LYNX MOSA.ic.VIE.EBF™
Virtual Integration Environment + Embedded Board Farm

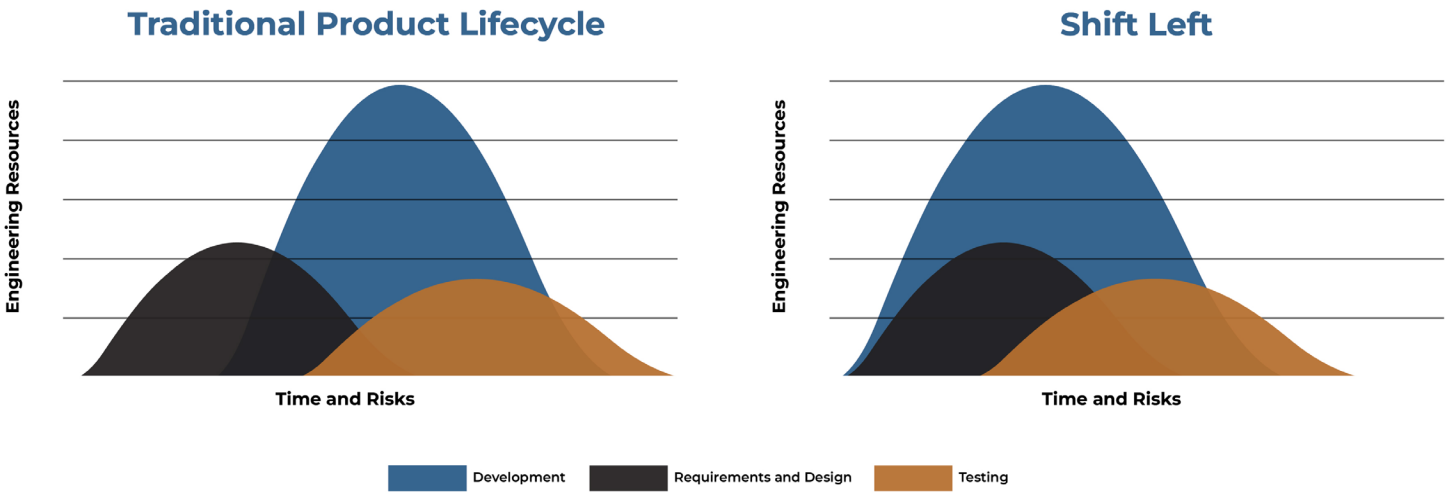
Save an amazing 45% of your development cost through simulation, automation, and asset management.
Source: McKinsey - Creating Value with the Cloud, 2018

Shift Left Your Entire Development Lifecycle with an On-Prem VIE.EBF

Modern engineering practices are shifting development and test activities left to meet the demands of aggressive deployment schedules. To keep pace with our adversaries, companies must reduce time to production, increase deployment frequency, and issue software updates at "the speed of operations."
Source: DoD Enterprise DevSecOps Reference Design, 2019

Lynx is proud to offer products that were specifically created to help our customers meet these challenges. LYNX MOSA.ic.VIE is a virtual hardware environment solution that easily integrates into CI/CD pipelines. Customers benefiting from the value of both virtual and physical environments can opt to add an Embedded Board Farm (EBF) with physical hardware through LYNX MOSA.ic.VIE.EBF.

Fundamentally, LYNX MOSA.ic.VIE decouples software development from hardware availability, enabling what the industry calls **Shift Left**.



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Virtual Target Infrastructure

LYNX MOSA.ic.VIE provides a disaggregated virtual target infrastructure, supporting QEMU virtual targets for Arm and Intel. It was designed from its inception to integrate into existing CI/CD pipelines to give customers a straightforward way to introduce virtual target testing into their workflows to accelerate schedules while reducing cost and risk.

With LYNX MOSA.ic.VIE, customers can create on-prem or cloud-based workflows that effectively enable the development and debugging of Linux and LynxOS-178 applications. The environment is easily established with what is fundamentally a client/server model.

- Deploy the Lynx DevOps Server with the Virtual Target Emulator and Manager
- Deploy the client side of the Virtual Target Manager on the MOSA.ic CDK workstations
- Build LynxOS-178 and Buildroot Linux images
- Use CLI to upload and run the images on the Virtual Target Emulator
- Script the deployment and execution of images on the virtual target

Physical Target Advantages

The integration of Lynx's Virtual Integration Environment (VIE) and Embedded Board Farm (EBF) is a breakthrough in embedded systems development. By combining secure remote access to live hardware with advanced virtual testing environments, this solution enables development teams to work more efficiently, reduce costs, and accelerate time-to-market for complex embedded projects. The VIE.EBF integration allows developers to seamlessly switch between virtual and physical testing environments, providing flexibility and scalability. Both platforms are designed to integrate into your existing development workflows. Development teams can use REST APIs and CLI tools to interface with popular test frameworks and CI/CD systems, making for seamless integration and simplifying the transition to automated, hybrid testing.

