# ORYX OBCS

## Modular flight software tailored for your mission

### ABOUT **ORYX**

Oryx is a **modular flight software** tool developed for the mission control of small satellites. It manages all satellite tasks – namely, **processing telecommands sent by the operators, monitoring the power budget, executing pre-defined schedules, managing emergencies and handling data from all the sensors on board.**

Oryx utilises an innovative framework that facilitates the customised development of your own mission. Thanks to its **modular architecture**, based on building blocks, it supports the rapid development of the mission's software by using a vast **library of components - logging, scheduling, testing and communication** to name but a few.

The ease at which a testing environment and software simulator can be set up ensures in-depth evaluation of your applied solutions from the onset of the project. Should your component not be supported by Oryx, you can simply **extend your simulation by creating customised drivers.**

Our on-board **software exposes an API** that can be accessed by the small Lua scripts, providing access to selected sensors and peripherals, which is definitely a game changer!

Oryx is part of the **Smart Mission Ecosystem** – hardware, software and AI-powered algorithms designed to complete your mission.

### ORYX **CAPABILITIES:**

**Satellite management**
Telemetry, tracking and command handling

**Fault detection**
Isolation and recovery support

**Task scheduling**
Flexible task management based on the time, position and platform status

**Data storage**
Managing up to 4 GB file-based storage with a short boot time

**Communication**
Access to the satellite through secure data links

**Extensibility**
Using scripting language to manage in-flight issues and extend the OBC features after the launch

**Testability**
Faster satellite integration thanks to the built-in algorithm, software and hardware-in-the-loop tests

### ORYX IS BUILT OUT OF **3 KEY ELEMENTS:**

- **The Software Development Kit (SDK)** – a set of libraries written in C++ containing crucial on-board services for telemetry and telecommand, a hardware abstraction layer and a library of drivers for popular systems.
- **Development Tools** – systems simulators and a suite of automated tests which enable comprehensive testing of the flight software either by running locally on the PC (using QEmu) or by connecting to the hardware engineering model (using the Oasis EGSE board).
- **Oasis EGSE** – a single-board, CubeSat PC-104 compatible EGSE that serves as an interface between the PC-running simulators and the hardware engineering model. Enables the running of integration tests which use actual hardware connections between satellite components (I2C, CAN, UART, SPI).

### THE MOST IMPORTANT ELEMENTS OF **ORYX SDK** ARE:

- **Scheduler** – used to run scheduled and automated jobs that can be time-triggered or initiated by any other telemetry values. Furthermore, it is extensible with the Scripting Engine.
- **The Scripting Engine** – a Lua-based service which enables the running of precompiled Lua scripts on board. All internal APIs are exposed to the Lua module to give the possibility of evolving the mission objective and automated jobs without the necessity of reuploading the entire flight software.
- **COMM Protocols** – a set of libraries implementing CCSDS-compatible communication channels for telecommands and telemetry with built-in security.
- **The Drivers Library** – a set of pre-existing drivers for popular nano- and small-satellite systems.

## TECHNICAL **SPECIFICATION**

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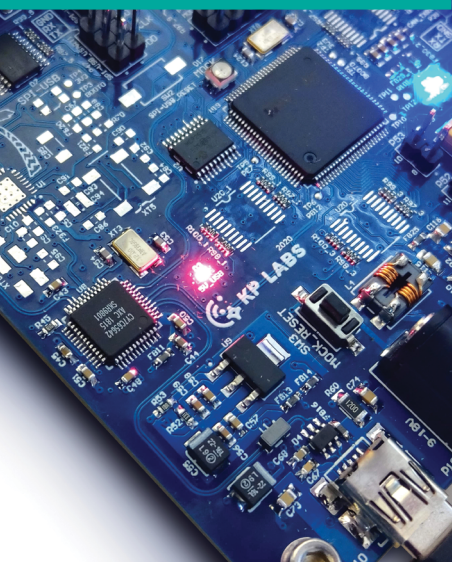
|---|---|
| **MEMORY** | ◆ Min. 1 MB (code) (depending on the selected features)<br>◆ Min. 1 MB (data) (depending on the selected features) |
| **SUPPORTED MCUs** | ◆ ARM Cortex-M, ARM Cortex-R |
| **RECOMMENDED MINIMUM CLOCK** | ◆ 50 MHz |
| **STORAGE** | ◆ Data storage: NAND flash memory up to 4 GB<br>◆ High reliability FRAM-based storage |
| **DEVELOPMENT TOOLS** | ◆ Open-source, cross-platform tools: CMake, GCC, Python<br>◆ Modern technologies: C++17 |
| **SUPPORTED OFF-THE-SHELF SUBSYSTEMS** | ◆ Kryten M3 by AAC Clyde Space<br>◆ EPS (STARBUCK) + Batteries by AAC Clyde Space<br>◆ ADCS by AAC Clyde Space<br>◆ UHF Transceiver by CPUT<br>◆ Antelope OBC by KP Labs<br>◆ Leopard DPU by KP Labs<br>◆ UVTRX by ISIS<br>◆ IMTQ by ISIS<br>◆ ANT module by ISIS<br>◆ uCam III camera module by 4D Systems<br>◆ Q20 HD GPS by QinetiQ and all NMEA-based receivers<br>◆ EWC27-SRX X/S Transceiver by Syrlinks<br>◆ Easy to add support for any subsystem using I2C, UART, CAN, SPI |
| **GROUND SEGMENT COMMUNICATION** | ◆ AX.25 based modules<br>◆ S/X stream-based modules (CCSDS compliant)<br>◆ Flexible communication stack<br>◆ Optional: encryption, authentication |
| **GROUND SOFTWARE SUPPORT** | ◆ XTCE and SEDS-compliant spacecraft database<br>◆ YAMCS integration<br>◆ Easy integration with any MCS during the whole process (from the mission development to in-orbit operations) |

Oasis is an EGSE used by Oryx to interface between an OBC hardware and the satellite systems simulators running on a PC.




## CASE STUDY

**Oryx will be the heart of the Intuition-1 mission, which is planned for launch in 2022/2023.** Intuition-1 is a 6U-class satellite with a data processing unit enabling on-board data processing acquired via a hyperspectral instrument with spectral resolution in the range of visible and near infrared light.

## ABOUT US

KP Labs is a NewSpace company based in Poland. We deliver AI computers and software to bring autonomy into demanding space missions. We are a team of more than 50 space enthusiasts who do not think that the sky is the limit.

## SOUNDS GOOD?

Contact us at **sales@kplabs.pl** to attain the benefits your organization deserves!

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