



DENSO Corporation

Software Strategy Briefing

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Agenda

1. External environment
2. DENSO's basic strategy for software
3. Integration capabilities : Leveraging Comprehensive Automotive Expertise to Apply to Product Development
4. Human resources capabilities : Strengthening the Global Development Structure
5. Deployment capabilities : Contribution to the Industry Through Software Talent Development Programs and the Standardization of Technology
6. Wrap-up

1

External environment

Environment surrounding vehicles

Traffic accidents and congestion

- Social significance of improving the safety of vehicles

Problems in logistics

- Social significance of improving the transport capacity of vehicles

Declining means of transportation in local areas

- Contribution to public transport in local areas

Environmental problems

- Energy management to improve fuel efficiency and electric mileage

Diverse needs

- Product appeal to quickly meet needs while taking advantage of individual diversity

Traceability and use of data

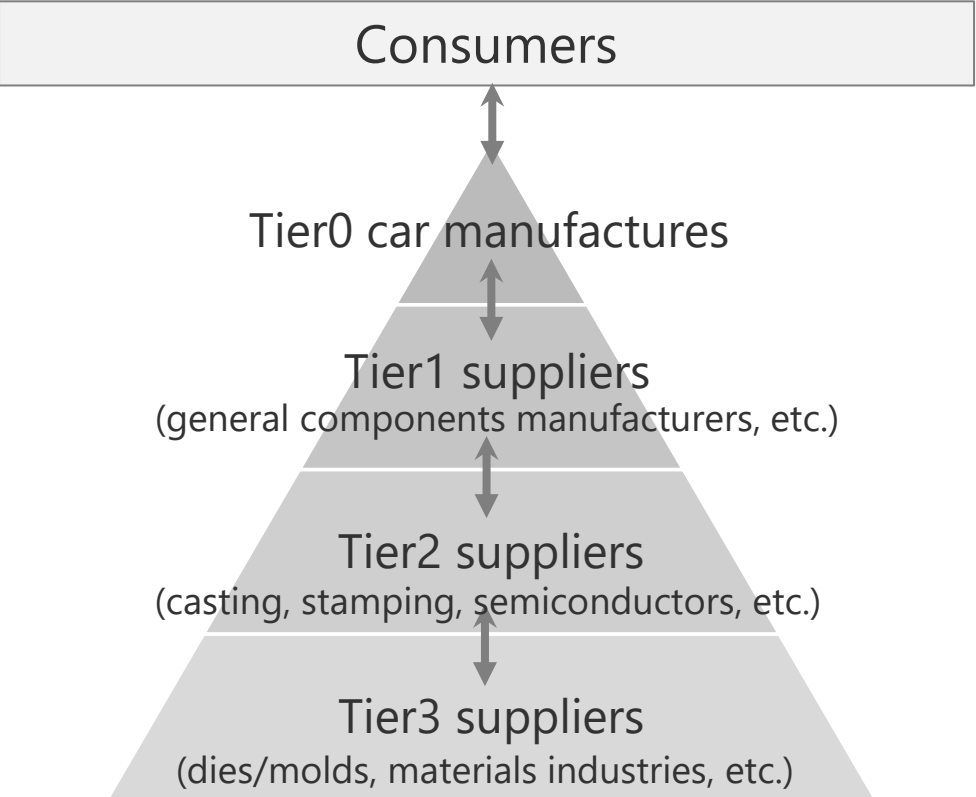
- Safety and carbon neutrality throughout the lifecycle

*SDV (Software Defined Vehicle): A car that is controlled by software and can expand functions and improve performance even after it is sold.

