3DRi
3D Real-time intelligence

More Information, Less Data!

The 3DRi Software Development Kit (SDK) is a library of proprietary software algorithms that extract actionable information from OPAL scanners in real-time.

The 3DRi algorithms sift through the millions upon millions of raw 3D data points generated by the LiDAR scanner and convey only the critical information needed for real-time operations of autonomous systems. This eliminates the need for painful post-processing on a back-office system as with conventional LiDAR systems.

Intelligent software for real-time mission-critical applications

Applications Include:
- Automatic Change Detection
- Obscurant filtering
- Object Segmentation
- Object Identification
- Object Tracking

SYSTEM MANAGER

VIEWER

REGISTER

SEGMENT

OBSCURANTS

MODEL

ALIGN

OBJECTS

DETECT

IDENTIFY

TRACK
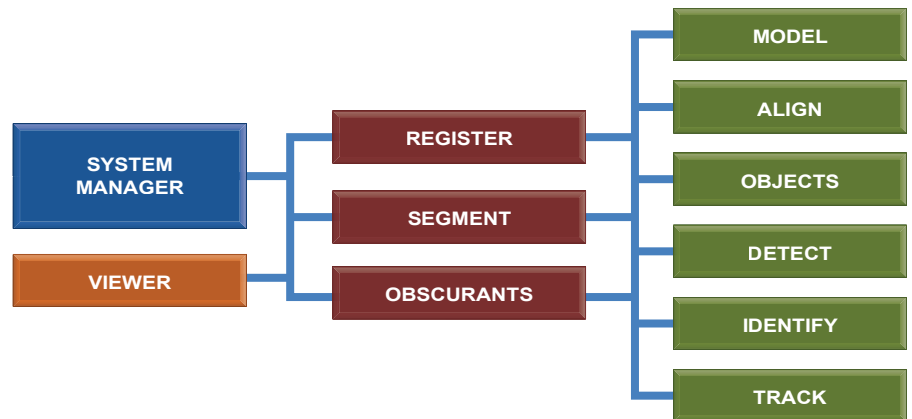
3DRi™ System Manager /API

The framework for collecting and managing 3D data from OPAL LiDAR scanners; based on an open "publish-subscribe" architecture where the various 3DRi components communicate with each other through a lightweight Ethernet-based data distribution service. This allows for rapid application development and facilitates scaling applications from one computer to a series of networked computers.

3DRi™ Viewer

An intuitive graphical user interface (GUI) used to configure and operate OPAL scanners and to manage the installed plug-in components. Scan data may be viewed live or as a logged data file for 3D point cloud visualization, data manipulation, range / elevation colourization, and basic size measurements of features in the data.

neptec
Technologies Corp

MARINE   AEROSPACE   MINING   CONSTRUCTION   TRANSPORT   OIL & GAS   SECURITY

www.neptectechnologies.com

3DRi™ Core Plug-in Components

REGISTER – Registers 3D point clouds to external navigation data in real-time (GPS & IMU).

SEGMENT – Segments registered OPAL 3D data into ground and above-ground data in real-time.

OBSCURANTS – Enables enhanced obscurant-penetration and filtering functions in harsh environments.
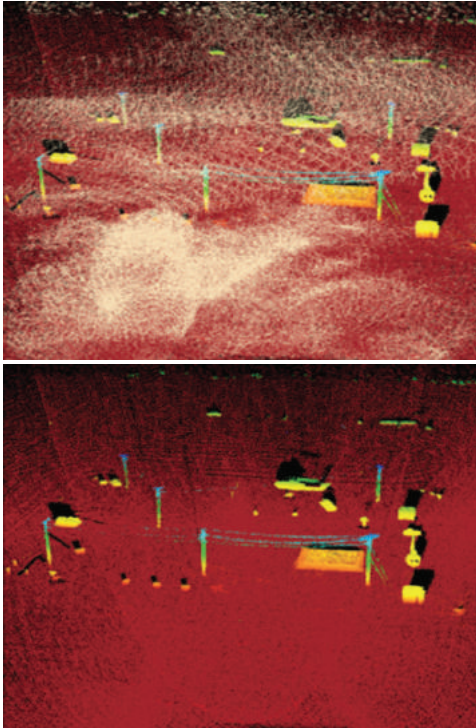
Rotor craft in brown-out conditions (top)
Filtered for dust using 3DRi software (bottom)

3DRi™ Advanced Plug-in Components

A suite of advanced, feature-rich plug-ins used by OEMs and system integrators to develop intelligent real-time applications.

