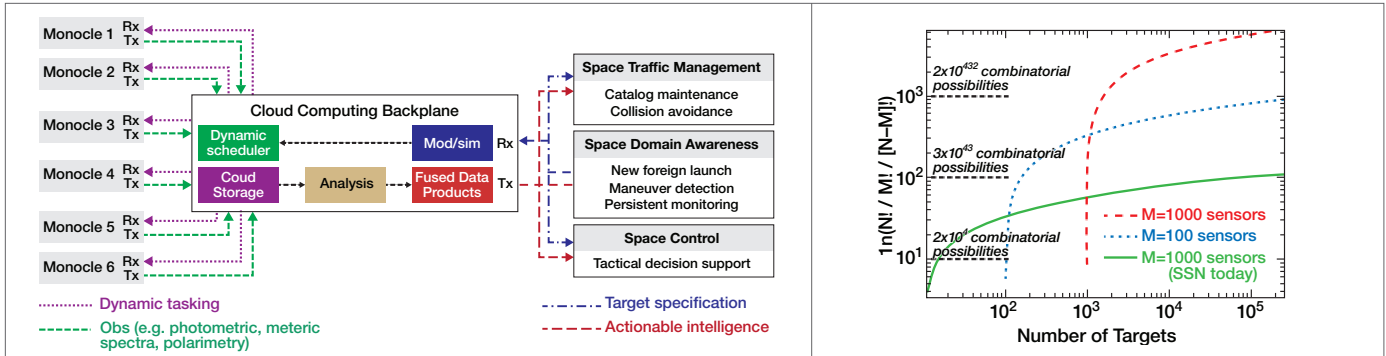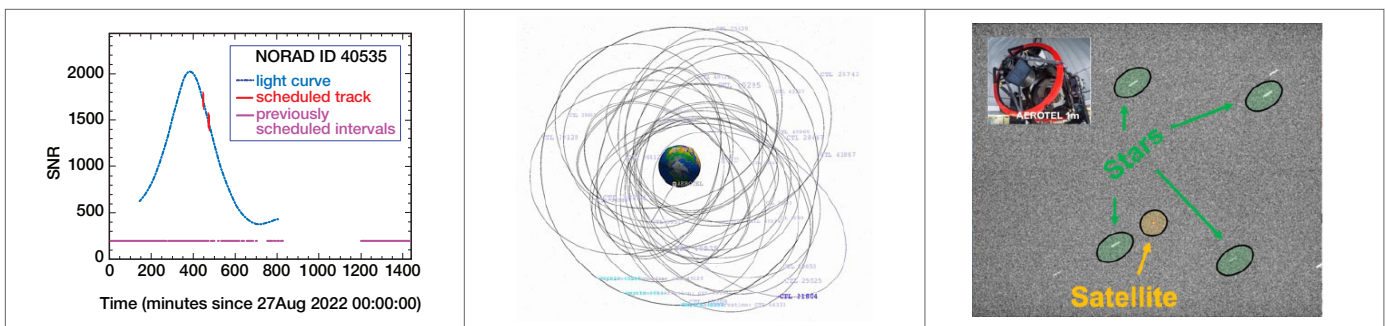# PRIME FOCUS

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The tasking, collection, processing, exploitation, and dissemination (TCPED) on resident space objects is a critical element for ground telescope networks. As the number of resident space objects in the catalog grows toward 10^5, TCPED systems must increasingly rely upon automation to address each element of the TCPED pipeline. The left panel above shows a notional TCPED pipeline in which users supply target lists to an ops center, which processes requests through mod/sim to produce a dynamic schedule for a telescope network. The resulting observations are returned to the ops center, processed, and reported to the requestors. The latency of this pipeline is of paramount concern to the users.

The right panel above illustrates the combinatoric challenge that these TCPED systems face. This plot shows the number of ways to assign M sensors to N targets vs. the number of targets. The current electro-optic Space Surveillance Network (SSN) operates near the lower left of this plot, with approximately 1,000 targets and 10 sensors. In the future, the SSN will operate near the upper right of this plot, with 10^5 targets and 1,000 sensors. The combinatorial possibilities increase from 104 to 10,432. Target selection and sensor assignment proceeds indefinitely in time, and the sensor network must respond to unanticipated events. Any TCPED methodology to address this problem must rely extensively on automation.

Prime Focus automates the TCPED pipeline using the AeroTel 1 m telescope in El Segundo, CA, as a surrogate sensor to represent the SSN. Prime Focus operates on a 24-hour cycle in which users upload target lists via webform, launching a series of autonomous operations. Target information is downloaded from the Space Track catalog. Aerospace's radiometric analysis tool TRADIX is used to model target light curves, as shown at left. A scheduling algorithm employs these light curves to allocate time based on high signal-to-noise ratio observing opportunities. A sample schedule for

27 August 2022 is shown at center. Observational tasking is issued to AeroTel, which performs collections and writes data to local cloud storage. These data are then encoded in schema for upload to UDL.

Prime Focus' automated TCPED pipeline relies entirely on cloud computing, cloud storage, and modern software practices. This cloud-based approach ensures scalability of this pipeline to large node count—an imperative for the future ground telescope network architecture.