COSYS Combat Systems for Thai Navy OPV's

The COSYS system for the Royal Thai Navy

Bremen-based STN ATLAS Elektronik has been chosen by the Royal Thai Navy to supply COSYS combat systems for two new offshore patrol vessels due to enter service in 2006. The systems will form a major part of OPV combat suites which will be integrated and delivered to the vessel project prime contractor, China Shipbuilding Trading Company (CSTC), following an agreement between the two companies signed in Beijing last December.

The complete combat suites comprise an Alenia Marconi Systems RAN-30 X/1 surveillance radar, and an Oerlikon Contraves TMX/EO fire control radar system together with a weapon control module for a 76/62mm OTO Melara gun and a target designation sight. A Low Probability of Intercept (LPI) radar will additionally provide the OPV's with a stealth feature for covert operations while supplementary systems include a Raytheon Marine Systems integrated navigation system and integrated communications from Rohde & Schwarz.

The COSYS combat system is based on an ARGOS combat management system. It basically consists of three multi-function consoles and is similar in format to systems currently in production for OPV's ordered by the Royal Malaysian Navy. Utilising state-of-the-art technologies, the versatile system features scalable architecture allowing simple adoption of specific user-designated sensor and weapons suite configurations aboard patrol boats, frigates and other naval-type vessels.

CMiles middle-ware

A key feature of COSYS system architecture also is CMiles middle-ware, an internet-type infrastructure capable of integrating differing generations of hardware, operating systems and software languages which can be configured automatically, online. Similarly, human machine interface (HMI) software, consisting of layout, text, language and interaction, is independent of that used for tactical applications and can be configured accordingly.

Major supplier

The Thai Navy OPV contract, which was won against strong international competition over some two years, further consolidates STN ATLAS Elektronik's role as a major supplier of combat systems for naval vessels. According to the Company, its close collaboration with China Shipbuilding Trading Company also marks a significant stage in the development and implementation of multi-national projects involving leading Asian sectors of industry.

New Command Trainer for German 212A-Class Subs

A new advanced Submarine Command Team Trainer (SCTT) designed by STN ATLAS Elektronik's Simulation Division has been installed at the German Navy' Submarine Training Centre at Eckernförde on the Baltic Coast. Designed for training of crews of the Navy's new U212A-class submarines being completed at the Nordseewerke Emden (formerly TNSW) yard, the simulator has been formally handed over by representatives of HDW in its capacity as prime contractor for the German Ministry of Defence's ARGE U212 project. Prior to handover, the simulator had already been used for some 18 months for testing of integration and interfacing requirements for a new combat system in advance of its installation aboard the first U212A submarine.

The SCTT will henceforth provide comprehensive specialist operating and maintenance training for submarine sonar equipment as well as for the basic command and weapons control system and combat information centre (CIC) teams.

The three-section system basically comprises a central control room with auditorium, instructor stations, slave and large-screen displays for briefing and debriefing; an electronics room housing main simulation facilities and a CIC consisting of both original and replica equipment.

Real-time simulation of original equipment functions covers those for DBQS-40 sonars, basic command and weapons control systems, central operation consoles, navigation plotting and internal communications. Additionally, performance characteristics of replica periscope, steering stand, electronic warfare support and DM2 A4 torpedoes will also be sim-

ulated while taking into account a wide range of selectable environmental and target conditions. Providing core functions for the complete trainer assembly is a decentralised Ethernet-linked computer system for generation, monitoring and control of exercise scenarios involving own-submarine and all other moving targets. Exercises

are recordable for replay in part or whole for subsequent evaluation via main screen displays. A similar SCTT facility is currently being developed for delivery to the Italian Navy in 2003.

Technical Information:

The new SCTT will be used to train the crews of the submarines in the following areas:
- Specialist military operating and maintenance training on the sonar equipment and on the Basic Command and Weapons Control System (BASIC CWCS / Basis-FüWES).
- Operational training and proficiency training of the Combat Information Centre team (CIC team).

The Trainer is divided into three sections:
- Control room with auditorium, operating and monitoring station for the instructors, slave displays of the CIC equipment units, and large screen displays for briefing / debriefing.
- Electronics room with the simulation units.
- Replica of the CIC of a 212A Class submarine with original equipment and replicas original equipment.

