Real-time communication

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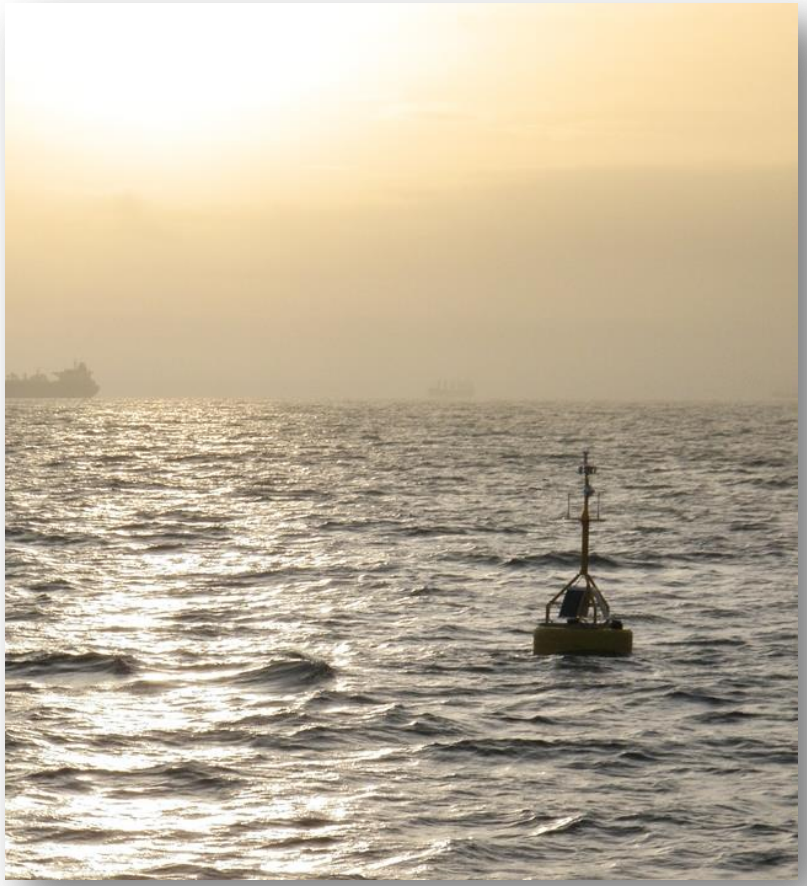
Challenges in Real-time Communication

- Subsea limitations
  - Large amounts of data, low bandwidth
  - Hardware complexity with cabling
- Remote sites
  - Power restrictions
  - Coverage problems
  - Stability of transmission



Subsea Limitations

Getting around the cables

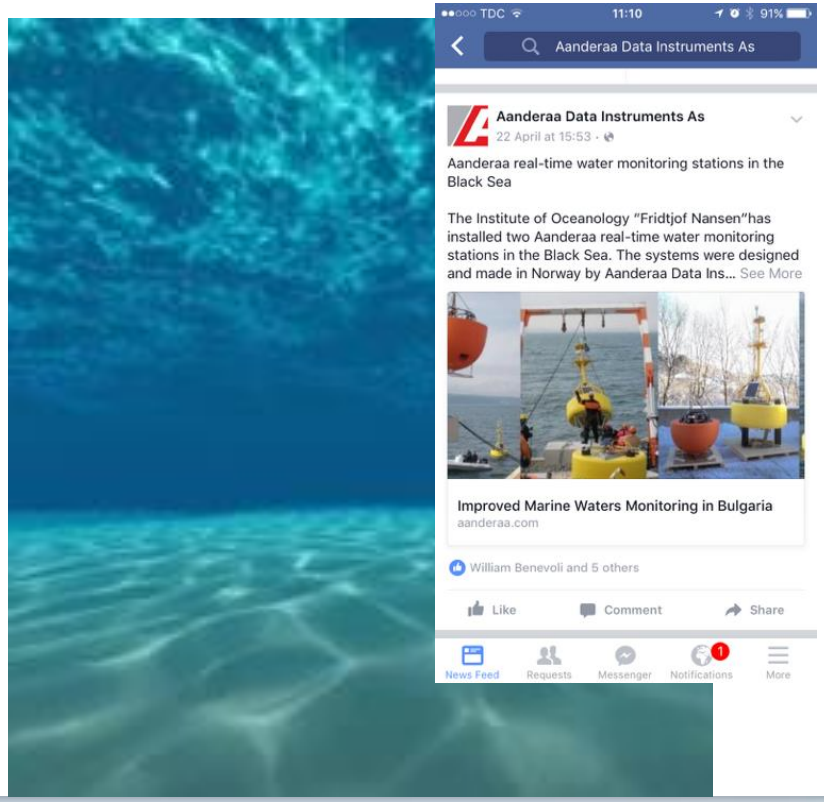
Request from IMAMO project:

