Open-Source in Heavy Machines
How we work with Open-Source @ Bosch Rexroth
Dr. Christian Grabe
Bosch Rexroth – WE MOVE. YOU WIN.
Bosch Rexroth – A Bosch Company – Key figures 2019*

Bosch Group

€ 77.9 billion euros
Sales revenue

402,800
associates

Mobility Solutions
▶ One of the world’s leading providers of mobility solutions

Industrial Technology
▶ Leading in drive and control technology, packaging, and process technology

Energy and Building Technology
▶ One of the leading manufacturers of security and communication technology
▶ Leading manufacturer of energy-efficient heating products and hot-water solutions

Consumer Goods
▶ Leading supplier of power tools and accessories
▶ Leading supplier of household appliances

Excerpt Presentation of the Bosch Group | January 2020
* As of 12.19 Preliminary, rounded figures based on internal accounting
Bosch Rexroth – WE MOVE.YOU WIN.
To be global, we go local

Sales and service network throughout 80 countries

5 continents work on research and development

Solve unique challenges in local markets

49 manufacturing locations and customization sites in 21 countries

31,000 total staff

6.2 bn€ total sales
5.6% R&D
Bosch Rexroth Digital Application Solutions = BODAS
IoT for Us is Part of a Comprehensive Solution for Off-Highway
Open-Source in our product(s)
BODAS Connect
The Comprehensive IoT Solution for Off-Highway Applications

Applications    Hardware    System    Web Portal
BODAS Connect
Open-Source relevance for different architectures

- Only few Open-Source modules available
- Distribution of license text difficult

- Higher relevance for Open-Source
- Many Open-Source modules available
- Many different coding languages e.g. C, C++, Python, Java, Go, JavaScript
BODAS Connect
Software Architecture within Connectivity Device

Device Management incl. OTA Services provided by Rexroth

Features / Snaps provided by OEM / 3rd party

Operation System provided with RCU Hardware

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BODAS Connect

Github – Example Code as Open-Source

https://github.com/boschrexroth/bodas-device-connectivity-samples

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BODAS Connect

Our top 5 reasons to use Open-Source

1. Time-to-market, if a respective module already exists
2. Proven by “heavy” use, but not for all domains available
3. Functionality: Focus on differentiating elements
4. No license fees, but internal maintenance costs
5. No vendor lock-in, but need to build up competency to be able to assess

5+ Cross-company collaborations easily possible

* Coverity Scan - Static Analysis, Linux code is the 'benchmark of quality,' study concludes | PCWorld, Four-Year Analysis Finds Linux Kernel Quality and Security Better than Most Proprietary Enterprise Software (govtech.com)

Coverity Scan - Static Analysis

- Kernel Defect Density
  - approx. 0.35 errors per kSLOC* (every 2857 lines/29 pages)
- Industry Defect Density
  - average 0.8 errors per kSLOC (every 1025 lines/10 pages)

Fictive Linux kernel cost
5.5.13 (2020-03-25)
Total Estimated Cost to Develop: ~1.6bn US$

1 COCOMO based; average annual salary Feb 2020 for Linux developers $110,000; overhead = 2.40
Collaboration within Bosch
– Inner source
Evolution of BIOS

2009 – Experiment
Mimic OSS processes, methods, tools and mindset on “noncritical projects”
Goal: Proof of Concept; Generate learnings and good practices

2013 – Extension
Establishment of BIOS as new development approach
- Transfer from research to business
- Establish and maintain BIOS work environment and legal framework

2016 – Expansion
- BIOS is the gold standard
- Social Coding – tool chain for non-BIOS development

Today...
- Decentralize facilitation for Social Coding & BIOS
- Revise BIOS Legal Framework
  “maximize freedom & minimize complexity”

Inner Source @ Bosch – Bosch Internal Open Source
Inner Source @ Bosch – Bosch Internal Open Source
Stats for Social Coding (BIOS + non-BIOS)

30 Countries

13000 Users

180 Business Units
Inner Source @ Bosch – Bosch Internal Open Source
Stats for Social Coding (BIOS + non-BIOS)

~ 20,000 Repositories

85% closed projects

15% BIOS
Inner Source @ Bosch – Bosch Internal Open Source
Stats for Social Coding (BIOS + non-BIOS)
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https://www.youtube.com/watch?v=qZ5lpIbdas0