Ground Station Software Team Project Management

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Overview

In CSCI 297 class we partake in learning the roles of software team leads and developers. With hands on activities that get us involved in what a real manager of a software team may do such as: defining a project, planning a project, developing a work breakdown structure, estimating the work, developing a project schedule, etc. This work is performed in the context of the OpenOrbiter project which seeks to build a low-cost spacecraft that can be produced with a parts budget of approximately $5,000. The ground station software team’s purpose within OpenOrbiter project is to facilitate the prioritization of sending and receiving tasks from the satellite as well as communications with the satellite. The priority of Ground Station is integral to teams/users that must communicate with the satellite. As you will see on this poster we have completed a document outlining our project definition, our work breakdown structure, and a project schedule.

**Goals & Objectives:** To produce a physically and digitally secure GUI for ground station technicians to create tasks and review completed tasks. Determine bandwidth, security, and protocol for satellite uplink and downlink communication. Create a robust task scheduler that effectively prioritizes a variety of tasks to ensure the satellite is able to complete all tasks before the next downlink period. Be able to accurately predict the location of the satellite at any given time and predict when the satellite will over specific coordinates. Create a server that runs all services necessary for the satellite. Overarching user and technical documentation that encompasses all aspects of the ground station.

**Success Criteria:** Tasks are prioritized and uplinked without issue, accurate results are then downlinked within time constraints. The location and predicted location of the satellite are known at any given time. The server stays online for as long as the satellite is active. Documentation can be interpreted and used by anyone who needs it.

**Project Context:** Ground station provides the interface for communication with the satellite. It is closely works/communicates with the Operating Software aboard the satellite which, in turn, communicates with the payload software. It fits into the OpenOrbiter project as one of the 5 pillars/teams that keep the project standing tall. The business of inputting tasks to the satellite is taken care of at this stage, showing where it fits in the business flow.

**Project Dependencies:** Operating Software being able to receive our tasks. Our servers being online and operational at all times. The satellite being able to communicate back down to earth. The FCC allows our communication on a frequency that allows for optimal and effective data transfer.

**Scope Specifications:** Develop ground station software that effectively and efficiently communicates with Satellite. This software will accept commands from one or more users and process them along mission critical commands in a time orderly and efficient cycle. Designing of the software and security measures/protocols. Planning and building a server.

**Out-of-Scope Specifications:** On-board software has successfully been designed and implemented. The payload software has also done the same. All of the software has been tested and is fully functional. The proper advertisement and promotion for the OpenOrbiter project has been displayed and distributed.

**Assumptions:** Equipment and monetary resources will be allocated to our team as seen necessary. Volunteers will do, to the best of their abilities, the tasks that they are assigned. The team leaders will properly and equally delegate work out to all members of their respective teams. The university will continue to promote and support our teams and the progress that we are making.

**Constraints:** Monetary constraints for purchases of the server as well uplink and downlink dishes and antennae. Limited volunteers and time constraints of those volunteers. FCC regulations regarding bandwidth and the communications over the links. The amount of computing power on the satellite itself.

**Risks:** School or workload increase resulting in the loss of volunteers. School or work schedule conflicts also resulting in loss of volunteers or the limitation of work done by volunteers. The likelihood of schedule in work or school changing is fairly high but communication between the teams and their volunteers can counter and effectively dissipate this risk. Server going down, potentially permanently severing communication with the satellite. The likelihood of this depends on the parts and host building for the server. The quality of parts used to build the server the and the connection to the power source used i.e. U.P.S. or surge protectors at minimum help to dilute this risk. If it were to happen a new server may have to be built and old parts may be salvaged, the problem may also be as simple as restarting the server itself. Budget cuts resulting in the termination of purchasing critical equipment. There is truly no counter to this unless volunteers offer up their own funds but the likelihood of this happening after the initial allocation of funds is very low.

**Stakeholders:** The stakeholders for all parts of this project should be fairly universal, including UND providing funds and housing for the project. Volunteers expecting a successful launch contributing their time and intellect. Any teachers/professors putting in their time and effort to help a particular group within the project. Other groups within OpenOrbiter working together to get this project off the ground. NASA contributing the transportation.

**References:**