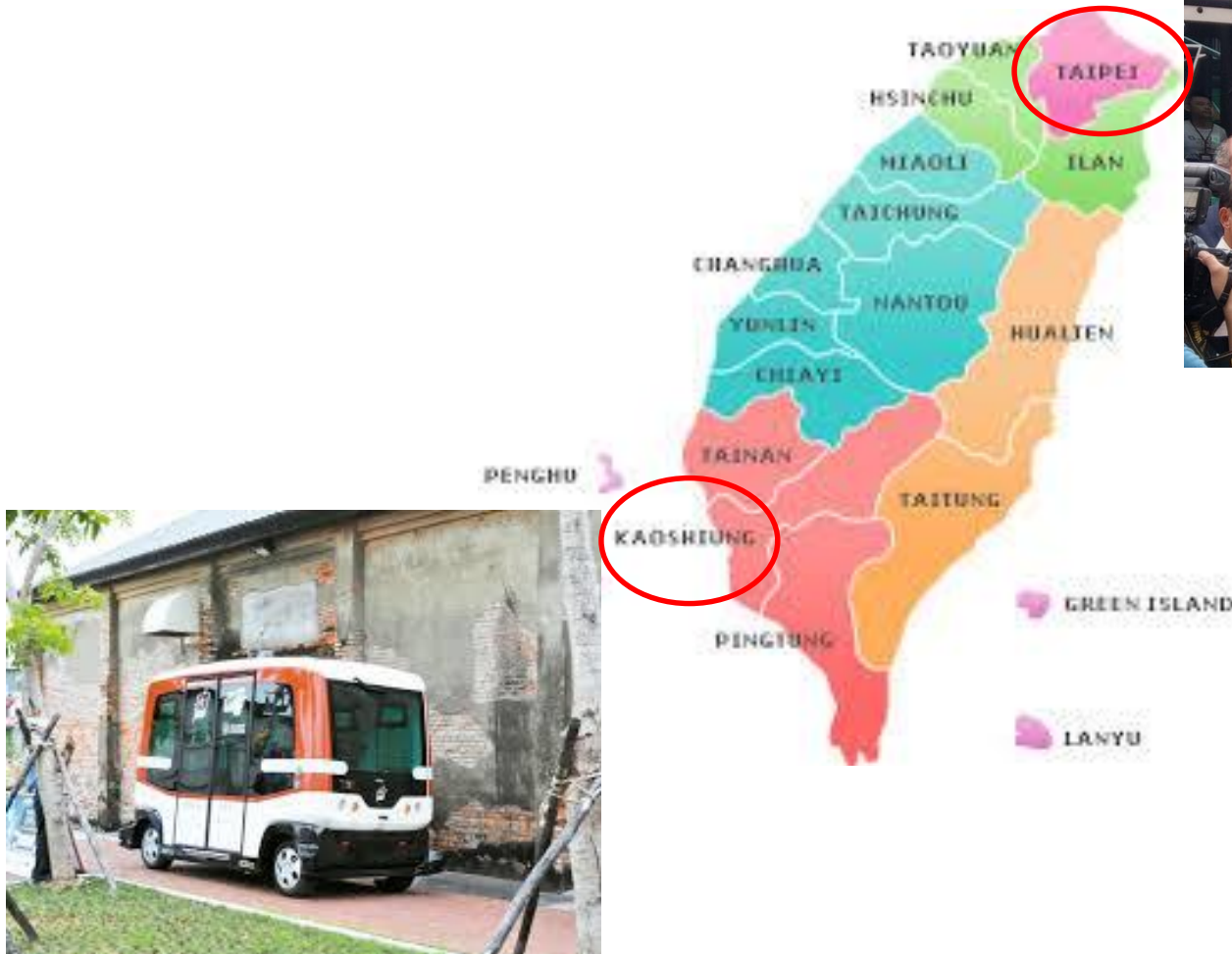


Development of Automated Vehicles in Taiwan

**Industrial Technology Research Institute
MSSL, Intelligent Mobility Division
Business Director
Wen-shu Chiang
2017/08/09**

Current Demonstration in Taiwan

Shuttle buses from France have been being demonstrated for public transportation

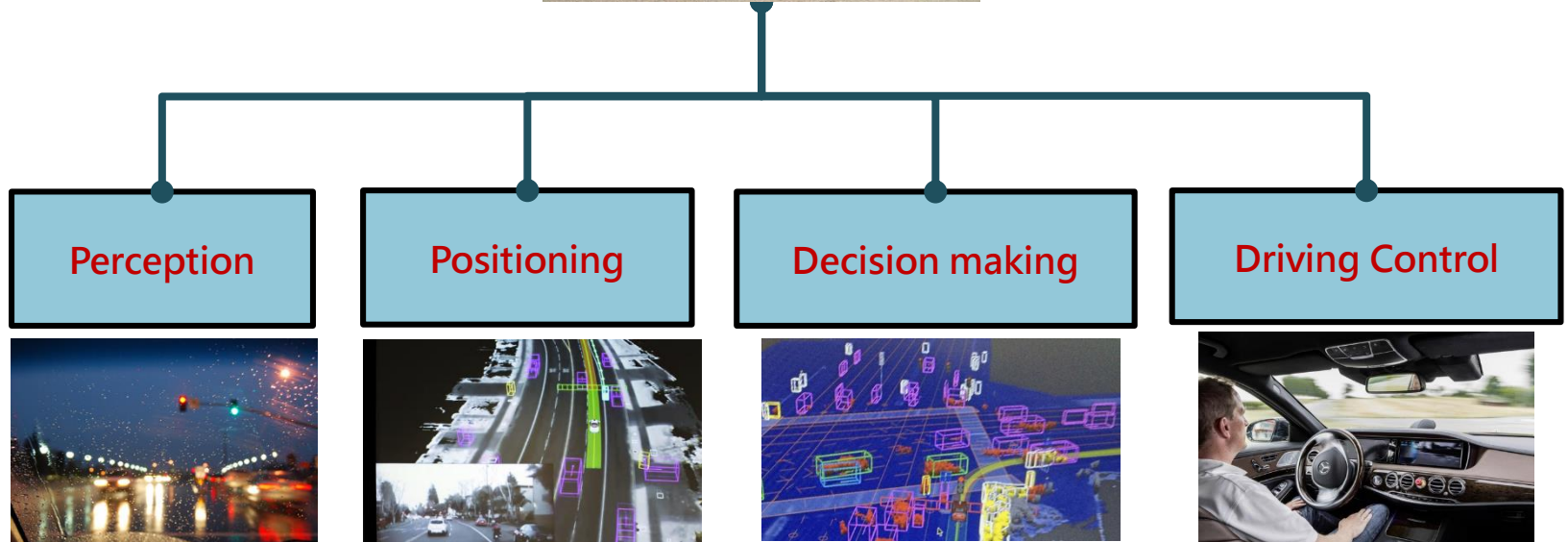


Automated Vehicles by Taiwanese industry

Taiwan's Auto industry has been integrating local institutes, companies and international companies to develop its own automated vehicles



Institute: ITRI/ARTC...



