

Offenburg University of Applied Sciences
Institute of Reliable Embedded Systems and Communication Electronics (ivESK)

DTLS Simulator

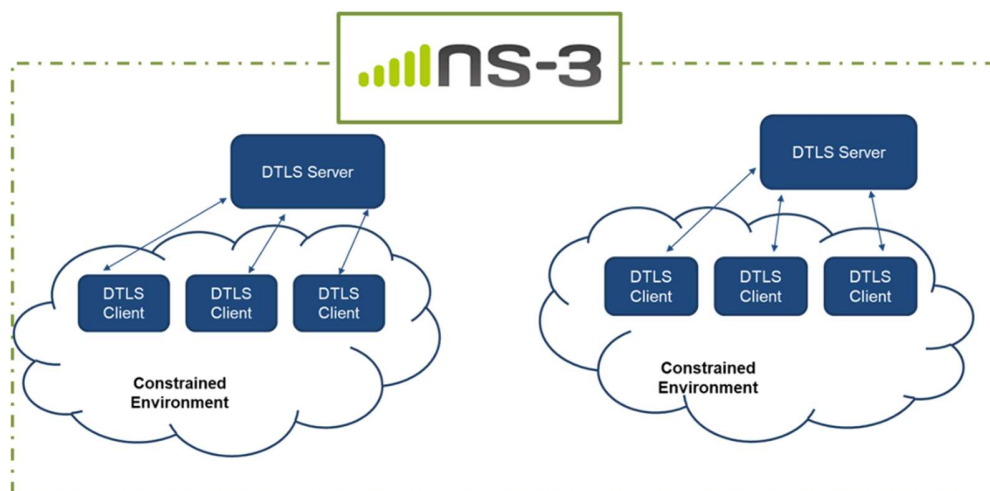
A Comprehensive Framework for Evaluating DTLS using Network Simulator (ns-3)

The Institute for Reliable Embedded Systems and Communication Electronics (ivESK) designs, implements and tests algorithms, protocols and platforms for efficient, secure, and reliable wireless and wired communication solutions using embedded systems. To support our work, we are looking for,

a student for a Bachelor's or Master's thesis from courses of study
Applied Computer Science, Electrical Engineering / Information Technology, Mechatronics
or similar specializations (under certain circumstances)

In combination with

Work as a research assistant



In today's digital landscape, secure communication is of utmost importance to ensure the confidentiality, integrity, and authenticity of sensitive data. Datagram Transport Layer Security (DTLS) is a widely adopted protocol that provides secure communication for datagram-based applications, such as real-time streaming and Internet of Things (IoT) devices. As the use of DTLS continues to expand, there is a demand for comprehensive tools that can assess its performance and effectiveness under various scenarios.

The objective of this work to develop a DTLS simulator, a comprehensive framework that can evaluate the behavior and performance of DTLS protocols.

To achieve this goal, we propose the utilization of ns-3, a powerful discrete-event network simulator. It will facilitate the emulation of diverse network conditions, including latency, packet loss, and bandwidth constraints. It also should emulate the specific challenges posed by some networks, such as LPWAN, where networks often impose duty cycle limitations, restricting the time allocated to each device for transmitting data. Furthermore, it should provide a unique provision to test the performance of DTLS protocols in scenarios involving multiple clients and servers. This is particularly relevant in congested network environments where each device operates under restricted time allotments and collisions are likely to occur. By simulating these complex conditions, simulator will provide a realistic environment for assessing different aspects of DTLS, its security, performance, and scalability in the presence of the challenges like network congestion, limited bandwidth, and resources.

More specifically, the tasks will include:

- Designing and implementing a modular DTLS simulator framework
- Developing simulation scenarios with multiple clients and servers in a congested network environment.
- Exploring the impact of network conditions, such as latency, packet loss, and bandwidth constraints, on DTLS behavior.
- Evaluating the performance of DTLS protocols under constrained time allotments and collision scenarios.

What you can expect:

- Opportunity to delve into cutting-edge security research with industrial relevance.
- A good balance between theoretical and practical work.
- Introduction to industry-standard tools and resources, including the NS3 network simulator.

What you should bring:

- Passion for exploring innovative approaches to produce high-quality software.
- Willingness to learn about communication and security protocols.
- Good experience in programming, preferably using C++.

If you have any questions, contact:

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