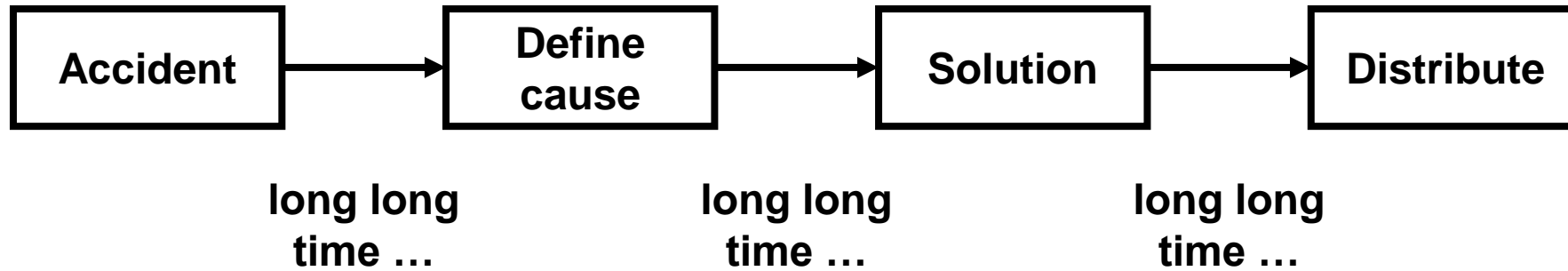


# **Network-Centric Approach Using Task Migration for Drive-by-Wire Vehicle Resilience**

**Jeanseong Baik**, Haegeon Jeong, Kyungtae Kang\*  
