Security in radio-based ICT systems

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Abstract: Past research in the security of ICT systems has primarily considered physical networks. However, there exists a large class of ICT systems that are primarily radio-based. Since they use radio waves for communication, all radio-based ICT systems share a common physical layer that is accessible to anyone within range. This brings with it many security challenges in addition to those present in all ICT systems. Furthermore, many specialized radio-based ICT systems were originally designed and built before the emergence of modern cybersecurity and have come to evolve from simple radio systems into full-fledged digital communications networks. Historically, the need for specialized radio equipment has set a relatively high bar for entry into studying the security of these systems. The bar has become significantly lower as software defined radio (SDR) technology has developed in the past decade. Researchers have found vulnerabilities in radio-based ICT systems used in, among others, the civil aviation, shipping, rail transport, public security, and military sectors. Despite vulnerabilities in a broad range of radio-based ICT systems, there appears to be no research into common causes of the deficiencies or why the organizations that use them seem to do very little to improve security. As a PhD student, my aim is to improve the understanding of security in radio-based systems. Ultimately, my hope is to develop a framework that can aid in helping organizations improve the security of their radio-based ICT systems.