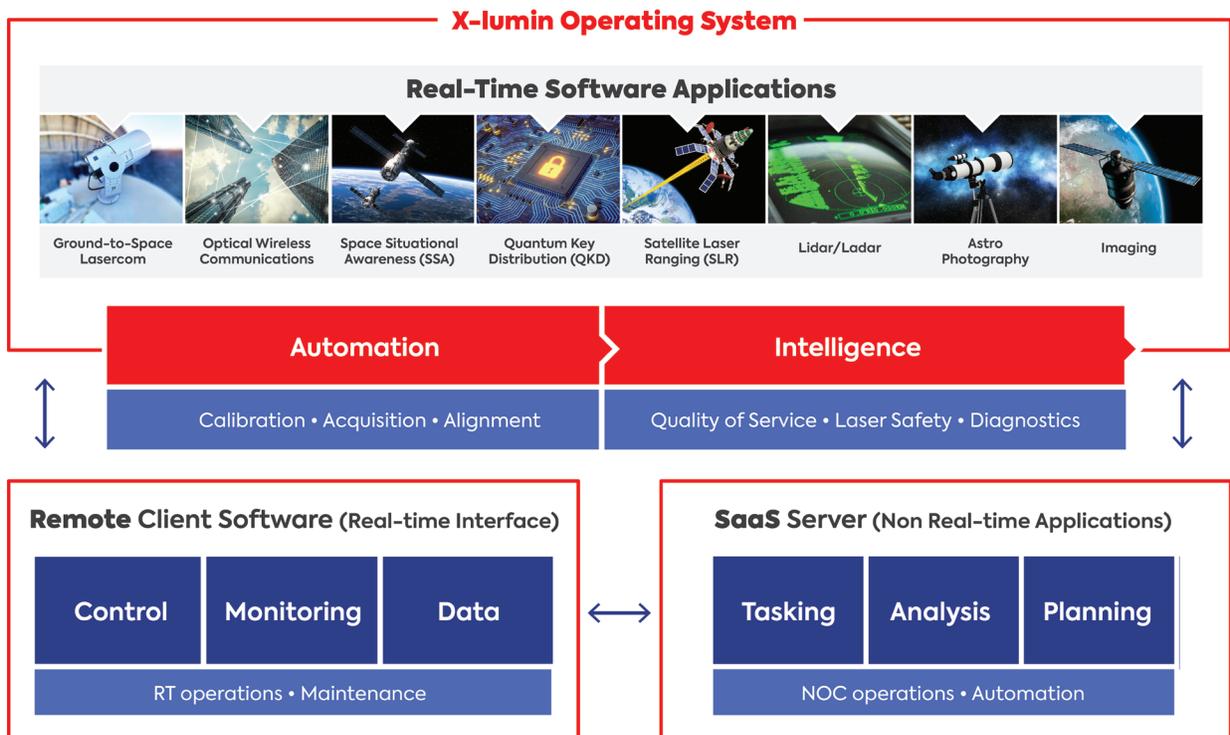


THE X-LUMIN OPERATING SYSTEM

The X-lumin Operating System (XOS) provides a comprehensive management system for the control of a variety of Precision Optical Pointing and Tracking applications including, ground-to-space; optical wireless communications; Quantum Key Distribution; Astronomy; Space Situational Awareness; and atmospheric sensing. This leading-edge operating system has been designed and developed through years of successful implementation of laser optical tracking and data collection and analysis systems. XOS is a system created to meet client requirements and does not require the use of specific vendors or components. It is hardware independent and one of the most advanced software systems supporting Precision Optical Pointing and Tracking applications.

Supporting a full range of critical functions from a single point of access with easy configuration, users can control the OTA, gimbals, cameras, lasers, and other features. The XOS client interface operates on multiple platforms including Windows, Linux, Mac, Android and IOS. Customized scripts allow for architecture systemization covering basic processes such as powering up and shutting down and complex processes such as remote control, user-defined automation, quality of service, laser safety, 24/7 operation, and extended ranges. The convergence of these features makes XOS an easy decision for operators looking to simplify, integrate, automate, and capture key analytics.



