



CONNECT

2023 AUSTIN





ARCHER



- ▶ Simulation Platform
for eVTOL
Integrated Test Labs

TRAMONE CURRY, PH.D.
ARCHER AVIATION INC.



▸ Integrated Test Labs

PURPOSE

- Provide test articles to support aircraft system HW/SW development
- Provide simulation environments for aircraft systems equivalent to real aircraft interface
- Support from individual system level to fully integrated aircraft level testing
- Safety
- Cost



▸ Requirements

LAB TEST REQUIREMENTS

- Individually stimulate system components
- Test integrated aircraft systems

SIMULATION REQUIREMENTS

- Model Simulation
- Signal Monitoring
- Fault Injection
- Real/Sim Switching
- Communication Bus Emulation

Simulation Platform Selection

LEAD TIMES

- Procuring HW
- Robust Product Line

COST

- > 30% Cost Reduction Comparatively
- Volume Discounts

FAMILIARITY

- Previous Usage
- Lower-Level Customization



Platform Architecture

PXI CHASSIS

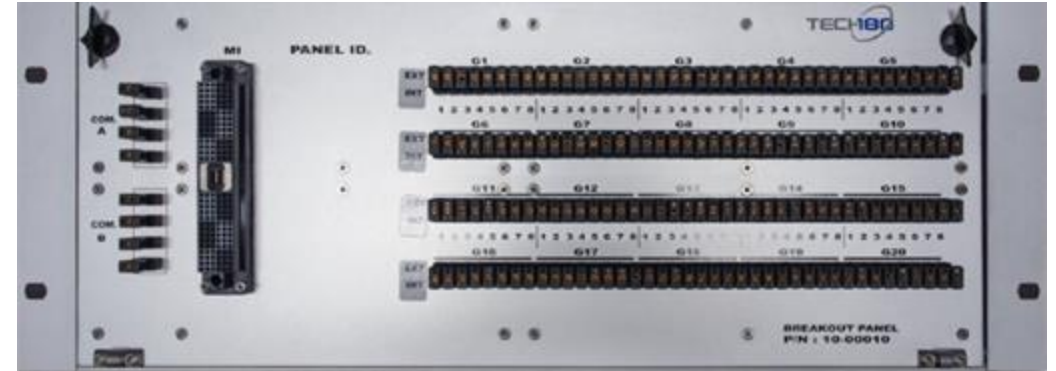
SLSC CHASSIS

- Routing and Faulting (SET-2010)
- VDT Simulation (SET-1240)
- Digital (Discrete) Output Simulation (SET-2010)
- Real/Sim Switching (SET-2010)



