

Moving Target Defense for Space Systems

PIs – Chris Jenkins, Eric Vugrin

Overview

- Determine MTD effectiveness and cost for protecting non-IP C2 networks
- Experiment on networks used in satellite systems
- Randomize features (e.g. device address) to prevent adversary from conducting reconnaissance

Status

- Conducted first experimentation with MIL-STD-1553
- Prototype implementation using real hardware (AltaDt ENET2-1553)

Accomplishments

- Developed patent-pending MTD algorithm for use in non-IP C2 networks
- Successfully randomized addresses while calculating the 24th Fibonacci number

Next Steps

- Conduct experiment with “rogue” node attempting to disrupt Fibonacci calculation
- Use resilience metrics to determine cost of MTD usage



0	1	2	3	4	N-2	N-1	N
8	19	3	4	0	12	9	5
19	3	4	16	27	28	15	12
3	4	17	29	20	1	14	11
4	17	12	21	24	30	1	16
29	3	0	13	25	..	..	..
3	0	13	25	1	23	..	..
29	3	0	13	25	..	..	..
1	30	2	17	5	19	4	..
30	2	17	5	19	22	..	..
2	17	5	19	22	..	..	..
17	5	19	22	..	..	..	..
5	19	22	..	..	..	..	..
19	22	..	..	..	..	..	..
22	..	..	..	..	..	..	..
..

...
..
..
..
..



Randomized Array
n! possible orderings
for array of size n

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

MTD Frequency (# of frames)	Predicted Overhead (%)	Actual Overhead (%)
1	50.0	50.1
2	25.0	25.1
3	16.7	16.7
5	10.0	10.2
10	5.0	5.0
20	2.5	2.6
50	1.0	1.0
100	0.5	0.5