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Software Architecture in Safety-Critical Control Systems

Project 7: Blind Spot Detection System SWC

TEST RESULTS

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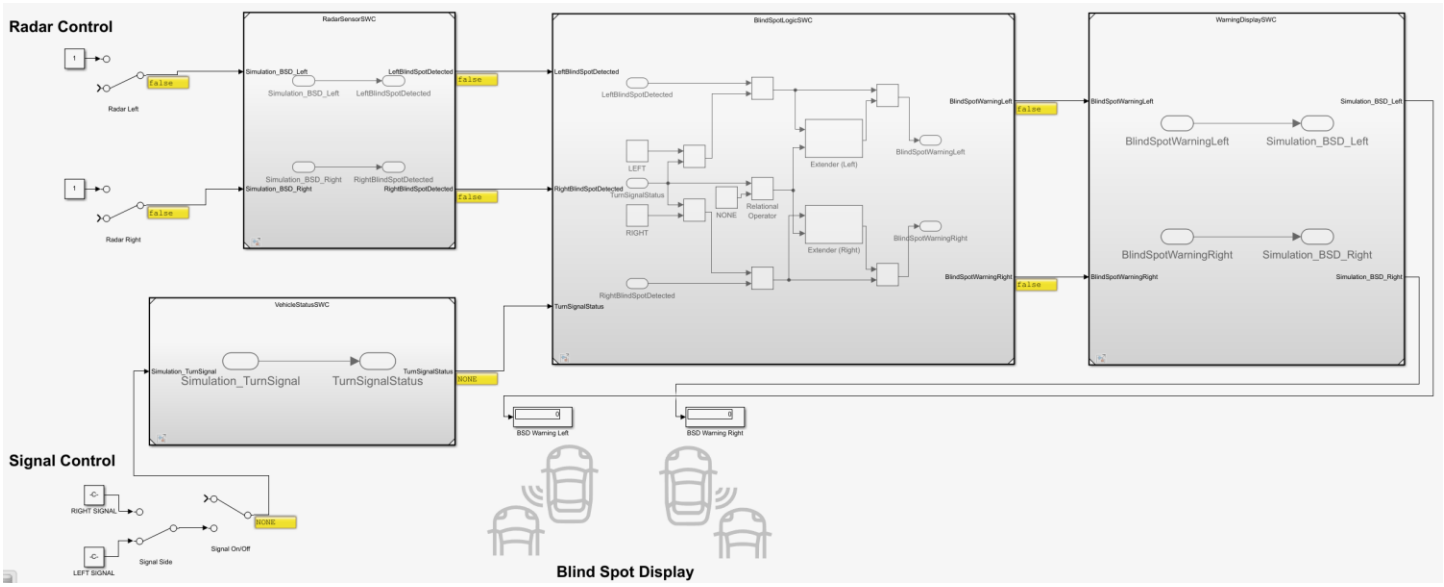
Category 1: Basic Functional Tests