Platform Architecture

TECH180 BREAKOUT PANELS

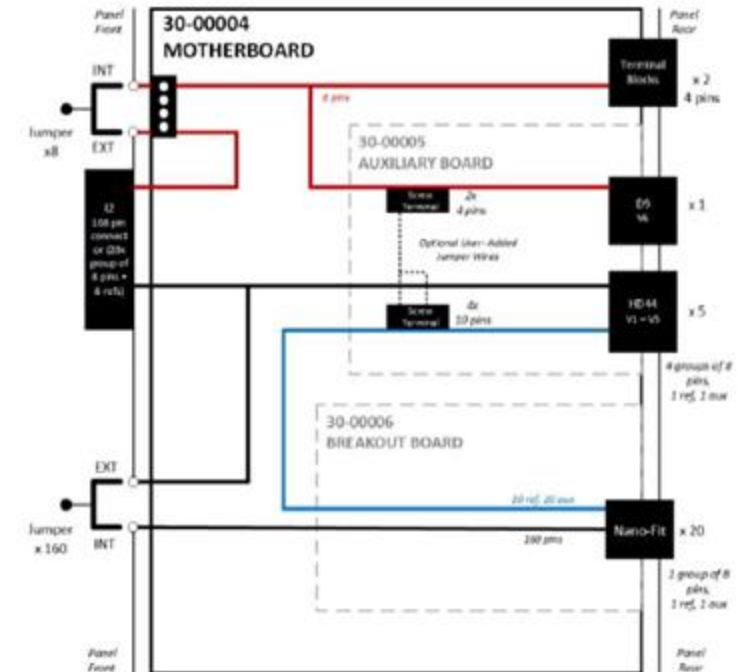


IN-HOUSE SOLUTION CONSTRAINTS

- Time
- Resources

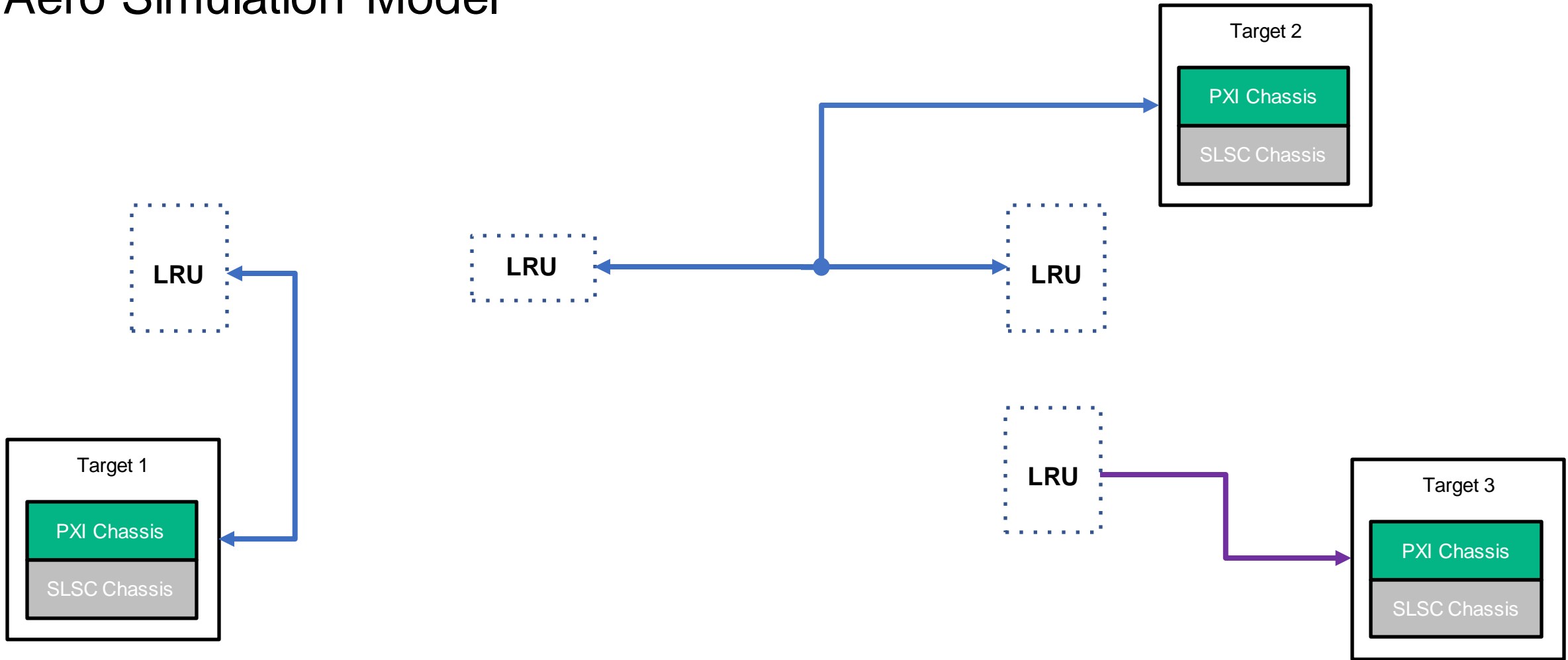
PREFABRICATED CABLES

10-00010 BREAKOUT PANEL

