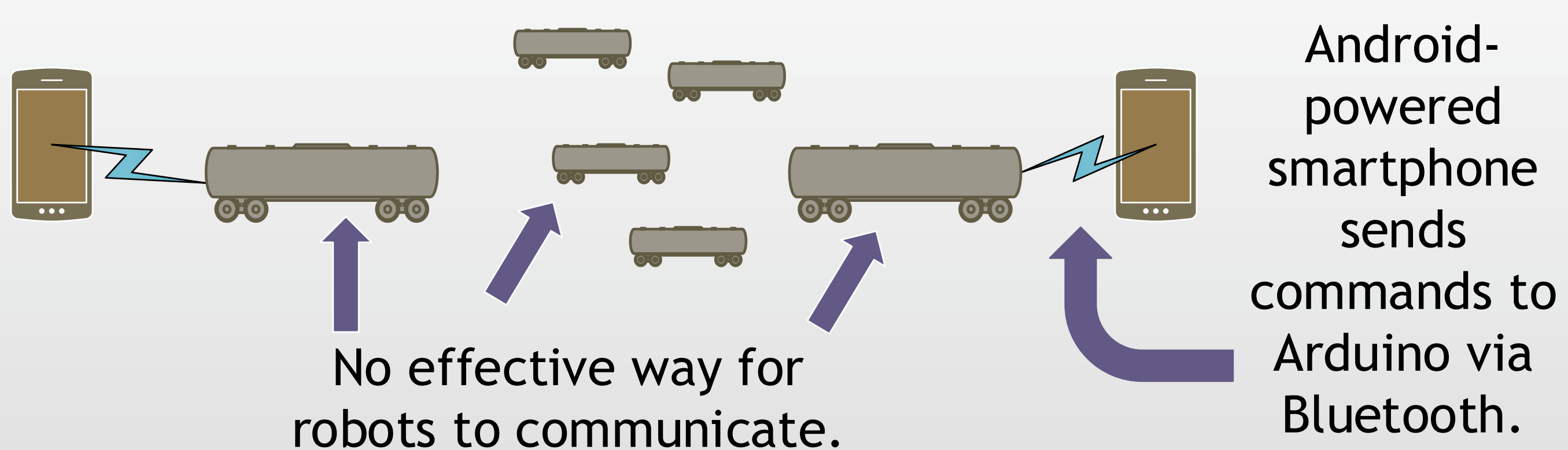


## Strategies for Autonomous Robots

### Problem

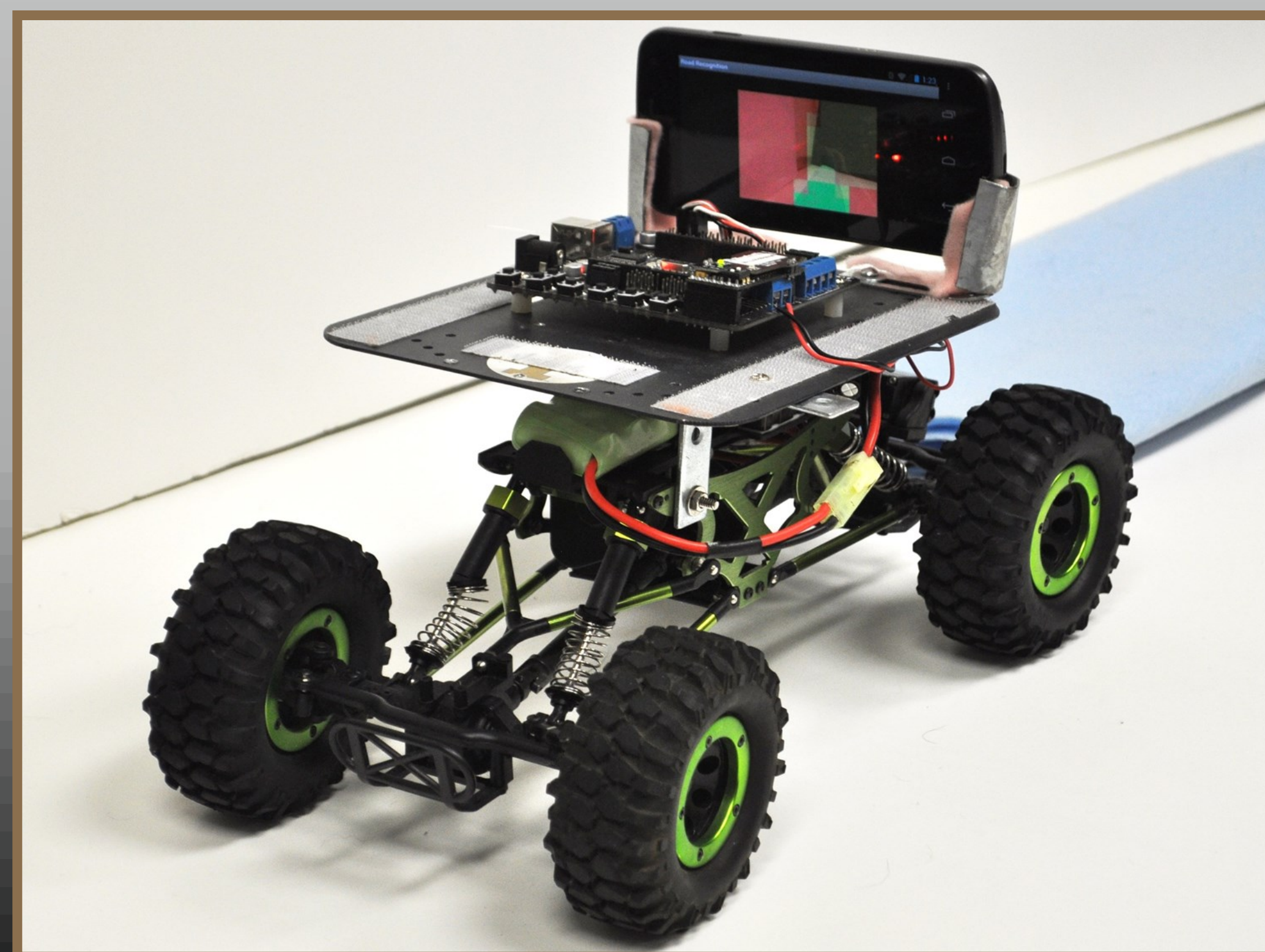
The current Commercial-Off-The-Shelf (COTS) Bots can perform tasks individually, but the current communication methods between robots for coordinated tasks have limitations.



### Project Goal

Adopt a physical layer and a transport networking standard.

Design and develop a protocol for managing robots on our network.

