CASE STUDIES OF MAPUSOFT SOLUTIONS

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Defense and Mil-Aero Industry Segment

Telecom & Networking

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Continental Automotive

BACKGROUND

Continental Automotive, commonly known as Continental, is a leading German automotive manufacturing company specializing in tires, brake systems, automotive safety, power train and chassis components, tachographs, and other parts for the automotive and transportation industries.

PROJECT

Continental was developing a next generation Multimedia Entry systems (without Navigation) on cars for one of their Japanese automotive client. Since μITRON is the predominant standard used across most of the Japanese industries, the client developed application based on μITRON interface standard for Renesas target platform. As a part of their Windows/.NET based test platform, Continental wanted to run the μITRON application natively on their test platform with hooks connected to various other window's based test tools. The μITRON simulators available from Renesas neither works under .NET framework nor integrated with other native windows test tools, hence MapuSoft solution was selected.

PRODUCT

micro-ITRON
⦰S **SIMULATOR**

μITRON OS Simulator on Windows/.NET framework for μITRON application development, simulation and testing on host.

SOLUTION

With MapuSoft's μITRON OS Simulator, Continental was immediately able to start their application development on a host (Windows), integrate applications for simulation and testing and was able to integrate with various automated test tools that were available on the native Windows platform.

Green Intelligent Transportation System

BACKGROUND

Green Intelligent Transportation Systems (Green-ITS) is a world class research program sponsored by Ontario Research Fund, focused on addressing serious environmental and safety concerns through an integrative approach that encompasses the entire automotive transportation paradigm in Canada. Green-ITS is a highly collaborative effort initiated thru University of Waterloo, University of Toronto in partnership with various industry experts.
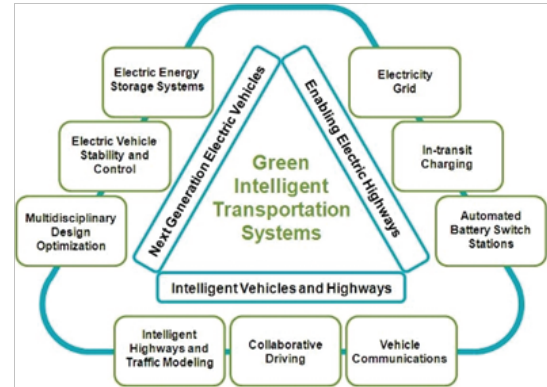
PROJECT

MapuSoft offered its products and services to the University of Waterloo's R&D team for its Green-ITS Program on an ongoing basis since 2010. MapuSoft's tools were to allow the University of Waterloo to develop reusable software components which can be deployed under various computing environments. There was a requirement that programs developed under the university's academic environment must be deployable within the automotive industry. The university wanted the development to be done using VxWorks and POSIX interfaces as they are prominently used in the industry. However, they wanted to run the application on Linux, QNX and Windows to collect various performance data.

PRODUCT

OS Changer Porting Kit to migrate VxWorks software to QNX and Linux target

Cross-OS development platform including Linux/POSIX Interface for QNX, Linux and Windows target platform

Application Common Operation Environment (AppCOE) IDE with Application/Platform profiling tools

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CASE STUDY
2

Green Intelligent Transportation System

SOLUTION

MapuSoft's Cross-OS development framework allowed the researchers to re-use code across various target OS environments, even though the code may have been developed for use on one specific OS. MapuSoft tools support a simulated environment where the real-time applications could run on host machines for modular testing and system integration without the real target OS and hardware. This gave the development team flexibility where the students were able to use standard low cost PC's for development without having to purchase the high cost development tools and target operating systems. In addition, MapuSoft's Profiling tools allows the researchers to collect performance and timing date on various embedded targets for analysis.

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CASE STUDY

3

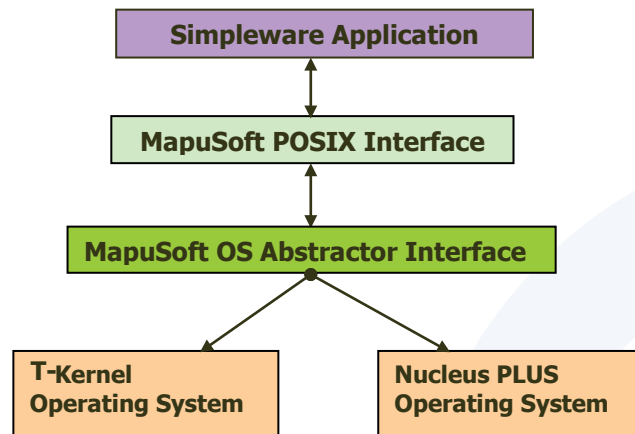Simple Devices Inc. (now part of Universal Electronics)