T001: Left Turn + Left Detection

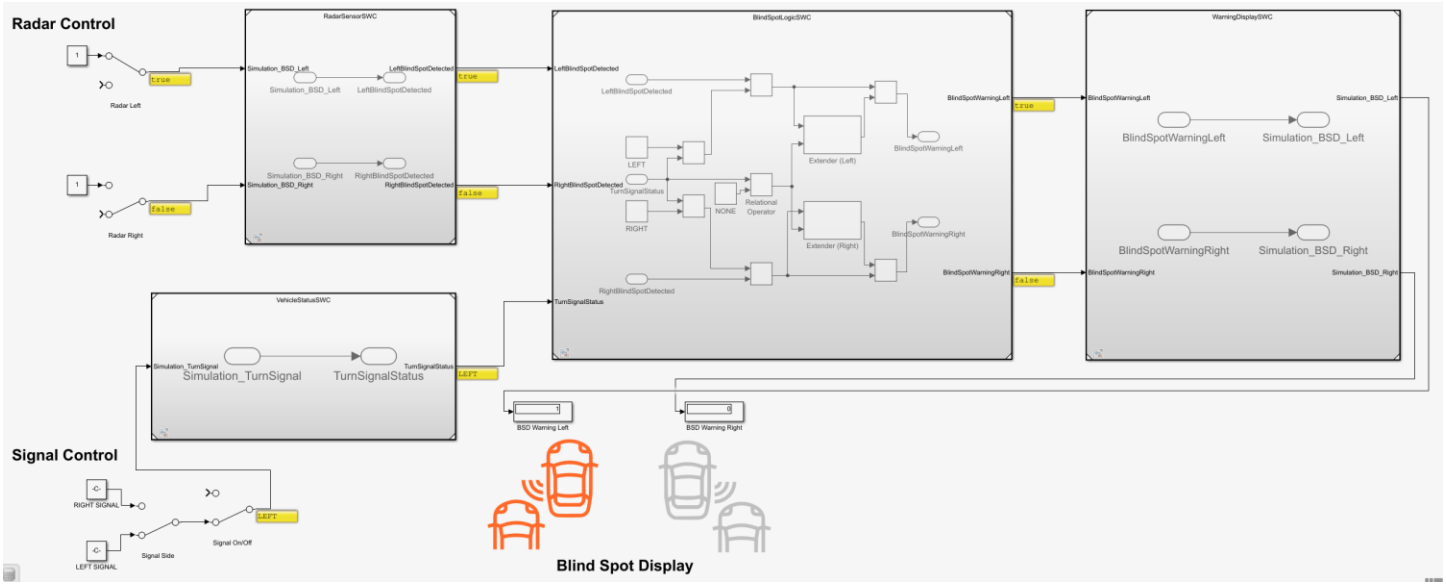
- **Scenario:** TurnSignalStatus = **LEFT**, LeftBlindSpotDetected = **true**
- **Expect:** BlindSpotWarningLeft = **true**

```
Test ID: T001
Test Name: Left Blind Spot Warning Activation
Objective: Verify left warning activates when left turn signal and left radar detection are both active
Setup: All signals OFF initially
Steps:
Turn ON left turn signal
Turn ON left radar detection
Observe warning status
Expected Result: Left warning LED ON immediately
```

Initial State (t=0.000)



Final State (t=0.100)