MODEL - Manages 3D data from multiple OPAL scanners in a single coherent database.

ALIGN - Automatically aligns 3D data using object features in multiple fields-of-view in real-time.

OBJECTS - Segments and classifies above-ground objects as stationary or moving, or by size.

DETECT - Automatically detects changes in the 3D data in real-time.

IDENTIFY - Recognizes objects using a database of known objects to provide ID, type, and confidence factor.

TRACK - Tracks objects in real-time and outputs object ID, 6DOF position, speed and heading.

Easy integration with OPAL™ LiDAR

Neptec Technologies can assist in the development of applications and solutions using the 3DRi framework and algorithms.

For more information please contact **NTCSales@neptec.com** or visit our website.

NEPTEC
Technologies Corp
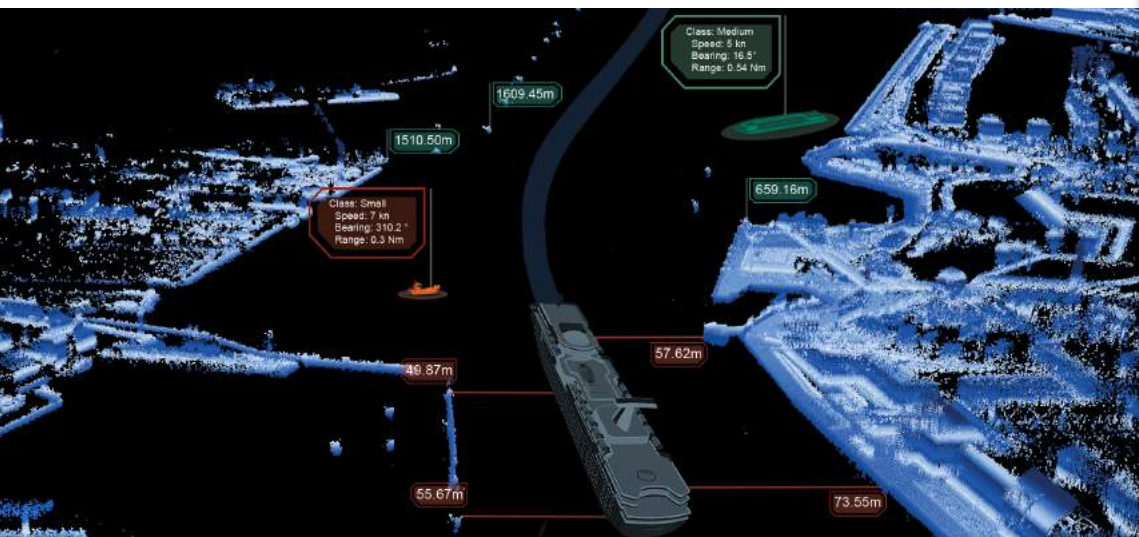
www.neptectechnologies.com

OPAL

LONG RANGE 3D LIDAR FOR MARINE PERCEPTION

A long-range 3D laser scanner providing precise real-time positioning of vessels, infrastructure, coastline, and other hazards. The OPAL™ LiDAR delivers unparalleled resolution and accuracy for autonomous vessel navigation, on-board automation, and enhanced perception for maritime and port operations.

CAPABILITIES

- **Precision Navigation**
- **Collision Avoidance**
- **Maritime Surveillance**
- **Vessel Detection & Tracking**
- **Coastline & Hazard Mapping**
- **Port & Waterway Automation**
- **Real-time 3D Measurements of Environment**
- **Minimal Returns Off Water**
- **Rugged All Weather Operation**
- **Object Classification**
- **Sensor Fusion with RADAR & Cameras**
- **Non-Metallic Object Detection**
- **Ice & Iceberg Detection**

Class: Medium
Speed: 5 kn
Bearing: 16.5°
Range: 0.54 Nm

1609.45m

1510.50m

659.16m

Class: Small
Speed: 7 kn
Bearing: 310.2°
Range: 0.3 Nm

57.62m

49.87m

55.67m

73.55m

NEPTEC
Technologies Corp

www.neptectechnologies.com

PROVEN MARINE EXPERIENCE

Capable of operating in extreme climates under adverse weather conditions, OPAL™ LiDAR is deployed globally on a wide variety of ship classes. Designed to function continuously with minimal maintenance and service requirements, OPAL LiDAR ensures high operational readiness and system uptime. OPAL LiDAR is currently being used in projects at the forefront of autonomous ship development.