BACKGROUND

Simple Devices (SD), a privately held company based in San Mateo, California, provides software and firmware solutions that enable devices such as TVs, set-top boxes, stereos, automotive audio systems and other consumer electronic products to wirelessly connect and interact with home networks and interactive services to deliver digital entertainment and information. SDs' multimedia connectivity software has an excellent track record with industry-leading customers in the automotive, home entertainment and wireless networking industries.

For this project, SD partnered with Blaupunkt GmbH [German manufacturer of electronics equipment, noted for its home and car audio equipment] to develop a next generation infotainment product for mainly the Japanese market.

PROJECT

SD wanted to migrate their legacy "Simpleware application" running on open-source Linux platform to T-Kernel (Japanese uITRON based OS) and also Nucleus PLUS.

PRODUCT

⌀SCHANGER®

POSIX OS Changer Porting Kit for T-Kernel and Nucleus PLUS target RTOS

🔒 Confidential and Proprietary

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CASE STUDY

3

Simple Devices Inc. (now part of Universal Electronics)

SOLUTION

Due to its multi-OS support environment MapuSoft was able to propose a solution which allowed the "Simpleware application" to run on not just one but two Operating Systems.In addition, MapuSoft also successfully completed custom engineering work for Simple Devices (e.g. DLL support for T-Kernel). MapuSoft's OS Changer Porting Kit allowed them to migrate their Linux-based legacy code by offering a POSIX complaint interface across T-Kernel and Nucleus PLUS platform.

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CASE STUDY

4 | Ferrari S.p.A., Modena, Italy

BACKGROUND

Ferrari S.p.A. is a sports car manufacturer based in Maranello, Italy. It was founded in 1939 and built its first sports car in 1940. Ferrari currently builds about 7,600 sports cars a year and is now one of the most successful sports car companies in the world.

PROJECT

Ferrari's Telemetry Data Logger ECU (Engine Control Unit) application consists of 100k lines-of-code that needed to be ported from a VxWorks® real-time operating system to Linux. Manual porting of the software from a VxWorks RTOS to a general purpose Linux OS platform is risky and time consuming. A Data Logger application is an on-board device that gathers data from the engine, transmission, suspension, frame components and other key elements, then encrypts and transmits the data to a trackside support team.

PRODUCT

⦿SCHANGER®   **Linux⦿K®**

Rapid Software Reuse on any Operating System with Performance Optimization

SOLUTION

MapuSoft's OS Changer Porting Kit automated the porting effort and allowed Ferrari to quickly migrate their application from VxWorks to Linux. OS Changer's core performance features hardened Linux to behave like an RTOS in order to make this migration feasible. MapuSoft also added support for additional VxWorks features under a service agreement in order to eliminate any effort related to manual porting.

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CASE STUDY

1 | Fuji Xerox, Japan

BACKGROUND

Fuji Xerox Company, Limited is a joint venture partnership between the Japanese photographic firm Fuji Photo Film Co. (75%) and the American document management company Xerox (25%) to develop, produce and sell xerographic and document-related products and services in the Asia-Pacific region. Its headquarters is in Tokyo, Japan. Fuji Xerox is the world's longest running joint venture between a Japanese and an American company.

Fuji Xerox, Japan was exploring alternatives to port their Multifunction Printer product-line, with a code base of over 10 million lines of code, away from the VxWorks operating system. Fuji wanted to move the code from VxWorks to a Linux platform in order to take advantage Linux's powerful networking features and also eliminate the run-time royalty cost associated with VxWorks. In addition to migrating the code, Fuji Xerox must retain the ability to do considerable new software development work.

PROJECT

Port their Multi-function Printer/Scanner embedded software code base from VxWorks to the Linux operating system. Harden Linux to behave and perform like a Real-Time Operating System (RTOS) so that new application development using Linux/POSIX API would provide stability and performance.

PRODUCT

⊘S CHANGER®   **Linux⊘K**®
Optimization Kit

VxWorks OS Changer Porting Kit and Linux Optimization Kit for a Linux Target

SOLUTION

By using OS Changer, Fuji Xerox was able to successfully migrate their VxWorks legacy code to the Linux platform, within budget and schedule. Linux OK optimization features provided enhanced performance of the Linux application that was integrated with the existing legacy application. Utilizing a product solution also allowed Fuji Xerox to assign its engineers to enhancing their code rather than spending time on unnecessary manual porting effort.