The individual simulation units stimulate the following real units of original equipment in real time:
- Sonar System DBQS-40
- Basic Command and Weapons Control System
- Central Operation Console
- Navigation Plotting Table
- Reduced Intercom System

In addition they simulate the following replica units of equipment:

- Periscope
- Steering Stand
- Electronic Warfare Support Equipment FL 1800 U
- Torpedo DM 2 A4
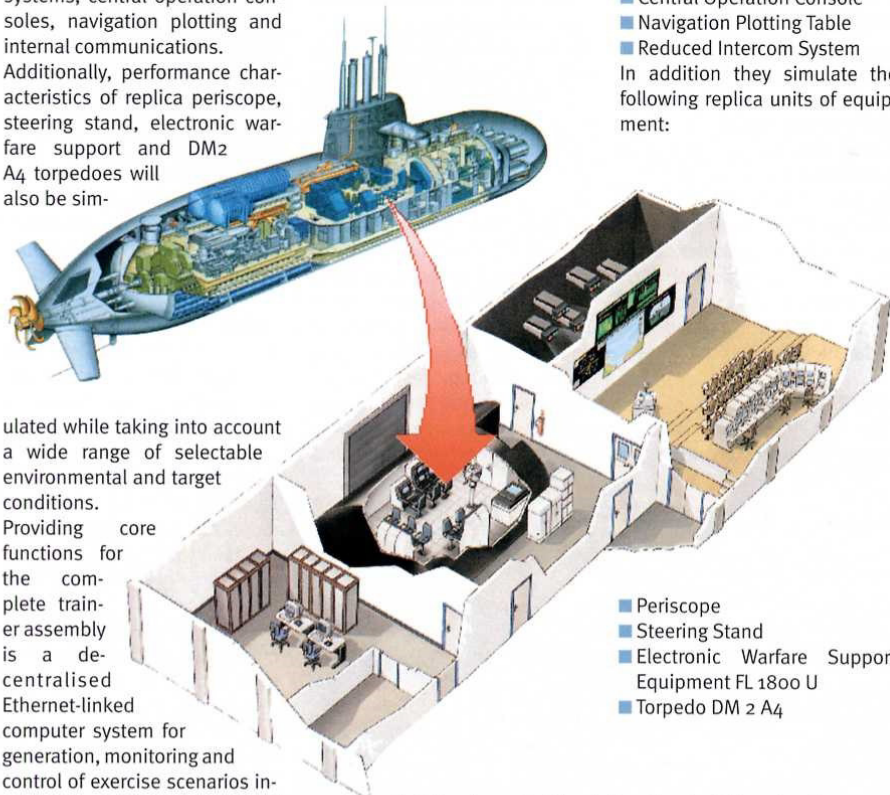
Building Layout of the Italian Navy's Submarine Command Team Trainer

CMiles – The Middleware On Cutting Edge of the IT

STN ATLAS Elektronik GmbH introduces new communication platform for Naval Combat Management Systems based on open standards

CMS Applications

Common Middleware Infrastructure Libraries Environment & Services — High Level Services

Real Time Publish&Subscribe | Real Time Fault Tolerance | Real Time Quality of Service — Low Level Services

Runtime Application Re-configuration | Application Development Utilities Toolkit

Standard CORBA

Challenges of the new world

Following the geopolitical changes in the last decade of the 20th century the possible conflict scenarios have changed radically. The world wide conflict between two large blocks currently seams unlikely. However new kinds of threads are emerging. Both the asymmetric conflicts and war on terrorism have to be faced. The notion of collateral damage imposes additional pressure on politics in democratic countries. The defense forces have to face these new challenges. This includes the entire spectrum of means like preparing for joint operations in multi-national coalitions, restructuring of services, developing new operational procedures and new weapon systems.

Dr. Zbigniew Marciniak

In the world of modern arms Information Technology (IT) holds the crucial position. It is obvious that one particular IT area has the biggest significance: the software communication infrastructure. This is true both in large scale, strategic systems as well as in tactical and operational, real time Combat Management Systems (CMS). This communication infrastructure is commonly named *the middleware*.

STN ATLAS response

Our company has developed and is deploying the most modern middleware in its naval systems. It is reffered to as the Common Middleware Infrastructure Libraries Environment and Services – CMiles ['si: mails] – which both expresses its maritime heritage and addresses the main application area: the real time and mission critical naval CMS.

Commenting on the impact of the CMiles on the CMS development Dr. Zbigniew Marciniak,

the head of the CORBA competence center and responsible for CMiles development points out: "CMiles turned out to be an important driving force in introducing open standards to the software development process in our company. That's great! However we have to see this in a much larger context. Our services will in future operate in coalitions. Information exchange needs between allied CMS will explode. The importance of the communication infrastructure will rapidly increase. The use of open standards will become essential and will determine the success on the market. CMiles is our solution. We apply vendor independent standards commonly used in civil real time and mission critical systems (e.g. air traffic control, banking, and medical systems). I believe offer our customers the best possible system flexibility together with optimal investment security".

