Case Study
NavyStar Project

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INTEGRATING TECHNOLOGY

ICL and Blazepoint NavyStar Team

Blazepoint and ICL worked closely throughout the bid phase of the NavyStar Project. The solution offered by the ICL Team to the MoD drew on the expertise and experiences of ICL, in terms of systems integration and IT infrastructure and Blazepoint, in terms of IT ruggedisation in extended environments.

On the award of the NavyStar contract Blazepoint undertook the task of designing mounting systems for the IT hardware, which included the pc workstations, tft screens, workgroup printers, line printers and hubs. The basis of the ruggedisation for the project was the requirement to be highly compact, flexible, ergonomic and meet stringent standards in an unusual operating environment.

The following criteria were taken into consideration during the project:

- Available desk space
- Access and connectivity
- Proximity to other equipment and structures
- Health and safety restrictions
- Shock in Zone A, B & C, D and RFA
- The installation environment
- Use of unmodified COTS equipment
- Time critical installation program

All the equipment was put through extensive testing using DERA's test facility at Rosyth. Drew Selwood (Head of Design) of Blazepoint said: "Due to the short time scales the key issues were to agree the design on paper with ICL and MoD and pass shock tests first time". This was achieved and all the mounting systems passed the initial tests of 30g and went on to pass the 70g test without the use of shock mounts. Thus removing the requirement for "x" mounts in certain locations and further reducing the space envelope and weight. The reduction of unit weight calculated across the installation base has a beneficial effect for naval ships, especially submarines, where weight and space are critical factors.

Having passed the testing and design reviews the first production units were manufactured and installed in a very short space of time meeting the tight refit schedule. Blazepoint and ICL had regular review meetings with the MoD to improve the products even further as additional requirements and requests were fed back from the users. Demand has increased due to the small footprint, much improved processing power and functionality of the workstations. The workstation and tft is smaller than the old display previously installed.

Blazepoint and ICL will continue to work closely together in partnership throughout this 5-year contract to supply the optimum solution to the MoD in this ever changing and progressive world. Blazepoint will continue to produce on average 150-200 units per month for the NavyStar Project.

Making Waves

Cover Story in New Electronics, 13th March 2001

A coherent IT platform providing office automation software and email has radically changed life aboard Royal navy ships (by Louise Joselyn)

Updating IT systems can be a headache for any company, but consider the issues involved with a fleet of 103 ships which are only accessible during major refits every five, seven or even 10 years. Add to this the need for ruggedised, highly compact equipment meeting stringent emc standards and fitted swiftly in an unusual operating environment. The Royal Navy began the epic task of deploying a single coherent IT structure for non operational shipboard systems in 1997 and expects the programme to be completed in 2009. Known as the Naval Sector Strategic Architecture and implemented by Project NavyStar, the initiative involves the installation of commercial off the shelf (COTS)hardware and software, providing a Microsoft based office automation environment.

Most ships already have some basic IT systems for administration, ranging from a single pc bolted to a desk and supplemented by laptops, to small lans or pc clusters.

Alan Habgood, Project Manager, ICL and
Chris Arnott, Business Development Manager
Government & Defence, Blazepoint

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The Strategic Defence Review resulted in a reshaping of the MoD's approach to logistics and NavyStar is now a key element of the new Defence Information Infrastructure (DII) Integrated Project Team, which itself is part of the Defence Communications Services Agency.

DII is tasked to provide a single coherent infrastructure for desktops and lans throughout the MoD. NavyStar is already installed in 35 ships, with another 15 to 20 expected to be completed this year. While the NavyStar team is keen to accelerate the programme, it is constrained by the refit schedules of the ships and by resources.

Mike Woodward, NavyStar project manager, is based at the Defence Logistics Organisation headquarters near Bath. "Installation has to be planned carefully and can only be achieved when the ship is in for a major refit. Yet we have to be flexible enough to move quickly, fitting in with a complex process. We cannot disrupt the ship's operational schedule. If we cannot complete the installation before it is due to sail, we cannot install it at all."