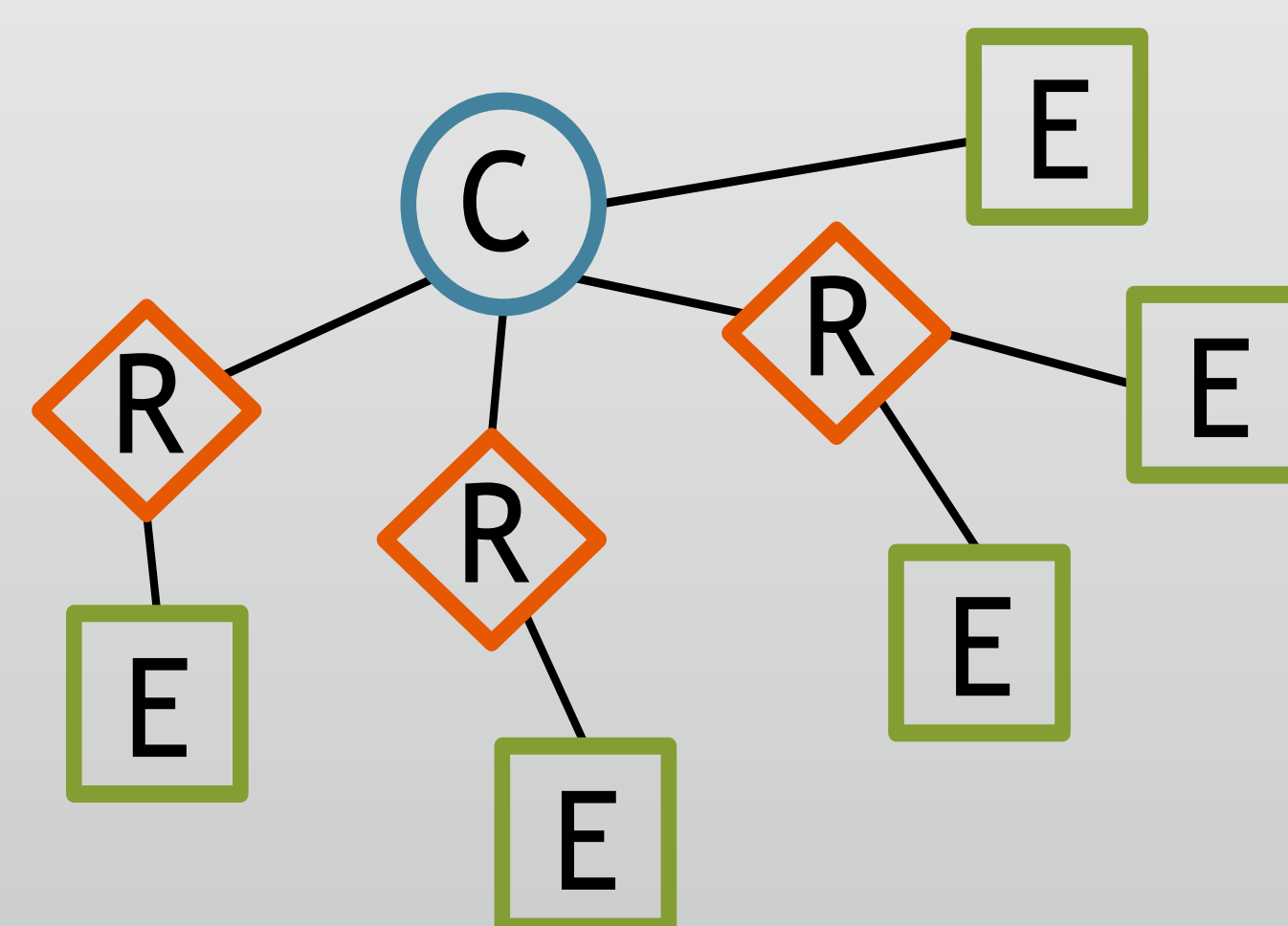


One current COTS Bot design using an RC Car body.

### Project Research

We decided to use the XBee RF Module, which can use the two different mesh-topology network protocols – ZigBee and DigiMesh.

The ZigBee Protocol can only have one Coordinator Node which is programmed in the firmware and each role has specific functions. ZigBee Networks also require a parent/child relationship which increases time for endpoints to receive messages.



ZigBee Topology based on 802.15.4  
Each node above represents a single robot in the network and its role.

