OBJECTIVE: Develop and demonstrate a standardized Remote Telescope Control hardware (RTC HW) solution that will allow the
United States Naval Observatory (USNO) to deploy telescopes to various places around the world and to assure data and network
connection integrity. These RTC HW boxes will include a set of standard interfaces, on-board computing and data storage capability
allowing for use in a client-server mode from USNO, and meet all Risk Management Framework (RMF), Information Assurance (IA), and
physical security rules.

DESCRIPTION: The Trident II (D5) weapon system utilizes astronomical information and data collected by various telescope systems.
These astronomical data sets must be measured and monitored yearly to ensure weapons system utility and performance. These
measurements will persist for an amount of time to sufficiently baseline particular stars’ photometric variability, which in some cases
are expected to span decades. Today, astronomical data gaps exist that require USNO to measure stars from various remote places
around the world. These data gaps include current collections of numerous bright stars’ photometry and astrometry. An RTC HW
solution will fill this data gap in a manner that is repeatable, efficient, and testable by using standard interfaces, on-board computing,
and data storage. The current state of deploying astronomic telescopes is not standardized in terms of data and network connectivity.
Current hardware technology requires on-site personnel. Additional cost is incurred by synthesizing various data collection from the
dissimilar hardware environments. An innovative RTC HW solution would lessen schedule impacts and cost of data collections by using
standardized equipment and remote utility. This SBIR topic is expected to work in a software counterpart under development.

PHASE I: Develop and define a concept design that standardizes RTC HW in a manner that assures data and network connection
integrity. Work with the Navy in understanding size, function, and interface requirements for the RTC HW solution that would enable
nightly measurement of preselected stars with visual magnitude greater than 10 and the ability to extract measured data on an ad hoc
basis. Construct measures that ensure data and network connection integrity and USNO software application. Identify risks to the
proposed concept and develop Phase II plans that include ways to mitigate those risks for Phase II. For hardware and associated
software configurations, apply appropriate cybersecurity standards as addressed by Security Technical Implementation Guides (STIGS)
that is provided by the DoD cyber exchange [Ref 6].

PHASE II: Produce and deliver a prototype RTC HW solution. Work with the Navy to fully understand the RMF and IA requirements, as
well as data and network connectivity measures of success. Work with the Navy to understand hardware standards for various software
applications to be executed on the RTC HW box including standards and software applications being developed for the RTC system.
Provide testing scenarios that ensure RMF and IA requirements are met. Test the hardware interfaces, on-board computing, and data
storage capability. Establish a feedback loop with the Navy for implementing changes due to prototype testing. As with cybersecurity
standards, RMF and IA requirements will be addressed by STIGS as provided by the DoD cyber exchange.

PHASE III DUAL-USE APPLICATIONS: Deliver a RTC HW solution for telescopes deployed by USNO in a manner that works with a USNO
software application under development. Provide design and test cases that demonstrate RTC HW interfaces, on-board computing,
and data storage capability. Support remote field qualification testing with RTC software applications that are in development. Work
with the Navy to set up RTC HW including trouble shooting plus resolving implementation and execution issues at various Navy, DoD, and civilian telescope observatories.

REFERENCES:


KEYWORDS: Remote Telescope; Standard Interfaces; Repeatable; Hardware Interfaces; Connection Integrity; On-board Computing; Data Storage; Photometry and Astrometry