

NOAA Communications Scheduling is EASI (Enterprise Automated Scheduling Implementation)

Katherine Cramer^a, William Ardanuy^b, Kacie Tafer^c, Ella Herz^d, Neil K. Dhingra^{e*}

^a Auria, 1755 Telstar Dr. Suite 400. Colorado Springs, Colorado 80920, USA, katherine.cramer@auria.space

^b Auria, 1755 Telstar Dr. Suite 400. Colorado Springs, Colorado 80920, USA, william.ardanuy@auria.space

^c Auria, 1755 Telstar Dr. Suite 400. Colorado Springs, Colorado 80920, USA, kacie.tafer@auria.space

^d Auria, 1755 Telstar Dr. Suite 400. Colorado Springs, Colorado 80920, USA, ella.herz@auria.space

^e Auria, 1755 Telstar Dr. Suite 400. Colorado Springs, Colorado 80920, USA, neil.dhingra@auria.space

* Corresponding Author

Abstract

The National Oceanic and Atmospheric Administration (NOAA) manages many satellites and partner assets, making the problem of scheduling communications with their satellites using partner government and commercial ground stations a large and challenging problem. The legacy solution for this problem had consisted of parallel stove-piped planning systems for each satellite mission. This planning concept of operations was slow and hard to adapt to the evolving, growing problem as assets or partners changed.

To improve the NOAA satellite communications planning process, Auria integrated all NOAA missions and ground antennas into a single enterprise planning model for the NOAA Office of Satellite and Product Operations (OSPO) under the Enterprise Automated Scheduling Implementation (EASI) planning system program. EASI plans for all NOAA and partner satellites and ground stations using automated scheduling software and is flexible so that it can be rapidly modified to support changing mission needs, requirements, and priorities.

Under EASI, Auria performs ground station antenna and satellite modeling and associated antenna scheduling for all NOAA satellites across all orbits and is extensible to support additional future missions/constellations and scheduling requirements. The system supports all current NOAA and commercial ground station antennas and associated equipment supporting NOAA operations; NOAA's LEO, GEO and deep space satellites; and external missions that utilize NOAA ground stations. The EASI system also supports integration with additional systems, such as Tracking and Data Relay Satellite System (TDRSS) and manages requests from partners like Landsat and the European Organization for the Exploitation of Meteorological Satellites.

At the core of Auria's EASI ground resource management and scheduling solution is our scheduling software STK Scheduler: an operationally proven COTS software product that has been deployed for planning and scheduling missions across the aerospace industry, including for other communications planning problems.

The scheduling software can work hand-in-hand with AGI's STK software for astrodynamics computations that drive planning problem constraints and objectives. This connection was leveraged for the EASI system; Auria worked with NOAA planners and engineers to transfer requirements into STK Scheduler and other STK module scenarios and model configurations.

The EASI solution leverages Auria's capabilities with not only the STK Scheduler planning engine, but its extensions to web and mobile interfaces. Auria created NOAA-specific pages and workflows within the STK Scheduler web application and provided pass alerts and status to NOAA operators and mission customers through a customized version of its mobile app and supporting server architecture.

Since it leverages Auria's mature scheduling product as well as the commonly used STK astrodynamics platform, the cost of developing and deploying EASI was considerably less than it would have been to develop a completely custom solution from the ground up.

Keywords: Automated Planning and Scheduling, Communications Planning, Optimization, Communications Relays, Contact Scheduling

1. Introduction

In the complex world of satellite operations, efficient scheduling is critical. The National Oceanic and Atmospheric Administration (NOAA) faces a unique challenge: coordinating multiple ground and space assets across various

orbital regimes. To address this, Auria has developed the Enterprise Automated Scheduling Implementation (EASI), a cutting-edge solution designed to streamline and automate satellite scheduling.

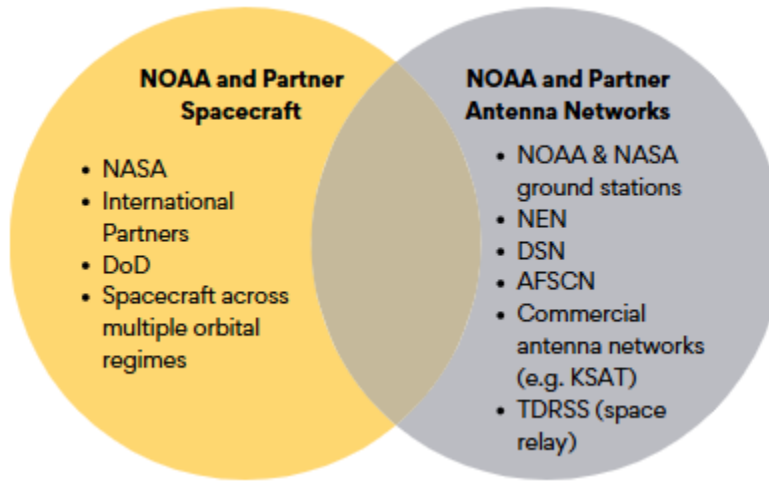


Figure 1: Assets to Schedule.