Sea miles mean CMiles

CMiles is a CORBA based communication infrastructure. It is composed of modules and consists of several distinct services and libraries. The CMiles services offer full functionality for the CMS administration. The libraries belong to particular services and hide the specific details behind an API.

CMiles is generally divided into two logical layers:

- Low Level Services
- High Level Services

The low level services basically offer real time data distribution and replication for CMS applications. The applications use the services actively, i.e. link their libraries and call their API functions.

The high level services offer their functionality out-of-the-box. They can be used by the CMS applications with no or with very little effort.

The service levels consist of the following components:

Low level services

- SoDoLib provides interfaces to an application to allow the system monitor and application manager to control this application.
- Real Time Notification Service distributes the information between different objects in distributed applications. It implements the Publish & Subscribe design pattern.
- Real Time Fault Tolerance Serv-

ice ensures system availability via object replication. It implements the open OMG standard "Fault Tolerant CORBA".

- Reliable Naming Service is a redundant Naming Service with consistent state enforcement. RNS implements the open OMG standard Naming Service specification with internal (i. e. transparent for the user) fault tolerance funtionality.
- Real Time Quality of Service is a class library for the definition and control of various real time policies.

High level services

- User Manager manages the users of the CMS.
- Role Manager manages user Roles within the CMS.
- World Management allow parallel operation of software components in different modes e.g. operational mode, simulated mode, and replay mode.
- Application Manager is responsible for the runtime management of the entire CMS. It defines applications in the CMS, GUI properties for each application depending on the Role etc.
- Information Manager provides the system user with the management mechanisms for the system information (alarms, alerts, warnings, information)
- System Monitor monitors continuously the state of the CMS hardware and software components. It includes built
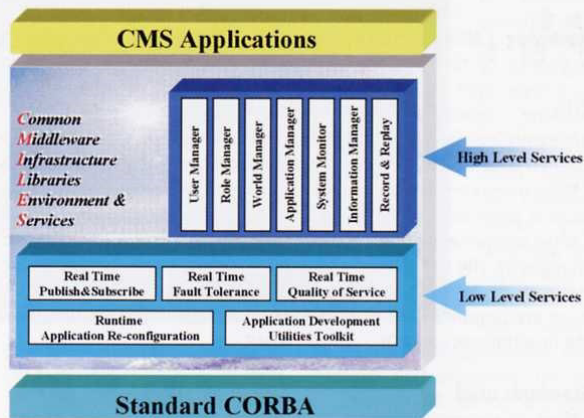
in test environment.

- Data Logging & Replay records and replays data in the CMS

Explicitly for Real Time

CMiles is explicitly addressed for real time combat management system applications. The Real Time Notification Service (RTNS), Real Time Fault Tolerance Service (RTFTS), Reliable Naming Service (RNS), and Real Time Quality of Service (RTQoS) form the CMiles core.

For example sensor data are distributed with high frequency from sensors to tactical applications using high performance RTNS. The throughput of this publish-and-subscribe service corresponds to many thousand sensor tracks per second.

System tracks are processed in parallel in redundant tactical applications using the RTFTS. The replication of track information ensures system availability.

The CMS system availability requires also RNS and RTQoS.

All these mechanisms are CMiles components and can be used in the CMS applications.

Customers new freedom

CMiles is modular and configurable. The CMiles services are independent from each other. They are implemented as a loosely coupled distributed sys-

tem. Therefore customers may select required parts and put them together according to their special needs.

From the business point of view the most important CMiles objective is to offer the customer maximum freedom in its CMS system design, development, configuration and maintenance in order to minimize the customer's TCO.

For this reason the CMiles design is purely interface-oriented. The services are described by their CORBA interfaces and they communicate only via these interfaces. The CMiles interfaces hide the implementation details completely so the CMiles services are "black boxes" for other CMS components. CMiles does not impose any specific and proprietary programming paradigm as is the case with the old all-in-one solutions existing on the market. Both features ensure the independence of CMS applications which permits the reuse and replacement of entire application – the tactical applications become portable!

CMiles provides also separation between Graphical User Interfaces (GUI) and its services. The CMiles front-ends follow the thin-client philosophy and can be easily adopted to particular project needs or replaced by GUI developed by other vendors.

