

Using ELBE for Realtime Embedded Linux for industrial automation in the automotive industry

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Overview

- 1 Motivation or the "challenge"
- 2 Realtime
- 3 The OSADL
- 4 Debian and ELBE
- 5 Conclusion

The challenge started more than 10 years ago...

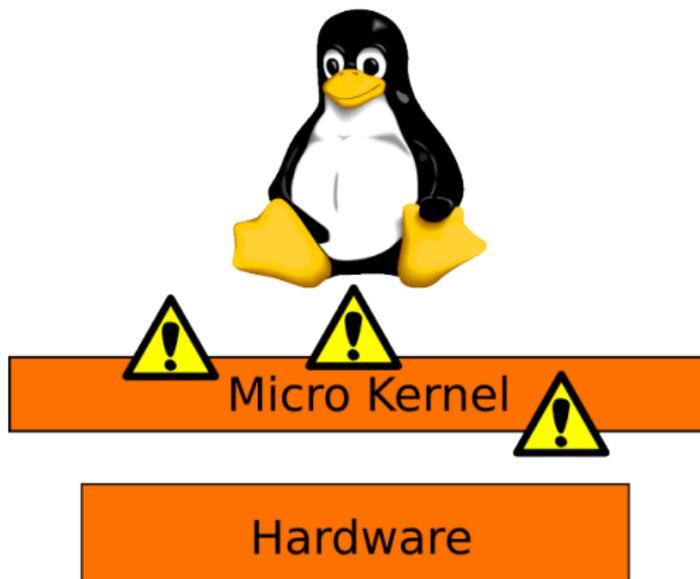


Machine producers started to look for replacements for their proprietary RTOSes. So, challenge accepted!! :)

Challenge Nr. 1 - Bringing Hard Realtime to Linux

- ❑ Starting from 2000 there were several approaches to make Linux Hard Realtime capable
- ❑ All these approaches were based on a so called dual-kernel concept
- ❑ These approaches didn't scale pretty well and they needed a special API
- ❑ These approaches didn't have any chance to be included to the mainline Linux Kernel

Dual-Kernel



How the story of Preempt RT began

"Controlling a laser with Linux is crazy, but everyone in this room is crazy in his own way. So if you want to use Linux to control an industrial welding laser, I have no problem with your using Preempt RT" - Linus Torvalds auf dem Kernel Summit 2006

Success Nr. 1: Preempt RT

- ❑ In-Kernel approach
- ❑ Founded by: Thomas Gleixner, Ingo Molnar
- ❑ POSIX realtime
- ❑ A lot of the features already made it into "Mainline"
- ❑ Huge community
- ❑ Highly accepted in the community

Success Nr. 1 ctd.: Bringing Preempt RT Mainline

Mainlining funded by a Linux Foundation working group:



Challenge Nr. 2 - Industrial customers had to have a "voice" in the community

- ❑ When using a Commercial RTOS, there is a company (usually the manufacturer) who can have a look at the needs of the customer
- ❑ But who can do that job when using Open-Source?

Success Nr. 2 - Founding the OSADL

In 2005 the OSADL was founded (Linutronix is a founding member):



Challenge Nr. 3 - Handling Security and Maintenance aspects



How to secure a device

Start with the simple things:

- ☐ Usermanagement
- ☐ Filesystem permissions
- ☐ Remove unnecessary services
- ☐ Make use of capabilities
- ☐ ...

BTW, if you decide to use a distribution like Debian, someone already took care about these things!

And remember: Security is NOT a onetime effort

- ❑ Remember: There might be bugs in third party software
- ❑ Just remember OpenSSL (heartblead)
- ❑ Tracking of security fixes is essential!
- ❑ Your device needs a method for security updates!

So, once again: if you decide to use a distribution like Debian, someone already took care about these things!

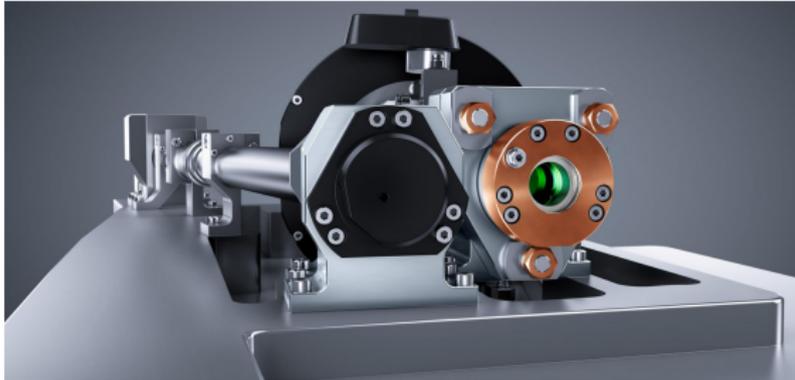
Success Nr. 3 - Using Debian for Industrial Devices

- ❏ Huge number of packages (for ARM, x86, PowerPC, ...)
- ❏ Security Tracking
- ❏ No need for Cross Compiling
- ❏ Powerful package management
- ❏ It can be easily stripped down for embedded devices

Success Nr. 3 ctd. - Coming up with ELBE

- ❑ **E mbedded L inux B uild E nvironment**
- ❑ **A buildsystem for reproducible Debian installations**
- ❑ **Can generate a ready-to-use target image**
- ❑ **Supports the user with license compliance**
- ❑ **It's Open-Source (GPLv3), available on github**

So, it might be crazy...



...but it works! :)

Conclusion

- ❑ **Linux is capable of Hard Realtime (Preempt RT became the de-facto standard)**
- ❑ **Debian is a perfect distribution for industrial customers**
- ❑ **Preempt RT and Debian are already widely used in the industry**
- ❑ **Also big companies like Toshiba are looking into Debian to solve the maintenance and security issues**

**Vielen Dank für Ihre
Aufmerksamkeit**

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