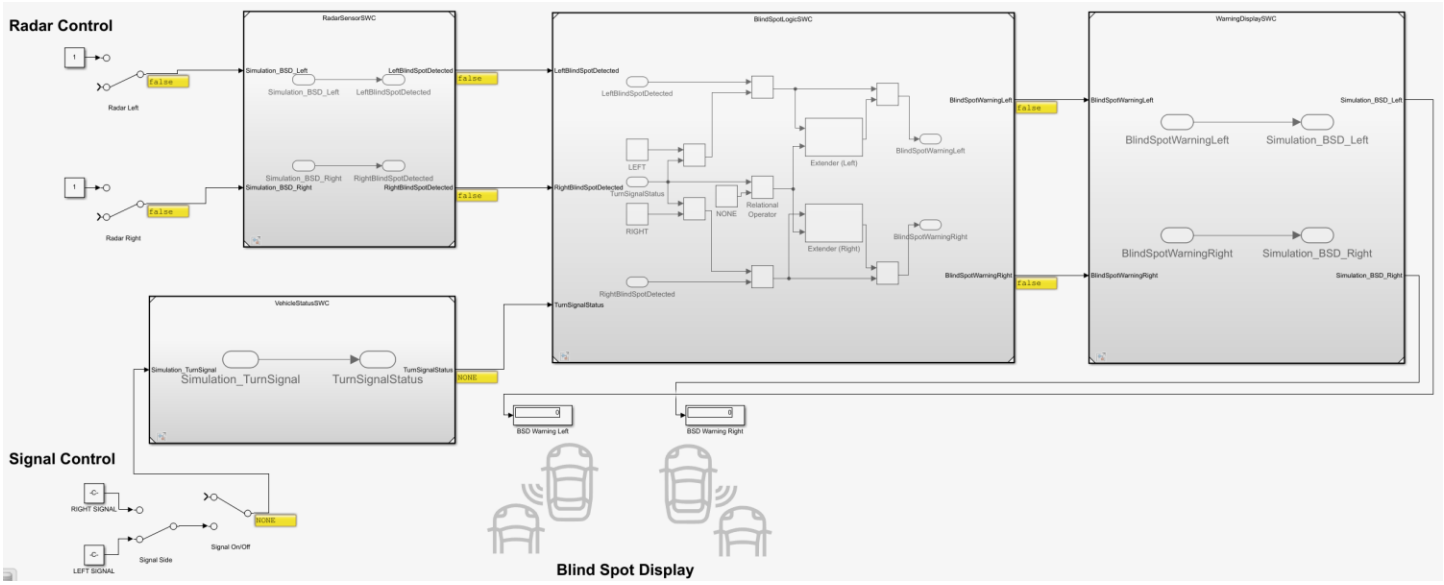


T002: Right Turn + Right Detection

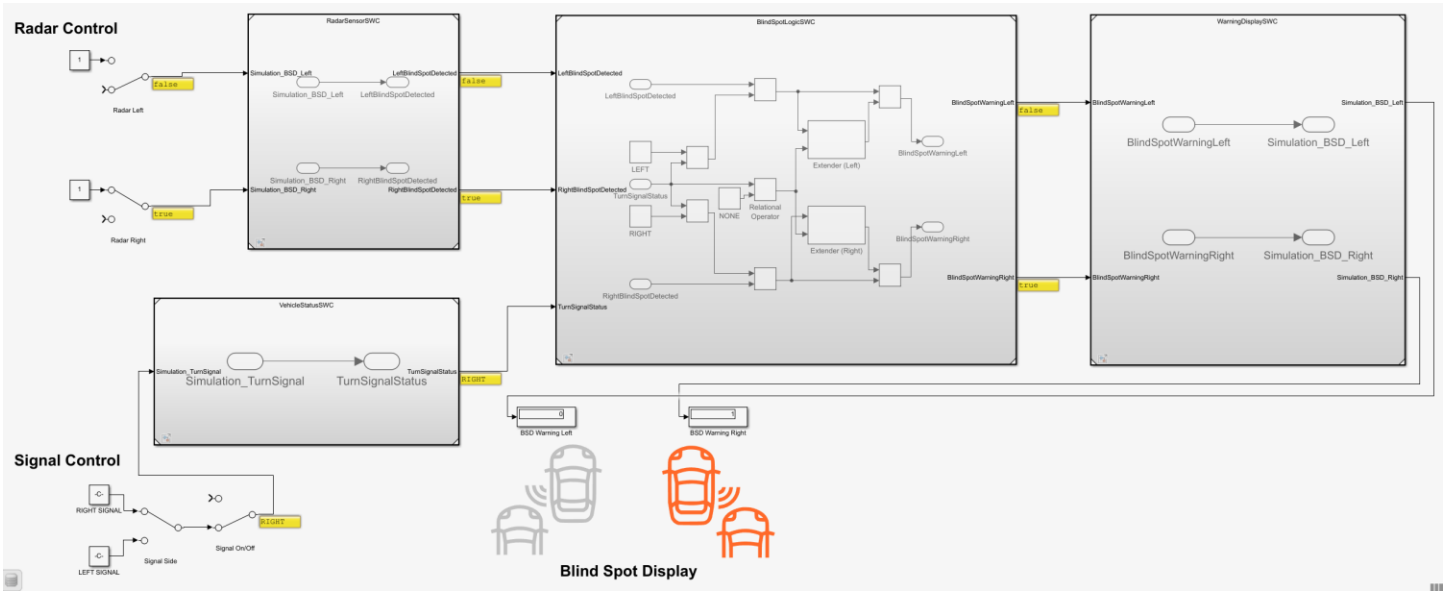
- **Scenario:** TurnSignalStatus = **RIGHT**, RightBlindSpotDetected = **true**
- **Expect:** BlindSpotWarningRight = **true**

```
Test ID: T002
Test Name: Right Blind Spot Warning Activation
Objective: Verify right warning activates when right turn signal and right radar detection are both active
Setup: All signals OFF initially
Steps:
Turn ON right turn signal
Turn ON right radar detection
Observe warning status
Expected Result: Right warning LED ON immediately
```

Initial State (t=0.000)



Final State (t=0.100)

