

# LynuxWorks

Open. Reliable. Safe. Secure.



Every day, millions of people worldwide are touched by products that rely on LynuxWorks™ software—from Internet and phone communications, to airline flight-control systems, office automation and medical devices. LynuxWorks software provides the hidden intelligence that empowers, protects and secures our modern world.

It's no secret to the people who build embedded applications like these that LynuxWorks operating systems offer unmatched levels of performance, stability, and security for their projects.

In 1988, LynuxWorks (formerly Lynx Real-Time Systems) made history right away with the launch of the LynxOS® real-time operating system (RTOS), offering UNIX® functionality to developers of embedded systems long before embedded Linux® became available.

Today—20 years later—LynxOS is in its fifth generation of reliability, boasts full POSIX® conformance and even symmetrical multiprocessing (SMP). LynxOS has matured over the years and evolved into a complete family of real-time operating systems, each enhanced for specific security and certification needs: LynxOS-178 for critical avionics systems requiring

software certification; LynxOS-SE with time and space partitioning; and the LynxSecure separation kernel and embedded hypervisor.

Our family of real-time operating systems is complemented by our open-source BlueCat Linux release and our Eclipse-based Luminosity Integrated Development Environment (IDE).

As processor-based embedded systems proliferate, and the functionality of today's connected devices continues to increase, the amount of embedded software included in the device continues to grow.

As a result, there is an ever-increasing need for reusability and reliability of embedded software and applications. At LynuxWorks we believe that open standards can be coupled with reliability, safety and security to meet the software needs of the most complex embedded systems.

**“Embedded is everywhere today, and safety, security and reliability are the keys behind its proliferation. With two decades of innovation, visionary leadership and dedication to open standards, LynuxWorks will continue to raise the bar for embedded software serving our customers and delivering next-generation products.”**

**GURJOT SINGH,  
CEO**



## LynuxWorks .. open.. reliable.. safe.. secure



## Our commitment to open standards

From our earliest days, LynuxWorks has conformed to open standards, such as UNIX and POSIX, embracing the rise of embedded Linux and even offering Linux compatibility in our LynxOS family with our unique Linux ABI.

Only LynuxWorks' products provide developers of embedded applications the ability to leverage the reuse of existing code, third-party commercial solutions and open-source applications seamlessly, with unrivaled interoperability and portability among various platforms.

LynuxWorks is active in many of the industry committees and groups that shape and maintain standards—such as OMG (Object Management

Group), power.org, and eclipse.org. This ensures that our customers' needs are met by the standards we support, keeping our open systems current as standards evolve. For our avionics customers, we adhere to the ARINC 653 standard, and we offer a MILS-based separation kernel for our customers demanding the highest levels of security. We utilize the industry-standard Eclipse framework and the open-source projects such as CDT to provide an enterprise-strength open development environment.

This commitment to openness extends to our customer relationships as well. We provide customers with access to source code and engineering resources, as well as the opportunity to participate in discussions of our product direction through our Customer Advisory Board.

### Fail-safe reliability

Unlike the typical desktop system, many embedded systems run 24 hours a day, seven days a week, maintaining our quality of life and ensuring our safety. The greatest challenge in designing such embedded systems is ensuring the fail-safe operation of these "always on" devices. LynuxWorks' products have proven their dependability time and again even in the most extreme environments.

LynuxWorks' operating systems are the most tested in the world—both in the lab and in everyday environments. In

**"Reliability is a key attribute of LynuxWorks software solutions. Our products have proven their reliability in both the lab and in real-world applications, allowing our customers to feel confident that their requirements will be met."**

**ARUN SUBBARAO,**  
VP Engineering



addition to our own thorough, in-house testing and verification measures, all LynuxWorks products are submitted to rigorous testing against a wide array of quality standards, including ISO and CMMI. The Linux Application Binary Interface (ABI) that allows LynxOS users to run Linux applications without modification has been tested against 20 million lines of Linux application code. This testing ensures that our software provide the utmost in reliability in the field. For example, LynxOS has been at the core of the British national telephone network for more than 10 years without a single failure. Our industry-leading avionics solution, LynxOS-178, has logged more than 500,000 flight hours for one of our leading avionics customers, over a number of airframe platforms in true safety-critical applications.