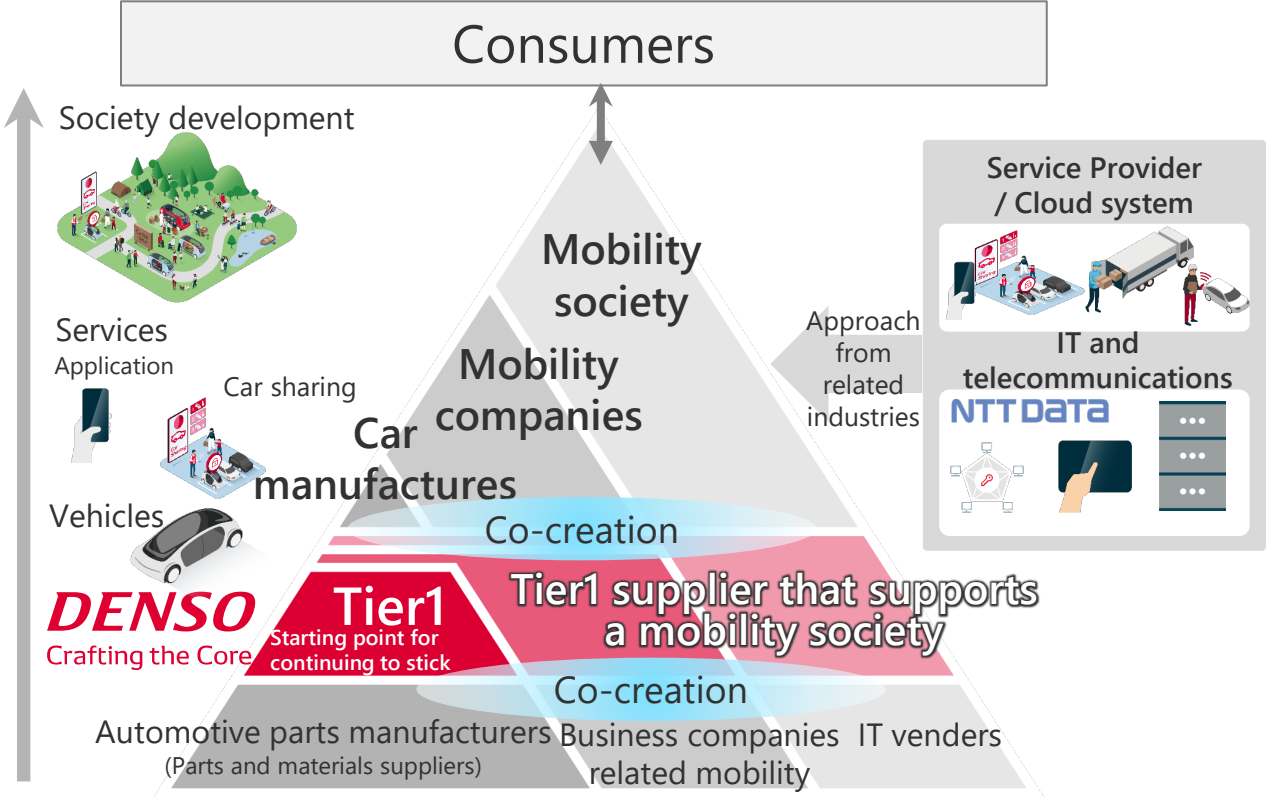
Evolution of mobility (DX) by SDVs* is required to solve social issues.

Changes in partnership

To date



Future



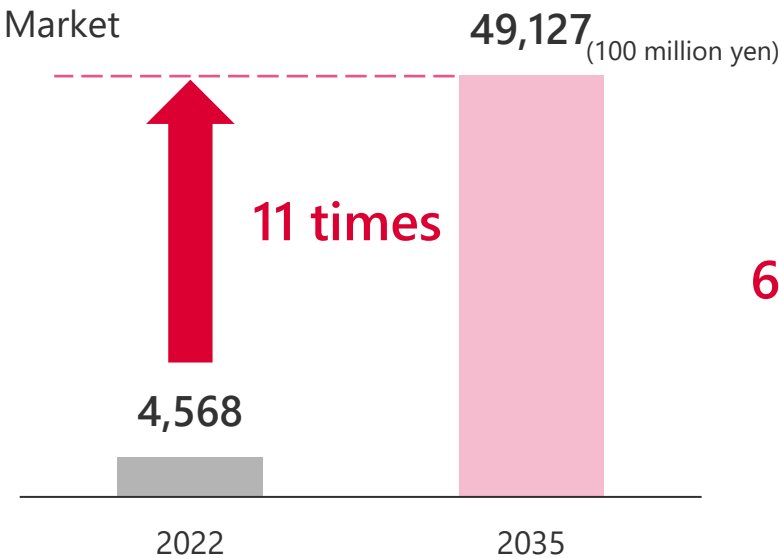
Diverse co-creation through software creates new value beyond the framework of vehicles.

Changes in the business structure due to the shift to SDVs

Global market for integrated ECUs*

The global market for integrated ECUs is estimated to increase 11 times by 2035.