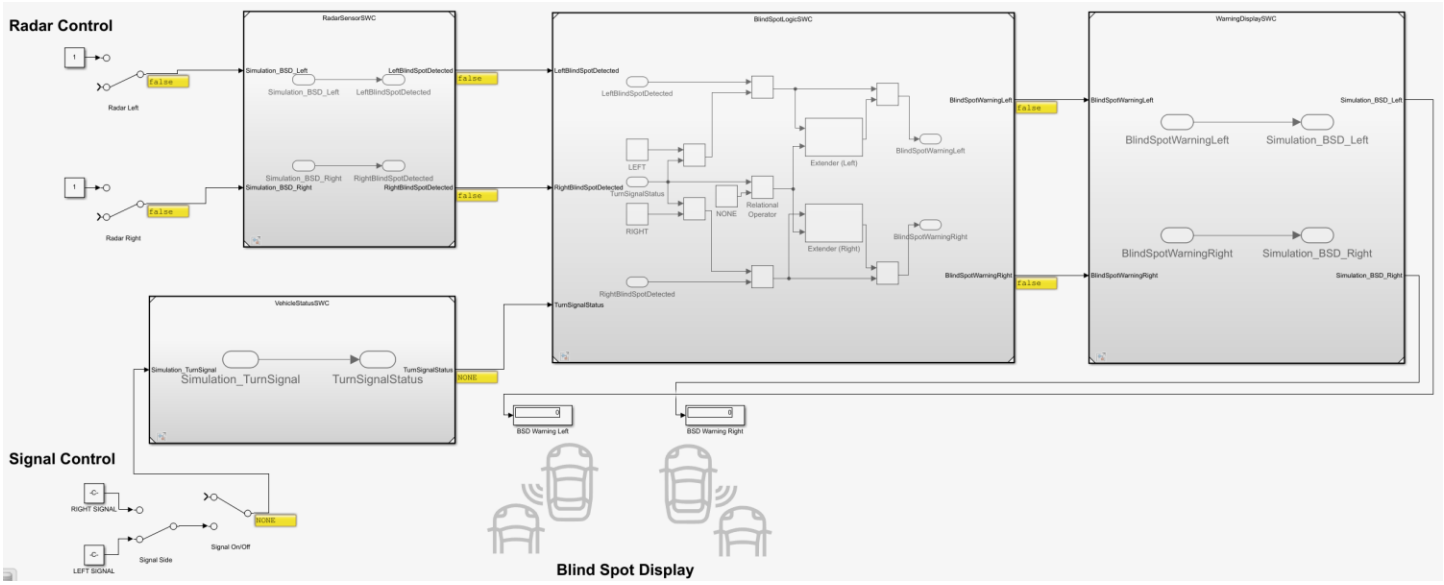


T003: Vehicle in Blind Spot, No Signal

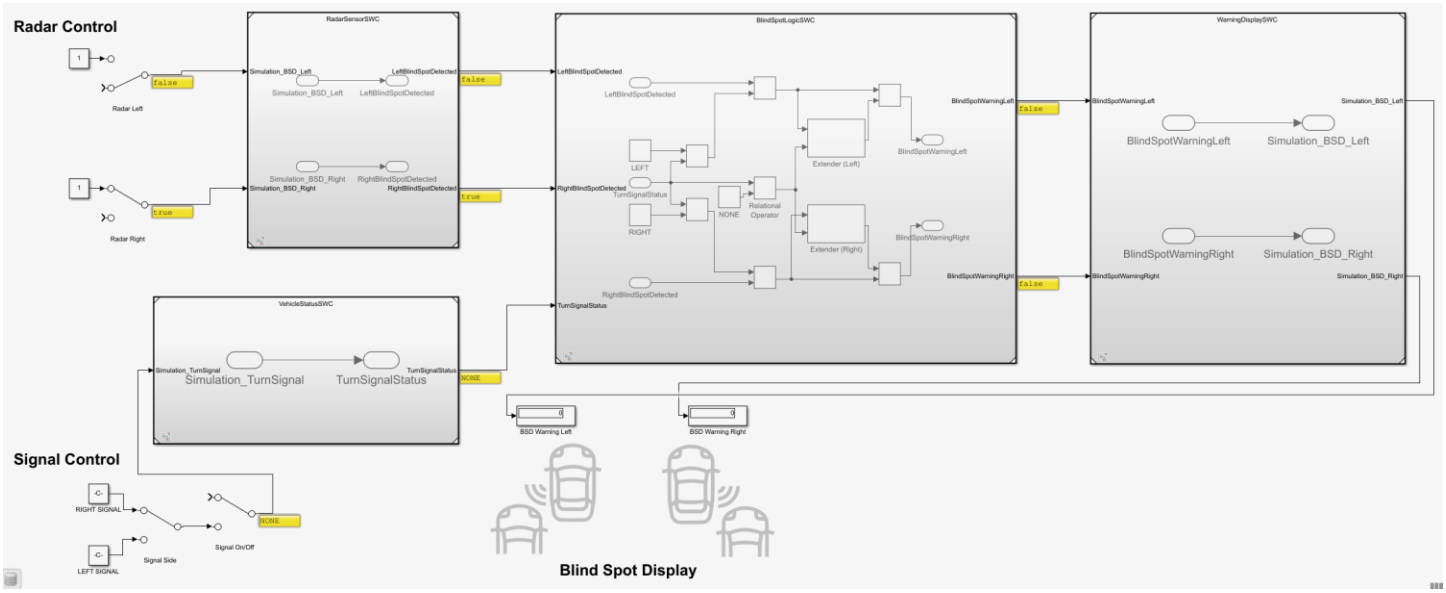
- **Scenario:** TurnSignalStatus = **NONE**, RightBlindSpotDetected = **true**
- **Expect:** BlindSpotWarningRight = **false**

```
Test ID: T003
Test Name: No False Alarm - Radar Without Turn Signal
Objective: Verify no warning when radar detects but no turn signal active
Setup: All signals OFF initially
Steps:
Turn ON right radar detection
Keep turn signal off (none state)
Observe warning status
Expected Result: No warnings active
```

