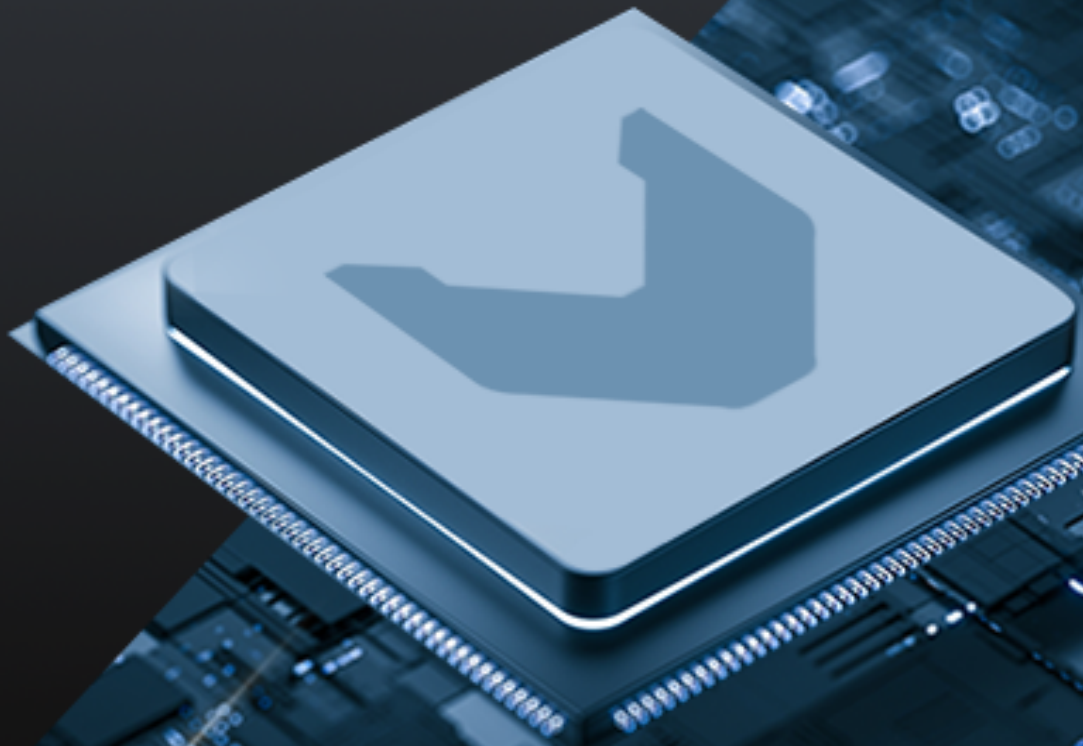# Lynx DO-178C Off-the-Shelf Certification Solutions for Safety-Critical Systems

Accelerating Safety-Critical Software Compliance with Lynx Commercial Offering

The Problem

Software certification programs in the avionics and defense industries frequently experience cost overruns ranging from 30% to over 100%, depending on the complexity of the system, regulatory requirements, and program management challenges. Historical data from DoD and aerospace programs indicates that major projects overruns can reach $1B+. It demonstrates the risks of underestimating software development, verification, and compliance efforts of achieving DO-178C certification for safety-critical software is a complex and resource-intensive endeavor, often leading to significant cost overruns and schedule delays in Department of Defense (DoD) programs.

Companies developing avionics systems, autonomous platforms, and safety-critical applications face challenges in managing software traceability, verification, and regulatory approval. The increasing demand for real-time AI, GPU-accelerated workloads, and mixed-criticality systems further complicates certification efforts. Traditional approaches often lead to delays, cost overruns, and increased program risk. To stay competitive, system integrators and OEMs need a streamlined, modular, and scalable certification solution that accelerates compliance while ensuring safety, security, and reliability.

To address these challenges head-on, Lynx developed MOSA.ic and CoreSuite — modular, certifiable software platforms engineered to de-risk and accelerate certification.

Our Solution

Lynx Software Technologies accelerates and simplifies DO-178C certification through its off-the-shelf commercial MOSA.ic™ and CoreSuite™ 2.0 — certifiable, modular, and scalable platforms designed for safety-critical software.

These offerings support software stacks, including RTOS, hypervisor, unikernel, GPU, and middleware components — all designed to maximize modularity and component separation and minimize certification effort and cost.

With a proven track record in safety-critical environments, Lynx helps developers reduce certification time, rework, cost, and risk, while ensuring compliance with FAA, EASA, and military safety standards.

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Lynx Certification-Ready Products

Lynx offers several DO-178C certification-ready products:

MOSA.ic:

- **LynxSecure Hypervisor —** a secure hypervisor using Lynx separation kernel, to provide strong isolation and security for applications, particularly in safety-critical and security-sensitive environments.

