SSC Data Initiatives Cross Mission Data SSC/ECXA

February 2022

Lt Col Dan Kimmich
Materiel Leader, Cross-Mission Data Branch
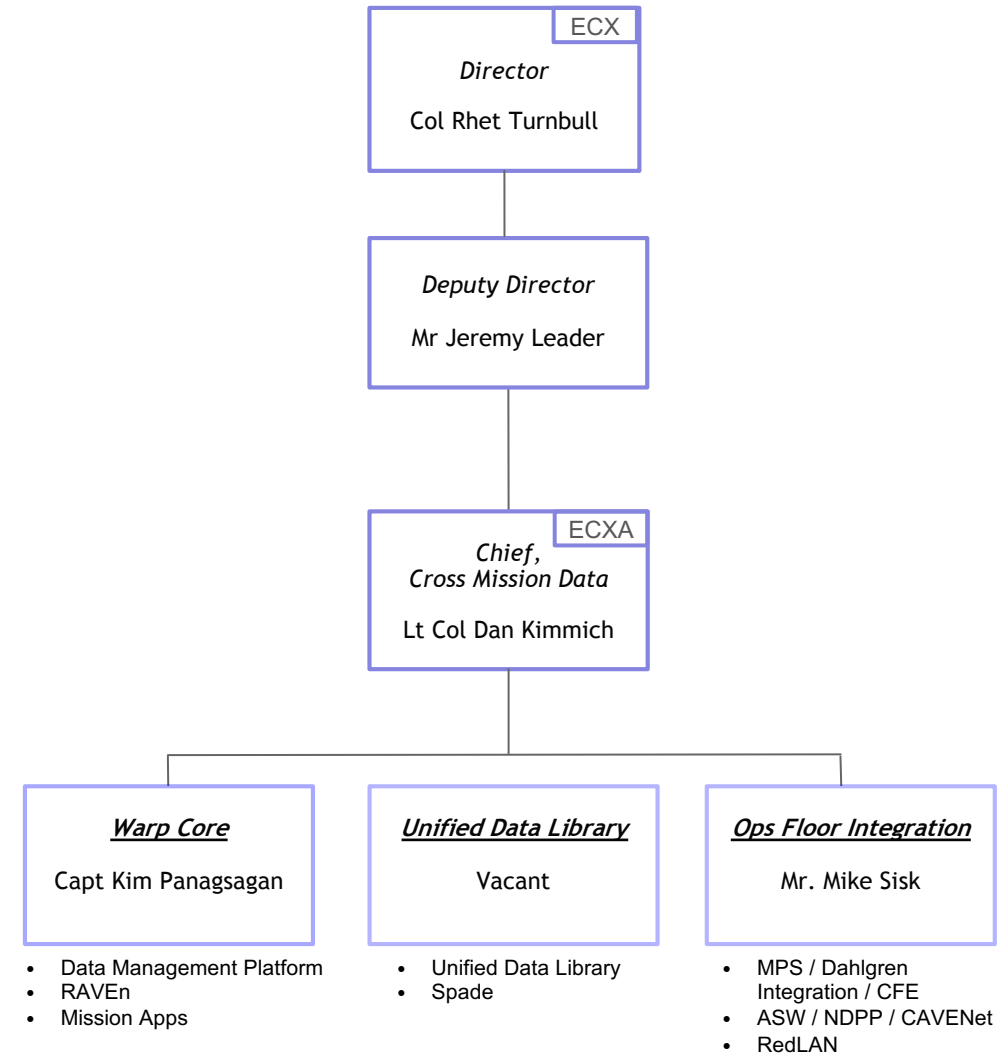
SPACE
SYSTEMS COMMAND

Introduction

- In 2020, the Department of Defense released their Data Strategy in support of the broader Digital Modernization effort, where it clearly states, "that data is a strategic asset that must be operationalized in order to provide a lethal and effective Joint Force that, combined with our network of allies and partners, sustains American influence and advances shared security and prosperity."