NOAA’s satellite operations involve a vast network of spacecraft and ground stations, including partnerships with NASA, international collaborators, the Department of Defense (DoD), and commercial entities. These assets span multiple orbital regimes and rely on diverse ground station networks, such as the Near Earth Network (NEN), Deep Space Network (DSN), and commercial providers like KSAT; see Figure 1.

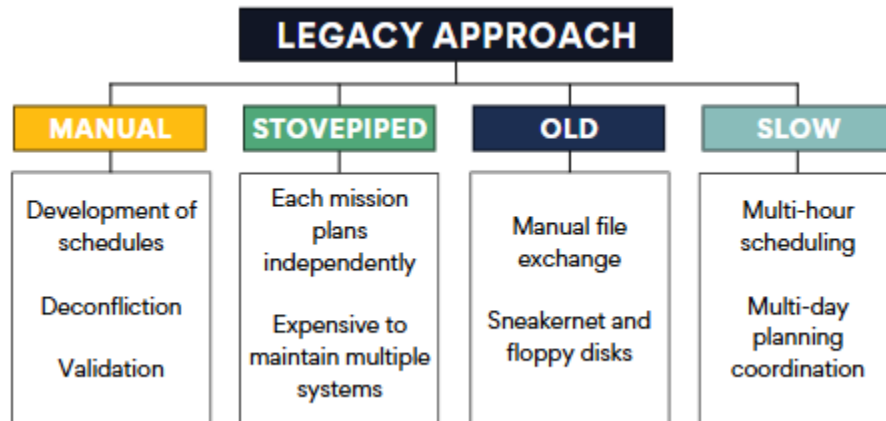


Figure 2: Legacy Scheduling Process.

Traditionally, NOAA relied on manual, stove-piped systems for scheduling. Each mission operated independently, leading to inefficiencies, high maintenance costs, and slow coordination. The legacy approach involved manual file exchanges, multi-hour scheduling processes, and multi-day planning cycles—methods that were no longer sustainable in an era of increasing mission complexity; see Figure 2.

2. Enterprise Automated Scheduling Implementation (EASI)

EASI represents a significant leap forward. Built on commercial off-the-shelf (COTS) software products, including Auria’s Astro Scheduler (formerly STK Scheduler) AI driven deconfliction and optimization engine and STK Pro for flight dynamics, EASI offers a flexible, extensible, and automated solution. Key features include:

- Enterprise-Level Integration: EASI consolidates scheduling for all NOAA missions into a single application, enabling cross-mission deconfliction and optimization.

- Modernized Interfaces: The system supports web and mobile access, along with APIs for seamless integration with other systems.
- Automation: EASI automates scheduling tasks, reducing the time required for planning and coordination.
- Extensibility: The system can accommodate new satellites, ground stations, and scheduling constraints without requiring additional software development.

