Part 2  How Tier IV strives in the Autoware world

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Present Chief Operating Officer at Tier IV. Leads business strategy building, project management, marketing and sales and external communication. Also Inspector of The Autoware Foundation.

Prior to joining Tier IV, Daisuke was a Business Solution Adviser at IBM Japan from 2003-2010. He built and managed global supply chain systems for leading global automotive companies. Daisuke was an Associate Partner at McKinsey & Company Tokyo Office from 2012-2018. He served global clients in Energy and Advanced industry for company-wide transformation.

Daisuke received MBA, Tepper School of Business at Carnegie Mellon University; LLB, University of Tokyo.

Daisuke Tanaka
COO
Who Are We?
Our Vision

Intelligent Vehicles for Everyone

We provide open access to AD technology such that everyone, from individuals to organizations, form a sustainable ecosystem that contributes to and applies AD technology to Intelligent Vehicles for the benefit of society.
How do we Win the Market?

The Autonomous Driving industry has entered a period of civil war. With Waymo at the top, there are many key players in the world that are bigger than Tier IV such as Aptiv, Aurora, Cruise, Zoox, and Argo AI.

One of the strengths of Tier IV lies in its position of having formed a global union. Together with the partners who are betting on the potential of Autoware, can we become the reference for Autonomous Driving Platforms? Can we become the standard that captures the hearts of potential customers all over the world?

By maintaining its popularity with open source, and with risk management know-how and all-round technology skills, we provide an open ecosystem with Autoware.
Tier IV has completed real-world road testing on public roads in about 50 municipalities across 18 prefectures in Japan.

It has achieved more than 80 ODD cases, and is in Japan's top tier of AD technology leadership.
Field Testing

At Tallinn University of Technologies, 18 professors and students created their own autonomous vehicles in a short period of time. Autoware contributed to their work.

The US Department of Transportation's Federal Highway Administration adopted Autoware as the AD platform for its CARMA traffic system, and implemented driving tests with real vehicles.

Estonia

Gave a keynote speech at the world-renowned AD conference offered by The China Automotive Technology and Research Center (CATARC). Completed the course in an AD competition.

Tianjin

United States

Supported a golf-cart demonstration at an industrial park in Bangkok in an ASEAN event. Implemented trial rides for senior government officials such as ministers.

Bangkok

Estonia

Tianjin

United States

Hong Kong

Taiwan

Hanoi

Tel Aviv
Autoware
What is Autoware?

Before the advent of Autoware, components of autonomous vehicles were developed as proprietary assets and the progress of autonomous driving technology was impeded, but now everything has changed.

• Originally created in 2015 by Shinpei Kato at Nagoya University
• Based on the open-source ROS middleware
• Autoware is:
  o Complete AD software stack
  o Independent of vehicle type or electronic hardware
  o Governed by an independent foundation
  o Completely open-source (licensed under Apache License 2.0)
There is no other Autonomous Driving software that can be applied to as many types of ECU, sensors and vehicles as Autoware. We offer various services such as integration, risk management and service platform.

The value of Tier IV for customers is that we can provide a wide variety of products through our alliances with countless partners. Whether you are in the city, in a park or in a factory, you can take advantage of products and services on the Autoware platform worldwide. This is the strength of Tier IV that no one, not even Waymo, can provide.
Autoware Ecosystem

Government
- Road Regulation
- Inspection Scheme
- Super City Planning

Infrastructures
- Insurance
- Communication LTE / 5G
- MAP

Technology
- Sensor / Silicon
- ECU manufacture
- By-wire / EV OEM

Service Provider
- Apps on Autoware
- MaaS Service
- Cloud Service
The Autoware Foundation (AWF)

Welcome to the Autoware Foundation.

The Autoware Foundation is a non-profit organization supporting open-source projects enabling self-driving mobility. The Autoware Foundation creates synergies between corporate development and academic research, enabling autonomous driving technology for everyone. Your contribution is essential.
Autoware Foundation successfully debuted on the 3rd World Intelligence...

The Autoware Foundation, the open alliance for autonomous driving technology, sent two teams to participate in the 3rd World Intelligence Conference (WIC) and the 3rd World Intelligent Driving...

First Autoware Meetup in the Bay Area

Approximately 40 guests joined us at the AutonomouStuff office in San Jose for an evening of food, drinks, networking, an Autoware technical update about changes which have taken place in the past 9 months, as well as an update from AutonomouStuff about their recent product...

The first Autoware Official Meetup in Shenzhen, China

The first Autoware Official Meetup in China was held at Robosense Office in Shenzhen. More than 20 foundation members from all over China joined the event. The event started with Shinpei Kato’s...

The Autoware Foundation and MACNICA showcased autonomous driving at...

The Autoware Foundation (AWF) and its premium member, MACNICA, Inc., participated in the Amata Smart City Showcase, one of the events at The ASEAN Smart Cities Network (ASCN) Conference...

Autoware does Autonomous Valet Parking!

October 5, 2020. On Friday, October 2, 2020, several Autoware Auto contributors succeeded demonstrated the Autoware Auto open source s...

Autoware Foundation Reception at ROSCon

It was great to see over 100 people at our reception on November 3, 2019 in Macau. A big thanks to the ADLink team for organizing the eve...