NavyStar is built around rack mounted servers running NT on deskstations and supporting Microsoft Office, Exchange and Outlook. Terminal emulation is provided to link to other legacy strategic applications – engineering, logistics and stores, for example.

The first systems installed were Hewlett-Packard pcs with 133MHz Pentium processors running Windows NT 3.51 and equipped with 14in crts. This year, Compaq 700MHz Pentium IIIs pcs running NT4 are being installed, with flat screen displays as standard.

Server cabinets, too, have seen a significant advance. A small cabinet containing four servers, each with three 9Gbyte disks, has been replaced with a cabinet containing up to seven servers, each with twin 36Gbyte disks and a drop down flat screen. There is still cabinet space for further storage for upcoming electronic documentation applications.

Alan Habgood,
Project Manager, ICL

"Blazepoint went beyond all expectations despite constant changes to the demanding user requirements and delivered on time and within budget."

Lan technology has moved from 100Mbit/s FDDI to 1000BaseSX Ethernet, providing 1Gbit/s performance over the backbone fibre optic cabling and 100Mbit/s over copper cabling to the desktop. One of the first ships to benefit from this latest technology will be aircraft carrier HMS Ark Royal.

Most warships have two server cabinets, though space restrictions mean smaller vessels, such as submarines and Royal Fleet Auxiliary ships, are limited to one. Increased server capacity is particularly welcomed, especially as usage of NavyStar has escalated fast.

Some of the early installations are already being retrofitted with the newer technology where possible. "Keeping on top of the technology and managing obsolescence is a major headace for the project," Woodward noted.

Installation

David Price, NavyStar's ship installations manager, emphasised the Navy now has extensive experience in installing COTS equipment that will survive in a military environment. One of his biggest challenges is balancing crew safety with the survival of the equipment.

"Equipment has to be tested to very stringent shock standards," price explained. The Navy uses DERA's Rosyth test facility to test equipment at up to 200g; simulating the pressure wave from a bomb hitting the water close to the ship. "We need to see what will happen to the equipment under these conditions," he said. In many cases, the crew's safety is more important than the survival of the equipment. "A crt that shatters can be a liability and a loose deskstation becomes a missile in a confined space," Price highlighted.

NavyStar IT servers, for example, are housed in specially mounted ruggedised cabinets that convert 200g to 12g. "If equipment doesn't meet our criteria, it can't be installed on board: it's as simple as that."

Price continued: "A ship generates a massive amount of rf and microwave emissions: any equipment has to survive this. But, more importantly, it must not interfere with it." All electronic systems are tested to the highest emc standards. Failing equipment is either modified until it passes or is replaced. Recently, a printer had to be removed from the list of acceptable equipment due to excessive rf emissions.

Acoustic noise can be a problem too. "A particularly noisy system, such as a daisywheel printer, can be detected easily by highly sensitive ship board sonar systems, which is totally unacceptable," Price commented.

NavyStar

David Price
NavyStar's Ship Installation Manager

"By passing the 70g stock tests without the use of 'x' mounts Blazepoint products reduce approximately 10 tonnes of deadweight from a typical submarine."

Health & Safety regulations apply on board ship, although there are some necessary exclusions when operating in a wartime environment. "A pc screen needs to be solidly secured to survive in rough seas, yet needs to be adjustable for the comfort of the user. But our biggest issue is space: we simply don't have enough space to comply with all the ergonomic recommendations."

Before NavyStar was installed, crew members rarely spent much time in front of a pc screen, but now these considerations have to be taken into account. Price has to ensure that equipment will continue to operate in harsh conditions, including extremes of climate, temperature, humidity and exposure to ozone. At the same time, Price has to consider the effects of fire on board ship. "We insist on low fire hazard fibre optic cable as this produces less noxious fumes in the case of fire." However, the sheathed cable is not only expensive, but is also bulky, which has meant the sourcing of special connectors in many cases.

