Resilient Communications Availability Inverting the Confidentiality, Integrity, and Availability Paradigm

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Keywords: Communications networks; Cyber electromagnetic spectrum; Radio frequency cellular coverage; Internet Protocol-based coverage; Signal boosters; Oscillation detection; Oscillation prevention; Spectrum analyzer; Smart auto switching; Non-bonded single channe

Abstract:
Communications networks are subject to degradation due to a variety of factors from the cyber electromagnetic spectrum. Interference may be unintentional and/or intentional, but the consequences are comparable; communications availability may be affected. Although cellular carriers must abide by the Federal Communications Commission's Enhanced 911 (E911) rules, poor radio frequency cellular coverage and intermittent connections remain problematic. As numerous communications networks transition to Internet Protocol-based operations, new service reliability vulnerabilities have emerged for, by way of example, 911 location services, and poor wireless internet network (a.k.a. wi-fi) coverage may cause availability issues for 311 (e.g., reportage of road damage), and 211 (e.g., facilitation for essential community services), among others. As society becomes more dependent upon wireless communications networks, it is vital to maintain acceptable service availability levels under prototypical circumstances as well as amidst incidents, including disruptions emanating from within the cyber electromagnetic spectrum ecosystem. In several cases, public safety systems, which have gone through full acceptance testing, have been adversely affected due to interference stemming from known systems (e.g., as they expand) as well as unknown systems (e.g., unregistered). Dropped calls, garbled messages, and blocked messages have been among the reported effects. Given these known phenomena, it is possible to interfere with both cellular and Voice over Internet Protocol (VoIP) 911 and first responder-related calls by the strategic placement of interfering nodes in the form of misused cellular boosters and/or strategically positioned femtocells, deliberate Bluetooth congestion so as to limit the number of frequency channels available and interfere with wi-fi and cellular network technologies (including spread spectrum), affecting the involved communications paradigm. This string of effects has segued into a potential cyber kill chain (which comprise the phases of a cyberattack from reconnaissance to exploitation) paradigm, which is examined in this paper. Among other items presented, an alarming spike in the prevalence of non-compliant boosters is noted. In addition, the increasing number of incidents as pertains to "incidental radiators" and "unintentional emitters" of Radio Frequency Interference (RFI) is also noted. Overall, as the potential for RFI has increased, the potency of the described cyber kill chain also increases. An outcome of the paper is the recognition of this potential blindspot within current communications architectural paradigms.

Pages: 58 to 65

Publication date: October 25, 2020

Published in: conference

ISSN: 2519-8599

ISBN: 978-1-61208-818-1

Location: Nice, France

Dates: from October 25, 2020 to October 29, 2020

DataSys 2020 Congress
September 27, 2020 to October 01, 2020 - Lisbon, Portugal

- **AICT 2020**, The Sixteenth Advanced International Conference on Telecommunications
- **ICIW 2020**, The Fifteenth International Conference on Internet and Web Applications and Services
- **ICIMP 2020**, The Fifteenth International Conference on Internet Monitoring and Protection
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- **CENICS 2020**, The Thirteenth International Conference on Advances in Circuits, Electronics and Micro-electronics
- **ICQNM 2020**, The Fourteenth International Conference on Quantum, Nano/Bio, and Micro Technologies
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- **eKNOW 2020**, The Twelfth International Conference on Information, Process, and Knowledge Management
- **ALLSENSORS 2020**, The Fifth International Conference on Advances in Sensors, Actuators, Metering and Sensing
- **SMART ACCESSIBILITY 2020**, The Fifth International Conference on Universal Accessibility in the Internet of Things and Smart Environments