

Wired Ocean Technology Guide



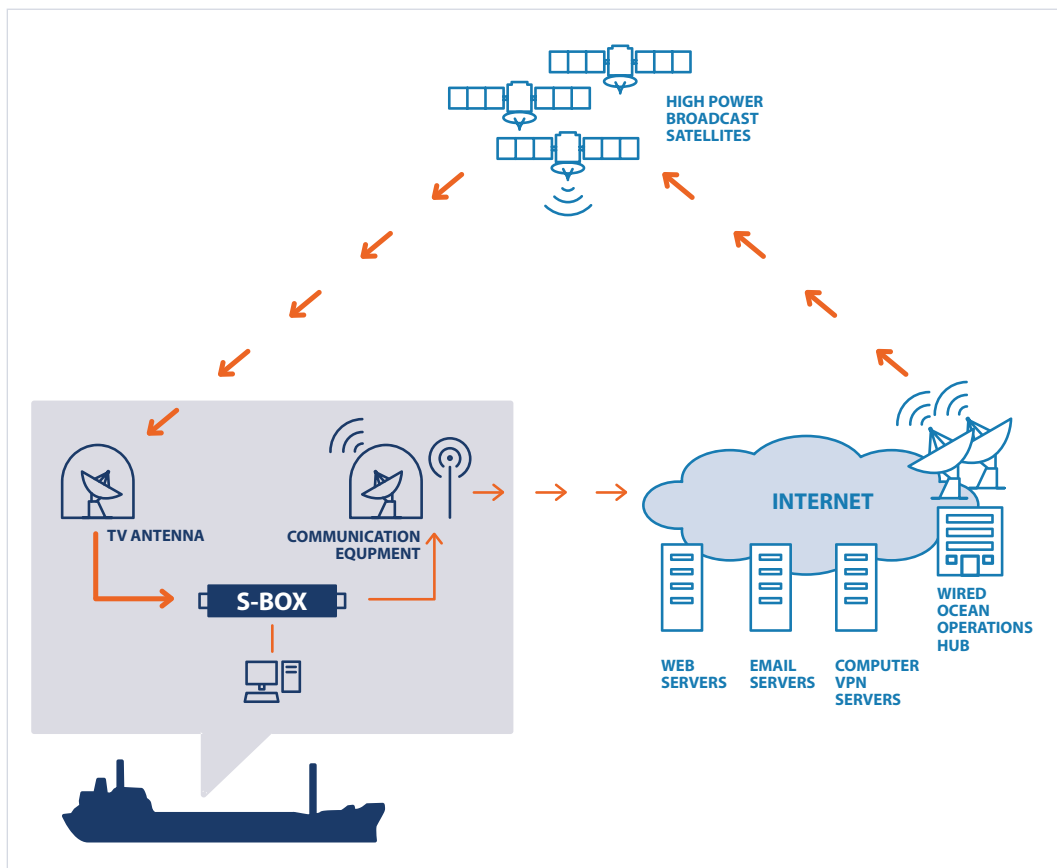
WIRED OCEAN

Making **broadband at sea** affordable

Introduction

Wired Ocean's system comprises five main elements:

1. S-Box
2. Network Operations Hub
3. Uplink Hubs
4. Satellite Capacity
5. Performance Enhancement Systems



S-Box (Satellite Broadband Server)

The S-Box is at the heart of the Wired Ocean system. It performs a number of functions. Primarily, it integrates the satcoms or cellular service with the Wired Ocean shore to ship service to provide seamless broadband internet.