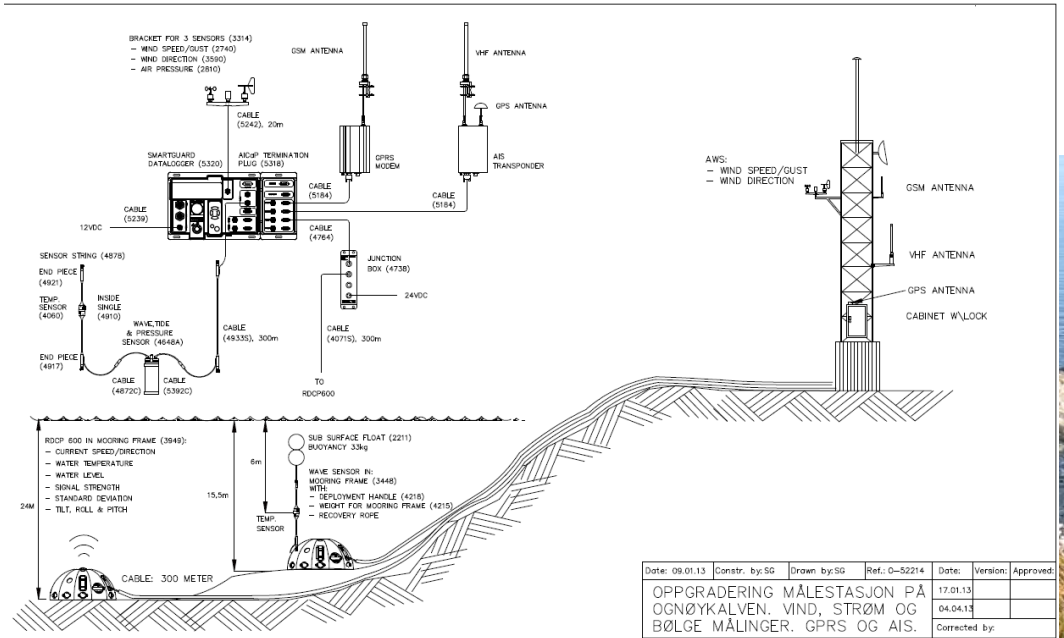
Robust solution collecting water quality and current data from a bottom and surface mounted sensors

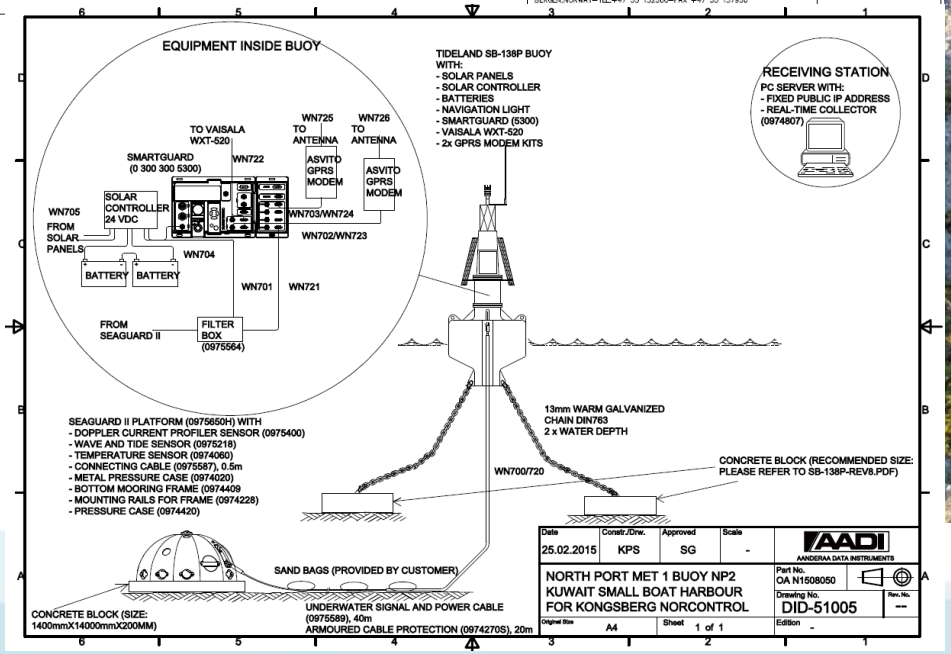
Challenge:

Real-time data from bottom node to surface

Desire for no cabled solution







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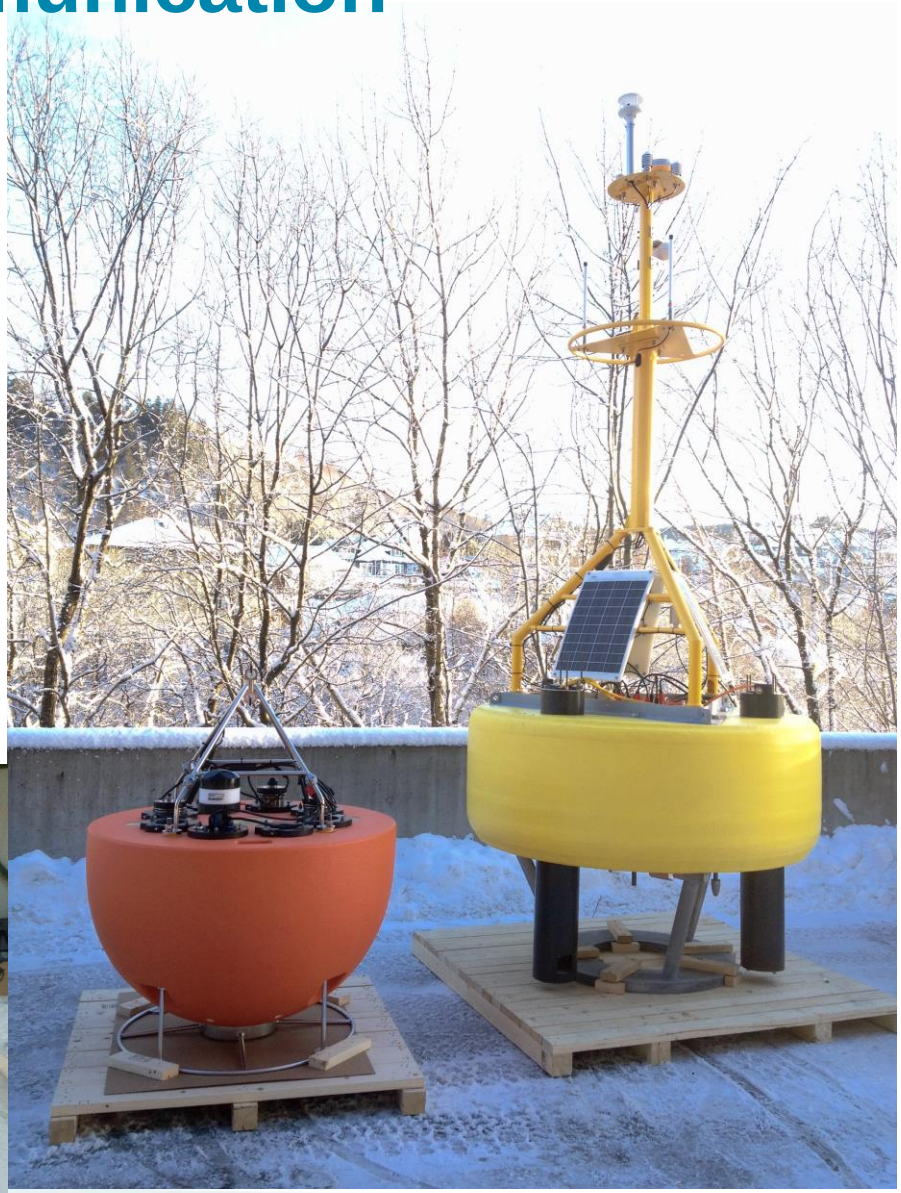
Acoustic Subsea Communication

Solution:

- Acoustic communication link from self contained bottom lander
- Top modem mounted on surface buoy
- SeaGuardII DCP collecting data from all subsea sensors



