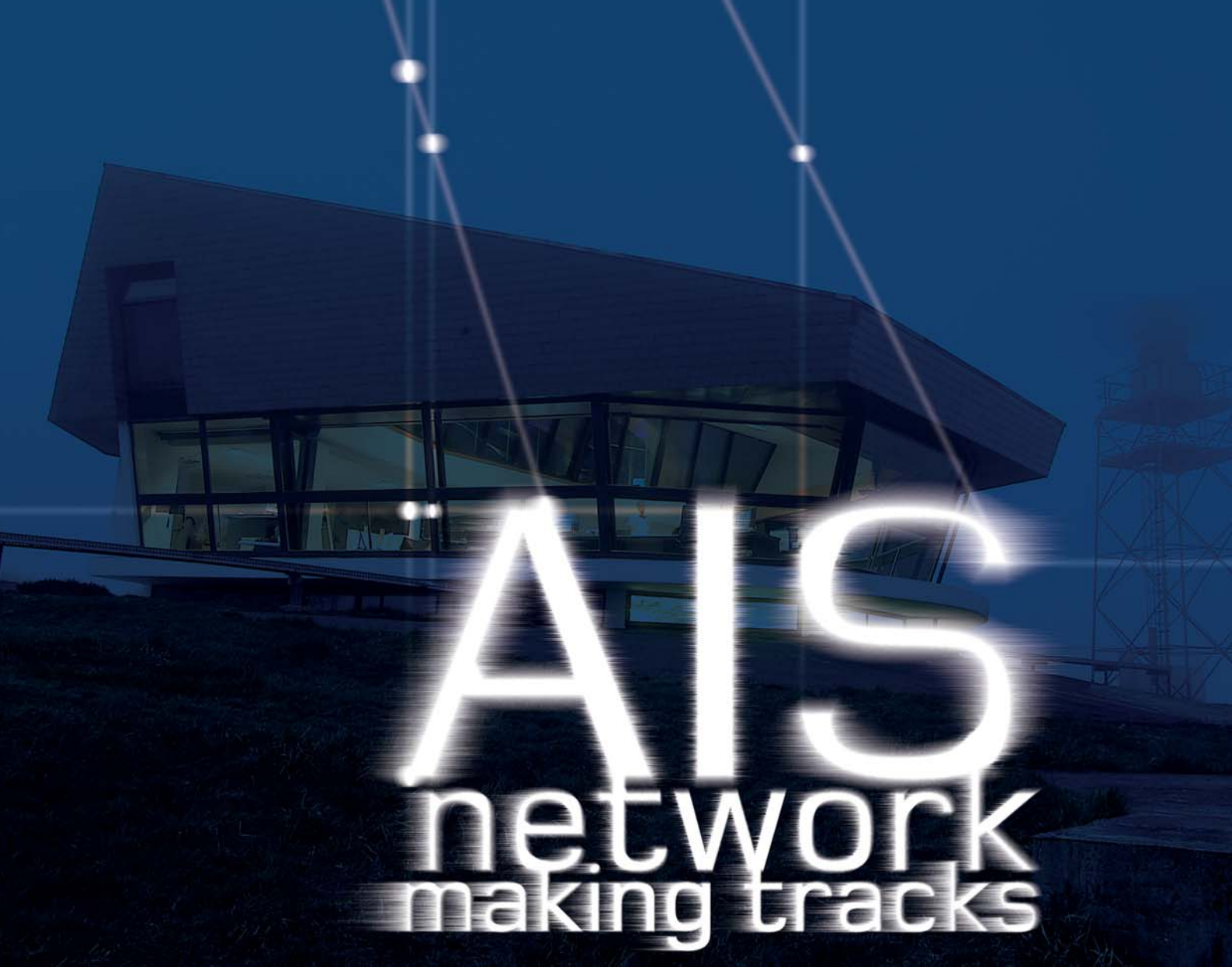

George Marsh charts the history and latest progress of an innovative new AIS network being established that will provide extended coverage of UK waters

By Spring 2006, the UK is due to have an Automatic Identification System (AIS) network covering most of its waters out to 30 nautical miles. The Maritime and Coastguard Agency (MCA) awarded a turnkey contract early this year to Norcontrol IT to implement the system, and work is proceeding according to schedule.

At the programme's completion, operators at some 53 workstations located at coastguard facilities round the coast, MCA headquarters and certain government facilities, will be able to 'see' all AIS-equipped vessels and other maritime assets operating within UK waters.

