



FENTİSS

FENT INNOVATIVE SOFTWARE SOLUTIONS



KOSMOS DAY - FENTISS

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FENT INNOVATIVE SOFTWARE SOLUTIONS

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I. Introduction
II. Fentiss : Who are we
III. XNG : Xtratum Next Generation
IV. XNG + Kosmos
V. Feedback
VI. Conclusion

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I. Introduction

Main points :

- KOSMOS relationship with XNG
- KOSMOS projects
- How XNG users see it
- Feedback on KOSMOS framework



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II. Fentiss

- Founded in 2010
- ~20 employees
- Software solutions for Real-Time embedded systems (particularly spacecrafts)

- Opened in 2025
- 2 employees
- Expanding



Fentiss Espagne
Valencia



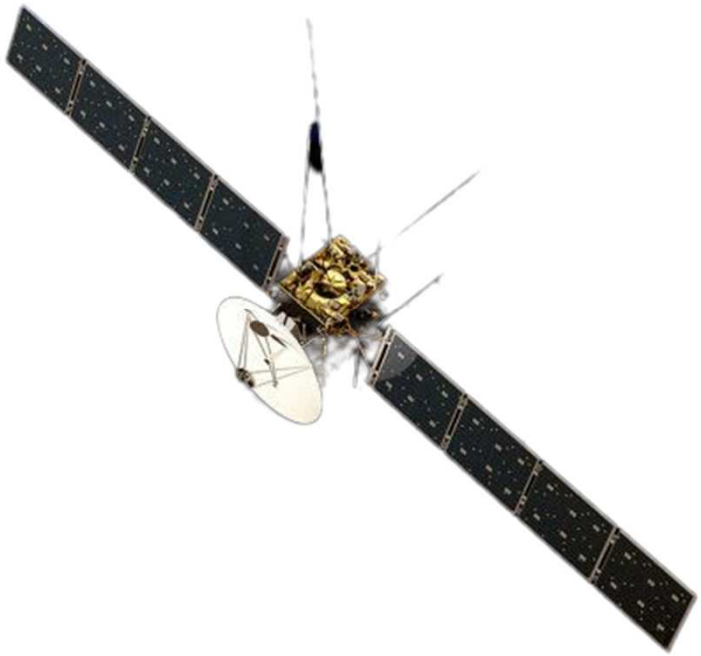
Fentiss France
Toulouse

Applications in satellites

CRITICAL APPLICATIONS

- Attitude & Orbit Control System
- Command and Data Handling
- Thermal Control
- Health monitoring tasks
- And more…

We lose the satellite



NON-CRITICAL APPLICATIONS

- Payload processing (image processing, compression…)
- Image processing algorithms
- AI inference, experimental algorithms



"How can we run critical and non-critical applications on the same hardware, safely, efficiently, and without interference?"