Whetron/nVIDIA

KingwayTek

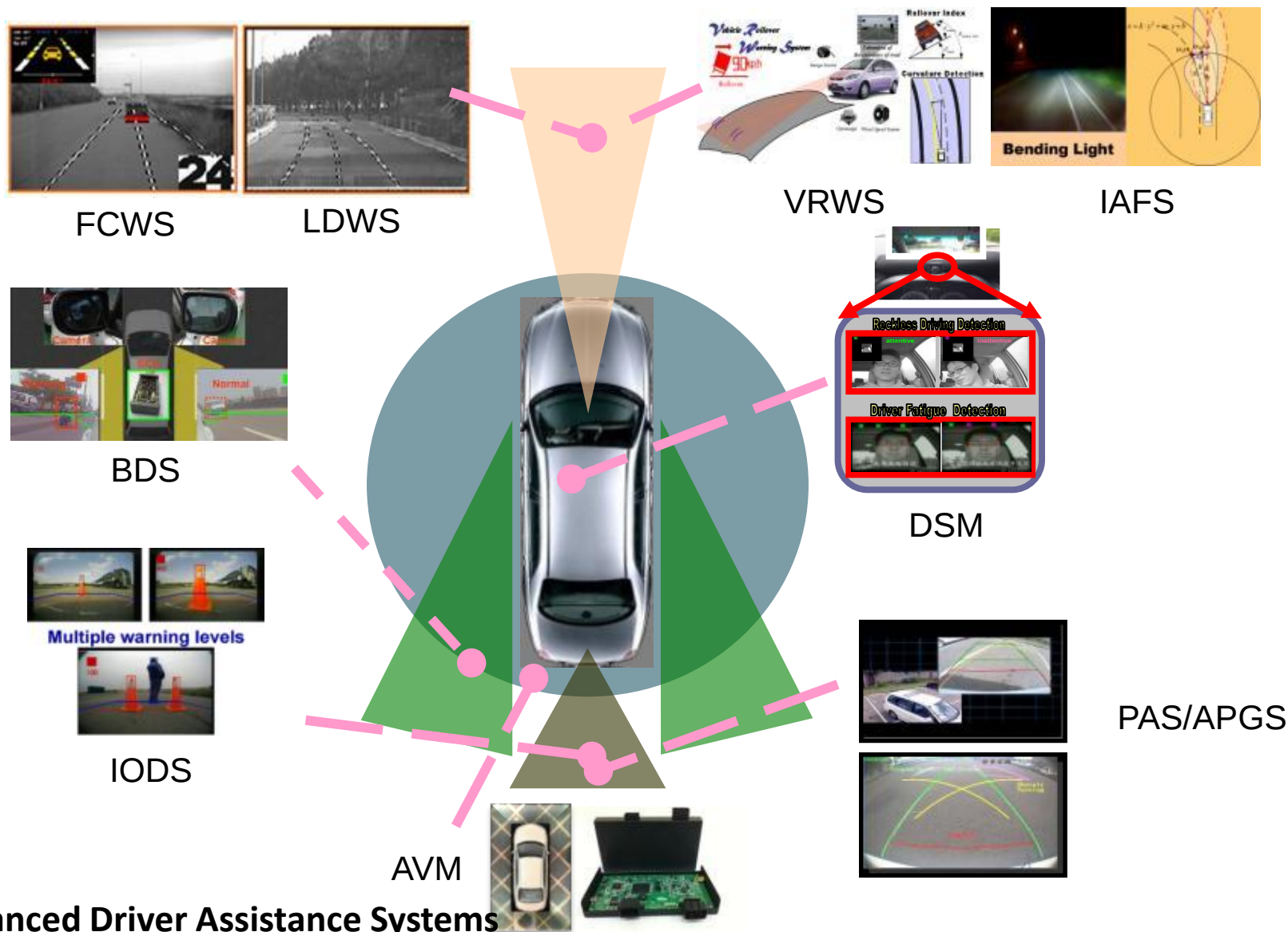
HAITEC/nVIDIA

Advanced Micro Electronics

local and foreign companies

The basis of Taiwan's automated vehicles

Mature ADAS (perception) solutions in Taiwan, but only for driver warning;



ADAS: Advanced Driver Assistance Systems

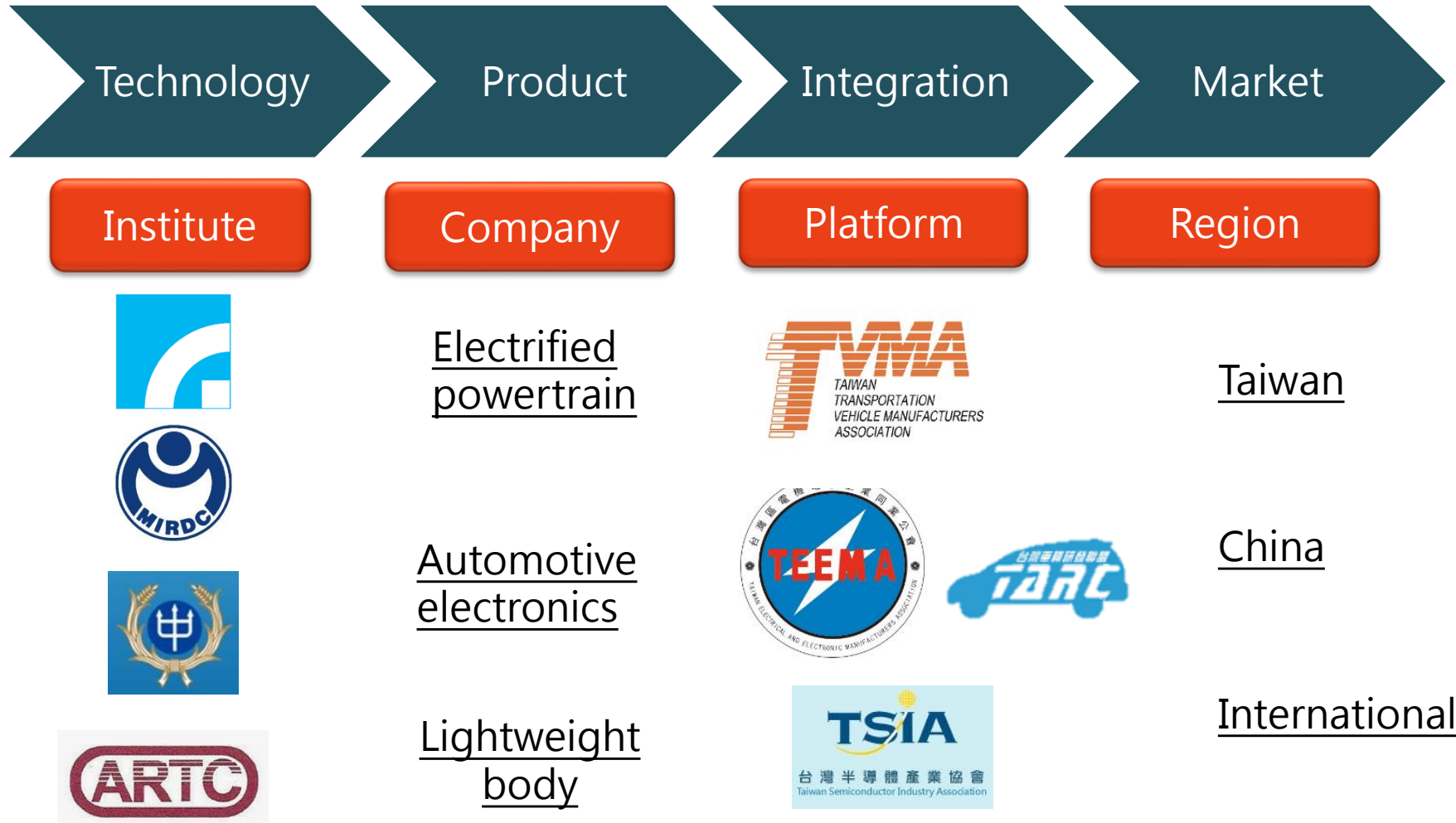


工業技術研究院
Industrial Technology
Research Institute

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Taiwan's Eco-system

Taiwan as a company: highly integrated from Technology to Market

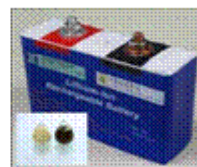


Members of TARC

- Organized and supervised by the DoIT, MOEA
- Integrating 4 local research institutes and HAITEC to work coherently



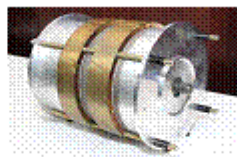
工業技術研究院
Industrial Technology Research
Mechanical & Systems Research Laboratories
Materials & Chemical Laboratories Institute (ITRI)
<http://www.itri.org.tw>



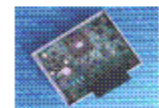
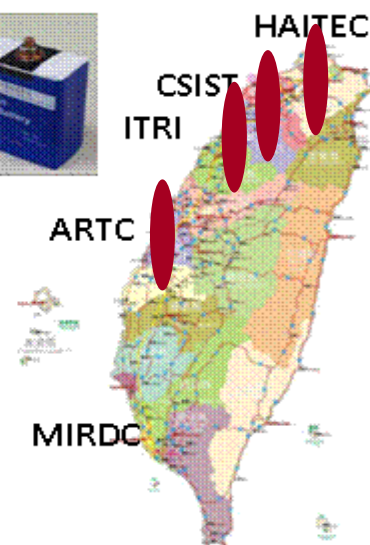
車輛研究測試中心
Automotive Research & Testing Center
(ARTC)
<http://www.artc.org.tw>



金屬工業發展中心
Metal Industries Research &
Development Center (MIRDC)
<http://www.mirdc.org.tw>



中山科學院
Chung-Shan Institute of Science &
Technology (CSIST)
<http://www.csistdup.org.tw>



華創車電公司
Hua-Chuang Automobile Information
Technical Center Co (HAITEC)
<http://www.haitec.com.tw>

Hua-chuang Automobile Information
Technical Center Co., Ltd.

