

UNDERWATER WEB

APPLICATION

The Underwater WEB is a smart underwater communication system suitable for any application where a high number of underwater detecting system/devices must be steadily deployed at sea in a large area, powered and properly connected to a receiving unit/centre on shore.

Therefore the system can be very useful in a number of applications like underwater networks for:

- port protection
- marine traffic monitoring
- seismic monitoring
- mammal survey
- etc

The Underwater WEB, in fact, is capable to interface a very high number of underwater sub-systems (called "host" units: systems/devices/sensors like sonars, hydrophone arrays, acquisition systems, etc) and to connect the output of such units to an on-shore control unit.

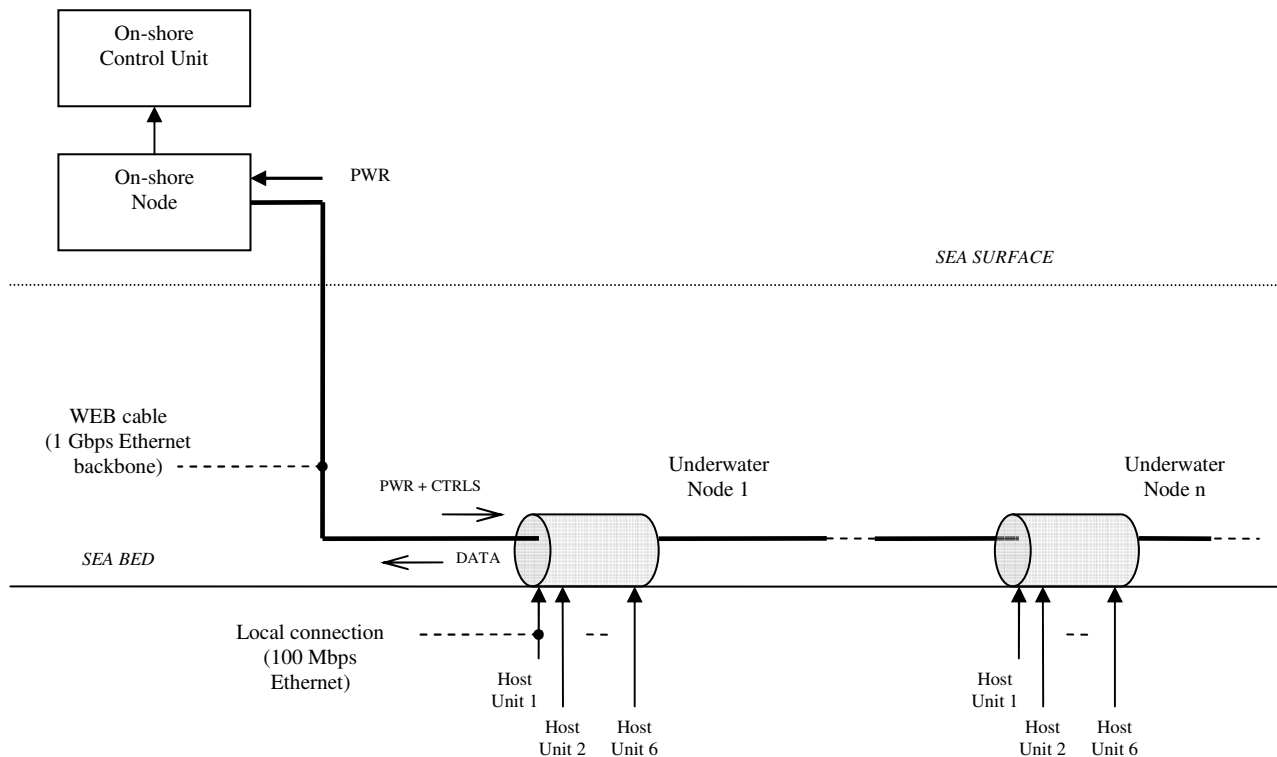
In other words the underwater web allows to use:

- One communication cable only (instead of multiple communication/power supply cables usually necessary to operate each single system/device/sensor of a underwater network)
- One control unit only (instead of multiple control units, one per each sub-system)

ARCHITECTURE

The Underwater WEB is a network based on the functional units listed here:

- Underwater cable (light-weight and easy to deploy)
- Underwater nodes (small and easy to handle)
- On-shore control unit (a COTS PC)



DESIGN

The cable of the WEB has been designed with proper fibre optic conductors (for data communication), copper conductors (for power supply), adequate mechanical properties (1.000 Kg of breaking strength) even though its dimensions have been kept low (diameter lower than 20 mm and minimal bending ray) for easy transportation and deployment at sea.

