A Hypothesis Testing Framework for Network Security

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Goals
To develop analysis methodologies needed to support scientific reasoning about the security of networks, with a focus on information and data flow security. The core of this vision is Network Hypothesis Testing Methodology (NetHTM), a set of techniques for performing and integrating security analyses applied at different network layers, in different ways, to pose and rigorously answer quantitative hypotheses about the end-to-end security of a network.

Hard Problems Addressed
This project covers four hard problems:
• Predictive security metrics
• Scalability and composability
• Policy-governed secure collaboration
• Resilient architectures

Research Plan
Foundational rigorous network model
• Develop technology to rigorously model network dynamics
• Develop technology to model virtualized networks
• Develop a database representation of network behavior

Effective evaluation methodologies designed scale to large and complex systems
• Develop scalable evaluation methodology via the marriage of emulation and simulation
• Develop a hybrid platform to realize the network models and the verification algorithms developed earlier
• Investigate the impact of various cyber-attacks on network behavior

ConVenus: Congestion Verification of Network Updates in SDN (WSC’16)

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CCG: Enforcing Generalized Consistency Properties in Software-Defined Networks (NSDI’15)

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