

# Syed Hashmi

## Experience

**Mechanical Engineering Co-Op** – UWaterloo Alternate Fuels Team – Waterloo ON Jan 2024 – April 2024

- Spearheading antenna design & integration for Lyriq revamp to achieve reliable GPS communication with team-implemented autonomous driving modules, resulting in 0.05% failure rate under normal driving conditions.
- Designing CNC motor mounts with .001" calculated bushing press-fit interference at LMC to ensure reliable bushing fit and vehicle NVH performance for competing at GM's Desert Proving Grounds test facility
- Rerouting entire vehicle high voltage system, designing custom HV motor connectors, interfacing with GM-required junction boxes, maintaining HV cable bend radii mins, and integrating HVD and HVIL to ensure all 200+ GM safety standards are met for vehicle technical inspection at Arizona EcoCar Challenge
- Designing and machining mounts, jigs, and components, mounting additional motors, integrating control module server rack, and relocating powertrain cooling systems to convert car from RWD to AWD

**Accumulator Mechanical Member** — UWaterloo Formula Electric — Waterloo ON Sept 2023 — Present

- Designing accumulator box fan shrouds for intake and exhaust fans, using 3D-printed prototypes to test and optimize airflow and experimenting with various gaskets and sealant to pass IP-testing per Formula Hybrid rules
- Using SolidWorks to model and fabricate bending- and punching-jigs used to produce over 1000 cell fuses for use in accumulator segments, preventing damage to segments by isolating shorting cells and reducing team-imposed motor-power restrictions, helping team achieve 10<sup>th</sup> place finish at Formula Hybrid competition

**Controls Engineering Co-Op** — Eclipse Automation — Cambridge ON Sept 2022 — Jan 2023

- Implementing safety measures and scenario-based responses in automated production lines using Siemens PLCs by programming E-stops, status indicators, start-up checks, segment isolation locks, and backup material reservoirs to ensure safe operation while minimizing impact on line 1.5s/item production rate
- Confirming system integrity of automated production lines by conducting I/O checks through manual sensor stimulation and PLC software overrides, identifying faults for resolution by engineering teams

## Projects

### Automated Home Systems

- Developing cost-effective home automation systems (garage opener, smart lock, garden watering) on Arduino platform, using environmental triggers and routine checks to help achieve up to 70% reduction in hydro usage

### Maglev Train

- Designing and constructing functional maglev train model using Onshape and 3D printed components, utilizing magnets, gyros, and thrust vector-controlled motor to follow along magnet tracks without losing balance

### First Robotics Competition

- Researching and designing telescopic robot arm to pick up items of various shapes and launch/hook them on to platforms of various heights to score competition points, achieving 2nd place finish at UWaterloo regional