AUTONOMOUS & UNMANNED NAVIGATION

OPAL LiDAR provides precise situational awareness to autonomous ships. It can enhance collision avoidance systems by detecting and tracking small objects that are often difficult to detect with other sensors. LiDAR's ability to discern individual ships when clustered together allows for efficient and reliable path planning. OPAL LiDAR can accurately distinguish nearby ships' size, speed, and direction. The 3D data streamed from an OPAL LiDAR allows autonomous ships to safely navigate under bridges, cranes, and other vertical hazards.
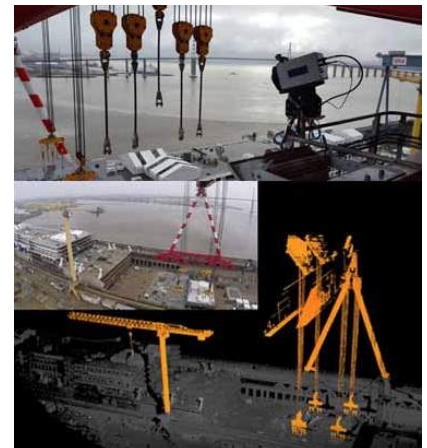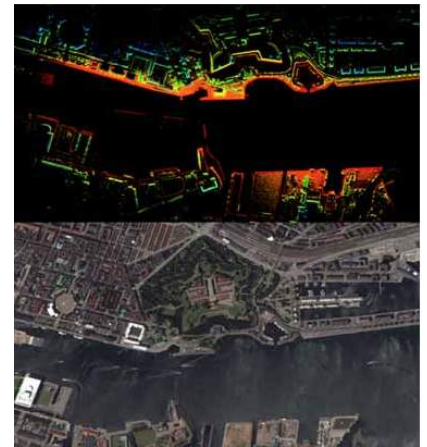

SENSOR FUSION

OPAL LiDAR supports an ideal sensing platform for fusing with existing maritime sensors including AIS, electronic charts, RADAR, infrared and visible spectrum cameras. LiDAR is less susceptible to clutter in comparison to RADAR and delivers higher resolution information crucial to mapping of environments for autonomous operation. In addition, OPAL LiDAR has superior detection performance against IR cameras for objects at ambient / water temperature, such as low docks and other semi submerged hazards.

OPAL LiDAR data is easily integrated with traditional electronic navigation systems such as ECDIS (Electronic Chart Display and Information System) and ECS (Electronic Chart System).

PORT & WATERWAY AUTOMATION

OPAL LiDAR offers a number of key features to improve automation of ports and waterways. This includes ship loading and unloading, cargo handling, and waterway system automation and control (locks, bridges, gates, and arrestors). OPAL LiDAR can also assist in surveillance and monitoring of valuable assets and infrastructures against incursions, collisions or theft.

OPAL

Obscurant penetrating LiDAR for harsh environments

The new OPAL™ Performance Series 3D LiDAR

Introducing the completely redesigned OPAL™ 3D LiDAR scanner from Neptec Technologies.

The OPAL™ is one of the most powerful and versatile 3D LiDAR sensors, and features optimized perception capabilities for detecting small targets at range. OPAL™ scanners are fully compatible with the 3DRi™ Software Development Kit (SDK), a library of proprietary algorithms for developing applications for Object Detection, Tracking, and Classification.

OPAL™ incorporates the latest innovations in laser optics and intelligent 3D processing to deliver an unprecedented combination of range, data density, and acquisition speed in a rugged, all-weather package.

Designed for real-world, mission-critical autonomy applications

INNOVATIVE
Advanced laser optics and 3D processing in a size, weight and power optimized package

OBSCURANT PENETRATING
Unparalleled performance in dust, smoke, rain and fog

HIGH RESOLUTION
300,000 points per second (single return mode)

CONSISTENT
Reliable low-reflectivity target detection in real-world scenarios

LONG RANGE
Superior range performance up to 1,000 m

CONNECTIVITY
Integrated GigE switch and port for GPS/INS

USER FRIENDLY
Intuitive 3DRi™ software tools for rapid application development

RUGGED
-40°C to +55°C operating temperature, resistant to shock and vibration, with a sapphire glass window and certified to IP67

