



**BRADLEY**  
University

**KOMATSU**

**ECE 497 - Senior Project Deliverables**

**Komatsu Sponsored - ECU Communication and Networking**

Zach Oakes  
Christian West

Advised by:  
Aleksander Malinowski

October 15, 2017

## **Statement of Problem**

Komatsu is interested in exploring new designs to modify the current Electronic Control Unit (ECU) networks on their ultra-class mining trucks. The goal would be to increase security and introduce more functionality. Currently, Komatsu cannot uniquely identify and track their ECUs, meaning that there is no accountability for which ECUs are on which truck. Additionally, ECUs do not know their own ID and cannot communicate this information, so there is not a method for an ECU to know which other units are apart of the same network. These networks do not have a protocol to allow a secure transfer of ECU information. If one of these units were to fail, someone has to go on-site with a laptop and manually program the new ECU with information about how it is installed. If the information about which ECUs were already on the network could be obtained automatically, then the labor cost for programming and the potential for operator error could be eliminated. As an additional goal, the master should be able to determine which truck it is installed on automatically, possibly by use of an RFID tag or barcode permanently attached to the frame of the truck.

## **Functional Description**

ECUs on the production truck use a master/slave network topology. We will simulate this network using Raspberry Pis, so we can model traffic and and behavior for a proof of concept. The simulated ECUs will be assigned unique identifiers, and communicate them to each other. When one is replaced it will need to be able to recover the IDs of all the others, in addition to updating the others to know it's new ID. In addition to the unique identifiers, there will also be a chassis ID that all of the devices on the network will need to know, ideally in the form of a tag that can be automatically read by the master unit. A secure message handling protocol will need to be created so the ECUs can share information between themselves.