p4workq abstraction for matching pooled threads with scheduler parameters.

Speaker:

- Andy Ross, Intel (LinkedIn)

Quality vs Safety in ISO 26262

Wednesday, June 9 (8am - 9am PDT / 5pm - 6pm CEST)

Live Attendees: 52

Presentation Slides: Link

Recording: https://youtu.be/GWToffQoNpU

Session Abstract:

- This presentation looks at the different development stages described in ISO 26262 (the automotive safety standard) and resolves the underlying quality expectations for each and distinguishes those from the safety expectations. As Zephyr works towards safety certifications and the formal capture of the requirements, these are important considerations to keep in mind as that process continues.

Speaker:

- Peter Brink, UL (LinkedIn)

Using Visual Trace Diagnostics on Zephyr Applications

Wednesday, June 9 (9:30am - 10am PDT / 6:30pm - 7pm CEST)

Live Attendees: 47

Presentation Slides: Link

Recording: https://youtu.be/GcUnmlewGgU?t=5

Session Abstract:

- Developing reliable and performant RTOS applications is far from trivial, in part due to challenges related to multithreading, software timing and resource usage. Such aspects are not apparent in the source code and calls for good insight into the runtime system to facilitate software design verification and system-level debugging.
- We will present new support for visual trace diagnostics that is being introduced in Zephyr, including what this concept implies, how to enable it and relevant use-cases. A demo will be provided using Percepio Tracealyzer, that is now being extended to also support Zephyr.

Speaker:

- Johan Kraft, Percepio AB (LinkedIn)

ACRN Hypervisor and Zephyr RTOS for Industrial IoT Applications

Wednesday, June 9 (10:00am - 10:30am PDT / 7:00pm - 7:30pm CEST)

Live Attendees: 35

Presentation Slides: Link

Recording: https://youtu.be/O9JA-agbP4Y

Session Abstract:

- Open-source ACRN hypervisor and Zephyr RTOS can be used together on an x86-based platforms, such as Elkhart Lake CRB. The combination leverages the isolated virtual machine environment of the hypervisor and the real-time capabilities of the operating system. This demonstrates ACRN hybrid scenario in which Zephyr is running in a pre-launched User Virtual Machine. Example usages include industrial IoT applications. This implementation uses twister and ztest framework for testing on HW.

Speaker:

- Jennifer Williams, Intel Corporation (LinkedIn)

Micropython binding to LVGL in Zephyr OS

Wednesday, June 9 (10:30am - 11:00am PDT / 7:30pm - 8:00pm CEST)

Live Attendees: 15

Presentation Slides: Link

Recording: https://youtu.be/IEqCvxFRghM?t=8

Session Abstract:

- The talk describes the integration of LVGL + Micropython as a Zephyr application.
- Possible use cases of the implemented solution are mentioned; moreover, the impacts which the Micropython layer brings to LVGL on Zephyr applications are discussed.
- In the end, a brief comparison of resource usage of Zephyr LVGL application both with and without Micropython layer is presented.

Speaker:

- Zuzana Miklánková, Masaryk University (LinkedIn)

Coredump: a brief introduction and demo

Thursday, June 10 (7:00am - 7:30am PDT / 4:00pm - 4:30pm CEST)

Live Attendees: 55

Presentation Slides: Link

Recording: https://youtu.be/gQRiDkxbcLM?t=13

Session Abstract:

- When fatal error occurs, it is usually preferable to restart the device so that it can continue providing services with minimal downtime. With coredump, it is possible to capture the software states associated with the fatal error, and has the information available for later retrieval and analysis. This presentation provides a brief introduction of the coredump subsystem in Zephyr, and a brief demonstration on how it works.

Speaker:

- Daniel Leung, Intel Corporation (LinkedIn)

Using CI-based workflow with Renode in bringing TensorFlow Lite to Zephyr

Thursday, June 10 (7:30am - 8:00am PDT / 4:30pm - 5:00pm CEST)

Live Attendees: 32

Presentation Slides: Link

Recording: https://youtu.be/jF94cXPoZZg?t=18

Session Abstract:

- With the ever-growing power and capabilities (and variety!) of microcontrollers, TinyML is becoming practical, in turn pushing complexity of MCU software stacks. To address that complexity engineers need versatile and portable tools and workflows, usable across vendors, architectures and use cases. The combination of the Zephyr RTOS, the Renode simulation framework and TensorFlow Lite for Microcontrollers adds up to form a bulletproof open source ecosystem for building advanced ML applications at the edge.
- The Zephyr Project provides developers and product makers with a modern, full-featured, customizable open source RTOS for a broad range of resource constrained devices.
- These edge, often battery-powered devices can now run TinyML workloads thanks to the TensorFlow framework. However, testing software at scale on many small and embedded devices can be a challenge.
- Renode, Antmicro's open source simulation framework, enables bringing these two worlds together. Allowing for hardware-less, Continuous Integration-driven workflows on embedded devices and IoT systems, Renode helped us run TensorFlow on Zephyr-supported hardware.