Initial State (t=0.000)



Final State (t=0.100)

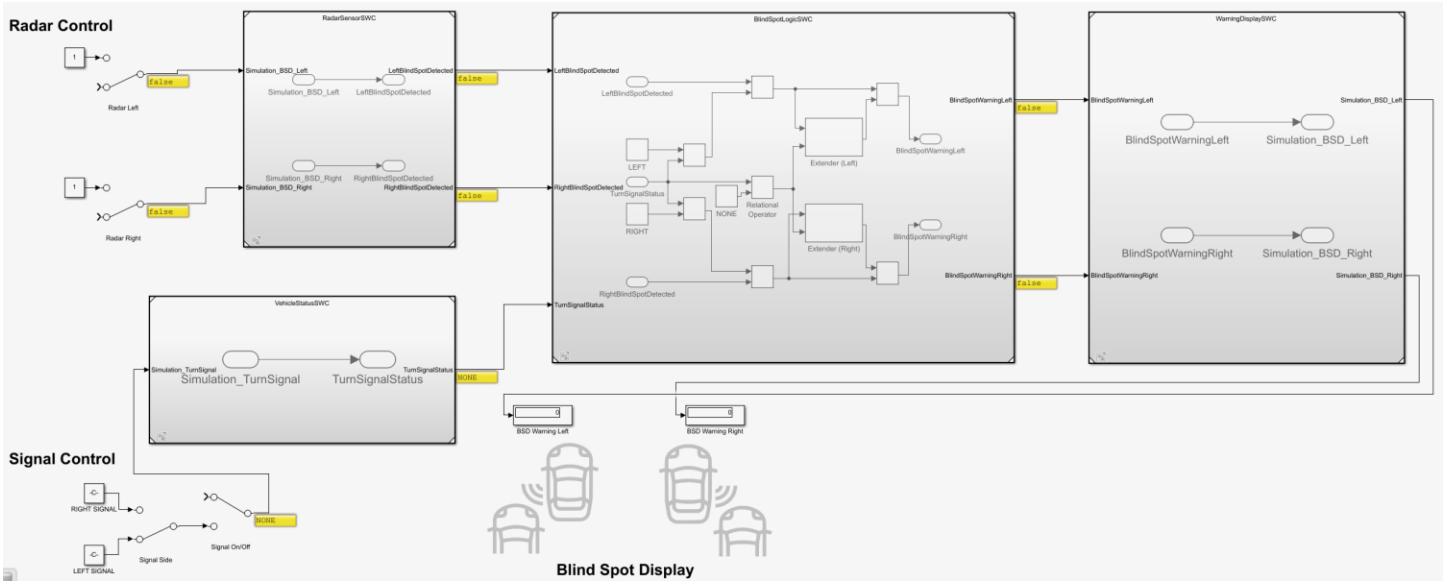


T004: False Positive

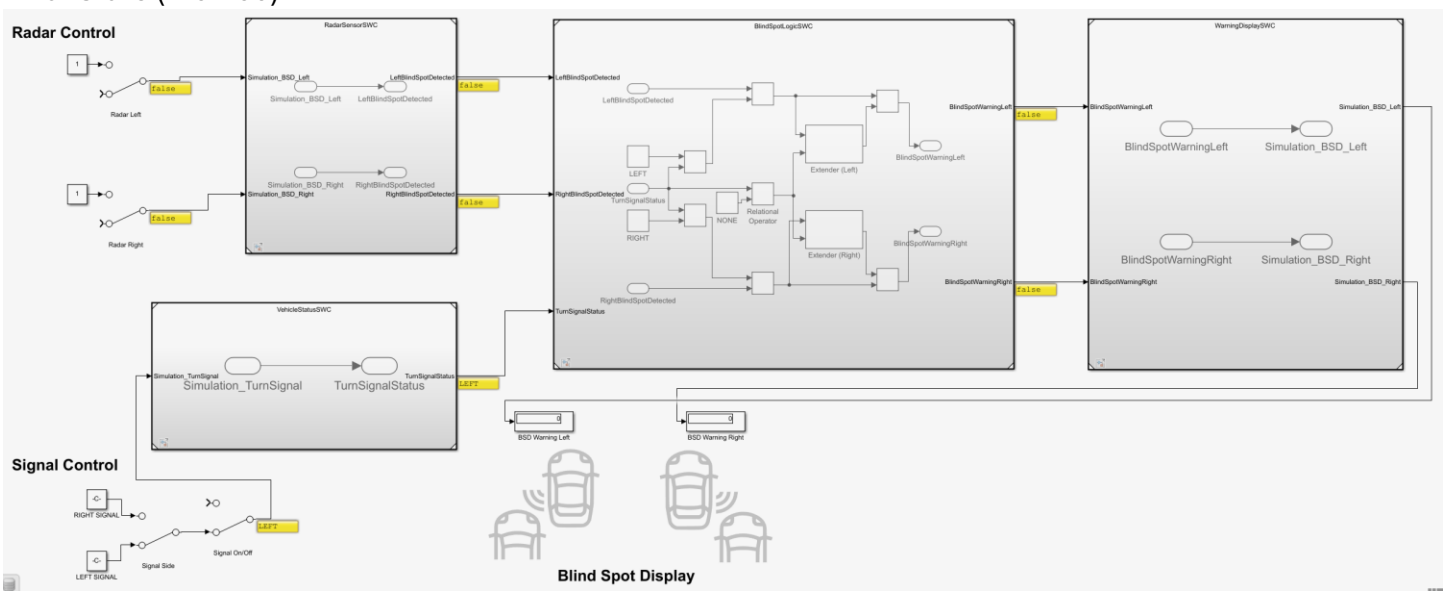
- **Scenario:** TurnSignalStatus = **LEFT**, LeftBlindSpotDetected = **false**
- **Expect:** BlindSpotWarningLeft = **false**

```
Test ID: T004
Test Name: No False Alarm - Turn Signal Without Radar
Objective: Verify no warning when turn signal active but no radar detection
Setup: All signals OFF initially
Steps:
Keep radar detection off (false state)
Turn ON left turn signal
Observe warning status
Expected Result: No warnings active
```

Initial State (t=0.000)



Final State (t=0.100)



