

CASE STUDY: Naval Undersea Warfare Center (NUWC)



KEY BENEFITS

- Enhanced quality of testing
- Shorter development schedules
- Lower development costs
- Ability to preview and post-run expensive in-water exercises
- Ability to synthetically recreate any environment in the world with the appropriate threats and real-world features

Working within a synthetic, simulated environment offers significant savings and reduces the time needed to get new capabilities to the fleet.

The Navy's Torpedoes Better Targeted Using iHawk™ Real-Time Simulation

Film buffs who remember *The Hunt for Red October* were thrilled by scenes of a rogue Soviet submarine as it evaded torpedoes by maneuvering through underwater canyons. The *Red October* may not have been so lucky if its hunters had the resources of today's U.S. Navy.

The Challenge: New Technologies and Next-generation Weapons

"The challenge for the Navy's research and development community is not only to improve the current generation of torpedoes but also to exploit new technologies for the next generation of underwater weapons. Using speed, stealth, and new engagement concepts, the modern torpedo – and other weapons that evolve from it – will continue to provide the capabilities needed to maintain a distinct advantage over our enemies."¹

The Solution: The Naval Undersea Warfare Center (NUWC) and Concurrent Real-Time

Right now, submarines like the USS *Oklahoma City* are using a digital network established by the Weapons Analysis Facility (WAF) of the NUWC in Newport, Rhode Island, to hone in on their targets and plot their own evasive actions. With the help of Concurrent Real-Time, they're doing it better, faster, safer and more efficiently using iHawk computer systems running RedHawk™ Linux®. You might say that *Red October* has yielded to RedHawk.

Synthetic Environment Meets Ocean Depths

While some testing of torpedoes still occurs in water – with vast areas being cleared of possible human and animal interaction – today's Navy also relies on hardware-in-the-loop (HIL) simulation systems in the WAF to develop, test and create tactics for new weapon systems. Working within a synthetic, simulated environment offers significant savings and reduces the time needed to get new capabilities to the fleet. The Navy and many private sector clients embrace HIL simulation for many reasons, including:

- Enhanced quality of testing, especially in creating and re-creating failure scenarios
- Shorter development schedules
- Elimination of prohibitive costs that are typical in weapons development
- Ability to preview and post-run expensive in-water exercises
- Ability to synthetically recreate any environment in the world with the appropriate threats and real-world undersea features

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**SOLUTION CHOSEN BY
NAVAL UNDERSEA
WARFARE CENTER (NUWC)**

- ☛ Concurrent RedHawk™ Linux real-time operating system
- ☛ Concurrent's iHawk host system
- ☛ Concurrent NightStar integrated debugging and analysis tool set

Using Concurrent Real-time solutions, submarines, such as those on the USS Oklahoma City, experience more accurate simulations even in the most complex scenarios featuring multiple weapons and targets.

In a previous HIL/MIL project, the *Oklahoma City* patrolled the clear waters of the Bahamas and launched 'virtual torpedoes' at designated 'targets.' The virtual torpedo launched was actually real, WAF-based torpedo hardware stimulated to engage the synthetic environment and targets. Feedback to the *Oklahoma City* was sent from the WAF through the land-based Synthetic Environment Tactical Integration network. To the *Oklahoma City*, there was no difference from a real-life scenario, including the capability to control the torpedo and receive real-time feedback.

Results: More Effective Weapons Systems with Lower Development Costs and Faster Deployment

Today, approximately two dozen Concurrent iHawk computers are running RedHawk Linux and utilizing Concurrent NightStar™ real-time development tools. These solutions provide the simulation platforms needed by the WAF to develop the applications to test the latest torpedo software and hardware in real-time.

Like exacting users in related industries, the Navy requires the guaranteed real-time latency (i.e. response to an external event in less than 15 microseconds) and repeatable, deterministic performance offered by the RedHawk Linux-powered iHawks. The Navy's complex simulations also take advantage of RedHawk's real-time optimization of the latest NVIDIA® graphics and CUDA® card drivers.

Value Add: High Performance Computing

The Navy's WAF leverages the use of GPU programming on iHawk graphics cards to perform digital signal processing in real-time. In essence, lower-priced graphic cards become powerful co-processors – the paradigm of today's high-performance computing (HPC). In fact, Concurrent's RedHawk Linux is unique in its ability to support real-time programming and GPU processing simultaneously.

The "Bottom" Line

Using Concurrent Real-time solutions, submariners, such as those on the USS *Oklahoma City*, experience more accurate simulations even in the most complex scenarios featuring multiple weapons and targets. This simulation results in more-effective weapons systems with lower development costs and faster deployment.

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LEARN MORE

about Concurrent's
award-winning
Linux solutions:
Visit real-time.ccur.com
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Or call 800.666.4544

About Concurrent

Concurrent Real-Time is one of the industry's foremost providers of high-performance real-time Linux computer systems, solutions and software for commercial and government markets worldwide. Concurrent has deployed and supported thousands of multi-core solutions for the most demanding of mission-critical applications for over four decades. These applications include hardware-in-the-loop and man-in-the-loop simulation; data acquisition; and process control in the aerospace, defense, automotive, medical, energy, transportation and financial industries. The company's products include the RedHawk Linux real-time operating system with guaranteed response; NightStar tools for advanced Linux debugging and analysis; and application-specific tools for simulation and testing.



When you need guaranteed response time, you need Concurrent Real-Time for your mission-critical applications. Schedule an online demo today.

¹ Source: http://www.navy.mil/navydata/cno/n87/usw/issue_14/torpedoes.html

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