- In a recent collaboration with Google, Antmicro brought Renode's capability of full SoC simulation to the TensorFlow Lite CI and enabled a variety of demos and flows to be run by users without access to hardware. Renode can test Zephyr + TF Lite Micro integration using the complete flow, as perceived by users - providing data to sensors connected to different busses and observing the results on output interfaces, using the same binaries they'd run on hardware. This paved the way for further porting of TFLite to new platforms, adding a powerful new use case to the Zephyr portfolio and becoming a ready-to-use base for both internal and academic research.
- The presentation will cover the process of the integration, describe the dedicated testing infrastructure and showcase practical application of the project.

Speaker:

- Peter Zierhoffer, Antmicro (LinkedIn)

Using Zephyr RTOS in an end-to-end IPv6 IoT solution

Thursday, June 10 (8:00am - 8:30am PDT / 5:00pm - 5:30pm CEST)

Live Attendees: 63

Presentation Slides: Link

Recording: https://youtu.be/cO5lAZawI5o?t=14

Session Abstract:

- Lemonbeat offers IoT connectivity solutions consisting of field devices, gateways, and a backend system using end-to-end IPv6. Based on the use case requirements we have to be flexible and support different types of connectivity between field device and gateway.
- This includes wireless connection via long or short range radio, wired connection via ethernet, and cellular connectivity (LTE cat-M1 or LTE cat-NB1). Zephyr enabled us to build a highly flexible software for our devices which seamlessly integrates our IPv6 based application layer with the underlying varying communication layers. In this talk we will show some of our use cases and explain how we used Zephyr RTOS to implement device and gateway firmwares. Additionally the talk covers some of the contributions we made to the Zephyr project (mostly related to IPv6 routing and PPP support). Finally we will explain challenges and learnings we experienced when moving from a legacy stack to Zephyr based solution.

Speakers:

- Jan Geldmacher, Lemonbeat GmbH (LinkedIn)
- Christian Taedcke, Lemonbeat GmbH (LinkedIn)

Taking Zephyr RTOS to the Virtual Edge

Thursday, June 10 (8:30am - 9:00am PDT / 5:30pm - 6:00pm CEST)

Live Attendees: 44

Presentation Slides: Link

Recording: https://youtu.be/sOWSoYWzyLk?t=11

Session Abstract:

- New edge computing architectures are using virtualization to partition the system into different functional domains. These use cases also have a requirement for real-time and safety-critical applications that can't be met by Linux. We will demonstrate how Zephyr RTOS may be used in these new designs by adding support for virtual I/O.

Speaker:

- Rob Woolley, Wind River (LinkedIn)

Best Practices for Debugging Connected Applications running Zephyr

Thursday, June 10 (9:30am - 10:30am PDT / 6:30pm - 7:30pm CEST)

Live Attendees: 76

Presentation Slides: Link

Recording: https://youtu.be/und6sMsjSHc?t=5

Session Abstract:

- Zephyr comes with a lot of built-in capabilities that, of course, provide a lot of value but can make it challenging to find the most efficient ways to debug issues quickly. In this talk, we will walk through configuration options and settings that can be used to investigate connectivity issues and faults when working with Zephyr. We will present how to use external tools like Memfault to speed up this process and fix these problems remotely. Finally, we will walk through some real-world examples of how IRNAS debugs their Zephyr devices in production.

Speaker:

- Chris Coleman, Memfault (LinkedIn)

- Luka Mustafa, IRNAS (LinkedIn)

Contributor Track: Topics/Speakers/Slides/Recordings

Navigation

Posted in order of appearance on the schedule

** Schedule is subject to change. For the latest, please see https://lists.zephyrproject.org/g/2021-Developer-Summit/calendar

Introduction to Zephyr

Tuesday, June 8 (7am - 8am PDT / 4pm - 5pm CEST)

Live Attendees: 78

Presentation Slides: Link

Recording: https://youtu.be/4m0DPV6-GCs?t=5

Session Abstract:

- In the last 5 years, Zephyr has seen a tremendous amount of growth. This session is in response to those who are new to the Zephyr project and would like an overview of how the project works, and what some of the capabilities are. Questions are welcome.

