Cosmos Business Systems SA
Marathon Data Systems
Greece

Real Time Vessel Monitoring System (VMS) with ArcGIS Server & Geoevent Processor for Fisheries
Vessel Monitoring System

VMS was designed to monitor the fishing vessels of Greece. It is in production and it is currently used by the Greek Ministry of Maritime and Fisheries.
Pre-VMS solution

- Simple tables to report lat/long
- Lack GIS
- Lack of alarm system
- Everything was manual
- Wrong data
- No compliance with the EU policies
System Architecture

The basic features of the VMS system are:

- ArcGIS 10.2.2 for Server Enterprise Standard
- Users Application
- Communications Servers
- Subsystem Gateway Server
- Geodatabase
System Architecture

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**ArcGIS for Server**

- **Administrator**
  - ArcGIS for Desktop
  - Data interoperability

- **ArcGIS for Server**
  - ArcGIS GeoEvent Processor

- **Oracle Database Server**

- **REST**
  - Integrated System for Monitoring and recording of fishing activities

- **OGC**
  - Integration with other VMS systems from different countries

- **SOAP**
  - Integration with European Comission

- **Integration with third party systems**

**Alerts and Events**

**Web Users**

- **Web platform**

**Users**

- **Kalymnos**
- **Patra**
- **Kavala**
- **Thessalonica**
- **Piraeus**
VMS Features

The basic features of the system are:

- Provides centralized management
- Provides the ability to support multiple users
- Allows interfacing with other agencies
- Provides integrity assurance mechanisms, and completeness of data
- Provides design capabilities and geographic information management
- Allows managing large amounts of data
- Complies and follows all open interoperability standards in both the GIS field and in the wider field of information technology
VMS users use a web browser to access a GIS web application in order to see the following information:

- An overview of the last available position of every vessel
- An overview of archive positions of monitored vessels during certain time periods
- An overview of basic data from the informational system of fisheries—a chosen vessel's owner, a chosen vessel's owner, dimensions, and so forth
- Statistical data about vessel movement
- Measure distances from coastline and buffer line around coastline
- Review on map the generated Spatial and system alarms
- Create and Edit Geo-fence Zones
- Set Alarm settings per Geo-fence Zone (period, vessel type, vessel speed)
- Create map reports per vessel, per alarm on map and so forth
- Create vessel positions by coordinates or from map
The vessels are showed on the map with different color and shape, depending on the type of the fishing vessel (seine, trawl, etc).
The course of the vessel is displayed on the map (appearance of the vessel’s positions), which has been recorded during the period set by the operator.
Create Geo-fence Zones on the map
Set Alarm settings in case of a boat enters a zone where fishing is prohibited
Set Alarm for not receiving position report for more than 6 or 12 hours

### Device Alarm Type Grid

<table>
<thead>
<tr>
<th>Alarm Type Description</th>
<th>Device Alarm Type</th>
<th>Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vessel Not Responding - TONADIKO - 12 hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vessel Not Responding - TONADIKO - 6 hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leaving the main port</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Αδύνατη ημερομηνία αποστολής σημάτων</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power On (IRIDIUM-1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Battery Low (IRIDIUM-1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication failure (IRIDIUM-1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transition to primary power</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transition to secondary power</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tampering</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Create New Alarm Type

Create New Alarm Type

Alarm Type Description

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Alarm Type Description
## Manage the Alarm Device

### Device Alarm Type Grid

<table>
<thead>
<tr>
<th>Description</th>
<th>Alarm Type Description</th>
<th>Device Alarm Type</th>
<th>Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iradius signal is lost</td>
<td>IRISIGNLOS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gsm/Gprs signal is lost</td>
<td>GSMSIGNLOS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gps signal is lost</td>
<td>GPSSIGNLOS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Device is in a on-to-switchoff zone</td>
<td>SWITCHOFF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Device is 50m from switchoff location</td>
<td>AUTOAWAKE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Battery is not charging</td>
<td>NCHARGING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SABOTAGE</td>
<td>SABOTAGE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Battery is running low to empty</td>
<td>BATTERYLOW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Disconnected</td>
<td>PWRRDISCONN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evropv orphaned (ALERT !!!)</td>
<td>ALARM</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Create alarms in real time
For each of these alarms, the user records the actions it performs