- C: Coordinator
- R: Router
- E: Endpoint

#### Team AutoCOTS

Chris Waltrip  
Robert Meine

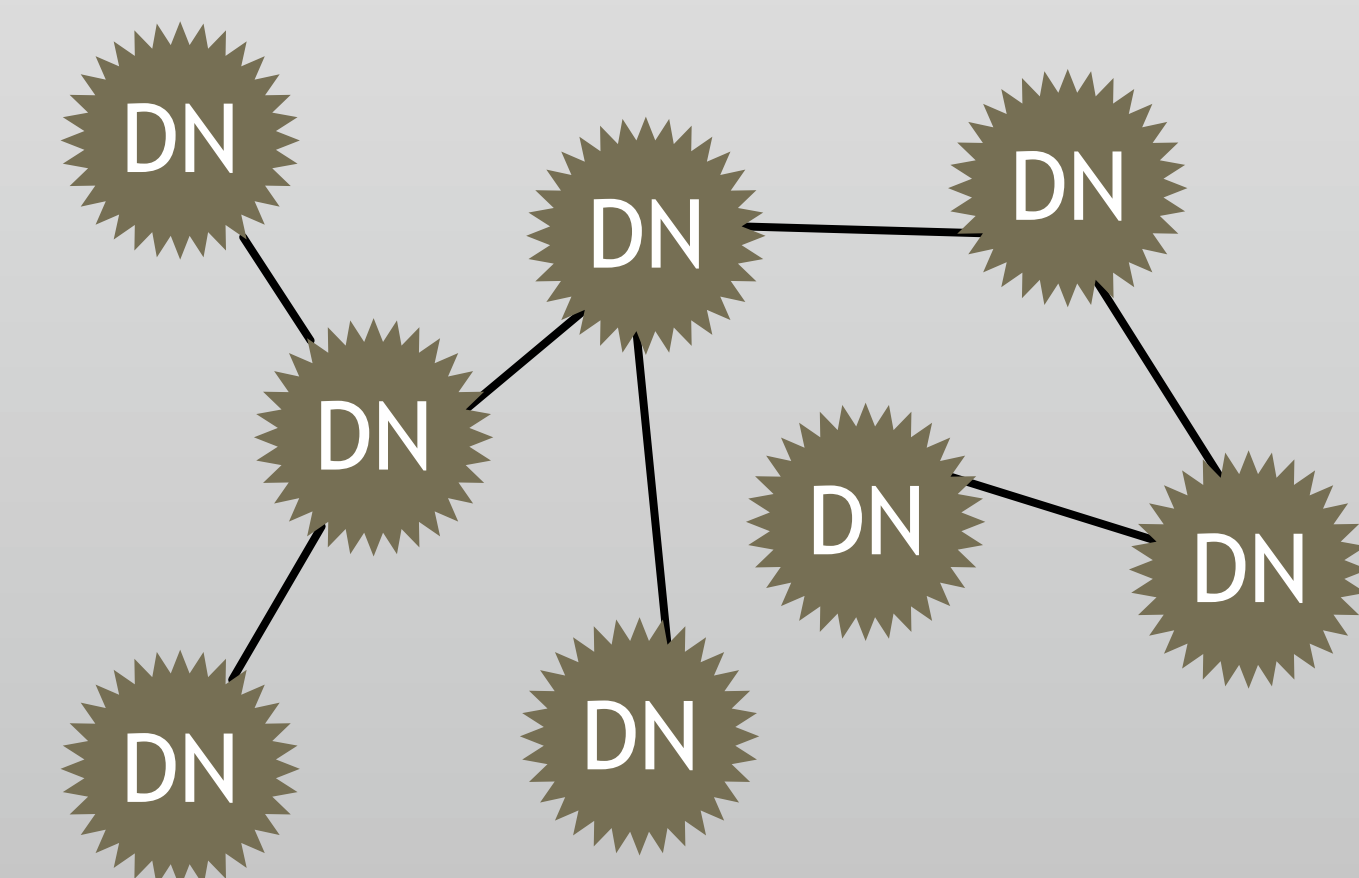
#### Faculty Sponsors

Dr. Terence Soule  
Dr. Robert Heckendorn

### Design & Solution

XBee Series 1 RF Modules using DigiMesh firmware connected to the Arduino will provide the communication infrastructure at the physical layer for networking the robots. The DigiMesh protocol additionally allows for larger packet payloads and provides a longer range (up to 40 miles).

We then create a protocol that is loosely based on Simple Network Message Protocol (SNMP) to craft small packets with any data payload. This allows for future expansion without modifications to the protocol.



DigiMesh Network Topology  
Homogenous network where all nodes are of one type.

