SAND2020-7317D

The Center for Cyber Defenders

Expanding computer security knowledge

Measuring Resilience in NOS^3

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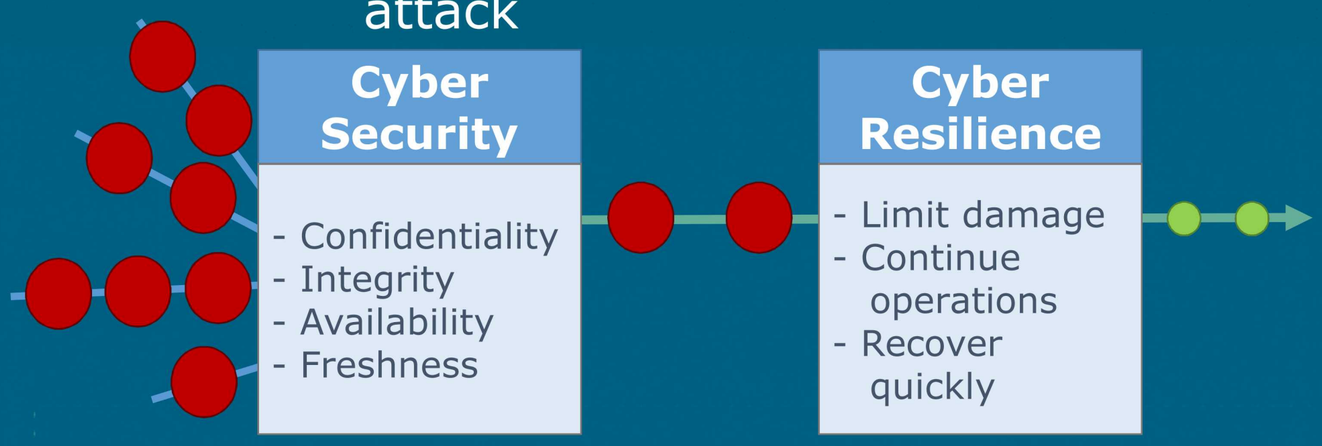
Problem Statement:

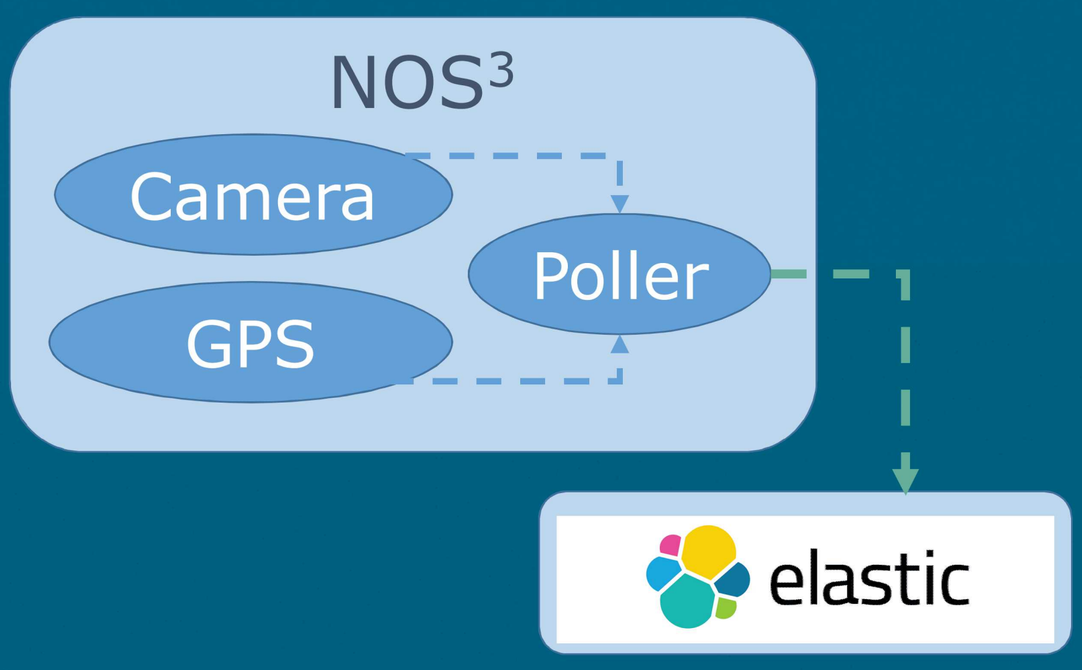
- It is impossible to guarantee a system is secure
  - Cyber security decisions work to increase system security confidence
  - Cyber resilience decisions work to decrease damage realized by an attack



- How can resilience be measured in virtual testbeds?