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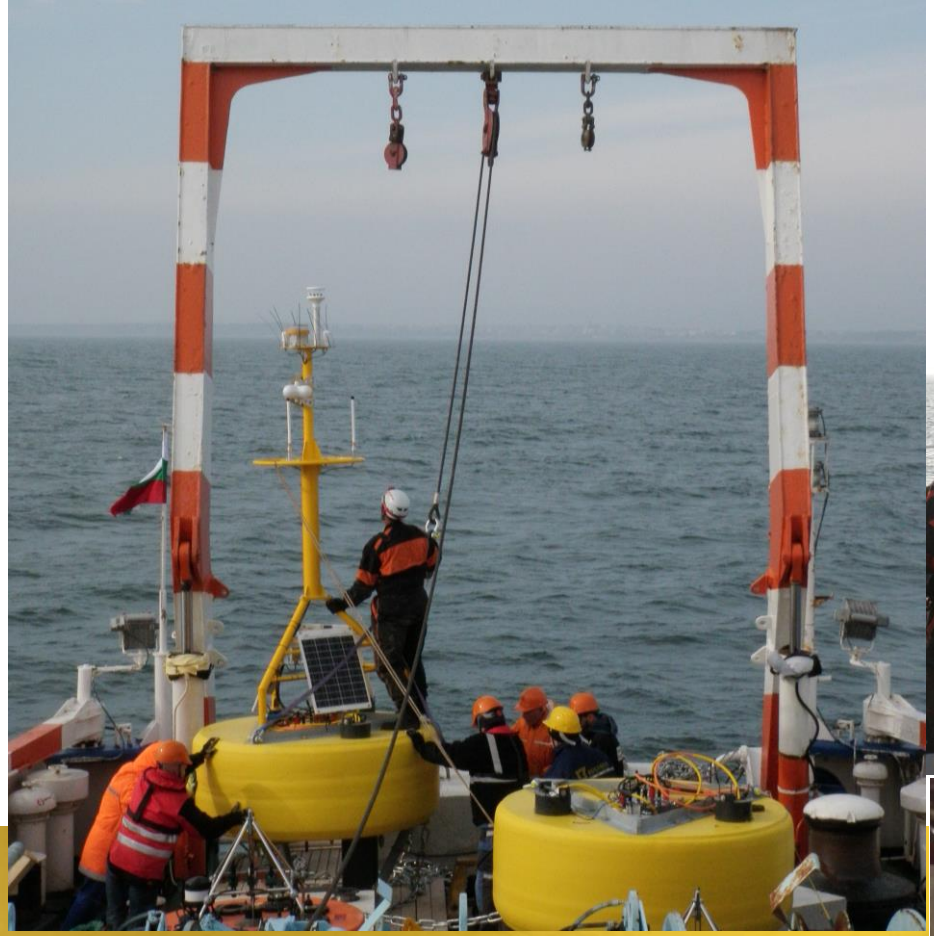