OS Changer & Linux OK were chose because they made the project financially and practically feasible. The potential cost of manual porting the code, the number of developers needed and the time required to complete this project were all prohibited. In addition, OS Changer does not require changing the VxWorks code base. Linux OK offers VxWorks real-time threading and memory management features over Linux to ensure product performance on the Linux platform.

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BACKGROUND

GE Intelligent Platforms is part of the GE family, which provides industrial software, control systems and embedded computing platforms to optimize the customers' assets and equipment. They work across industries, including manufacturing, water, oil & gas, mining, power, defense and aerospace. GE Intelligent Platforms was one of the first companies in the Unites States to become a certified ISO 9001 manufacturer. They are headquartered in Charlottesville, VA.

For the past 25 years GE's traditional PLCs provide powerful solutions to mid-range, stand-alone or distributed industrial control. VersaMax PLC is one of its first solutions for control and distributed I/O. The VersaMAX PLC product line was such a success that the customers demanded a longer product life and support from GE and was not willing to upgrade to a different controller systems. Previously the VersaMAX PLX product family was running on the pSOS platform, however the chip vendor is no longer supplying the main processor. GE was looking to find an alternative chip vendor, however the new chip was not supporting the pSOS operating system. GE was looking for solutions which will enable them to keep the tried and tested legacy application code which worked perfectly for years and at the same time swap the processor chip which supported a NetOS/ThreadX environment.

PROJECT

A hardware obsolescence problem occurred due to the fact that the main processor chip used in the VersaMAX PLC controller product family had became unavailable. GE's customer demanded the same system when they placed a new large order. GE's VersaMAX product required new hardware and a modern operating system while keeping the original pSOS application unchanged. This created a significant challenge for GE; even if GE manually ported the code, the customers requirement not to modify the original application code would not be met.

PRODUCT

⬤S CHANGER®

OS Changer® Porting Kit for re-hosting pSOS applications on NetOS/ThreadX

CASE STUDY

2

GE Intelligent Platforms, Hyderabad, India

SOLUTION

MapuSoft's OS Changer Porting kit allowed GE to migrate its important PLC application code to a new platform and operating system without re-writing/porting the code, thereby meeting GE's customer's requirements. The new product met GE's customers requirement for performance and stability.

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MAPUS✦FT®

3

GE Power Systems & GE Electric, Canada

BACKGROUND

GE Power provides a broad array of power generation and energy delivery products to solve challenges. They work in several industries including renewable resources such as wind and solar, biogas and alternative fuels as well as coal, oil, natural gas and nuclear energy. They are headquartered in Schenectady, New York.

GE develops multi-functional power meters providing electric power automation functions. The primary purpose of these products is to collect, store and process real-world information and to perform automated control functions based on that data. These products also have communication capability for collecting and/or forwarding information from/to other devices. Some products may be equipped with a graphics display panel that provides a local operator interface. The product was working on an older pSOS platform release successfully for several years and GE wanted to first move this product to a different platform like MQX and then after many years to Linux.

First Project

Migrate multi-functional power gateway controller applications developed for pSOS operating system to MQX. The application is real-time and mission critical and needs to support at least the same or better performance after switching the OS. The project involved offering a custom solution involving faster messaging and support for a specific and older version of pSOS operating platform.

Second Project

Migrate multi-functional power gateway controller applications developed for pSOS operating system to Linux. The application is real-time and mission critical and needs to support at least the same or better performance after switching the OS.

Product

✦S CHANGER®

OS Changer® Porting kit for re-hosting pSOS application onto MQX and Linux platforms

CASE STUDY

3

GE Power Systems & GE Electric, Canada

SOLUTION

MapuSoft's OS Changer Porting kit allowed GE to successfully migrate its multi-function power gateway controller applications from pSOS to MQX and then to the Linux operating system. In both instances, the code was migrated without code re-write and with maintaining or exceeding the stability and performance of the original system.

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CASE STUDY

1 | Moog, US

BACKGROUND

Moog Inc is a worldwide designer, manufacturer, and integrator of precision motion control products and systems. Moog's high-performance systems control military and commercial aircraft, satellites and space vehicles, launch vehicles, missiles, industrial machinery, wind energy, marine applications, and medical equipment.

