

ECX

CROSS-MISSION GROUND & COMMUNICATIONS ENTERPRISE

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GSAW 2021



GENESIS: Protected Band Satellite Resources Automation

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Agenda: The GENESIS Road to Automation

- In the beginning there were spreadsheets
- First Iteration through Innovation: GENESIS Minimum Viable Product (MVP)
- GENESIS Today: Modernization via Automation
- GENESIS Tomorrow: Supporting the 'Fighting SATCOM' Vision



Bottom Line up Front (BLUF)

- **GENESIS began as a prototype to address an Urgent Needs Issue Paper submitted by the 4th Space Operations Squadron (4SOPS) to replace 25+ year old resource planning spreadsheets, checklists and Sharepoint files in a simple but elegant web application**
- **GENESIS is integrating previously stove-piped protected band data by bringing it into a web database that improves the overall data quality. This brings efficiency to the resource planning process through Agile/DevSecOps principles (DSOP) & Platform ONE with the support of the Combat Development Division (CDD)**
- **GENESIS is bringing automation to the MILSTAR & AEHF resource planning process by ingesting Satellite Access Request (SAR) and Satellite Access Authorization (SAA) messages. This improves mission planning and space situational awareness for the MILSTAR & AEHF Constellations**
- **GENESIS supports the Enterprise Ground Services (EGS) mission to synchronize tactical C2 with the introduction of real-time data, and enables the broader MILSATCOM community & Fight Satcom Vision**



In the Beginning...

There were spreadsheets



MILSATCOM Resource Planning Overview



AEHF & MILSTAR Satellites

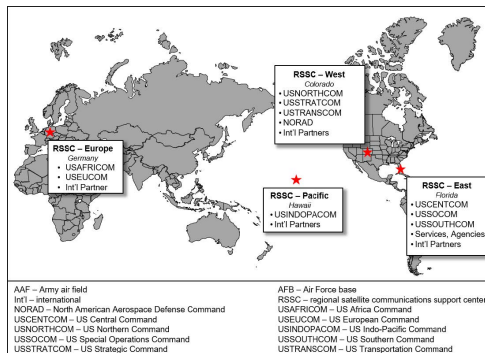
Provides Voice Communications, email and other C2 communications



SATCOM Users

(COCOMs/foreign mission partners)

1 User/Warfighter Submits Satellite Access Request (SAR) to COCOM

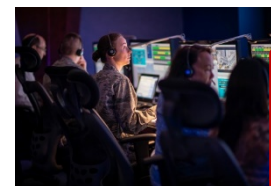


2 COCOM reviews SAR & passes it to the Regional Satellite Support Centers (RSSCs)

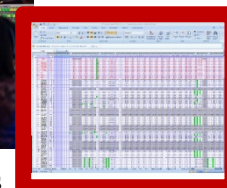
4 PBC Adjudicates Satellite Access Authorization (SAA)