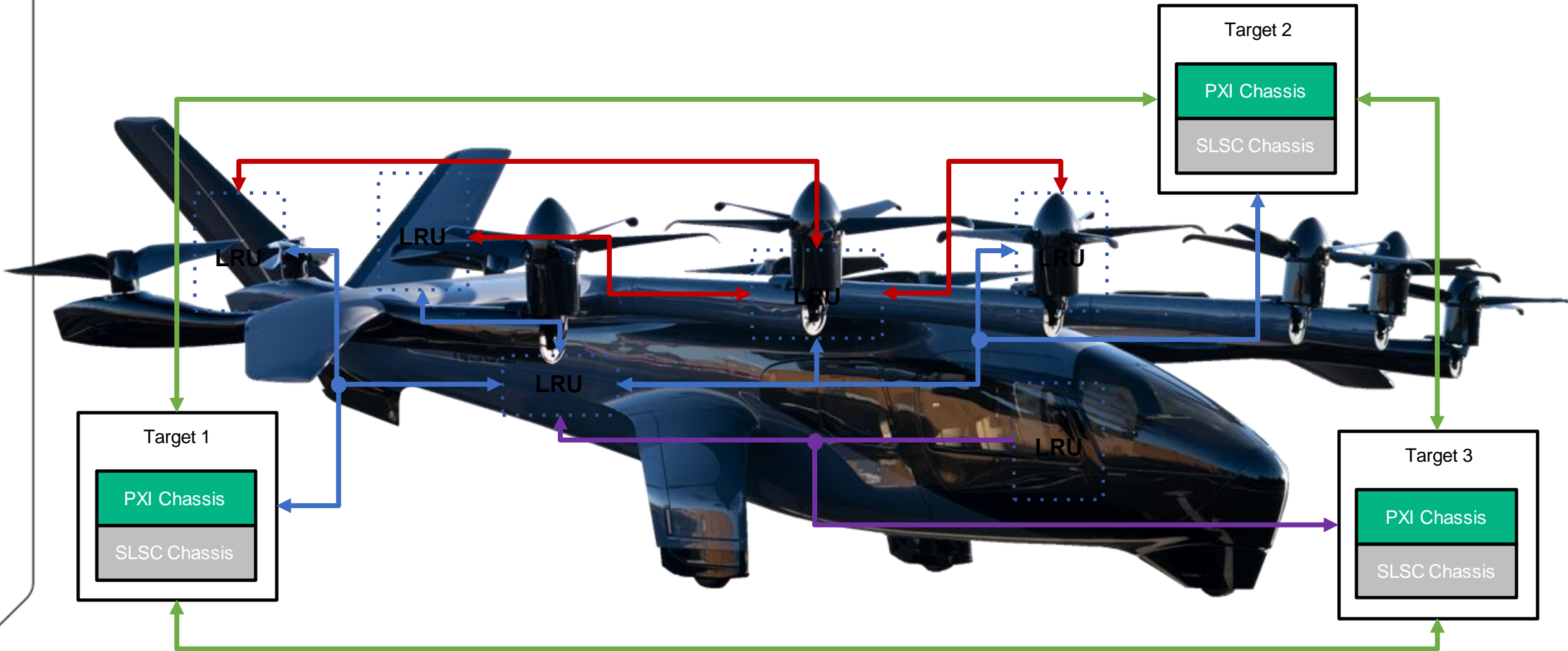


Integrated Test Lab

Aero Simulation Model



Distributed Simulation Architecture



▸ Distributed Simulation Architecture

OBJECTIVES

- Monitor signals between LRUs