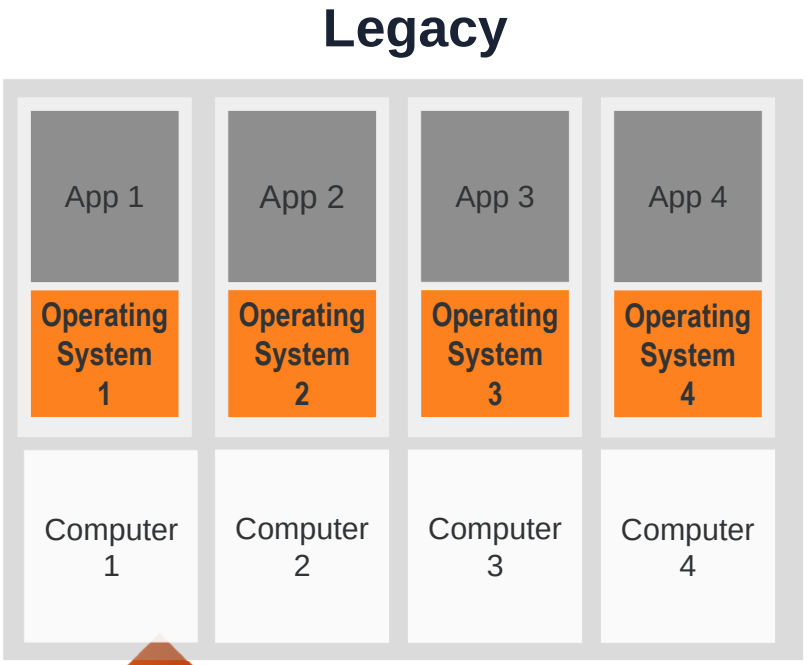


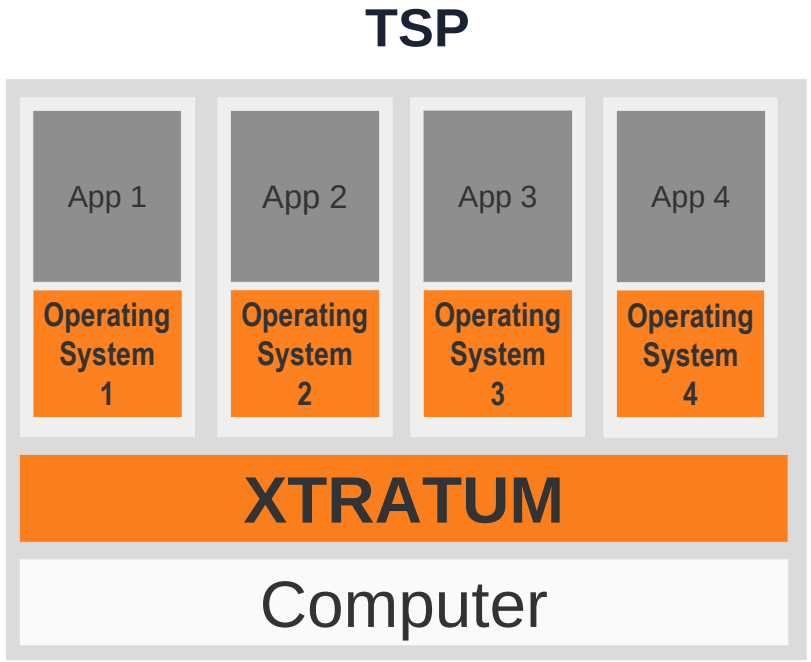
Virtualization

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XtratuM: real-time hypervisor





Multiple computers, High SWaP and Expensive certification

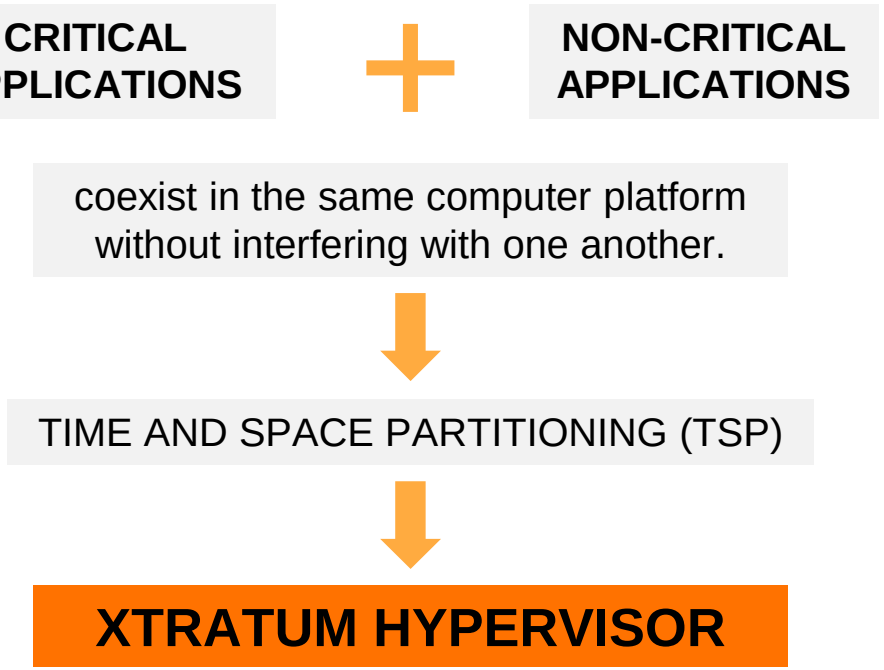
SWaP : Size Weight and Power

XtratuM: real-time hypervisor

XtratuM enables critical and non-critical applications to share a common hardware platform without interfering with one another.

- Qualified per ECSS category B
- Time & Space Partitioning similar to ARINC 653.
- Supports architectures: SPARC, ARM, RISC-V.