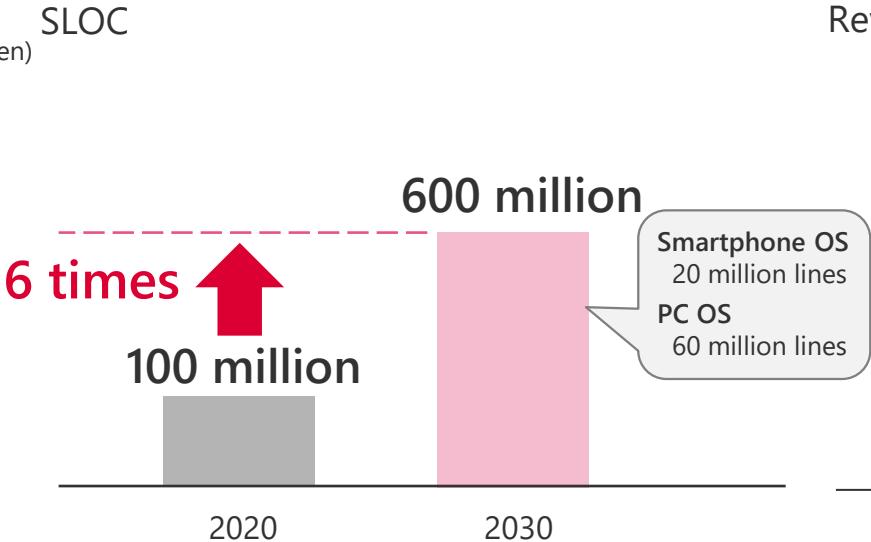
*Integrated ECUs that exist in each functional domain, such as ADAS and power training. It processes and judges vehicle data in an integrated manner, and issues instructions to a large number of connected devices.



Source: Fuji Chimera Research Institute, Inc., "Comprehensive Study on automotive electrical devices & components 2023 (Volume II: ECU-related devices)"

Changes in source lines of code (SLOC)

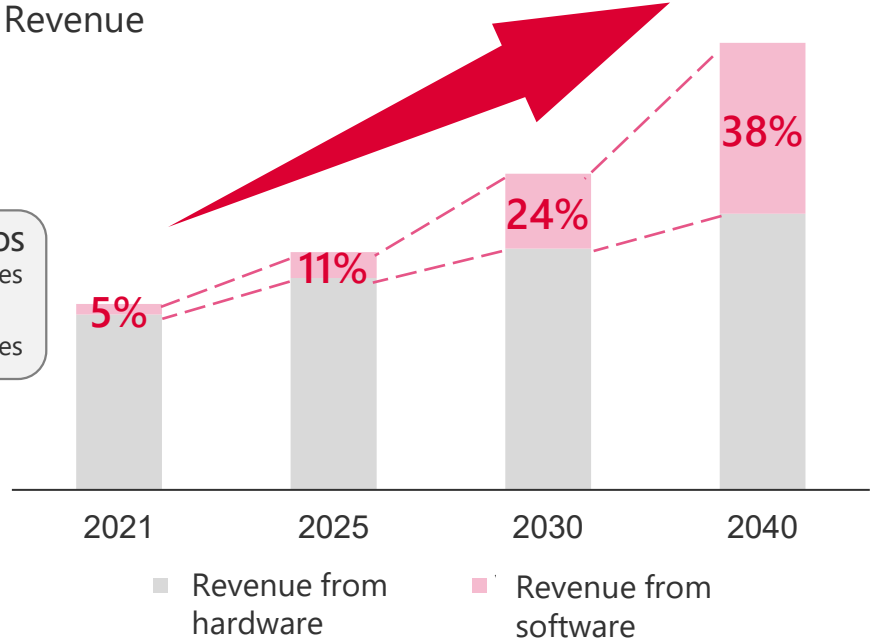
The SLOC for realizing composite functions of an entire vehicle by software is estimated to more than 6 times by 2030.



Source: The Ministry of Economy

Projection of car manufacture's revenue from hardware and software

Car manufacture's revenue from software is estimated to increase from 5% to 38% of the total revenue of the automotive industry by 2040.



Source: Graph created by DENSO using data from the Ministry of Economy

The value of software will expand due to the shift to SDVs.