5 PBC provides SATCOM mission support to users

3 Protected Band Cell (PBC) adjudicates SAR & plans available resources (Beams)



Excel Spreadsheets

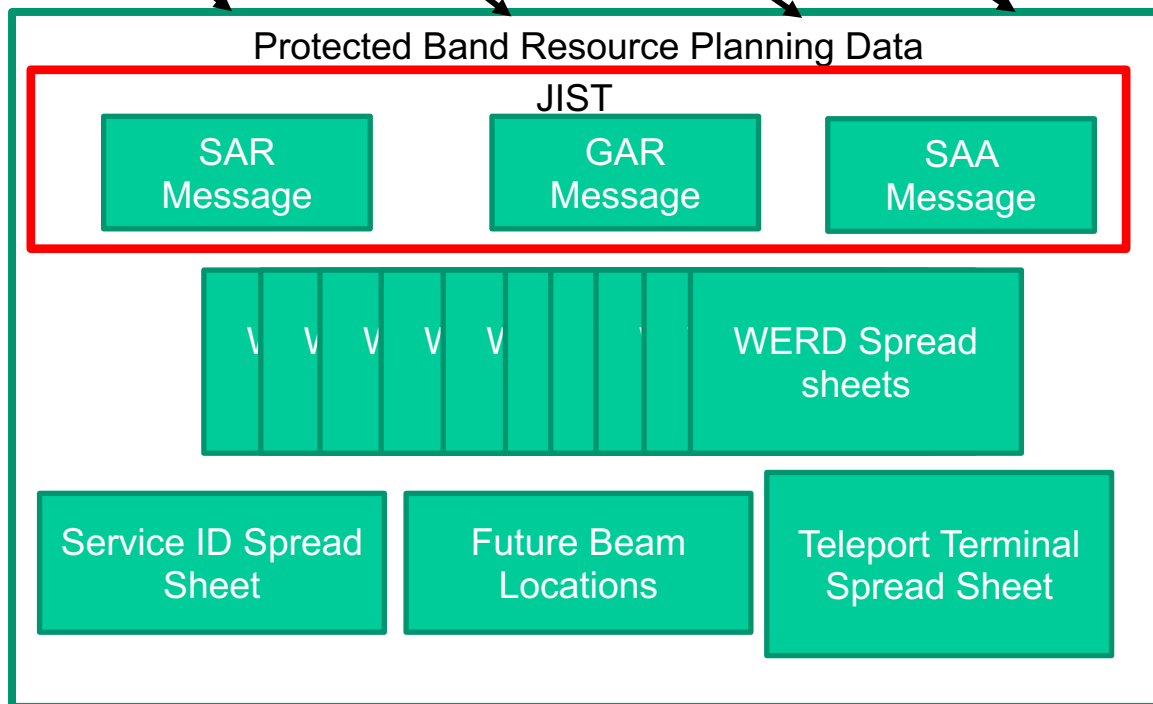
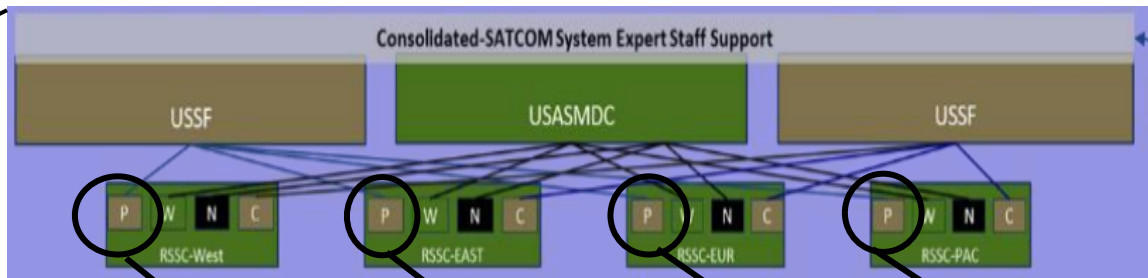
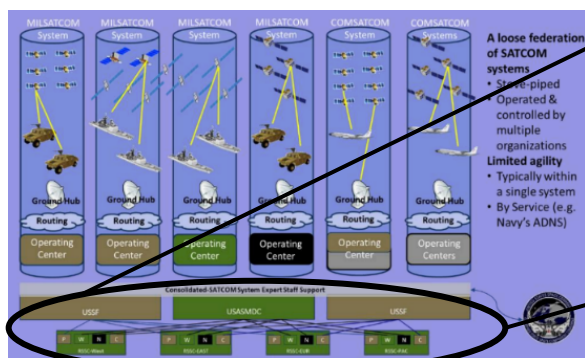


GENESIS modernizes and improves the current MILSTAR & AEHF resource planning process

[illegible]



Pre-GENESIS Planning Process





Current PBC Pain Points

- **Single user access to WERD via Sharepoint w/ local copies stored for backup**
 - **Protected band resource data is silo'd by RSSC , manually maintained & NOT available to the other Bands**
- **Other key documents stored/managed locally via SharePoint**
- **No ability to ingest external data from systems like Joint Integrated SATCOM Tool (JIST) or Mission Planning Environment (MPE)**
 - **Data must be manually extracted and entered into Joint Integrated SATCOM Tool (JIST)**
- **Data entry is manual and subject to errors**
 - **A SAR message can take days to enter**
- **Each RSSC has data management challenges that adds a lot of additional time to the process**

