X-By-Wire Network Dependability

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Objectives:

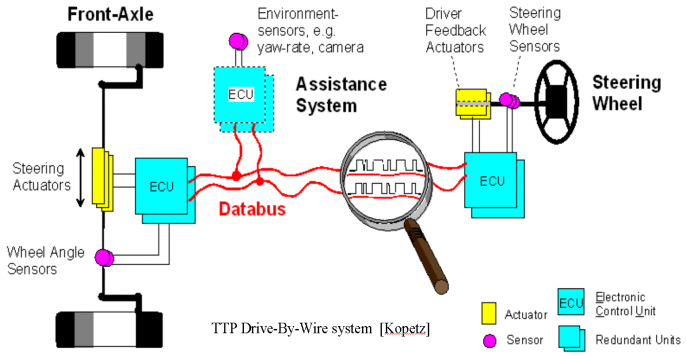
- Create a generic "recipe book" for embedded network safety cases
- Apply to specially designed safety-critical embedded networks
- Apply to application-specific messaging over off-the-shelf networks

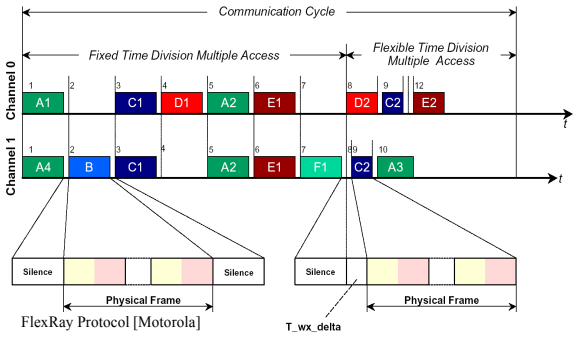
Challenges:

- Lightweight mechanisms for safe operation (FlexRay)
- Use of commodity networks (Ethernet; WiFi) in critical applications

Strategy:

- Efficient group membership
  - New paradigm: Group by period, not physical node
  - Cost of guarantees (availability, bandwidth)
  - Appropriate fault identification and tolerance (*e.g.,* transient vs. permanent)
- End-to-end approach to sources of errors
  - Data values & real time delays both matter
  - Network interface
  - Network transmission errors
  - Intermediate network routing/forwarding errors

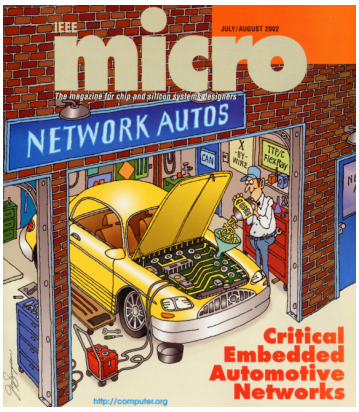




FlexRay Protocol [Motorola]

- Apply to protocols of interest
  - FlexRay (Bosch; GM)
  - Flexiblok rail safety system (Bombardier Transportation)
  - TCN (rail application reference protocol)
  - TTP (automotive application reference protocol)
  - CAN (automotive application non-critical reference protocol)
- Create generic approach to understanding protocols
  - Mechanisms to provide basic safety building blocks (should be in hardware/firmware)
  - Policies to manage mechanisms (should be in software)

Guest Editor: P. Koopman, Carnegie Mellon



Expected Outcomes:

Electrical & Computer ENGINEERING

- Methodology for creating protocol safety cases
  - End-to-end data transmission errors – assumes correct design
  - Complements formal methods approaches that check design correctness
- Tradeoffs: cost/performance points with quantifiable safety levels
- Answers to pressing protocol questions:
  - What policies and approaches are required to achieve safe FlexRay operation?
  - Provide an independent check to Flexiblok safety case

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