

Analysis on Security and Privacy in Low Earth Orbit (LEO) Satellite Communications (Bachelor/Master Thesis)

Background

Low Earth Orbit (LEO) satellite internet systems like Starlink and the upcoming Project Kuiper are transforming global connectivity. This trend presents both new opportunities and security and privacy challenges. This thesis will theoretically investigate the privacy and security of current LEO solutions for Internet connectivity, e.g. analysis of the security architecture, threat modeling, data protection and anonymity in satellite communications. Current findings and countermeasures from research and development are to be compared and evaluated in a literature study. At least one practical test should be carried out, depending on the complexity and technical feasibility.

Objectives

Analyzing communication systems by actively interfacing proprietary API's or passively analyzing the network data traffic can reveal potential security or privacy vulnerabilities. This may allow to learn about active system components or reverse-engineer undocumented communication protocols or interfaces. This thesis aims to evaluate the practical feasibility of passive and active LEO security analyzes based on practical experimentation and provide recommendations for improving the security and privacy in current LEO architectures.

Objectives of a possible thesis includes:

- Literature Review: Analysis and review of state-of-the-art privacy and security solutions (Anonymity/Privacy, Passive/Active Fingerprinting and Component Identification)
- Prototyping: Implementation of practical measurements or attacks on active components
- Evaluation: Evaluation of the prototype performance with regard to information obtained, effort required, success rate and resulting privacy threat
- Documentation: Thoroughly documenting the research process, findings, and strategies employed to navigate and resolve challenges encountered during the study.

The exact scope of the project depends on the thesis type (Bachelor/Master).

Requirements

Candidates should be interested in communication networks focusing on network protocol and security analysis. Experience in setting up and using new communication technologies (e.g. Starlink) is a benefit.

Application Process

All applications must be submitted through the application website INTERAMT:

<https://www.interamt.de/koop/app/trefferliste?partner=339>

(Abschlussarbeiten Bachelor / Master; Pflichtpraktika)

Carefully note the information provided on the site to avoid any issues with your application.

Your application should include

- a short CV
- a current transcript of records
- the keyword "T3-SC-SATCOM" as a comment

For any questions or further details regarding this thesis and the application process, please feel free to contact ZITiS T3 (t3@zitis.bund.de) or PD Dr. Corinna Schmitt.