GENESIS is addressing these current challenges & ingesting/parsing JIST data

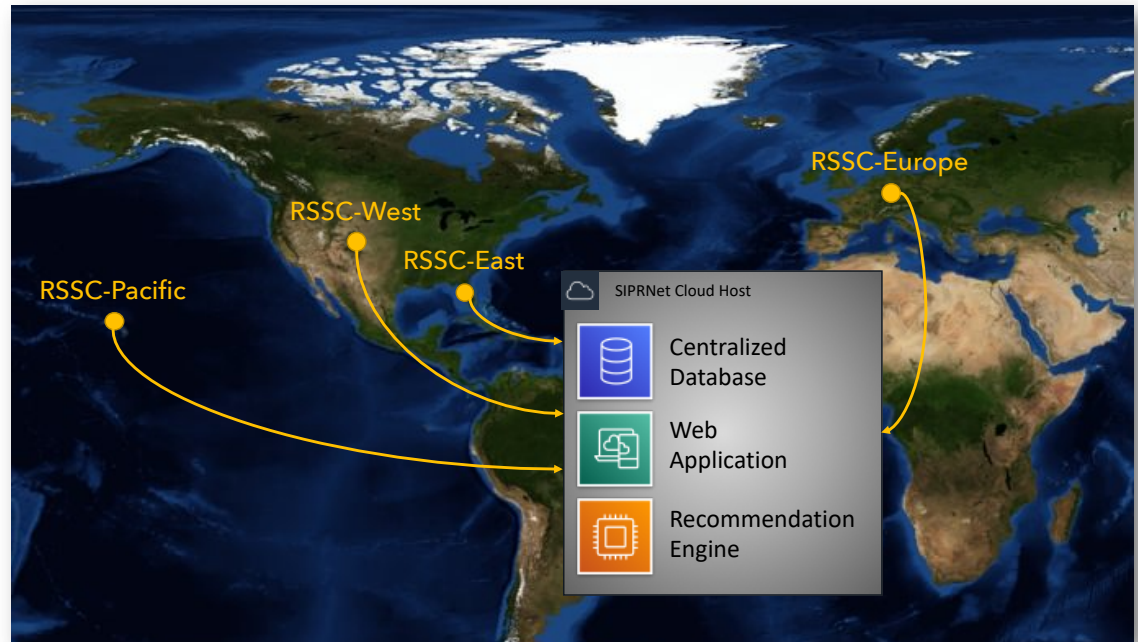


First Iteration through Innovation: GENESIS Minimum Viable Product (MVP)



Initial SBIR Phase I GENESIS Solution

- **Build a centralized database to allow simultaneous access**
- **Create a web application to enable data filtering**
- **Introduce automation to reduce labor-intensive data entry**
- **Leverage software factory & DSOP best practices to demonstrate innovation**