Several years ago, the MCA realised that, as a result of an intended European Vessel Traffic Monitoring Directive and an emerging 'e-navigation' policy within the UK's Department of Transport, there would be a need for a nationwide maritime domain awareness solution. This would permit, without voice radio intervention, the rapid and unambiguous identification of vessels — the purpose for which the Automatic Identification System was originally devised — but would also provide additional information about vessel tracks, speeds, cargoes, voyage status and intentions.

Multiple benefits

Coverage, though extending around the entire 10 500 mile coastline of the United Kingdom, would be concentrated in areas critical to shipping such as the Dover Strait, the Scilly Isles and south-western approaches, the Smalls, the North Channel, Pentland Firth, the Fair Isle Gap, the Firth of Forth, the Minches and the north-east coast.

The scheme would improve situational awareness in these mandatory and voluntary reporting areas. Additionally, enhanced awareness of traffic in the North Sea was considered of interest.

The MCA believed that AIS would significantly enhance the operational effectiveness of itself and other maritime agencies. It would facilitate search and rescue operations by providing positions and other data on casualty vessels promptly, improve pollution control by helping to identify 'rogue' vessels, contribute to traffic surveys and civil hydrography, and strengthen the agency's enforcement capability.

Data would also be of interest to other agencies such as the Marine Accidents Inves-

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Local network

This national scheme is not the only AIS network destined for UK service. Recently, the Port of London Authority (PLA) acquired a network-based solution, also from Norcontrol IT, so that vessel track and other data could be exchanged readily between its own IALA-compliant base stations, a local Sofrelog VTS system and an STN Atlas VTS system serving the nearby port of Harwich.

Emphasising the benefits of the networking approach, Steve Guest, General Manager for Norcontrol IT, UK, explains: 'Many ports in the UK need to exchange information with geographically adjacent VTS systems but this has been difficult, if not impossible, when those systems are from different manufacturers. Our networked AIS solution overcomes this limitation in a cost-effective manner.'

The PLA will use the new installation to track its own port service vessels as well as other AIS-equipped traffic in its waters. The system will be able to provide single tracks integrated from various different tracking systems, ensuring maximum clarity in presenting the traffic situation.

It relies on the same third-generation software that is embodied within the UK national system and has been selected by the Norwegian Coastal Directorate. Norcontrol IT was able to install the PLA's network software into existing hardware remotely.

Integration of port management information systems (PMIS) with VTS systems is a growing requirement in the overall management of maritime assets. Korea, for example, has selected Norcontrol IT's solution to meet such a need at its port of Busan, where the port authority wanted to integrate its PMIS with both a new VTS system and an older one that was already in place. AIS integration was also a feature of this contract. Networking is the logical solution to such diverse integration needs.

tigation Branch (MAIB) and navigational interests like the General Lighthouse Authorities (GLA). AIS is, for example, included within the GLA's '20:20 Vision' for future maritime provision. These various bodies are keen to achieve a common surveillance and aid-to-navigation strategy for the UK without duplication of effort. Overall, it was thought that an AIS network would represent the best solution, with great advantage to maritime safety and security.

Dover testbed

Since there were few precursors on which to model such a system — those few being mainly in Scandinavia — the MCA felt it necessary to test both the potential benefits and the technologies available. It therefore decided to conduct an engineering trial and to use the upgraded Channel Navigation Information Service (CNIS) at Dover as the trial hub.

The Langdon Battery Vessel Traffic Services (VTS) station at Dover monitors, jointly with French counterparts, one of the world's busiest stretches of water. Typically, some 500-600 vessels per day are seen in the 20-mile wide Strait between France and England, and these include numerous crossing movements of ferries and leisure craft.

Dover was one of the first UK VTS stations able to display fused radar and AIS, and the fact that it is also equipped as a Maritime Rescue Coordination Centre (MRCC) enhanced its suitability for the trial.

The contract for implementing the trial network was awarded to Norcontrol IT, which had been able to cite its on-going experience in integrating AIS networks elsewhere, notably in the Gulf of Mexico, Singapore and Norway.

Fifteen AIS base stations from different manufacturers were installed at strategic locations around the UK to cover the various traffic 'pinch points'. An existing MCA wide area network was utilised, in conjunction with an Ethernet backbone, to support communications both within the Dover centre and with other MCA locations.

At the start of the trial early in 2003, only a few ships using the Dover Strait and other UK waters were equipped with AIS, but this rapidly increased when the international deadline for mandatory ship installation was brought forward to December 2004.

Norcontrol IT provided Dover and nine other MRCCs throughout the UK with network control facilities and access to a central AIS database. This gave the ten networked centres access to positional, dynamic and static data relating to shipping in their regions. So popular did this information prove among the various duty operators that most looked forward to when the system would become a permanent fixture in the operations room.