XOS INTEGRATION

The versatility and adaptability of the XOS make it a top choice for a variety of Optical Pointing and Tracking (OP&T) and Optical Target Characterization (OTC) applications. Intelligent by design, XOS manages multiple applications through a standard network interface that allows for third-party software integration. For example, XOS can enable lasercom on an astronomical Optical Telescope Assembly (OTA) as a stand-alone feature, or incorporate the OTA into a larger network. Additionally, the user has the option of planning for future add-on features and capabilities to allow multiple uses of expensive gimbal and telescope assemblies. For example, Space Situation Awareness (SSA) or Tracking and Imaging can be added to an existing laser communication ground station, helping to manage costs over time.

XOS is also unique in its offering of collection options – allowing the client to locate their systems on mobile platforms or moving platforms. Also, the XOS client can remotely control multiple platforms from a single interface. XOS supports the following optical applications: Networked and Stand-Alone Optical Ground Stations; Optical Wireless Communication (OWC); Space Situational Awareness (SSA); Satellite Laser Ranging (SLR); Quantum Key Distribution (QKD); Mobile Tracking & Imaging (and Mobile Launch Tracking); LiDAR/LADAR; Astro Photography; and Laser Safety Systems.

XOS APPLICATIONS

Networked or Stand-Alone Optical Ground Station (OGS)

XOS is the mastermind behind X-lumin's Lasercom OGS. XOS manages the various functions of the OGS for laser communication networks providing superior-quality, bi-directional links to low Earth orbit (LEO), medium Earth orbit (MEO), and geostationary Earth orbit (GEO) satellites. XOS has a flexible and adaptable single-user interface that provides state-of-the-art pointing and tracking capabilities, such as: manual & automatic guiding; remote control; motion stabilization; video tracking; calibration and alignment; target acquisition; and a highly configurable control interface. As a "Stand-Alone" system,

XOS provides comprehensive management and control of a single OGS. Optimizing detection, tracking, and characterizing near-Earth space objects, the software creates an ideal system for conducting free space optical communications research demonstrations. XOS can also be integrated into networked architecture to control multiple OGS' from a single client interface.





Optical Wireless Communication (OWC)

Supporting line-of-sight Short Range Optical Wireless Communications (OWC), XOS enables faster, secure and more cost effective optical laser data transmission between geographically separated locations from a remote, single user interface. XOS works on on fixed sites such as buildings and oil rigs; on moving vehicles, and on aircraft. Its simplicity allows for rapid deployment of temporary OWC infrastructure in emergencies or natural disasters.

Space Situational Awareness (SSA)

Our XOS can be configured to control SSA Tracking Systems. It includes a highly configurable data collection system capable of collecting high quality radio metrically calibrated imagery of LEO, MEO and GEO space objects. XOS integrates seamlessly state-of-the-art gimbals, telescope, and cameras and provides the user with the ability to access the system from multiple remote locations simultaneously.



Satellite Laser Ranging (SLR)

Laser ranging – or optical radar – is an enabling technology for high- precision satellite-to-satellite tracking for object space tracking. XOS can help capture and store this data along for future use and analysis. Additionally, XOS provides laser-specific features to include laser control and monitoring, and integration with our laser safety system. XOS provides a single point of access for SLR tracking stations and places additional control and monitoring data into the hands of the operator.

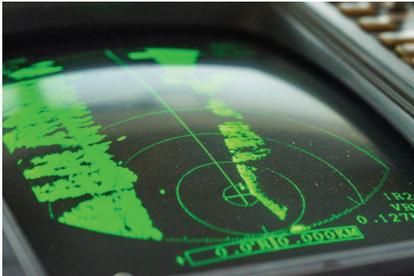
Quantum Key Distribution (QKD)

With the security threat posed by hackers, demand for quantum communication capabilities is mounting. While short-link QKD in fiber systems is advancing, interconnecting links over significant distances faces a big technological hurdle: amplification or retransmission of a quantum state alters its properties. A viable solution is using satellites that distribute secure keys to ground stations via free-space optical links. XOS offers a solution that can be adapted to manage QKD free- space ground stations.



