STANDARD ANDOID APPLICATION TEST CASES
WS 2025/26

Technische Hochschule Deggendorf

Faculty of Applied Computer Science

Master of Automotive Software Engineering

Lecture: Wireless and Car2X-Communication

Project 2: Smartphone-Based RSU – Car2X Demo

Real-World Detection Tests

Name & Matriculation number:
Niraliben Yash Jani - 22402416
Deep Bharatbhai Savaliya - 12501180
Satyajit Sushant Pardeshi - 22408966
Yutsav Hari Bhagat - 12500192

Supervisor:
Prof. Dr. Andreas J. Kassler

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Project: Smartphone-Based RSU – Car2X Demo
Applications Under Test:

- Vehicle Application (OBU)
- RSU Application

Android App Test Case Format

Each test case follows standard Android QA documentation structure:

- Test Case ID
- Test Case Title
- Test Type
- Test Level
- Preconditions
- Test Data
- Test Steps
- Expected Result
- Pass / Fail Criteria

ATC-01 — App Launch & Permissions

- **Test Type:** Functional, UI
- **Test Level:** System
- **Preconditions:**
  - Vehicle and RSU apps installed on two Android smartphones
- **Test Data:**
  - GPS ON
  - WiFi ON
- **Test Steps:**
  1. Launch RSU App on Phone-1
  2. Launch Vehicle App on Phone-2
  3. Verify permission prompts (Location, Network)
  4. Allow all required permissions
- **Expected Result:**
  - Both applications launch without crash
  - Permissions are granted successfully
  - User interface loads correctly
- Pass / Fail Criteria:
  - Application runs normally with permissions granted

ATC-02 — Connectivity Setup (Listening & Broadcasting)

- **Test Type:** Integration, Network
- **Test Level:** System, Integration
- **Preconditions:**
  - Both devices connected to the same WiFi network
- **Test Data:**
  - CAM Port: 30001
  - DENM Port: 30002

- **Test Steps:**
  1) Tap Start Listening on RSU App
  2) Tap Start Broadcasting on Vehicle App
- **Expected Result:**
  - RSU displays “Listening…” status
  - Vehicle displays “Broadcasting CAM beacons…”
  - No network or connection errors
- **Pass / Fail Criteria:**
  Successful connection established between Vehicle and RSU

ATC-03 — CAM Message Transmission & Reception

- **Test Type:** Functional, Integration
- **Test Level:** System
- **Test Steps:**
  1) Keep both apps running
  2) Move Vehicle device slightly to update GPS
  3) Observe RSU application interface
- **Expected Result:**
  - Vehicle ID displayed on RSU
  - Latitude, longitude, and speed shown
  - Vehicle marker appears on RSU map
  - Updates occur continuously (2 Hz)

- **Pass / Fail Criteria:**
  - CAM messages transmitted and received successfully

ATC-04 — Real-Time Distance Calculation.

- **Test Type:** Functional, Algorithm Validation
- **Test Level:** System
- **Test Steps:**
  1) Keep RSU device stationary
  2) Walk Vehicle device toward RSU
  3) Observe distance value on RSU app
- **Expected Result:**
  - Distance value decreases smoothly
  - No sudden jumps due to GPS filtering
- **Pass / Fail Criteria:**
  - Accurate and stable distance calculation

ATC-05 — Warning Zone Trigger (Approaching State)

- **Test Type:** Functional (Safety Logic)
- **Test Level:** Acceptance
- **Test Steps:**
  1) Move Vehicle device into warning zone (~7 meters)
  2) Observe RSU application output
- **Expected Result:**
  - “Vehicle Approaching RSU” warning displayed
  - Visual warning zone shown on map
- **Pass / Fail Criteria:**
  - Approaching warning triggered correctly

ATC-06 — Collision Risk & DENM Generation

- **Test Type:** Functional, Integration
- **Test Level:** System
- **Test Steps:**
  1) Move Vehicle device into critical zone (<5 meters)
  2) Observe RSU and Vehicle application screens
- **Expected Result:**
  - RSU generates DENM warning
  - Warning severity shown as high
  - Vehicle app receives and displays DENM
- **Pass / Fail Criteria:**
  - Collision risk detected and DENM delivered successfully

ATC-07 — Speed Variation Impact on Risk Level

- **Test Type:** Functional (Rule Validation)
- **Test Level:** System
- **Test Steps:**
  1) Approach RSU slowly (walking)
  2) Increase speed (running or cycling simulation)
  3) Observe RSU warning severity
- **Expected Result:**
  - Speed updates correctly on RSU
  - Risk severity increases with higher speed
- **Pass / Fail Criteria:**
  - Speed correctly influences risk evaluation

ATC-08 — Start / Stop Controls Reliability

- **Test Type:** UI, Integration
- **Test Level:** System
- **Test Steps:**
  1) Tap **Stop Broadcasting** on Vehicle app
  2) Observe RSU behaviour
  3) Tap **Start Broadcasting** again
- **Expected Result:**
  - RSU stops receiving CAM messages
  - CAM reception resumes after restart
  - No application crash or freeze
- **Pass / Fail Criteria:**
  - Start/Stop controls function reliably

ATC-09 — Network Loss and Recovery Handling

- **Test Type:** Network, Robustness
- **Test Level:** System
- **Test Steps:**
  1) Disable WiFi on Vehicle device during operation
  2) Observe RSU behaviour
  3) Re-enable WiFi
- **Expected Result:**
  - RSU stops receiving CAM during network loss
  - CAM reception resumes automatically after reconnection
  - Application remains stable

- **Pass / Fail Criteria:**
  - System handles network interruption gracefully

ATC-10 — End-to-End Acceptance Test

- **Test Type:** Acceptance, End-to-End
- **Test Level:** Acceptance
- **Test Steps:**
  1) Show Vehicle and RSU apps side-by-side
  2) Broadcast CAM messages
  3) Enter warning zone
  4) Enter critical zone
- **Expected Result:**
  - Full Car2X workflow executed
  - CAM → RSU processing → DENM → Vehicle alert
  - Correct UI and map updates
- **Pass / Fail Criteria:**
  - Complete Car2X system works as expected

Test Execution Summary

- Total Test Cases: 10
- Passed: 10
- Failed: 0

Final Result:

All Android application test cases passed successfully, confirming correct functional, integration, and acceptance behaviour of the Smartphone-Based RSU – Car2X system.