

**NAUTRONIX**

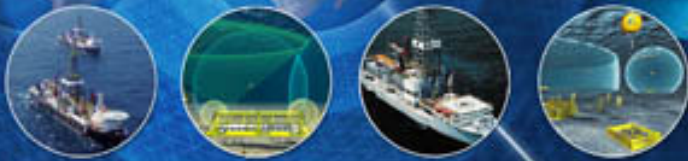
**MARINE TECHNOLOGY SOLUTIONS**



[www.nautronix.com](http://www.nautronix.com)

*OFFSHORE*

*Global Leaders in Through Water Communication and Positioning Technology  
for the Offshore Industry*



**“Subsea Wireless  
Communication – Real  
World Considerations in an  
Offshore Environment ”**

**Dr Andrew Jaffrey  
Technology & Development Manager**

**FFU 2008 – Stavanger**

The banner features a dark blue background with three overlapping, semi-transparent globes of the Earth. The Nautronix logo is in the top right, and the company name and tagline are in the top left. The word 'Introduction' is prominently displayed in the center-left.

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# Introduction

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- **This is the third year that Nautronix has presented at FFU**
- **This time I want to look at subsea wireless controls and communications in a different way**
- **One year on from FFU 2007, what's happened in the industry?**
  - **Many more kilometres of fibre optic cable have been installed subsea**
  - **People are more used to megabytes / gigabytes of data**
  - **Vessel costs have risen, but availability is lower**
  - **Companies have shown increased interest in subsea acoustic solutions (25% of Nautronix turnover last year was from wireless controls products, up from 12% in 2006); major operators (BP) have gone to market to find alternatives to umbilicals for subsea communications**



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## Why Not Umbilicals?

- **The industry is moving too fast and suppliers cannot keep up with demands for equipment and vessels**
- **Schedules are being turned upside down and some infrastructure can be installed before drilling, pipelines etc.**
- **Umbilicals do not offer operational flexibility, e.g. rapid redeployment to different points of need**
- **Their direct cost and their installation cost**
- **The desire to instrument more equipment in more locations making it infeasible to use umbilicals**



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# Alternatives

- **If not umbilicals, then how to communicate?**
  - **This presentation will concentrate on acoustics**
  - **Other technologies exist for transferring data through water, but none offers the possibility of such long range, with the high integrity and reliability that can be achieved with modern acoustic solutions**

# Definitions

- **Deep water > 500 m**
  - Acoustics regularly work in ultra-deep water; 3,500 m and beyond
- **'Long' range > 5 km**
  - A short distance compared with wired / fibre optic cables, but long in terms of acoustics
  - Slant range, so affected by the sound velocity profile and refraction
  - Every environment is different
- **Low data rate < 100 baud**
  - To many, this will be seen as meaningless; but to those who understand the constraints of physics in the subsea environment, it is a realistic value for true data rates for long range communication



# Acoustic Digital Spread Spectrum (ADS<sup>2</sup>)

- **History**
  - Spread spectrum signalling is in daily use in satellites and mobile telephones – it is not a new technique
  - Nautronix discussed this technology at FFU 2006
  - At FFU 2007 I presented on subsea control using acoustics
- **Concept**
  - ADS<sup>2</sup> is a broadband signalling technique
  - It uses coded signals ‘spread’ over 3 kHz
- **Advantages**
  - Longer range for lower power
  - Good immunity to interference
  - Very high signal integrity
  - Good performance in poor signal / noise environments
- **Limitation**
  - Use of low frequency means data rates are also low