Key Customer Benefits of Lynx MOSA.ic.VIE.EBF

Customer Benefits	Capabilities Enabled by LYNX MOSA.ic.VIE.EBF
Accelerate Development Timelines by up to 40%	• Reduce hardware dependencies by enabling software development to begin before target hardware is available • Built-in support for virtual target lifecycle management allows developers to spin up or shut down guest OS images and applications on demand
Minimize Program Risk – Saving up to 80% of one rework	• Start development, testing, and integration earlier reducing overall project risk • Begin with the desired RTOS, eliminating the need to port software from Linux to LynxOS-178 or LynxElement
Lower Development and Certification Costs – Saving an average of $150,000 per certification defect	• Decrease the need for physical hardware, cutting associated costs • Achieve significant savings by maximizing the efficiency of engineering time • Reduce risk of DO-178C target testing objectives by finding and addressing defects early and leveraging MOSA.ic.VIE.EBF to remove lab and physical resource access bottlenecks
Reduce Hardware Cost - $20,000 or more per board	• Limit hardware procurement to resources needed for precise timing and corner cases • Reduce stress on systems, extending hardware lifespan and reducing replacement costs
Faster Onboarding with LYNX MOSA.ic technology	• Use the MOSA.ic environment with representative hardware at the start of the project • Quicker familiarization with ANSI/POSIX libraries • Define the optimal Linux configuration for your system
Agile Software Development for Critical Systems - Save on average 30% of development time	• Accelerate and parallelize development and testing cycles • Evaluate alternative system architectures effectively before hardware finalization • Use support tools and python libraries to build and test Buildroot, LynxOS-178, and Lynx-Element images in CI/CI pipelines, enabling seamless deployment to target hardware
Scalable Development with Minimal Infrastructure - Virtually zero cost to add users	• Expand the development team without rigid infrastructure dependencies • Provide early prototype access to development and testing teams

Key Capabilities

Early-Stage Development and Increased Productivity

LYNX MOSA.ic.VIE - Historically, embedded software development efforts have had a dependency on hardware availability to even start the first stages of development and integration. Often at the mercy of hardware vendors and supply chain considerations, the cost and schedule risks are enormous and can put a program behind schedule from the start. LYNX MOSA.ic.VIE addresses this problem by providing an environment that is built to be used with LynxOS-178 and Linux applications so engineering teams can get started immediately using the operating systems and associated toolchain.

LYNX MOSA.ic.VIE.EBF - Introducing the Embedded Board Farm provides the additional benefit of being able to tackle even the most complex hardware timing design aspects of development early, providing the opportunity to expose issues that could be fundamental to the design and costly to resolve later in development.

Increased Productivity

LYNX MOSA.ic.VIE - Even when physical hardware is available, it is a costly and limited resource. Engineering teams have to work around lab scheduling conflicts that create frustration and slow progress, Accessing the hardware often requires teams to be onsite and introduces challenges for remote testing. With the emulated environment provided by MOSA.ic.VIE, the development team is no longer dependent on the presence of or the availability of the physical hardware to proceed with development and start reaching critical milestones.

LYNX MOSA.ic.VIE.EBF - Having the Embedded Board Farm in the loop provides even more flexibility. The tools are designed to operate and transition seamlessly between virtual and physical environments. Engineers developing in the virtual environment can easily transition to develop and run tests on the physical hardware as required.

Safety Certification Risk Reduction

LYNX MOSA.ic.VIE - Establishing a CI/CD workflow that includes LYNX MOSA.ic, VIE provides confidence early in the development cycle that difficult DO-178C target testing objectives will be met. Programs that develop software in host environments and only move to target testing for formal qualification testing risk being derailed by late-breaking architecture and processor-specific defects. Precise cyclic timing may still only be achievable with the target hardware, but the vast majority of target-related bugs will be exposed early by executing tests in the representative hardware emulation environment.

LYNX MOSA.ic.VIE.EBF - Adding the Embedded Board Farm provides an additional layer of risk reduction and efficiency. Precise timing and cyclic tests that are not appropriate for a virtualized environment can be run on the physical hardware. Programs can also explore options to use EBF as “for credit” DO-178C testing to meet on-target test objectives, greatly reducing the risk of lab and hardware asset availability constraints adversely impacting schedule.

