

# Générateur de moniteurs SCADE à partir de scénarios de Safety pour le véhicule autonome

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SCÉNARIOS SAFETY

LANGUAGE CCSL

# Introduction



ADAVEC

PSPC (ADAVEC)

MONITEUR SCADE

# Où en est le projet ADAVEC ?

Librairie SCADE / Librairie Eclipse / Scénarios Excel

# Notre travail

## Transformation, Adaptation, Génération

EXCEL → CCSL → JAVA → XML → SCADE

# 1. Transformation

Analyse de 31 scénarios  
Implémentation en CCSL  
Supposition, Simplification et Factorisation

ID	Mode Start	Trigger	Weather	Road	Traffic	Vehicle	Human	Mode (End)
A1	Manual Mode (No Transfer Planned)	Fog suddenly appears	Dangerous, fog and ice	Nominal : Interurban	Nominal : Light	No issue	Relaxed and focused	Manual Mode
A2	Manual Mode (No Transfer Planned)	One of the radar doesn't send data anymore	Nominal : Night	Nominal : Urban	Nominal : Light	Faulty sensors	Relaxed and focused	Manual Mode
A3	Manual Mode (No Transfer Planned)	Driver becomes stressed beyond allowed level	Nominal : Sunny	Unknown countryside road	Nominal : Light	No issue	Stressed	Manual
A4	Manual Mode (No Transfer Planned)	Driver has been drinking	Nominal : Sunny	Nominal : Urban	Nominal : Light	No issue	Driver is drunk	Autonomous Mode
A5	Manual Mode (No Transfer Planned)	Driver loses consciousness	Nominal : Sunny	Nominal : Urban	Nominal : Light	No issue	Driver is unconscious	MRM
A6	Manual Mode (No Transfer Planned)	Driver has high mental load	Heavy Rain	Nominal : Urban	Nominal : Light	No issue	Driver is not focusing entirely on the road (phone call)	Autonomous Mode
A7	Manual Mode (No Transfer Planned)	None	Nominal : Sunny	Nominal : Urban	Nominal : Light	No issue	Relaxed and focused	Manual Mode
B1	Manual Mode (Transfer Possible)	Rain starts pouring heavily	Heavy Rain	Nominal : Highway	Nominal : Light	No issue	Relaxed and focused	Manual Mode
B2	Manual Mode (Transfer Possible)	Lidar doesn't produce usable data	Dangerous, fog and ice	Nominal : Interurban	Nominal : Light	Faulty sensors	Relaxed and focused	Manual Mode
B3	Manual Mode (Transfer Possible)	Driver is fatigued	Heavy Rain	Nominal : Urban	Heavy Traffic	Faulty sensors	Long driving shift (2h+)	MRM
B4	Manual Mode (Transfer Possible)	Driver is high	Nominal : Sunny	Unknown countryside road	Nominal : Light	No issue	Under the Influence	MRM
B5	Manual Mode (Transfer Possible)	Driver is high	Nominal : Sunny	Nominal : Urban	Nominal : Light	No issue	Under the Influence	Autonomous Mode
B6	Manual Mode (Transfer Possible)	Driver loses consciousness	Nominal : Sunny	Nominal : Urban	Nominal : Light	No issue	Driver is unconscious	MRM
B7	Manual Mode (Transfer Possible)	None	Nominal : Sunny	Nominal : Urban	Nominal : Light	No issue	Relaxed and focused	Autonomous Mode
B8	Manual Mode (Transfer Possible)	Driving has been driving for a long time	Heavy Rain	Nominal : Urban	Nominal : Light	No issue	Long driving shift (2h+)	Autonomous Mode
C1	Autonomous Mode (No Transfer Planned)	Snow appears	Snow	Nominal : Urban	Nominal : Light	No issue	Relaxed and focused	Autonomous Mode
C2	Autonomous Mode (No Transfer Planned)	Driver has been drinking	Heavy Rain	Nominal : Urban	Nominal : Light	No issue	Inebriated	MRM
C3	Autonomous Mode (No Transfer Planned)	One of the radar doesn't send data anymore	Nominal : Sunny	Nominal : Urban	Nominal : Light	Faulty sensors	Stressed (moderate)	Manual
C4	Autonomous Mode (No Transfer Planned)	Driver dies	Nominal : Sunny	Nominal : Urban	Nominal : Light	None	Death	MRM
C5	Autonomous Mode (No Transfer Planned)	Driver becomes stressed beyond allowed level	Nominal : Sunny	Nominal : Urban	Nominal : Light	No issue	Stressed (intense)	Autonomous Mode
C6	Autonomous Mode (No Transfer Planned)	None	Nominal : Sunny	Nominal : Urban	Nominal : Light	No issue	Relaxed and focused	Autonomous Mode
C7	Autonomous Mode (No Transfer Planned)	Driver has high mental load	Nominal : Sunny	Nominal : Urban	Nominal : Light	No issue	High Mental Load (Inattentive)	Autonomous Mode
C8	Autonomous Mode (No Transfer Planned)	Driving hasn't been driving for a long time	Nominal : Sunny	Nominal : Urban	Nominal : Light	No issue	Driver has been inactive for a while	Manual
D1	Autonomous Mode (Transfer Planned)	Highway exit coming up	Nominal : Sunny	Highway exit coming up	Nominal : Light	No issue	Relaxed and focused	Manual Mode
D2	Autonomous Mode (Transfer Planned)	Driver has high mental load	Nominal : Sunny	Nominal : Urban	Nominal : Light	No issue	High Mental Load (Inattentive)	Autonomous Mode
D3	Autonomous Mode (Transfer Planned)	One of the radar doesn't send data anymore	Nominal : Sunny	Highway exit coming up	Nominal : Light	Faulty sensors	Relaxed and focused	Manual Mode
D4	Autonomous Mode (Transfer Planned)	Driving hasn't been driving for a long time	Nominal : Sunny	Nominal : Urban	Nominal : Light	No issue	Driver has been inactive for a while	Manual Mode
D5	Autonomous Mode (Transfer Planned)	Driver loses consciousness	Nominal : Sunny	Nominal : Urban	Nominal : Light	No issue	Loss of Consciousness	MRM
D6	Autonomous Mode (Transfer Planned)	Driver is stressed because of the previous conditions	Nominal : Sunny	Nominal : Urban	Vehicle stopped ahead, hidden from sight (stm)	No issue	High Level of Stress	Autonomous Mode
D7	Autonomous Mode (Transfer Planned)	None	Nominal : Sunny	Nominal : Urban	Nominal : Light	No issue	Relaxed and focused	Manual Mode
D8	Autonomous Mode (Transfer Planned)	Driver is high	Nominal : Sunny	Nominal : Urban	Vehicle stopped ahead, hidden from sight (stm)	No issue	Under the Influence	Autonomous Mode