Speaker:

- Thea Aldrich, Zephyr Community Member (LinkedIn)

Weaving Xtensa Yarns with Zephyr, Notes on an Idiosyncratic Architecture

Tuesday, June 8 (8am - 9am PDT / 5pm - 6pm CEST)

Live Attendees: 36

Presentation Slides: Link

Recording: https://youtu.be/iKc5HuFFawE

Session Abstract:

- Zephyr is increasingly applied on the Cadence Xtensa architecture, whose non-traditional features and highly configurable IP pose problems at multiple levels for an OS attempting to exploit them. Includes brief overview of toolchain architecture, build- and run-time configuration choices, interrupt entry and exit in the presence of register windows, cache incoherence and control, and emerging work on MPU and MMU solutions.

Speaker:

- Andy Ross, Intel (LinkedIn)

Lightning Talk: The ESP32 Status on Zephyr

Tuesday, June 8 (9:30am - 9:45am PDT / 6:30pm - 6:45pm CEST)

Live Attendees: 20

Presentation Slides: Link

Recording: https://youtu.be/Lct81v9CYzg

Session Abstract:

- In 2020, Espressif Systems has officially started to support its ESP32 family of WIFI/Bluetooth microcontrollers on Zephyr. Being complex devices and fully featured, such support takes considerable amount of work. This lightning presentation summarizes the current state of ESP32 port and what is currently being under development. Finally, the next steps in terms of support will be presented, alongside a product vision for ESP32 under Zephyr.

Speaker:

- Ricardo Tafas, Espressif Systems (LinkedIn)

Golioth: connecting Zephyr-based devices to the cloud

Tuesday, June 8 (10:00am - 10:30am PDT / 7:00pm - 7:30pm CEST)

Live Attendees: 35

Presentation Slides: Link

Recording: https://youtu.be/lS6-nmHnlTg?t=11

Session Abstract:

- Golioth is an IoT platform built to reduce the friction for hardware devs to securely develop, connect and manage their devices from the cloud. A core pillar of Golioth is the device SDK built on top of Zephyr. During this presentation you'll hear why we chose to build on Zephyr. Learn how we designed our module, integrated our services with the native networking stack, and how we were able to leverage powerful subsystems like MCUboot and logging. You'll walk away understanding how Zephyr helped get us to market faster and why we're so excited to be a part of the community!

Speaker:

- Jonathan Beri, Golioth (LinkedIn)
- Alvaro Viebrantz, Golioth (LinkedIn)

Machine Learning with TensorFlow Lite Micro on Zephyr

Tuesday, June 8 (10:30am - 11:30am PDT / 7:30pm - 8:30pm CEST)

Live Attendees: 34

Presentation Slides: Link

Recording: https://youtu.be/vMDxmEwu51M?t=4

Session Abstract:

- Did you know that TensorFlow Lite Micro is now a Zephyr module? Come to this talk to learn the new Zephyr-centric way to build TensorFlow Lite Micro applications on Zephyr! This talk will introduce machine learning and TensorFlow before discussing the new module and guiding you through the process of developing, building and flashing a TensorFlow Lite Micro application on Zephyr with Visual Studio Code and Zephyr's meta-tool, West.

Speaker:

- Lauren Murphy, Intel (LinkedIn)

Securing MCUBoot in 5 minutes or less

Wednesday, June 9 (7:00am - 7:30am PDT / 4:00pm - 4:30pm CEST)

Live Attendees: 43

Presentation Slides: Link

Recording: https://youtu.be/fR-N6K5GmKQ

Session Abstract:

- Learn how to generate and use a signing key to secure your OTA updates in a few short steps.