2

DENSO's basic strategy for software

The future that DENSO aims to achieve

Contributing to people's happiness by expanding technologies cultivated in mobility to a wide range of industries and society

Software supports safe transportation

Operation control

Advanced safety and autonomous driving

City watch

Automated valet parking

Passenger sensing

Car sharing

Software spreads contribution to the environment

Heat and energy management

Multimodal

Hydrogen utilization

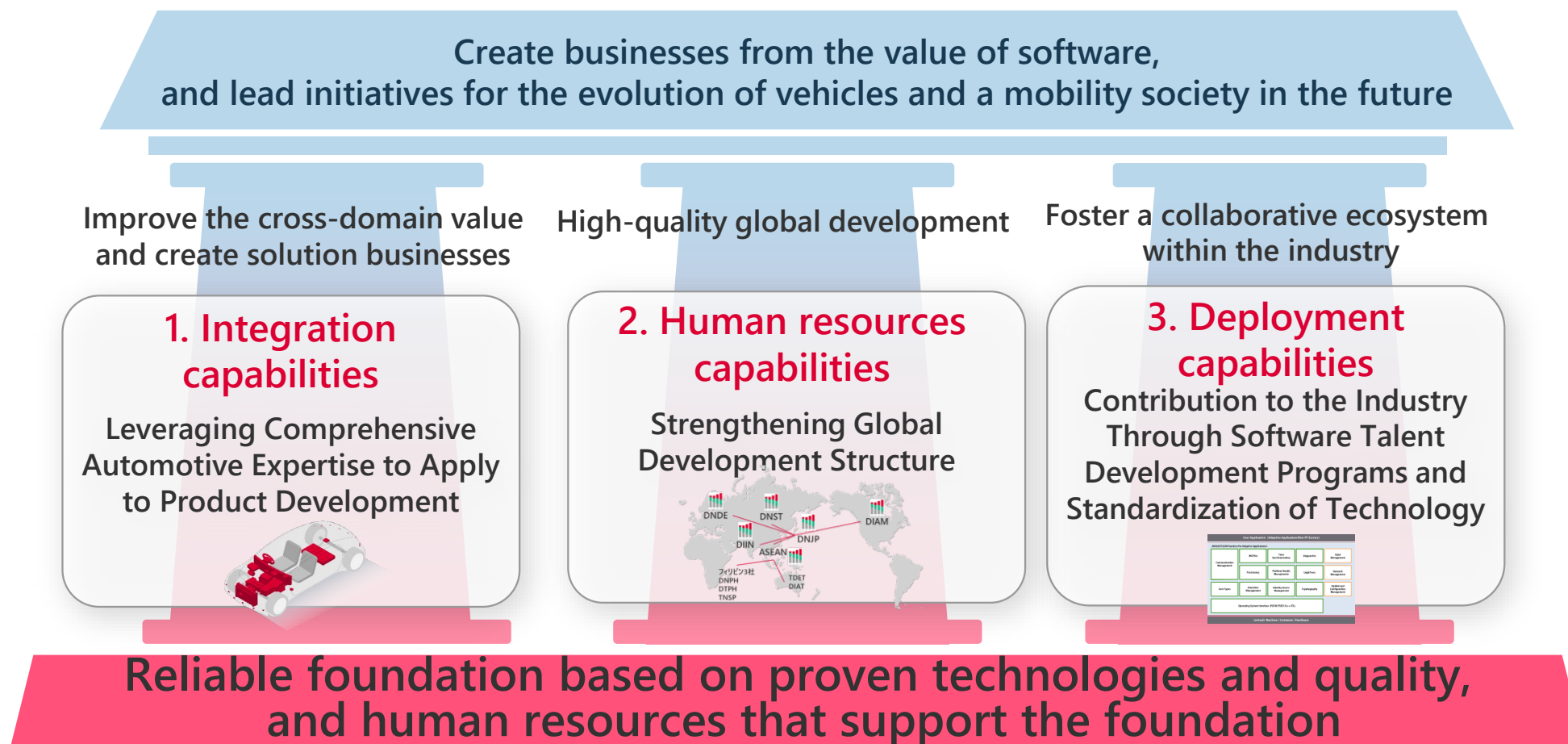
Logistics

Agriculture



Contributing to the safety and environment of the entire mobility society through the expertise of an integrated system manufacturer.