Start Mode	Change?	Weather	W Problem?	Road	R Problem?	Traffic	T Problem?	Vehicle	V Problem?	Human	H Problem?	Final Mode	Equation
Manual	VRAI	Heavy Rain	VRAI	Urban	FAUX	Heavy	VRAI	FaultySensors	VRAI	LongDriving	VRAI	MRM	Manual Mode + Heavy Rain + Heavy Traffic + Faulty Sensors + Long Driving
Manual	VRAI	Sunny	FAUX	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Unconscious	VRAI	MRM	Manual Mode + Unconscious
Manual	VRAI	Sunny	FAUX	CountrySide	VRAI	Light	FAUX	NoIssue	FAUX	Influenced	VRAI	MRM	Manual Mode + Country Side + Influenced
Automatic	VRAI	Heavy Rain	VRAI	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Inebriated	VRAI	MRM	Automatic Mode + Heavy Rain + Inebriated
Automatic	VRAI	Sunny	FAUX	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Unconscious	VRAI	MRM	Automatic Mode + Unconscious
Automatic	VRAI	Sunny	FAUX	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Dead	VRAI	MRM	Automatic Mode + Dead
Manual	IDEM	Sunny	FAUX	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Relaxed/Focused	FAUX	Manual / Automatic	Everything nominal
Automatic	IDEM	Sunny	FAUX	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Relaxed/Focused	FAUX	Manual / Automatic	Everything nominal
Manual	FAUX	Fog/Ice	VRAI	Interurban	FAUX	Light	FAUX	NoIssue	FAUX	Relaxed/Focused	FAUX	Manual	Mode not changed
Manual	FAUX	Fog/Ice	VRAI	Interurban	FAUX	Light	FAUX	FaultySensors	VRAI	Relaxed/Focused	FAUX	Manual	Mode not changed
Manual	FAUX	Heavy Rain	VRAI	Highway	FAUX	Light	FAUX	NoIssue	FAUX	Relaxed/Focused	FAUX	Manual	Mode not changed
Manual	FAUX	Night	FAUX	Urban	FAUX	Light	FAUX	FaultySensors	VRAI	Relaxed/Focused	FAUX	Manual	Mode not changed
Manual	FAUX	Sunny	FAUX	CountrySide	VRAI	Light	FAUX	NoIssue	FAUX	Stressed	VRAI	Manual	Mode not changed
Automatic	VRAI	Sunny	FAUX	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Inactive	VRAI	Manual	Automatic Mode + Inactive
Automatic	VRAI	Sunny	FAUX	Urban	FAUX	Light	FAUX	FaultySensors	VRAI	ModerateStress	VRAI	Manual	Automatic Mode + Faulty Sensors + Stressed
Automatic	VRAI	Sunny	FAUX	HighwayExit	VRAI	Light	FAUX	NoIssue	FAUX	Relaxed/Focused	FAUX	Manual	Automatic Mode + HighwayExit
Automatic	VRAI	Sunny	FAUX	HighwayExit	VRAI	Light	FAUX	FaultySensors	VRAI	Relaxed/Focused	FAUX	Manual	Automatic Mode + HighwayExit + FaultySensors
Manual	VRAI	Heavy Rain	VRAI	Urban	FAUX	Light	FAUX	NoIssue	FAUX	NotFocused	VRAI	Automatic	Manual Mode + Heavy Rain + Not Focused
Manual	VRAI	Heavy Rain	VRAI	Urban	FAUX	Light	FAUX	NoIssue	FAUX	LongDriving	VRAI	Automatic	Manual Mode + Heavy Rain + Long Driving
Manual	VRAI	Sunny	FAUX	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Drunk	VRAI	Automatic	Manual Mode + Drunk
Manual	VRAI	Sunny	FAUX	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Influenced	VRAI	Automatic	Manual Mode + Influenced
Automatic	FAUX	Sunny	FAUX	Urban	FAUX	Light	FAUX	NoIssue	FAUX	IntenseStress	VRAI	Automatic	Mode not changed
Automatic	FAUX	Sunny	FAUX	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Inattentive	VRAI	Automatic	Mode not changed
Automatic	FAUX	Sunny	FAUX	Urban	FAUX	StopAhead	VRAI	NoIssue	FAUX	Influenced	VRAI	Automatic	Mode not changed
Automatic	FAUX	Sunny	FAUX	Urban	FAUX	StopAhead	VRAI	NoIssue	FAUX	IntenseStress	VRAI	Automatic	Mode not changed
Automatic	FAUX	Snow	VRAI	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Relaxed/Focused	FAUX	Automatic	Mode not changed