Speaker:

- Jared Wolff, Circuit Dojo LLC (LinkedIn)

Using OPC UA with Zephyr

Wednesday, June 9 (7:30am - 8:00am PDT / 4:30pm - 5:00pm CEST)

Live Attendees: 24

Presentation Slides: Link

Recording: https://youtu.be/HqDxohtaFUU?t=50

Session Abstract:

- In the Industry 4.0 context, data are a valuable asset that must be protected.
- Ensuring the confidentiality and integrity of the data exchanged by the IIoT devices is challenging,
- OPC UA provides the appropriate mechanisms to build scalable, secure and interoperable solutions with end-to-end encryption,
- After a short introduction to OPC UA, you will see in this presentation how you can deploy S2OPC (https://gitlab.com/systerel/S2OPC) with Zephyr on your product to fulfill these requirements,
- As a bonus, we will see how Renode (https://github.com/renode/renode) can be used with the solution in continuous integration.

Speaker:

- Vincent Lacroix, Systerel (LinkedIn)

Trusted Firmware M in Zephyr

Wednesday, June 9 (8:00am - 8:30am PDT / 5:00pm - 5:30pm CEST)

Live Attendees: 75

Presentation Slides: Link

Recording: https://youtu.be/7G1KE98un4I?t=5

Session Abstract:

- An overview of the current integration work enabling Trusted Firmware M as a secure processing environment (SPE), with Zephyr as the non-secure/application environment. Presents key features of TF-M 1.3.0, and current integration work and goals with Zephyr.

Speaker:

- Kevin Townsend, Linaro (LinkedIn)

Lightning Talk: Connecting Zephyr To Students

Wednesday, June 9 (8:30am - 9:00am PDT / 5:30pm - 6:00pm CEST)

Live Attendees: 28

Presentation Slides: Link

Recording: https://youtu.be/kh26lb7KwCA

Session Abstract:

- This talk is planned to be centered around how Zephyr can be connected with the students or the newbies. The current issues and the problems being faced by them and how can that be resolved.

Speaker:

- Aveek Basu, Zephyr Community Member (LinkedIn)

Demand Paging: when software is bigger than available memory

Wednesday, June 9 (9:30am - 10:30am PDT / 6:30pm - 7:30pm CEST)

Live Attendees: 45

Presentation Slides: Link

Recording: https://youtu.be/vYThqzCz5RQ

Session Abstract:

- Feature rich software requires lots of memory to function. Hardware targeting IoT applications usually have limited physical memory to keep cost and power consumption low. Demand paging comes to the rescue when software grows larger than available memory by swapping memory into lower cost but slower storage devices. This presentation gives an overview of demand paging in Zephyr.

Speaker:

- Daniel Leung, Intel (LinkedIn)

Zephyr Developer Environments (Birds of Feather discussion topic)

Wednesday, June 9 (10:30am - 11:30am PDT / 7:30pm - 8:30pm CEST)

Live Attendees: 57

Presentation Slides: Link

Recording: https://youtu.be/QQ4cgkAZs1E

Session Abstract:

- Now that we've added several new members to the ranks of the Zephyr Project and even more products are adopting Zephyr, there are more Zephyr developers than ever before - almost 3000 on Slack alone! We'd like to meet informally to discuss your tips and tricks for setting up your developer environments. Topics include IDEs, text editors, tools, operating systems (Windows / Mac / Linux), and anything else you think would be helpful to Zephyr developers and maintainers. For example, we'll be asking Visual Studio Code developers about your must-have extensions and asking Windows 10 developers for your feedback on the Getting Started Guide.
- Please come to this BoF session ready to share your settings, configurations, tweaks, and hacks with the Zephyr community!

Speaker:

- Lauren Murphy, Intel (LinkedIn)

Integrating RISC-V PMP Support in Zephyr

Thursday, June 10 (7:00am - 8:00am PDT / 4:00pm - 5:00pm CEST)

Live Attendees: 27

Presentation Slides: Link

Recording: https://youtu.be/bwLbvFves0E

Session Abstract:

- RISC-V architecture has a hardware feature named PMP (Physical Memory Protection). Integrating PMP in Zephyr was key to enable the support of userspace (with shared memory) and stack guard features.
- The purpose of this presentation is to describe all the work that has been done, providing more details on the challenges and key decisions/choices that had to be taken.

Speaker:

- Kevin Hilman, Baylibre (LinkedIn)

Developing Hardware for Zephyr

Thursday, June 10 (9:30am - 10:00am PDT / 6:30pm - 7:00pm CEST)

Live Attendees: 32

Presentation Slides: Link

Recording: https://youtu.be/h5aazhjGmMY?t=2

Session Abstract:

- Learn about some of the biggest takeaways from the development of the Nordic Semiconductor based nRF9160 Feather.

Speaker:

- Jared Wolff, Circuit Dojo LLC (LinkedIn)