Leverage User-Centric Design to Deliver Quickly



Phase II SBIR & 2019 Space Pitch Day

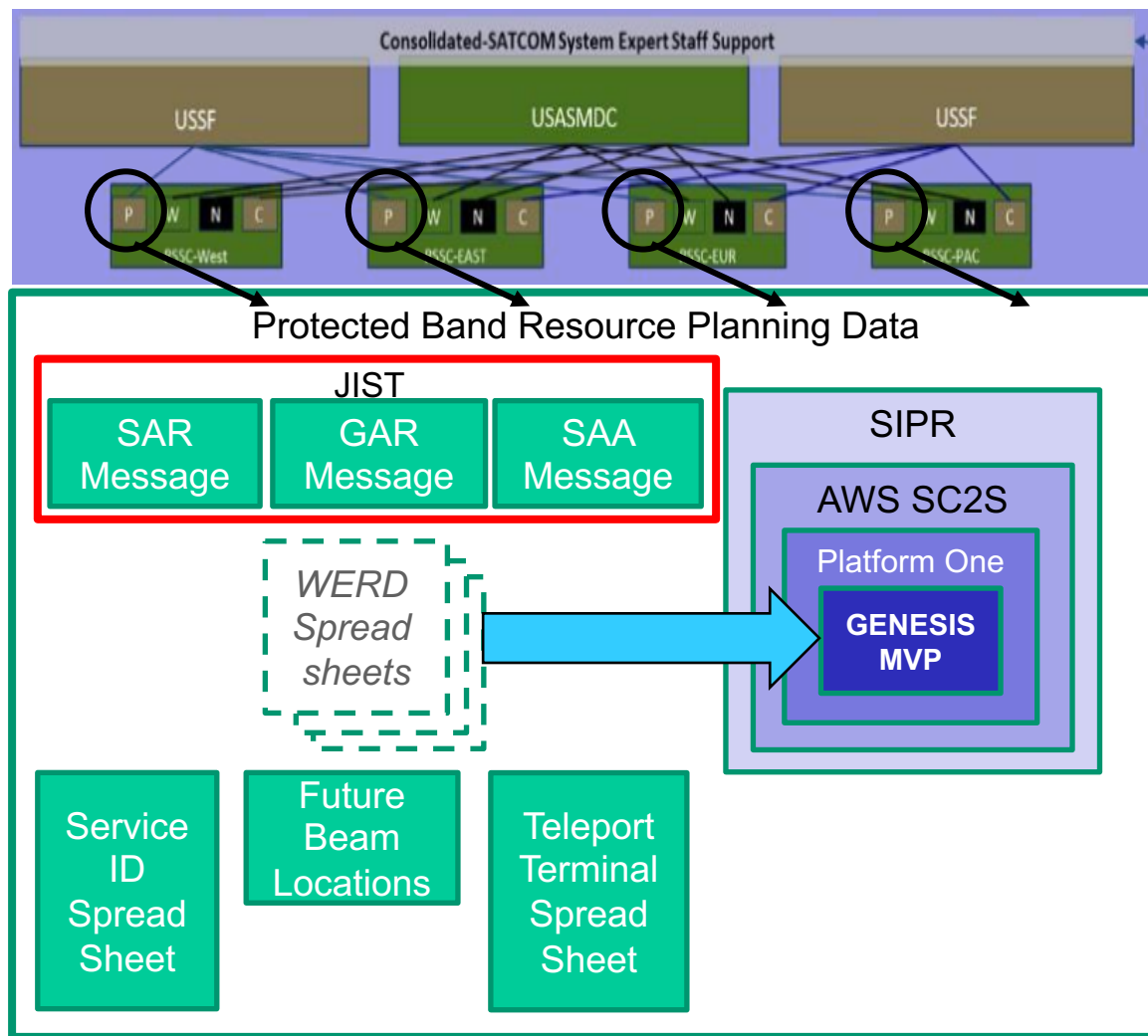
- **Phase II SBIR Award**
- **Firm Fixed Price contract:
\$749,988.04**
- **Period of Performance: 11/6/19 –
11/5/20**
- **Minimum Viable Product (MVP)
delivery by 6 May, 2020**
- **Chose to work at SpaceCAMP &
deploy on Platform One via the
Continuous Integration/ Continuous
Delivery pipeline**
- **Business acquisition model allowed
users to be involved throughout the
development process**