Computer Science and Engineering, Hanyang University

# Rise of the Autonomous Vehicles

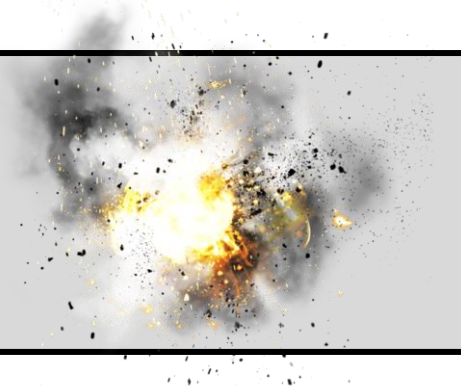


**Seamless services**

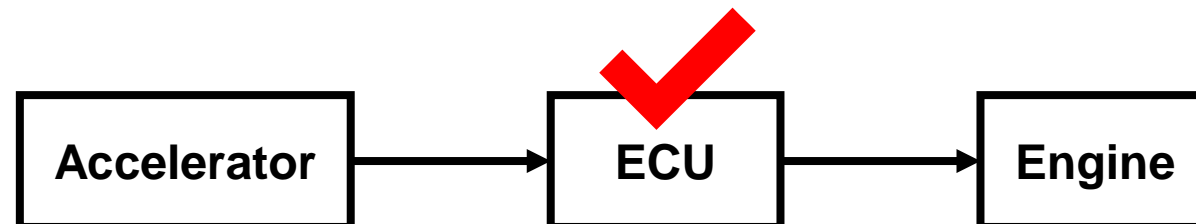