- The Cross Mission Data branch was created to align SSC's key data initiatives and to rapidly scale the portfolio to support Space C2 and the Advanced Battle Management System (ABMS)

- The creation of the Cross Mission Data branch is an explicit response to the Chief of Space Operations (CSO) intent to break down barriers between stove-piped systems across the space enterprise

- <u>Mission</u>: Ingest and expose data that is discoverable, protected, and actionable to maintain battlespace superiority

- <u>Vision</u>: Enable decision dominance at the speed of relevance

- <u>Core Competencies</u>: Cross-Domain Solutions; Ingestion; Discovery; Storage; Translation & Pre-processing; Provenance; Exposure; Distribution; Data visualization; Federation

ECX
Director
Col Rhet Turnbull

Deputy Director
Mr Jeremy Leader

ECXA
Chief,
Cross Mission Data
Lt Col Dan Kimmich

Warp Core	*Unified Data Library*	*Ops Floor Integration*
Capt Kim Panagsagan	Vacant	Mr. Mike Sisk

Warp Core
- Data Management Platform
- RAVEn
- Mission Apps

Unified Data Library
- Unified Data Library
- Spade

Ops Floor Integration
- MPS / Dahlgren Integration / CFE
- ASW / NDPP / CAVENet
- RedLAN

Unified Data Library (UDL) 2021 Achievements

- Supported ABMS on-ramps and Sprint Advanced Concept Training (SACT) demonstrations. Integrated key data sets to assist in mission demonstrations, to include support for the Russian Direct Ascent (DA) Anti-satellite (ASAT) and Shijian-21 activities.

- During the Project Convergence 2021 experiment, the UDL supported multiple scenarios in which air-and-missile defense engagements were conducted in response to simulated enemy missile attacks. This was accomplished by completing the Sensor-To-Shooter kill chain by rapidly connecting sensors to ingest and share data through the UDL to Army weapon systems for a live fire execution

- Early discovery and engineering efforts with the Department of the Air Force Rapid Capabilities Office (DAFRCO) to develop a UDL outpost across data center geographical regions in a peer-to-peer paradigm that does not rely on a master node responsible for keeping all peer nodes in synchronization.

Warp Core (WC) 2021 Achievements

Space/CAT (Space/Counterspace Analyst Toolkit)
A centralized analyst toolkit to input, fuse, and display adversary intelligence for trend analysis and informed decision making.
Ops Accepted: 7 April 2021 **Deployed Environments:** JWICS
Users: J2 Intel Analysts, JTF-SD/NSDC, CSpOC

Minerva
Provides a Request for Information and Knowledge Management tool to receive, research, and answer all inbound space-related RFIs.
Ops Accepted: 27 May 2021 **Deployed Environments:** JWICS
Users: CSpOC ISRD and JTF-SD | RFIs submitted from

COMET (Common OPSCAP/SYSCAP Monitoring Engine Threshold)
COMET provides full awareness of the OPSCAP/SYSCAP information for all mission essential tools, systems, and assets for the NSDC.
Ops Accepted: 28 Apr 2021 **Deployed Environments:** JWICS
Users: Mission Directors, JTF-SD/NSDC | ~25 Users

R-Del 8
R-Del 8 allows near real time status reporting for personnel, equipment, OPSCAP/SYSCAP for the Delta 8 Missions Areas to operational and strategic decision makers
Proj Ops Accepted: 16 Nov **Deployed Environments:** SIPR
Users: Del 8/CC, 2 SOPS, 4 SOPS

JMS Decommissioning
Warp Core replaced a 10-year failed program in under a year with 4 months contributed solely to ODR approval. 1st CAT A in USSF.
Ops Accepted: 1 Oct 2021
Deployed Environments: NIPR, SIPR, JWICS, Program
Users: DoD and OGA

18 SPCS/JTF-SD IPO ODR Process Streamlined
Got initial agreement from 18 SPCS for pre-approved ODR requirements to get access to catalog data and products via Warp Core. Deployed two applications to ensure control and transparency for 18 SPCS/DOX and JTF-SD IPO
Projected Ops Accepted: 12 Nov 2021
Deployed Environments: NIPR, SIPR, JWICS
Users: USSF