Tracking & Imaging

XOS can control systems used for tracking and imaging of terrestrial or space objects. These systems can be based on mobile or moving platforms with Visible, NIR, SWIR, and MWIR imaging cameras. With XOS the user can preview, record and analyze imagery, either at the tracking station or at a remotely controlled location. XOS provides the client a configurable interface; remote control and remote processing capability; as well as the ability to add tracking and imaging to other applications.

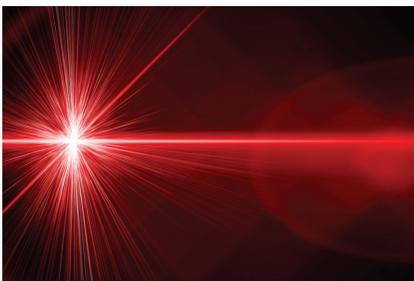


LiDAR /LADAR

LiDAR: Light Detection And Ranging and LADAR: Laser Detection And Ranging - are expressions referring to a type of remote sensing technology that can determine the distance between a sensor and an object using a pulsed laser to measure ranges. The term LiDAR is typically used to refer to mapping terrain or collecting information on the atmosphere; while LADAR is used to refer to locating and characterizing smaller point targets like vehicle or other man-made objects. Whatever the application, XOS can provide a single interface for tracking and sensor control data collection.

Astro Photography

With increased volumes of data from various astronomical telescopes, XOS offers a high speed, low interference, relatively low cost means to enhance existing astronomical telescopes by enabling additional functionality. Our hardware agnostic design allows XOS to provide a single user interface for control of the gimbal, telescope, camera, focuser, and rotators. In addition, XOS provides interfaces for metric and radiometric calibration of cameras and sensors.



X-lumin Laser Safety System (X-LSS)

The XOS platform serves as the foundation of the X-LSS, a highly adaptable, real-time laser safety solution for use with the following systems: X-lumin's Lasercom OGS and (some) versions of our Short Range Point-2-Point Lasercom System for moving platforms. X-LSS can be customized for use with LIDAR/LADAR; lasercom; laser imaging; and high energy lasers. Ideal when dynamic pointing is in play, the X-LSS provides a layer of assurance against inadvertent illumination of people, wildlife, objects, and moving vehicles. The X-LSS is deployable on dedicated hardware and embedded with command and control functions.

XOS WARRANTY, SUPPORT, & LICENSING

XOS comes with a 90-day manufacturer's warranty from the date of acceptance. XOS is offered on an annual licensing basis with Customer Support. A minimum one-year contract is required with all purchases; additional 3 to 5-year renewal periods can be purchased for a discounted price with the initial contract.



XOS ADVANTAGES ACROSS APPLICATIONS



Communication. XOS can communicate via remote control GUI and allows for both remote and local scripting with Python.



Automation. XOS can be pre-programmed with user-specified parameters for calibration & alignment, acquisition, quality of service and diagnostics, laser safety, data analytics, etc.



Collection Options. Can collect data from fixed and mobile platforms; moving platforms; and remotely across platforms from a single interface.



Data Logging. Data can be logged for performance troubleshooting and analysis.



Remote Control. A single interface allows for remotely managed operations of all system hardware components, including acquisition sensors, gimbals, and lasers, through single interface.



Hardware Agnostic. XOS is designed to operate across a wide variety of hardware vendors, offering unparalleled flexibility for meeting current needs while allowing for future capability expansion.



Quality of Service. Enhanced service quality and reliability obtained from automated optimization of bandwidth and hardware utilization as well as access to real-time comprehensive diagnostics; video tracking available.



Day and Night Operations. Can be programmed for uninterrupted tracking and data collection - 24/7, 365.



Cross-Platform Availability. XOS operates on multiple platforms including Windows, Linux, Mac, Android and IOS.

ABOUT X-LUMIN

X-lumin is on a quest to build an effective and efficient bridge between existing optical communications technology and the need for a high-speed data highway to meet exploding IoT demands. Our innovative and cutting-edge solutions incorporate state-of-the-art optical and photonic components which comes from over 25 years of experience in the design, development and integration of optical technologies and solutions, laser systems, tracking and surveillance, atmospheric propagation, and video and image processing. While the early foundations of our products and solutions focused on universities and government agencies, our solutions today allow us to bring these leading-edge solutions to the commercial marketplace which create new standards and solutions that have broader impact.

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