## Skills

Siemens NX  
AutoCAD

SolidWorks  
OnShape

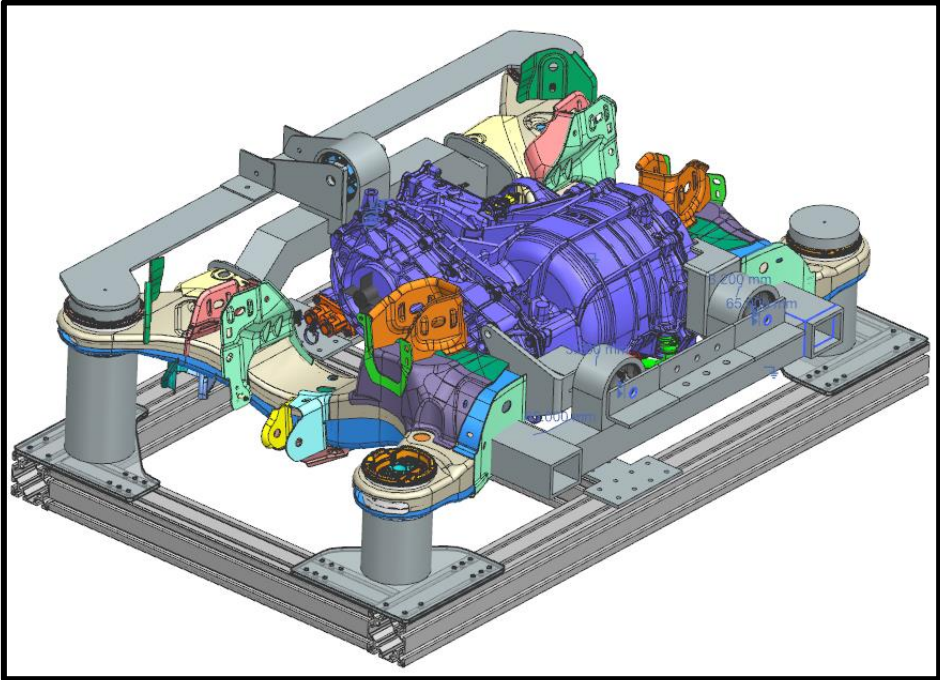
Siemens LOGO!  
C++

## Education

**Mechatronics Engineering** – University of Waterloo

Sept 2023 – April 2028

# Subframe Modification Welding Jig



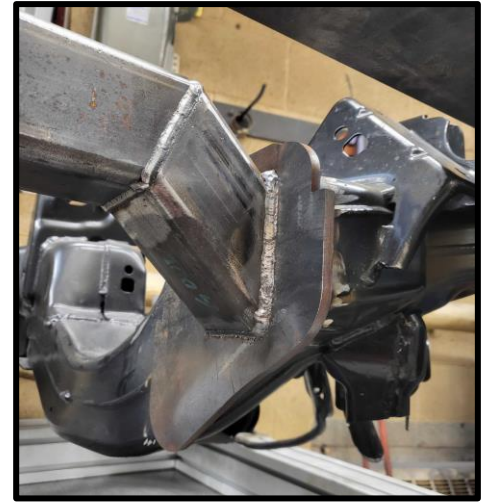
**Problem:** In order to pass strict GM-mandated FEA thresholds, and due to number of welds and fasteners being used on full assembly, welds need to be toleranced to  $\pm 1\text{mm}$  for motor mounts to align with mounting points on motor without causing imbalanced load distribution and failing in FEA

**Solution:** Designed and manufactured subframe welding jig, using motor-mounts as datum-points and maximizing usage of stock and waterjet parts in order to ensure best load distribution and accuracy for assembled jig



*Assembly fit test*

**Result:** Welding jig manufactured and given to machine shop which was able to use it to complete all welds required for subframe modification. Motor mount holes



