The VHF Data Exchange System (VDES) – Connecting the maritime world.

Connecting the maritime world is an enabler of innovation.
IMIS Global Limited (https://imisglobal.com/) is based in Fareham in the United Kingdom and was formed in 2000. IMIS focuses on the provision of Maritime Information Services (MIS) on a global basis. This is achieved using the Hosted MariWeb environment which is a cloud based, standards compliant, MIS that integrates a wide range of maritime centric peripherals.

IMIS is an active IALA member and is also part of the European Union datAcron project (http://datacron-project.eu/).

Ernest Batty
Technical Director, IMIS Global

Werner Hauptfleisch
DevOps Manager, IMIS Global
The economic value of the maritime industry in Australia (PWC 2015)

- **GDP**
  - Direct contribution: $1.85 billion
  - Indirect contribution: $2.40 billion
- **Employment**
  - Direct contribution: 6,324 jobs
  - Indirect contribution: 2,823 jobs
- **Tax revenue**
  - Direct contribution: $606 million
  - Indirect contribution: $261 million

**Total contribution:**
- $4.25 billion to GDP
- 9,147 additional jobs
- $867m in additional taxation revenue
The economics of information sharing

Ships in a port do not earn maximum revenue
Ships at anchor do not earn maximum revenue
Ships not sailing at the optimal (best value) speed are not competitive
Ships sailing on a sub-optimal route are not competitive
Ships sailing on a sub-optimal route may have a greater environmental impact
Ports with empty berths do not earn maximum revenue
Ports that are inefficient are not competitive and may lose some ship business
The evolution of Maritime Information Systems

Telescope with pen and paper logbook entries

Sensors feeding Maritime Information Systems with data analytics, machine learning and artificial intelligence
Maritime Information System stakeholders
Connecting the maritime world

The maritime environment in common with most other industries, is being ‘digitised’.

Discover
Data sources need to be located and evaluated for cost, coverage, and quality.

Ingest
Ingest the data that is available in various formats from various sources.

Process
Transform the data into a format that facilitates its use and then reuse.

Store
Store data in a manner that adds value to other process especially analysis.

Integrate
Combine the variety of data sources to find new insights.

Analyse
The star of the show. New insights and actions are derived from data often adding new data.

Share
The results of analytics and data that are exposed to the organization in a way that makes them useful for value creation and innovation.
Connecting the maritime world

In the AIS domain

1. There are **194 AIS messages** defined by the various working groups and governments that use AIS.

2. There are **271 different information fields** contained in the 194 AIS messages.

How many are used by the typical maritime authority?

1. Message type 1, 2 and 3 (Class A vessels)
2. Message type 4 (AIS base stations)
3. Message type 5 (Class A details)
4. Message type 9 (SAR aircraft)
5. Message type 18 (Class B vessels)
6. Message type 21 (AtoN)
7. Message type 24 (Class B details)
Hosted MariWeb data storage for a typical customer

35,539,099,393 messages stored
Maritime Information System (VDES)

- >100 AIS enabled satellites
- >50 million messages per 24 hours

AIS vessels at sea
Coastal and port VDES vessels

VDL

ITU-R M. 2092- x
IEC 61993-2 (Class A)
IEC 62287-1 (CS Class B)
IEC 62287-2 (SO Class B)
IEC [VDES] (VDES BS)
IEC 62320-2 (AIS AtoN)
IEC 61162-1
NMEA 0183 version 4

Maritime Information System

Compute
Storage
Database

Users
The VHF Data Exchange System (VDES) advantage

Increase in data bandwidth!

AIS = 9,600 bits per second

X2

ASM = 19,200 bits per second

X32

VDE = 307,200 bits per second
VHF Data Exchange System integration

- **Radio Applications**
  - RF section
  - Link Layer
  - Presentation Interface

- **Interface between radio applications and hardware**

- **Software Defined Radio (SDR) hardware**

- **25Khz**
  - AIS VDL
  - ASM VDL

- **50 / 100Khz**
  - VDE VDL

- **Receiver and transmitter application**
- **The radio application protocol and control system**
- **The communication interface to the ship and shore networks and systems**
VHF Data Exchange System hardware

Marketed and supported exclusively by CML Microcircuits.

Designed and manufactured in partnership with Senro.

Available from: http://www.cmlmicro.com/products/vhfdataexchangesystem/
VDES Base Station integration

A VDES base station includes:

- Channel and modulation - Modulation and Coding Scheme (MCS1 etc.)
- Coverage area - constrained by propagation losses from any particular location
- Service area - a defined area in which the service is offered

**Rule 1:** The service area for one base station is always less than the coverage area.

**Rule 2:** The service area can stretch across multiple base stations areas where these VDES base stations are part of the same system.
Voyage Manager – Port Gantt Chart view

<table>
<thead>
<tr>
<th>Planning phase</th>
<th>Execution phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arr. pilot station</td>
<td>Arr. tug zone</td>
</tr>
<tr>
<td>Arr. Berth</td>
<td>1 Cargo Ops start</td>
</tr>
<tr>
<td>Cargo Ops end</td>
<td>Ready to sail start</td>
</tr>
<tr>
<td>Ready to sail end</td>
<td>Dep. Berth 1</td>
</tr>
<tr>
<td>Arr. Berth 2</td>
<td>Cargo Ops start</td>
</tr>
<tr>
<td>Cargo Ops end</td>
<td>Ready to sail start</td>
</tr>
<tr>
<td>Ready to sail end</td>
<td>Dep. Berth 2</td>
</tr>
<tr>
<td>Dep. tug zone</td>
<td>Dep. pilot station</td>
</tr>
</tbody>
</table>

- **Terminals**
- **Linesman**
- **Port**
- **Ship agent**
- **Vessel**
  - **Pilot**
  - **Escort tug**
  - **Tugboat**
  - **VTS**

**Phases:**
- Pre arrival
- Arrival
- Berth 1 visit
- Berth 2 visit
- Departure
- Port departure

© IMIS Global NAV18 – May 2018
The route planning method is described in IEC 61174 ed. 4 as a message RTZ that contains the route in three information blocks:

1. Route General Information
2. Route Geometry block
3. Route Schedule block

WP1 (coordinates)  
WP2 (coordinates)  
WP3 (coordinates)
VDES being prepared for R-Mode

R-Mode report: Predicted AIS R-Mode positioning accuracy (m) using a 0-100m scale [5].
Voyage Manager – Sea Voyage view
Information sharing

New Services
(ship and shore side)

1000’s of users per port

Maritime Information System

Services
Data

Compute
Storage
Database

Innovation

Ideas
Final thoughts

VDES, R-Mode, PCDM and STM are new tools in the maritime communications and operations tool box.

Connecting the maritime world is the enabler.

Be surprised by the innovation that follows.
The VHF Data Exchange System (VDES) – Connecting the maritime world.

Connecting the maritime world is an enabler of innovation.