DESIGN OF A FREE AND OPEN SOURCE DATA PROCESSING, ARCHIVING, AND DISTRIBUTION SUBSYSTEM FOR THE GROUND RECEIVING STATION OF THE PHILIPPINE SCIENTIFIC EARTH OBSERVATION MICRO-SATELLITE

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ABSTRACT:

The Philippines's PHL-Microsat program aims to launch its first earth observation satellite, DIWATA, on the first quarter of 2016. DIWATA's payload consists of a high-precision telescope (HPT), spaceborne multispectral imager (SMI) with liquid crystal tunable filter (LCTF), and a wide field camera (WFC). Once launched, it will provide information about the Philippines, both for disaster and environmental applications. Depending on the need, different remote sensing products will be generated from the microsatellite sensors. This necessitates data processing capability on the ground control segment. Rather than rely on commercial turnkey solutions, the PHL-Microsat team, specifically Project 3:DPAD, opted to design its own ground receiving station data subsystems. This paper describes the design of the data subsystems of the ground receiving station (GRS) for DIWATA. The data subsystems include: data processing subsystem for automatic calibration and georeferencing of raw images as well as the generation of higher level processed data products; data archiving subsystem for storage and backups of both raw and processed data products; and data distribution subsystem for providing a web-based interface and product download facility for the user community. The design covers the conceptual design of the abovementioned subsystems, the free and open source software (FOSS) packages used to implement them, and the challenges encountered in adapting the existing FOSS packages to DIWATA GRS requirements.

1. INTRODUCTION

1.1 Background

The Philippines's PHL-Microsat program aims to launch its first earth observation satellite, DIWATA, on the first quarter of 2016. DIWATA's payload consists of a high-precision telescope (HPT), spaceborne multispectral imager (SMI) with liquid crystal tunable filter (LCTF), and a wide field camera (WFC). Figure 1 shows the technical specifications of DIWATA's payloads.

	High Precision Telescope (HPT)	*Space-borne Multispectral Imager (SMI) with LCTF*	*Wide Field Camera*
FOV	1.9 x 1.4 km	52 x 39 km	180° x 134°
Spatial Resolution	3 m	80 m	7 km
Spectral Range	NIR,R,G,B	2 LCTF: 420 - 650 nm 700 - 1050 nm	panchromatic
Spectral Resolution		10-20 nm	

Figure 1. DIWATA payloads

Depending on the need, different remote sensing products will be generated from the microsatellite payloads. This necessitates data processing capability on the ground control segment.

The PHL-Microsat program is composed of five components:

- Project 1: Microsatellite BUS Development
- Project 2: Ground Receiving Station
- Project 3: Development of a Data Processing, Archiving, and Distribution Sub-system (DPAD)
- Project 4: Calibration and validation of remote sensing instruments
- Project 5: Data product generation

Of the five projects, four (projects 3-5) are involved in the data processing chain. Project 2 is in charge of receiving the data from the satellite. Project 4 provides the calibration values for the instrument, whereas Project 5 is in charge of researching and developing data product generation algorithms. Project 4 and Project 5 both provide inputs to Project 3 which is in charge of the data processing pipeline.

Rather than rely on commercial turnkey solutions, the PHL-Microsat program, specifically Project 3: DPAD, opted to design its own ground receiving station data subsystems. The decision to design and implement the system was made due to the following reasons:

- **Capacity building.** Turnkey solutions are black boxes. They will work but the Philippines will not have learned anything from it.

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