*Welded subframe sections*

**Tools Used:** NX, AutoCAD, Waterjet Cutter, Hypermesh



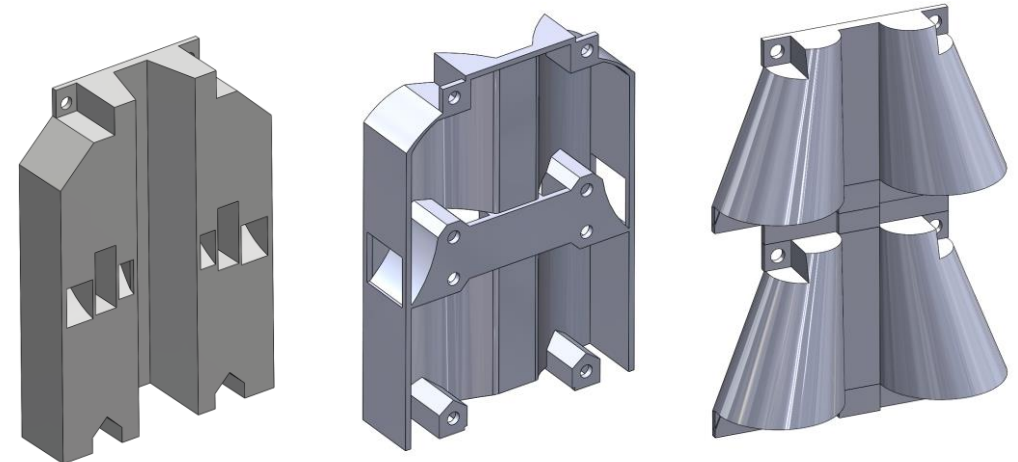
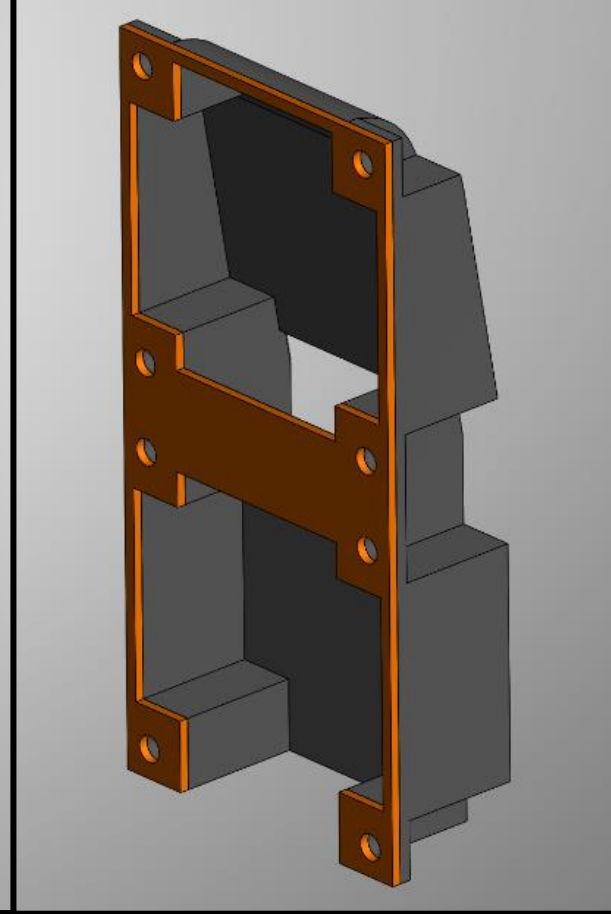
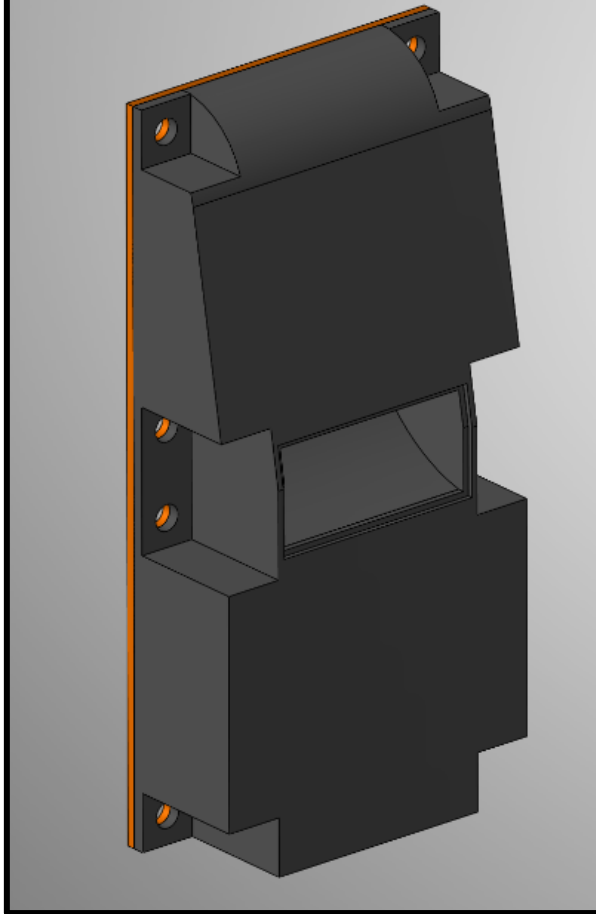
# Accumulator Box Fan Shrouds

**Problem:** Accumulator box requires fans for cooling cell segments but competition rules require accumulator boxes to be able to withstand 2 minutes of water-spray from all sides. Fans must be prepared for waterproof testing while maintaining optimal airflow to segments

