Cryptology ePrint Archive: Report 2011/639

Towards a Probabilistic Complexity-theoretic Modeling of Biological Cyanide Poisoning as Service Attack in Self-organizing Networks

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Abstract: We draw an analogy of \emph{biological cyanide poisoning} to security attacks in self-organizing mobile ad hoc networks. When a circulatory system is treated as an enclosed network space, a hemoglobin is treated as a mobile node, and a hemoglobin binding with cyanide ion is treated as a compromised node (which cannot bind with oxygen to furnish its oxygen-transport function), we show how cyanide poisoning can reduce the probability of oxygen/message delivery to a rigorously defined ``negligible" quantity. Like formal cryptography, security problem in our network-centric model is defined on the complexity-theoretic concept of ``negligible", which is asymptotically sub-polynomial with respect to a pre-defined system parameter x. Intuitively, the parameter x is the key length n in formal cryptography, but is changed to the network scale, or the number of network nodes N, in our model. We use the $\RP$ (n-runs) complexity class with a virtual oracle to formally model the cyanide poisoning phenomenon and similar network threats. This new analytic approach leads to a new view of biological threats from the perspective of network security and complexity theoretic study.

Category / Keywords: foundations / biochemical science based on complexity theory

Date: received 25 Nov 2011

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