The Autoware Foundation Meetup in Tokyo

The Autoware Foundation (AWF) hosted the meetup event for the first time in Japan. Approximately 40 participants from the 15 member companies joined the event held in Nagoya University Tokyo Office. All the participants enjoyed the presentations by Jan Becker (Apex.AI), Geoffr...
### Ideal and reality

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<tr>
<th>What we aspire...</th>
<th>What it is...</th>
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<td>→ People love Autoware and actively offer contributions based on the common visions</td>
<td>→ Very challenging to balance between individual interests and community-wide directions</td>
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<td>→ The community grows as developers and implementors get together for continuous evolution</td>
<td>→ The AD technology is still developing; how can we attract early adopters while giving them tangible benefits?</td>
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<td>→ We build the foundation of technologies together, and implement them locally.</td>
<td>→ AD/Mobility is often times very local in terms of preferences, regulations etc; how should we drive the initiatives in an effective manner?</td>
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Reference Design
How do we implement Autoware?

What we want to achieve:
- Shortest time to market and cost optimization
- Data security and local requirements/regulations

Tier IV to support global customers through AWF ecosystem
Tier IV’s Reference Design

Tier IV is undergoing on-going and fluid development in all three ODDs

**ODD1**
(AD dedicated environment)

- **LiDAR**
- **Camera**

**Reference Design for In-Factory Transportation**

**ODD2**
(Transportation inside factories / Cyclic routes inside facilities)

- **LiDAR**
- **Camera**

**Reference Design for Robo-bus/Shuttle**

**ODD3**
(Suburban areas /Urban areas)

- **LiDAR**
- **Camera**

**Reference Design for Robo-taxi**

**Reference Design for AMR**
### ODD 1
Slow speed use cases supported by short range and minimal sensing. No other vehicles or pedestrians.

**AD dedicated environment**

**Activities**
- Test driving
- AD in research institutes

### ODD 2
Use cases supported by short range sensing. All vehicles are slow.

**Logistics roads inside factories**

**Activities**
- Component transportation within Yamaha’s manufacturing plant

**Cyclic routes inside facilities**

**Activities**
- A loop line bus in Moricoro Park (small-sized EV)
- Facility to facility automated transportation in Shimizu-Kensetsu’s factory (small-sized EV)
- A loop line bus at the Olympic Village (bus)

### ODD 3
Use cases supported by long range sensing. Vehicles are mid to high speed.

**Cyclic routes in suburban areas**

**Activities**
- Public roads in Sakado-shi, Saitama (bus)
- Local roads in Tokyo coastal area (passenger car)

**Mountain areas**

**Activities**
- One-mile transportation in mountain areas such as Ube-shi, Yamaguchi (passenger car)
- Regional transportation at Tobishima-mura, Aichi (passenger car)
- Tourism-oriented MaaS in Hirayama-ji (bus)

**Urban areas**

**Activities**
- Shinjuku city area (passenger car)
Case Study
eve autonomy is a joint venture between Tier IV and Yamaha Motor, focused on delivering autonomous transport solutions for use inside factories (indoors and outdoors).

This is the first case to apply the Pilot.Auto X1 to Yamaha’s vehicle (Golf Cart) for transportation.

By combining Tier IV’s integration technology using Autoware and Yamaha’s highly reliable vehicle development technology, eve autonomy will promote the development scalable and broadly accessible autonomous transport solutions.
RoboShuttle

Maas Platform for slow-speed bus

Next Mile is a fully autonomous EV designed primarily designed for driving at low speeds (up to 20 kph).

It is based on a small sized bus (up to 10 passengers) and is equipped with LiDAR sensors and cameras.
RoboTaxi

We are participating in robot taxi demos, aiming to improve social acceptance of AD

Tier IV has been testing robot taxis with the goal of developing an optimized autonomous vehicle Reference Implementation, as well as a platform for service operation and management.

We are operating robot taxis in various environments, collecting and analyzing collected data, and applying knowledge towards optimization of AD system implementations evaluated relative to actual taxi driving.
自動車・原付

塩尻駅前
Shiojiri Sta.

塩尻市

スクリーン式
(押しボタン式)
AMR (Logiee)

Maas Platform for AMR

Logiee is a prototype for a fully autonomous AMR designed for driving at low speeds (up to 6km/h) in private and public areas. It is based on a wheelchair and is equipped with LiDAR sensors and cameras.

Logiee can be used for delivery of goods, as the body accompanies a compartment that can store items.
SELF DRIVING IN PROGRESS
Our Solutions
Tier IV’s Value Proposition

Tier IV has a full stack solution to develop and operate AD system based on Autoware.

Leveraging the vast experience and know-how, Tier IV can provide a variety of services for OEMs, Service Operators or any other stakeholders that want to efficiently and effectively develop or operate AD vehicles.
Development Process and Tier IV’s Services

**AD Service Value Chain**
- Design:
  - Define requirements
  - Define ODD
  - Design vehicle / system

- Development / Integration:
  - Procure ADK
  - Procure vehicle / components
  - Assemble vehicle / Integration
  - Test / Evaluation

- Adaptation:
  - Assess ODD and required service level
  - Risk Assessment
  - Map Creation
  - Site adaptation and tuning vehicle based on actual environment

- Operation:
  - Operation and management of vehicles
  - Trouble shooting at site
  - Training for operators

- Maintenance:
  - Preventive maintenance (periodic inspection)
  - Corrective maintenance (repair, bug fix)
  - System upgrade / OTA
  - Security

**Tier IV Services**
- Pilot.Auto
  - Reference ADKit for Autoware
    - (Customization, Integration, Maintenance & Upgrade)

- Web.Auto
  - Web Toolchain for Autoware
    - (Account Service, Cloud Service)

- Other Services
  - Education and R&D for Autoware
    - (Academy Service, FOT Service etc.)
Web.Auto

- **Fleet Management System**: Manage the dispatch of autonomous vehicles
- **OTA Update**: Update AD system to the latest version
- **Vector Map Builder**: High-precision 3D map builder
- **Scenario Editor**: Edit driving scenarios
- **CI/CD Dashboard**: Manage all test results
- **Autoware Drive**: Real-time remote monitoring of vehicles