**Task migration + Network-centric**

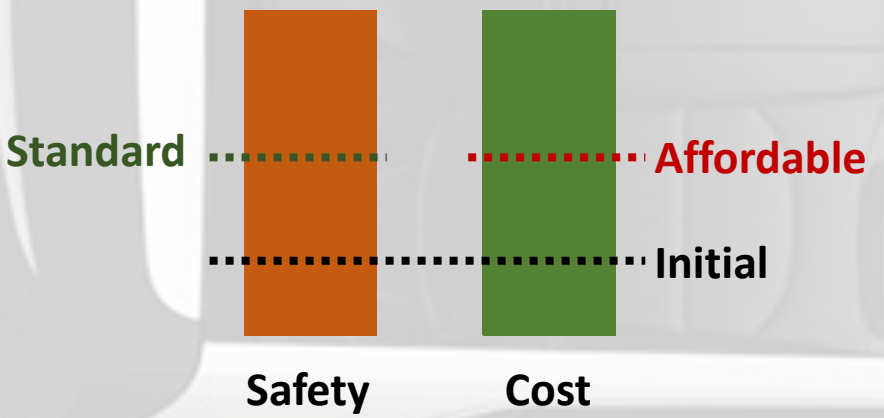
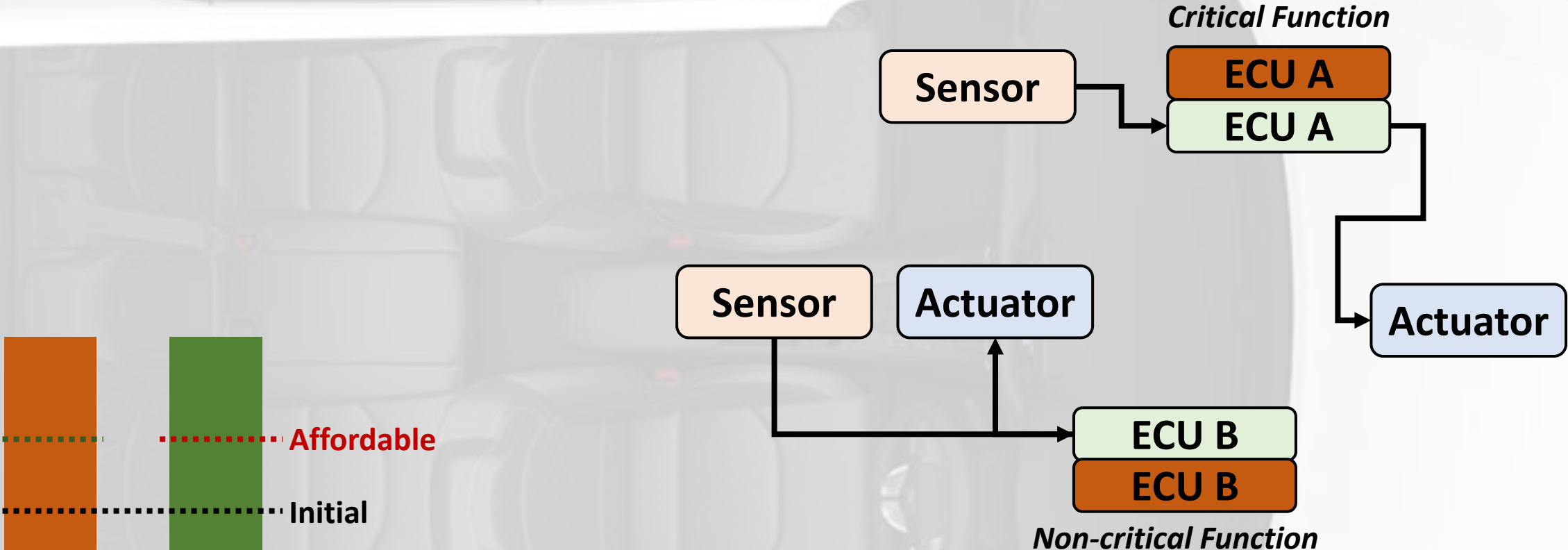
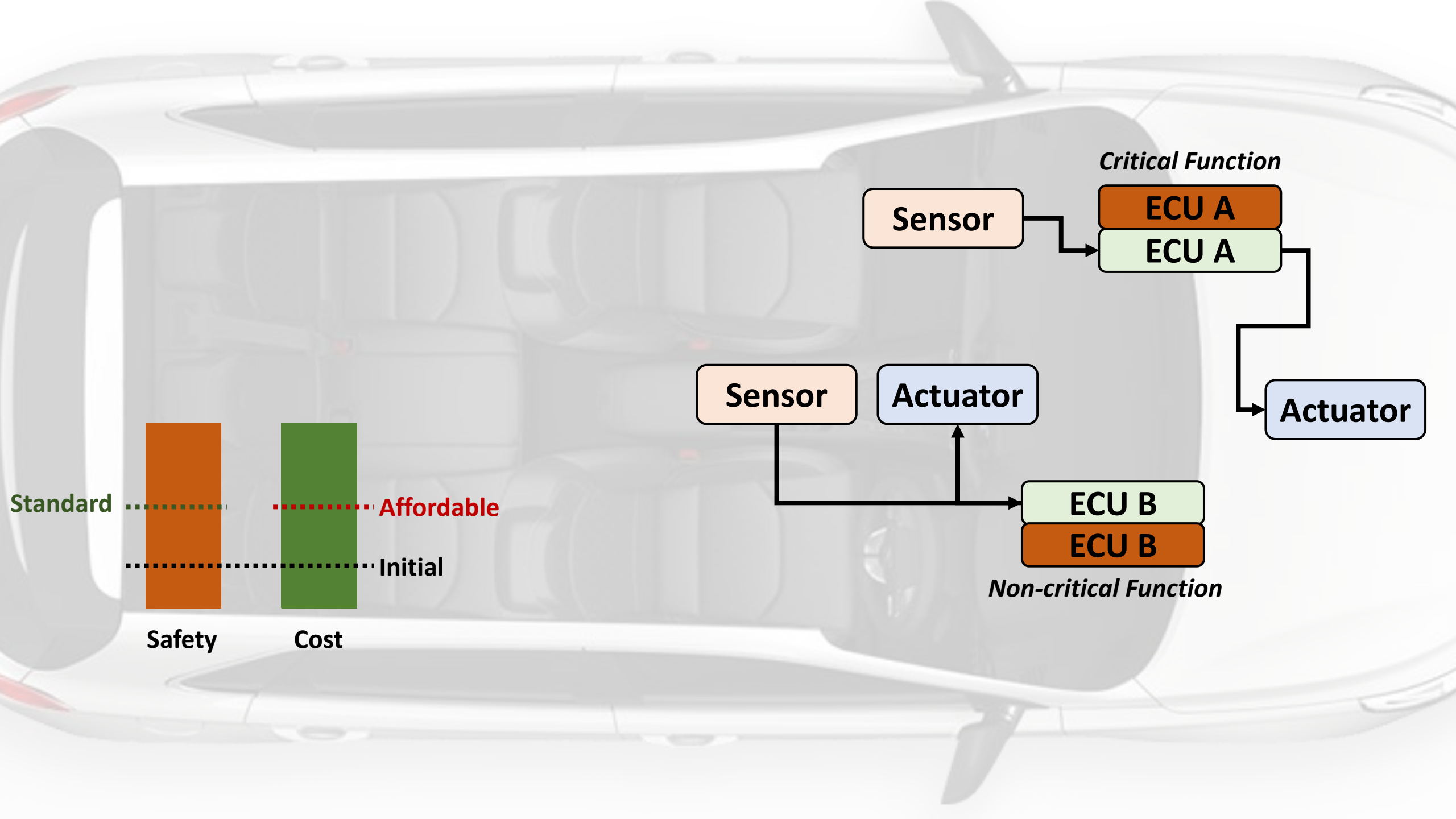
# Vehicle accident