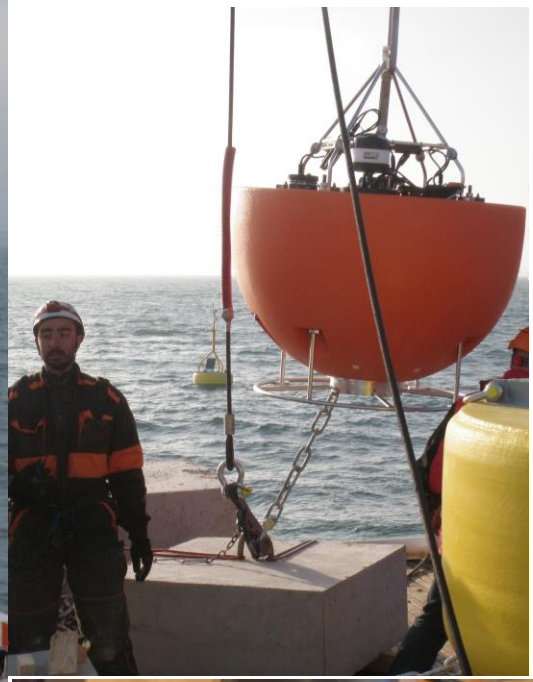

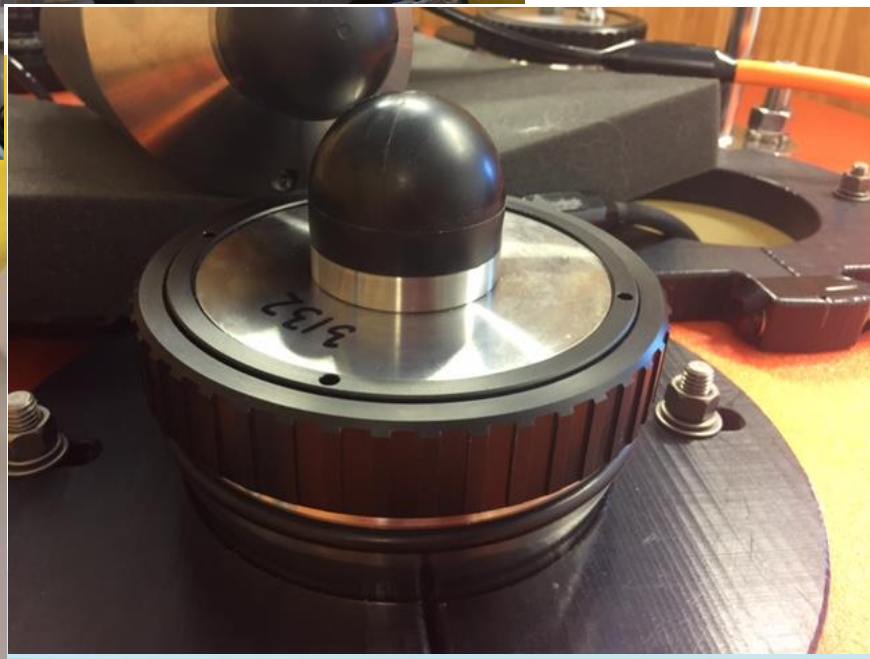
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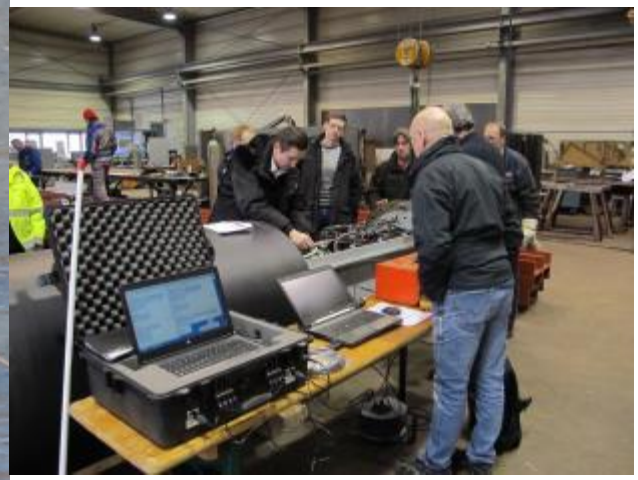
SPAR Buoy with Acoustic Link



- For offshore conditions, a SPAR buoy can be used as a platform for data relay
- In the Aasta Hansteen project, the buoy will receive data from instruments in its own mooring and from a separate mooring close by