<table>
<thead>
<tr>
<th>RadioCallSign:</th>
<th>SV2243</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name A/X Vessel:</td>
<td>ΑΓ. ΒΑΡΒΑΡΑ NK189</td>
</tr>
<tr>
<td>Region Number:</td>
<td>NK189</td>
</tr>
<tr>
<td>FleetRegisterNumber:</td>
<td>GRC0000C0044</td>
</tr>
<tr>
<td>Vessel Types:</td>
<td>TRAWLER</td>
</tr>
<tr>
<td>Home Port:</td>
<td>ΧΑΛΚΙΔΑΣ</td>
</tr>
<tr>
<td>Captain's Details:</td>
<td>6984633433</td>
</tr>
<tr>
<td>Inmarsat Mobile Number(IMN):</td>
<td>423765810</td>
</tr>
</tbody>
</table>

| Position Date: | 02/04/2015 21:40:00 |
| Alarm Description: | Ανοιχτό - Σκάφος ΜΝΚΑΝΔ |
| Severity: | Medium |
| Vessel Position: | Latitude: 36° 56.680' Longitude: 23° 5.260' |
| Heading: | 0 |
| Speed: | 0 |

| Action Types: | Κλείσιμο εξάρτησες |
| Action: | |
| Comments: | |

Process
Measure manually distances between points on the map.
Create map reports (e.g., export of the total number of hours the vessels remain within each fishing area for a specified period)

<table>
<thead>
<tr>
<th>RadioCallSign</th>
<th>Vessel Name</th>
<th>FleetRegisterNumber</th>
<th>Vessel Types</th>
<th>Ζώνη</th>
<th>ZONENAME</th>
<th>Total Time Inside Zone(Minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SX74394</td>
<td>ΚΑΠΕΝΤΑΝ ΤΑΚΗΣ</td>
<td>GRC 000198277</td>
<td>ΔΙΣΤΥΤΑ / ΠΑΡΑΓΑΔΙΑ</td>
<td>1</td>
<td>ΑΠΟΜΑΚΡΥΙΜΕΝΗ ΖΩΝΗ</td>
<td>2</td>
</tr>
<tr>
<td>SW7615</td>
<td>ΠΟΡΕΙΟ ΑΙΓΑΙΟ</td>
<td>GRC 00044050</td>
<td>ΔΙΣΤΥΤΑ / ΠΑΡΑΓΑΔΙΑ</td>
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<td>ΑΠΟΜΑΚΡΥΙΜΕΝΗ ΖΩΝΗ</td>
<td>1</td>
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<tr>
<td>SY4688</td>
<td>ΚΑΠΕΝΤΑΝ ΝΙΚΟΛΑΣ</td>
<td>GRC 00036689</td>
<td>ΔΙΣΤΥΤΑ / ΠΑΡΑΓΑΔΙΑ</td>
<td>4</td>
<td>ΑΠΟΜΑΚΡΥΙΜΕΝΗ ΖΩΝΗ</td>
<td>44722</td>
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<tr>
<td>SW5993</td>
<td>ΕΛΕΥΘΕΡΙΟΣ</td>
<td>GRC 00038266</td>
<td>ΔΙΣΤΥΤΑ / ΠΑΡΑΓΑΔΙΑ</td>
<td>3</td>
<td>ΑΠΟΜΑΚΡΥΙΜΕΝΗ ΖΩΝΗ</td>
<td>0</td>
</tr>
<tr>
<td>SW3789</td>
<td>ΚΑΛΛΙΟΠΗ Β</td>
<td>GRC 00035484</td>
<td>ΔΙΣΤΥΤΑ / ΠΑΡΑΓΑΔΙΑ</td>
<td>5</td>
<td>ΑΠΟΜΑΚΡΥΙΜΕΝΗ ΖΩΝΗ</td>
<td>18482</td>
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<tr>
<td>SV5059</td>
<td>ΜΑΡΓΑΡΙΤΑ</td>
<td>GRC 00038074</td>
<td>ΔΙΣΤΥΤΑ / ΠΑΡΑΓΑΔΙΑ</td>
<td>6</td>
<td>ΑΠΟΜΑΚΡΥΙΜΕΝΗ ΖΩΝΗ</td>
<td>587853</td>
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<tr>
<td>SV43394</td>
<td>ΛΕΝΑ</td>
<td>GRC 00006091</td>
<td>ΔΙΣΤΥΤΑ / ΠΑΡΑΓΑΔΙΑ</td>
<td>6</td>
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<tr>
<td>SV42207</td>
<td>ΕΡΗΝΗ</td>
<td>GRC 00003400</td>
<td>ΔΙΣΤΥΤΑ / ΠΑΡΑΓΑΔΙΑ</td>
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<td>11070</td>
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<tr>
<td>SV5558</td>
<td>ΖΩΡΜΑΣ</td>
<td>GRC 000200475</td>
<td>ΔΙΣΤΥΤΑ / ΠΑΡΑΓΑΔΙΑ</td>
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<td>0</td>
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<tr>
<td>SXS883</td>
<td>Ν.Κ.ΚΟΥΤΑΡΟΣ</td>
<td>GRC 00039404</td>
<td>ΔΙΣΤΥΤΑ / ΠΑΡΑΓΑΔΙΑ</td>
<td>2</td>
<td>ΑΠΟΜΑΚΡΥΙΜΕΝΗ ΖΩΝΗ</td>
<td>0</td>
</tr>
<tr>
<td>SW2176</td>
<td>ΑΓΙΟΣ ΣΑΒΒΑΣ</td>
<td>GRC 00034566</td>
<td>ΔΙΣΤΥΤΑ / ΠΑΡΑΓΑΔΙΑ</td>
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<td>GS667</td>
<td>ΣΤΡΑΤΟΣ</td>
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<td>ΔΙΣΤΥΤΑ / ΠΑΡΑΓΑΔΙΑ</td>
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<tr>
<td>SY9485</td>
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<td>GRC 00032221</td>
<td>ΔΙΣΤΥΤΑ / ΠΑΡΑΓΑΔΙΑ</td>
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<td>ΑΠΟΜΑΚΡΥΙΜΕΝΗ ΖΩΝΗ</td>
<td>0</td>
</tr>
<tr>
<td>SW3333</td>
<td>ΟΜΗΡΗΣ - ΑΠΕΙΠΟΣ</td>
<td>GRC 00021108</td>
<td>ΜΗΧΑΝΟΣΤΡΑΤΑ</td>
<td>9</td>
<td>BUFFER 1,5 MILES</td>
<td>116145</td>
</tr>
</tbody>
</table>
Polling in vessels or group of them and scheduling the time when the signal will be transmitted
As part of the interoperability and exchange of data with third party systems we have achieved:

- The interface of the system with the Community Fisheries Register.
- The interconnection with the European Commission.
- The interconnection with other CAF (Spain, Italy, Malta, France, Cyprus and Mauritania)
Physical Architecture of VMS

The physical architecture of the system includes:

- **At the level of the database (Database Tier)** installed software Oracle 11gR2 Standard Edition RDBMS in Active-Passive configuration.

- **At the application server level (Application Tier)** installed in backup device (Failover) and load balancing ArcGIS 10.2 for Server Enterprise Standard and software "Geo-Event Processor" which is an extension thereof.

- **At the level of communications servers (Communication Tier)** installed subsystem Gateway Server in backup device (Failover)

- **At the level of presentation servers (Presentation Tier)** will install the users’ application in backup device (Failover)
Physical Architecture of VMS

- Communication Tier (2 Servers)
  - Gateway Server [Fail-Over Architecture]
  - Oracle 11.2 Standard [Fail-Over Architecture]

- Database Tier (2 Servers)
  - Oracle 11.2 Standard [Fail-Over Architecture]

- Application Tier (2 Servers)
  - ArcGIS Server 10.2
  - Web Map Services [Fail-Over Architecture]

- Application Tier (2 Servers)
  - ArcGIS Server 10.2
  - GeoEvent Processor
  - AIC Example
  - AIC Example [Fail-Over Architecture]

- Presentation Tier (2 Servers)

- Application [Fail-Over Architecture]

- LAN/WAN

- Cosmos Business Systems SA
Our system has been designed and developed according to the standards of the European Union.

Our system’s data structure is compatible to the format needed by the European Union for exchanging data between European Union and other Member states using FLUX v1.5.4.
Conclusion

- A complete GIS system for cartography, analysis, reports & alerts
- Deployed on-premise
- Customization (interface/alarms/geofence/device)
- Advanced geofences boost system performance
- Alarms & reports that help the officer
- Support all fishing GPS devices
- 10 days delivery
Thank you!

for more information, please contact

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Heracles Taslakidis : taslakidisi@cbs.gr