Start Mode	Change?	Weather	W Problem?	Road	R Problem?	Traffic	T Problem?	Vehicle	V Problem?	Human	H Problem?	Final Mode	Equation
Manual	VRAI	Heavy Rain	VRAI	Urban	FAUX	Heavy	VRAI	FaultySensors	VRAI	LongDriving	VRAI	MRM	Manual Mode + Heavy Rain + Heavy Traffic + Faulty Sensors + Long Driving
Manual	VRAI	Sunny	FAUX	Urban	FAUX	Light	VRAI	NoIssue	FAUX	Unconscious	VRAI	MRM	Manual Mode + Unconscious
Manual	VRAI	Sunny	FAUX	CountrySide	VRAI	Light	FAUX	NoIssue	FAUX	Influenced	VRAI	MRM	Manual Mode + Country Side + Influenced
Automatic	VRAI	Heavy Rain	VRAI	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Inebriated	VRAI	MRM	Automatic Mode + Heavy Rain + Inebriated
Automatic	VRAI	Sunny	FAUX	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Unconscious	VRAI	MRM	Automatic Mode + Unconscious
Automatic	VRAI	Sunny	FAUX	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Dead	VRAI	MRM	Automatic Mode + Dead
Automatic	VRAI	Sunny	FAUX	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Inactive	VRAI	Manual	Automatic Mode + Inactive
Automatic	VRAI	Sunny	FAUX	Urban	FAUX	Light	FAUX	FaultySensors	VRAI	ModerateStress	VRAI	Manual	Automatic Mode + Faulty Sensors + Stressed
Automatic	VRAI	Sunny	FAUX	HighwayExit	VRAI	Light	FAUX	NoIssue	FAUX	Relaxed/Focused	FAUX	Manual	Automatic Mode + HighwayExit
Automatic	VRAI	Sunny	FAUX	HighwayExit	VRAI	Light	FAUX	FaultySensors	VRAI	Relaxed/Focused	FAUX	Manual	Automatic Mode + HighwayExit + FaultySensors
Manual	VRAI	Heavy Rain	VRAI	Urban	FAUX	Light	FAUX	NoIssue	FAUX	NotFocused	VRAI	Automatic	Manual Mode + Heavy Rain + Not Focused
Manual	VRAI	Heavy Rain	VRAI	Urban	FAUX	Light	FAUX	NoIssue	FAUX	LongDriving	VRAI	Automatic	Manual Mode + Heavy Rain + Long Driving
Manual	VRAI	Sunny	FAUX	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Drunk	VRAI	Automatic	Manual Mode + Drunk
Manual	VRAI	Sunny	FAUX	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Influenced	VRAI	Automatic	Manual Mode + Influenced