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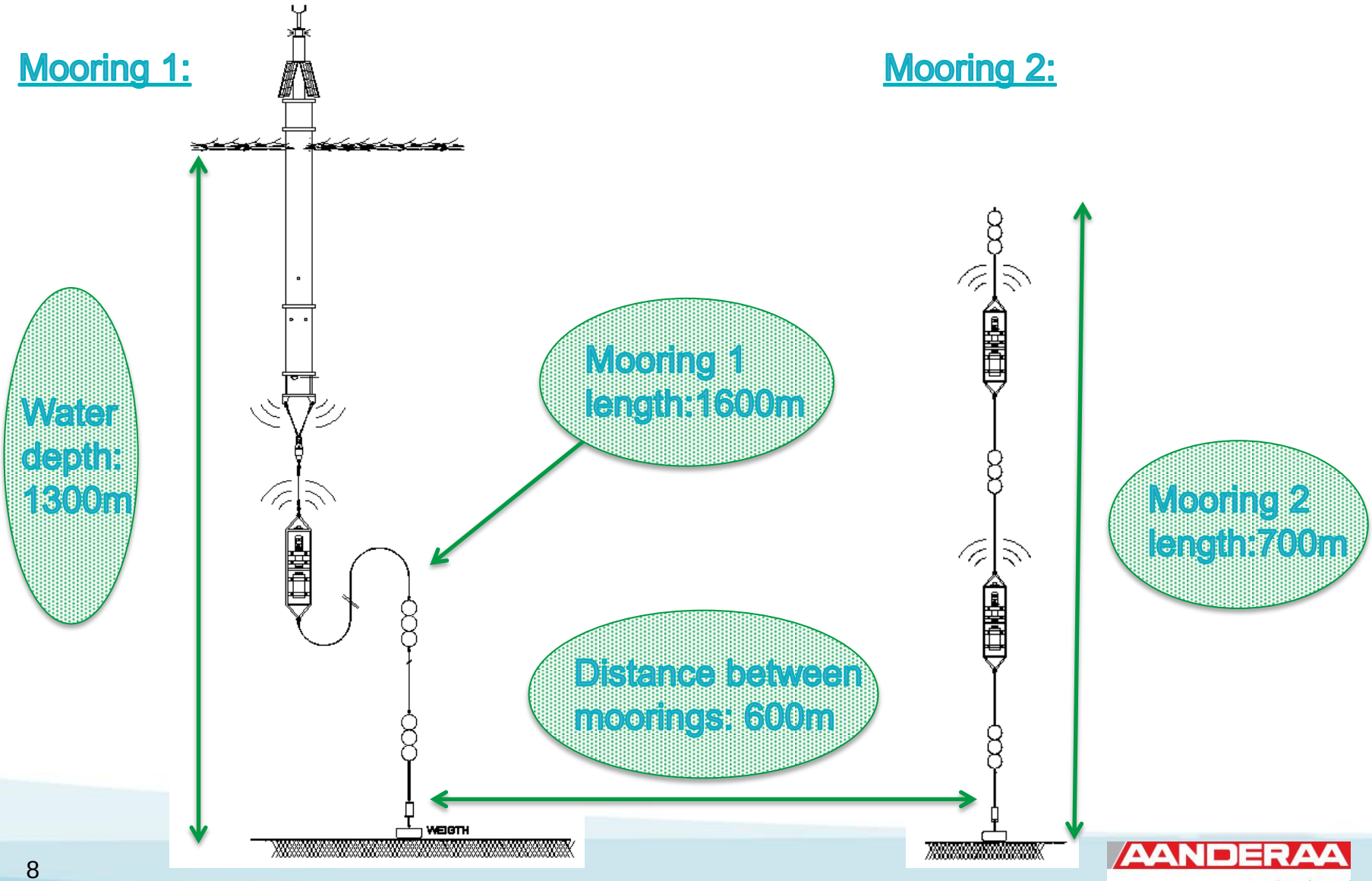
Deep Sea Mooring Design



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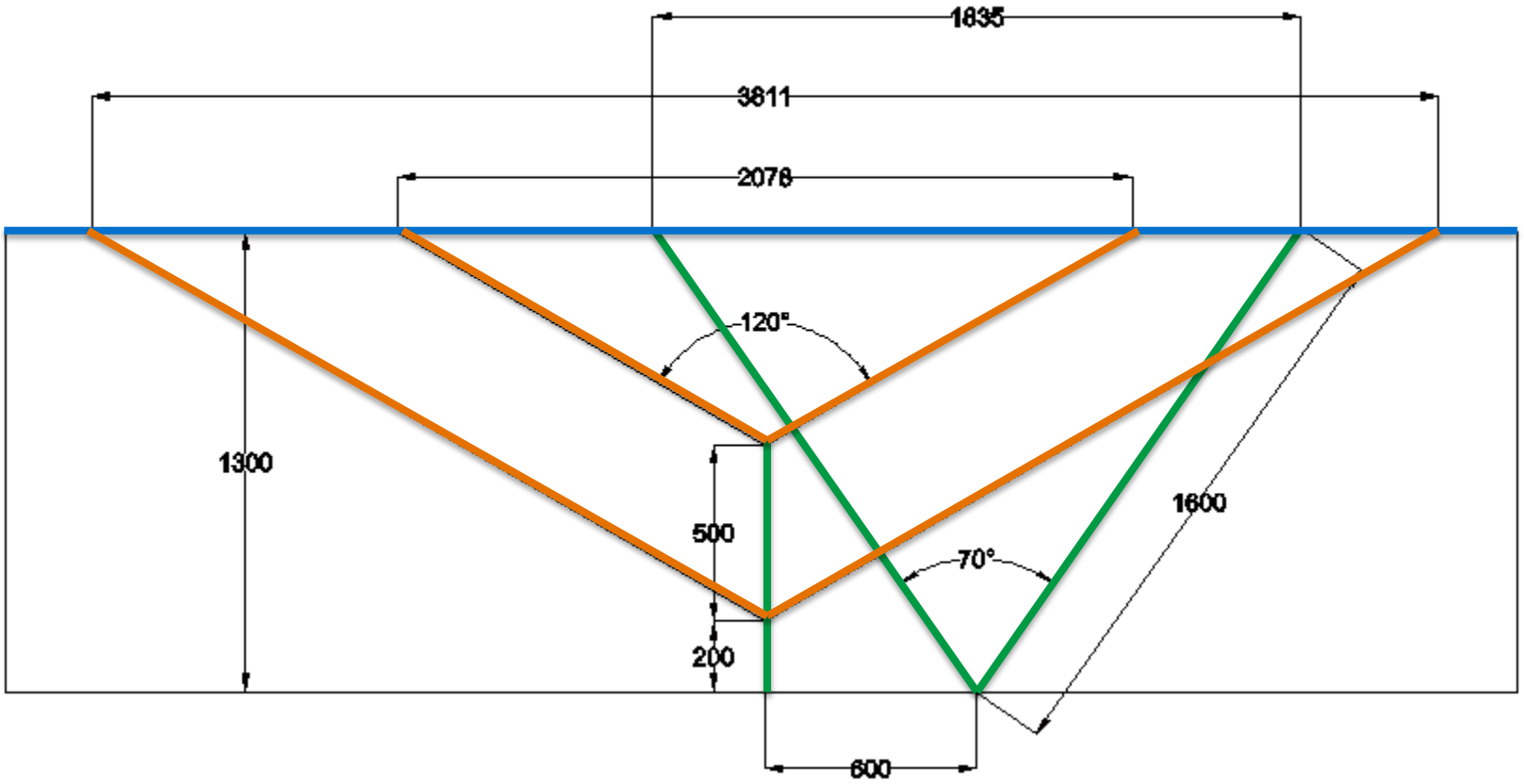
Complexity of mooring design and transducer reception



