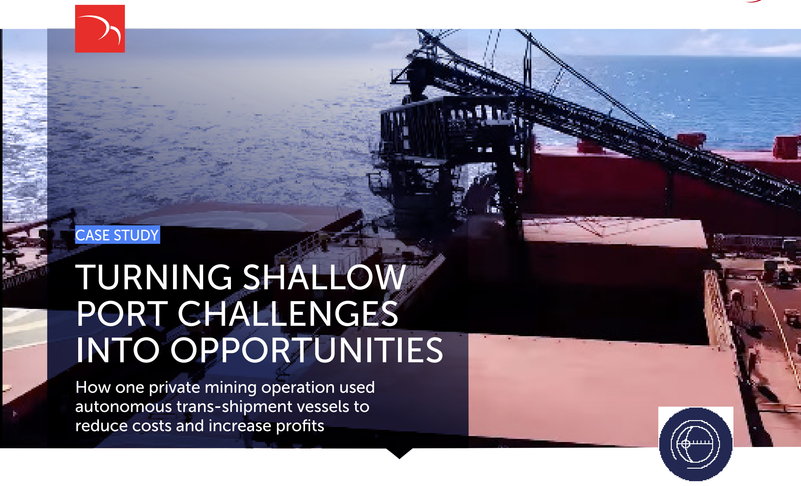

CASE STUDY

TURNING SHALLOW PORT CHALLENGES INTO OPPORTUNITIES

How one private mining operation used autonomous trans-shipment vessels to reduce costs and increase profits

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Iron ore is a fundamental building block of modern industry yet extracting and transporting this essential material is no easy feat. A leading mining company in Western Australia aimed to revolutionize this process by building a fully autonomous iron ore extraction and processing facility. However, the mining company faced a common hurdle, the only port they could use to transport their goods to market was too shallow to accommodate the large deep-water vessels required.

Shallow ports are a global challenge and are usually dealt with in one of two ways. The first, and by far the most expensive and time-consuming option is 'dredging' or digging up the port to increase its depth. In addition to the initial considerable costs, dredging also requires continuous depth management to prevent future sediment accumulation and re-silting.

The second option is trans-shipment. This solution involves carefully coordinated teams of trans-shipment Vessels (TSVs) taxiing cargo from a shallow port to a deep-water vessel moored safely several kilometers offshore. The TSVs or "tug and barge" teams all work in a delicate dance of synchronicity. While one TSV team loads cargo at the port, another offloads at the deep-water vessel. While one TSV begins its 40km journey out to the moored vessel, another is heading back to port.

All of this occurs continuously, round-the-clock, 24/7. Managing all these moving pieces is by no means simple. However, the biggest challenge related to trans-shipment is the cost and complexity of maintaining multiple qualified crews to man each of the tug and barge vessels required to make trans-shipment efficient and profitable.

The iron ore mine operator knew exactly how to overcome this challenge. They would extend their business model offshore with an autonomous loading and offloading TSV solutions. The only obstacle they faced was locating a wireless connectivity partner with a stabilized maritime solution capable of high-capacity low-latency connectivity for autonomous trans-shipment operations.

THE CHALLENGES

Transport Limitations Caused by Shallow Water Port | Need for Stabilized High-Capacity Wireless Network | Full Redundancy Required for Autonomous TSV Loading/Unloading Operation

The mining company set out to establish a new benchmark for modern mining operations by transitioning from traditional methods to fully autonomous mining operations on the remote coast of Western Australia. This transition aimed to address common problems faced by the mining industry, such as labor shortages, high operational costs, safety risks, and the need for 24/7 round-the-clock operations. For this transition, the biggest challenge they faced was setting up a reliable, high-capacity wireless communication network. The network needed to provide connectivity between the onshore processing facility located near the port where the iron ore would be autonomously loaded onto the trans-shipment Vessels (TSVs) and the large cape-size vessel located 40km offshore in deep-water, where the TSV would then autonomously unload its iron ore cargo.

KEY CHALLENGES

- **Reliable Wireless Offshore Communication:** A stable network across a 40km ocean route was required with built-in redundancies for uninterrupted 24/7 operations.
- **High Availability and Low-Latency:** Autonomous vessel operation requires >99.99% network availability and less than 50ms latency for real-time data transmission.
- **Flexible Interoperability of TSVs:** To ensure optimal efficiency and continuous operation, all barges need to be able to quickly connect and communicate with any tug vessel.
- **Stabilized Connectivity for Maritime Conditions:** All antennas located on TSVs would need to be stabilized to counteract the severe motion caused by wind, waves, and harsh maritime weather.

THE SOLUTION

Redundant Wireless Network Connectivity | PointLink Stabilized Offshore Communication | Autonomous Teams of TSVs for 24/7 Operation

Ceragon provided a comprehensive autonomous shallow port solution that meets the network needs of the mining company allowing them to achieve their goal of a faster 'mine-to-market' with shorter cycle times and lower cost-per-ton of trans-shipping. This includes enabling continuous offshore connectivity with Ceragon's stabilized PointLink solution, ensuring the remarkably high level of network availability required for the mission-critical autonomous loading and unloading operation of all TSV teams.

THE SOLUIONS INCLUDES:

- **Redundant Connections:** Each TSV assembly (tugboat and barge) is equipped with Ceragon's PointLink stabilized antenna solution, helping to ensure uninterrupted communication while minimizing the risk of network failure. In addition to providing redundancy, the dual radio configuration increases ongoing operational communication capacity for seamless operations with hitless failover.
- **High Availability and Low-Latency:** Autonomous vessel operation requires >99.99% network availability and less than 50ms latency for real-time data transmission.
- **Low Latency and High Availability:** The LTE network delivers low latency (<50ms) and high availability (>99.99%), essential for real-time data transmission and reliable operations, supporting continuous and efficient 24/7 autonomous loading and offloading.
- **Enhanced Autonomous Operation:** The network supports functionalities such as, video surveillance, environmental monitoring, and geolocation services, making the transition from traditional to modern autonomous mining seamless and effective.

This innovative shallow port solution enables the operation of 10 autonomous vessels (5 tugs and 5 barges) simultaneously for 24/7, round-the-clock transport, significantly reducing OPEX while boosting productivity and overall operational efficiency.