

ENG 4000 Weekly Meeting Minutes



Every week, this document should be presented to the supervisor, as this will be the basis for grading.

Project Name	Satellite Operations Services Optimizer
Date & Time of Meeting	2023/09/22 (~3:30 PM)

Attendees			
#	Name	Student ID	Username (email)
1	Youssef Hany	216885766	youssef8@my.yorku.ca
2	Rafael Dolores	216142069	rafd47@my.yorku.ca
3	James Le	217270943	jamesmql@my.yorku.ca
4	Walid Al Dari	218375162	walidald@my.yorku.ca
5	Ruth Bezabeh	216171795	ruttkas@my.yorku.ca
6	Stanley Ihesiulo	216985236	ihesiulo@my.yorku.ca
7	Hashir Jamil	217452954	hashirj@my.yorku.ca

Decision Made / Agenda / Objectives / Plan for the Coming Week	
Conclusions:	<ul style="list-style-type: none"> - Tech Stack developed and received feedback on constraints. - Observation opportunities need to be calculated. - Agile Methodology -> Show prototype and receive feedback. - Testing Protocols -> "Day in a life" scenarios based on given inputs and outputs. - What systems are currently in place and are in use? They have systems right now that perform these tasks. Many satellite interactions right now are done manually. The objective is to move this to an optimised form. Will provide 3 short list of optimization goals <ol style="list-style-type: none"> 1. use few resources as possible 2. ??? 3. ??? - optimization is up to us (minimising number of contacts to fulfil ordered request) - No budget needed, except maybe hosting our own domain. - STK testing is not needed but could be used for validation.

Team Responsibilities for the Coming Week		
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1	Youssef Hany	Investigate what needs to be calculated for the schedule building, satellite, and ground station.
2	Rafael Dolores	Finalize Architecture, Create Github Repository.
3	James Le	UI/UX Design of the front-end of the web-app.
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7	Hashir Jamil	Investigate Event Broker Product.

Progress Report on Last Week's Activities			
#	Name	% Completed	Comment (provide the reasoning only if 100% is not completed)
1	Youssef Hany	100	

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3	James Le	100	
4	Walid Al Dari	100	
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7	Hashir Jamil	100	

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Project Name	Satellite Operations Services Optimizer
Date & Time of Meeting	2023/09/29 (~1:30 PM)

Attendees			
#	Name	Student ID	Username (email)
1	Youssef Hany	216885766	youssef8@my.yorku.ca
2	Rafael Dolores	216142069	rafd47@my.yorku.ca
3	James Le	217270943	jamesmql@my.yorku.ca
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Decision Made / Agenda / Objectives / Plan for the Coming Week

Question 1: optimization based on resources, which resources to use as little as possible of

- Number of assets that have their own resources
- First Ground Station ☐ don't use more than one station per orbit; no hand offs, one station should be able to see enough
- Second ☐ spacecraft ☐ there are 5 of them. Use them equally and distribute the load; each image should only be taken once not multiple times by more than one satellite.

Question 2: Image format question: let's say a user makes a request for a certain area of interest; will image file format

- The image order will have a tag attached and fed up to the satellite and the satellite has to take the appropriate image corresponding to the order
- Satellite responds to image order, and we have data requirements

- Later, they may add power requirements that vary but for now assume power requirements are the same

Question 3: Architecture feedback AWS or not

- We can deploy on cloud, but we cannot lock into a specific cloud framework
- Lambda is too locked in
- Having vendor locking is a deal breaker
- We need to make sure its open source, a cloud lock-in will defy the open-source principle
- We need to have docker containers that get deployed into cloud in a general sense

Question 4: Image order/storage

- We never store or transfer images
- We keep track of them and the status of the image order to confirm its completion or retry

Question 5: Paper question about ephemeris

- Mysterious third party gives us the image, don't worry about where it comes from
- Just be able to take it in
- TLE is one of the spacecraft parameters
- A changed TLE needs to be responded but ephemeris is not important
- The ground station is not directly interfaced
 - We have mock states/activities of it and then respond to these
- We have logs about ground station activities, and we need to respond to this

Question 6: Login/Registration

- Very good feature to have
- Not a required feature but they won't deny

Question 7: Microsoft teams group chat

- Good to go

Question 8: priority of users; how to determine this?