**Tools Used:** SolidWorks, Cura, 3D printing, Waterjet Cutter

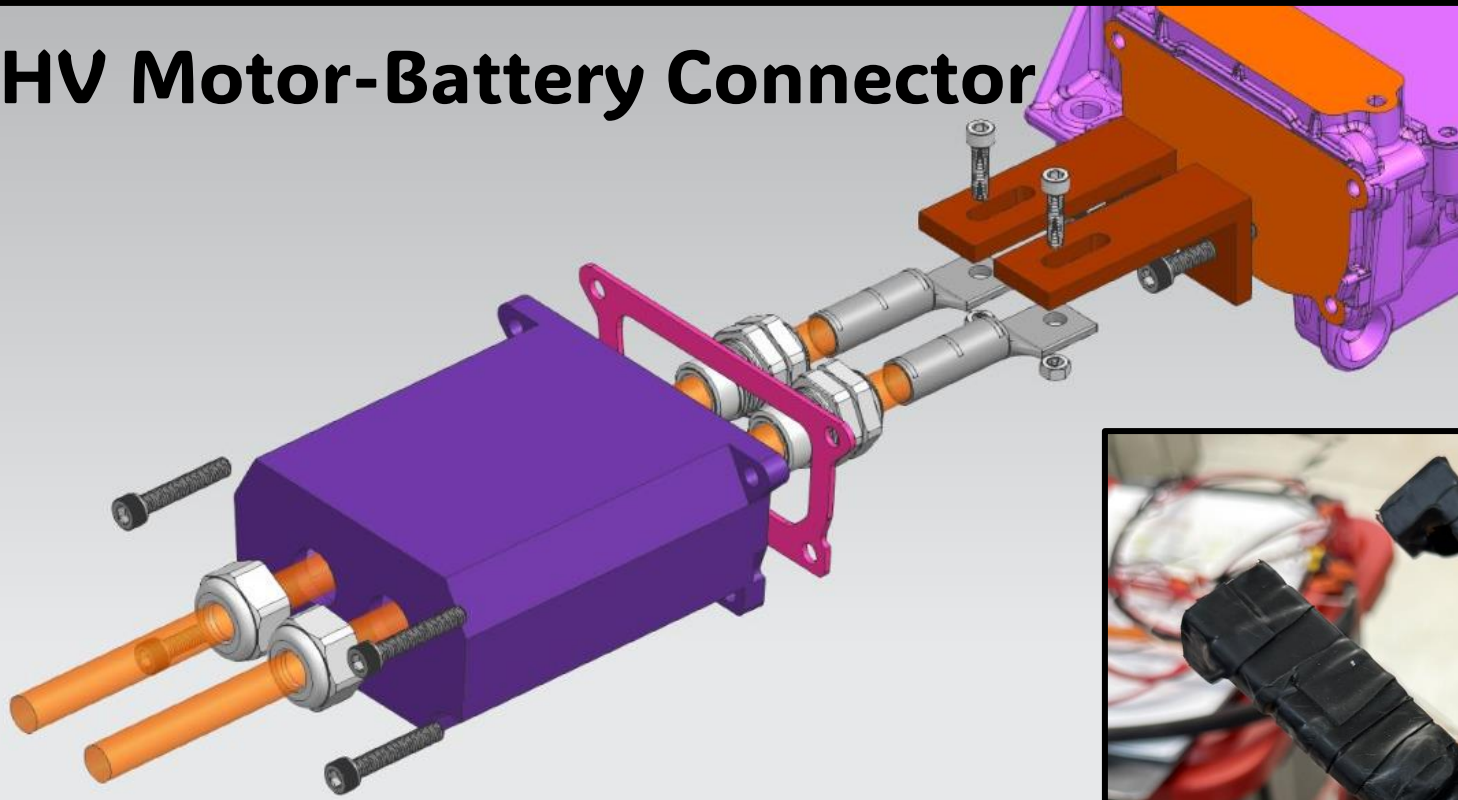
**Solution:** Designed fan shroud variations using SolidWorks, testing 3D-printed prototypes for ingress protection and accumulator temperatures under load. Used PETG, silicone gasket, and nylon mesh to create final assembly for use on box