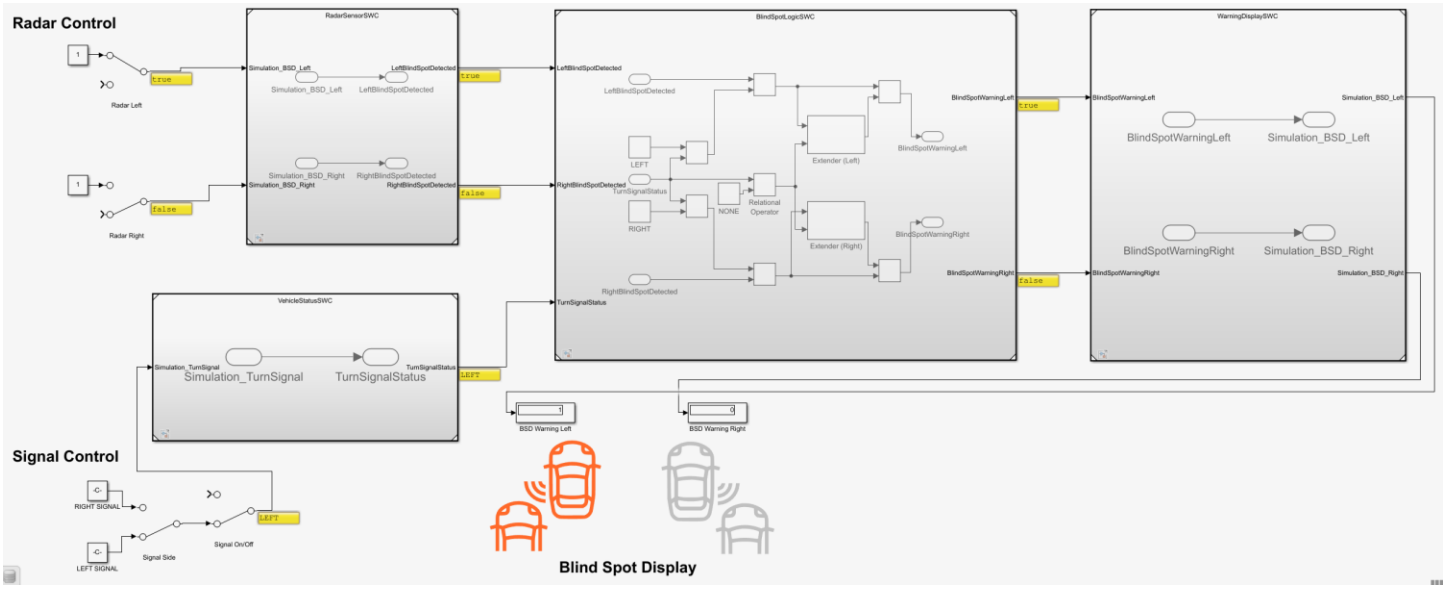
Category 2: Temporal Logic/Suppression Tests

T005: Suppression Logic (2-Second Hold Mechanism)

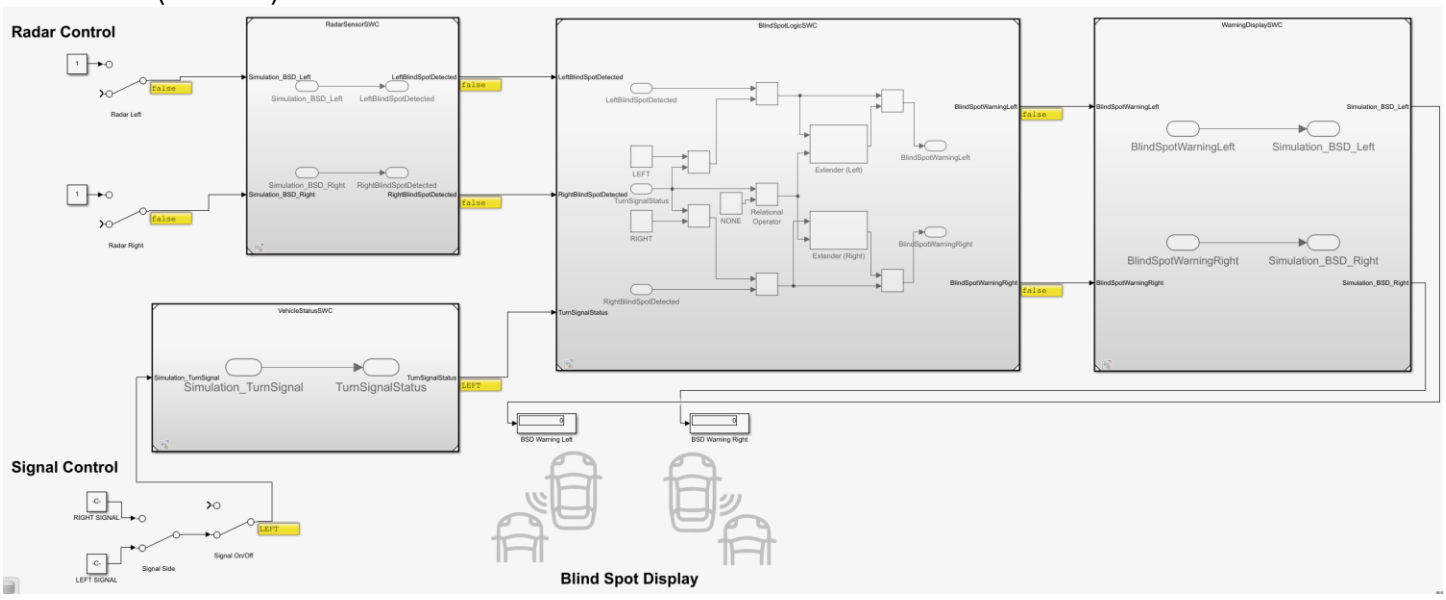
- **Scenario:** TurnSignalStatus = **LEFT**, LeftBlindSpotDetected = **true**, BlindSpotWarningLeft = **true**
- **Expect:** BlindSpotWarningLeft = **false @ t= 2.000 ± 0.1**

```
Test ID: T005
Test Name: Warning Hold Duration Test
Objective: Verify warning holds for exactly 2 seconds after radar signal lost
Setup: Left warning active (turn signal ON + radar ON)
Steps:
Confirm left warning ON
Turn OFF left radar detection (keep turn signal ON)
Observe warning duration
Expected Result: Warning stays ON for 2.0 ± 0.1 seconds, then turns OFF
```