- Inject failure signals to LRUs
- Partially or fully simulate aircraft LRUs
- Instrumentation (Data acquisition)

VERISTAND INTEGRATION

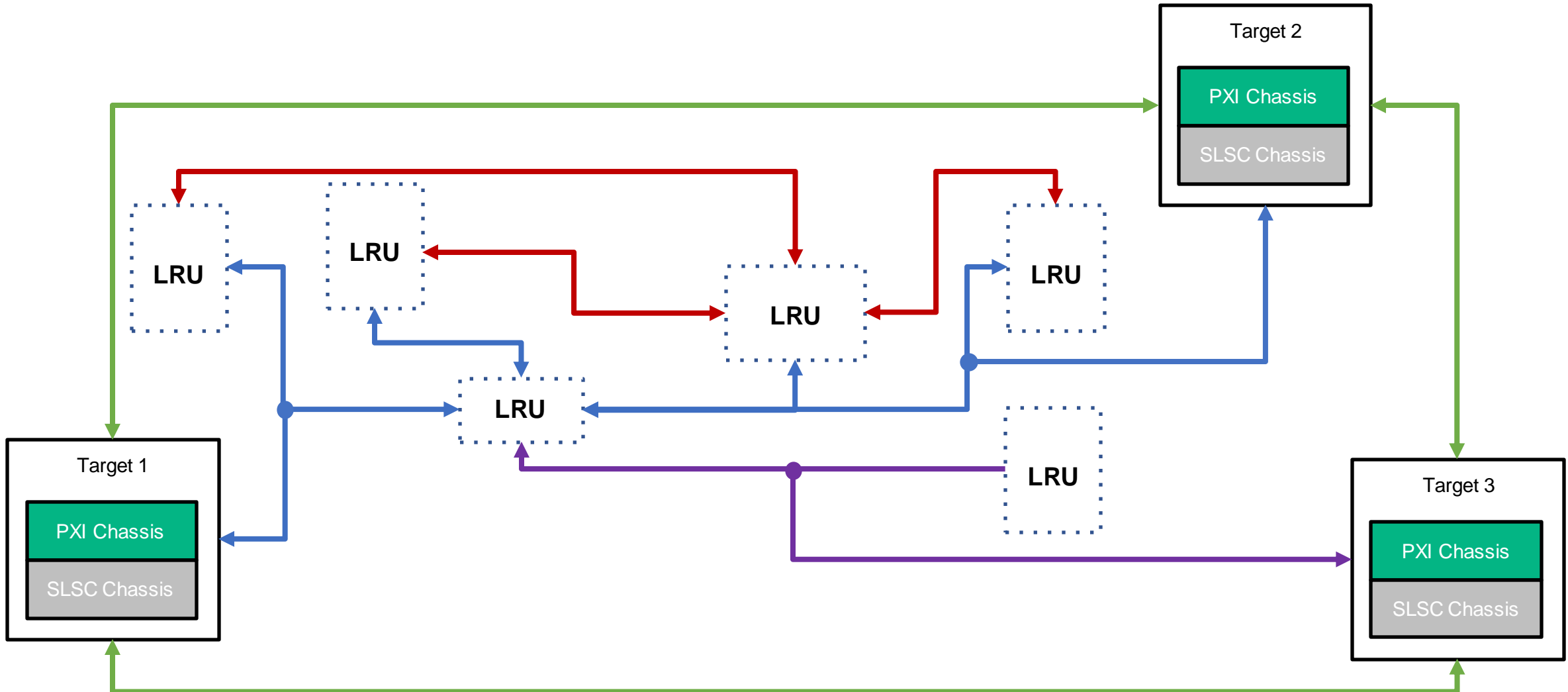
- Simulink Model Generation
- Custom Devices

