Seismic surveys using autonomous Ocean Bottom Nodes (OBNs) are becoming an increasingly popular technique to acquire reservoir imaging data. Sonardyne's acoustic navigation and data telemetry technology can be used to support all stages of these operations. When deploying and recovering nodes, their position can be accurately determined using Ranger 2. During data collection, Sonardyne's wireless, high-speed acoustic communications technology uploads status data to the surface enabling operators to check that each node is functioning correctly.

Node Positioning and QC Data Telemetry

Installed on the surface vessel, the Ranger 2 USBL (Ultra-Short BaseLine) positioning system tracks the position of the ROV deploying each node and also the node basket from where the nodes are withdrawn. As the ROV places each node on the seabed, a highly accurate position fix for the ROV and therefore the node, is recorded.

Ranger 2 builds on the simplicity and reliability of Sonardyne's popular Ranger 1 system but adds support for the latest sixth generation (6G®) acoustic instruments and Wideband 2 signal architecture. 6G® systems offer higher precision acoustic ranging, faster data telemetry and hardware that is easier to set-up and operate even in the most challenging subsea operating environments.

Transfer of node quality control (QC) information is performed using a low-power Acoustic Telemetry Module (ATM) attached to each node. These ATMs communicate with a local Subsea Data Collection Node (SDCN) anchored several metres above the seabed. Multiple SDCNs form an acoustic network that autonomously hops the QC data through multiple SDCNs and uploads it to a waiting surface vessel located anywhere within the survey area. Once received, the status monitoring software shows each node's operating status. A 'traffic light' display allows operators to check the status of the entire node network and identify problems at a glance.

Features at a glance

- Provides both position and autonomous QC data upload
- Simple-to-use Sonardyne 6G® technology
- 0.1% system accuracy when optimised
- Up to 1Hz positioning update rate regardless of water depth
- Transmission of QC data to a surface vessel anywhere within the survey area
- 'Traffic light' software allows for quick check of node function status
- Acoustic node modules depth rated to 3,000 metres
- 60 days battery life

System Overview

Ranger 2

Ranger 2 allows for multiple subsea targets to be tracked simultaneously from a surface vessel. To allow pre-plotted lines to be run and the active transponder list to be automatically updated without operator intervention, Ranger 2 is interfaced to a dedicated survey management application called HydroPos USBL.

Fitted in the vessel instrument room, the Ranger 2 and HydroPos software runs on a Navigation Computer connected to a Navigation Sensor Hub (NSH). The NSH provides the interface between the computer and the subsea transponders via the vessel-mounted HPT transceiver.

The software is easy and intuitive to use, requiring only basic operator training to become familiar with it. Ranger 2 includes an extensive array of tools to allow the user to assess the performance of the system, including real-time acoustic quality indicators, noise analysis and signal travel time displays.

Acoustic positioning operations can be monitored over a vessel network using either HydroPos or Viewpoint which offers the added the functionality of supporting .dwg format backgrounds and geodesy.

Transceiver

HPT is a high performance, vessel-mounted acoustic transceiver that enables the targets being tracked with Ranger 2 to be precisely positioned. The HPT transceiver is also used as a modem with Sonardyne's Acoustic Telemetry Module (ATM) and Subsea Data Collection Nodes (SDCN) thereby allowing the transfer of short QC data messages between each seismic node and the vessel.

The deployment method of the HPT transceiver is critical to Ranger 2's positioning and modem performance. It should ideally be rigidly mounted to the vessel well below the keel away from any weather or vessel induced aeration. Sonardyne's hydraulic through-hull deployment systems are extremely rigid and ideal for permanent vessel installation, whether new-build or retro-fit. For short-term projects on vessels-of-opportunity, a high quality over-the-side deployment system is available that is practical to transport and install on a vessel whilst it is alongside.

ROV and Basket Transponder

Ranger 2 is compatible with a wide range of Sonardyne 6G and previous generation subsea transponders. For ROV operations the small, lightweight Wideband Mini Transponder (WMT) is recommended. It is depth rated up to 3,000 metres and can operate as either a transponder or as a responder which offers faster position updates.

HydroPos Software

Survey data can be imported into HydroPos from client supplied OGP P1 pre-plot files, CSV files or entered by the user directly. Final survey coordinates for the deployed and as-pinged nodes can be similarly exported in OGP P1 or CSV format. The raw survey data can also be exported as a OGP P2 file as well as a variety of other proprietary formats supported by many of the independent QC packages.