<http://www.ev.org.tw/Home/index>



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Research Institute

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ITRI's Vehicle Platform

Gen 1

Electric Vehicle



2017 Pre-production
by a local OEM

Gen 2

Self-driving Car



2018 Site Testing
in ITRI Campus

Gen 3

AI Car



Presented by Jensen Huang in 2016



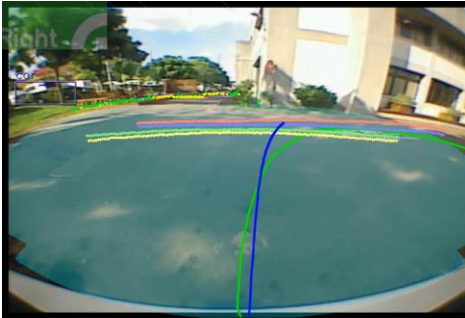
2019 Site Testing
around Hsinchu High
speed train station

Gen2 Self-driving Car

Demonstration of the automated vehicle -1



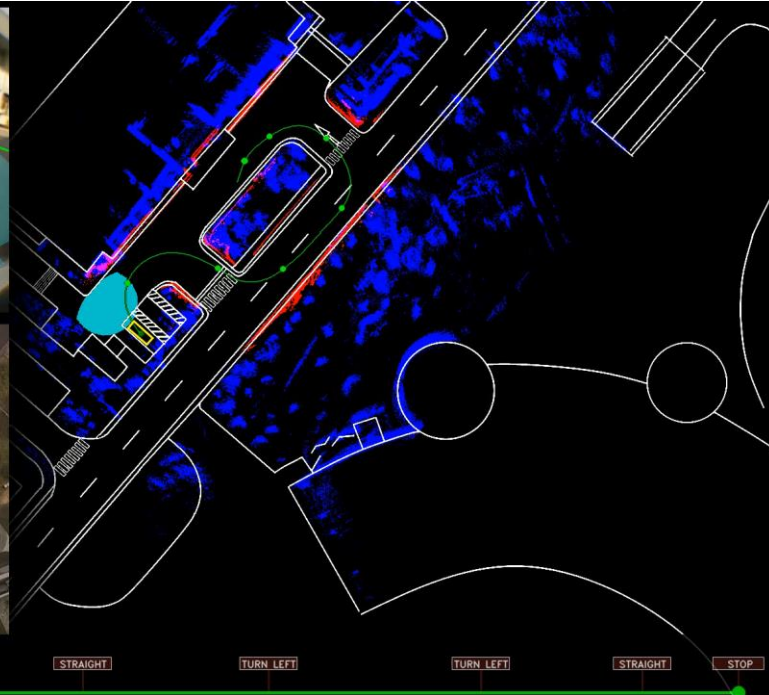
Camera



GPS



Lidar



Gen2 Self-driving Car

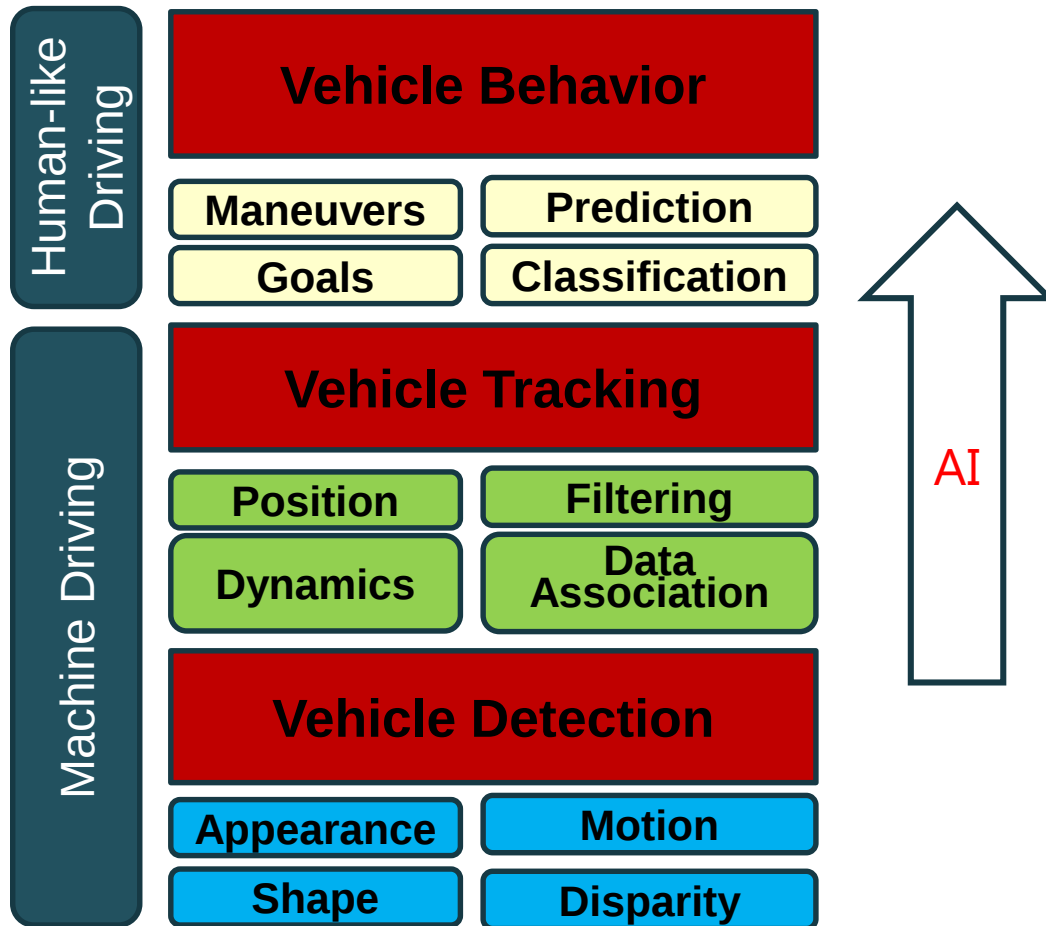
Demonstration of the automated vehicle -2



Gen-3 AI Self-driving Car

To replace traditional obstacle tracking from numerical data, it is a necessity of using visual depth learning on intuitive traffic scene understanding