Expedited JET 2 Support for SC2
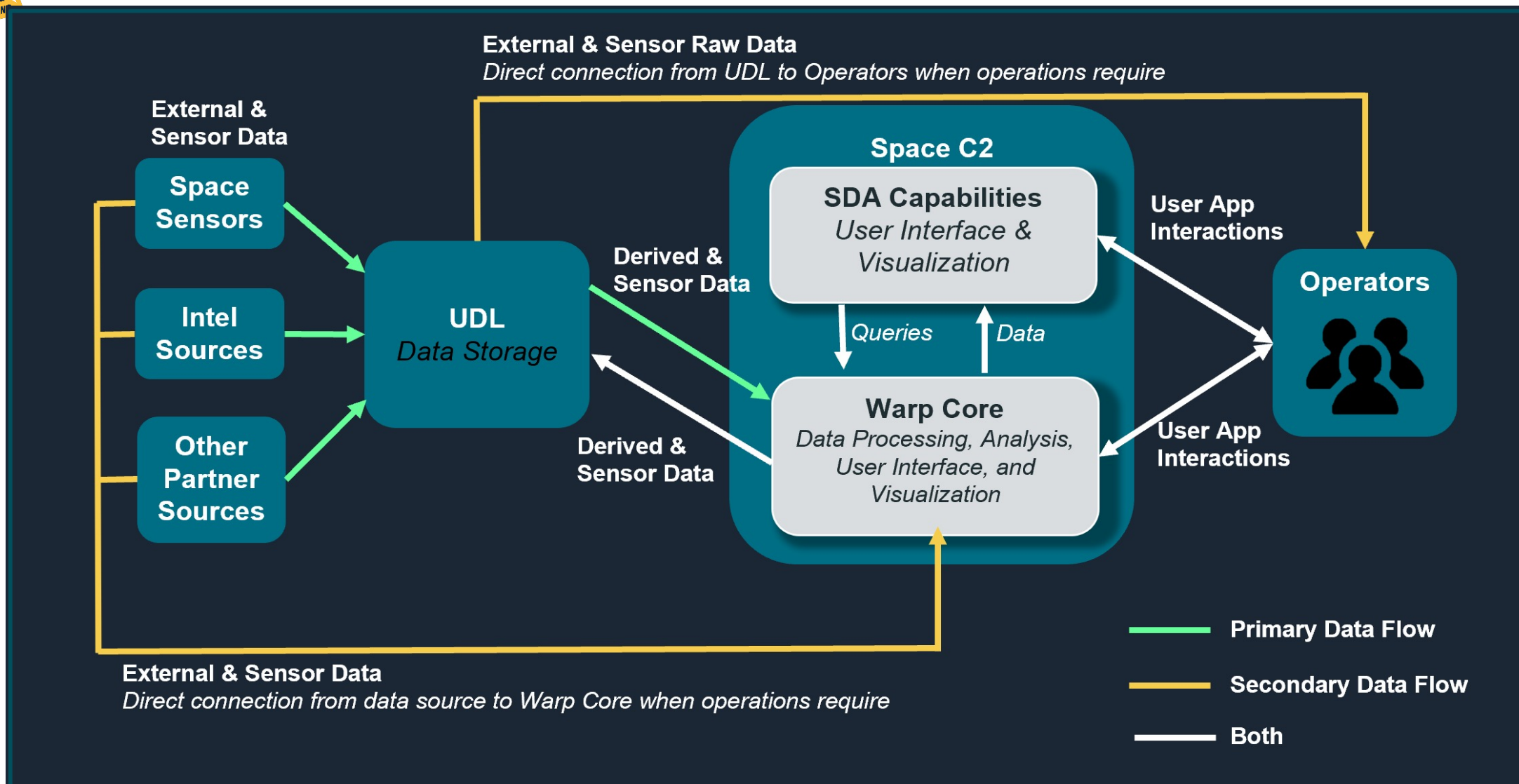Enabled SC2 access to critical CAVENet data (TCONS, TLEs, VCMs, SatCat, Maneuver Log) in 11 days in time for JET 2.
Ops Accepted: 2 Feb 2021 - **Current**
Deployed Environments: NIPR, SIPR, JWICS, Program
Users: Other Orgs (PIC Members)

Support to OAR/OAW

- "The UDL and Warp Core's usefulness is not limited to the space domain. Recently, both were leveraged to integrate numerous data sets to help leaders make swift and informed decisions to assist humanitarian efforts to evacuate U.S. allies from Afghanistan.

- During Operation Allies Refuge, led by Air Mobility Command under the U.S. Air Force, critical logistics and operations data from across the U.S. Department of Defense, the State Department, and other U.S. agencies was needed to ensure quick and efficient evacuation efforts. Later, during Operation Allies Welcome, data management and analytics were focused on ensuring successful relocation, in-processing, and resettlement of Afghan refugees in the United States.