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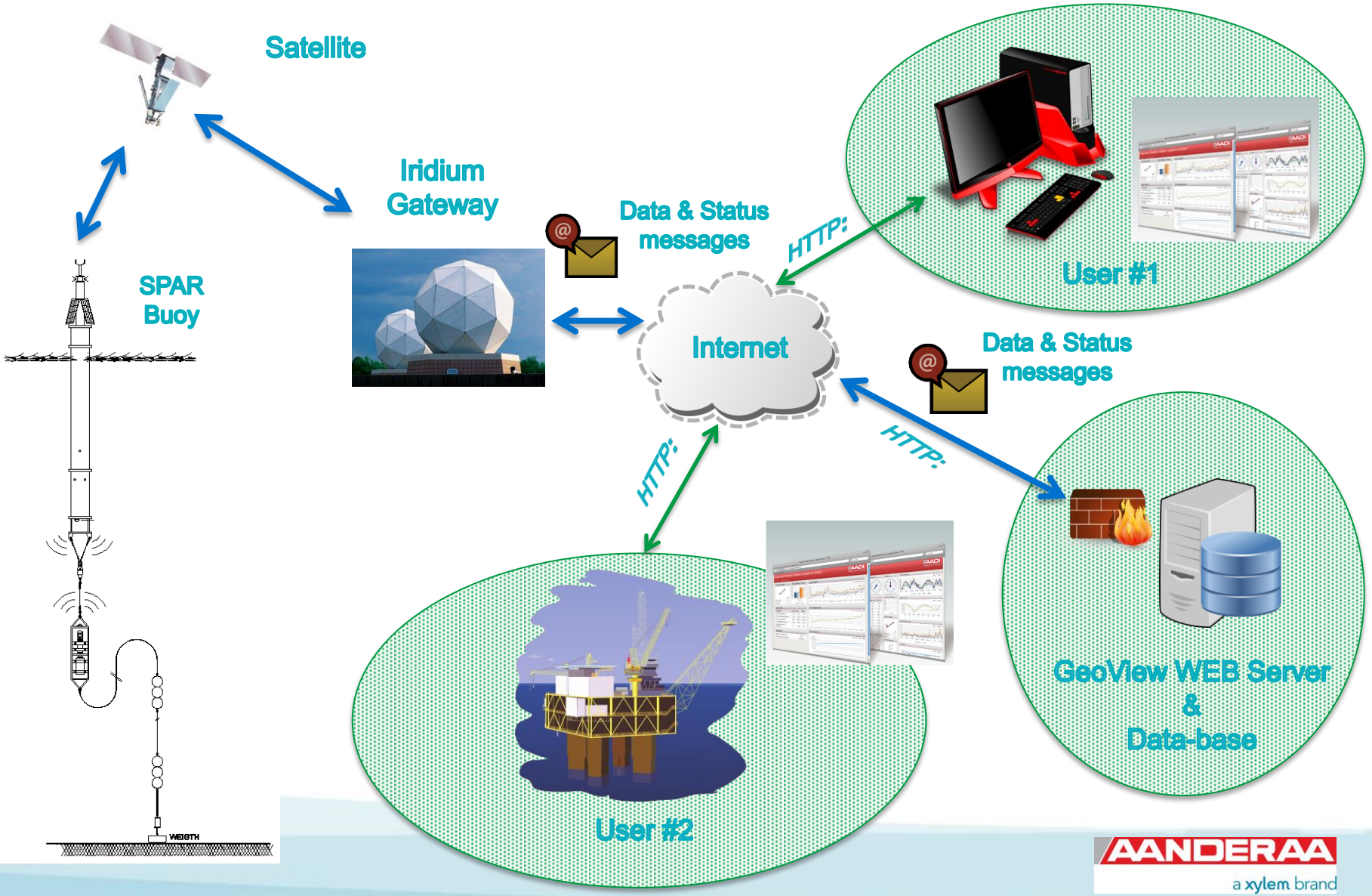
System DataFlow