- **LynxElement —** a unikernel element designed to minimize complexity and only use resources necessary for a specific task, reducing the burden of corcore timing analysis and behavior characterization.

- **LynxOS-178 —** a real-time operating system (RTOS) built on open standards and designed to fulfill the stringent needs of multi-process, mixed-criticality systems.

CoreSuite 2.0:

A framework of hardware accelerated visualization and computational libraries, along with supporting tools, that have been designed from the ground up for deployment and certification in safety-critical edge computing environments. It is composed of:

- **VkCoreSC®:** CoreSuite 2.0 foundation layer for certifiable GPU processing leveraging Khronos Vulkan® SC 1.0 API.

- **VkCoreGL® SC1 and SC2:** Khronos OpenGL® SC 1.0 and SC 2.0 support.

- **TrueCore™:** GPU safety monitoring.

- **EncodeCore® and DecodeCore®:** Accelerated video encoding and decoding (if supported by the GPU).

- **ComputeCore™/TrustedAI**: Computer vision, neural network inferencing and artificial intelligence tasks.

Services to Align to the Customer Configuration:

- Defining the plan to ensure Design Assurance Level A (DAL A) compliance for a multicore system, including:

  - Usage Domain Evaluation

  - Resource Allocation

  - Shared Resource Enumeration

  - WCET (Worst-Case Execution Time)

  - Hazard Analysis

- Managing the certification program for the customer.

- Development and certification of customer-specific Board Support Packages.

- Mentoring and Training.

- Development and certification of specific features not available off-the-shelf from the Lynx offering.

For more details on Lynx products please check the product datasheets or contact sales@lynx.com.

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Lynx DO-178C Certification Offerings

Lynx's DO-178C Approach: Providing of the shelf Certification-Ready Software, Artifacts and Integrated Modular Avionics (IMA) Framework

At its core, Lynx simplifies DO-178C certification by delivering a certification-ready, deterministic executable software component along with a comprehensive set of certification artifacts that system integrators can use to accelerate compliance and reduce risk. MOSA.ic and CoreSuite 2.0 are architected for modularity — where software components can be developed, tested and verified independently - facilitating incremental and independent certification of individual components.

This approach eliminates the need for integrators to focus on testing the underlying hypervisor, unikernel, RTOS and driver libraries themselves, allowing them to focus on their application-layer development and integration rather than the foundational platform. This includes drivers for networking, storage, and GPU subsystems — such as graphics processing and video decode/encode — which are notoriously time-consuming to verify in safety-critical systems. The framework is built to be adaptable and to accommodate future innovations that require rapid re-certification and deployment.

Certification-Ready, DO-178C-Compliant Software Image

- The software is delivered as a pre-compiled, validated binary image that has undergone rigorous verification and testing under DO-178C guidelines.

- It is a deterministic software component that ensures well-defined, repeatable behavior suitable for safety-critical application integration and system certification.

- Designed to eliminate the need for system integrators to modify or re-verify the hypervisor, unikernel, RTOS or GPU driver libraries when other components are modified or introduced.

Designed for Safety-Critical Systems

- Built to DO-178C standard, ensuring predictable, real-time execution and deterministic behavior.

- MOSA.ic modular architecture enforces DO-297 Integrated Modular Avionics (IMA) principles Minimizes re-certification costs.

- MOSA.ic supports ARINC 653 time and space partitioning for mixed-criticality applications. CoreSuite 2.0 is available also with ARINC 653 compatible API.

- MOSA.ic addresses relevant objectives of A(M)C 20-193 and CAST-32A concerns regarding multicore processors.

- CoreSuite 2.0 TrueCore supports the display system to address concerns about displaying Hazardous Misleading Information.

- Can be integrated into safety-critical avionics, flight control systems, UAVs, and cross-domain solutions.

- Lynx offers derivations to standards such as MIL-HDBK-516C to ensure compliance with military regulatory standards.

Certification Artifacts

Along with the binary and source code, Lynx produces a comprehensive set of DO-178C certification artifacts, reducing the burden on system integrators and accelerating their path to compliance. Some of these artifacts are delivered to the customers, while others are available for audit.