INTER-TARGET COMMUNICATION

- Data Sharing Framework
- IRIG-B Time Synchronization

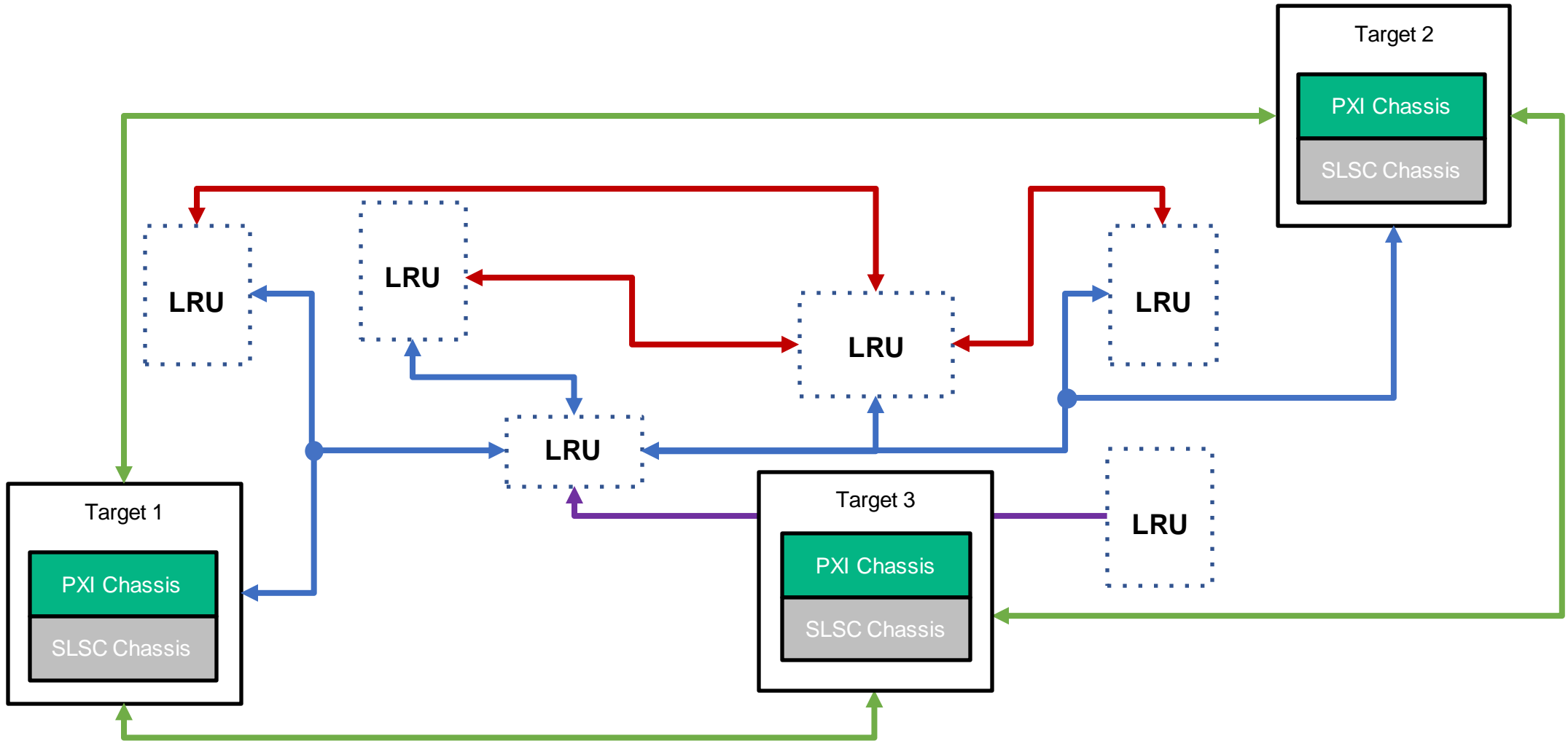
Distributed Simulation Architecture

SIGNAL MONITORING



