Towards a Global Network Reputation System: A Mechanism Design Approach

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Homeland
Security

Science and Technology

Team Profile

- University of Michigan
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Customer Need

- Risk management
  - A systematic way to quantify and measure security risks at an organizational level
  - A set of risk-aware policies

- Incentive design
  - Incentive mechanisms to induce desirable security investment and behavior

Approach

- To establish a network reputation system
    - Reputation at an appropriate level of abstraction/aggregation
    - Large scale data analysis and modeling
    - Predictive measure leading to proactive policies

- Mechanism design
    - Incentive mechanisms to encourage data input leading to more accurate reputation assessment
    - Incentive mechanisms to induce desirable security investment and behavior

Benefits

- Risk management
  - Better understanding and assessment of security risks
  - More systematic and predictive risk management
  - Proactive and risk-aware policies

- Incentive design
  - Better understanding of the needed incentive structure for security investment
  - Policy guidance and recommendations

Competition

- Risk management
  - Reputation at the host level
  - Reactive policies

- Incentive design
  - Unregulated interdependent security games (IDS)
  - Price of anarchy
  - Does security need to be mandated?

Current Status

- Network reputation
  - Preliminary data analysis and aggregation on a set of host reputation lists
- Mechanism design
  - A crowd-sourcing reputation mechanism to collect data input
  - A positive externality mechanism to incentivize investment in non-excludable public goods
  - Issue of voluntary participation

Next Steps

- Year 1
  - Data analysis
  - Reputation mechanism and implementation
- Year 2
  - Completion of data analysis
  - Risk-aware policy design
- Year 3
  - Incentive mechanism using reputation assessment
  - Policy implementation

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