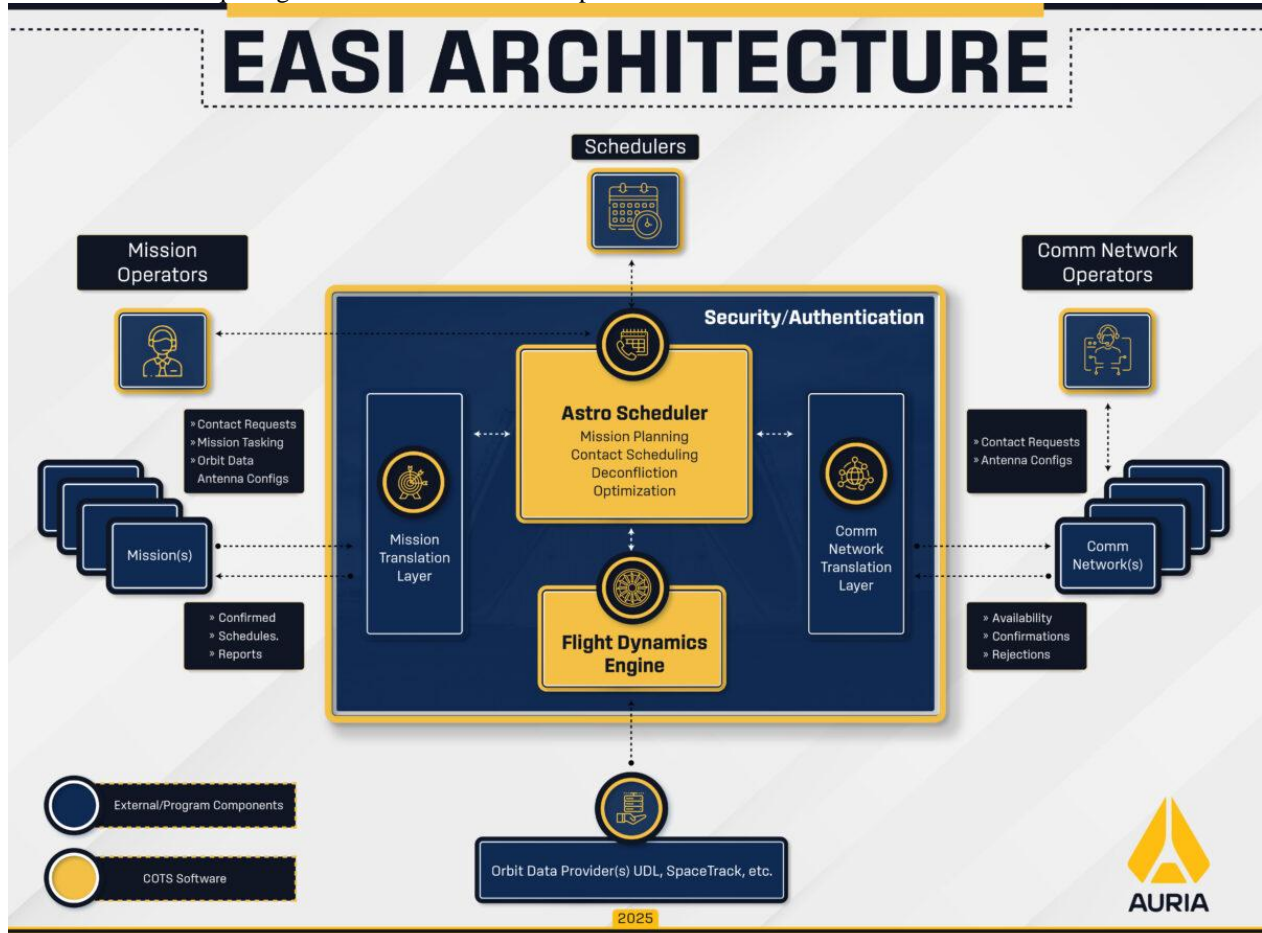


Figure 3: Diagram of Auria's EASI Architecture for NOAA, showing the workflow between schedulers, mission operators, and communication networks, including components like Astro Scheduler, flight dynamics engine, and COTS software.

The EASI architecture integrates mission operators, schedulers, and communication network operators into a unified workflow. Users log in via a web browser with admin-defined permissions from there they import orbit data, review schedule constraints, and update availability information. The system then generates a deconflicted schedule and outputs custom reports for communication networks and satellite operations.