Installing NavyStar equipment has created its own set of challenges. The server cabinets may be located in the storage office or a recreation room. Tracing cabling through bulkheads has proved especially tricky. "You can't simply drill a hole through a water or gas tight bulkhead," Price said. Gas tight bulkheads are penetrated with a tube which contains the cabling. The tube is then filled with a mastic type plastic filler to generate a seal. Submarine bulkheads are more problematic as they are much thicker and need specially designed pentrators. Fibre optic cable tends not to be used through the whole of the submarine as experience has shown that radiation clouds the glass. These technical quality issues mean that, in many cases, the problem has been avoided, rather than solved.

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Early installations

Early network installations were based on a fibre distributed data interface ring, but, says Chris Osment, technical manager, the commercial world has moved on. "We are now replacing this with an Ethernet mesh in most cases. Smaller vessels, such as minehunters, are installed with a central hub and spurs radiating, while submarines cause special problems because of the need to minimise the penetration of watertight bulkheads."

Roger Pullen, Technical Manager, ICL and
Drew Selwood, Head of Design, Blazepoint

Osment pointed out the main difference between networking a ship and a building. With a building, it is convenient to locate clusters of hubs in racks, say, on every floor. On board ship, this is impossible because of space considerations. "An aircraft carrier may have up to 30 hubs, individually located wherever convenient, and each at half capacity because cable runs are limited. But this does give us room for growth," he added.

Each ship's network has extra cables for redundancy and potential expansion. There are more access points than there are deskstations; which allows portable terminals to be plugged in where required: for engineering tasks, for example.

Day to day support of NavyStar means ships have to carry spares of essential equipment, such as network hubs. Crew members have had to be trained in hardware and software systems support, supplementary to their primary roles. NavyStar training courses are now established and are popular, reflecting a shift towards greater IT skills on board ship. A shore based help desk is on hand at all times and hardware/software engineering support teams are familiar with every component of all versions of shipboard systems.

Applications

The primary applications initially envisaged for the shipboard IT systems were for strategic applications, such as stores administration, engineering applications and access to personnel records, medical records and reporting tools: Officers would use the systems for personnel assessments, report writing and other general administration tasks while at sea.

However, since the first systems were installed, their usage has escalated, with a myriad new applications emerging that were simply not feasible before until a coherent platform became available. The Bath based NavyStar team is kept busy ensuring all new applications are approved before they are installed.

The expansion in planned usage has occurred in parallel with ship/shore email becoming available for the first time. NavyStar links via shipboard satellite communications (Inmarsat) to the shore based NavyNet system, which itself links to MoD's secure network and on to other service networks and out to the world wide web. Extensive use of encryption and other security devices ensures the integrity of voice and data across all the networks and their interconnects.

Roger Pullen,
Technical Manager, ICL

"We selected Blazepoint as our rugged solution provider because of their knowledge, experience and reputation in the defence peripherals market."

Improving morale

"Ships are becoming increasingly reliant on NavyStar for day to day business applications," Woodward confirmed. However, probably the most extensive unplanned use of NavyStar, is email between the ship's crew while at sea, and family and friends. Ship/shore link manager Geoff Howell admitted: "Family mail has increased email usage fourfold, but this has been swiftly welcomed as a major benefit, with an incredibly positive impact on the morale of the crew and officers. Every crew member has an email address, although access to the system is limited to the 30 or 40 pc terminals available on board.

NavyStar is essentially an enhancement programme. Next generation Naval weapons platforms, such as the Type 45 Frigate, will be designed with an integral IT system for non operational applications. However, the NavyStar team continues to work on technology updates, including the management of electronic documentation of all ships systems, a ship based intranet and the integration of more portable data I/O devices.

John Cundy,
Consultant, MoD Catalogue Operations, ICL

"Blazepoint's pro active approach to the working partnership through regular communication and reviews resulted in the optimum solution at good value for money."

The NavyStar team is delighted to see the instant acceptance of the new IT systems. On Type 42 Destroyer HMS Cardiff – the first ship to be fitted with NavyStar - David Price, ship installation manager, noted: "Three days after the installation, I toured the ship at about 9pm and found all network deskstations in use by the crew: some were emailing friends and family, some were writing orders!"

Despite the enormity of the programme, Woodward maintains NavyStar is not only on schedule, but within budget and the customer – the Navy – wants more. How many IT upgrade projects can claim that?

NavyStar vertical workstation and tft

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