## Sudden unintended acceleration

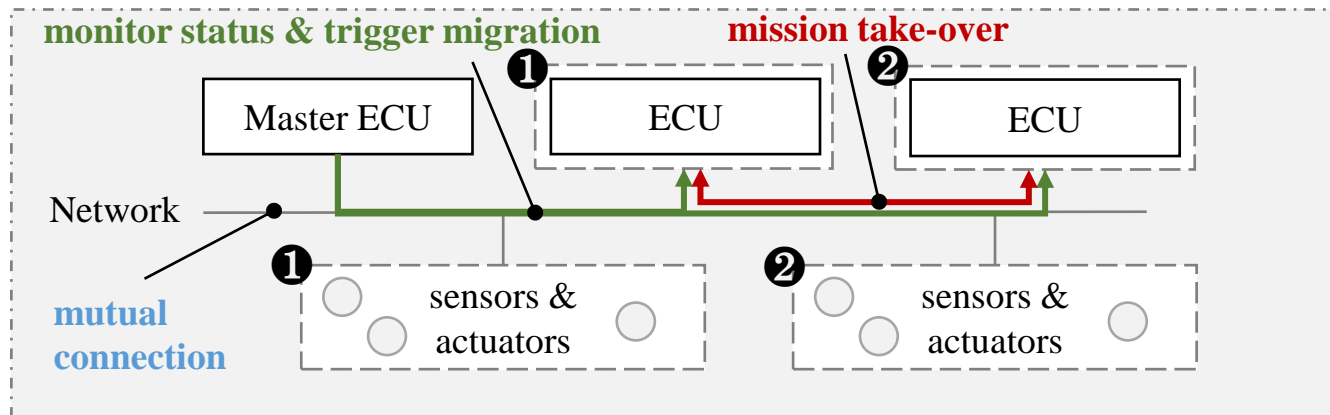
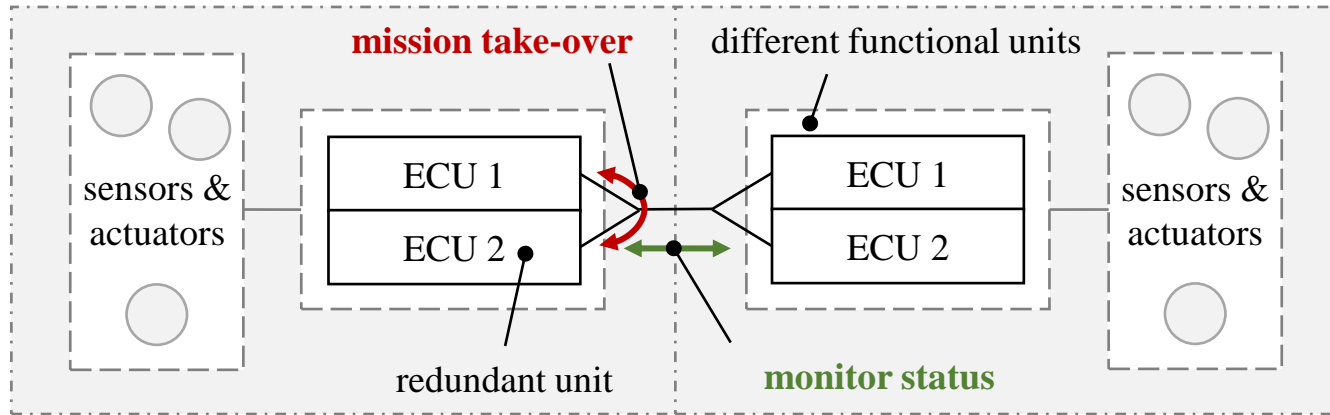


- Suppose Three vehicles driving in same speed, and the **middle vehicle suddenly accelerates**
- Unintended, unexpected, uncontrolled **acceleration** of a vehicle
- Cause: **Control failure of ECU** (Electronic Control Unit)