Start Mode ▾	Change? ▾	Weather ▾	W Problem? ▾	Road ▾	R Problem? ▾	Traffic ▾	T Problem? ▾	Vehicle ▾	V Problem? ▾	Human ▾	H Problem? ▾	Final Mode ▾	Equation ▾
Manual	VRAI	Sunny	FAUX	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Drunk	VRAI	Automatic	Manual Mode + Drunk

```

Specification ScenarioA4 {
  Clock Fog, Rain, Snow, Sunny, Night, // Weather Clocks
    HighwayExit, Highway, Interurban, Urban, CountrySide, // Road Clocks
    HeavyTraffic, Light, StopAhead, // Traffic Clocks
    FaultySensor, NoIssue, // Vehicle Clocks
    Stressed, StressedIntense, StressedModerate, //
    Death, Drunk, Unconscious, Inebriated, Relaxed, Influenced // Human Clocks
    NotFocused, Inactive, Inattentive, LongDriving //
    Automatic, Manual, MRM // Final Mode Clocks
  Seconds [ // Time-based ultimatum

  // Objective: Inform the driver that his driving abilities
  // are impaired and that the vehicle is taking over
  // Trigger: Driver has been drinking

  // Weather
  Let DayTime be Sunny + Night // UTILE SI ON PEUT PROFITER DE L'INFORMATION DONNEE
  Precedence Sunny < (max: 1) Night

  // Road
  Let Road be Highway + Interurban + Urban
  Exclusion Highway # Interurban # Urban

  // Traffic
  Let Traffic be HeavyTraffic + Light + StopAhead

  // Vehicle
  Let Sensors be FaultySensor + NoIssue

  // Human - Health -----START TRIGGER-----
  Let Health be Death + Drunk + Unconscious + Inebriated + Relaxed + Influenced
  -----END TRIGGER-----

  // FinalMode
  Let FinalMode be Automatic + Manual + MRM

  Transfer = Drunk $ 5 on Seconds
  Precedence Drunk <= Automatic <= Transfer

}

```

```

Specification ChangeMode {
  Clock start finish trigger RTime
  [
    Let Mode be start + finish
    Exclusion start # finish
    Precedence start <= trigger
    Precedence trigger < RTime
    Precedence RTime < finish
  ]
}

```

```
changeMode(simple, "Manual", "Autonome", "Drunk");
```

```

public void changeMode(ISimpleSpecification simple, String start,
                      String finish,
                      String trigger) {

  simple.addClock(start);
  simple.addClock(finish);
  simple.addClock(trigger);
  simple.addClock("RTime");
  simple.union("Mode", start, finish);
  simple.exclusion(start, finish);
  simple.causality(start, trigger);
  simple.precedence(trigger, "RTime");
  simple.precedence("RTime", finish);
}