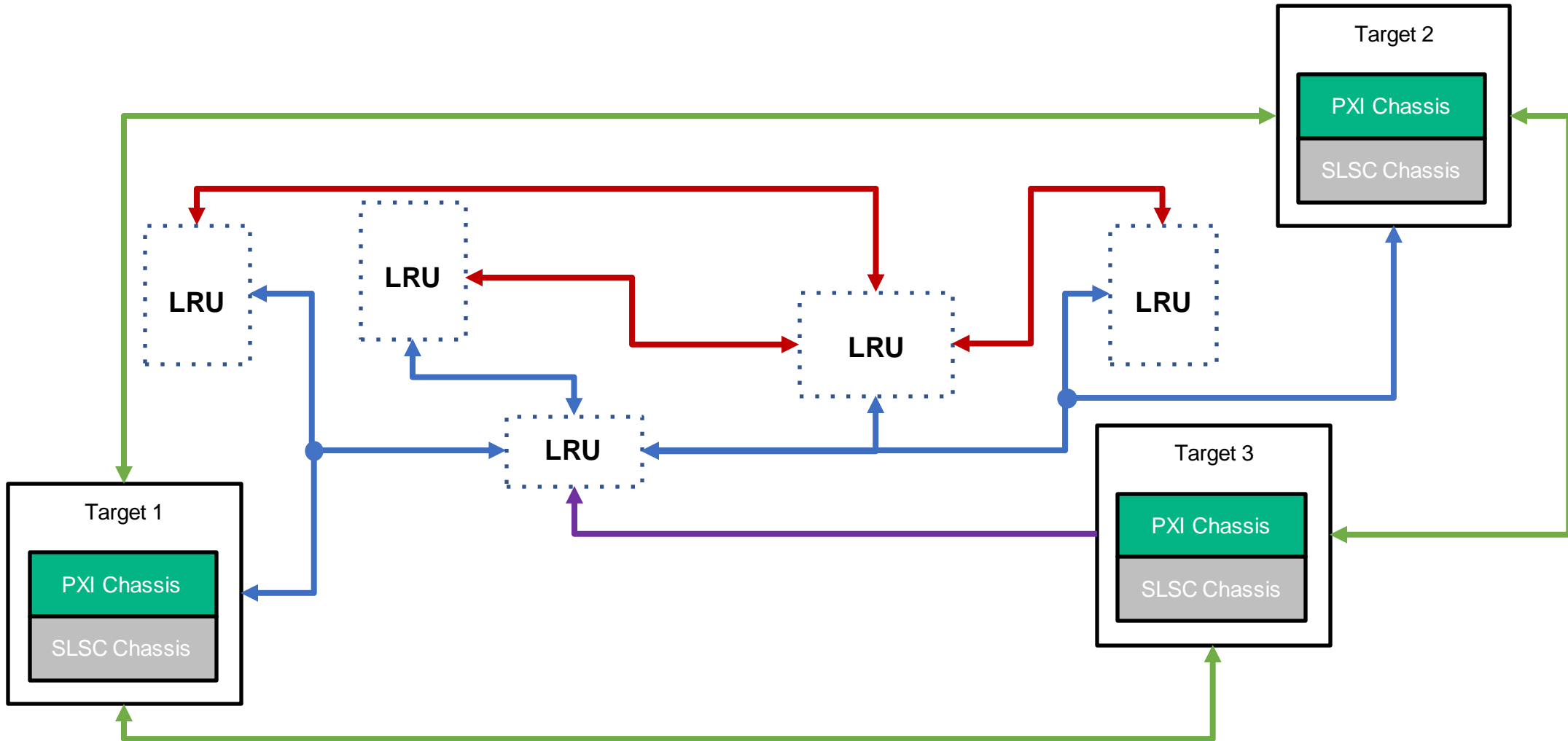
Distributed Simulation Architecture

FAULT INJECTION



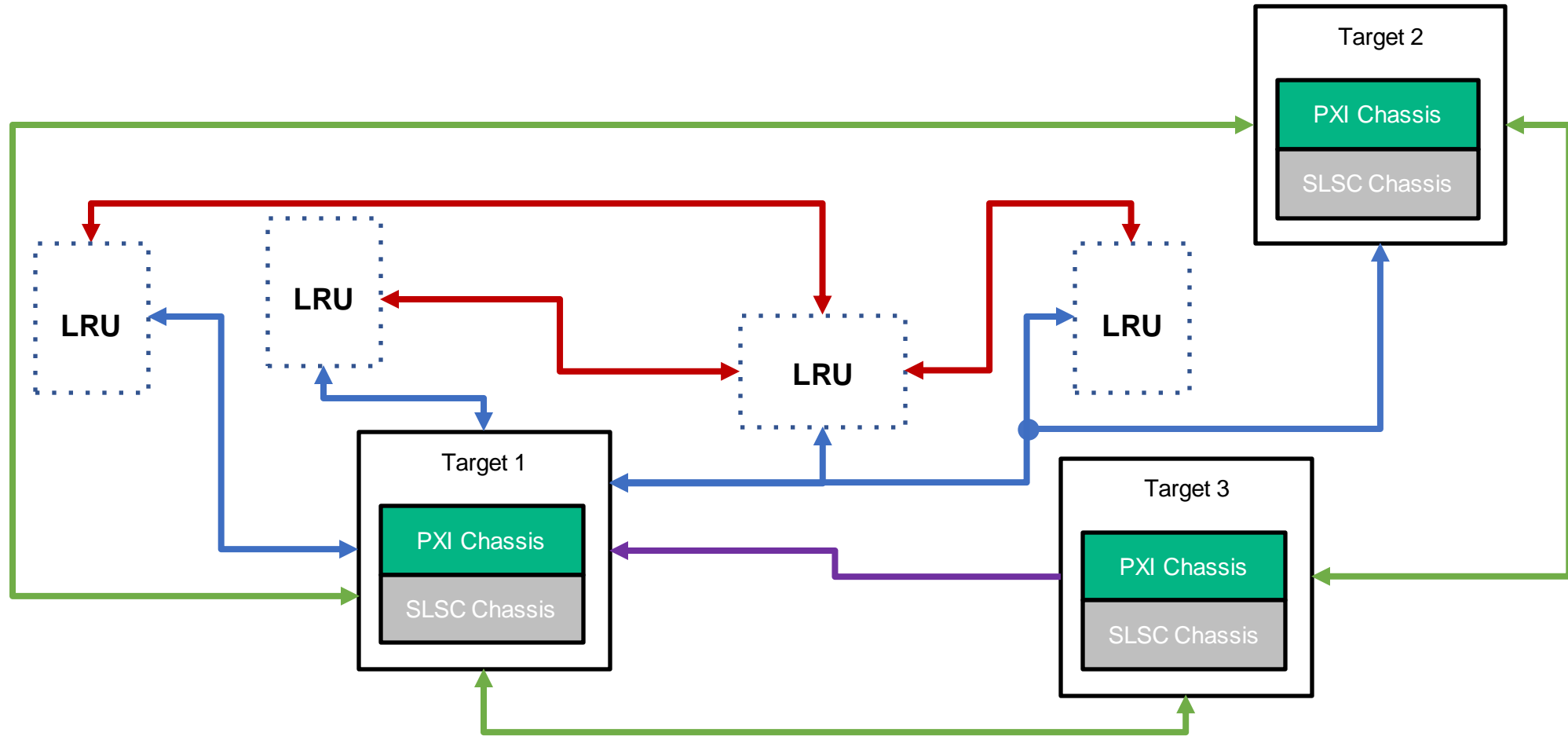
Distributed Simulation Architecture

LRU SIMULATION