Automated driving functionality



Driving environment

Urban road
15~80km/h



Highway
80~110km/h

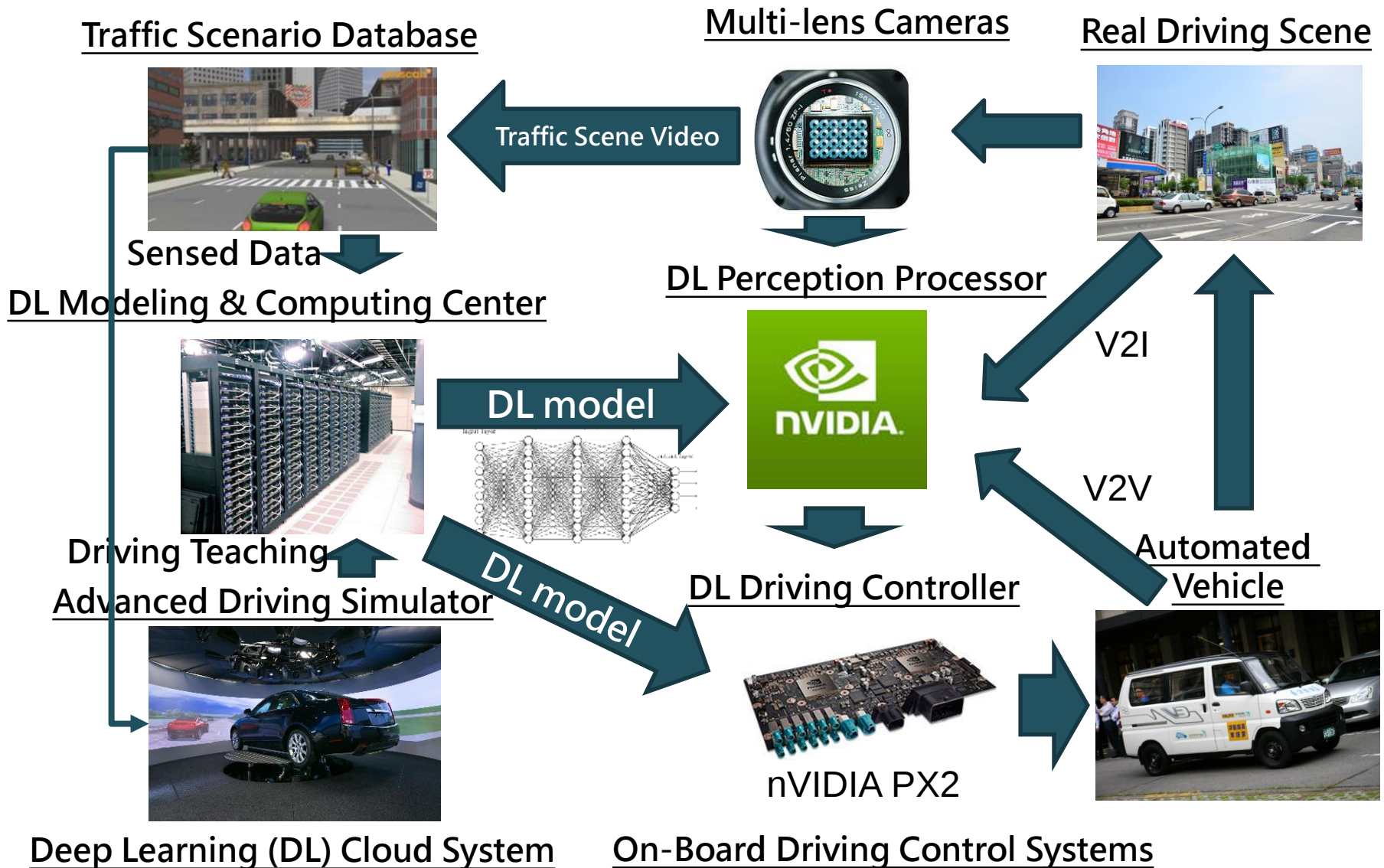


Urban road
Traffic jam
<15km/h



Gen-3 AI Self-driving Car

R&D Eco-system of ITRI's AI Automated Vehicle



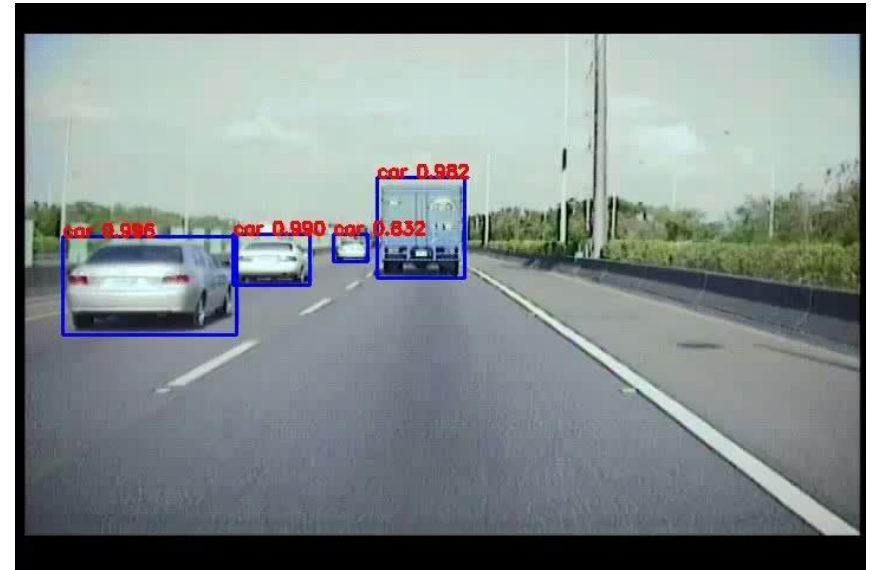
Deep Learning Improves Quality of Object Detection

Traditional Approach (SVM)



- Only front vehicle on the same lane could be precisely detected!
- Recognition Rate: 93%

Deep Learning



- Easy to precisely detect multiple vehicles at the same time!
- Recognition Rate: 98%

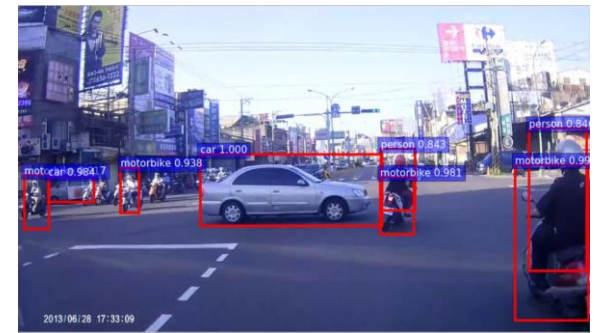
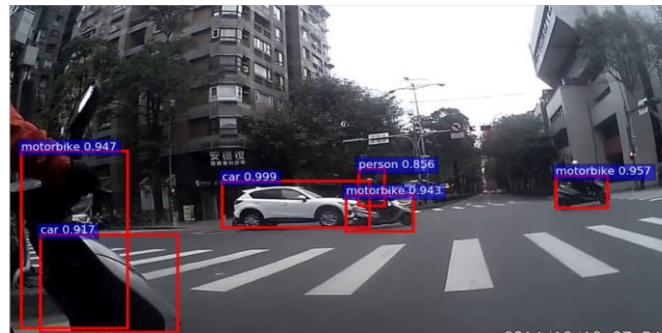
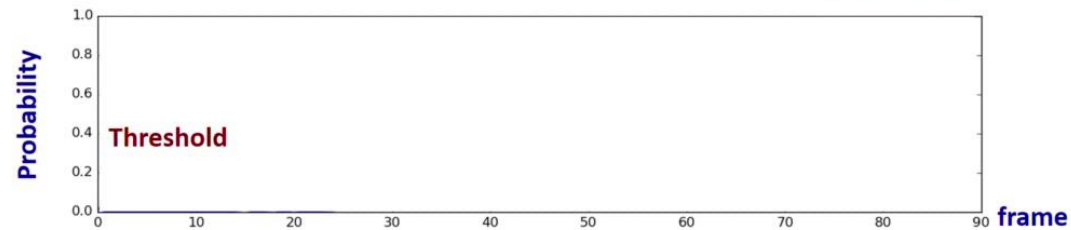
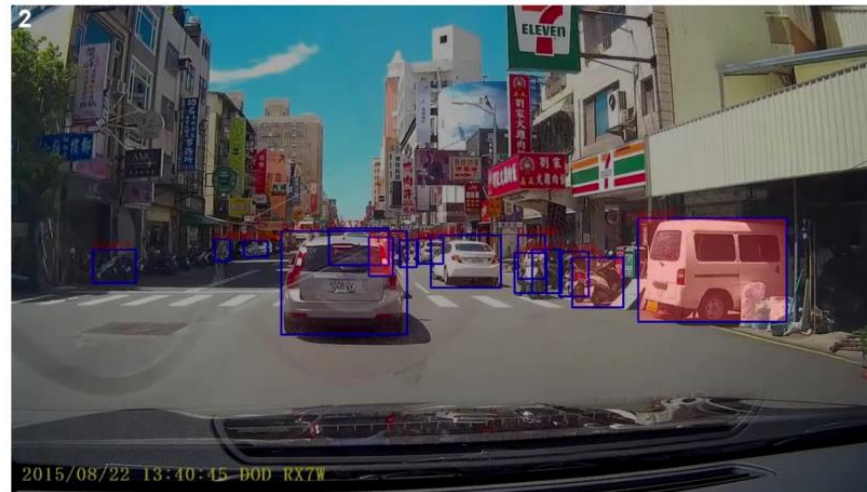
Gen-3 AI Self-driving Car