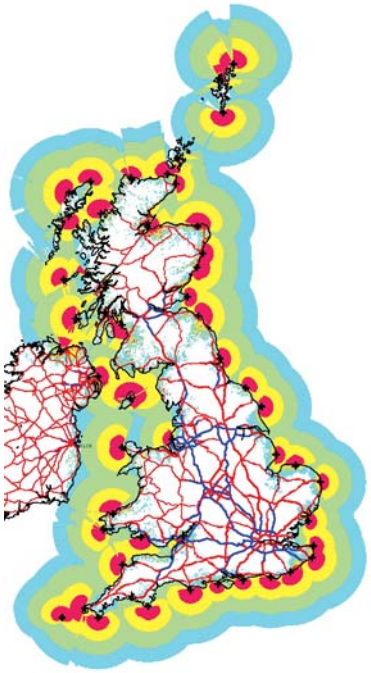
Armed with a better idea of what shoreside equipment it would need to support a national network, the MCA solicited European procurement bids for the full system. Prime requirements included scaleability to allow for future expansions and upgrades, compliance with relevant engineering standards, nationwide coverage, ability to be interfaced with other MCA system elements, high availability, intuitive operation, intelligent software providing advanced functionality, and affordability.

Norcontrol IT won the prime integration contract, with a bid of some £1.54M to cover the entire system. It was able to promise this low cost through the use of an open hardware-independent network architecture permitting the extensive use of commercial off-the-shelf equipment, and software that was largely proven, requiring relatively little further development to meet the MCA's needs. It was also helped by the thorough and detailed technical specification that MCA was able to prepare as a result of the AIS network trial.

Modular architecture

The new network is based on Norcontrol IT's AIS 5060, a system whose open architecture facilitates later addition of base stations, workstations, sensors and new functions.

At the core of the system will be half a dozen or so node managers, essentially central PC-based servers that will receive and condition AIS returns from maritime assets. These returns will be distributed to 53 of the MCA's 154 remote radar/radio sites that



Fifty-three of the MCA's remote radar/radio stations are being equipped with base stations as part of an AIS network extending around the entire UK coastline.

are being equipped with AIS base stations.

VTMIS Ltd from Leicester has supplied Saab Transpondertech base stations, these having been chosen because they performed well in the trials and because a recent upgrade was available.

The remote sites will pass radar (at Dover) and AIS data to major user centres, in particular 19 MRCCs. Here, local servers will combine the incoming data and process the result to provide clear, uncluttered synthetic displays for operators.

Two graphical user interfaces (GUI) are being provided — a Web-based interface similar to AISLive, and a GUI based on an existing NATO-compliant windows system developed by Teleplan AS of Norway.

The communication system enables data to be exchanged freely between the MCA, Department of Transport, the GLA and other relevant authorities. (Data exchange trials between MCA and GLA facilities are due soon, while discussions are in progress with the Port of London Authority over similar exchange.)

Future system expansions or changes are facilitated by Ethernet interconnectivity and the British Telecom wide area network (WAN). Norcontrol IT software distributed around the system controls the use, filtering, routing and storage of the AIS data.

In-built protection

Earlier this year Norcontrol IT released the third generation of its AIS 5060 network infrastructure software, which is to form the basis of the UK AIS network. The system meets high standards set by the MCA, the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) and other bodies, for system resilience.

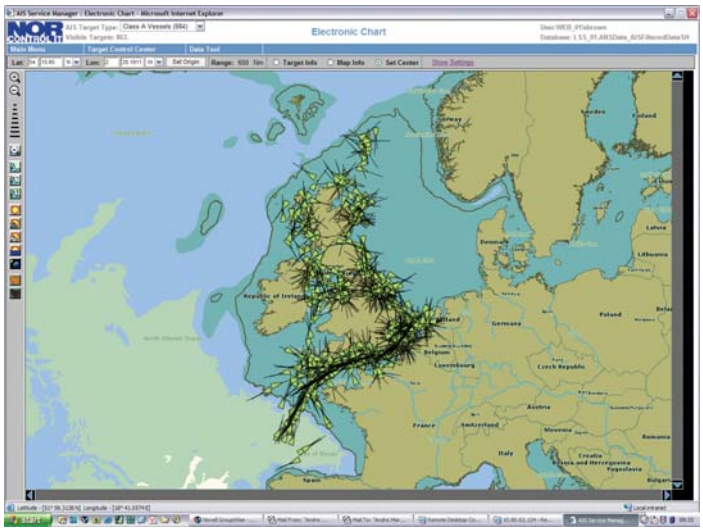
Such resilience, against both failure and unauthorised system entry, is essential for guarding against potential loss of data, with consequent degradation to safety and security. The highly distributed nature of the system, combined with adequate system redundancy, ensures that this need is met.