Delivered *GENESIS* Prototype

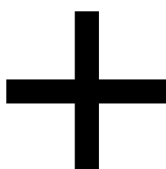
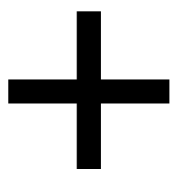
- **Minimum Viable Product (MVP):** Replace spread sheets with a web application & database
- **MVP delivered on 5 May 20**
- **Improved data quality & allowed data filtering**
- **Eliminated need for spreadsheet maintenance and version control management**
- **Added 10+ new features that reduce unnecessary steps/manual data entry process**





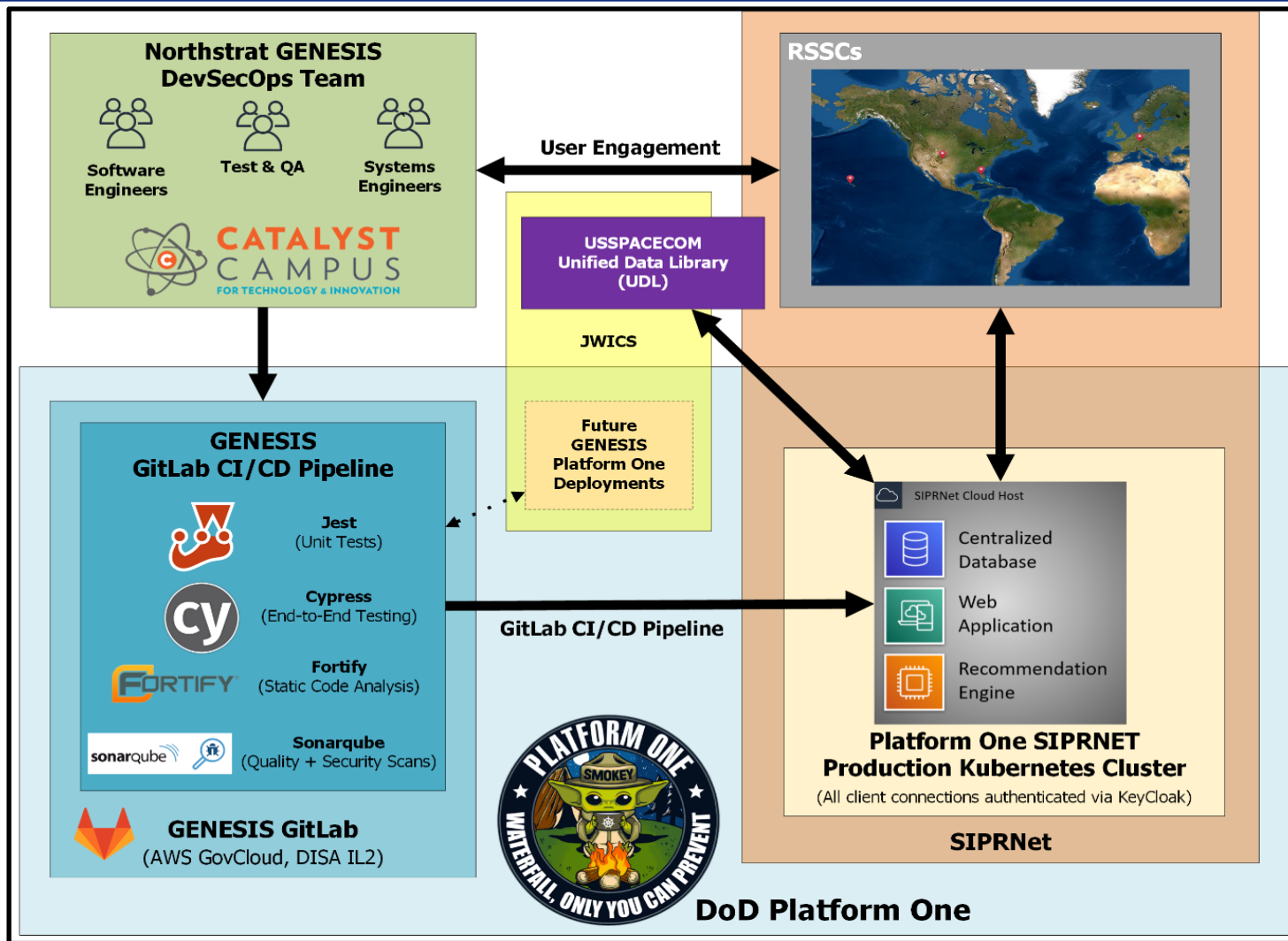
Innovation Meets the Software Factory

- Innovation formula: CDD & user-centric design while leveraging Agile Development Methodology & DSOP best practices fostered prototype success
- GENESIS is being developed at SpaceCAMP & deployed via Platform One (P1) to exploit continuous integration/continuous development (CI/CD) Pipeline
- GENESIS platform agnostic architecture allows minimal work to transition to a different platform
- GENESIS attained Certificate to Field (CtF) & deployed onto SC2S in < 6 months
- P1 containerizes GENESIS & deploys it to SIPRnet (SC2S) up to a weekly basis
- User feedback was built into the design process and led to greater automation





GENESIS Architecture





GENESIS Today: Modernization via Automation



Evolution of GENESIS Features

Genesis Phase II Features

- Centralized Database
- Web Application
- Forms to create, edit, & schedule mission
- Form to edit spacecraft resource model
- Timeline view
- Recommend channel & first hop assignments
- SAR/SAA Import

Current GENESIS
Dev Team FOCUS

Supports MILSATCOM Vision

- **Automation** – Intelligently select satellite & ground resources to fulfil comm requirements
- **File Parsing** – Decrease operator workload; improve speed & accuracy
- **Lightweight App** – Web based, DevSecOps hardened, UCD app
- **Data Fusion** – Bring together data from historically disparate systems
- **Compatible Messages** – Parse enterprise standardized messages (SAR/SAA)

Future / Fighting SATCOM

- Improved Protected Band Situational Awareness & Planning
- Add Wideband, Narrowband, Commercial Cells (Merge Stovepipes)
- MILSATCOM CoP – Enterprise situational awareness, resilient planning & execution



