DAQ/Electrical/Software Lead Responsibilities

Andrew Hellrigel, 12/2021

# Purpose

The goal of this document is to provide clear responsibilities for data acquisition and electrical/software sub-team leads since a lot of their domain of operation overlaps (i.e. most of what the electrical/software teams will be doing will be for the purpose of data acquisition). It should go into enough detail on each subject so that it can also act as a knowledge transfer when leads graduate and are replaced with new leads. This is most important for non-technical items such as how to add people to the Github.

This document should be frequently updated (at least every year), especially if any restructuring of the leads takes place. A copy of the document should be stored in the GTOR network drive under the data acquisition folder in the current season, and the main document should be stored in the GTOR Documentation Github on the main branch in the Misc Documentation > Lead Documents folder.

# Revisions

Andrew Hellrigel (12/2020) – Made original version of document

Andrew Hellrigel (12/2021) – Added updates to include senior software engineer

# Shared Responsibilities

## Recruiting

All leads should be actively engaged in the recruiting process because it is arguably the most important task for team leads since it is crucial for the sub-team’s longevity and success. In the past, a list of fun projects that new members could get to work on has been compiled and a recruitment email has been made based on that. Once a recruitment email has been made, it should be given to the current business lead so that they can add information to it such as the current recruitment flyers and when the recruitment meetings will be taking place. Personal emails should also be included for the current leads so that if anyone wants to contact them directly with questions, they are able to. This should then be sent out to the ECE and CS mailing lists.

An example recruitment email can be found in GTORDocumentation > Misc Documentation > Lead Documents.

The recruitment email for the ECE mailing list can be mailed directly to [news\_ugrads@ece.gatech.edu](mailto:news_ugrads@ece.gatech.edu)

The recruitment email for the CS mailing list is [cc-newsandevents@lists.gatech.edu](mailto:cc-newsandevents@lists.gatech.edu)

This team has also had a lot of success with word-of-mouth style recruiting, so make sure people know to ask their friends to join too!

## Financials

The team leads should both be very conscious of the budget and make sure that money is being allocated appropriately for the current projects. Sub-team leads should approve purchases for parts for their members projects before they are placed on the purchasing spreadsheet. It is important that the members add their own purchases to the purchasing spreadsheet because it is their responsibility to make sure they have all the parts they need for their project to work.

### Digikey Orders

For Digikey orders, sometimes it is easier for the team/business lead if a Digikey cart is made so that they can just buy it instead of having to add all the items individually from the purchasing spreadsheet which is more prone to error. This is more useful for large quantity purchases. Individual line items for each part should still be added to the purchasing spreadsheet as it makes referring to things that have already been purchased much easier. A complete Digikey cart can then be sent in a Slack message to the business team or a purchasing liaison.

### PCB Orders

For PCB orders, generally we use JLCPCB because they tend to be the cheapest option. A cart should be made in JLCPCB under the GTOR Gmail account so that the team/business lead can just log into it and purchase what is in the cart. This allows you to make sure all the settings are correct for purchasing. The Gmail account should also be frequently checked shortly after a purchase because sometimes JLCPCB will send emails with inquiries if they have any questions about the manufacturing process for your PCBs. Make sure that the team/business lead knows what shipping method you would like. Generally, DHL might be preferred because it is usually around $18 for 3-4-day shipping vs. standard shipping which is like $9 for 22-30-day shipping.

## Member Management

As of now (12/2021), members are not assigned to a specific sub-team. (They can say they are a DAQ/Electrical/Software team member for resume purposes if they want). This is because they are assigned project-based tasks where they get to see the entire lifecycle of a project from conception, to design, to manufacturing, to software, to testing, etc. This naturally spans the DAQ, electrical, and software side of things entirely. This means that different parts of a member’s projects are different leads’ responsibilities to see that they get done properly. This will be outlined more each team leads’ respective responsibilities section. This, however, means that member retention is important for both leads, and they should both be paying attention and following up with all the members to make sure they have what they need to succeed.

