Presented by:

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Coimbra, Portugal – 16.09.2023
Jonas Petereit

- Software engineer since 2017 (B. Eng.)
- Human Machine Interface (HMI) development
- Developing cross-platform applications for Windows, Linux and FreeBSD

Beckhoff Automation GmbH & Co. KG
(https://www.beckhoff.com/en-us)
- Industrial automation
- PC-based control
- “TwinCAT transforms almost any PC-based system into a real-time control […].”
  - Windows: an OS distributed by Microsoft, TwinCAT support since 1996
  - TC/BSD: an OS based on FreeBSD which includes real-time extensions
1. .NET fundamentals
   - Common Language Runtime (CLR)
   - Just-In-Time (JIT) compiler
2. Support for FreeBSD
   - History
     - Initial support in 2019
     - Private and community support since 2020
   - Patches and compilation
3. Use cases
   - Azure Pipelines Agent
   - Custom cross-platform applications → Live demo
4. Next steps
1. **.NET fundamentals**

**Common Language Runtime (CLR)**

- Executes managed code
  - Written in high-level languages like C#
  - Compiled to Intermediate Language (IL)

- CLR itself is unmanaged code
  - Mainly written in C/C++
  - Turns managed code into machine code

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**Platform independent**

**Platform dependent**

**CLR needs FreeBSD support!**
1. .NET fundamentals
Just-In-Time (JIT) compiler

Language-specific but platform-independent

Language-independent and platform-independent

Language-independent but platform-specific
Microsoft says about .NET:

“Fast and cross-platform
[...] You can write, run, and build on multiple platforms, including Windows, Linux, and macOS.”

(https://dotnet.microsoft.com/en-us)

2. Support for FreeBSD
History – Initial support in 2019

- OSPlatform.FreeBSD property was added with .NET Core 3.0 in September 2019

2. Support for FreeBSD

History – Private and community support since 2020

- In early 2020...
  
  “We lost build servers [...].”

  ![Image](https://github.com/dotnet/source-build/issues/1139#issuecomment-522106312)

- (Semi-)official FreeBSD support has been dropped

- FreeBSD support only from private and community developers (by companies like Beckhoff and on GitHub)
C++ code in CLR still exists but sometimes needs patches:
- Problems with unsupported library versions
- FreeBSD releases reached EOL
- Missing NuGet package versions

At Beckhoff we...
- ... set up a GitLab pipeline to build .NET and test it on TC/BSD
- ... cross-compile .NET Runtime and SDK on Linux
- ... can provide new versions for a .NET release on demand

At GitHub there are...
- ... pre-built .NET binaries for FreeBSD available
- ... build scripts and documentation (https://wiki.freebsd.org/.NET)
3. Use cases

Azure Pipelines Agent

- **Azure DevOps Server**
  - Collaboration software for **software development teams**
    - Version control and project management
    - **Build and test**
      - Closed source
      - Hosted on Windows

- **Azure Pipelines Agents**
  - “Azure DevOps build and test client”
  - Source code available on GitHub
  - Hosted on Windows, Linux, macOS and FreeBSD
**3. Use cases**

**Custom cross-platform applications**

- **Remember:**
  Compiler creates IL assemblies that are **platform-independent**

- **But:**
  Binary executables are **platform-dependent**

- **Live demo:**
  Compile and run .NET Console apps on Windows and FreeBSD
4. **Next steps**

- **Short-term goals**
  - Ask yourself: *Do I need .NET for FreeBSD?*
  - Use existing .NET binaries for FreeBSD ([https://wiki.freebsd.org/.NET](https://wiki.freebsd.org/.NET))

- **Medium-term goals**
  - Moving Beckhoff’s GitLab repo to GitHub
  - Keep Azure Pipelines Agent for FreeBSD up to date ([https://github.com/microsoft/azure-pipelines-agent/pull/3266](https://github.com/microsoft/azure-pipelines-agent/pull/3266))
  - Fix existing bugs and missing .NET unit tests for FreeBSD
  - Request FreeBSD support from NuGet package developers

- **Long-term goals**
  - Convince Microsoft to officially support FreeBSD
  - Add .NET to the FreeBSD ports tree
Thank you for your attention!
Picture Sources

- dotnet bot (normal):
  https://avatars.githubusercontent.com/u/9011267

- dotnet bot (waving 1):

- dotnet bot (waving 2):

- Tux (Linux character):
  https://en.wikipedia.org/wiki/Tux_(mascot)#/media/File:Tux.png

- FreeBSD daemon with trident:
  https://www.freebsd.org

- FreeBSD daemon with hammer:
  https://www.freebsd.org/gifs/daemon_hammer.jpg
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