

Scheduling Offset-Free Systems Under FIFO Priority Protocol (Artifact)

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Abstract

On UAVs, telemetry messages are often sent following a FIFO schedule, and some messages, depending on the FIFO queue state may suffer long delays, and can even be lost if the FIFO queue is full. Considering the high complexity of the problem of assigning offsets to periodic tasks, we propose a new heuristic, called GCD+, that we compare to

the methods of the state of the art, showing that GCD+ significantly outperforms them on synthetic tasks sets. Then we use a real UAV use case, based on Paparazzi autopilot, to show that GCD+ behaves well. The proposed algorithm is meant to be the new Paparazzi's automatic offset assignment method for messages.

2012 ACM Subject Classification Computer systems organization → Real-time system architecture; Computer systems organization → Embedded software

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1 Scope

This artifact provides the Python files used to make the experiments depicted in Figures 6 to 12 of the related article.



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4:2 Scheduling Offset-Free Systems Under FIFO Priority Protocol (Artifact)

2 Content

The artifact package includes the following files:

- `README.md`: “Read Me” file with instructions on how to replicate the experiments.
- `requirements.txt`: List of Python modules required for the use of the toolbox.
- `probabilityFromXml.py`: Extracts the distribution of prime factors of a Paparazzi message configuration file.
- `offsetAssignmentAnalysis.py`: Calculates offsets for randomly generated task sets using different techniques and compares their results using simulations.
- `case_offsetAssignmentAnalysis.py`: Calculates offsets for a given use case using different techniques and compares their results using simulations.
- `case_offsetAssignmentAnalysis.py`: Calculates offsets for a given use case using different techniques and compares their results using simulations.
- `.xml` and other `.py` files: Necessary files for executing the algorithm.

3 Getting the artifact

The artifact endorsed by the Artifact Evaluation Committee is available free of charge on the Dagstuhl Research Online Publication Server (DROPS). In addition, the artifact is also available at: <https://github.com/lia-laboratory/gcdplus>.

4 Tested platforms

The algorithms were implemented and executed in Python 3.9, using a laptop with Ubuntu 18.04.1, Intel Core i7-4710MQ CPU (2.50GHz, 4 cores, 8 threads, 2054MHz), and 16 GB of RAM.

5 License

The artifact is available under license LGPL.

6 MD5 sum of the artifact

d2666d4c36bc4b50845163e799cd2acb

7 Size of the artifact

45.9 kB