COSYS-Combat Management System (CMS)

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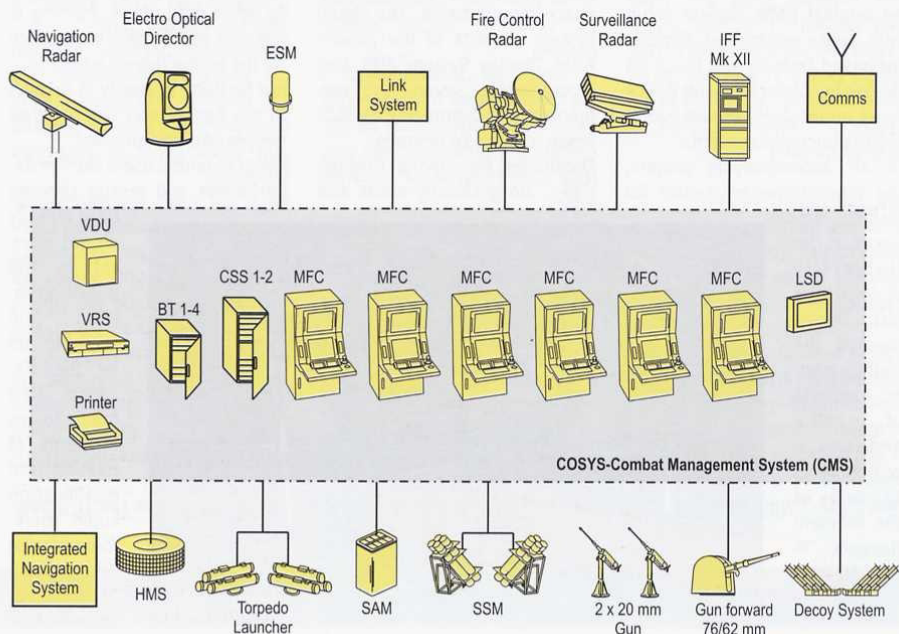
Deploying CMiles ensures the openness of the CMS. CMiles is independent from hardware platform, operating systems, programming languages, user defined data structures etc. CMiles users can at anytime add tactical applications which use CMiles components without any changes in the middleware infrastructure. No CMiles adaptations are required. This secures the investments and ROI.

Standards used

CMiles is completely based on open standards. According to the Model Driven Archtecture (MDA) CMiles has been designed in Unified Modeling Language (UML). The software itself has been largely generated from the UML platform independent models. The entire inter-process communication is based on Common Object Request Broker Architecture (CORBA) standard Internet Inter-ORB Protocol (IIOP). Interfaces to the CMiles services are defined in the standardized Interface Definition Language (IDL). The component configurations are provided in Extensible Markup Language (XML) files.

Of course all CMiles services can be used from C++, Ada95 and Java applications.

Fast to build

CMiles speeds up the system development dramatically. Interfaces are modeled in UML and the models are available. Engineers can focus purely on the tactical functions of their CMS applications. The entire network communication tasks are automatically covered by CMiles. CMiles low level services provide real time behavior to the CMS.

High level services are ready-to-use applications which are configured to the customers needs. For configuration purposes XML is used. No programming is needed.

Dr. Marciniak recalls experiences from 2001: "We were able to connect our CMiles RTNS to F124 German Navy Frigate consoles which were not designed for this at all. Further we were also able to distribute tracks from Sun Solaris servers with a proprietary middleware used in F124 via RTNS to the consoles on DEC Alphas and on Windows-based PCs.

We did this job in two weeks with five man-weeks effort! For this kind of work usually many months were estimated. CMiles is indeed a quantum jump in the middleware area."

STN ATLAS drives the IT Standards

The IT competence of STN ATLAS Elektronik GmbH allows the company to drive software standardization processes in the area of defense systems.

STN ATLAS Elektronik GmbH has been a member of the Object Management Group (OMG) for many years. The company's representatives track and influence the OMG standardization processes.

The company is in particular involved in the military oriented C4I Domain Task Force and in the Real-time, Embedded, and Specialized Systems Platform Task Force of the OMG.

Currently STN ATLAS Elektronik GmbH is leading the work on the Generic Sonar Interface standard.

CMiles references

STN ATLAS Elektronik GmbH applies CMiles in a number of current naval projects.