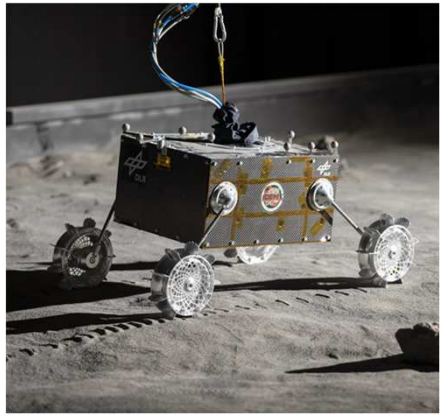
Benefits: reduced certification effort, support for multi-OS in a single box.



Mission Examples



JUICE
(ESA/CNES)
XtratuM + LithOS on instrument MAJIS



MMX Rover
(JAXA/CNES/DLR)
XtratuM + LithOS (ROMA and CROW modules)



CO3D
(CNES/ADS)
XtratuM + RTEMS BSP (OBC)

More than 1000 spacecrafts running XtratuM

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XNG + KOSMOS



XNG is KOSMOS's framework hypervisor for ZYNQ targets

Responsible for :

- Memory management
- Scheduling
- IRQ management
- Time management
- Inter-partition communication
- Health monitoring
- Tracing facilities

Also, XNG introduces LithOS as a real time operating system (RTOS)



XNG + KOSMOS

KOSMOS framework achieves its goal

➔ Providing the tools needed to develop flight software quickly

The use of :

- Generic partitions + BSW (CCSW, IOS, MMDL, HSEM...)
  - Scheduling, communication, device access, fault management...
- Libraries (LibPUS)

Speed up the development time significantly, by giving a blueprint to start working on.

This leads to progressing towards a working product very fast once the system is setup.

In FENTISS France we worked in 2 different projects using the KOSMOS framework





XNG + KOSMOS : project 1

As a team of 2 :

Simulation : Minimal satellite flight software

- Initial setup (Xilinx SDK, Basiles Docker, submodules)
- Executing tests
- Adding a custom partition
- Adding private PUS services
- Dedicated memory zones, communication ports, permission management
- Adding the sandbox partition

Board used : Zybo Z7-10



XNG + KOSMOS : project 1

Flight software : very simple Earth observation-type mission

Custom partition **“Payload”** simulated “black-box” component that produces image-like data at regular intervals.

➔ Goal : to be minimal enough while maintaining the behavior of a real payload, commands in, data out.

Satellite must be able to support a limited set of actions.

Custom **private service** : 200

- with 8 subservices (5 TC, 3 TM) to manage this partition

While integrating these features, we tested every functionality and checked the data flow to confirm proper behavior.





XNG + KOSMOS : project 1

While working on this project, we documented all encountered issues and fixes.

We also updated all existing tutorials and created new ones.

- How to do the KOSMOS initial setup + execute a first test
- How to add a custom partition
- How to add a private PUS service
- How to add a sandbox partition and how to use it
- How to debug KOSMOS using XSCT

End result : Working flight software containing a custom partition and pus services, achieving the satellite's goal (data request and transmission).