DENSO's basic strategy for software



**DENSO will acquire a new competitive advantage based on software.
DENSO aims to increase the number of software engineers to 18,000 by 2030^{*1}
and achieve an 800 billion yen business scale* by 2035.^{*2}**

*including software with ECU

3

Integration capabilities

Leveraging Comprehensive Automotive Expertise to Apply to Product Development

1. Integration capabilities

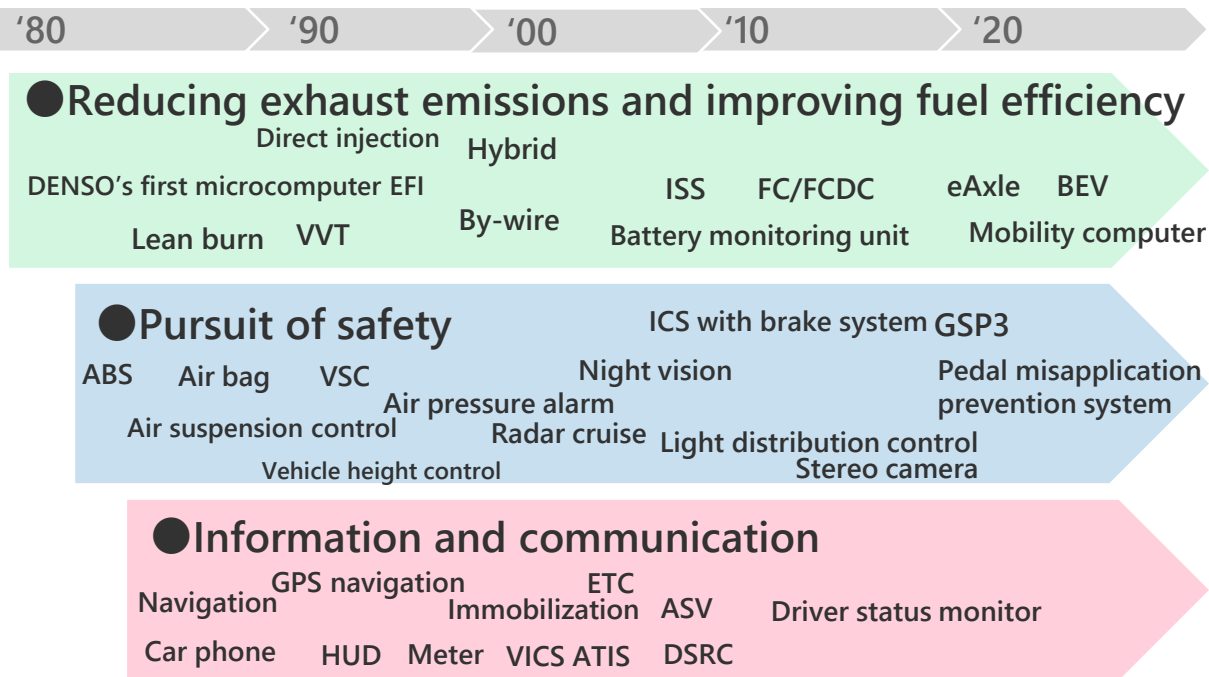
Using software know-how for an entire vehicle and finishing it into a product

History of DENSO's in-vehicle software and various types of software

1. Integration capabilities

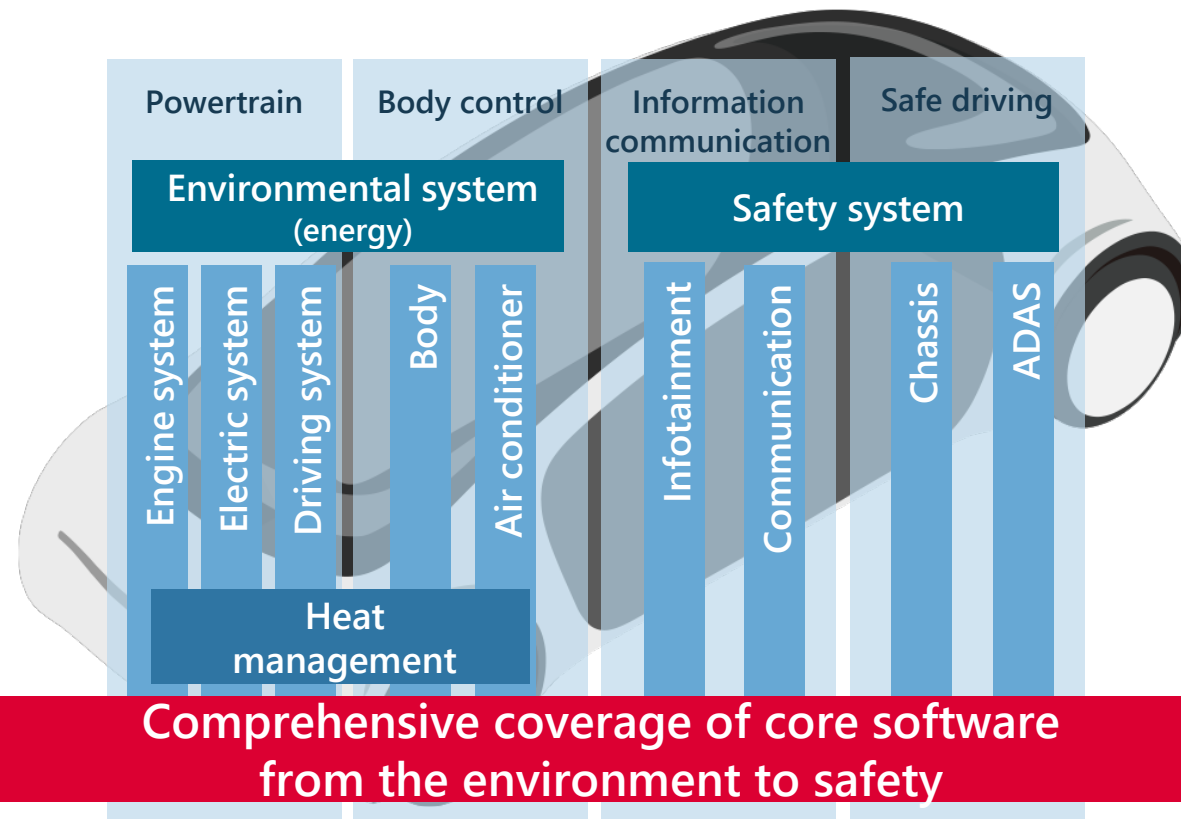
Using software know-how for an entire vehicle and finishing it into a product