Initial State (t=0.000)



Final State (t=2.100)

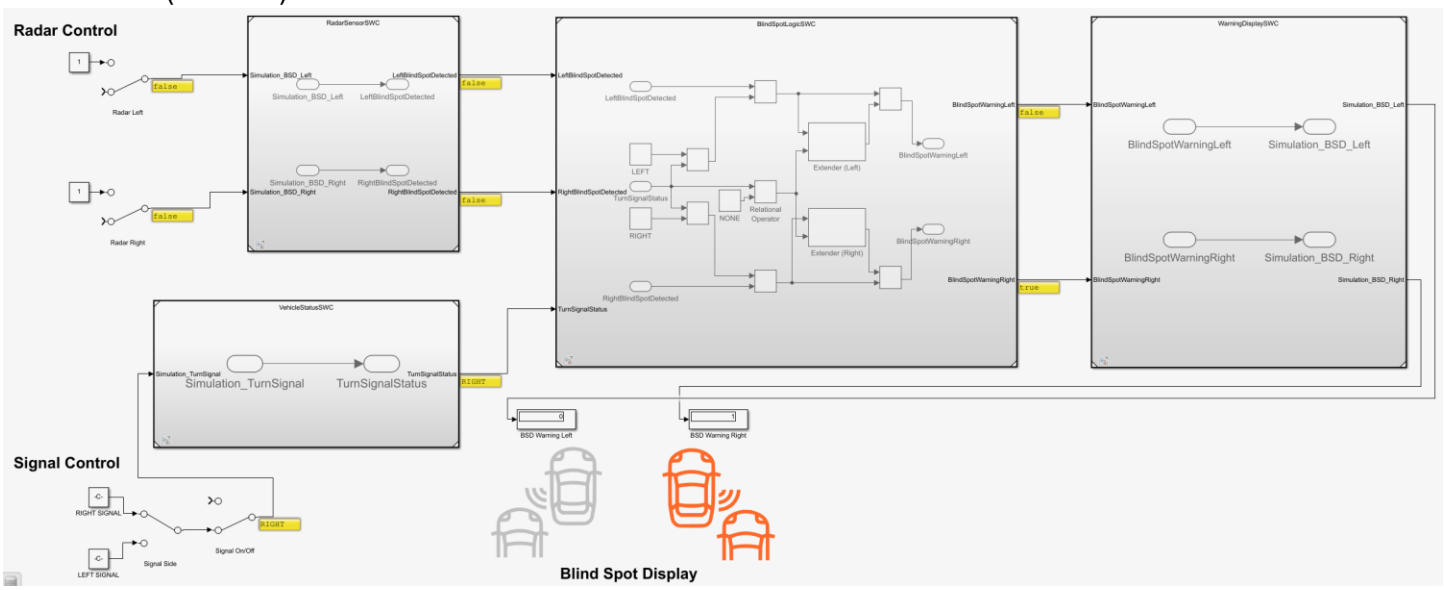


T006: Turn Signal Reset Override

- **Scenario:** TurnSignalStatus = **RIGHT**, RightBlindSpotDetected = **false @ hold state (2.0s)**
- **Expect:** BlindSpotWarningRight = **false @ immediately**

```
Test ID: T006
Test Name: Turn Signal Reset Override
Objective: Verify immediate warning deactivation when turn signal turned OFF
Setup: Warning in hold state (radar OFF, warning still ON due to hold)
Steps:
Activate warning, then turn OFF radar (enter hold state)
During hold period, turn OFF turn signal
Observe warning status
Expected Result: Warning turns OFF immediately, hold mechanism reset
```

Initial State (t=0.100)



Final State (t=0.200)