Software-based filters within the network serve to sideline data known to be inaccurate or corrupted. (Unfortunately, instances of ships' officers entering data incorrectly or failing to update it from voyage to voyage are not rare.) Other software safeguards ensure that data reaches only the intended recipients and is not available to competing interests.

As Steve Guest, General Manager of Norcontrol IT in the UK, comments: 'We proved the resilience of our AIS infrastructure during the network trial with the MCA. With the release of the third generation, our network software is stronger still in terms of robustness, flexibility and functionality. It is hardware independent and provides relatively low cost of ownership.'

Recently, the MCA's Head of Information and Communication Technology, James Findlay, demonstrated to *MIT&E* at MCA's regional headquarters in Southampton, a Beta version of the operator workstation software. The choice of data and presentation options was impressive.

Typically, the situation for a given area is presented in plan view, AIS tracks being presented over an S-57 vector or Admiralty raster chart. Operators can retrieve details for any particular vessel at the click of a mouse, after placing a cursor over the relevant target. Further detail can be culled from an AIS database by means of menu selections.

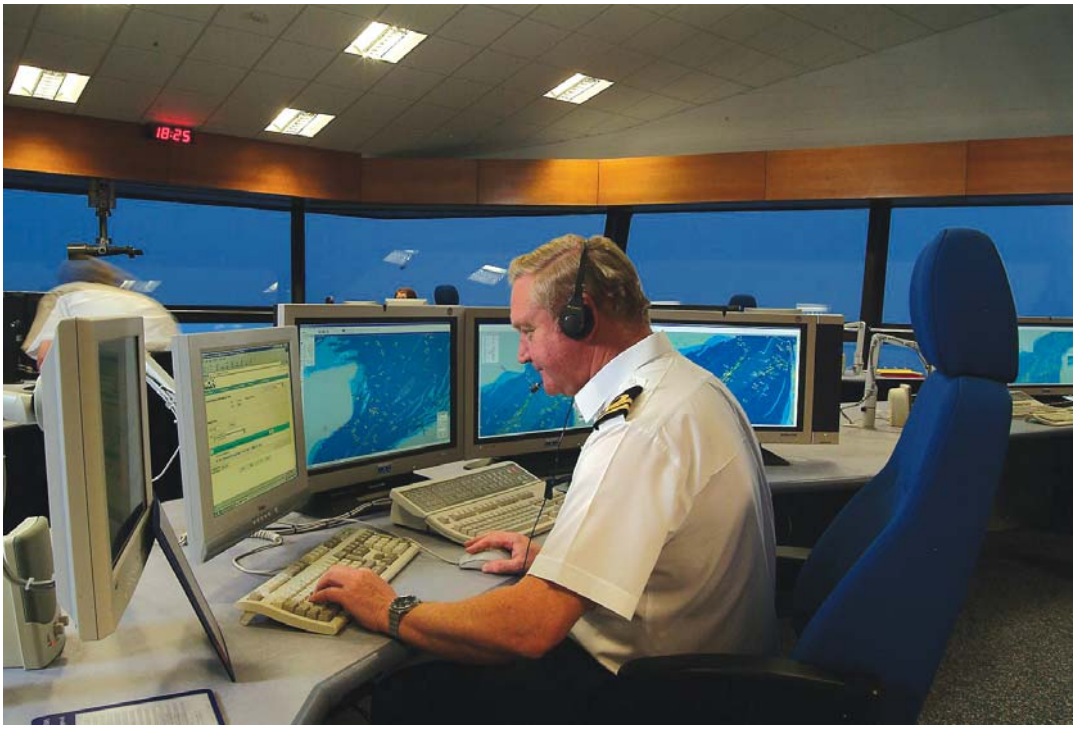


This modelled accumulation of AIS returns and tracks indicates the scope of the coverage that will be provided.