- Multiple data sets related to aircraft tracks, mission status, mobility, logistics, personnel, and supply-chain data were integrated into the UDL. Warp Core consolidated, curated, and fused data provided from the UDL with data collected from other on-going DoD-wide initiatives to deliver an authoritative picture of events, both in Afghanistan and the continental United States (CONUS), for decision-makers across the government and Joint Staff to support OAR and OAW, including mission tracking, in-country operations, and CONUS processing."

    --SSC Data-Management Software Plays Critical Role in SDA, Afghanistan Airlift

Delivering at the Speed of Need – OAR/OAW Exemplar

MISSION

OAR – Integrated 7 data feeds from UDL & WC for the safe airlift of
120K+ evacuees from Afghanistan
OAW – Created 3 applications on WC for the tracking of 70K+ refugees
inbound to the United States

XMD Contributors

USSF Unified Data Library
USSF Warp Core
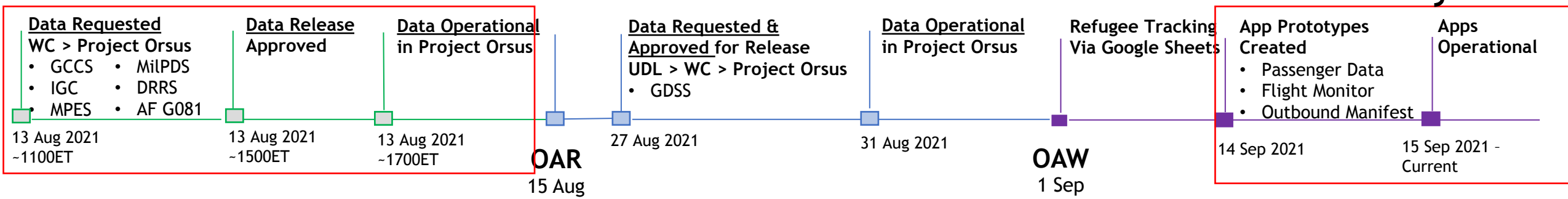DAF Envision (WC Tenant)
N-NC North Star (WC Tenant)

Data

GCCS - Blue Force Tracking; IGC - US TRANSCOM Aircraft Logistics
MPES - Manpower Programming and Execution System; MilPDS - Military
Personnel Data System; DRRS - Defense Readiness Reporting System
AF G081 - Mobility Aircraft Data Systems; GDSS – AMC Aircraft Logistics

6 Hours

Data Requested
WC > Project Orsus
- GCCS
- IGC
- MPES
- MilPDS
- DRRS
- AF G081

13 Aug 2021
~1100ET

Data Release
Approved

13 Aug 2021
~1500ET

Data Operational
in Project Orsus

13 Aug 2021
~1700ET

OAR
15 Aug

Data Requested &
Approved for Release
UDL > WC > Project Orsus
- GDSS

27 Aug 2021

Data Operational
in Project Orsus

31 Aug 2021

Refugee Tracking
Via Google Sheets

OAW
1 Sep

1 Day

App Prototypes
Created
- Passenger Data
- Flight Monitor
- Outbound Manifest

14 Sep 2021

Apps
Operational

15 Sep 2021 –
Current

Summary

- The newly-formed Cross Mission Data branch is providing an enterprise data integration capability that spans the USSF and DoD user base

- The integration of these systems within ECXA will further strengthen data that is delivered to the warfighter and broader space community

- Lastly, ECXA systems provide the foundational layer to enable a service-wide digital engineering ecosystem within USSF

ECXA Digital Engineering Pathfinder Debris Modeling & Simulation

February 2022

Jake Albrecht

Data Platform Technical Lead, The Aerospace Corporation

Background

- USSF and mission partner organizations need a means to quickly iterate on various debris modeling and simulation scenarios

- Historically, a lengthy process that will be challenged by the proliferation of capabilities by the space community

- Problem statement: Can the Government leverage capabilities within Warp Core to solve non-traditional problems in the space domain?