```



Start Mode	Change?	Weather	W Problem?	Road	R Problem?	Traffic	T Problem?	Vehicle	V Problem?	Human	H Problem?	Final Mode	Equation
Manual	VRAI	Heavy Rain	VRAI	Urban	FAUX	Heavy	VRAI	FaultySensors	VRAI	LongDriving	VRAI	MRM	Manual Mode + Heavy Rain + Heavy Traffic + Faulty Sensors + Long Driving
Manual	VRAI	Sunny	FAUX	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Unconscious	VRAI	MRM	Manual Mode + Unconscious
Manual	VRAI	Sunny	FAUX	CountrySide	VRAI	Light	FAUX	NoIssue	FAUX	Influenced	VRAI	MRM	Manual Mode + Country Side + Influenced
Automatic	VRAI	Heavy Rain	VRAI	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Inebriated	VRAI	MRM	Automatic Mode + Heavy Rain + Inebriated
Automatic	VRAI	Sunny	FAUX	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Unconscious	VRAI	MRM	Automatic Mode + Unconscious
Automatic	VRAI	Sunny	FAUX	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Dead	VRAI	MRM	Automatic Mode + Dead
Automatic	VRAI	Sunny	FAUX	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Inactive	VRAI	Manual	Automatic Mode + Inactive
Automatic	VRAI	Sunny	FAUX	Urban	FAUX	Light	FAUX	FaultySensors	VRAI	ModerateStress	VRAI	Manual	Automatic Mode + Faulty Sensors + Stressed
Automatic	VRAI	Sunny	FAUX	HighwayExit	VRAI	Light	FAUX	NoIssue	FAUX	Relaxed/Focused	FAUX	Manual	Automatic Mode + HighwayExit
Automatic	VRAI	Sunny	FAUX	HighwayExit	VRAI	Light	FAUX	FaultySensors	VRAI	Relaxed/Focused	FAUX	Manual	Automatic Mode + HighwayExit + FaultySensors
Manual	VRAI	Heavy Rain	VRAI	Urban	FAUX	Light	FAUX	NoIssue	FAUX	NotFocused	VRAI	Automatic	Manual Mode + Heavy Rain + Not Focused
Manual	VRAI	Heavy Rain	VRAI	Urban	FAUX	Light	FAUX	NoIssue	FAUX	LongDriving	VRAI	Automatic	Manual Mode + Heavy Rain + Long Driving
Manual	VRAI	Sunny	FAUX	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Drunk	VRAI	Automatic	Manual Mode + Drunk
Manual	VRAI	Sunny	FAUX	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Influenced	VRAI	Automatic	Manual Mode + Influenced

Supposition : non-souhaitable dans les systèmes critiques !

OU ou ET ?

Stop en campagne ?

Inutile?