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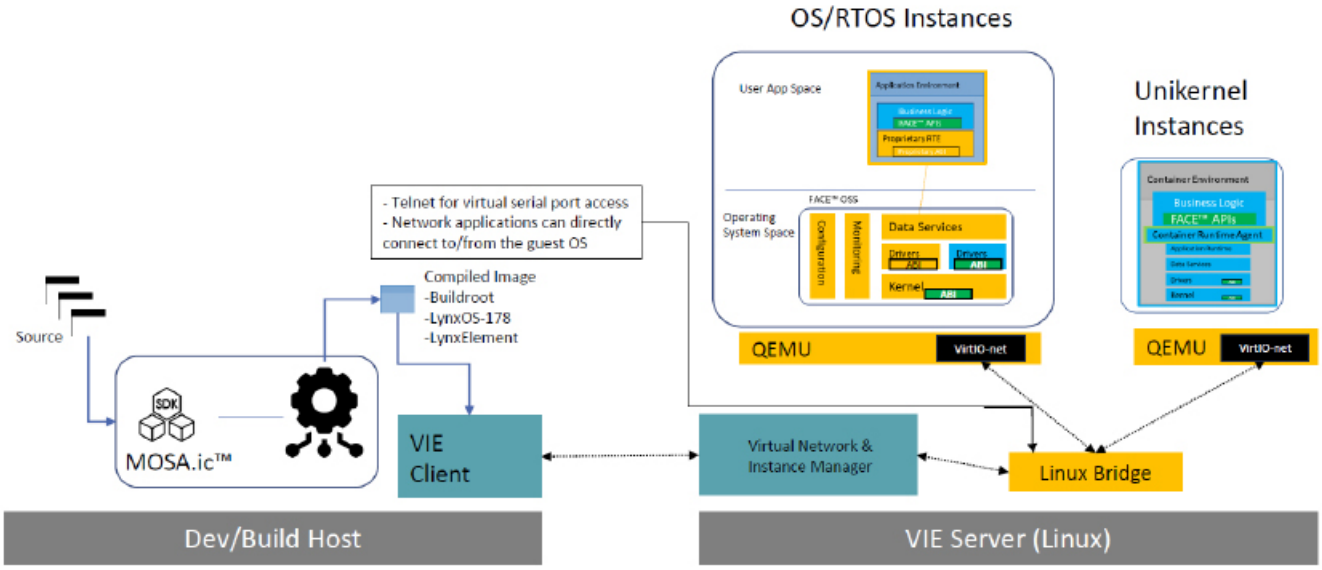
LYNX MOSA.ic.VIE Architecture and Features

As shown in the diagram below, the VIE system runs guest OSes in QEMU instances on the VIE Server, providing greater flexibility and enhanced debuggability compared to running them on LynxSecure. By disaggregating Buildroot Linux, LynxOS-178, and LynxElement from LynxSecure, LYNX MOSA.ic.VIE allows for more adaptable development and testing environments. The client uploads OS images to the server and manages their deployment through commands such as:

- Upload OS images to the server
- Launch the image in a new virtual target
- Delete a virtual target

The server hosts these images in QEMU instances, controlled through the client's command line interface (CLI) or Python APIs. The inclusion of Python APIs simplifies testing and integration with CI/CD pipeline automation.



LYNX MOSA.ic.VIE + Embedded Board Farm (EBF) Integration

For customers interested in taking the next step towards scaling development and testing workflows with the introduction of real physical hardware, MOSA.ic.VIE is now integrated with Embedded Board Farm (EBF). LYNX MOSA.ic.VIE provides seamless testing on both virtual and physical environments. Adding EBF offers remote access to live hardware, managing tasks like power control, USB hot-plugging, and network management. This combined solution enables continuous integration, remote debugging, and automated testing, enhancing collaboration and reducing reliance on physical hardware, all within a secure and efficient framework.

Education and Services

Lynx offers a range of services to accelerate the deployment of MOSA.ic.VIE.EBF including:

- **Quick Start Training:** Get your team productive in days
- **Productivity Assessment:** Consultative and collaborative project where our experts work with your team to assess how your bottlenecks can be addressed to streamline your productivity
- **Deployment Acceleration:** Quickly identify how to deploy the tools in your software pipeline

Our team of experienced subject matter experts hold security clearances and offer the ability to work with customers in controlled environments.

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