

Satellite Anomaly Injection & Detection Testbed

Team Members: Marth Caldera, Diana Degiacomo, Jae Lee, Michael Morris, Gustavo Torres, Tomas Velarde, Dearo Yam, Rafael Zaragoza Faculty Advisor: Zilong Ye Aerospace Liaisons: Andre Chen, Denny Ly, Karina Martinez, Vivian Sau **Department of Computer Science** College of Engineering, Computer Science, and Technology California State University, Los Angeles



Background

Satellites deal with a numerous amount of different anomalies. These anomalies range from cyber attacks, hardware failures, system failures, and many more. This year's mission was to focus on detecting and resolving cyber attacks, Syn Flood and Single Bit Error attacks in particular.

Deliverables

Single Bit Error

core Flight System - cfsat View Terminal Tabs Help Disabling synchronization. EVS Port1 42/1/DOSD 9: Detection for Denial of Service

OpenSatKit

OSK is an open source project that connects cosmos with the core flight system to create applications and flight software

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OpenSatKit								
FS Education	Mission FSW	Pi-Sat	R&D					
System - cfsa Start cFS Stop cFS	it Target					8	System Ti 100 ⁻	me(secs) 1443
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- Occurs when one bit of a given data unit is changed from 1 to 0 or 0 to 1 undesirably.
- Implemented hamming code which utilizes a parity check system in order to determine if a single bit error has occurred

EVS Port1 42/1/DOSD 9: Network Flooding NotDetected EVS Port1 42/1/DOSI 9: Injecting Network Flooding Atta EVS Port1 42/1/DOSD 9: Network Flooding NotDetected

D	en	ial	of	Ser	vi	се

- Syn flood attack occur when there is too many unsuccessful connections between a server and client. • Implemented machine
- learning which helped notify our system when it was under an attack.

<u>F</u> ile <u>M</u> ode <u>H</u> elp	Comi	mand S	ender 😑 🖻 😣
Target: DOSD	*) Corr	mand:	DETECT + Send
Description: Detect floo	oding attack	inidito.	v Seid
Parameters:			
Name	Value or State	Units	Description
CCSDS_STREAMID:	8010		Packet Identification
CCSDS_SEQUENCE:	49152		Packet Sequence Counter
CCSDS_LENGTH:	3		Packet Data Length
CCSDS_CHECKSUM:	0		CCSDS Command Checksum
CCSDS_FUNCCODE:	3		Command Function Code
APP_STATE:	0		0=Disconnect TFTP, 1=Remain connected

nd History: (Pressing Enter on the line re-executes the command)

with CCSDS_STREAMID 8010. CCSDS_SEQUENCE 49152, CCSDS_LENGTH 3, CCSDS_CHECKSUM 0, SDS_FUNCCODE 3, APP_STATE 0")

d("DOSI INJECT with CCSDS_STREAMID 8020, CCSDS_SEQUENCE 49152, CCSDS_LENGTH 1, CCSDS_CHECKSUM 0, CSDS FUNCCODE 3")

Conclusion

We were able to detect and send alerts for single bit errors and syn flood attacks occurring in our satellites through the use of hamming code and machine learning. The satellites continue to operate with established communications with an extra layer of security.

