

GSoC 2025 Proposal Driver Adaptation for Network Stack

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About Me

I am Muhammad Abdul Rehman Khan, a Computer Science student currently focusing on low-level kernel development and driver building. I have worked on various projects related to systems programming and am eager to dive deeper into kernel and driver development.

Why This Project

This project aligns perfectly with my interests in low-level programming and kernel development. While I haven't worked with the specific drivers listed in the project, I have experience in **C programming**, **networking**, and **systems programming**, giving me a solid foundation to adapt these drivers. I see this as an excellent opportunity to strengthen my understanding of hardware interaction, network stacks, and multi-core synchronization.

Project Plan

1. **Research and Learning:** I will start by reviewing the documentation on the current driver implementations and study the specific drivers that need adaptation (e.g., Realtek, Atheros).
2. **Driver Adaptation:** I will work on adapting the drivers to support multi-core network stack operation and optimize performance. My approach will involve analyzing the current code, identifying potential improvements, and implementing solutions to make these drivers SMP-friendly.

3. **Testing and Documentation:** I will thoroughly test the adapted drivers using both real hardware (if available) and QEMU. I will also ensure that detailed documentation is provided to make the process replicable for others.

Why Im a Good Fit

I am comfortable working with low-level system code, including kernel and driver-related tasks. My experience with multithreading, C programming, and networking protocols gives me the confidence to handle this project efficiently. I am also excited to dive into areas I havent worked on yet, like adapting specific drivers to improve performance.

Goals

- Adapt and improve the network drivers for SMP support.
- Ensure compatibility and performance on multi-core systems.
- Contribute to the NetBSD projects long-term development by enhancing its network stack.

Timeline

Community Bonding Period: - Study and familiarize myself with the current codebase and project documentation. - Prepare by setting up the development environment and identifying which drivers to begin with.

Phase 1 (Weeks 1-4): - Focus on adapting **one or two drivers** from the list, including initial testing and ensuring basic functionality. - Start implementing changes to make the drivers SMP-compatible and optimize them for multi-core systems.

Phase 2 (Weeks 5-8): - Continue adapting additional drivers as time allows, focusing on performance improvements and multi-core synchronization. - Begin testing all adapted drivers on both real hardware (if available) and virtual machines to ensure stability.

Phase 3 (Weeks 9-12): - Finalize any remaining driver adaptations. - Conduct extensive testing and benchmark the performance improvements across all adapted drivers. - Write detailed documentation for the drivers and the process, making it easier for others to follow and replicate the changes.

Conclusion

Im excited about this opportunity and looking forward to contributing to the NetBSD project by improving its network stack. This project will give me a deeper understanding of kernel development and hardware interaction, which is exactly what I am looking for.