PROJECT

For the next generation medical infusion pumps, Moog was looking for a suitable COTS abstraction solution that offers advanced real-time performance and mission critical features and allow the software to run across multiple OS platforms while supporting a host based development environment. The abstraction solution was required in order to protect the software investment while extending the product life cycle which will survive OS version upgrades and even changing operating systems if necessary. Further, the Infusion pump system is running under multi-OS and multi-processor environment and as such Moog wants to stream-line the development using a common OS interface APIs and IDE across multiple OS environment. In order to stream-line the development, Moog partnered with an Indian service company for manpower and technical consultancy and MapuSoft for their OS abstraction solution and on-site training.

PRODUCT

Cross-⌀S®
Development Platform

Cross-OS Development Platform with OS Abstractor & POSIX development interfaces

SOLUTION

After a long search and several product evaluations, both Moog and the consultant company selected Mapusoft's flagship AppCOE product with OS Abstractor and POSIX interfaces to develop their next generation product line. This way Moog can launch their next generation medical product line quickly and still continue to use their tested code.

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CASE STUDY

2

Analogic Corporation, US

BACKGROUND

For over 40 years Analogic has created markets by anticipating and solving some of the world's most complex medical and engineering challenges. Their specific areas of expertise include developing enabling technologies used in computed tomography (CT), ultrasound, digital mammography (DM), and magnetic resonance imaging (MRI). They also develop state-of-the-art threat detection systems for airport checked-baggage screening as well as motion controls.

PROJECT

Analogic was looking for a way to port their legacy A3 Patient Monitor application running on pSOS to the Nucleus operating system while upgrading their hardware.

PRODUCT

⊘S CHANGER®

pSOS OS Changer Porting Kit for Nucleus Target

SOLUTION

Analogic was able to successfully port their pSOS application to Nucleus within one week's time.

Here is a quote from the customer:
"OS Changer works great. I really didn't have to 'convert' any code from pSOS to Nucleus. I just had to integrate OS Changer into the combination of pSOS and Nucleus tasks that we ported from two previous projects. It took about a week. I had to integrate maybe 75 KLOC, about a hundred pSOS calls."

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CASE STUDY
3
GE Healthcare, US

BACKGROUND

GE Healthcare (GE) is a subsidiary of the General Electric Corporation, provides transformational medical technologies and services that are shaping a new age of patient care. GE offers a wide range of medical equipment and diagnostic products including medical imaging systems, medical diagnostics and patient monitoring. GE Healthcare is headquartered in Chicago Illinois.

GE's OEC C-Arm is a radiological image processing and image-intensified fluoroscopic X-ray system used during diagnostics, surgical and interventional procedures, such as orthopedic, cardiac, critical-care, and emergency room procedures and other imaging applications.

C-Arm products are a completely different family of products when comparied to handheld low end to high definition high ends like 9800 series, 9900 elite series, 6800 MiniView series etc. Each of these products was running on different hardware and software platforms. Even though the systems are hardware and software specific, the basic functionality is similar.

PROJECT

Maintain a single code base for multiple Operating Systems to operate GE's OEC C-arm surgical navigation and visualization low-end and a high-end products.

PRODUCT

Cross-⬤S®
Development Platform

Cross-OS Development Platform with OS Abstractor for Linux and ThreadX target OS platforms.

SOLUTION

MapuSoft's Cross-OS Development Platform enabled GE to enhance their OEC- C-arm surgical navigation products so they will run on both a Linux and ThreadX target OS platforms. Having a single code base for multiple platforms simplifies GE's product smaintenance and provides an easier upgrade path in the future.

CASE STUDY

1

The Boeing Company, California, USA

BACKGROUND

Boeing's defense division developed an advanced platform architecture called System of Systems Common Operating Environment (SoSCOE) for the US military under the Future Combat System (FCS) program (aka BCT Modernization program). SoSCOE enabled enhanced joint connectivity and situational awareness while supporting multiple operating systems and hardware target platforms. SoSCOE was hosted upon MapuSoft's Cross-OS platform solution which provided interoperability between VxWorks®, Linux, and LynxOS while freeing applications from their underlying operating systems to allow future portability

PROJECT

• FCS program is a very large program for which the software assets needed to be reusable and not tied to a specific vendor's solution.

• US military required that applications developed on SoSCOE be based on strict POSIX standards; however the commercial real-time operating systems needed to run SoSCOE did not support the required POSIX standards.

