

# OpenHarmony - more than an OS

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Breaking hardware boundaries, transcending the classic dichotomy of an OS, this is what OpenHarmony is about. Catering the needs from tiny sensors up to powerful systems, from edge to cloud.

In this presentation I will address questions every FOSS developer will have, when hearing about OpenHarmony for the first time. If you are curious about the architecture, used FOSS projects, or want to know more about contribution guidelines and start picking in the code this talk would be a good start.

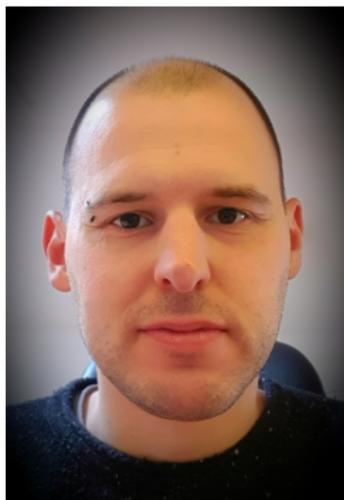
I will talk about the multiple-kernel approach, the distributed architecture and layers. Additionally I will also explain our public development infrastructure and contribution flows.

# Agenda

- About me
- Open Source and Huawei
- Open Source Technology Center
- OpenHarmony
- Distributed Architecture
- Used FOSS projects
- Hardware
- Multiple-kernel approach
- Infrastructure and contributions
- Roadmap

# About me

- Principal Solution Architect Open Source, OSTC@Huawei
- ex-OpenMoko, ex-BugLabs, ex-Samsung OSG
- 16 years in Open Source
- First FOSDEM presentation in the embedded room in 2007 :-)
- OpenEmbedded now Yocto, Linux Kernel subsystem maintainer, linux-wpan, Enlightenment Foundation Libraries, dfu-util, etc.



- Open Source is **strategic** to Huawei
- Breaks up vendor lock-in
- Huawei products are built on technology shared by most
- Already contributing to a lot Open Source projects across the company
- E.g. top Linux Kernel contributor employer in 5.10  
<https://lwn.net/Articles/839772/>

# Huawei Open Source Technology Center

- Founded in 2020
- Pan European
- Milan, Munich, Warsaw, Helsinki, London, Cork, Lyon
- Engineering, Marketing, Product Management, Field Eng, Evangelism
- First big project: take **OpenHarmony** to Europe

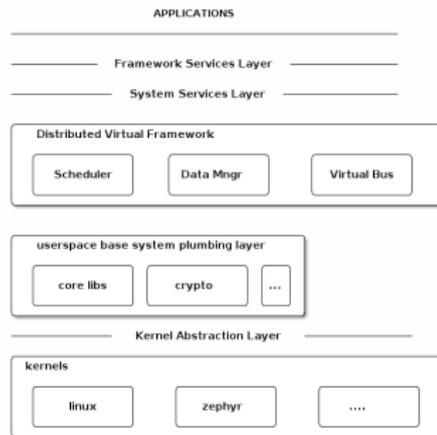


- Edge to cloud operating system for IoT and consumer devices
- Delivers on the promise of autonomous, cooperative devices
- Forming virtual super devices with capabilities and resources from individual devices
- Leverages a broad spectrum of Open Source components

We open up **very early** to allow for community engagement right from the start

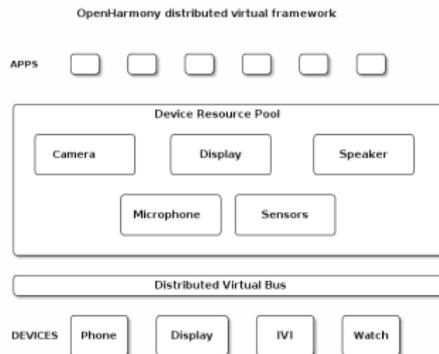
# OpenHarmony architecture

- Pretty common on the kernel and base system layers
- Having multiple kernels at the bottom being a big difference
- The distributed virtual framework brings in some interesting concepts to extend beyond hardware boundaries on **consumer devices**



# OpenHarmony: Distributed Virtual Framework

- Stationary as well as mobile devices will form a distributed virtual bus as communication channel
- On top of this bus the connected devices resources will form a so called super device with an augmented resource pool
- Applications can make use of this resource pool through an API



# FOSS projects usage and participation

- Strong focus on using existing FOSS projects and **upstreaming**
- FOSS not only on engineering but also on project management side
- Linux, OpenEmbedded/Yocto, Linux plumbing layer, Zephyr, GitLab, OpenProject, Mattermost, etc are already in use

## Housekeeping

Releasing as OpenHarmony we take the opportunity to evaluate each in-house component, see if we find something better

- We have meta-ohos for our OpenEmbedded/Yocto build
- Easy to bring your own BSP or software layers into the build

## Example setup

```
mkdir ohos; cd ohos
repo init -u https://git.ostc-eu.org/OSTC/manifest.git
repo sync; cd poky
. oe-init-build-env
bitbake-layers add-layer ../meta-openembedded/meta-oe
bitbake-layers add-layer ../meta-openembedded/meta-python
DISTRO=poky MACHINE=qemux86 bitbake core-image-minimal
```