**Result:** Accumulator box passed waterproofing test at competition and accumulator was able to run full load without thermal throttling, enabling top 10% scores at dynamic events and allowing team to secure 10th place finish

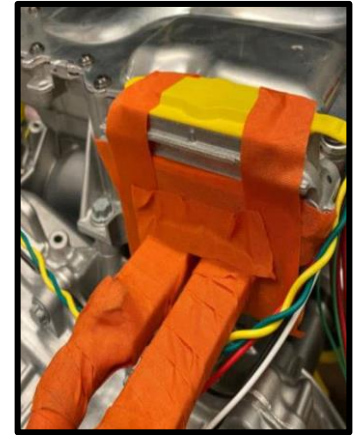


*Some other tested designs*

# HV Motor-Battery Connector



**Tools Used:** NX,  
AutoCAD, Mill, CNC,  
Tapping Machine,  
Waterjet Cutter,  
Hydraulic Crimper



*Original connection method*

**Solution:** Designed an insulated waterproof/HV-safe connector using a CNC'd enclosure, team-designed copper busbars, stock HV-rated cable, and cable glands, accounting for cable bend-radii restrictions, clearance constraints, and CNC tooling availability

**Result:** Team was able to power the new motors, converting car from RWD to AWD and doubling its output torque in preparation for performance categories at EcoCar 5 Year 2 competition

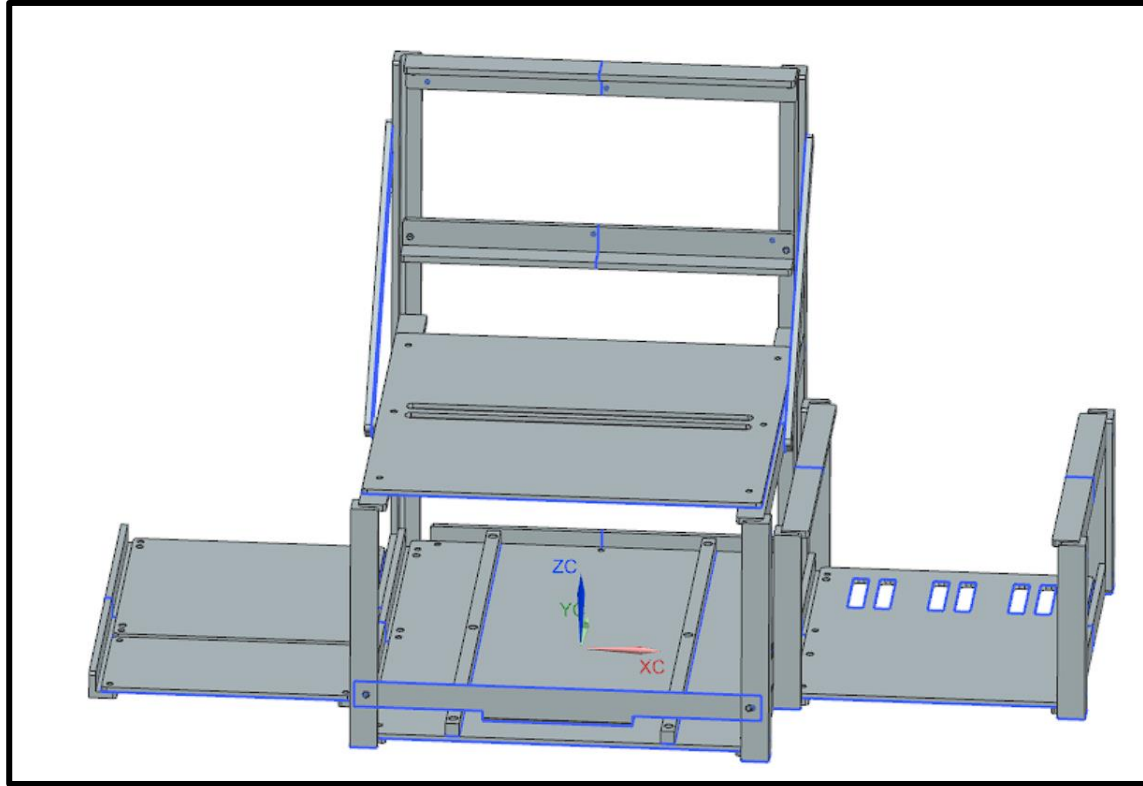


*Connector being assembled*

**Problem:** Team integrated motors originally manufactured for use in a discontinued car; connectors no longer available for these motors; team relying on electrical tape and naked wire to interface