# Cost Reduction



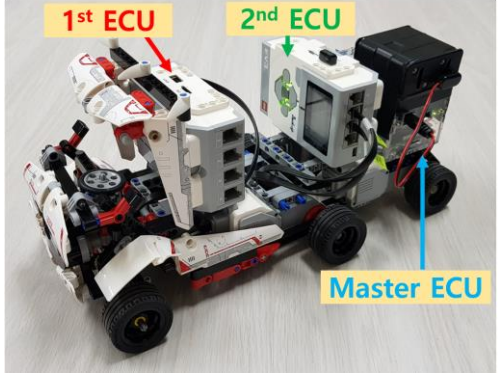
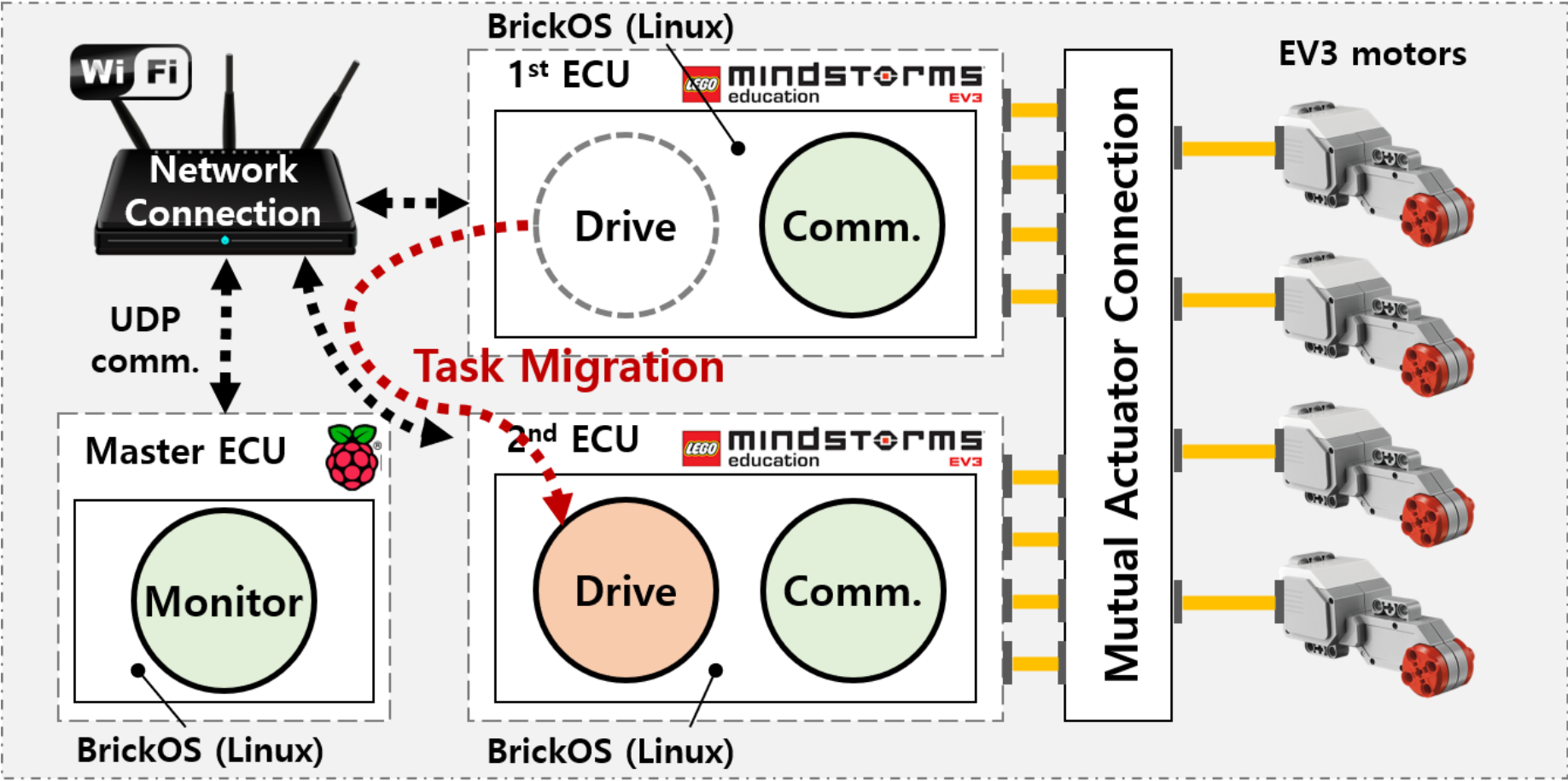
**Cost**

