In order to decrease response time to control inputs abd improve the reactivity of the drone (https://www.researchgate.net/publication/328131120\_Real\_Time\_Operating\_SystemsRTOS\_For\_Drones\_Asad\_Abbas) the implemanttion of RTOS was considered leading to the question – which RTOS solution should we choose?

Not having any experience working with RTOS, we researched the topic to identify the operating system most suitable to our needs. Taking into account the choice of microcontroller ( Seeed Studio XIAO nRF52840 Sense) we narrowed the list to two top condenders – FreeRTOS and Zephyr.

Both solutions are open source, widely used and support the Microcontroller board we have chosen.

According to 2018 IoT Developer Survey (https://www.slideshare.net/kartben/iot-developer-survey-2018), FreeRTOS is one of the most popular OS used and while Zephyr only received a 2.8% rating in 2018, it is often described as one of the fastest growing RTOS and in 2022 has become the largest open-source RTOS project by the number of commits and developers (https://lembergsolutions.com/blog/freertos-vs-zephyr-project-embedded-iot-projects)

Chart

Description automatically generated

Here is a list of pros and cons for both RTOS:

|  |  |
| --- | --- |
| **FreeRTOS** | **Zephyr** |
| **Pros** | |
| * Beginner friendly * Open source – online comunity support available * Libraries for Seeed XIAO Sense available * Constantly improved * Fast execution * Low memory size | * Open source – online comunity support available * Libraries for Seeed XIAO Sense available * Constantly improved * Designed to ensure energy efficiency * Highly configurable * Event-driven * Kernel can create additional system threads * Possible to exclude multithreading * Additional debugging features * Supported by Nordic Semiconductor |
| **Cons** | |
| * Not event-driven (scheduler will only be called once in a certain period of time) * Less flexible | * More difficult to set-up * Potentially complicated to use with no experience |

More detailed comparison between features of FreeRTOS and Zephyr:

<https://micro.ros.org/docs/concepts/rtos/comparison/>

Overall Free RTOS seems to be a better established more simple solution to be used in case of no experience whereas Zephyr offers more flexibility and is a fast growing popular solution well suited for our application and would be a worthwile investment to build our skillset for future projects (<https://www.iiot-world.com/industrial-iot/connected-industry/freertos-vs-threadx-vs-zephyr-the-fight-for-true-open-source-rtos/>) (https://www.byte-lab.com/why-developers-should-choose-zephyr-rtos/)