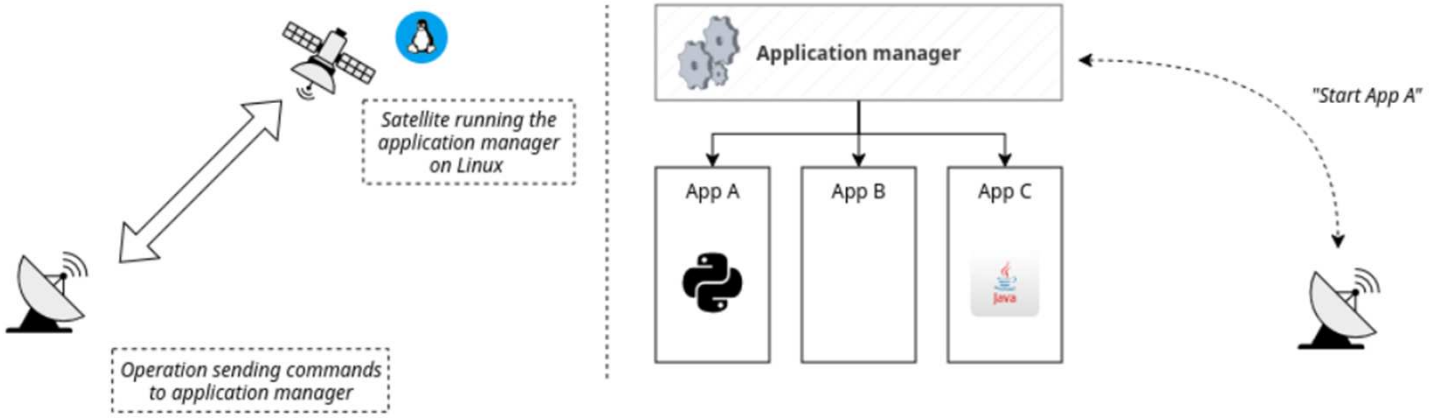
XNG + KOSMOS : project 2

Linux Partition application manager

Goal : To build a new applicative development kit based on Linux : the Linux applicative partition by FENTISS

➔ Linux based on-board application manager

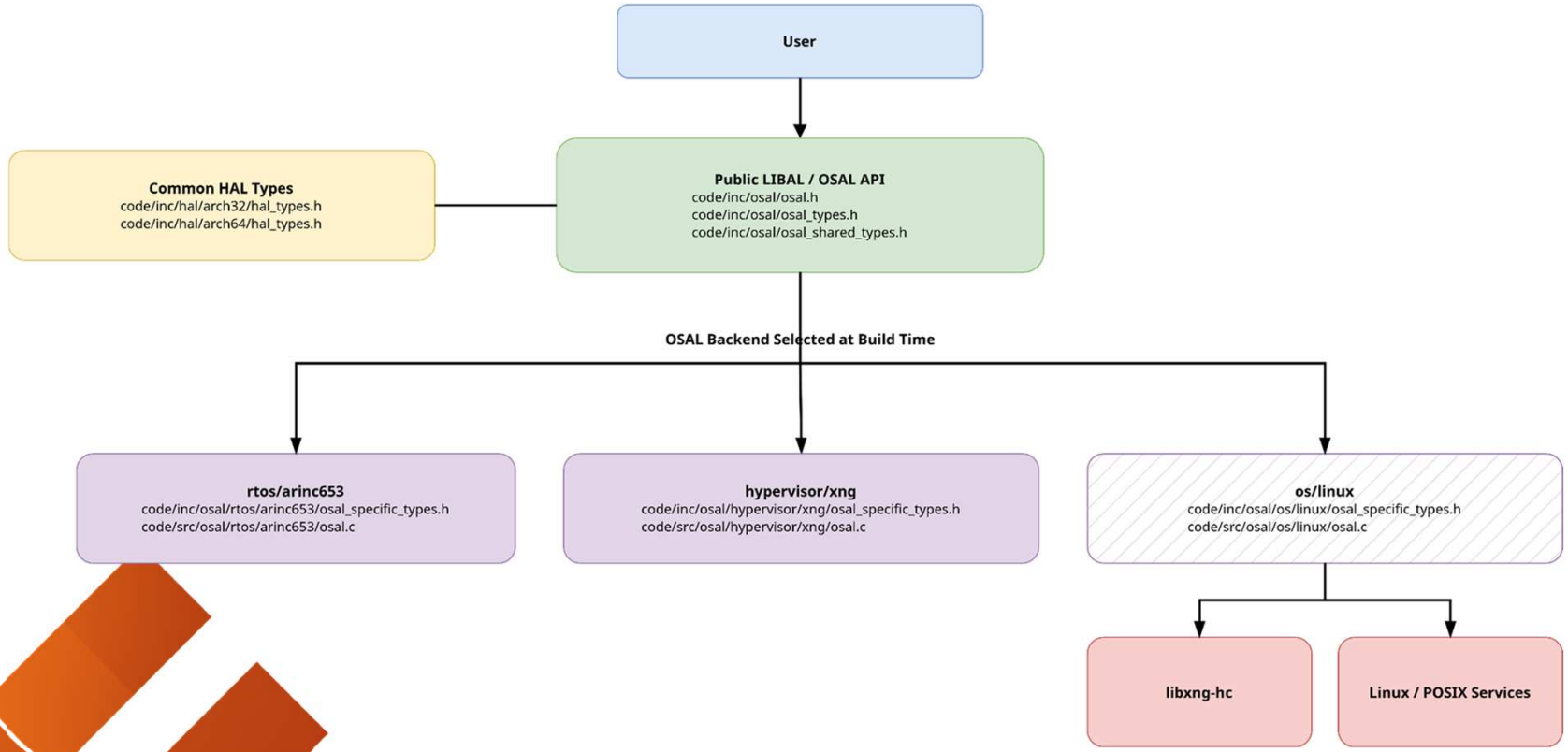
First step : To add a working linux partition to a KOSMOS project



