## Introduction

**Goal**
- To investigate a Domain Specific Aspect Language that reduces development effort by providing higher level programming abstractions and domain-specific constructs for tasks and entities in Driver Information Systems (DIS).

**Background**
- Driver Information Systems improve awareness by providing information such as weather conditions, route directions, and anti-collision warnings. The vehicle communicates with an intelligent transportation infrastructure and other intelligent vehicles.
- Domain Specific Languages help to reduce development effort by provide higher level programming abstractions.
- Aspect-Oriented Programming modularises crosscutting concerns.

D4Driving is an aspect language that provides language constructs For programming DIS systems.

### Implementation

D4Driving defined using JAMI (open source framework) with following steps:
- Define Domain-Specific construct.
- Define grammar.
- Generate parser and lexer.
- Map Abstract Syntax Tree to Aspect Meta Model.
- Integrate with code base.

### Evaluation

Three ways to implement Driver Information Systems investigated.

- **Metrics used that indicate development effort.**
  - Response for a module (RFM) measures the potential communications between a given module to other ones.
  - Instability (I) is an indicator of the module’s resilience to change.
  - Number of lines of code.
  - Coupling on method call (CMC).

### Crosscutting concerns

- **Emergency**
  - Driver Information System will warn driver of emergency (e.g., ambulance nearby or speeding) in a timely fashion.
- **Distributed Communication**
  - Driver Information System must be able to communicate with transportation infrastructure and other intelligent vehicles.

### Research Question.
- Can we improve modularisation and reduce development effort for DIS by combining AOP and Domain-Specific Programming techniques?

### Result

- **Developer Lines of Code**
- **CMC - Coupling**
- **Instability**

### Conclusion
- A Domain-Specific Aspect Language has been introduced to address two significant crosscutting concerns in Driver Information System.
- Modularisation is improved.
- Development effort has been reduced by providing high level programming constructs for those concerns to developers.