Prediction of Car Accidents with deep-learning techniques

Behavior



Detection

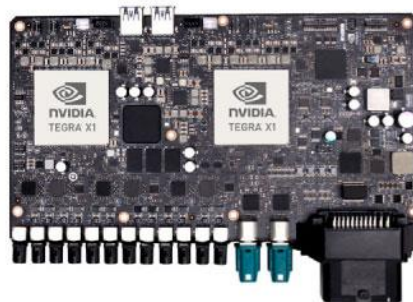


Gen-3 AI Self-driving Car

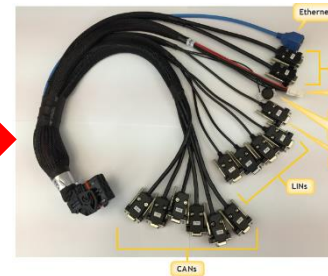
End-to-end driving with Deep-learning Techniques, nVIDIA PX2 based



Camera



Drive PX2



CAN



EPS

Integration Platform

- Systematic
- Flexible

Systematic R&D on EVs

Demonstration: ITRI's virtual vehicle technologies

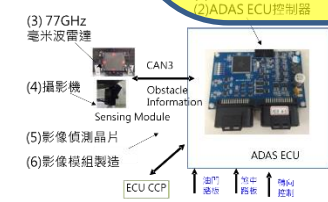
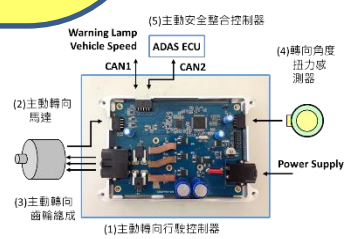
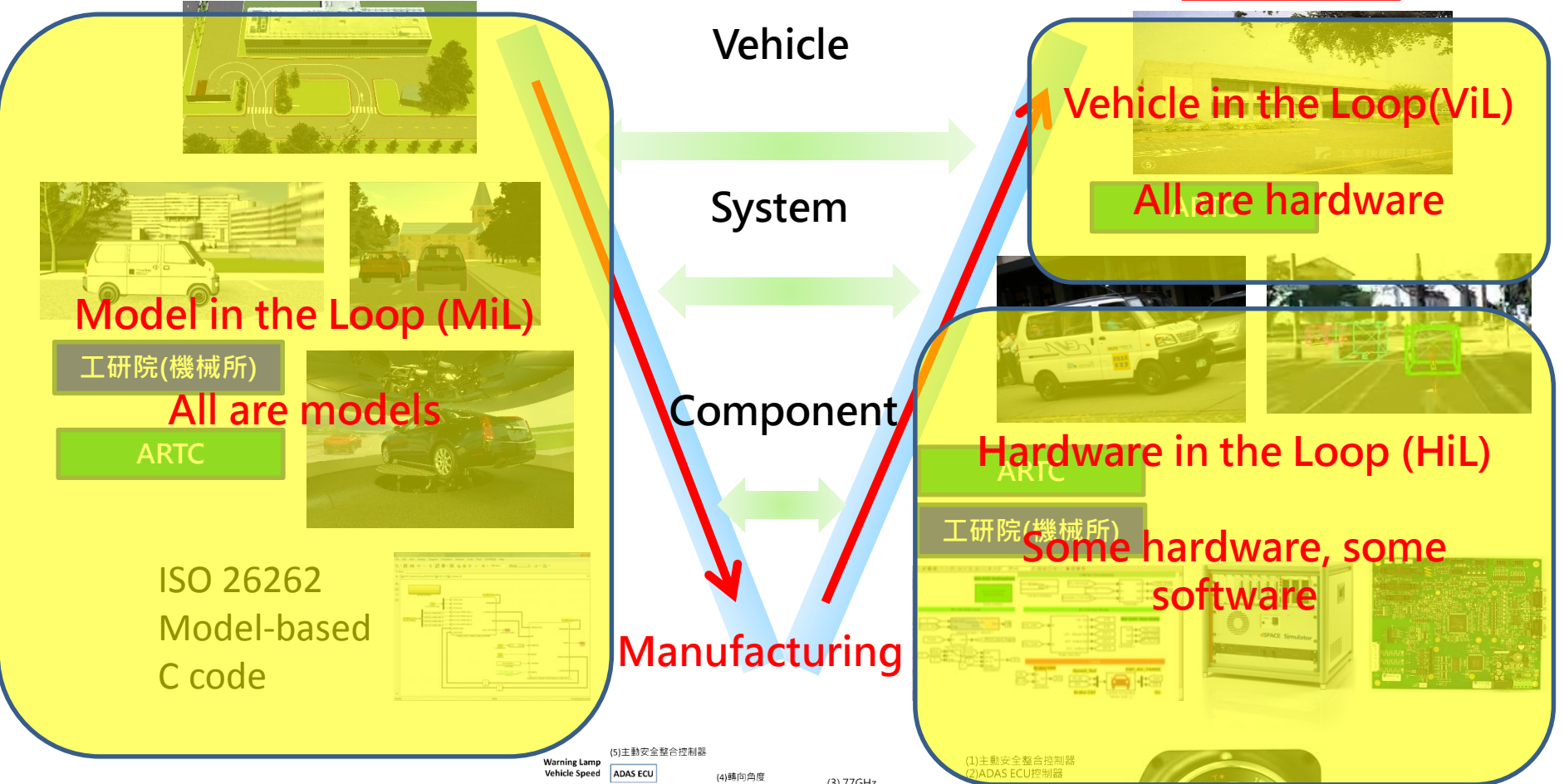


Systematic Integration

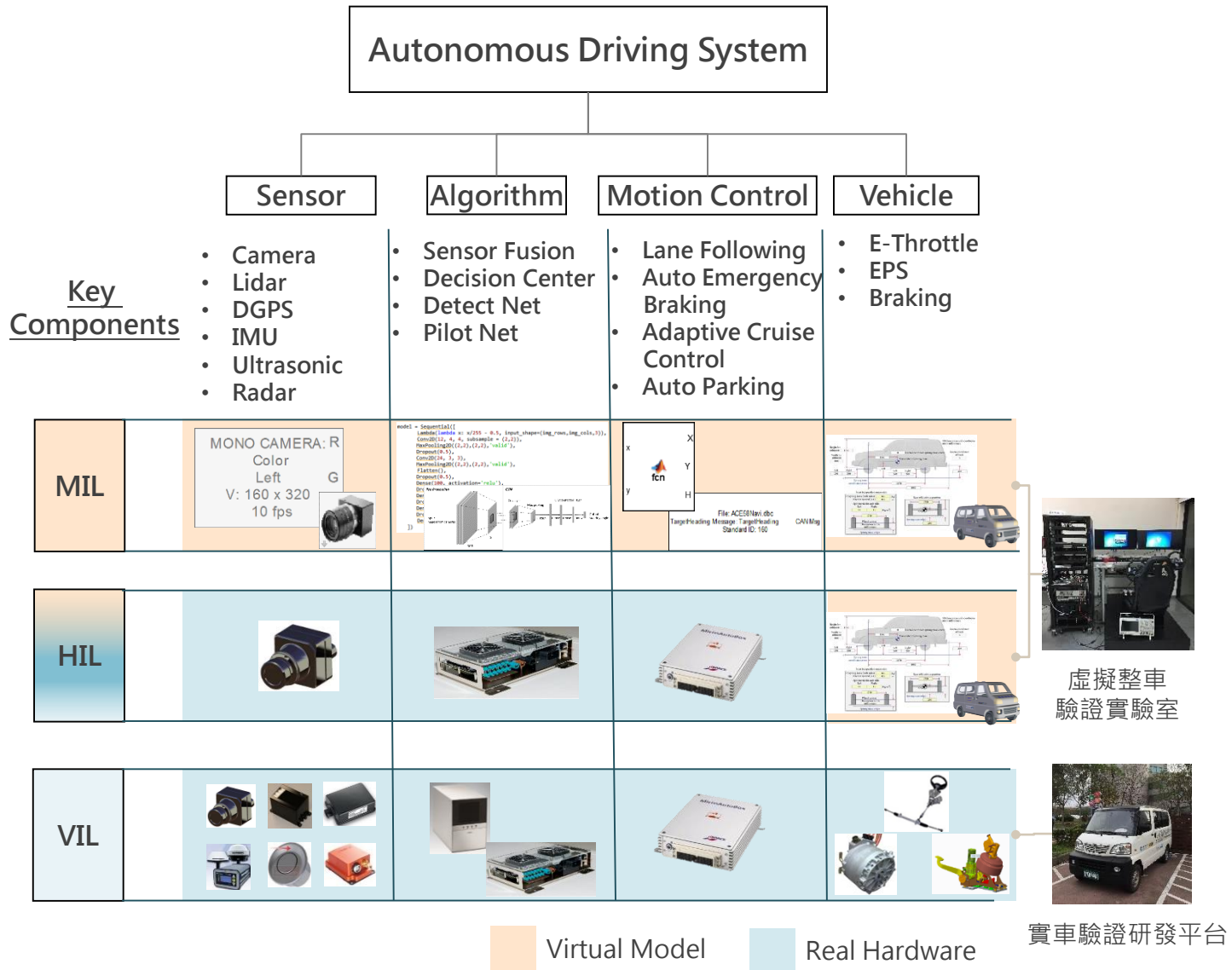
Vehicle to Component; Simulation to Verification