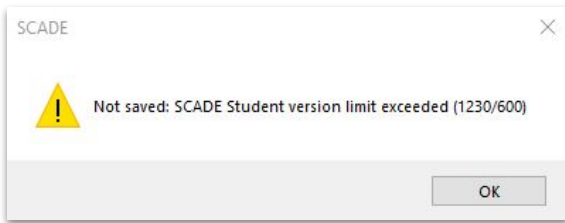
```

public void build(ISimpleSpecification simple) {
    changeMode(simple, "Manual", "Autonome", "Drunk"); // Scenario A4
    changeMode(simple, "Manual", "MRM", "Unconc"); // Scenario A5
    changeMode(simple, "Manual", "Autonome", new String[]{"Rain", "NotFocus"}); // Scenario A6
    changeMode(simple, "Manual", "MRM", new String[]{"Rain", "HTraffic", "NoSensors", "LongDriv"}); // Scenario B3
    changeMode(simple, "Manual", "MRM", new String[]{"Country", "Influenc"}); // Scenario B4
    changeMode(simple, "Manual", "Autonome", "Influen"); // Scenario B5
    changeMode(simple, "Manual", "Autonome", new String[]{"Rain", "LongDriv"}); // Scenario B8
    changeMode(simple, "Autonome", "MRM", new String[]{"Rain", "Drunk"}); // Scenario C2
    changeMode(simple, "Autonome", "Manual", new String[]{"NoSensors", "Stress"}); // Scenario C3
    changeMode(simple, "Autonome", "MRM", "Death"); // Scenario C4
    changeMode(simple, "Autonome", "Manual", "HWEExit"); // Scenario D1
    changeMode(simple, "Autonome", "Manual", new String[]{"HWEExit", "NoSensor"}); // Scenario D3
    changeMode(simple, "Autonome", "Manual", "Inactive"); // Scenario D4
    changeMode(simple, "Autonome", "MRM", "Unconc"); // Scenario D5
}

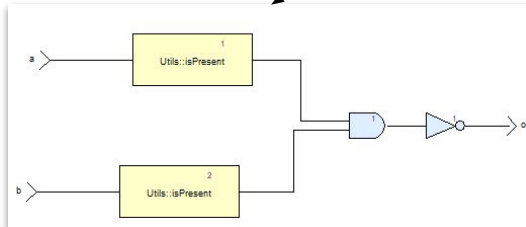
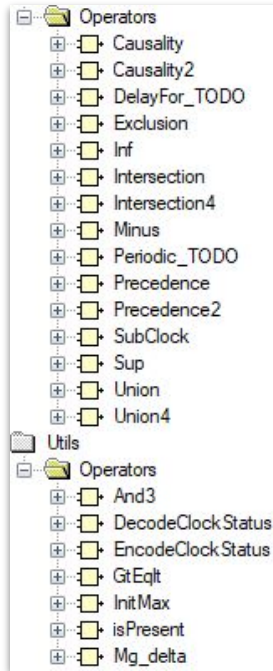
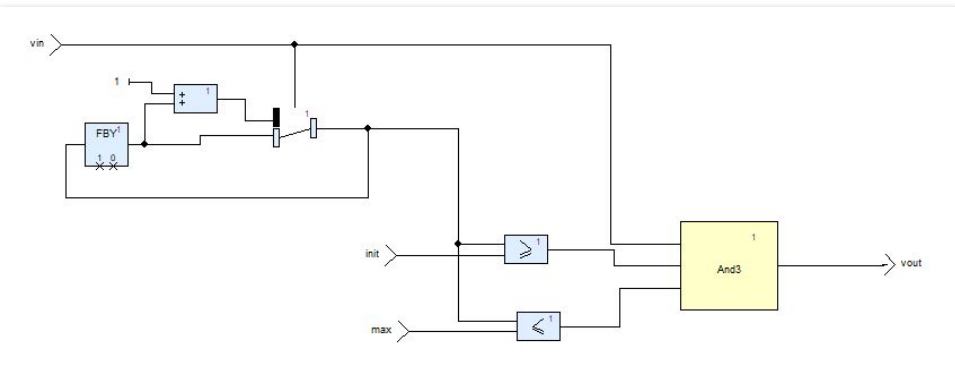
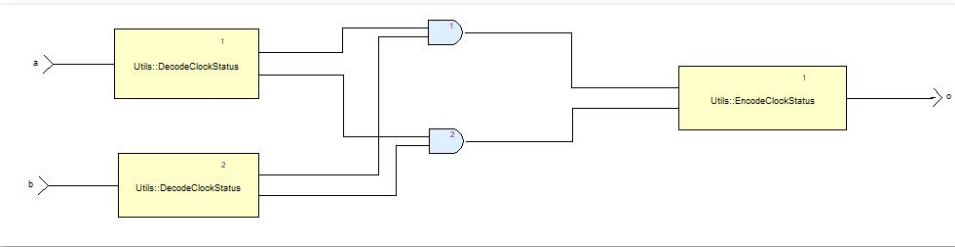
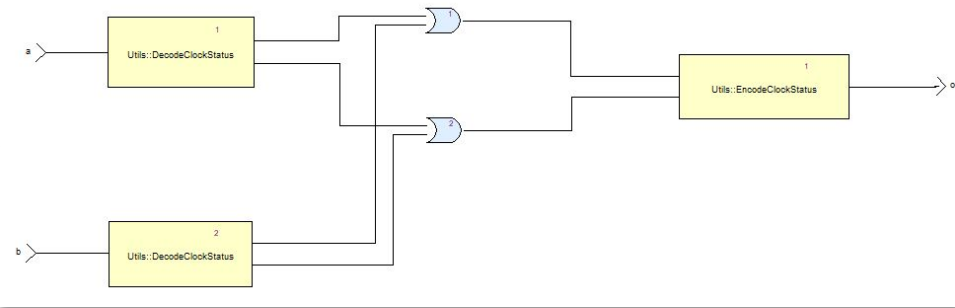
```

## 2. Adaptation

Étude de la librairie SCADE de Mr. ANDRÉ  
Ajouts et modifications



“Redéfinition”  
des horloges  
pour un meilleur  
fonctionnement



# 3. Génération

CCSL → SCADE  
Eclipse Modeling Tools

Start Mode ▾	Change? ▾	Weather ▾	W Problem? ▾	Road ▾	R Problem? ▾	Traffic ▾	T Problem? ▾	Vehicle ▾	V Problem? ▾	Human ▾	H Problem? ▾	Final Mode ▾	Equation ▾
Manual	VRAI	Sunny	FAUX	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Drunk	VRAI	Automatic	Manual Mode + Drunk