CMiles is the basic communication infrastructure in the COSYS 110 for Royal Malaysian Navy. CMiles is also used in integrated mine countermeasure systems for Royal Dutch Navy (IMCMS) and for Germany Navy (MJ2000). Parts of CMiles are used in the

RAM-HAS, a project of CMS upgrades on German Navy frigates and speed boats. CMiles components are also used in a number of other projects e.g. in the Submarine Combat Management System ISUS 90 simulator Sim90, in the low frequency towed array sonar LFTAS project, and in the active sonar ASO project.

CMiles future development

In the non real time areas (CMS intranet) the CMiles services will also be accessible as Web Services. The Web Services Definition Language (WSDL) interface description allows to connect additional components via Simple Object Access Protocol (SOAP) protocol.

In the next CMiles Versions more security related aspects will be covered e.g. SSL, X.509 protocols.

Support of other operating systems will be provided on demand.

The Object Management Group (OMG) is a standardization organization for object-oriented distributed software systems. It gathers about half thousand corporations, universities and governmental organizations. OMG has established such well know standards like (UML), Model Driven Architecture (MDA), Common Object Request Broker Architecture (CORBA), and (IIOP).

OMG has a number of Task Forces whereas one of them – C4I – deals explicitly with defense systems.

STN ATLAS Elektronik GmbH is contributing member of the OMG and directly involved in the C4I work.

Airbus places major cargo loading system order with STN ATLAS

The new Airbus A380 also symbolizes an important step into the future for the supplier industry. Approximately 700 such aircraft are to be built and sold between 2006 and 2021, with firm orders for 103 aircraft already on the Airbus order book. This means that suppliers can anticipate a significant workload over a longer period of time. Bremen-based STN ATLAS has secured the order for the electrical part of the lower deck cargo loading system. Related turnover with be in the order of a three-digit figure in million euros.

The new Airbus A380 represents a new dimension in the aircraft industry. The basic A380-800 version which will be superior to any competitor models in terms of noise development and fuel consumption will already be able to transport 555 passengers. More than 400 aircraft of this basic version are planned; additionally there will be further variants of the A380 as passenger aircraft and an A380-F freighter version.

All of the aircraft have to be equipped with a cargo loading system which meets all the relevant electrical and mechanical requirements regarding ease of handling, reliability and durability in service. Airbus has chosen to continue the proven, long-

standing cooperation with the flight systems unit of STN ATLAS Elektronik GmbH, a licensed manufacturer and supplier of aeronautical products with its headquarters in Bremen.

In parallel with preparations for the maiden flight of the A380 in November 2004 and delivery of the first aircraft to the customer in March 2006, our company has launched related cargo loading system activities in Bremen. The aeronautical specialists of STN ATLAS in Bremen are also widely known to experts for their know-how in the field of military unmanned air vehicles (UAVs). The major order from Airbus has given additional momentum to the non-military activities of this part of the company.

Flashing lights and sirens

Assignments with special signals and special rights present a particular challenge to policemen and policewomen in their patrol cars, involving a high stress and risk potential. Driving a car with the siren and flashing lights switched on needs a lot of practice. For a new way of training a traffic training simulation system was officially handed over to the Bavarian alert police forces on 22 January 2003 at Sulzbach-Rosenberg.

The Bavarian alert police has started to improve its training. To this end, a traffic training simulator with several satellite learning stations was already taken into operation in October 2002 by the 7th alert police department at Sulzbach-Rosenberg.

The police simulator includes an original BMW vehicle cabin with police equipment. Simulator-based training will focus on driving in connection with police tasks under stress during (simulated) police assignments.

In an accompanying project, the interdisciplinary center for traffic sciences at the University of Würzburg has implemented the traffic related aspects of police and special assignments as well as the inherent dangers in a training concept so that in future trained

police forces will have acquired some experience in dealing with difficult traffic situations even before they actually have their first assignment.

Amongst other things, the simulator is distinguished by a motion system with lateral attachment points and minimal space requirements. The visual system consists of the proven Atlas Display System ADS 400 incorporating seven 30° elements and guaranteeing a visual range of 210 x 40 degrees.

Databases for driving through cities, along country roads and

motorways under different environmental conditions (day, night, fog, ice etc.) are available with further functions to cover typical scenarios arising when performing emergency assignments. Special training can be carried out to learn adequate reaction in case of wrong behavior by other road users. Training is possible now to gain experience for the young drivers which cannot be done in reality in respect to the danger and risk to other people and environment.

Other potential users like fire departments and rescue services have already shown interest in the police simulator. The example set by the Bavarian alert police forces in terms of training and qualification could therefore prompt other institutions to follow suit.

The new traffic training simulator for the Bavarian police