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Artifact Category	What It Includes	Purpose
Planning Documents	• Plan for Software Aspects of Certification (PSAC), • Software Development Plan (SDP), • Software Verification Plan (SVP) • Software Configuration Management Plan (CMP) • Software Quality Assurance Plan (QAP)	Establishes certification scope and process
Requirements & Design	• Software Requirements Standards (SRS) • Software Design Standard (SDS) • Software Code Standards (SCS) • Software Requirements Data (HLR, LLR) • Software Architecture Description (SAD)	Ensures compliance with DO-178C objectives
Verification & Testing	• Trace Data • Test Cases • Test Procedures Structural Coverage Analysis (MC/DC) • Software Verification Results	Proves correctness and safety compliance
Tool Qualification	• Tool Qualification Plan (TQP)	Ensures verification tools are properly qualified
Final Data	• Software Configuration Index (SCI/SECI) • Software Accomplishment Summary (SAS) • Configuration Management Records • Quality Assurance Records • Open Problems Report	Provides regulatory authorities with final compliance evidence

DO-178C Objectives Supported

Supporting DO-178C means adhering to the rigorous development guidelines of the primary document used by certification authorities such as the Federal Aviation Administration (FAA) and European Union Aviation Safety Agency (EASA). This includes following specific processes, procedures, and using tools to demonstrate the software meets its intended functional requirements and safety objectives. Lynx develops software to achieve up to Design Assurance Level (DAL) A objectives, the most stringent level defined by DO-178C.

Lynx will support system integrators to achieve the objectives that require the system integration to be fully achieved.

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Stages of Involvement (SOI)

SOI are formal milestones where a FAA Designeted Engineering Representative (DER) reviews and audits the compliance of a project with DO-178C objectives.

Lynx certification artifacts are made available to DER the for review, as follow:

SOI Stage	Artifacts
SOI #1: Planning Review	PSAC, SDP, SVP, QAP, CMP, SRS, SDS, SCS, Open Problems Report
SOI #2: Development Review	Software requirements, design documentation, source code and related review records, executable object code, Open Problems Report, Trace Data
SOI #3: Verification Review	Test cases, test procedures, Software Verification Results, Structural coverage analysis, Object Code to Source Code Analysis Report, Data and Control Coupling Report, Open Problems Report, Trace Data
SOI #4: Final Review	Software Configuration Index (SCI/SECI), Open Problems Report, Configuration Management Records, Software Quality Assurance Records, Software Quality Assurance Records, Software Accomplishment Summary, Tool Conformity Review

Lynx's Role vs. System Integrator's Role

DO-178C certification is a shared responsibility between Lynx as the RTOS and middleware provider and the system integrator (OEM, Tier 1 supplier, or avionics contractor). Understanding the clear division of roles ensures a successful, efficient, and cost-effective certification process while reducing risk, avoiding duplication of effort, and optimizing compliance strategy.

Unlike traditional RTOS solutions, MOSA.ic is a complete modular operating environment framework designed to support system integrators building safe, secure, deterministic systems. MOSA.ic is designed to maximize modularity and minimize complexity. This empowers system integrators with the flexibility to design true IMA systems that are built to accommodate growth and accelerate certification timelines. This approach embraces modular design and the use of only essential system resources. This eases the burden of multi-core certification by reducing or eliminating the presence of interference channels and greatly simplifying robust partitioning analysis and compliance to CAST-32A and A(M)C 20-193.

Lynx not only delivers certification-ready software components but also offers integration support for customers who choose to partner during the certification process. Our engineering and certification experts assist system integrators in aligning their solution with DO-178C objectives, which can only be fully satisfied in the context of the complete system. We design our products to simplify integration and avoid introducing obstacles that could complicate certification, enabling a smoother path whether customers engage us directly or proceed independently.

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Activity	Lynx Responsibilities	System Integrator Responsibilities
Software	Provide certification-ready hypervisor, unikernel, RTOS, APIs, libraries (MOSA.ic and CoreSuite 2.0)	Integrate into final system
Certification Artifacts	Supply DO-178C compliance evidence for MOSA.ic and CoreSuite 2.0	Ensure end to end system level compliance
Testing & Validation	Deliver test and verification reports for MOSA.ic and CoreSuite 2.0	Conduct system-level verification
Regulatory Engagement	Support FAA/EASA compliance efforts	Own final certification submission

Why is this Critical?

Certification is System-Level, Not Just Component-Level

- DO-178C certification applies to the entire avionics system, not just the operating system or middleware.

- While Lynx provides a certification-ready suite of products and artifacts, the system integrator is responsible for integrating it into the final aircraft system.

- Certification authorities (FAA/EASA) require evidence that the entire software stack, including Lynx's hypervisor, unikernel, RTOS, application code, drivers, and system interfaces, meets the required DAL (Design Assurance Level) objectives.

Avoiding Certification Bottlenecks & Cost Overruns

- Misalignment in roles can lead to unnecessary duplication of verification efforts, costly delays, and gaps in compliance evidence.