Simulation

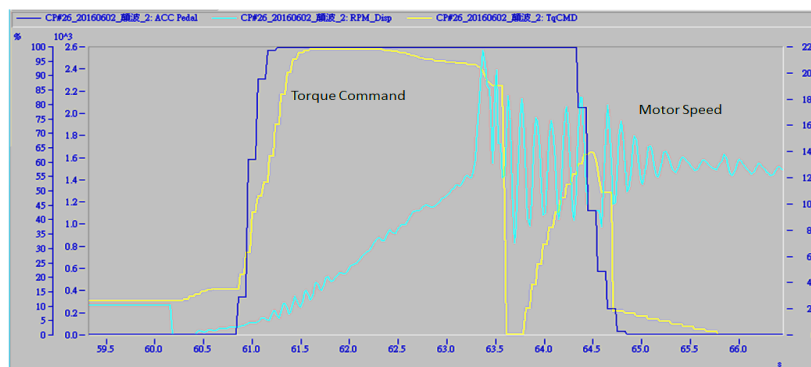
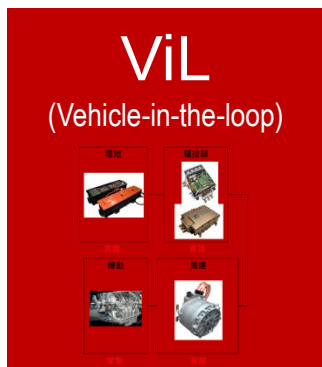
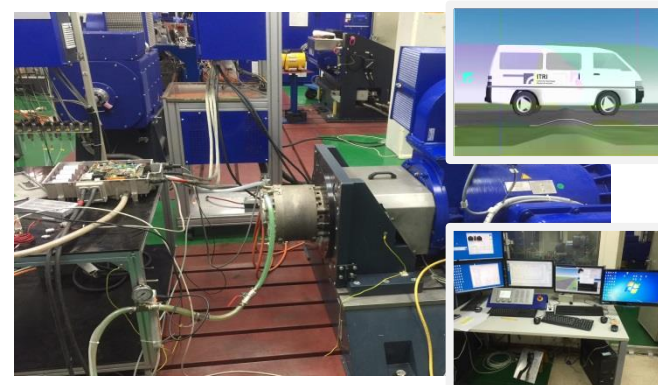
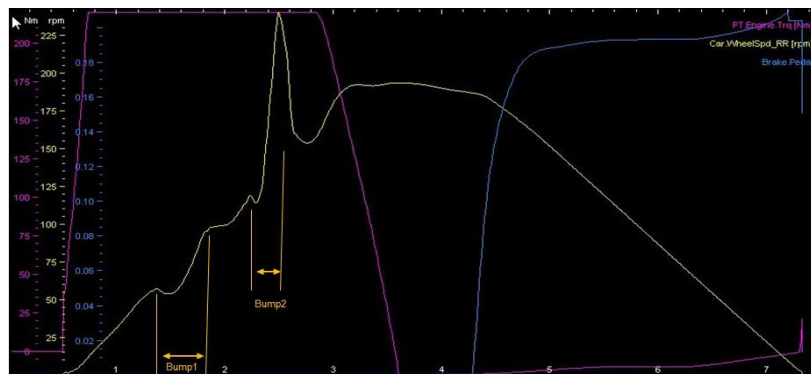
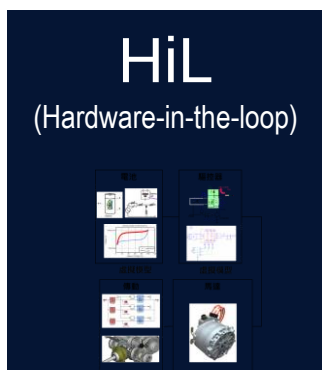
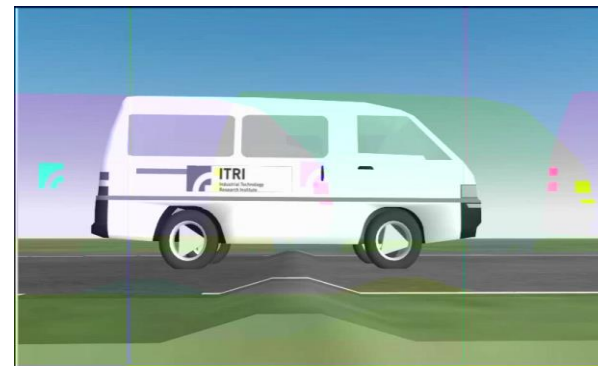
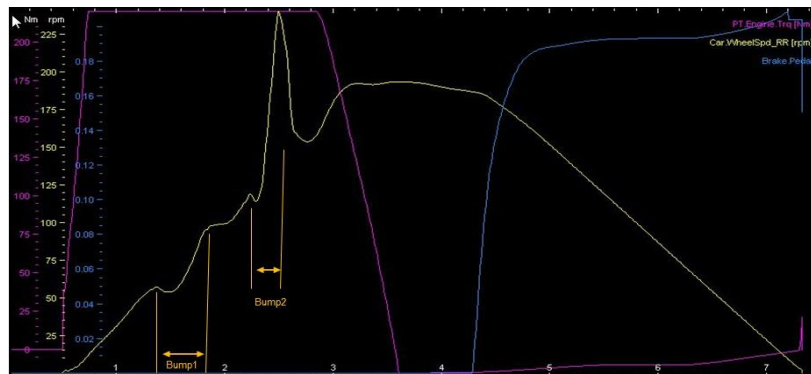
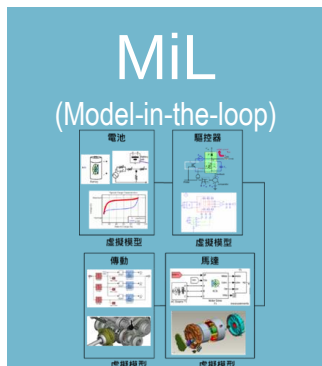
Verification