# Approche Textuelle

Codage en Java des opérateurs SCADE

```

public void exclusion(java.lang.String arg0, java.lang.String arg1){
    bodyOutputfile.println("L" + ++countL + " = " + arg0 + ";");
    localHM.put("L" + countL, "ClockStatus");

    bodyOutputfile.println("L" + ++countL + " = " + arg1 + ";");
    localHM.put("L" + countL, "ClockStatus");

    bodyOutputfile.println("L" + ++countL + " = "
        + "MSG::Exclusion(L" + (countL - 2) + ", L" + (countL - 1) + ");");
    localHM.put("L" + countL, "bool");

    bodyOutputfile.println("O" + ++countO + " = L" + countL + ";");
    outputHM.put("O" + countO, "bool");
}

```

```

public void precedence(java.lang.String arg0, java.lang.String arg1){
    kind = "node";
    bodyOutputfile.println("L" + ++countL + " = " + arg0 + ";");
    localHM.put("L" + countL, "ClockStatus");

    bodyOutputfile.println("L" + ++countL + " = " + arg1 + ";");
    localHM.put("L" + countL, "ClockStatus");

    bodyOutputfile.println("L" + ++countL + " = "
        + "MSG::Precedence(L" + (countL - 2) + ", L" + (countL - 1) + ");");
    localHM.put("L" + countL, "bool");

    bodyOutputfile.println("O" + ++countO + " = L" + countL + ";");
    outputHM.put("O" + countO, "bool");
}

```



# XML comme intermédiaire entre JAVA et SCADE

```
public void generateXMLFile(String name) throws IOException {  
    startXMLFile(name);  
    inputXMLFile(inputHM);  
    outputXMLFile(outputHM);  
    localXMLFile(localHM);  
    endXMLFile(name);  
    updatingPackage(name);  
}
```

```
public void inputXMLFile(LinkedHashMap<String, String> inputHM) {  
    outputfile.println("\t<inputs>");  
    for(Entry<String, String> i : inputHM.entrySet()) {  
        outputfile.println("\t\t<Variable name=\"" + i.getKey() + "\">");  
        outputfile.println("\t\t\t<type>");  
        outputfile.println("\t\t\t\t<NamedType>");  
        outputfile.println("\t\t\t\t\t<type>");  
        outputfile.println("\t\t\t\t\t\t<TypeRef name=\"" + i.getValue() + "\"/>");  
        outputfile.println("\t\t\t\t\t\t</type>");  
        outputfile.println("\t\t\t\t\t</NamedType>");  
        outputfile.println("\t\t\t\t</type>");  
        outputfile.println("\t\t\t</Variable>");  
    }  
    outputfile.println("\t</inputs>");  
}
```

Start Mode ▾	Change? ▾	Weather ▾	W Problem? ▾	Road ▾	R Problem? ▾	Traffic ▾	T Problem? ▾	Vehicle ▾	V Problem? ▾	Human ▾	H Problem? ▾	Final Mode ▾	Equation ▾
Manual	VRAI	Sunny	FAUX	Urban	FAUX	Light	FAUX	NoIssue	FAUX	Drunk	VRAI	Automatic	Manual Mode + Drunk

```

<inputs>
  <Variable name="Manual">
    <type>
      <NamedType>
        <type>
          <TypeRef name="ClockStatus"/>
        </type>
      </NamedType>
    </type>
  </Variable>

```

```

<outputs>
  <Variable name="O1">
    <type>
      <NamedType>
        <type>
          <TypeRef name="ClockStatus"/>
        </type>
      </NamedType>
    </type>
  </Variable>

```

```

<locals>
  <Variable name="L1">
    <type>
      <NamedType>
        <type>
          <TypeRef name="ClockStatus"/>
        </type>
      </NamedType>
    </type>
  </Variable>

```

```

L1 = Manual;
L2 = Autonome;
L3 = MSG::Union(L1, L2);
Mode = L3;
L4 = Manual;
L5 = Autonome;
L6 = MSG::Exclusion(L4, L5);
O1 = L6;
L7 = Manual;
L8 = Drunk;
L9 = MSG::Causality(L7, L8);
O2 = L9;
L10 = Drunk;
L11 = RTime;
L12 = MSG::Precedence(L10, L11);
O3 = L12;
L13 = RTime;
L14 = Autonome;
L15 = MSG::Precedence(L13, L14);
O4 = L15;