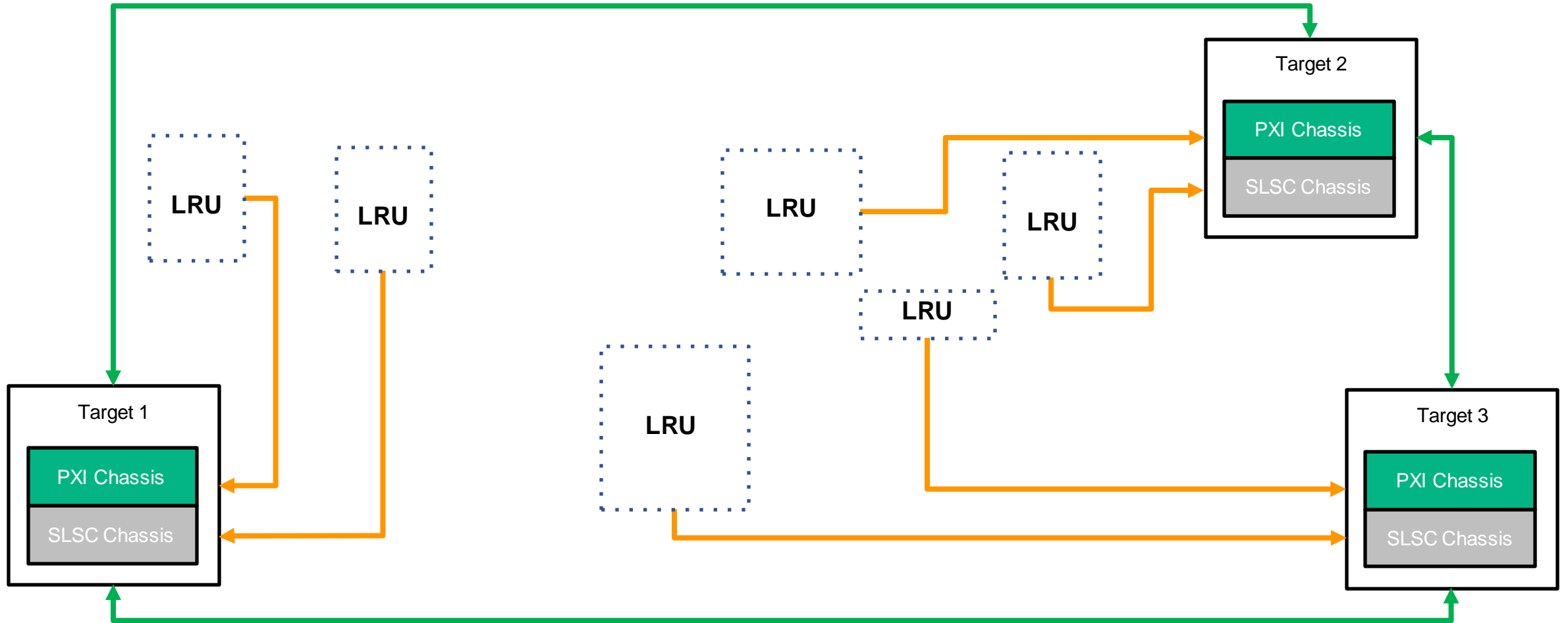
Distributed Simulation Architecture

MULTIPLE LRU SIMULATION



Distributed Simulation Architecture

INSTRUMENTATION (DATA ACQUISITION)