Underwater nodes, to be used between successive network tracts, are special underwater boxes with proper electronics for host units interface and network backbone continuity.

The nodes have been designed to interface most underwater sub-systems available on the market, they are small in dimensions, easy to be deployed at sea, duly resistant to work in long term underwater conditions.

WEB design allows to:

- Connect each host unit to a node (through 100 Mbps Ethernet lines on copper cable)
- Carry data from all the connected host units (through 1 Gbps Ethernet fibre optic backbone) to the on-shore control unit
- Forward commands from the on-shore control unit to the connected host units
- Use COTS/industrial PC as the on-shore control unit
- Supply power to all the connected host units



WEB cable and connectors



Underwater nodes and metallic structure for quick deployment



Test at sea under NURC (NATO UNDERWATER RESEARCH CENTER) supervision



On-shore control unit

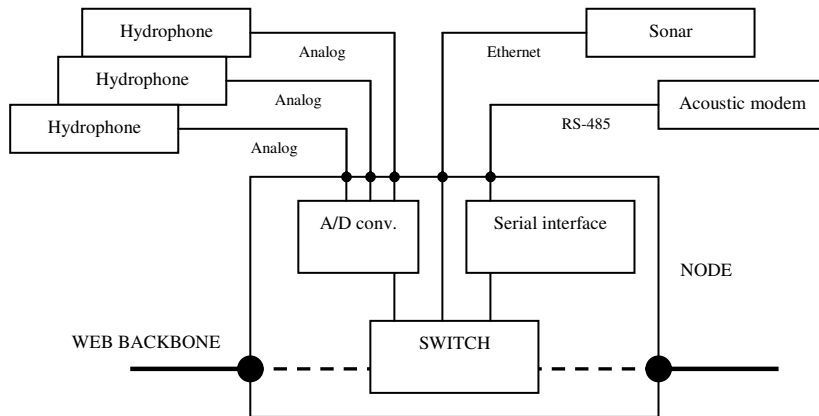
Underwater nodes

Each underwater node is equipped with:

- n° 2 hybrid connectors to connect the Node to the WEB backbone
- From n°1 to 6 connectors to connect standard host units (100 Megabit Ethernet interfaces)

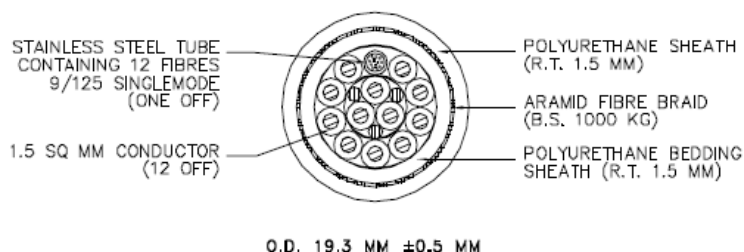
Underwater nodes can include special interfaces for connecting non-standard host units:

- Serial interfaces (RS-422 to Ethernet, RS-232 to Ethernet, etc)
- A/D converters and serial interfaces



SPECIFICATION

WEB specification	
Power supply	220 V
Maximum power transferred to host units	72 kW
WEB maximum length	10 km
Max. distance between nodes	1.2 Km
Operating depth	100 m to 300 m
Backbone communication protocol	1 Gbps Ethernet
Local connection communication protocol	100 Mbps Ethernet
Underwater nodes dimensions and weight	300 mm x 450 mm; 65 Kg
Underwater nodes (typical configuration)	4-6
Underwater nodes standard interfaces	6 (100 Mbps Ethernet type)
Underwater nodes special interfaces	Serial to Ethernet
	A/D converters and Serial to Ethernet
CABLE specification	
Overall diameter	19,3 mm
Polyurethane sheath thickness	1,5 mm
Polyurethane bedding sheath thickness	1,5 mm
ARAMID fibre braid breaking strength	1.000 Kg
Weight in air	468 kg/km
Weight in water	168 kg/km
Static bending ray	174 mm
Dynamic bending ray	251 mm
Max. continuous length	1.200 m
Copper conductors	12
Copper conductor section	1,5 mm ²
Copper conductor resistivity	13,7 Ω/km
Spark test voltage	6 kV
Max. voltage	1.000 V
Isolation resistance between conductors	> 500 MΩ
Maximum current (per each 1.5 mm ² conductor)	12 A
Maximum total current	144 A
Fibre optics conductors	12
Fibre optics type	Single mode 9/125



Additional features available

- Interface with underwater modem units available on the market
- Connection of one or more diagnostic PCs to the WEB
- Special structure for long term nodes deployment
- Redundant network topology for increasing system reliability