```

Model Explorer

type filter text

- > Lcadavec.java
- > Lcalt.java
- > LcAltern.java
- > LcAlternates.java
- > LcAlternatesInit.java
- > LcAlternCompose.java
- > LcBoundedCausality.java
- > LcChangeMode.java
- > LcChangeModeOld.java
- > Lcerc20.java
- > LcHuman.java
- > LcInstructions.java
- > Lcmodes.java
- > LcNewModes.java
- > Lcprec.java
- > LcRoad.java
- > Lcsafe.java
- > LcScenarioA1.java
- > LcScenarioA2.java
- > LcScenarioA3.java
- > LcScenarioA4.java
- > LcScenarioA5.java
- > LcScenarioA6.java

Outline

- project
  - > ChangeMode
    - INSTANCE : ChangeMode
    - ChangeMode()
    - build(SimpleSpecification) : void
    - changeMode(SimpleSpecification, String, String, String) : void
    - changeMode(SimpleSpecification, String, String, String[]) : void
    - utilities : IUtility[]
    - main(String[]) : void

MyScadeGenerator.java

ChangeMode.lc

ChangeMode.java

```

30 //changeMode(simple, "Manual", "Autonome"); // Scenario A5
31 //changeMode(simple, "Manual", "Autonome", new String[]{"Rain", "HotFocus"}); // Scenario A6
32 //changeMode(simple, "Manual", "HRM", new String[]{"Rain", "HTraffic", "NoSensors", "LongDrive"}); // Scenario B3
33 //changeMode(simple, "Manual", "HRM", new String[]{"Country", "Infusion"}); // Scenario B4
34 //changeMode(simple, "Manual", "Autonome", "Infusion"); // Scenario B5
35 //changeMode(simple, "Manual", "Autonome", new String[]{"Rain", "LongDrive"}); // Scenario B8
36 //changeMode(simple, "Autonome", "HRM", new String[]{"Rain", "Drunk"}); // Scenario C2
37 //changeMode(simple, "Autonome", "HRM", new String[]{"NoSensors", "Stress"}); // Scenario C3
38 //changeMode(simple, "Autonome", "HRM", "Death"); // Scenario C4
39 //changeMode(simple, "Autonome", "Manual", "HWExit"); // Scenario D1
40 //changeMode(simple, "Autonome", "Manual", new String[]{"HWExit", "NoSensor"}); // Scenario D3
41 //changeMode(simple, "Autonome", "Manual", "Inactive"); // Scenario D4
42 //changeMode(simple, "Autonome", "HRM", "NoSensor"); // Scenario D5
43
44
45
46 public void changeMode(ISimpleSpecification simple, String start, String finish, String trigger) {
47     simple.addClock(start);
48     simple.addClock(finish);
49     simple.addClock(trigger);
50     simple.addClock("RTIME");
51     simple.union("Mode", start, finish);
52     simple.exclusion(start, finish);
53     simple.causality(start, trigger);
54     simple.precedence(trigger, "RTIME");
55     simple.precedence("RTIME", finish);
56 }
57
58
59 public void changeMode(ISimpleSpecification simple, String start, String finish, String[] trigger) {
60     simple.addClock(start);
61     simple.addClock(finish);
62     for(int i = 0; i < trigger.length; i++) {
63         simple.addClock(trigger[i]);
64     }
65     simple.addClock("RTIME");
66     simple.union("Mode", start, finish);
67     simple.exclusion(start, finish);
68     for(int i = 0; i < trigger.length; i++) {
69         if (i == 0) {

```

Console

```

<terminated> ChangeMode [Java Application] C:\Program Files\Java\jdk-11.0.8\bin\javaw.exe (16 juin 2021 à 15:05:06 - 15:05:30)
1: !Manual !Autonome !Drunk !RTIME
2: Manual !Autonome ?Drunk !RTIME
2 solutions. pick one ?
1
0: stop
1: Manual !Autonome !RTIME
1 solutions. pick one ?
0
clock | 0 1 2 3
Manual | x
Autonome | x
Drunk | x
RTIME | x
Mode | x x

```

Writable Smart Insert 49: 1 [254]



# Gestion de Projet



## Conclusion

Excel → CCSL → JAVA → XML → SCADE : ✓

Perspectives et réflexions personnelles



# Merci de votre attention



MALLET Frédéric

BOUALI Amar

LAUBRY  
Vincent

MARINO  
Samuele

Java

XML

CCSL

SCADE