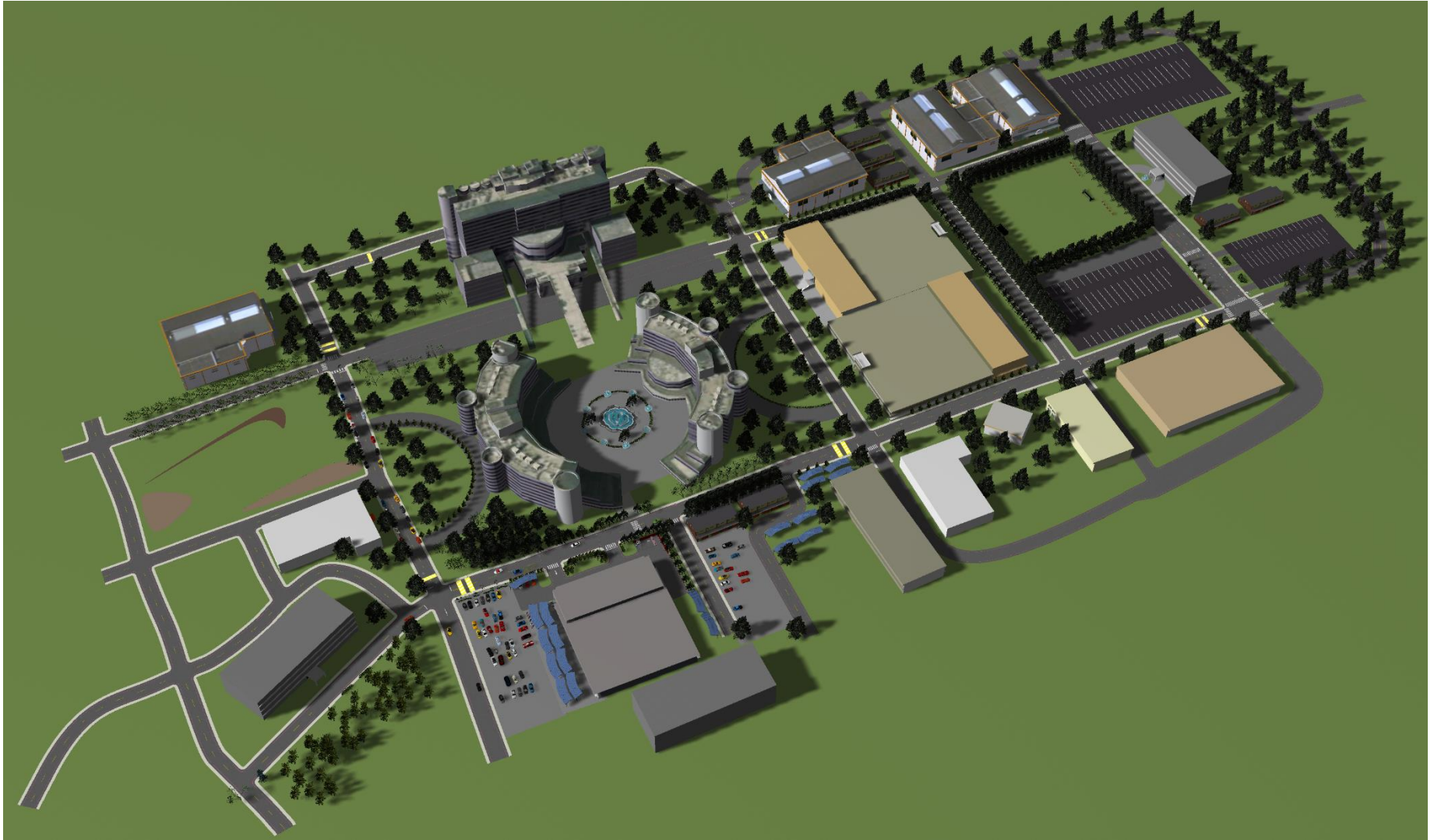
Flexible Integration



Example 1: Virtual EVs and systems

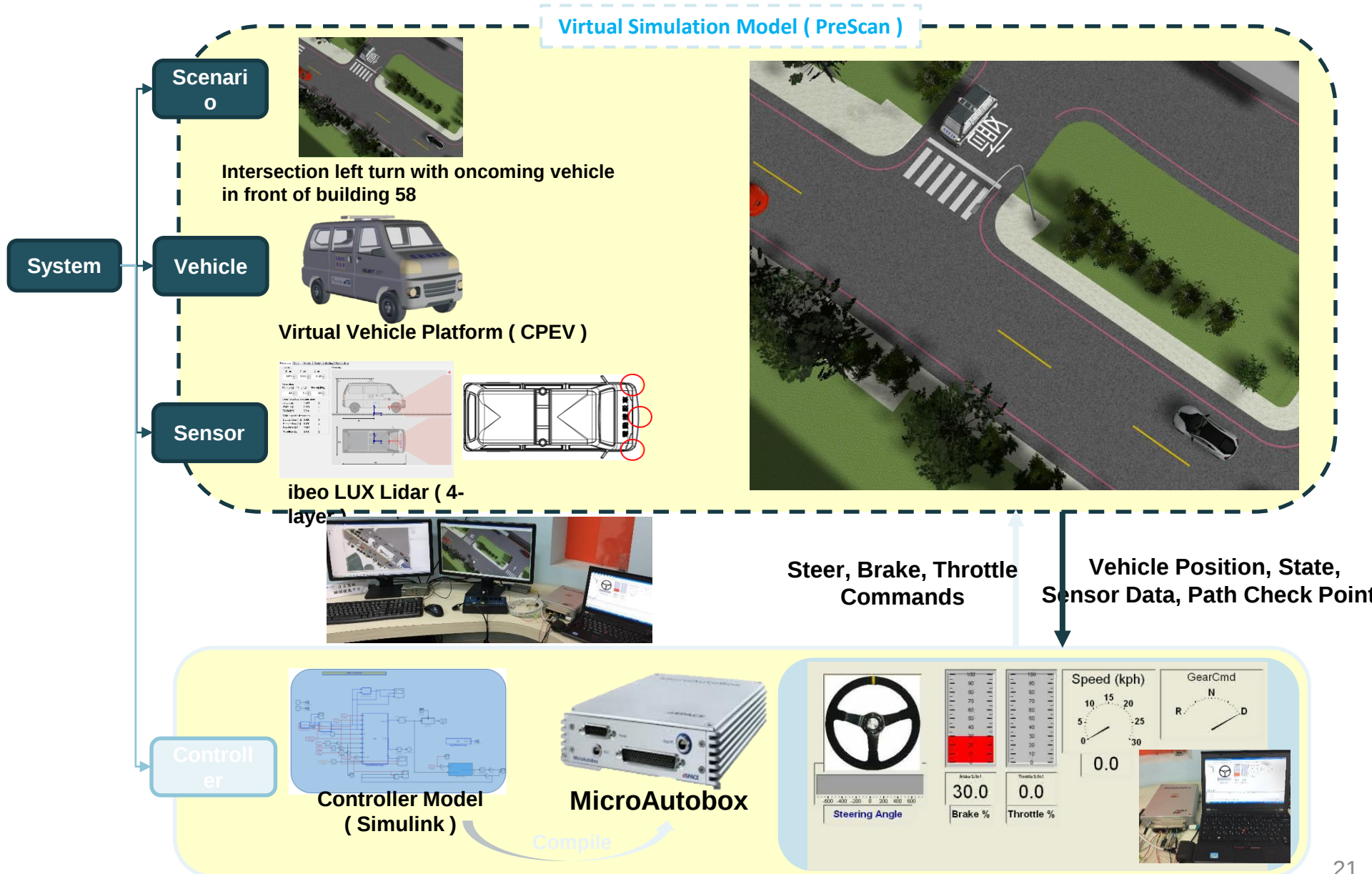


Example 2: Virtual Site



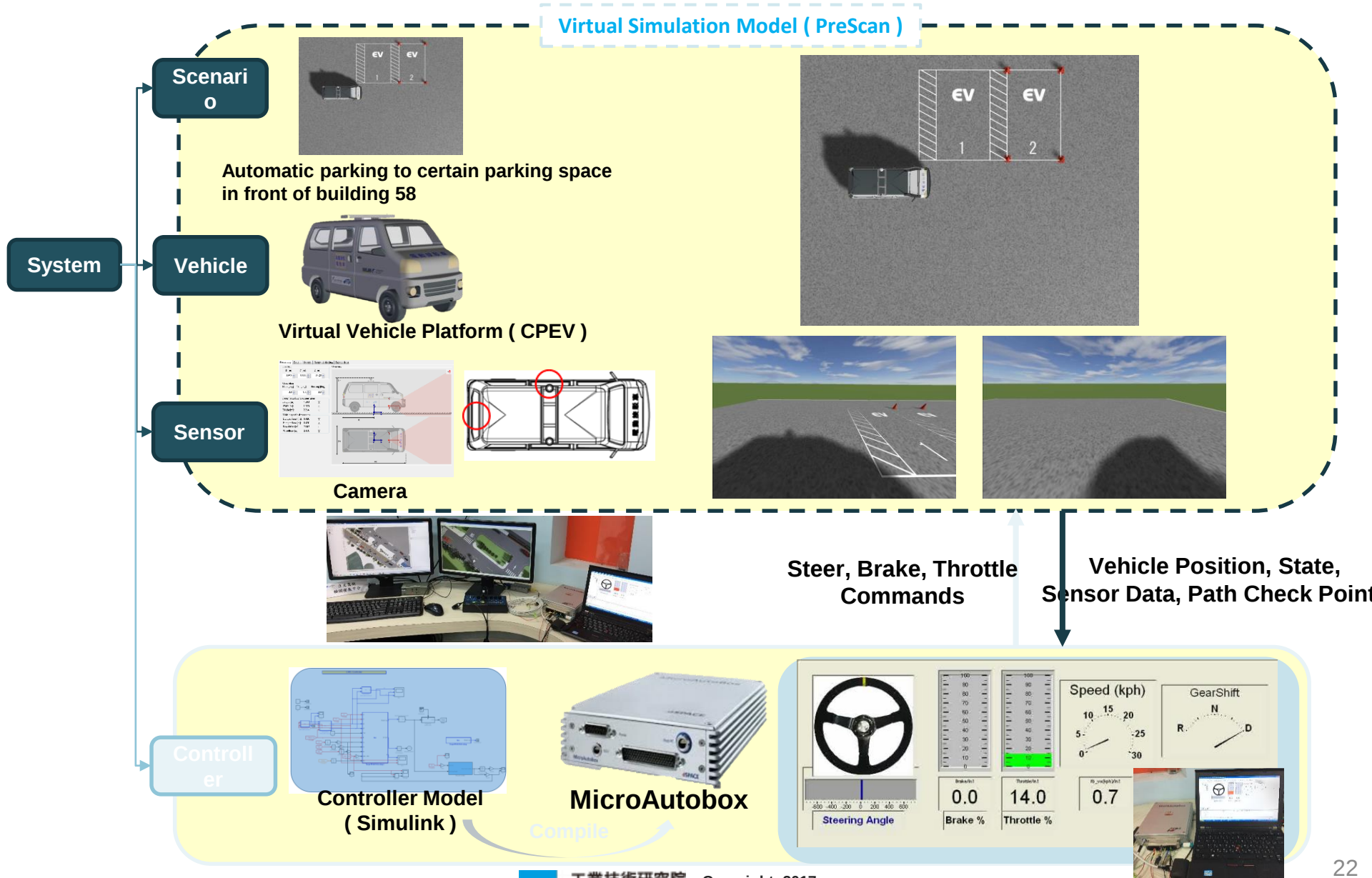
Example 3

- Auto Braking and Turning Verification: **Controller in the loop**



Example 4

- Auto Parking Verification: **Controller in the loop**



Example 5

Testing System for

- Steering
- Brake



Example 6: Deep Learning Platform

Data Training

CNN model:
Object detection: SVM,
Faster R-CNN, YOLO
Classify: Lenet, Alexnet,
Caffenet, DriveNET