From Prototype to Robust Planning Tool

Genesis

01 Dec 2020 336 15:37:10 UTC

Timeline Missions Create Mission Dashboard Frequency Plan Beam Location Admin

Search Fields

View Beams Start Date 12/01/2020 End Date 12/05/2020 Flight FLT-3

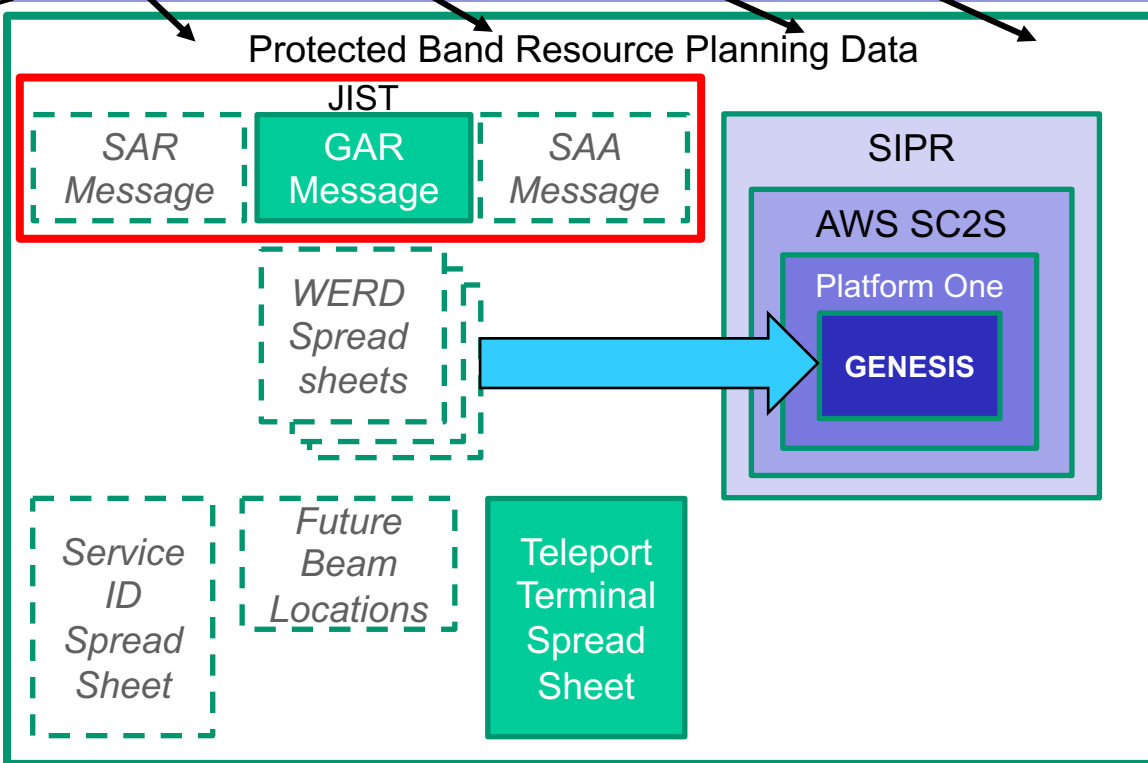
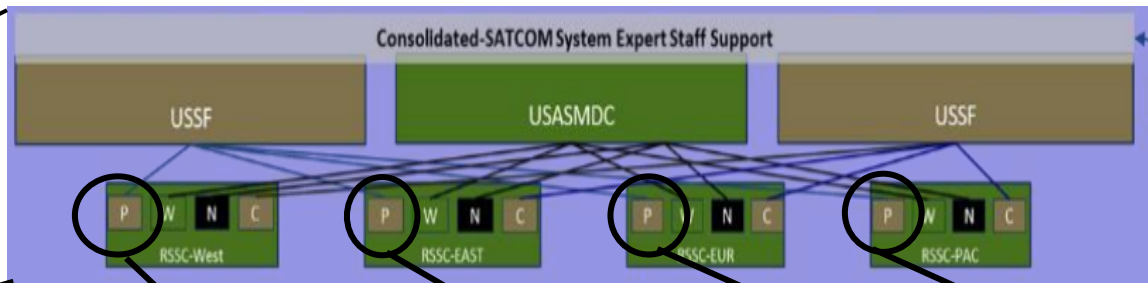
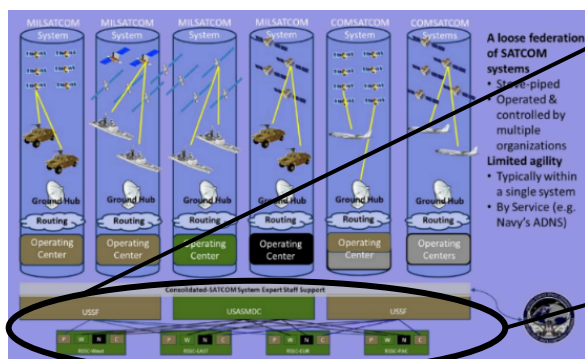
SEARCH

Location	Logical XDR	XDR Count	XC2	Logical MDR	MDR Count	MC2	Logical LDR	LDR Count	C2
(200, 100), Static	HRCA-1	1	VIEW	NULLER A	0		SBA	0	
(6, 4), Static	HRCA-2	0							
(500, 5), Steerable	MRCA-1	0		DUCA-A1	0				
(60, 300), Steerable							SBB	0	
(10,), Steerable	MRCA-4	0		DUCA-A3	0				
(2, 1), Static	MRCA-2	0					SBC	0	
(111, 50), Static				DUCA-B2	0				
(30,), Static	MRCA-6	0		DUCA-B3	0				
COORDINATES	BSMRCA-1 0 0 0 0	0							
COORDINATES	BSMRCA-2 0 0 0 0	0							
COORDINATES	BSMRCA-3 0 0 0 0	0							
(,), Steerable	3.4 Spot	0					HHR	0	
(,), Steerable	SHGEC-2	0					CA/DA	0	
(,), Steerable	AHGEC	0					AG/DA	0	
(,), Steerable	XRB	0					RBA/DA	0	
(,), Steerable	LGEC	0					EC	0	

GENESIS is now providing PBC planners the ability to see planned beam status "on-demand"...
if GENESIS can process planned data – it can also process real-time data



GENESIS Today





Current Planning Process Improvements

- **Enabling auto-population of SAR/SAA message ingest into GENESIS from JIST**
- **Assessing Service ID usage**
- **Automating Service ID assignments into GENESIS from existing PBC spreadsheets**
- **Moving Beam location schedules into GENESIS**
- **Allowing Multiple frequency plans to be loaded into GENESIS**
- **Providing visual notification of resource conflict to the Planners**
- **Building the foundation of a Recommendation Engine: assign optimal satellite resources based on data in the database (think Waze Application)**