nepTec Technologies Corp

SECURITY   MARINE   AEROSPACE   TRANSPORT   OIL & GAS   CONSTRUCTION   MINING

www.neptectechnologies.com

Sensor		
Technology Type[1]	Time of Flight (TOF) 3D Laser Scanner with OPAL™ Obscurant-Penetrating LiDAR Technology	
Scanning Mechanism	Risley Prisms	
Range[2]	Up to 500 m	Up to 1000 m
Multi-return	Up to 7 returns	
Accuracy[3,4]	<2.5 cm (typical)	
Precision[5]	<2.0 cm (typical)	
Field of View[6]	Conical 45°, 60°, 90°, and 120°	
Scan Pattern	Rosette type, non-overlapping	
Laser		
Product Classification	Class 1 - Eye safe	
Wavelength	1550 nm	
Output		
Pulse Repetition Frequency	25 kHz, 50 kHz, 100 kHz, 200 kHz, 300 kHz	
Data Stream Format	IPv4 Multi-cast UDP packets	
Data Format	Time-stamped position (x,y,z) plus intensity	
Interfaces		
Ethernet (Integrated GigE switch with PoE)	4	
PPS (Time Synchronization)	1	
Physical		
Dimensions	17.8 x 17.8 x 33.8 cm (7.0 x 7.0 x 13.3 inches)	
Weight (without cables)	11.8 kg (26.0 lbs)	
Operating Voltage	18–36 VDC	
Power Consumption[7]	110 W (typical), 220 W maximum	
Ingress Protection Rating	Certified to IP66/IP67	
Operating temperature[8]	-40ºC to +55ºC	
Storage temperature	-40ºC to +85ºC	
Shock	Designed to 5 G's	
Vibration	Designed to 20 Hz - 2 kHz, 0.04 g² / Hz	
Regulatory Compliance	CE $\boxed{N}$ 61010-1	

[1] Performance in obscurants is dependent on obscurant type and density, laser pulse energy, and target characteristics. Please contact NTCSupport@neptec.com to discuss your specific requirements.

[2] Achievable maximum range is dependent on target size, reflectivity, angle of incidence, and PRF, measured at the centre of the FOV in clear atmospheric conditions.

[3] Accuracy is the degree of conformity of a measured quantity compared to its actual (true) value.

[4] Some distortion effects at the edge of the FOV may impact accuracy as follows: <2.5 cm within 100º, <3.5 cm between 100º FOV and 120º FOV. One sigma at 12 m range as measured under Neptec test conditions.

[5] Precision, or repeatability, is the degree to which further measurements provide the same result. One sigma at 12 m range as measured under Neptec test conditions.

[6] OPAL Conical LiDARs exhibit a small (1° circular) area of distortion at 8° from the centre of the FOV. Data within this area may be excluded via a software feature.
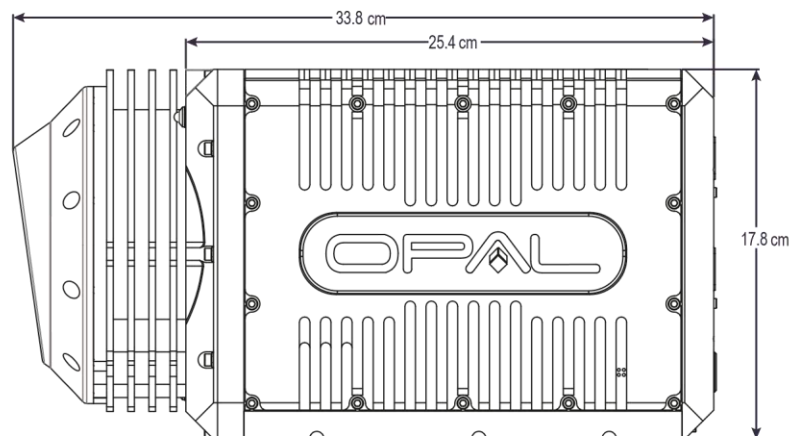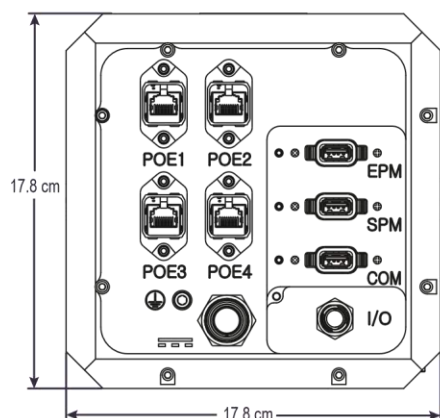
[7] Typical power consumption considers the OPAL LiDAR operating at typical processing demands, with no external peripherals connected to available PoE ports. Power available for peripherals connected to the PoE ports is 100 W total.

[8] Assumes adequate convection airflow over the unit. For applications in environments exceeding +40°C, please contact NTCSupport@neptec.com to discuss mounting options.

* Specifications are subject to change without notice.