Datasets: Pascal +
MSCOCO + KITTI+



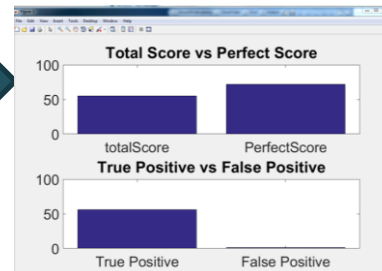
Data Mining & Labeling



Label Tool: Vatics
Labeled : >1,000k images
Object type : Pedestrian, Bike,
Motorcycle, Vehicle, Bus, Truck

Data Server -144 TB

Ground Truth

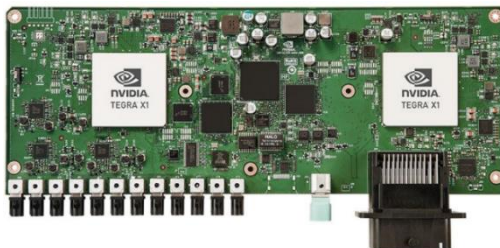


Data Capture



10GB/day

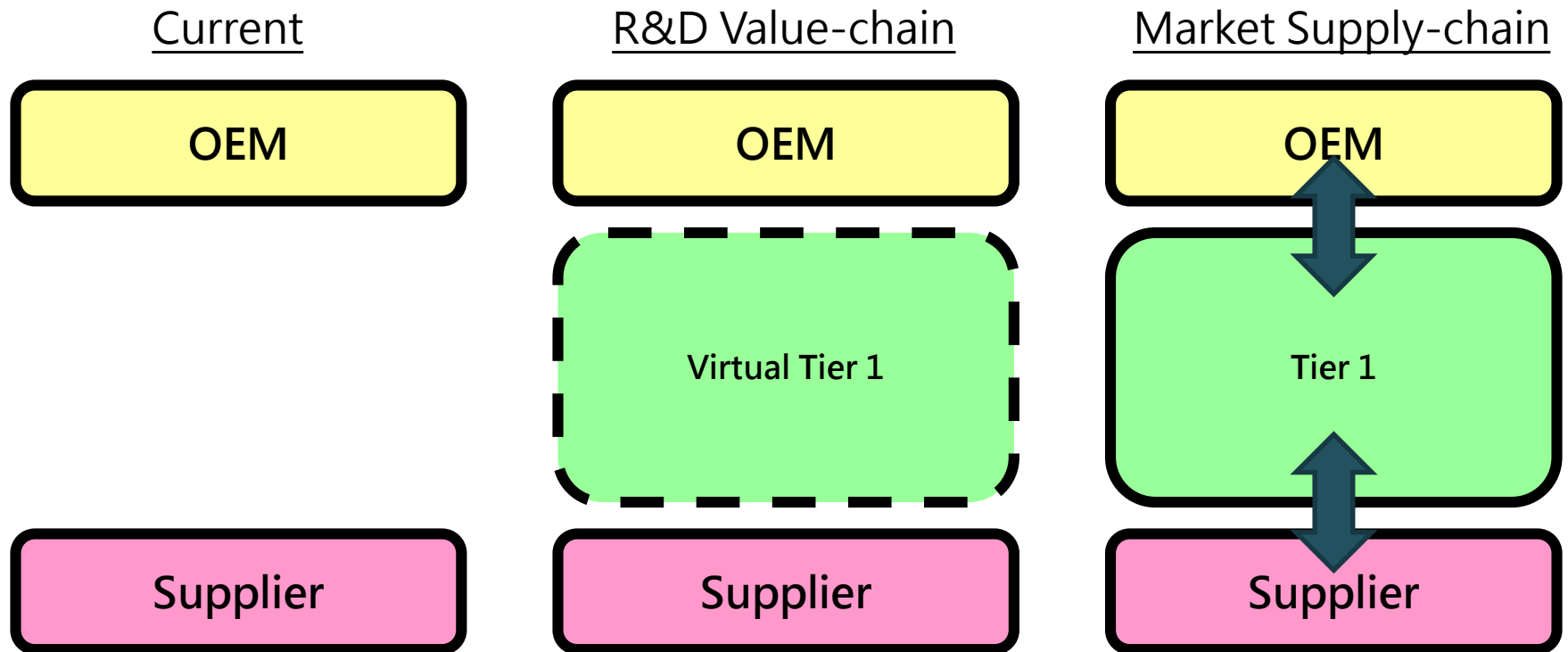
Embedded SW Porting



TX1, DrivePX2

ITRI could Serve as Virtual Tier 1

To bridge OEMs and Tier 2 suppliers during R&D phase



Welcome to Join our Platform to development your Automated Vehicles and Systems