XNG + KOSMOS : project 2

Adapt and understand LIBAL

Second step : To create a LIBAL version extended to support Linux

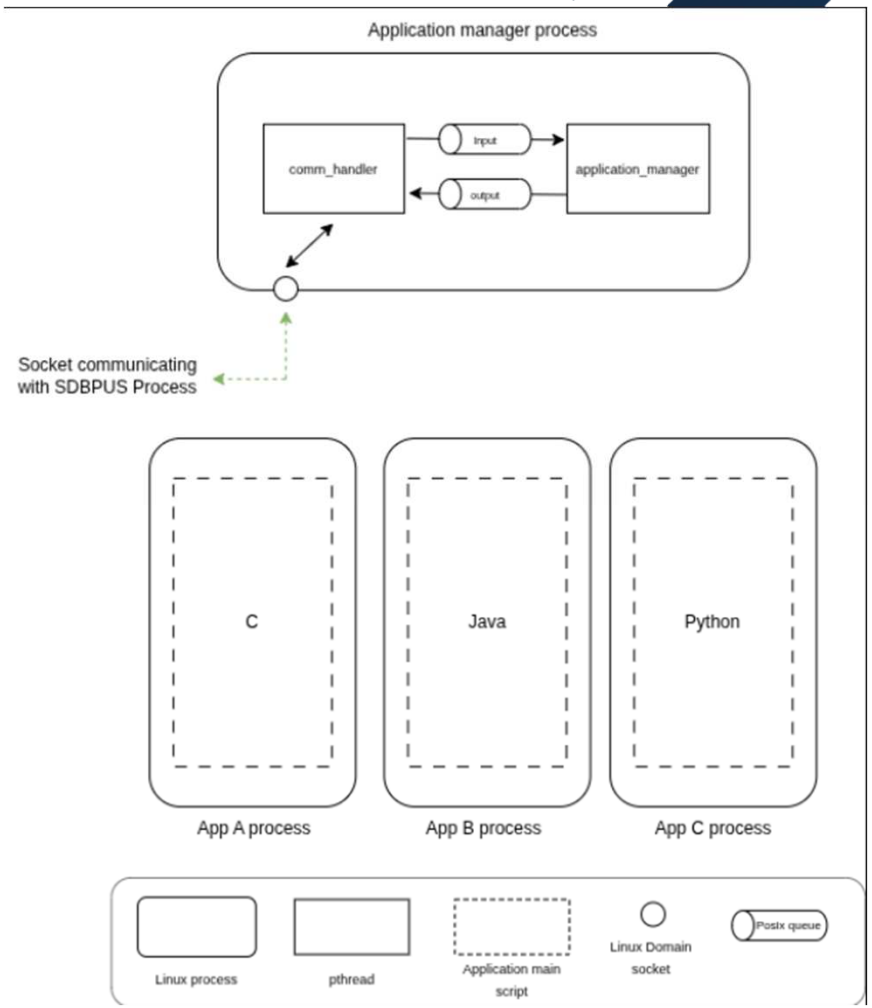


XNG + KOSMOS : project 2

Third step : Use the new LIBAL adaptation to create the app manager

Result :

- Working Linux partition
- Adapted LIBAL with Linux/POSIX tools
- Working application manager



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Feedback

Experience itself : Smooth once setup

New user experience : **hard**

Solution?

More tutorials :

- First setup : Explain how to get all dependencies and launch a first test
- Doing tests : Explain the different types of tests and how to execute them
- Adding a partition : Update the tutorial on how to add a partition
- Make general tutorials : Examples on how to customize the software (add memory zones, communication ports, etc.)