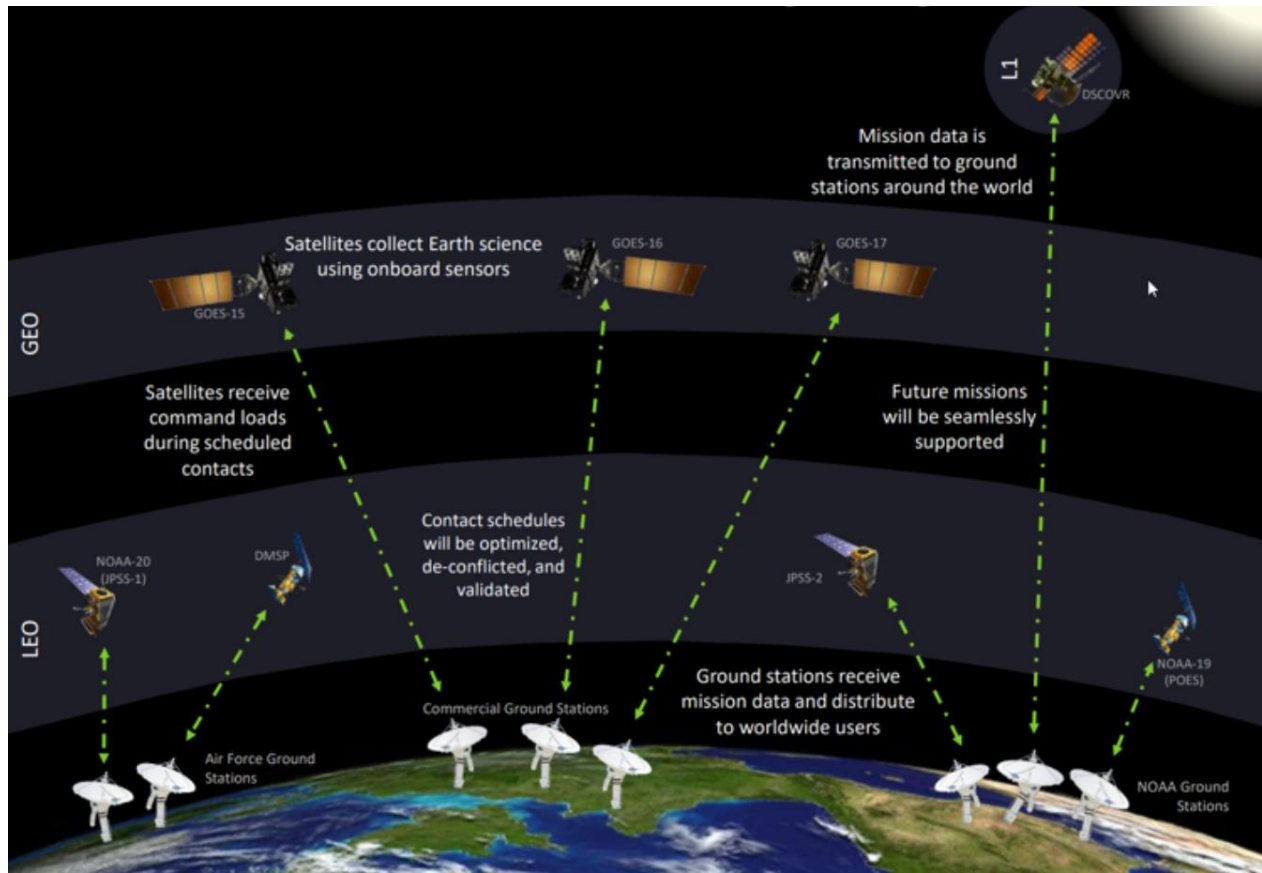


Figure 4: EASI Overview Figure.

3. Deployment

EASI is operationally deployed with NOAA. The overall process managed by EASI is visualized in the overview illustrated in Figure 4. A screenshot of the user interface can be found in Figure 5 while a diagram of the user workflow is shown in Figure 6.

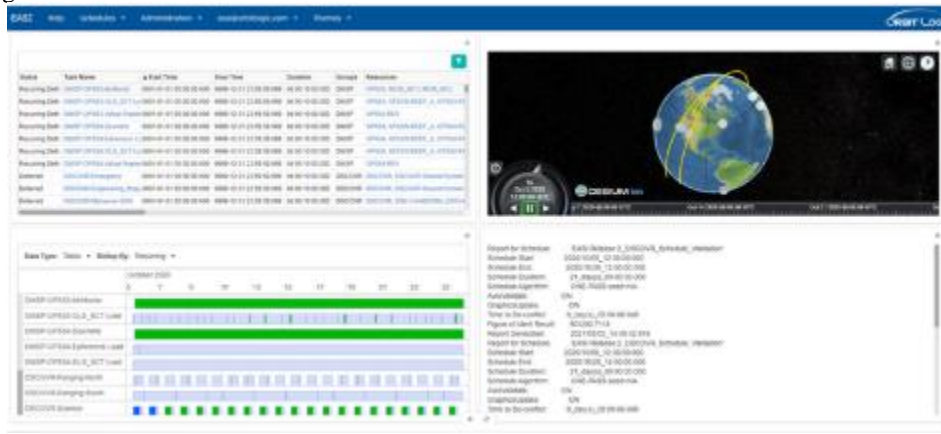


Figure 5: EASI User Interface.