Main functions of the S-Box are to:

- Work in conjunction with Wired Ocean's network operations hub to compress, accelerate and optimise data sent to and from the vessel, and to cache data sent to the vessel
- Manage the connections of the satcoms/cellular terminal to send data from the ship efficiently
- Work in conjunction with Wired Ocean's network operations hub to compress, accelerate and optimise data sent to and from the vessel, and to cache data sent to the vessel
- Receive, via the satellite television antenna, the data requested as a UDP stream, convert it to its original format and deliver it to the requesting computer
- Provide internet sharing for connected computers and manage the connected computers' internet access
- Undertake security functions such as industrial level encryption and firewall protection

Network Operations Hub

Wired Ocean's network operations hub is located at the Brookman's Park teleport north of London. This hub supplying the hosted applications servers and satellite uplink services manages the operations of the Wired Ocean system, hosts performance enhancement functions and performs operations, management and monitoring functions. It has excellent connectivity to London Internet Exchange (LINX) and is the site of the uplink to the Eurobird satellite. The hub systems provide full hardware redundancy with failover at both hubs, real time monitoring and automatic SMS & email alerting on fault identification.

The network operations hub also hosts a remote monitoring and diagnostics capability that tracks the communications performance of each SBS. The quasi-realtime traffic log that this produces is available to dealers and fleet operators via Wired Ocean's intranet to monitor their vessels communications usage.

Uplink Hubs

These hubs use Digital Video Broadcasting (DVB) technology, the most common standard for transmitting MPEG-2 digital TV channels via satellite. The DVB standard includes techniques which allow MPEG-2 data packets to carry IP traffic, enabling both digital TV and Internet traffic to be supported on the same system. The hubs receive the data requested by the vessel, package (encapsulate) it into DVB, then into MPEG-2 packets and MPEG transport streams, and uplink it to the appropriate satellite. A remote hub in Stockholm uplinks to the Hotbird and Thor satellites.

Satellite Capacity

Wired Ocean has capacity on high powered Ku-band broadcast satellites. These satellites are capable of broadcasting hundreds of television channels simultaneously as well as supporting various data services. They receive the requested data and beam it down to the satellite television antenna on the vessel.

Performance Enhancements Systems

Wired Ocean incorporates performance enhancement systems into the SBS and at the network operations hub to reduce unnecessary handshaking and minimize data transfer. Common 'labels' for these are 'acceleration', 'compression' and 'caching'. The specific techniques employed are:

Negative Acknowledgement

Instead of using TCP/IP, which requires that each data packet is acknowledged by the receiver, Wired Ocean encapsulates data in a UDP stream requiring that a response is sent only if a packet is not received. This is proven to increase speed, avoiding the 'TCP slow start' effect that causes most of the performance problems associated with satellite data links. Our 'negative acknowledgement' system also reduces wasteful (and costly) 'chatter' on the uplink.

Lossless Compression

Wired Ocean compresses data in both directions, saving time and money. Some compression systems throw away data while compressing; Wired Ocean doesn't.

Web Prefetching

When a web browser opens a web page, it typically retrieves some parts of the page first, before acknowledging and requesting more of the page. Today's web-pages do not just consist of just a single HTML file. Instead, multiple objects are used, often including large numbers of frames and individual images.

A web browser usually only requests 4 objects (e.g. sub files / images) at a time. Since the round trip delay over satellite links is extremely high, this results in long waiting times before the (typically) 20 objects for a page have been retrieved by the browser. This problem is increased by the structure of today's HTML web pages itself. A main web page often just 'points' to a number of HTML-frames while the content of each of these is defined in a separate file. After retrieving an HTML object, the Web Browser is very likely to learn from its contents that it has to retrieve more sub-objects (like frames, images, scripts) before the web page can be fully displayed for the user.

The Wired Ocean hub scans all HTML requests for referenced sub objects, fetches them and proactively pushes them to the client – often long before the client has received the main object and finally finds out that it is going to need these objects as well.

Web Caching

Up to 40% of the web content requested by users is content they have requested before and is still fresh. This includes static parts of web pages. Wired Ocean saves a local copy, so that next time it is requested, unchanged information is served instantly from the S-Box rather than the internet. This makes the service faster and reduces the volume of billable data.

Domain Name (DNS) Caching

Wired Ocean remembers the web addresses that it has already looked up, so a round trip isn't wasted on a lookup for every request.

A vessel that receives 10 times as much data as it sends can save about \$1,000 on every 100Mbytes of data by using Wired Ocean's shore to ship service.