- Answer: Yes! Aerospace and the ECXA Warp Core program office have demonstrated a debris modeling capability by fully exploiting the services that WC SaaS solution offers

- Debris Modeling pathfinder is an *example* of what can be developed organically to rapidly deliver DE analytics to inform decision-makers

- Note: Ref. GSAW 2020 for a general overview of the Warp Core data management platform
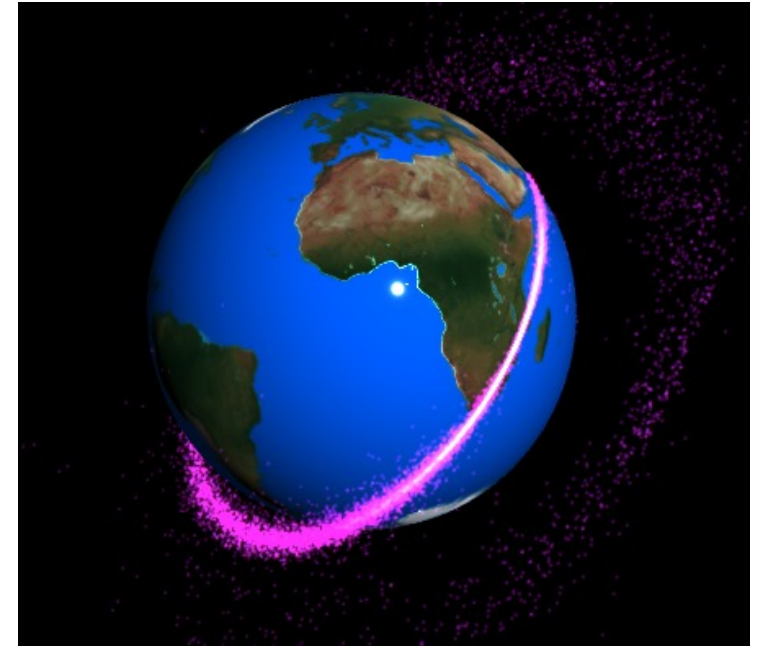
Example Debris Simulation using ECXA Capabilities

Overview and Prototyping

- Debris modeling service is a reference implementation using the NASA Standard Breakup Model

- Initially prototyped in Warp Core using the Code Workbook application
  - Rapid code development, testing, and output validation

- Workbook allows creation of debris fragment datasets, which can be used as input to orbit propagation code

- Propagated fragments can be used for post-processing, to include creation of plots, movies, etc.
  - All using in-platform tooling

- Rapid prototyping is a relative term!
 - ~2 weeks part-time from in inception to working prototype
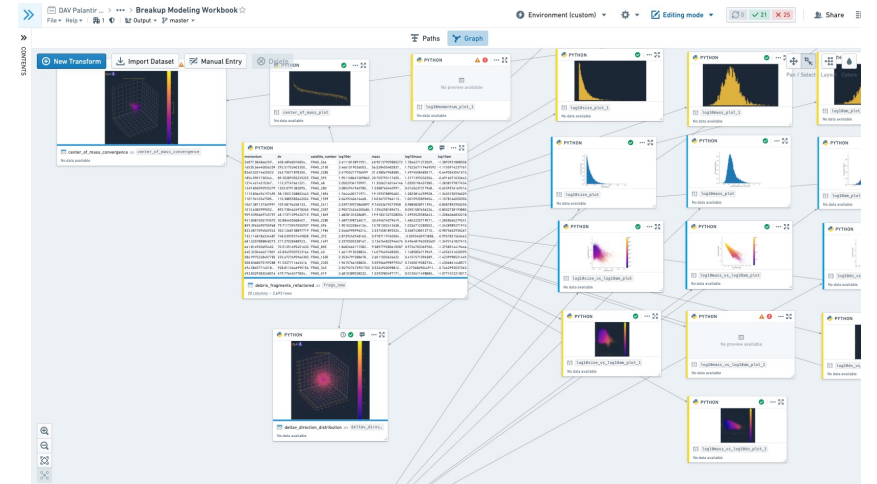
*Rapid Prototype Development using in-platform Code Workbooks*