**"Use of open standards allows our customers to take advantage of open-source and commercial applications to complement their own proprietary applications. By utilizing maximum reuse, they build complex embedded software systems on-time and on-budget."**

**ROBERT DAY,**  
VP Marketing



**LynxOS-178 brings openness and reliability together with certifiable safety to offer the best solution for systems that have human lives depending on them. Our products have been deployed or designed into the best-known military and commercial avionics systems in the world."**

**MARK BAKER,**  
VP Sales



### **Ultimate safety for safety-critical systems**

Our LynxOS-178 RTOS remains the only hard real-time operating system certifiable to the DO-178B level A avionics software certification process accepted by both U.S. and European regulators. LynxOS-178 also offers the interoperability benefits of POSIX and support for the ARINC 653 Application Executive (APEX).

Widely deployed in both commercial and military avionics applications, LynxOS-178 offers brick-wall partitioning of applications allowing integrated software systems to coexist on the same hardware platform without compromising system safety. Due to

its modular design, in which large segments of the RTOS remain standard regardless of the hardware it runs on, LynxOS-178 is the only operating system to have been awarded a reusable software component (RSC) rating from the FAA. This rating makes it easier for developers of safety-critical systems to transfer the component from one system to another, without recertification. LynxOS-178 is appropriate for—and has been deployed in—non-avionics environments as well and has been used in other safety-critical applications in the automotive, industrial-control, medical and transportation industries.

### **Security for the modern world's interconnected systems**

Today's embedded systems require interconnectivity, therefore, the need for increased security. Designing security into embedded systems is not an easy task and requires security from the network, through the application and down to the operating system. For military systems, guidelines and certification requirements ensure that systems are secure, and today's operating systems need to adhere to them. Security standards such as those defined by Common Criteria have different levels of information assurance (EAL1 to EAL7), with increasingly stringent requirements.

At LynuxWorks, we have been designing our operating systems to help our customers meet whatever security requirement is demanded. Our LynxOS family of operating systems provides

open POSIX APIs and the Linux ABI, and our LynxOS-SE operating system adds on time and space partitioning to meet the medium-assurance (EAL4) requirements of many of today's military programs.

For higher levels of security (up to EAL7), we designed, from the ground up, the LynxSecure separation kernel. LynxSecure is a MILS (multiple independent levels of security) architecture and employs a high-performance hypervisor (HPH). This hypervisor allows multiple applications and multiple operating systems to run on the same hardware system, all in their own secure partitions, operating at their own levels of security.

**"LynxSecure represents the forefront of today's embedded operating system technology. This hypervisor allows for high-assurance applications to run next to large guest operating systems such as Linux or Windows, giving ultimate flexibility to both our military and general embedded customers."**

**INDER SINGH,**  
Chairman



## Example application: F-35 Joint Strike Fighter's (JSF) Cockpit Display System

The Lockheed Martin F-35 Joint Strike Fighter (JSF) is a supersonic stealth aircraft designed to replace a wide array of existing fighters.

The Panoramic Cockpit Display (PCD) subsystem for the F-35 delivers information on major functions such as flight and sensor displays, communication, radio and navigation systems as well as an identification system which gives the pilot total situational awareness.

L-3 Communications Display Systems chose the DO-178B-certifiable LynxOS-178 (RTOS) to power a portion of the Panoramic Cockpit Display subsystem. Key factors in L-3's choice include LynxOS-178's adherence to open standards, its Linux compatibility, the interoperability benefits of its POSIX API and support for the ARINC 653 specification.



LynxSecure is small, fast, secure and meets the design requirements for high-assurance systems. The technology is also flexible with the incorporation of the HPH and can be used for other non-secure systems where there is a need to run multiple operating systems in virtualized partitions.

### Tools, support, services, training, partners

LynuxWorks' operating systems are used by leading companies in a wide array of industries, from aviation and defense to networking and telecom to consumer electronics and industrial automation. Companies including 3Com, Alcatel, Boeing, Ericsson,

Hewlett Packard, iRobot, Galileo, Lockheed Martin, Marconi, Mitsubishi, Motorola, General Dynamics, Raytheon, Northrop Grummun, Rockwell Collins and Xerox have selected LynuxWorks' products as the basis of hundreds of thousands of projects.

We work with our customers to develop open-standards-based products that are the most reliable, safe and secure in the world. Our customers have grown to rely on our development expertise and our ISO 9001 compliance to bring their innovations to market. Our training and support teams support our customers throughout their products' extended

lifecycles, starting with our catalog of embedded system programming workshops, which allow our customers to get the most from their investment in our products.

Headquartered in San José, California, LynuxWorks, Inc., is a pioneer and proven leader in the embedded software market, and its strict adherence to, and evangelism of, open standards is unique among embedded software vendors. For more information about LynuxWorks and our products, please visit: <http://www.lynuxworks.com> or call (800) 255-5969.



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