

Towards a Theory of Moving Target Defense

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The static nature of cyber systems gives attackers the advantage of time. Fortunately, a new approach, called the Moving Target Defense (MTD) has emerged as a potential solution to this problem. While promising, there is currently little research to show that MTD systems can work effectively in real systems. In fact, there is no standard definition of what an MTD is, what is meant by attack surface, or metrics to define the effectiveness of such systems. In this paper, we propose an initial theory that will begin to answer some of those questions. The paper defines the key concepts required to formally talk about MTD systems and their basic properties. It also discusses three essential problems of MTD systems, which include the MTD Problem (or how to select the next system configuration), the Adaptation election Problem, and the Timing Problem. We then formalize the MTD Entropy Hypothesis, which states that the greater the entropy of the system's configuration, the more effective the MTD system.