• SoSCOE requires kernel resources with guaranteed availability during run-time.

PRODUCT

Cross-OS®
Development Platform

SOLUTION

MapuSoft's Cross-OS Development Platform (previously called OS Abstractor) was chosen because of its POSIX standards compliance and OS Abstractor's advanced real-time memory and thread management features. Boeing's SoSCOE was integrated with the Cross-OS Development Platform in order to allow SoSCOE to support multiple Target OS environments. The POSIX component offers industry standard API compliance for new code development and/or re-use of existing POSIX code base across multiple OS platforms while adhering to the standards set by the US military for the POSIX requirements. MapuSoft's Cross-OS Development Platform protects software investment by eliminating the risks associated with OS selection and/or use of proprietary API features. It allows developers to use a standard API interface across multiple OS platforms and greatly reduces the costs associated with code maintenance andlearning multiple operating systems.

CASE STUDY

1

The Boeing Company, California, USA

"MapuSoft's Cross-OS Development Platform provides many OS back ends which will be a great benefit to SoSCOE, which runs in a variety of environments", said Al Williams, SoSCOE's Chief Architect.

Contact:

Mr. Thomas Schoch, Procurement Agent

The Boeing Company

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CASE STUDY

2 | L-3 Communications, Alpharetta GA, USA

BACKGROUND

L-3 Communications (L-3) is an aerospace and national security solutions contractor. L-3 is also a leading provider of a broad range of communication and electronic systems and products used on military and commercial platforms. L-3 supplies critical aircraft and system integration design and support services to aircraft primes, integrators and military services/users such as NASA, Lockheed Martin and Raytheon, etc.

PROJECT

L-3 wanted to integrate and re-use their state-of-art display software written in Ada code into Lockheed Martin's C-130J Super Hercules aircraft system developed using C/C++ language running VxWorks.

PRODUCT

Ada-C/C++
CHANGER®

SOLUTION

MapuSoft's Ada-C/C++ Changer tool provided 100% code conversion of Ada code to C/C++ which eliminated the need for an expensive, risky and time consuming manual code re-write. In addition, the OS Abstractor component integrated with Ada-C/C++ Changer provided the real-time scheduling services for the converted code and allowed them to seamlessly integrate with the rest of the C/C++ code and run on the VxWorks platform.

The MapuSoft solution provided L-3 with the flexibility to adapt the existing Ada solution to the customer's C/C++ requirement with a re-write of the original Ada code thereby reducing the total project cost and time.

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CASE STUDY

3

Northrop Grumman Technical Services, Oklahoma City, USA

BACKGROUND

Northrop Grumman (Northrop) is a leading global security company providing innovative systems, product and solutions in unmanned systems, cyber, C4ISR and logistics and modernization to government and commercial customer worldwide.

PROJECT

Northrop's Data Acquisitions & Performance Advisories systems consist of several functions like Takeoff and Landing Data (TOLD), Center of Gravity Weight and Balance, Data Acquisition functions, Fuel Target Selection, ARINC 739 communication, Voice Alerter functions, LN-120 Data Loader function, Flight Data Recorder output function and Maintenance function. Northrop wanted to move the system to a new target platform running on LynxOS-178 operating system. Unfortunately, the target system does not support the Ada tools.

PRODUCT

Ada-C/C++
CHANGER®

SOLUTION

Northrop decided to use MapuSoft's Ada-C/C++ changer to convert their Ada code to C/C++ and then use a C/C++ tool chain to build the application for the new target hardware. In addition, the OS Abstractor component integrated with Ada-C/C++ Changer provided the real-time scheduling services for the converted code and allowed them to seamlessly run on the ARINC 653 certified LynxOS-178 platform.

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CASE STUDY

4

Northrop Grumman Corporation, Baltimore MD, USA

BACKGROUND

Northrop Grumman (Northrop) is a leading global security company providing innovative systems, product and solutions in unmanned systems, cyber, C4ISR and logistics and modernization to government and commercial customer worldwide.

PROJECT

Northrop's Next Generation Vehicle and Dismount Exploitation Radar system (NGV VADER,) an airborne tactical radar system is currently was running on the VxWorks operating system and Northrop wanted the system to run on Linux.

PRODUCT

OSCHANGER®

SOLUTION

Using MapuSoft's VxWorks Porting Kit, Northrop easily and quickly moved their legacy system from VxWorks to Linux. MapuSoft also provided real-time functionalities to the Linux platform.