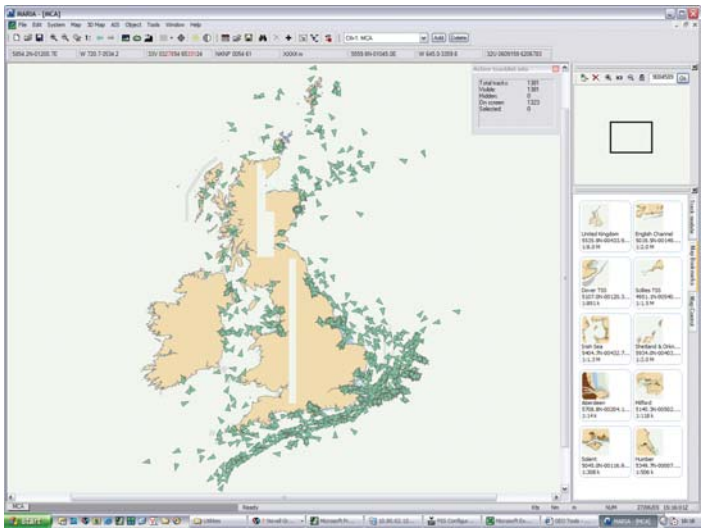
All standard AIS messages are supported, including Class A and Class B position reports, static data, safety and text messages, channel management, interrogations, mode assignments, navigation routes and VTS targets (where connected to a VTS system).

Varied data

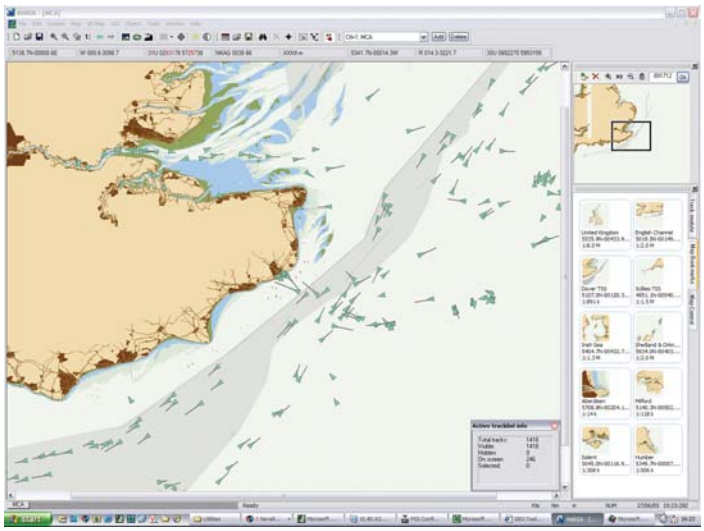
According to Findlay, operators will also be able to call up other images, ranging from



The VTS station at Dover is responsible for monitoring one of the world's busiest stretches of water



A heavy concentration of traffic in the English Channel, especially the Dover Strait, is evident from this screen shot



The traffic separation scheme off Dover is particularly busy with traversing and crossing traffic – one reason Dover was chosen as the main focus for the MCA's AIS networking trial

stored photographs and 3D views to processed satellite imagery. These can be of great assistance in a variety of tasks, from detecting Colreg contraventions to pollution control. A range of ancillary data, from radio and radar coverage predictions to tidal rates and directions, will also be available.

Operators will be able to display particular types of asset, navaids or SAR helicopters for instance, selectively as required. Any instances of information overload and consequent screen clutter can be addressed by reducing the reporting rate, while it will be possible to filter out Class B returns if necessary.

Guest adds that the operator workstation also permits seamless transition from sea to land and vice-versa, using sea charts and land maps that include Ordnance Survey detail and Digital Terrain Elevation Data (DTED). The MCA will be using these to complement its command and control system.

The MCA will receive a centralised AIS Service Management (ASM) solution at Spring Place in Southampton, facilitating the management of users and system resources plus the addition of new functions, without the need to visit physical installations.

Given the remote nature of some of the sites, this will be a particular benefit. The Agency's routing and filtering requirements were demanding and these can be set at port level using a Node Configuration Manager.

The MCA has deemed the AIS network mission critical, and an essential element of the solution is the fully integrated Health Monitoring System (HMS), which continuously monitors system performance and provides managers and network administrators with advanced health monitoring features.

The ability of the MCA's new system to store and retrieve AIS data and conduct statistical analyses is seen as increasingly important, particularly given the growth of port, coastal and offshore wind energy infrastructure and the future development of wave and tidal resources around the UK. To meet this requirement, a comprehensive suite of logging, replay and query facilities will be available.

By October this year, Norcontrol IT expects to have the full hardware infrastructure in place, and Spring '06 should find the system fully commissioned and accepted. Only then will the benefits of improved maritime domain awareness within United Kingdom waters become fully apparent.

Enhanced maritime domain awareness delivered by AIS will help both the MCA and VTS fulfil their responsibilities for busy waters like the Solent and approaches to the ports of Portsmouth and Southampton.