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Bandwidth Limitations

- Bandwidth limitations exist in subsea communication like acoustic links
- Some data transmission methods also have significant cost

- Two ways to get around this:
  - Compression
  - Data selection

Bandwidth Limitations

More data – Less Bytes

Large number of parameters
+
Satellite communication
=
Expensive

Need a method to select parameters to be sent real-time, and compress

Wind Speed, Wind Gust Wind direction, Conducutivity, Salinity, Temperature, Turbidity,
Oxyge
Sign
Air
batt

Output example Binary

AZ`@@@@@A@@@UUUUu[Wsxt@R`@@@@ABA\vuBByZpaCP@@@@@@@@@@@@@@@@@@
@@PGQDBrKSuCBE~syAf@C@{P@CLOgEB@kLJm@poD

Wind
Curre
radiation, Air temperatures, buoy orientation, GPS position

Built-in techniques in SeaGuardII DCP: selection, compression

Bandwidth limitations

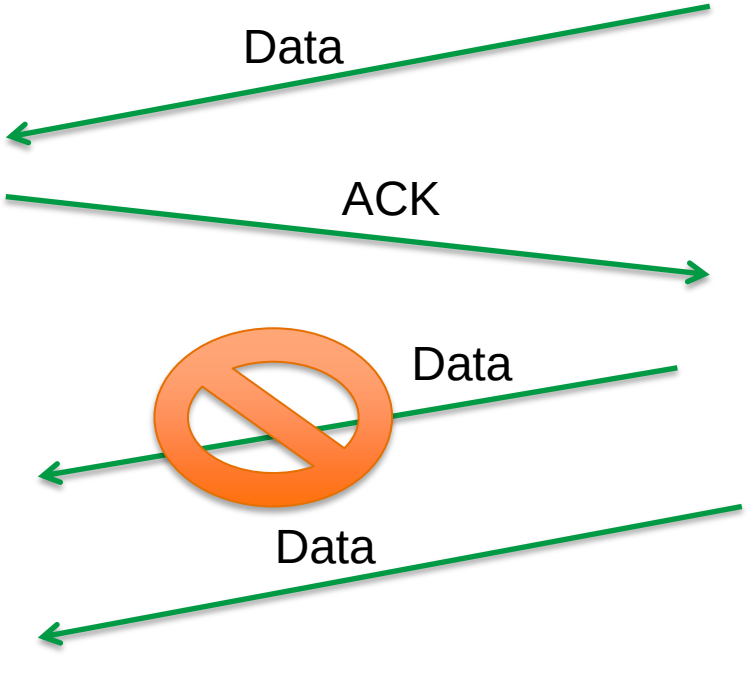
Intelligent Interval Settings

Transmission interval

Recording interval

- Sensor readings done at one interval
- Data output at a different output rate to save transmission cost

Stability of tranmission using retransmission



Improved interaction between receiver software and instrument

Power Restrictions

- Low power by design
  - AiCaP protocol
  - Advanced power control features for connected sensors and modems