When new DAQ/Electrical/Software members are added to the team, they should:

* Be given a link to the team’s internal website <https://www.gtoffroad.org/data-acquisition> where they can download the new member guide, find the DAQ Github, and join the Discord
* Be added as a contributor to the teams Github (Senior Software Engineer’s responsibility)
* Install GitKraken (unless they are proficient in git and prefer to use CLI or their own GUI)
* Have the structure of our Github explained to them and be taught how to use Git/GitKraken if they don’t already know how to
* Install EAGLE (they don’t need to do this right away unless their first project involves PCB design)
* Join the #new-members channel and #data-acquisition channel in the slack
* Be instructed on how to access the GTOR network drive (only if they will be doing CAD)
* Install DAATA so that they can begin to become familiar with it

### Updating the Internal Website

To update the internal website with new Data Acquisition information, first ask the team’s IT lead to be added to the GT Off-Road Leaders google group, ([gt-off-road-leaders@sccgt.org](mailto:gt-off-road-leaders@sccgt.org)). Once you are in the leaders group you will have edit access to the internal website. Go to Google Sites to be able to edit the website <https://sites.google.com>.

### Communications

With the migration to Discord complete, basically all individual and team communications should occur through Discord (sometimes it is easy to DM someone on Slack, especially if they are new to the team, but Discord often works better since messages never get deleted). Any changes to team meetings should be communicated through #announcements channel on the Discord. Ideally it is better to meet in person, but if virtual meetings are necessary then meeting in the voice channels in the Discord is easiest. The only time Microsoft Teams should be used is if there needs to be a meeting with someone from another sub-team, although maybe try to convince them to use Discord :)

### GTOR Network Drive

To connect to the GTOR Network Drive, refer to the presentation in GTORDocumentation>01 – New Students (or ask the team’s IT lead). Only large CAD files should go in the network drive. If there is a design that only has a handful of CAD files (such as an case/enclosure) it is fine for that file to go into the DAQ GitHub, but if there will be a large assembly (such as the engine dyno) then it should go in the network drive to avoid having too many large files on the GitHub.

## Documentation

Since knowledge transfer is critical to our team’s success it is important that all the leads make sure that documentation that falls under their respective sub-team gets done. All documentation that is created should live in the GTORDocumentation GitHub.

# DAQ Lead(s) Responsibilities

## Communication with Other Leads

The main responsibility of the DAQ Lead is to make sure that they are communicating with all the other mechanical sub-teams and the chief engineer to know what all of their validation plans are. Their job is to know where all the sensors need to go on the car to fulfill the validation plans of all the mechanical sub-teams. They will also oversee the design of any separate rigs for validation (such as the shock dyno) so that validation can be performed separate from the car.

The DAQ lead needs to decide how much of the validation process falls on him/herself and how much of it falls on the respective sub-teams. As of now (12/2021), must of the experimental design and validation plans falls on individual sub-teams, whereas figuring out appropriate sensors for measuring things falls on the DAQ lead.

## Communication with Electrical Lead and Senior Software Engineer

The DAQ lead is also responsible for communicating high level electrical and software requirements as determined by the testing needs to the respective electrical lead or senior software engineer. This also means scheduling any meetings to reevaluate the DAQ team goals, member management, etc.

## Creation of DAQ Validation Plan

This document will drive development of all software and electrical systems for the year, so care should be taken to make sure it is well developed. A preliminary version of the document should be created by having meetings with each of the design sub-team leads, the VD sub-team lead, and also the chief engineer to cover all of the tests that need to be run on the car. Then it should double checked by all of the leads once it has been fully developed so that a final draft of it can be completed by late summer/early fall. It needs to be completed so early since it will drive a lot of the development of DAQ systems and since a lot of the DAQ systems get designed in the summer, the designs need to be double checked to make sure they support the needs of Spring validation before they can get manufactured in the Fall. The document should be stored in GTORDocumentation>06 – Misc Documentation>ValidationPlans>20xx Car.