# Vehicle Computer Server Rack



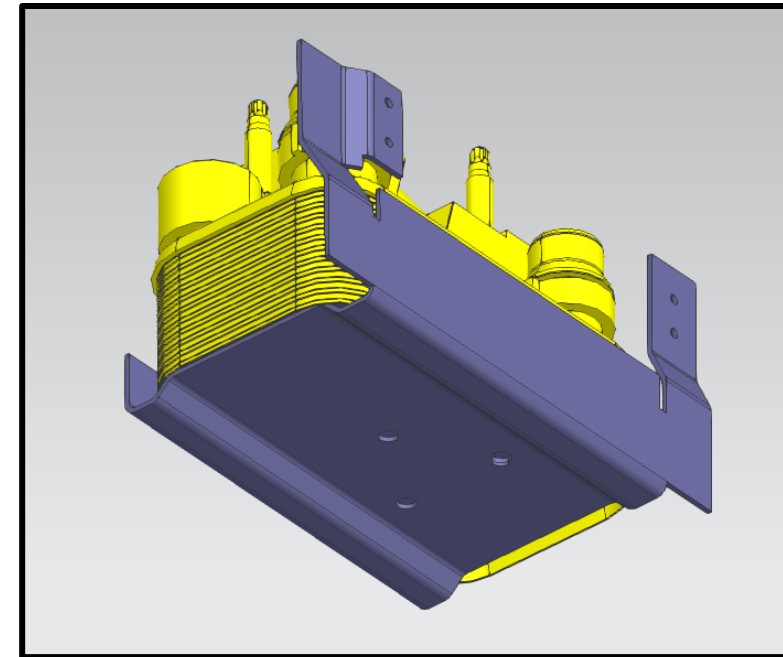
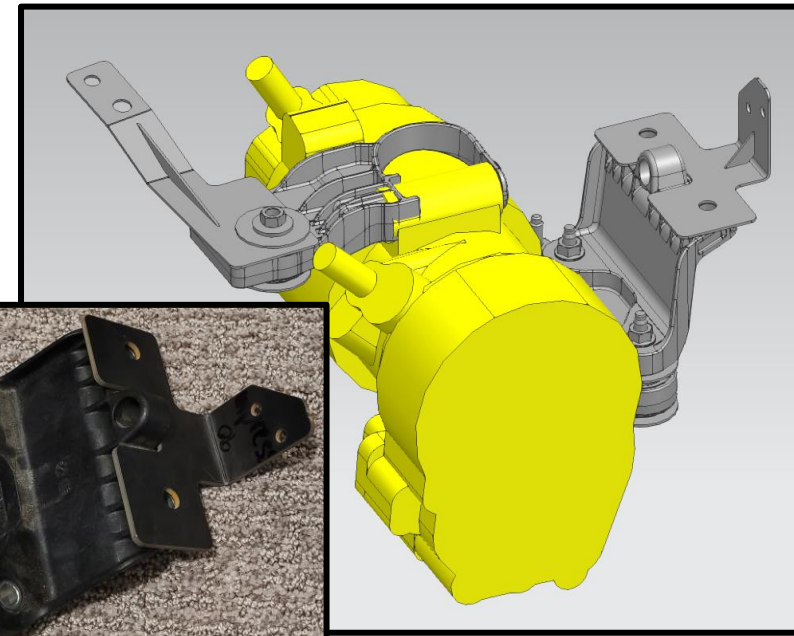
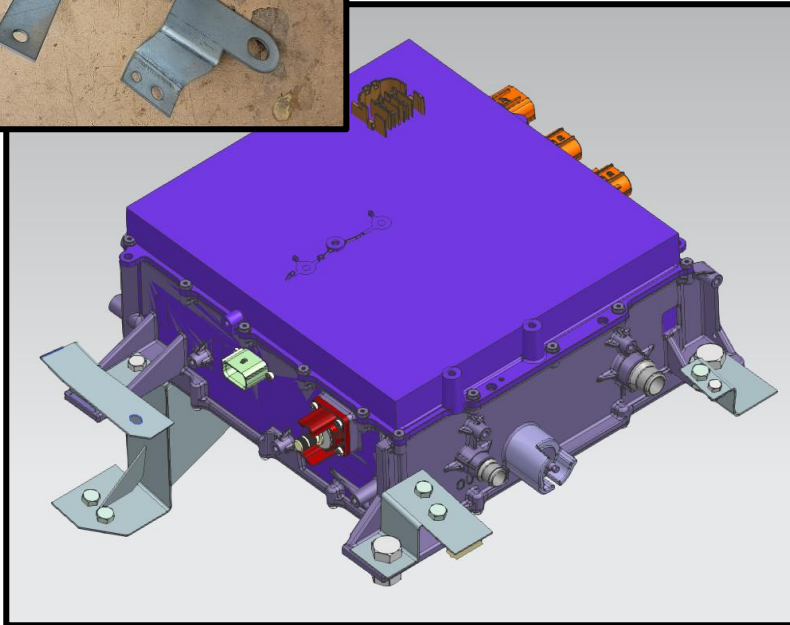
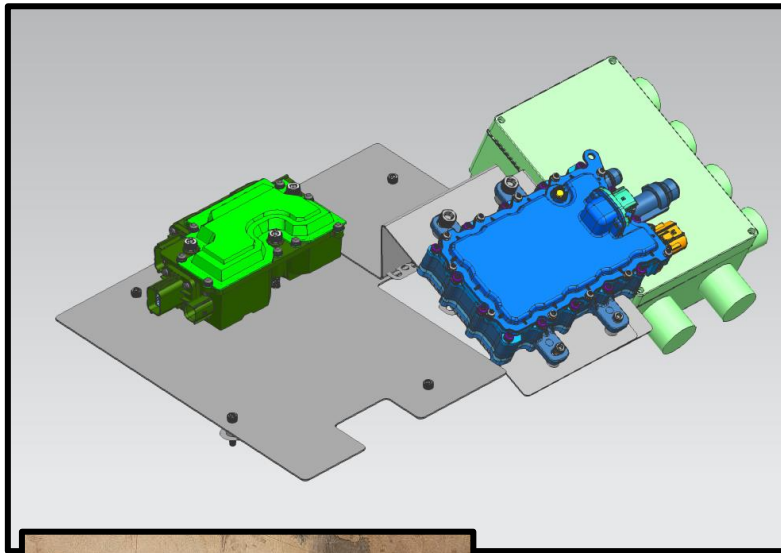
*Assembled server rack mounted in vehicle*

**Problem:** Need mounting solution for autonomous driving, propulsion controls, communications, and datalogging computers. Design requirements mandate computers should be readily accessible and removable for quick team modifications, wiring, and troubleshooting

**Solution:** Server rack solution with sliding drawers and collapsible mounts that firmly fastens all computers to body chassis while still allowing team access, minimizing risk of vibration/motion damaging or disconnecting wires

**Result:** Server rack manufactured in machine shop and mounted into car in order to interface with vehicle CAN lines and EDUs, allowing propulsion controls teams to commence testing prior to competition start

**Tools Used:** NX, AutoCAD, Waterjet Cutter, Bandsaw, Mill, Break, Tapping Machine



## Auxiliary Component Relocation + Mounting

Repositioning all front HVAC, powertrain cooling, and controls systems in order to make space for addition of Front EDU: conducting space claim for all parts, routing necessary wires and pipes between component, creating sheet metal mounting solutions for components and routes, and manufacturing all mounts in the machine shop, ensuring optimal NVH performance for new AWD vehicle configuration.