- This will be associated with image orders themselves
- Image orders will have a priority parameter (e.g., high, medium, low)

Question 9: Downlinking question

- Tell satellite when to download
- The system will update the activities

- The system will downlink the activities when the ground station is available
- Send messages to ground station to let it know
- The system will model the ground station, satellite, and timings; no real objects/times
- It's a mock
- Need to calculate when a ground station has visibility with each satellite
- Respond accordingly to create a downlink request

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Project Name	Satellite Operations Services Optimizer
Date & Time of Meeting	2023/10/06 (~2:30 PM)

Attendees

#	Name	Student ID	Username (email)
1	Youssef Hany	216885766	youssef8@my.yorku.ca
2	Rafael Dolores	216142069	rafd47@my.yorku.ca
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Decision Made / Agenda / Objectives / Plan for the Coming Week

- You should be able to configure a ground station - add it to the system, so that users can just refer to them by id and have their info, like latitude, longitude, e.t.c.
 - Think of it as 2 user classes - people submitting image orders/people receiving orders (these are the ones that will be responsible for making sure the orders get scheduled)
 - The users of this system will be the satellite operators. The other users will just receive requests via an api dropbox, e.t.c. The people ordering images will not be able to go into our system to order the images. We don't need to design for that. We can just have them use an api. It is the operators that will use the system to follow the status of the orders, add satellites, remove, submit maintenance requests for satellites, outages for ground station and satellites, e.t.c.
 - In summary, image orders won't be made through our web interface. Just an api or a dropbox
- Using antenna design - what is the depth? do trait study on which antennas, e.t.c.
 - no need to go into that at all. Just take the ground station, work with their location, and have the ability to create a mask, and if it is above this level, for example, then the satellite can operate. don't have to worry about weather conditions, e.t.c.
 - prince albert/gatineau height is in metres above sea level
 - Will orders be collected in batches, e.t.c.?
 - Depends on the structure and methodology we chose. Ideally, each order we receive gets acted on, or alternatively, we accumulate orders, like, every 3 minutes and act on them. But the main thing is orders come in, the system takes them, processes them, and our orders are relatively agile in adapting to orders. Don't have to submit at a particular time to have the order processed. Ideally we want to minimise time that someone can submit an order and get it acted upon
- Selecting different satellites - they will have different storage capacities.
 - Each satellite will have a limited amount of images that they can store on board. They can't keep them there, they need to be downlinked.
 - if we overload a satellite, then it will be unavailable to fulfil orders when it may have been the only satellite that will be able to fulfil another future order. So now that new order will be impossible to fulfil. So we don't want to overload any one satellite
 - The only storage factor we care about is images. maintenance activities are negligible in size
- Will we have
 - have state models for the different things. The satellite doesn't know anything. You need to let the satellite know when to downlink, when to take the image, e.t.c. It doesn't know anything about that, so we need to track these statuses in our own state model
- power:
 - The document says we assume the sun has sufficient power to sustain. However, satellites will enter eclipses. We will need something in our system to let us know if the satellite is in eclipse or not. If it is in an eclipse, we need something to sort of ration the power. Say eclipse takes 20 minutes, so within this period, the satellite will be able to take only 6 images, so we may need to reject and adjust our schedule so that the satellite battery will not get too low from it taking too many images for example
 - our system should be able to tell eclipse periods (python library exists, feed TLE, feed time, then it tells you am i in eclipse or not)
 - sun is blocked by the earth
 - working on batteries
- 2 possible outages:
 - spacecraft