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CASE STUDY

5

Northrop Grumman Corporation, Baltimore MD, USA

BACKGROUND

Northrop Grumman (Northrop) is a leading global security company providing innovative systems, product and solutions in unmanned systems, cyber, C4ISR and logistics and modernization to government and commercial customer worldwide. Northrop is a principal member of the Lockheed Martin-led industry team that is heading F-35 program. Northrop plays a critical role in the development, demonstration and production of this multi-role fighter.

PROJECT

Northrop wants to develop a new prototype software taken from the current F-35 program which is jointly run with Lockheed Martin. The system runs on the VxWorks operating system and Northrop wants the new prototype to run on a Linux platform.

PRODUCT

OSCHANGER®

SOLUTION

Northrop decided to use MapuSoft's migration tools for their internal testing and development of their new prototype model. Once developed and tested, these prototypes will be demonstrated for their aerospace and defense customers and upon a successful demonstration and acceptance, the prototype products will be put into production.

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CASE STUDY

6

Lockheed Martin Corporation, Orlando, Florida

BACKGROUND

Lockheed Martin (Lockheed) is an American global aerospace, defense, security and advanced technology company with worldwide interests. It was formed by the merger of Lockheed Corporation with Martin Marietta in March 1995. It is principally engaged in the research, design, development, manufacture, integration and sustainment of advanced technology systems, products and services.

PROJECT

As part of the C143 Program, Lockheed introduced embedded training on the USS Arleigh Burke (DDG-51), the lead ship of the Arleigh Burke-class guided missile destroyers. Part of this task is to simulate existing propulsion software on their instructors WindowsXP workstations. So their application needed to be ported to run on the Windows XP platform.

PRODUCT

ØSCHANGER®

SOLUTION

MapuSoft's VxWorks OS Changer Porting Kit allowed Lockheed to quickly port their LM STS application to the Windows XP operating system while adding real-time features to Windows XP.

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CASE STUDY

7

Raytheon Company, Tewksbury MA, USA

BACKGROUND

Raytheon works on different product development segment like Missile Defense, Command, Control, Communications, Computers, Intelligence, Surveillance, Reconnaissance, Electronics Warfare and Precision Weapons. The Raytheon Company is a major American defense contractor and industrial corporation with core manufacturing concentrations in weapons, military and commercial electronics. Raytheon is the world's largest producer of guided missiles.

PROJECT

Raytheon was looking for a simulation platform where their developers would be able to develop and test VxWorks applications on Windows host machines before their target hardware would become available. The VxSim option provided by Wind River was expensive and didn't integrate with the MFC based test code.

PRODUCT

SOLUTION

MapuSoft's VxWorks OS Changer Porting Kit contains VxWorks interface APIs which allowed Raytheon to develop VxWorks applications on Windows Host machines. They can now Build, Run, Debug and Test VxWorks applications natively without tools from Wind River. This allowed them considerable savings during software development.

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CASE STUDY
1 | ST Microelectronics, US

BACKGROUND

STMicroelectronics is a French-Italian multinational electronics and semiconductor manufacturer headquartered in Geneva, Switzerland. STMicroelectronics is one of the world's largest semiconductor companies with net revenues of US$ 8.49 billion in 2012. Offering one of the industry's broadest product portfolios, ST serves customers across the spectrum of electronics applications with innovative semiconductor solutions by leveraging its vast array of technologies, design expertise and combination of intellectual property portfolio, strategic partnerships and manufacturing strength.

PROJECT

STMicroelectronics was looking to create a reference platform for their DSL Residential Router/Bridge. Their requirement was to share code across VxWorks and Nucleus operating systems.

PRODUCT USED

ØSCHANGER®

DSL Residential Router/Bridge code-base shared across VxWorks and Nucleus operating systems

SOLUTION

STMicroelectronics in Raleigh "...used OS Changer in an ARM9-based ASSP to provide a reference solution for a DSL Residential Router/Bridge. The software included a BSP, device drivers, configuration database, HTML UI, bridge/router-ware, and OS-independent layers (for future porting). These parts were integrated with a proprietary DSL modem library and commercial RTOS and stackware (Nucleus PLUS and Nucleus Net)... Because VxWorks support was on our product roadmap, we opted to use the VxWorks I/O interfaces instead of native-Nucleus interfaces to minimize time, effort and costs associated with development and maintenance. As a result, we chose to use OS Changer from MapuSoft to provide the VxWorks interfaces on top of Nucleus." – Mike Williams, ST Microelectronics