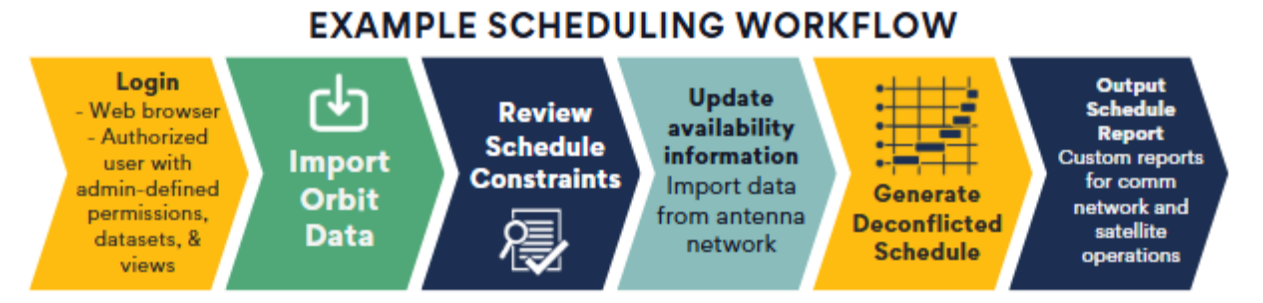


Figure 6: Sample EASI Workflow.

Some key features of the EASI deployed architecture are as follows.

- Based on COTS Software Products
 - Astro Scheduler core scheduling engine and web application
 - STK Pro flight dynamics computations
 - SpyMeSat Mobile App
- Flexibility and Extensibility
 - Any type of task or resource
 - No software development needed for new satellites, ground stations, physical constraints
 - Controlled web access management
- Enterprise Level Solution
 - Single application for all missions
 - Cross-mission deconfliction
 - Automation
 - Modernized interfaces
 - Web
 - Mobile
 - API
- Configuration and plugins provided to the government
 - Custom inputs, outputs, and schedule constraint values
 - Uses standard COTS API's

An outline of the development and release schedule for NOAA EASI is shown in Figure 7. The quick turnaround from the onset of development to a mature, deployed solution underscores the benefits of building on COTS software. The approach used on NOAA EASI accelerated deployment timelines and reduced costs to the end user.

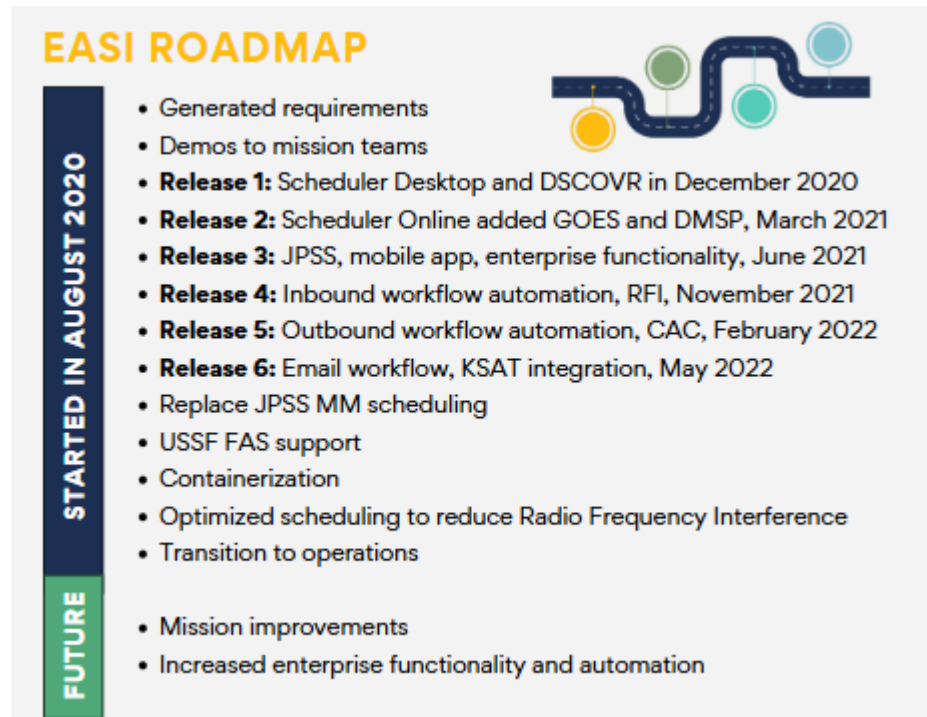


Figure 7: EASI Deployment Roadmap.

4. Conclusions

EASI is not just a solution for today—it’s a platform designed to grow with NOAA’s future needs and can easily be applied to any system needing multi-mission planning and coordination with multiple communication networks. By moving away from legacy systems and embracing automation, EASI ensures that NOAA can efficiently manage its expanding satellite fleet and ground station networks. This innovation sets a new standard for enterprise-level scheduling in the aerospace industry.

EASI’s development overlaps with other work for Landsat 8/9 [1-3], BridgeComm laser communications scheduling [4], the SDA Tranche 2 Tracking Layer, commercial customers, and the Air Force Satellite Control Network (AFSCN).

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