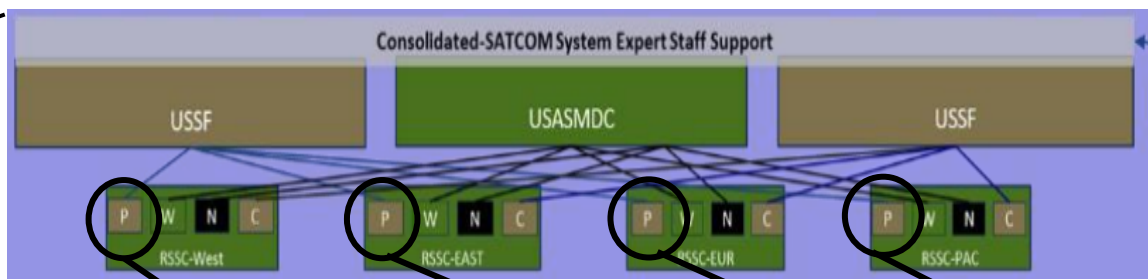
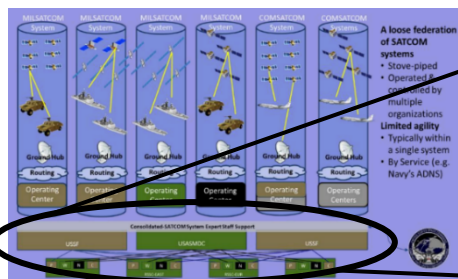
GENESIS reduces network planning tasks from ~4 hours to 15 minutes on average & reduces scheduling errors



GENESIS Tomorrow: Supporting the 'Fighting SATCOM' Vision



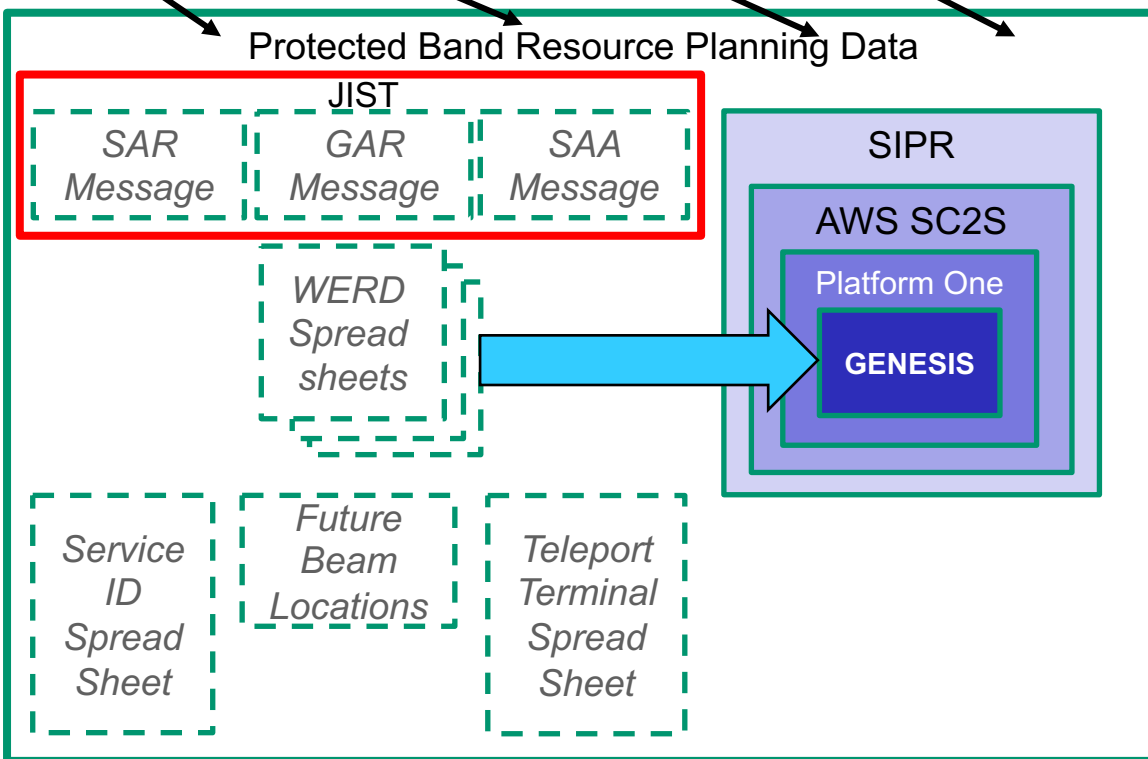
GENESIS Tomorrow: The Future of Protected Band Cell Process



Planned GENESIS Enhancements*

- Full Automation of SAR/SAA ingest & parsing from JIST
- SAR data validation
- Integrate Teleport Terminal Spread Sheet
- Automate resource selection
- Provide suggested optimizations of payload configurations
- Optimize resource usage

* This list pulled from the current GENESIS Feature Backlog





How does *GENESIS* fit into *EGS*

GENESIS supports the Enterprise Ground System (EGS) portfolio by:

