# Systems Programming Coursework 2

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## Introduction

The purpose of this report is to outline the concurrency, synchronisation, and memory management features of 3 programming languages. This is with the aim to provide a recommendation for an approach for writing the software for the new *SpaceY* satellites. These satellites have large numbers of sensors gathering a diverse array of information which is required to be processed by the software. This primary requirement is why the language chosen for the implementation of the satellite software must have effective, robust concurrency, synchronisation, and memory management features to ensure the accuracy of the collected data. This report will cover the evaluation of C, Python and Java.

## C Overview

C is a lower-level language more associated with operating systems and system software rather than higher-level languages primarily used in modern application software. This leads to the concurrency and synchronisation features linking closely to the concepts themselves without being hidden behind a higher level of abstraction. The concurrency aspects of C utilise the `pthreads` library which is included in most C distributions and is a common piece of learning for developers working with C.

### Concurrency

Concurrency is achieved through multithreading and multiprocessing which have some key differences. Threads can be thought of as mini programs which can combine to make up a multi-threaded process. Threads share the same memory space and hardware resources meaning they are much lighter weight than processes as they have their own. Multithreading allows many threads to run concurrently within a single process