## Organization of Team Meetings

It is the DAQ leads responsibility to organize team meetings. Typically, the DAQ team just meets when the rest of the team meets for simplicity, but it is up to the DAQ leads discretion if any changes need to be made. Mostly this just means that it is the DAQ leads job to make sure the DAQ team has the proper space needed to meet. Refer to the SCC wiki on how to reserve SCC conference rooms. It is usually easiest to ask to reserve the room on a recurring basis for the entirety of a semester. <https://sites.google.com/sccgt.org/sccwiki/general/schedule-the-conference-room>

## Data Postprocessing

It is also up to the DAQ lead to make sure there is a plan for post-processing the collected data, or at the very least, making sure that all collected data is stored properly in an organized and easy to find place in an easy-to-use format (such as .mat files or excel files). Thus, the DAQ lead will oversee the part of DAATA that manages collected data, and any data that is collected without DAATA is properly managed.

# Electrical Lead(s) Responsibilities

## Wiring the Car

It is up to the electrical lead to make sure that the car gets properly wired in a robust way. Failure points in wiring on the car should be identified and properly taken car of (such as using connectors with proper ingress protection to protect against water and mud). It also includes making sure that the firewall has holes in the proper places for wires to go through and also making sure that there are tabs on the chassis for wires to be secured to.

## Kill switch/Brake light

The kill switch and brake light are the two electrical components that must be wired on the car every year that do not have anything to do with data acquisition. Therefore, they naturally fall on the electrical lead to make sure these things get done.

## Driver dashboard

The driver dashboard also mostly falls on the electrical lead with the exception being that the speed sensors that control the dashboard falls on the DAQ lead to make sure that these are properly in place.

## eCVT / differential controller / etc.

If it is decided that an eCVT or a differential controller or anything else electrical/software related that will be designed to control physical aspects of the car is going to be used, then the electrical lead assumes responsibility in making sure that these things get done. Again, the electrical lead should work with the DAQ lead to make sure that there will be the sensors necessary to collect the data needed for the control algorithms used for these systems.

## PCB Designs

All PCB designs are a part of the electrical lead’s responsibilities to make sure that they work and are designed properly. This includes making sure that a proper design review is done of the PCB and that all parts needed for the PCB are approved to be ordered and are ordered in sufficient quantities. A good rule of thumb is that you should almost always buy 2.5x more parts than you will need to make the circuit board (except for exceptionally expensive components, or components that are very unlikely to break and are easy to desolder and move to another circuit board such as a terminal block).

# Senior Software Engineer(s) Responsibilities

## Description of Role

The main role of the Senior Software Engineer is to manage the team’s software development (such as DAATA and all embedded software). The person in this role is not officially a lead (although this decision should be occasionally reevaluated) because it functions more as an internal role to DAQ. The electrical lead frequently must communicate with other sub-team leads and needs to attend lead meetings to making sure wiring the car goes smoothly, however there is really no need for the senior software engineer to participate in lead meetings. If/when DAATA becomes sophisticated enough that other sub-teams are frequently using it to perform testing and need to support of an official software lead, then it may be worth looking in to creating this position.

## DAATA

It is up to the senior software engineer to make sure that DAATA is being properly maintained and that it is updated with user interfaces that make it easy for anyone on the team to use and collect data.

## Hardware Level Software

It is the senior software engineer’s responsibility to make sure that all the software that is written at the hardware level (most likely in C++) is properly design reviewed and has been tested properly before being used on the car. This includes all sensor libraries, all control algorithms, and the top-level code as well.

## GitHub

It is the senior software engineer’s role to manage the team’s GitHub and make sure everything is kept as clean as possible. This includes adding/removing people’s GitHub access as needed and making sure that everyone using the GitHub knows where things are and where specific types of files should go so that it is kept organized. For a refresher on the GitHub structure, refer to section 2.3 of the new student guide. To add someone to the GitHub, ask the person to put their GitHub username in the #git channel on the Discord, go to the “people” section of the teams organization, and then click “invite member” to invite the person based on their username.