# Hardware



<https://www.96boards.org/product/nitrogen/>

<https://www.96boards.org/product/avenger96/>

- Two boards from the 96boards initiative as first devices
- Avenger96 (cortex A7 + M4) and Nitrogen (cortex M4)
- To allow easy purchase and hardware bringup
- Support will grow based on community, Huawei and partner needs and preferences
- With the chosen kernels and buildsystem enabling more hardware will be easy

# Multiple-kernel approach

- Linux for powerful systems (let's say cortex A7)
- Zephyr for low end systems (let's say cortex M4)
- A combination of both as heterogeneous remote processor devices (remoteproc)
- Yocto/OE will handle the overall build, independent from used kernel
- Abstraction and support libraries to augment kernel APIs are added where needed, details TBC
- On the RTOS side we start with Zephyr and imagine to offer choice with LiteOS and FreeRTOS, if there is demand later on

# Public code and planning

The screenshot shows the GitLab interface for the 'Projects' section. At the top, there are navigation menus for 'Projects', 'Groups', and 'More'. A search bar is present with the text 'Search or jump to...'. A 'New project' button is in the top right. Below the navigation, there are tabs for 'Your projects', 'Starred projects', and 'Explore projects'. A filter box 'Filter by name...' and a dropdown 'Last updated' are also visible. The main content is a list of projects, each with a colored icon, repository name, description, statistics (stars, forks, issues, pull requests), and an 'Updated' timestamp.

Icon	Repository Name	Description	Stars	Forks	Issues	Pull Requests	Updated
D	Gururaj Shetty / developer-guide		0	0	0	0	Updated 3 hours ago
D	OSTC / docs / developer-guide		0	3	0	0	Updated 3 hours ago
M	OSTC / manifest	Repo manifest for working with Open Harmony OS using Yocto	0	0	1	0	Updated 12 hours ago
M	OSTC / meta-ohos	Set of meta-layers for building Open Harmony OS using Yocto	0	0	1	1	Updated 12 hours ago
F	playground / fossology	Apache License 2.0	0	0	0	3	Updated 13 hours ago
O	OSTC / tools / oh-spread	GNU General Public License v3.0 Friendly fork of <a href="https://github.com/snapcore/spread">https://github.com/snapcore/spread</a> intending to develop spread into new areas	0	0	0	1	Updated 13 hours ago
T	OSTC / planning / testing		0	0	0	6	Updated 13 hours ago
C	OSTC / comms / FOSDEM 2021 booth / content		0	0	0	0	Updated 14 hours ago
D	ARUL DEVARAJAN / developer-guide		0	0	0	0	Updated 19 hours ago
P	OSTC / planning / process	Process activities that don't fit anywhere else	0	0	0	1	Updated 20 hours ago
C	OSTC / docs / ci	Documentation of the CI system at OSTC	1	2	1	8	Updated 20 hours ago
T	ohos / third_party_bounds_checking_function		0	0	0	1	Updated 3 days ago

# Infrastructure and contributions

- Run like an Open Source project, not a company product
- Distributed development and DevOps
- Public communication channels like mattermost
- Public GitLab instance to bring it all together
- Public project planning with OpenProject
- CI/CD with pipelines going from simple style checks to on-hardware testing

## Contributions

- We welcome contributions already at this early stage
- Merge requests and issues for discussions, mattermost for chat

# OpenHarmony roadmap for EU release

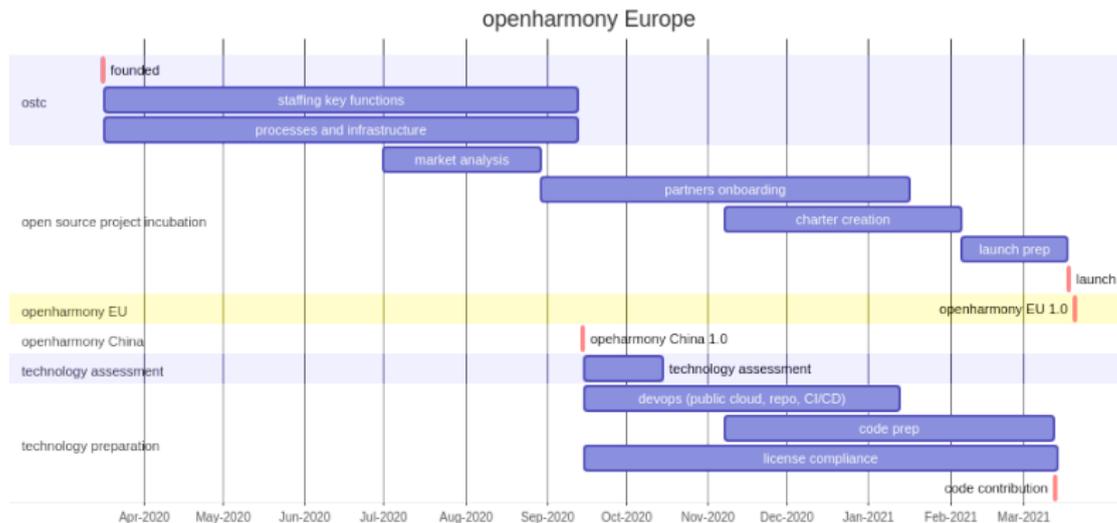


Figure 1: OpenHarmony EU roadmap

Thank You!  
... and get in touch



## Find us here:

- Chat: <https://chat.ostc-eu.org/>
- Gitlab: <https://git.ostc-eu.org/>
- Website: <https://www.ostc-eu.org/> Launching soon