- Lynx provides certification-ready software artifacts and certification kits, which the system integrator must properly integrate, extend, and validate within their system.

- Without clear role separation, programs risk failing audits, costly rework, and extending project timelines by months or even years.

Security and Safety Requirements Differ by Application

- Lynx delivers certifiable RTOS and middleware, but system integrators define and validate specific safety and security requirements based on their use case.

- For example, avionics display system and a flight control system may have different safety-criticality levels, requiring different levels of verification, testing, and documentation.

Lynx's Maintenance & Support for Certification Products

- Lynx provides comprehensive maintenance and support services for the software and certification artifacts, ensuring long-term reliability, compliance, and safety assurance for customers operating in DO-178C-certified environments. Under a formal support contract, Lynx commits to software updates and corresponding certification artifact revisions in the event that safety-critical defects are identified.

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Why Maintenance & Support is Critical for DO-178C-Certified Systems

Avionics Systems Have Long Lifecycles

- Aircraft software must be maintained for decades, requiring continuous updates, safety fixes, and regulatory revalidation.

- Any change to a certified component, including an RTOS update or security patch, requires formal documentation and compliance validation.

Regulatory Compliance Requires Continuous Verification

- FAA/EASA audits may require updated certification evidence if software defects are found.

- Any safety-related software defect reported by a Designated Engineering Representative (DER), or customer must be addressed with a structured, certifiable fix.

Certification Artifact Alignment

- Any modification to the RTOS or middleware requires a corresponding update to the certification artifacts to ensure traceability and compliance with DO-178C.

- Without proper artifact maintenance, regulatory approvals could be invalidated, leading to costly recertification efforts.

Lynx's Maintenance & Support Offerings

Under a formal contract, Lynx provides structured, long-term support for the software and certification artifacts, ensuring safe, secure, and compliant operations throughout the lifecycle of an avionics system.

Support Activity	What Lynx Provides	Customer Benefit
Safety Defect Support	Investigate and resolve any reported safety-critical defect.	Ensures continuous safety compliance under DO-178C.
Customer DER Collaboration	Work directly with the customer's Designated Engineering Representative (DER) to validate issues and implement fixes.	Ensures regulatory acceptance and minimizes recertification risks.
Binary Rework & Artifact Respin	Modify, recompile, and validate the affected software components when defects require changes. Update certification artifacts (requirements, test cases, verification evidence, traceability matrices) accordingly.	Keeps the RTOS and middleware aligned with certification evidence, ensuring FAA/EASA compliance.
Regression Testing & Requalification	Retest modified binaries to validate changes do not introduce unintended behaviors. Perform structural coverage, traceability checks, and compliance reviews.	Guarantees software integrity and maintains DO-178C certification.
Long-Term Product Support	Provide updates, patches, and compliance reports for 10+ years, ensuring system longevity.	Prevents unplanned recertification costs, ensuring sustained compliance.

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Lynx annual maintenance and support ensure support for certified binaries for customers who choose this option, which is mandatory for the first year.

How Lynx's Support Model Works in Practice

Customer or DER Identifies a Safety Issue

- The customer reports a functional, safety, or compliance-related defect in the Lynx product.

- A DER (Designated Engineering Representative) may escalate findings requiring immediate attention.

Lynx Investigates & Confirms the Issue

- Lynx reproduces the defect, assesses safety impact, and determines if changes are necessary.

- If confirmed, Lynx creates a corrective action plan in collaboration with the customer.

- The corrective action plan could be a workaround that avoids software modification and re-certification or it might require code updates and associated certification artifact updates.

Lynx Software Updates

- If the corrective action plan requires code modification, the affected software is modified, recompiled, and validated to ensure compliance with DO-178C.

- The updated software components are tested against all required safety and functional requirements.

Lynx Updates and Reissues Certification Artifacts

- Lynx respins the certification package, updating:

  - Requirements documentation

  - Verification evidence

  - Structural coverage analysis

  - Traceability matrices

- These updates ensure the newly modified software remains certifiable without triggering unnecessary rework for the customer.

Regression Testing & Recertification Support

- Lynx performs full regression testing to ensure that changes do not affect existing functionality.

- If necessary, Lynx supports the customer in engaging with FAA/EASA for revalidation.

Final Delivery & Compliance Assurance

- The customer receives an updated software delivery and updated certification artifacts, ensuring seamless compliance with DO-178C.

- Lynx provides ongoing monitoring and long-term lifecycle support for future certification needs.

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Ready to revolutionize your mission-critical systems?

Contact Lynx today to learn more about how LYNX MOSA.ic
can empower your success and help you Seize the Edge in
every mission-critical endeavor.

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