Easy to integrate with IP connectivity

For more information please contact opal_sales@lumibird.com or visit our website.

neptec
Technologies Corp

www.neptectechnologies.com

OPAL

Obscurant penetrating LiDAR for harsh environments

The new OPAL™ Performance Series 3D LiDAR

Introducing the completely redesigned OPAL™ 3D LiDAR scanner from Neptec Technologies.

The OPAL™ is one of the most powerful and versatile 3D LiDAR sensors, and features optimized perception capabilities for detecting small targets at range. OPAL™ scanners are fully compatible with the 3DRi™ Software Development Kit (SDK), a library of proprietary algorithms for developing applications for Object Detection, Tracking, and Classification.

OPAL™ incorporates the latest innovations in laser optics and intelligent 3D processing to deliver an unprecedented combination of range, data density, and acquisition speed in a rugged, all-weather package.

Designed for real-world, mission-critical autonomy applications

HIGH RESOLUTION
300,000 points per second (single return mode)

RUGGED
-40°C to +55°C operating temperature, resistant to shock and vibration, in an IP67-certified enclosure

CONSISTENT
Reliable low-reflectivity target detection in real-world scenarios

OBSCURANT PENETRATING
Unparalleled performance in dust, smoke, rain and fog

LONG RANGE
Superior range performance up to 1,000 m

CONNECTIVITY
Integrated GigE switch and port for GPS/INS

USER FRIENDLY
Intuitive 3DRi™ software tools for rapid application development

INNOVATIVE
Advanced laser optics and 3D processing in a size, weight and power optimized package

Neptec
Technologies Corp

MARINE   AEROSPACE   MINING   CONSTRUCTION   TRANSPORT   OIL & GAS   SECURITY

www.neptectechnologies.com

OPAL

Performance Series with Panoramic Field of View

	OPAL-P500	OPAL-P1000
Sensor		
Technology Type[1]	Time of Flight (TOF) 3D Laser Scanner with OPAL™ Obscurant-Penetrating LiDAR Technology	
Scanning Mechanism	Risley Prisms	
Range[2]	Up to 500 m	Up to 1000 m
Multi-return	Up to 7 returns	
Accuracy[3,4]	<3.5 cm (typical)	
Precision[5]	<2.0 cm (typical)	
Field of View	Panoramic 360° horizontal FOV, 45° (+5°/-40°) vertical FOV	
Scan Pattern	Non-overlapping	
Laser		
Product Classification	Class 1 - Eye safe	
Wavelength	1550 nm	
Output		
Pulse Repetition Frequency	25 kHz, 50 kHz, 100 kHz, 200 kHz, 300 kHz	
Data Stream Format	IPv4 Multi-cast UDP packets	
Data Format	Time-stamped position (x,y,z) plus intensity	
Interfaces		
Ethernet (Integrated GigE switch with PoE)	4	
PPS (Time Synchronization)	1	
Physical		
Dimensions	17.8 x 17.8 x 45.6 cm (7.0 x 7.0 x 18.0 inches)	
Weight (without cables)	13.2 kg (29.1 lbs)	
Operating Voltage	18–36 VDC	
Power Consumption[6]	110 W (typical), 220 W maximum	
Ingress Protection Rating	Certified to IP66/IP67	
Operating temperature[7]	-40ºC to +55ºC	
Storage temperature	-40ºC to +85ºC	
Shock	Designed to 5 G's	
Vibration	Designed to 20 Hz - 2 kHz, 0.04 g² / Hz	
Regulatory Compliance	CE cN (61010-1) US	

[1] Performance in obscurants is dependent on obscurant type and density, laser pulse energy, and target characteristics. Please contact NTCSupport@neptec.com to discuss your specific requirements.
[2] Achievable maximum range is dependent on target size, reflectivity, angle of incidence, and PRF, in clear atmospheric conditions.
[3] Accuracy is the degree of conformity of a measured quantity compared to its actual (true) value.
[4] One sigma at 12 m range as measured under Neptec test conditions.
[5] Precision, or repeatability, is the degree to which further measurements provide the same result. One sigma at 12 m range as measured under Neptec test conditions.
[6] Typical power consumption considers the OPAL scanner operating at typical processing demands, with no external peripherals connected to available PoE ports. Power available for peripherals connected to the PoE ports is 100 W total.
[7] Assumes adequate convection airflow over the unit. For applications in environments exceeding +40ºC, please contact NTCSupport@neptec.com to discuss mounting options.

* Specifications are subject to change without notice.

Easy to integrate with IP connectivity

For more information please contact
opal_sales@lumibird.com or visit our website.

nepTec
Technologies Corp