$$2N$$

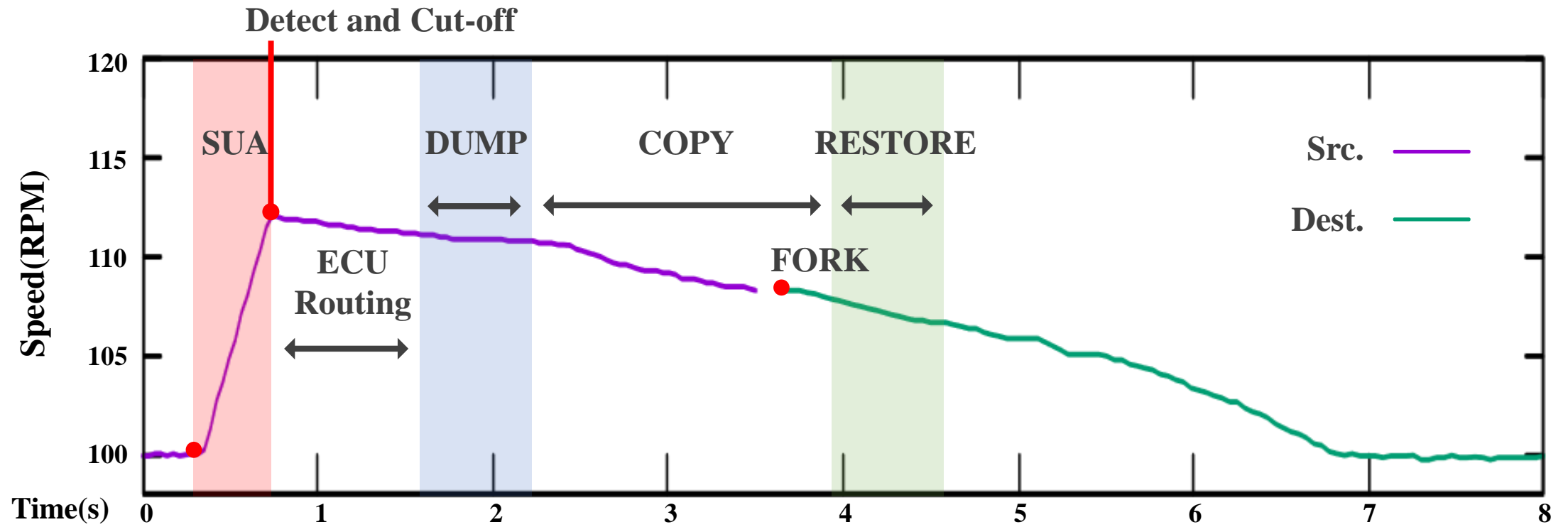


$$2N - \sum_{r=1}^N \text{Replace}(\tau) * \text{Capacity}(W_{\tau})$$

# Implementation of LEGO Vehicle



# Results using Migration



# Avoiding Sudden unintended acceleration



- **Monitoring** all nodes with central node
- Sustaining the process state (Copy and paste to secondary node)
  - Knows the **speed**, **direction**, etc.



# Conclusion

- **Implemented** a task migration method on a single ***Lego vehicle***
  - Recovers dead-end functions to avoid collisions
- **Overcome the limitations of the SPOF**
  - utilized the network connectivity of ECUs and used task migration techniques between ECUs to sustain the critical functions.
- Three main advantages
  - **Maintains the main state** of the previous task
  - **Whenever** a central ECU detects a fault with an observed ECU, it will identify a replaceable **ECU dynamically**
  - It is **cost-effective** because this method guarantees safety using existing mutually connected ECUs without redundant ECUs.

**Thank you.**

**jsbaik@hanyang.ac.kr**