Operationalizing the Workflow

- Once proven viable, the prototype was moved into a 'Workshop' application
  - Workshop is a no-code, in-platform app development framework
- Workshop app provides 3 sequential workflows:
  - Create a Debris Cloud
    - Parameterized by RSO mass, density, fragment size, etc.
    - View analytics and fragment metadata after model creation
  - Simulate a Debris Cloud
    - Against a user-assigned catalog object, at the supplied epoch
    - Initiates a numerical propagator for all fragments using auto-scaled Spark cluster
  - Post-processing artifacts, including density heatmaps, in-browser animations, videos, etc.
    - Automatically created and associated to the simulation as downloadable artifacts
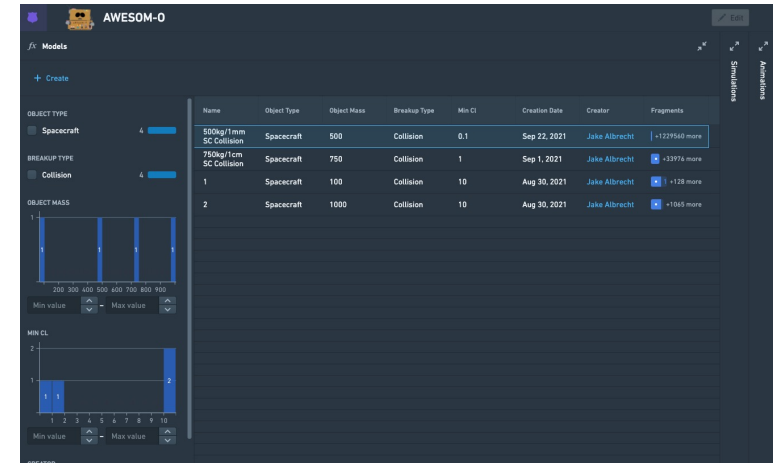

Debris Mod/Sim UI
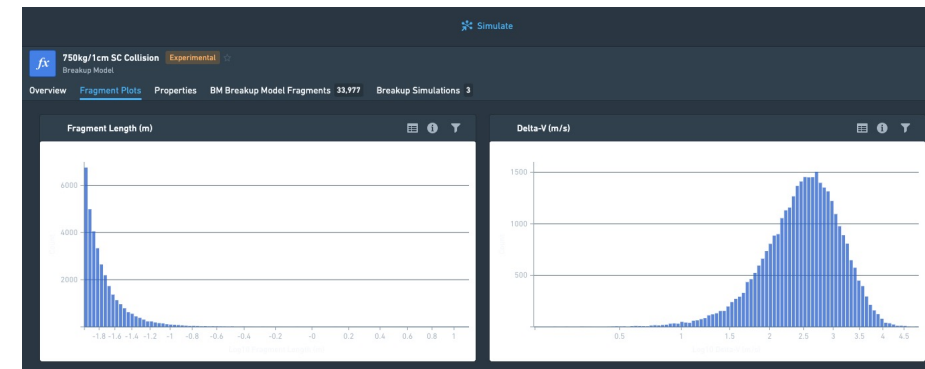
Automated Model Analytics

Summary

- Debris Modeling pathfinder is an example of the current extent of development capabilities within the Warp Core platform

- Users have the capability to define their own analyses by hosting their libraries, code, and data in-platform for exploration and analysis

- The end goal: build operational workflows that influence and support decision-making for operational users *and* provide insights to the performance and acquisition of new space capabilities
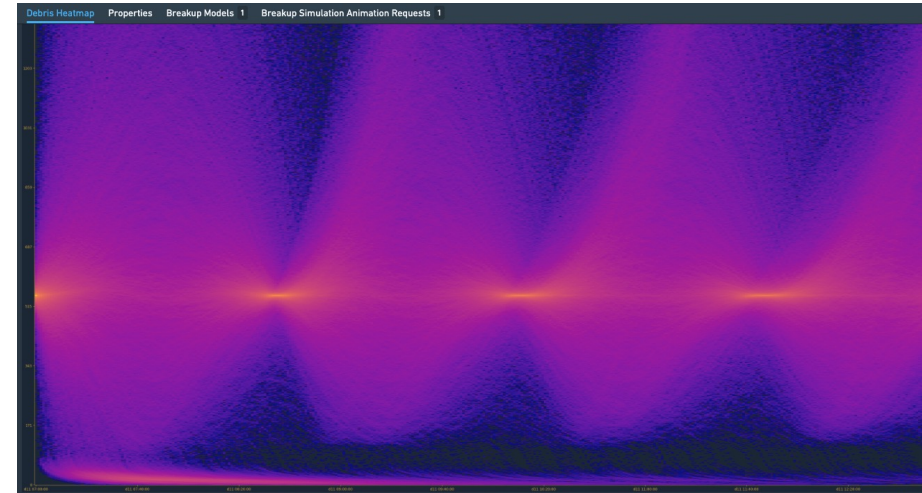
Example Debris Density Plot

Contact Information

Thank you!

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