

# PKI for 6G Satellite Communication

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## Abstract

The rapid growth of the "New Space" sector and the deployment of Low Earth Orbit (LEO) satellite constellations are revolutionizing satellite communications (SATCOM), making it an integral part of the anticipated 6G infrastructure. However, integrating SATCOM with terrestrial networks introduces complex security and privacy challenges that conventional Public Key Infrastructure (PKI) solutions cannot fully address. This is due to the unique characteristics of space-based networks, including highly dynamic topologies, mobility, and resource constraints. PKI serves as a cornerstone of internet security and has, for decades, ensured robust authentication and message confidentiality and integrity across terrestrial networks. While proven effective for terrestrial networks, traditional PKI faces limitations in SATCOM deployments due to the unique characteristics of space-based communication systems. Specifically, SATCOM networks introduce a highly distributed and mobile infrastructure, exhibit significant latency variability, and operate under strict resource constraints, which collectively necessitate the development of optimized, lightweight security solutions. We study the challenges and requirements for deploying PKI in a space environment, for a safer 6G.