HydroPos is configured around a graphical screen, providing the user with a clear visual display of the data acquisition process, whilst all raw and processed data is stored in a single log file to allow for easy archiving of the data.

Subsea Inertial Navigation

The addition of Sonardyne's SPRINT technology allows full integration of Sonardyne's 6G acoustics with a dedicated subsea inertial navigation sensor. SPRINT allows for the final position of the node to be fixed quicker than solely acoustics, thereby operational time on each node deployment.

ROV and Node Tracking

The system calculates the position of a subsea target by measuring the range and bearing from a surface transceiver to a transponder fitted on the target.

Software

Ranger 2's software interface is intuitive and easy to learn, ensuring users quickly gain confidence.
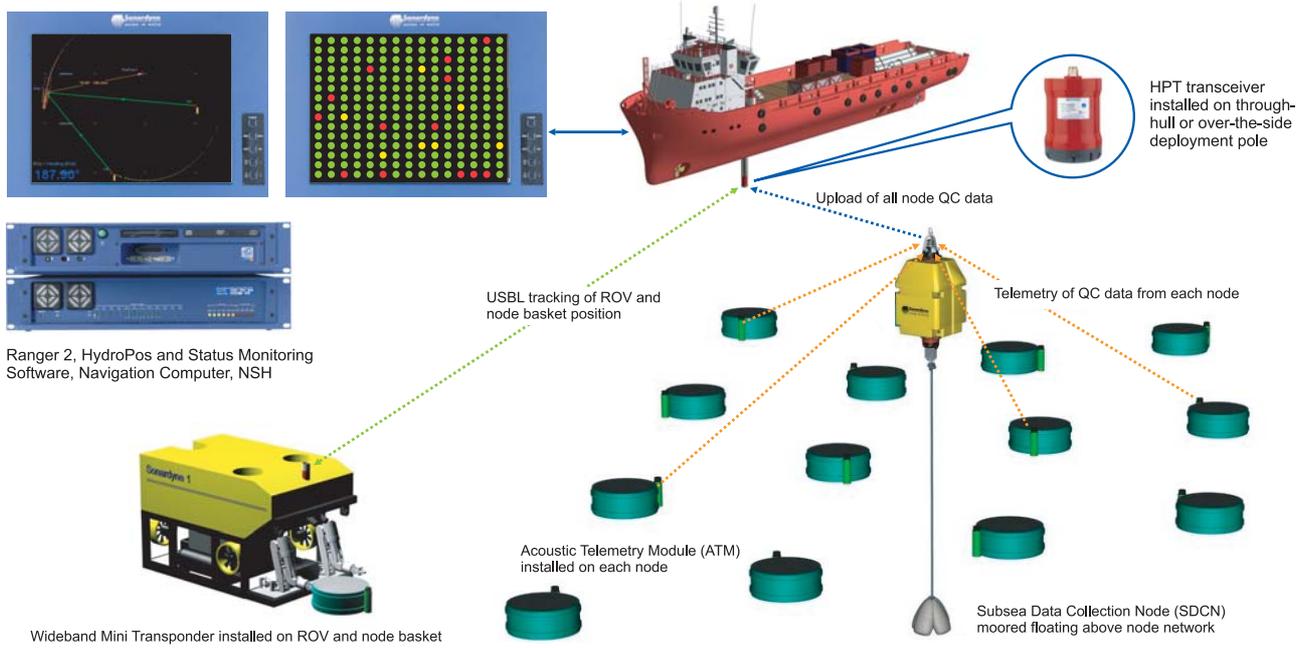

HPT Transceiver and Modem

A number of different array designs are available including a tilted array to allow the tracking of long layback targets at shallow angles.

HydroPos USBL

HydroPos is a dedicated survey management tool.

HPT transceiver installed on through-hull or over-the-side deployment pole

Upload of all node QC data

Telemetry of QC data from each node

USBL tracking of ROV and node basket position

Ranger 2, HydroPos and Status Monitoring Software, Navigation Computer, NSH

Acoustic Telemetry Module (ATM) installed on each node

Subsea Data Collection Node (SDCN) moored floating above node network

Wideband Mini Transponder installed on ROV and node basket

Nodal Acoustic Telemetry

Sonardyne's nodal acoustic telemetry technology allows for the transfer of a short QC status record from each 4C seismic node back to a master vessel, regardless of the position of the master vessel within the survey area.

The data uploaded contains information such as the recording status of the node, along with parameters such as remaining data capacity and battery capacity. This data can be tailored to clients' requirements but will always contain a unique node identifier.