Automated scripts :

- Existing script to add partition : current method is long and manual
- Adding a private PUS service

Where Fentiss comes in

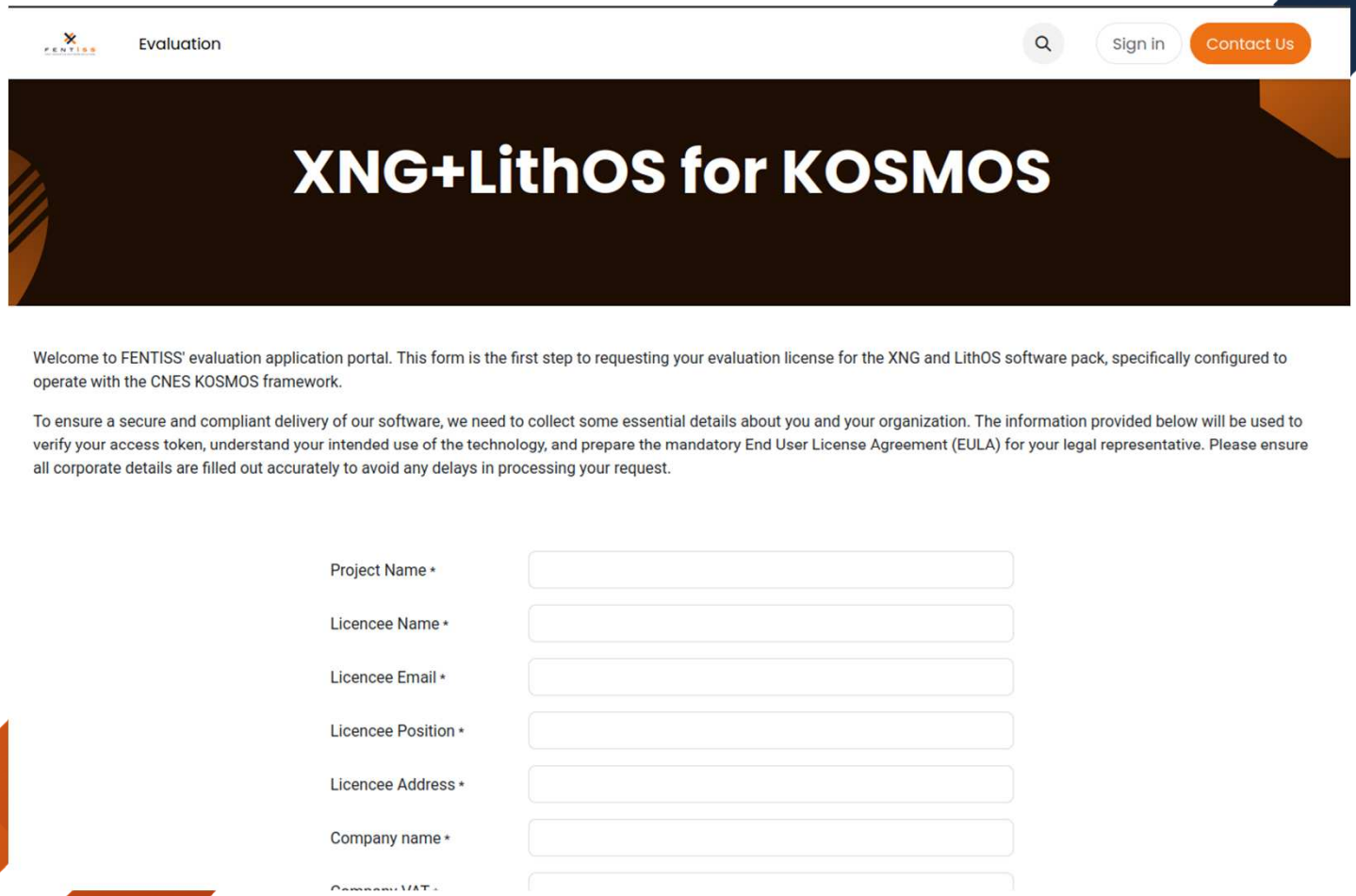
At Fentiss we offer our experience in the development of partitioned systems :

- Our knowledge in low level programming bring significant advantages in these environments.

We are developing a marketplace where users can download an evaluation version of FENTISS products, necessary to use KOSMOS (launched in Q4 2026)

- Apply using a form, filling essential details about you and your organization.

Where Fentiss comes in



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Conclusion

KOSMOS framework is an extremely powerful tool that gives its users a solid foundation on which to start building a flight software.

The experience once everything is setup is smooth, and the issues we mentioned are easily fixable.

We are excited to see what the future brings in regards of KOSMOS future updates and we hope our feedback was useful.

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