Control & User Interface

LABVIEW FOR SIMULATION CONTROL

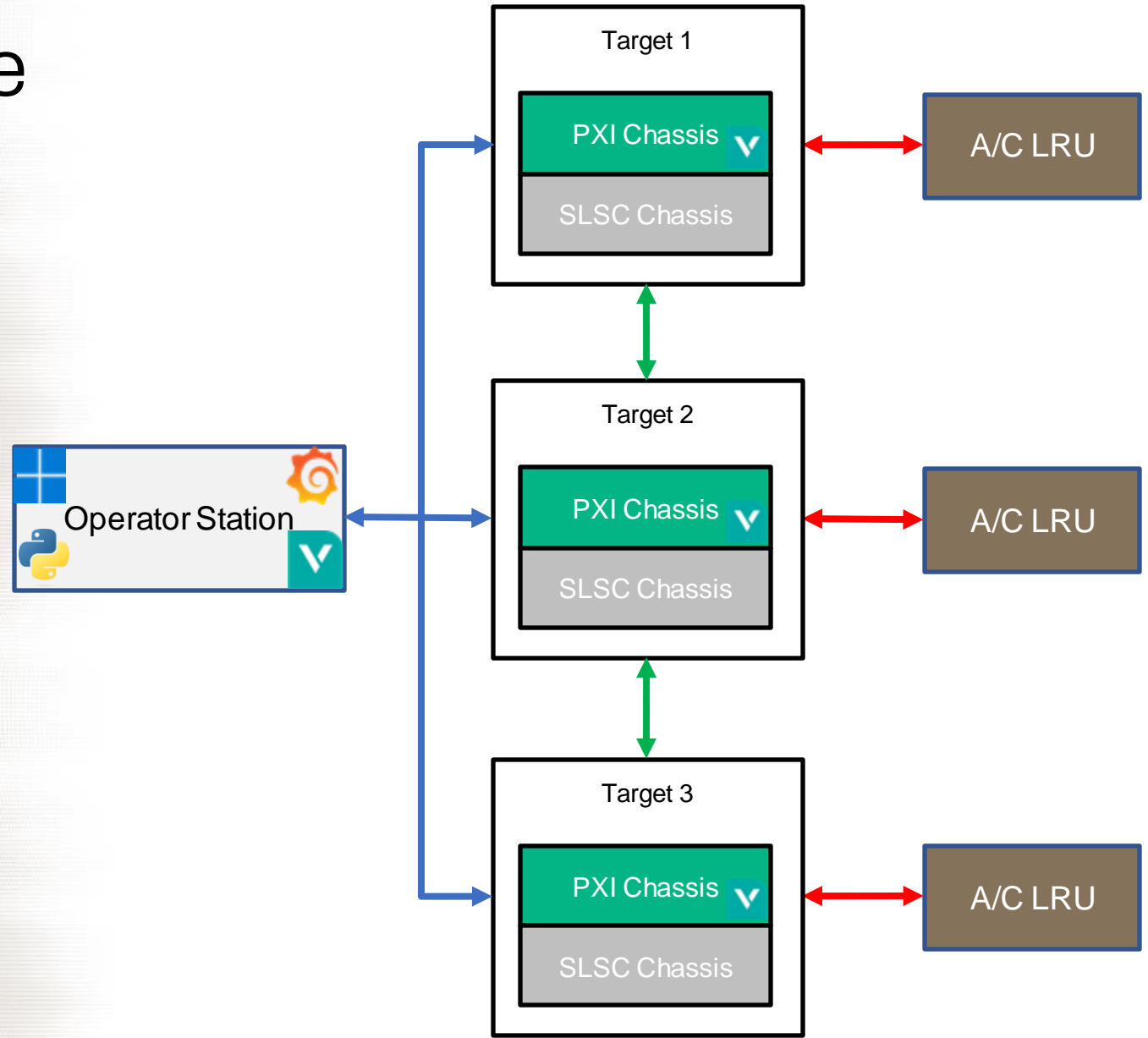
- VeriStand Engine

TEST AUTOMATION

- In-House Framework
- Python Scripting

DATA VISUALIZATION

- Grafana



▸ Test Labs With NI

LAB BUILDS ✓

- 3 Fully Integrated Labs
- 6 HIL Benches
- Mechanical Rigs

OPERATIONAL ARTICLES WITHIN 3 MONTHS ✓

EARLY MILESTONES ACHIEVED ✓

CONTINUED INTEGRATION AND MATURATION





ARCHER

Thank You



Give us your feedback!

Quick 2 Question Survey

In the mobile app,
click into the
session you would
like to provide
feedback for

Tue May 23

MAY 22 MAY 23 MAY 24

- 10:15 AM - 11:15 AM** Multichannel RF Data Recording and Analysis
Meeting Room 19A
Aerospace & Defense • Technical Session
- 10:15 AM - 11:15 AM** Optimizing Validation Processes: Building Complex Test Systems with Distributed I/O
Meeting Room 19B
Aerospace & Defense • Technical Session
- 10:15 AM - 11:15 AM** Panel: Continuous Integration (CI/CD)—Don't Leave Home without It
Meeting Room 12A
Programming Essentials • Technical Session
- 10:15 AM - 11:15 AM** Using Python and TestStand to Boost Your Test Development
Ballroom G
Product & Technology • Technical Session
- 10:15 AM - 11:15 AM** What Does Left Shifting Test Mean in the NI Ecosystem?
Meeting Room 18A
Transportation • Technical Session

Tue May 23

Add to Schedule iCal Check In

Optimizing Validation Processes: Building Complex Test Systems with Distributed I/O
Tue May 23 10:15 AM - 11:15 AM
Map Meeting Room 19B
Aerospace & Defense • Technical Session

Surveys

Take Session Survey

In this session, learn to improve efficiency and reduce non-recurring engineering costs in validation labs by connecting multiple distributed line-replaceable unit (LRU) test systems. Also learn how to abstract LRUs and construct complex test systems faster and more efficiently using existing distributed I/O and edge computation technology.

Click “Take the
Session Survey”