Malaysia’s Perspective on Autonomous, Automated and Connected Vehicles

Purpose: Information
Submitted by: Malaysia
MALAYSIAN PERPECTIVE ON AUTOMATED, AUTONOMOUS AND CONNECTED VEHICLES (AACV) BY MALAYSIA
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To further enhance the Automotive Ecosystem in Malaysia, Malaysia has conducted a Global Benchmarking study between year 2017-2018 which aims to:

i. map the automotive policies and technologies in the focus markets;

ii. assess automotive policies and technologies in the focus markets, especially from incentive and benchmark against the National Automotive Policy (NAP);

iii. recommend measures to enhance the existing NAP

As the outcome of the study, Automated, Autonomous and Connected Vehicles (AACV) which is part of the Next Generation Vehicle (NxGV), has become one of the elements that is expected to drive the growth of Automotive Industry in Malaysia.
### AACV Definition

#### What does the human in the driver’s seat have to do?

<table>
<thead>
<tr>
<th>Level 0</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>You are driving whenever these driver support features are engaged – even if your feet are off the pedals and you are not steering.</td>
<td>You must constantly supervise these support features; you must steer, brake, or accelerate as needed to maintain safety.</td>
<td>You are not driving when these automated driving features are engaged – even if you are seated in the driver’s seat!</td>
<td>When the feature requests, you must drive.</td>
<td>These automated driving features will not require you to take over driving.</td>
</tr>
</tbody>
</table>

#### What do these features do?

**Example features**:
- **Level 1**:
  - Automatic emergency braking
  - Blind spot warning
  - Lane departure warning
- **Level 2**:
  - Lane centering OR
  - Adaptive cruise control
- **Level 3**:
  - Lane centering AND
  - Adaptive cruise control at the same time
- **Level 4**:
  - Traffic jam chauffeur
- **Level 5**:
  - Local driverless taxi
  - Pedals/steering wheel may or may not be installed

#### These are automated driving features

- These features can drive the vehicle under limited conditions and will not operate unless all required conditions are met.
- This feature can drive the vehicle under all conditions.

#### Operation Condition

- **Level 3/L4**: Preset condition will define operation.
- **Level 5**: Unconditional operating parameters (geography/use case).

#### Vehicle Hardware

- **Level 4/5**: Both can have steering wheel/brake.
- **Level 4**: Can be controlled by teleoperation.

#### Handover

- **Level 3**: AACV feature will request handover.
- **Level 4/5**: AACV feature will not request handover.
Evolution of AACV

<table>
<thead>
<tr>
<th>MEGA TREND</th>
<th>SUB TRENDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobility Services</td>
<td>Peripheral Services</td>
</tr>
<tr>
<td>Convergence of various fragmented mobility modes that exist today due to automation</td>
<td>OEMs offering value-added services using analyzed connected and autonomous vehicle data.</td>
</tr>
<tr>
<td>Future vehicle platforms will be designed to scale and adopt to L4/L5 autonomy</td>
<td>Vehicles will need to collate various sensor data to get a complete picture of the surrounding, leading to sensor fusion</td>
</tr>
<tr>
<td>AACV Vehicle Platform</td>
<td>Sensor Fusion Solutions</td>
</tr>
</tbody>
</table>
Ecosystem of AACV

Working in collaboration

Platform, storage, and data analytics provider

Third-party service provider such as insurance and mapping companies

Big Data Analytics

Stakeholders & Services

Fleet Management
- GPS vehicle tracking
- Operational efficiency
- Value-added services

Insurance Companies
- Usage-based insurance
- Vehicle usage monitoring
- Tracking/theft protection

Smart Cities
- Traffic flow management
- Urban planning
- Parking
- Automated road toll

Retail
- In-car offerings and targeted advertising
- Retail store information

Energy
- Real time location-based promotion
- On-demand services
- Usage insights

OEM & Partners
- New vehicle features
- Design improvement
- Data feedback for R&D optimization

AACV User

Value-added Services

OEM
Future Autonomous Vehicle Platform

Future vehicle platforms will be designed to scale and adopt to L4/L5 AACV

Future Sensor Fusion Solutions

Vehicles will need to collate various sensor data to get a complete picture of the surrounding, leading to sensor fusion

Data Storage and Computing

Data size, connectivity, and latency will influence the adoption of computing platform

Testing and Validation

Scenario-based testing and validation is considered over conventional driven miles methods
AACV Technology

Discrete Sensor Operation
Signals from each sensor need processing and validation. As all sensors work discretely, the process is time consuming and information is less robust.

Sensor Fusion Operation
Sensor fusion provides inputs of various discrete sensors and sensor types and uses the combined information to perceive the environment more accurately. This increases perception accuracy, data robustness, and reliability.

ECU-LEVEL SENSOR FUSION
Data from multiple raw sensors are processed in a single central unit. This approach reduces data loss due to pre-processing or compression. However, the ECU will need high-processing power.

SYSTEM LEVEL SENSOR FUSION
Smart sensors perform data processing and sensor-based decision making locally in the sensor modules. Only processed data is sent back to a central Multipoint Control Unit (MCU) for actionable decision making.
AACV Testing and Validation

1. Low-speed, parking area
2. Multi-lane high speed area
3. Downtown area
4. Suburban area
5. T-junction area
6. 5G Connectivity
AACV Testing and Validation
Thank You