



## *BoF: Challenges of Low Spec Embedded Linux*

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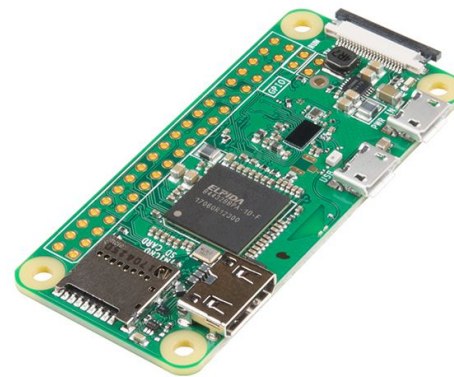
## Goal of this BoF

- Establish a shared mindset amongst participants on what a “Low Spec Linux Device” is in 2019
- Explore various dimensions of “Low Spec Linux” and pinpoint Hotspots that could deserve attention in 2019/20
- Discuss potential Agenda, Topics and Actions for ongoing Linux Low Spec efforts

## What is Low Spec Linux in Year 2019?



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## What is Low Spec Linux in Year 2019?

- *Idea: everything that cannot run a traditional linux desktop distribution could be low spec*
- *Idea: You wouldn't be able to use glibc*
- ~~*Idea: C++ is not very suitable for low spec*~~
- ***Idea: Low spec devices are typically build with resources constrained to the level that you need for a specific purpose***
- *Idea: limited bandwidth from storage to CPU*



## What are Hotspots of Low Spec Challenges in 2019?

*Linux Components (Footprint)*

*Distributions (Footprint+Velocity)*

*Other (Development and Mindset)*

## Component Hotspots

Bootloader  
**U-Boot**

Init System  
*systemd*, **sysvinit, procd, pantavisor,...**

Kernel  
**Linux**

Middleware  
**Bus, Bluetooth, Graphics?, Networking?, ...**

libc  
**MUSL, GLIBC, ...**

Container Engines  
**docker, lxc, pantavisor, systemd**





## Component Hotspots

- *graphics*
- *systemd*
- *networking*

## Linux Distribution Hotspots

Raw: Busybox  
**< 1MB**

OpenWRT  
**> 2MB**

Alpine  
**> 2MB**

Yocto  
**> 3MB (poky-tiny)**

Buildroot  
**> 700KB**

Debian  
**> 20MB**



## Linux Distribution Hotspots

- *buildroot*
- *busybox*
- *Yocto not so much*
- *Alpine interesting binary option while still smallish*
- *Debian not low spec suitable*

## Development and Mindset Hotspots

Cross Development  
**Toolchains, Build Systems**

Frameworks  
**Boost, Qt**

Snapd  
**Is this Embedded?**

Higher Level Languages  
**Python, Javascript, Rust, ...**

Upstreaming  
**no-upstreaming**

Docker  
**Cloud is good for Embedded?**



# Pantacor

... at the core of edge innovation ...

## Results: Actions & Findings

- *What is low spec linux: Low spec devices are those that have lowest BoM cost (which these days is roughly 64M mem & 16M of flash)*
- *Linux Kernel meets these days requirements for such devices*
- *Main Focus should be on unbloating Middleware as well as having good tools for keeping low spec devices updated and secured*