Objectives and Approach:

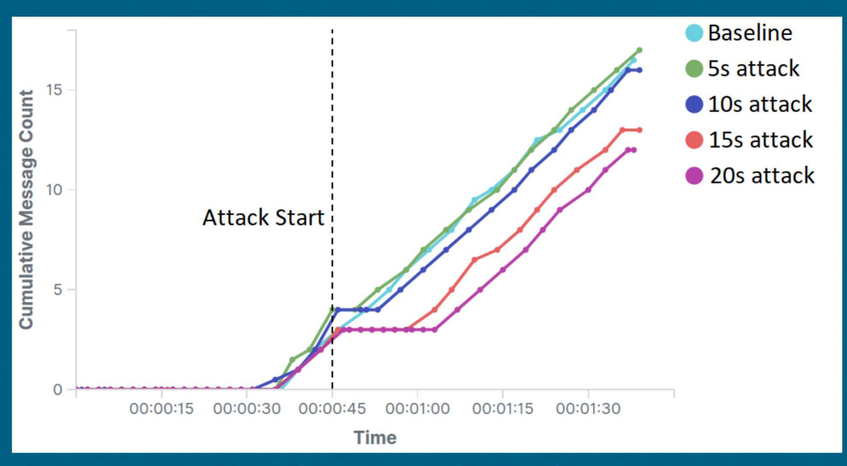
- Create a poller to actively collect data in NOS^3
  - NOS^3 is a NASA-developed simulation platform for small satellites



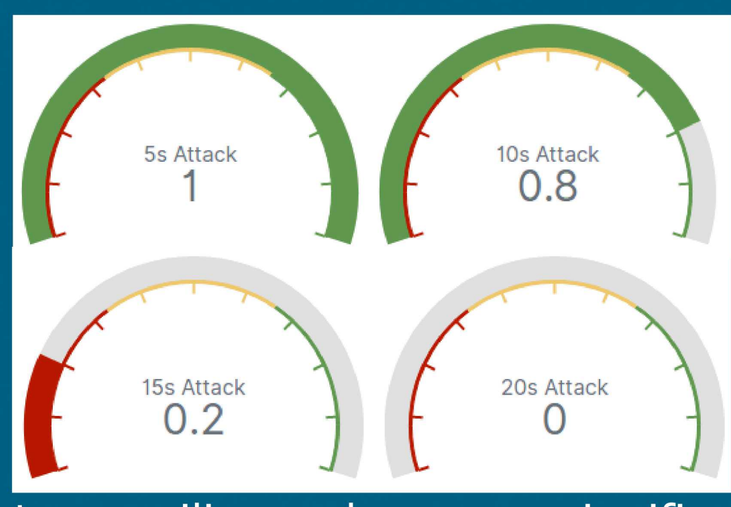
- Improve Resilience Verification Unit (RevRun) tool
  - Improved configurations, additional preprocessing options
- Integrate poller with RevRun
- Design resilience metrics
  - How long is a system in an unsafe state?
  - How critical is the unsafe state?

Results:

- Experimental setup
  - Mission: SmallSat takes pictures of target locations and downlinks to the ground station
  - Simulated attack scenarios: Camera is disabled for 5, 10, 15, 20 seconds
  - Resilience measure: How much experimental data was properly sent to the ground station?
- Attack and Resilience Results:



Longer attacks result in less camera data received



System resilience decreases significantly with attack length

Impact and Benefits:

- Data collection techniques further the ability to analyze the NOS^3 System
  - Data collection times are significantly reduced
  - The reproducibility and traceability of the experiments will be significantly improved
- Quantifying resilience
  - Determines how well a system is able to carry out its mission
  - Better informs which mitigation strategies best defeat attacks

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