- ground station:
 - say gs gatineau, outage for 2 days. any contact that you have to update that satellite, or downlink images, will no longer be able to be carried out. Our system will need to reschedule these things. Move those uplinks to a different ground station, move downlinks to different ground station as well
 - System will need to have a capacity to react to such outages. You will have to move those activities to other resources, as well as not schedule additional resources using those resources
 - system can communicate to ground station to send maintenance request
 - maintenance requests may be viewed as an outage. maintenance may prevent other activities from taking place, it may not. The difference between maintenance and outage is that we are able to schedule it to a convenient time
- 4 things to consider in schedule (at least we can think of as of now):
 - storage capacity
 - outages
 - maintenance activities
 - eclipses
 - image resolutions are static, configurable parameters
 - if a new satellite gets introduced, it may have different kinds of parameters, and those may need to be tweaked.
 - there will be upper limit for these
 - request priority
 - will be provided by operator with the request - 3 levels (high, medium, low)
 - for repeat cycle
 - number of times it repeats, and how often it repeats. The difference between those two is this:
 - e.g. flushing the ram on-board the satellite
 - you want that to occur every 2 days. you want it to occur 14 times. So you have 2 things - every 2 days, and it will happen 14 times

Sample orders will be sent to us middle-end of next week with concrete numbers

on document, it says that the schedules should be automated, but also user configurable
Does that mean we need to keep track of every schedule sent to the ground station so that that schedule can be reconfigured?

- kinda - maybe an operator wants a schedule to be created and wait for approval before it is sent. You have user intervention - you have steps within the workflow where the user can see what's going on, and can push things forward, e.t.c. so they want to be able to control that.

Team Responsibilities for the Coming Week

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Decision Made / Agenda / Objectives / Plan for the Coming Week
<p>our updates setting up servers</p> <p>plan for this week basic front end framework set up</p> <p>what are expectations milestones iterative depends on how you set up maybe share sprints yes or maybe not right dir depends on you - propose what you want we'll say valid or not, provide guidance</p> <p>what about at the end of the project good solution would be front end: view status from gs, satellite status - available storage, power, position , order status</p>

system: efficiently allocates /schedule distributed schedule
reallocate tasks not lose activities

what are your priority on deliverables viewing status or backend algorithms
look at project milestones and decide what to focus your resources on
we don't have a set outcome
might be better to work on seperate services rather than one ui
you can work on aspects and we'll give feedback and iterate and have a back and forth.
pretend we don't really know what we want and

Expectations new weekly inputs coming in will we have a new expectation in january
you don't have all the expectaions right now, we'll keeep asking or adding to see how
system will react to the different cases and activities

technical optimizing - number of requests we can except to recieve
100 per day per spacecraft - is idealized range
either batchdrop or spreadout

load balancer

see how system performs first before thinking about scalability. see how it performs on
a smaller scale. figure out limitations first you might think one will be a bottle neck but find a
different one.

will send package with 50 sample orders.

Team Responsibilities for the Coming Week

#	Name	Responsibility
1	Youssef Hany	Develop satellite and ground station calculations.
2	Rafael Dolores	Image & Activity Request Endpoints for Event-Relay-API
3	James Le	Research similar web-apps to our product.
4	Walid Al Dari	Outbound Functionality into Ground Station Outbound Microservice.
5	Ruth Bezabeh	Database Code Development Example
6	Stanley Ihesiulo	Integrate Satellite Calculations into scheduler microservice.
7	Hashir Jamil	NGINX vs. Kubernetes investigation + Design Database Schema.

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2	Rafael Dolores	216142069	rafd47@my.yorku.ca
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Decision Made / Agenda / Objectives / Plan for the Coming Week	
<ul style="list-style-type: none"> - Databases are set-up now. - Database code for Postgres set-up now. - Requirements should include: <ul style="list-style-type: none"> - Ground station constraints - Project scope constraints - Satellite constraints - Recursive scheduling issues need to be addressed with CSA. <ul style="list-style-type: none"> - Scheduling trucks amazon problem. - Two things to show to the CSA: <ul style="list-style-type: none"> - Visual update to show to the CSA - Progress report coming up for ENG4k 	

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2	Rafael Dolores	Image & Activity Request Endpoints for Event-Relay-API
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#	Name	% Completed	Comment (provide the reasoning only if 100% is not completed)
1	Youssef Hany	75	
2	Rafael Dolores	100	

3	James Le	100	
4	Walid Al Dari	0	Pushed to next sprint
5	Ruth Bezabeh	100	
6	Stanley Ihesiulo	0	Pushed to next sprint
7	Hashir Jamil	100	