- Laying the foundation of integrated MILSTAR & AEHF Tactical C2
- Demonstrating success via the Developer Services model
- Supporting Enterprise Efficiency by utilizing Platform ONE cloud services
- Enhancing resilience across the RSSC by providing simultaneous access to pre-planning resource data



- Creating automation for reusable components that can be used on other EGS applications:
 - User Authorizations, user authentication code, and user activity logging



SATCOM Today



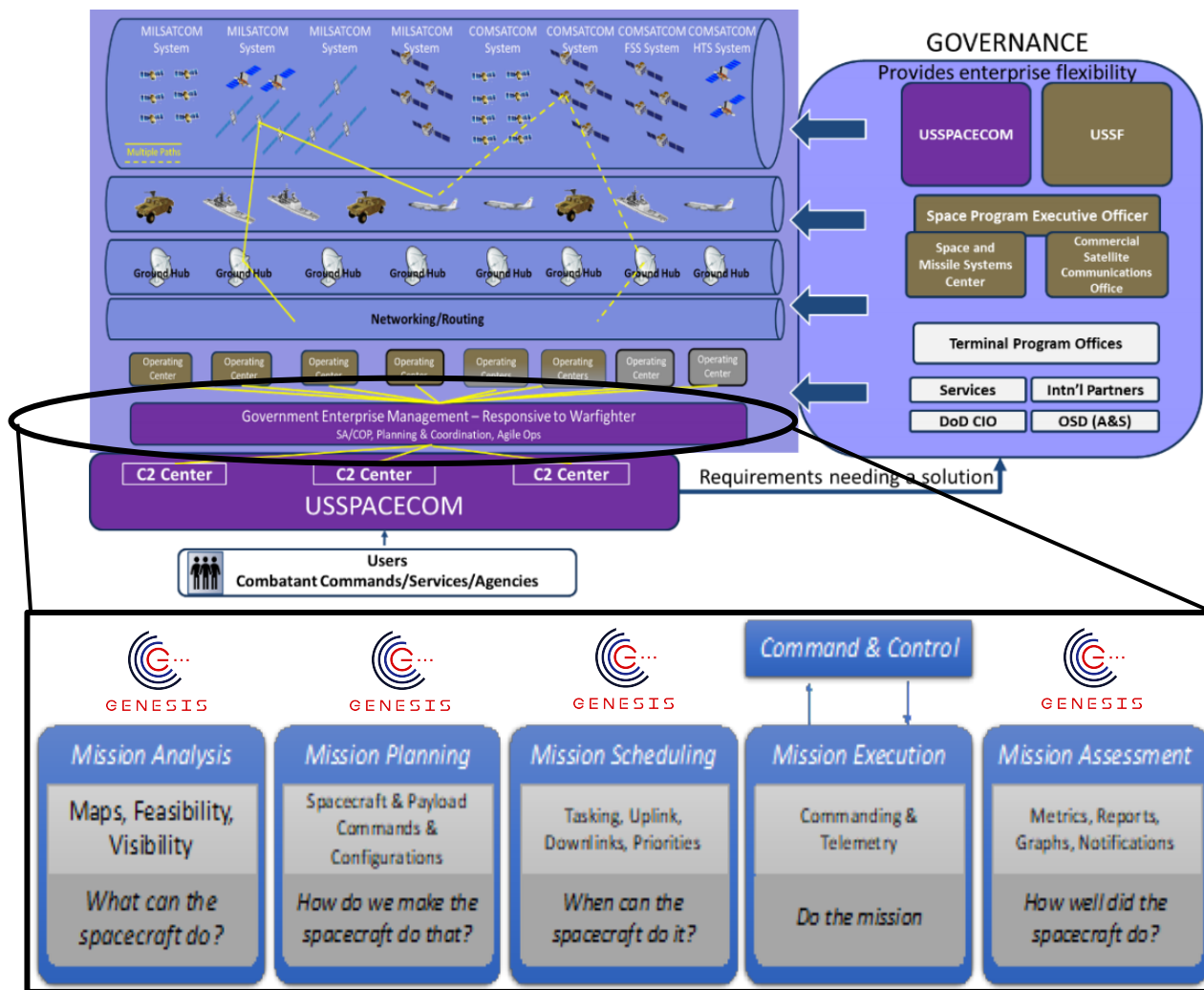


The Art of the Possible: Beyond Protected Band & Towards MILSATCOM Resilience

The next logical step from automation is **adding real-time data** into GENESIS

This can be done by:

- Adding live telemetry feed data that already exists at the RSSCs
- Fully-integrating GENESIS with JIST/SOMSAT
- By Integrating live telemetry into GENESIS – it can provide expanded MILSTAR/AEHF Situational Awareness and Mission Assessment
- The GENESIS concept can be expanded to the other Bands to support the greater Fighting SATCOM Vision





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