# Philosophies

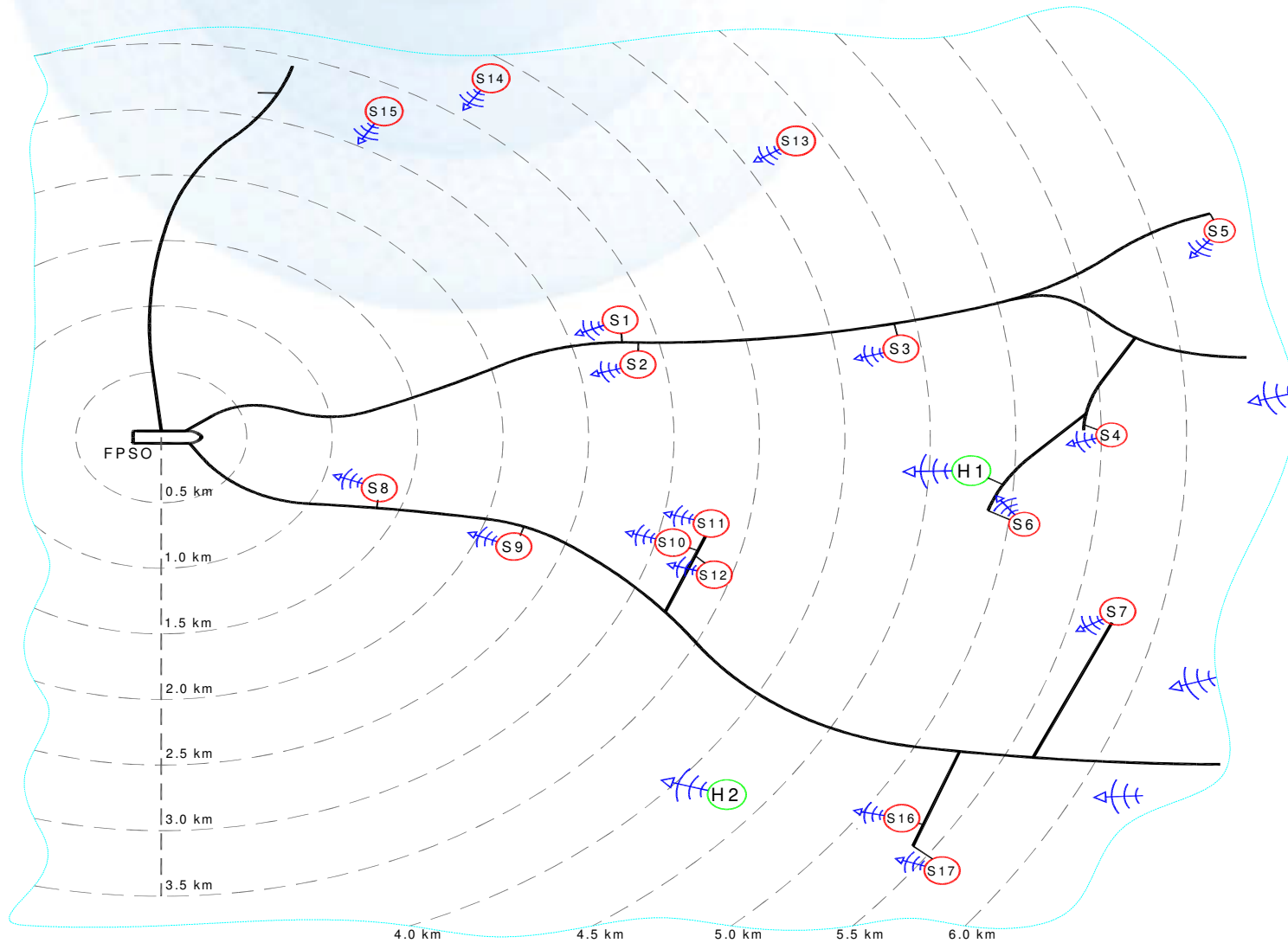
- **What If...**
  - The infrastructure is not in place to connect remote sensors
- **Then...**
  - Consider, is it absolutely necessary to receive huge amounts of data ?
  - Or, is it more important to be able to monitor the installation, with enough information fed back to be able to make informed decisions ?
- **What If...**
  - The infrastructure breaks, e.g. an umbilical fails
- **Then...**
  - Is it necessary to have an immediate and complete shutdown ?
  - Or, is it more important to be able to operate safely, with enough information fed back to be able to make informed decisions ?
  - Low data rate signalling can be (is) used to monitor equipment and if necessary, command a shutdown / disconnect as appropriate

# Some Applications

- **Pipelines**
  - Hydrate build-up
  - Cathodic protection
  - Flow
  - Temperature
  - Pressure
- **Pre-production wells**
  - Temperature
  - Pressure
- **Approaches include**
  - Data logging for later retrieval, e.g. fly-by using any size / cost of vessel
  - Data retrieval in pseudo real-time – either directly from source to end user, or via relay hubs



# Hypothetical Field



# Reporting

- **Why send data that do not change, or are within performance limits?**
- **Report on exception**
- **Out of range**
  - Too high
  - Too low
- **Rate of change**
  - Too fast
  - Too slow
- **Missing data**
  - Alarm if miss 'N' consecutive readings
- **Modify these settings remotely as required**
  - Adapt to suit the circumstances
- **This can all be achieved with surprisingly low data rates**



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## **Benefits?**

- **With minimal data, achieve visibility of irregular or unacceptable events**
- **Trigger operational changes in response to these events**
- **Flexibility of deployment**
  - **Move communication units to points of interest / concern**
  - **Umbilicals cannot be reassigned so readily**
- **Control over monitoring and reporting behaviour**
- **If pre-installed as a back-up to a fixed system, have immediate availability of the secondary system; without the need for vessel time**



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# Final Thoughts

- **We have all become used to immediate access to large volumes of data – at home, at work, on the move**
- **Do we really need this?**
- **Have we lost sight of what it is possible to achieve with small amounts of carefully chosen information?**
- **Is ‘more’ always ‘better’, or should we remember ‘fit-for-purpose’?**
- **At NOK 4 M to NOK 8 M per installed kilometre for umbilicals in deep water, alternative means of gathering data are of increasing interest and, with pragmatic expectations of performance, acoustics are a cost-effective option**





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**Our vision is to be...**



***‘Global Leaders in Underwater  
Communication and Positioning Technology  
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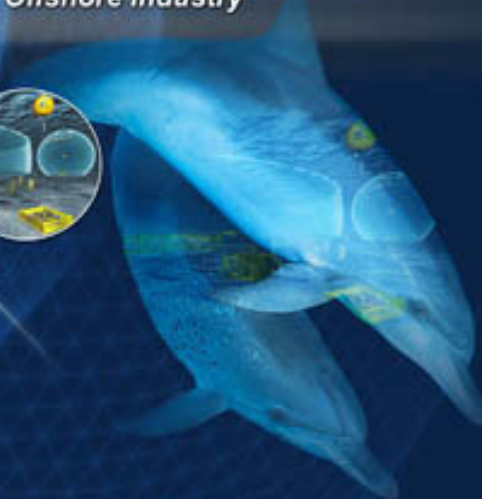
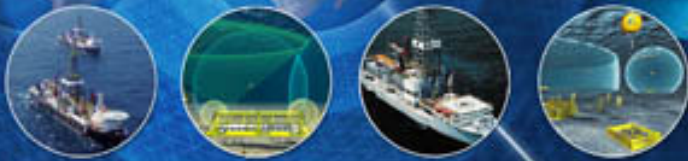
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