

P4Docker: Simplifying P4 Switch Testbeds with Docker Integration

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Software Defined Networking (SDN) and the P4 programming language have revolutionized how network infrastructures are designed and managed. However, the complexity of setting up and managing P4 test beds poses a significant challenge. To address this, we present P4Docker[Silva et al. 2024], a tool based on Docker containers to streamline the design, deployment, and debugging of P4-based network environments. Additionally, we introduce P4FlowForge¹, a tool that allows users to generate traffic for standard and custom protocols, making it ideal for testing various network scenarios.

Key Features of P4Docker: Intuitive GUI - P4Docker offers a user-friendly graphical interface for creating and managing network topologies, making it accessible to both novice and experienced users; Docker Integration - Using Docker containers, P4Docker ensures isolation and consistency in the test bed environment, allowing for accurate simulations and experiments; Comprehensive Debugging Tools - Detailed logging and system metrics are provided to facilitate in-depth analysis and debugging of network behavior.

Integrating P4FlowForge: P4FlowForge complements P4Docker by enabling the generation of custom network traffic and P4 code. This integration enhances P4Docker capabilities, providing a comprehensive network protocol testing and validation solution. Users can define custom protocols using a JSON-based interface, which can then be implemented and tested within the P4Docker environment.

Demo: To demonstrate the tool, we intend to create a demo that showcases the creation of a custom network protocol using P4Docker and P4FlowForge. We will use both tools to configure a network test bed with P4 switches and simulated hosts, validating the custom protocol's functionality and performance.

Expected Results: Integrating P4Docker and P4FlowForge provides a powerful and flexible platform for network experimentation. This combination simplifies the setup of complex network environments and allows for precise control and analysis of custom network protocols.

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References

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¹<https://github.com/dnredson/p4flowforge>