The node status record is transmitted via a small unit attached to the side of the node. The Acoustic Telemetry Module (ATM) has been designed to have minimal impact on the handling of the node, both onboard the vessel and subsea. The unit is depth rated of 3,000 metres, allowing for use with all known current nodal operations.

The node status record is received in the water column by a network of Subsea Data Collection Nodes (SDCN) deployed across the nodal network. Anchored to the seabed on long strops and supported by subsea floatation devices, the SDCNs are typically deployed by ROV to ensure complete acoustic coverage of a specific section of the seabed network. This also ensures a SDCN is not inadvertently placed directly on top of a node.

The SDCN uses Sonardyne's Wideband 2 signal technology to then transmit the status data packet from each node across the seabed network, acoustically 'hopping' from SDCN to SDCN until it is received by the SDCN that is closest to the surface vessel. Data is then uploaded to the vessel-mounted HPT installed on the survey vessel for analysis.

Once the survey is complete, the precision offered by Ranger 2 ensures that the ROV can navigate directly to each node to recover it. This ensures no nodes are left behind on the seabed. The SDCNs can be efficiently recovered by acoustically commanding them to release their anchor weights so that they float up to the surface.
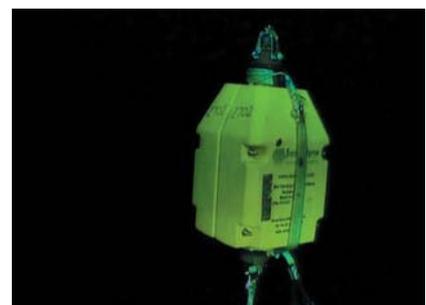

WMT and ATM
WMTs are used to track an ROV and node basket. ATMs collect QC data from each node.

Subsea Data Collection Node
An array of SDCNs receive QC data from each node, transmitting it on the survey vessel.

Performance Summary

Operating Range		>6,000 metres
Operating Depth		3,000 metres
System Accuracy	Typical	0.2% of Slant Range
	Optimised	0.1% of Slant Range
		Depending on the installation quality, system accuracy can vary greatly. Where every effort is made to ensure the rigidity of the deployment pole, an appropriate transceiver has been selected and the vessel's AHRS is high quality, standard Sonardyne USBL systems have been proven to achieve 0.1% of slant range error. In 1,000 metres, this is equal to 1 metre.
Number of Targets Tracked		1 surface, unlimited subsea
Position Update Rate		1 second, independent of water depth
Output Telegrams		Supports all industry standard survey and DP telegrams, including OGP P1 and P2 formats when using HydroPos USBL software.
Date Rate		Up to 10K baud
Maximum Number of Nodes		Unlimited

Equipment List   Key: ● = Required ○ = Optional

● Software Ranger 2 (Std or Pro)

● Software HydroPos USBL

● Software Status Monitoring

● Type 8026 Navigation Computer

● Type 8098 Navigation Sensor Hub

● Type 8142 HPT USBL Transceiver

● Type 7950 Deployment Machine

○ Type 8097 Over-The-Side Deployment Pole

● Type 8190 Wideband Mini Transponder`

● Type 8177 Acoustic Telemetry Module

● Type 8000 Subsea Data Collection Node

○ System SPRINT

Other Acoustic Positioning Systems from Sonardyne

● SIPS 2

● TZ / OBC

● Scout USBL

● DP-INS

Key Technology

6G®
Sonardyne's new sixth generation (6G®) technology platform provides robust performance, ease of use, greater functionality, equipment flexibility and compatibility with aided inertial technologies. Its features reduce operational risk, deliver more efficient operations and lower the cost of ownership.

Wideband 2®
Sonardyne Wideband® 2 is an ultra-wide bandwidth signal architecture exclusively developed for 6G® hardware. Delivering seamless acoustic navigation and telemetry of subsea data, the technology offers a host of benefits; fast and robust transmission of data, precise ranging, wide area coverage, mitigation from multipath signals and greater immunity to noise from vessels and other acoustic systems.

Multiple Target Numbers
Sonardyne Ranger 2 Pro systems can track an unlimited number of targets simultaneously. With the 'ping stacking' software feature enabled, one second position updates can be achieved independent of water depth.

High-Speed
Data acquisition time is dramatically shorter for both calibration and measurement phase. Ranges, diagnostics and sensors data is acquired simultaneously to multiple instruments in a fraction of the time previously taken.

Battery Life
Do more for longer. 6G® products are designed using the latest low power electronic architecture saving time and money by not having to recover equipment to recharge or replace transponder battery packs.