

48th STUDENT CONFERENCE (E2)  
Educational Pico and Nano Satellites (4)

Author: Mr. Atharva Lohangade  
College Of Engineering , Pune, India, lohangadeaa17.comp@coep.ac.in

Mr. Bhaskar Pardeshi  
College Of Engineering , Pune, India, pardeshibs17.comp@coep.ac.in

Mr. Sanjay Patil  
College of Engineering, Pune, India, patilsp16.it@coep.ac.in

Mr. Jatish Kharade  
College Of Engineering , Pune, India, kharadejm18.comp@coep.ac.in

Mr. Avishkar Andhale  
College Of Engineering , Pune, India, andhalear19.comp@coep.ac.in

Mr. Runal Tembhurne  
College Of Engineering , Pune, India, tembhurnerr18.comp@coep.ac.in

Mr. Rushikesh Deshmukhe  
COEP, India, rushideshmukhe@gmail.com

EFFICIENT STORAGE OF DATA FOR FASTER ACCESS TIME ON NON-VOLATILE MEMORIES  
IN NANOSATELLITES**Abstract**

The paper presents a detailed procedure for storing and retrieving the data generated periodically in the satellite during the course of its mission. Demonstrating orbit maneuvering using solar sail is the scientific objective of COEPSAT-2, a satellite being developed by undergraduate students of College of Engineering, Pune. The satellite attains desired orientations by running algorithms using the data acquired from sensors. This crucial data is required to be stored on on-board secondary storage which can be further downlinked on demand for debugging purpose. The periodic data consists of angular velocities, magnetic fields, GPS positions, health monitoring data (current, voltage, temperature values) and sun sensor values. The logging procedure involves usage of both - on-chip flash memory and the secondary storage like sd-card or nand flash memory. The access time (i.e. read, write and erase) for the secondary storage is quite high compared to on-chip flash. Thus it is more feasible to log data directly on on-chip flash. But the data cannot be stored permanently for longer duration on on-chip flash owing to its small size. Thus, the on-chip flash is to be used as a fast accessible buffer. Few pages of on-chip flash are reserved for this. After the data stored on on-chip flash fills up to a particular limit, it is written to the secondary storage. Timestamp can be stored with the data if needed. The block number of the secondary storage at which the data will be stored is figured out using the time parameter. Thus the block number is a function of time. The memory region of the secondary storage is divided into sections with each section storing particular type of data. During retrieval of data, a function of time is used that maps to a particular block of secondary storage. Burst read is performed on that block to get the requested data along with the data on some preceding and following consecutive locations. Thus, the storage and retrieval of data is done in constant time. If the secondary storage becomes full, whole memory can be erased, refreshed and reused for further storage by doing minor changes in required variables' value. Time analysis, detailed read/write procedure, mapping functions used, division of secondary storage, additional overhead incurred, etc. described in paper gives us a preliminary assurance of this reliable file system.