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Implementation of a Secure Satellite Communications Channel

Master thesis proposal (external thesis in collaboration with armasuisse)

More and more satellites are being deployed for general purpose Internet communication. From a conceptual perspective, many of them are insecure as security was never part of their design. In conjunction with the long lifetime of deployed satellites, this means that there are many vulnerable satellite systems used around the world for very diverse purposes. Recent contributions from academic and hacking communities have exploited this inherent vulnerability and demonstrated attacks on some of these technologies. For example, the communication on ships and vessels can be eavesdropped on with relatively low technical and financial resources [1].

To solve this issue, QPEP has been designed.QPEP is an encrypted performance enhancing proxy designed to protect high-latency satellite connections without TCP performance degradation. QPEP leverages a QUIC-tunnel to encapsulate TCP traffic over the satellite hop and de-encapsulate it on an internet connected server [2].

In this dissertation, you will implement, set up and evaluate QPEP in practice over a real-world satellite link in the Satellite Lab at the Cyber-Defence Campus in Thun, where practical experiments can be conducted. Consequently, this work is looking for a student who enjoys tinkering with different hardware and radio signals.

Requirements

- Low-level knowledge of software-defined radio hardware, radio frequency communication.
- Ability to create hard- and software systems based on existing building blocks
- Programming knowledge and willingness to build on or adapt the existing framework implemented in Go [3]

References

[1] A Tale of Sea and Sky: On the Security of Maritime VSAT Communications
James Pavur, Daniel Moser, Martin Strohmeier, Vincent Lenders and Ivan Martinovic
In 2020 IEEE Symposium on Security and Privacy (S&P). IEEE. May, 2020.

[2] QPEP: A QUIC-Based Approach to Encrypted Performance Enhancing Proxies for High-Latency Satellite Broadband
James Pavur, Martin Strohmeier, Vincent Lenders and Ivan Martinovic
February, 2020. https://arxiv.org/abs/2002.05091

[3] QPEP: An Encrypted QUIC-Based Performance Enhancing Proxy for Modern Satcoms
Github: https://github.com/ssloxford/qpep

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