History of in-vehicle software



Over 40-years of experience in in-vehicle software

Proven experience at all car manufacturers
An extensive library of in-vehicle software



Comprehensive coverage of core software from the environment to safety

Proven development experience and deep know-how of important software in all areas of in-vehicle that are not available in competitors.

DENSO's competitive advantage in integrated ECU

1. Integration capabilities
Using software know-how for an entire vehicle and finishing it into a product

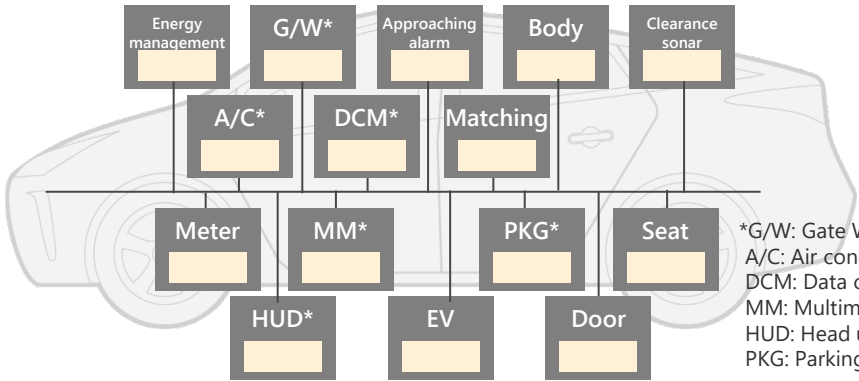
To date

In-Car single domain

Up to 10%

Software cost as a percentage of the vehicle

Hardware
Software



Shift to integrated ECU

Future

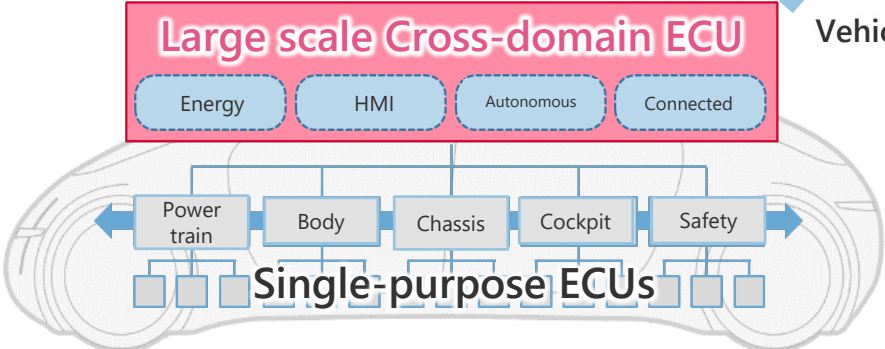
In/Out-Car cross domain (mobility society)

50% or more

Update



Vehicle data



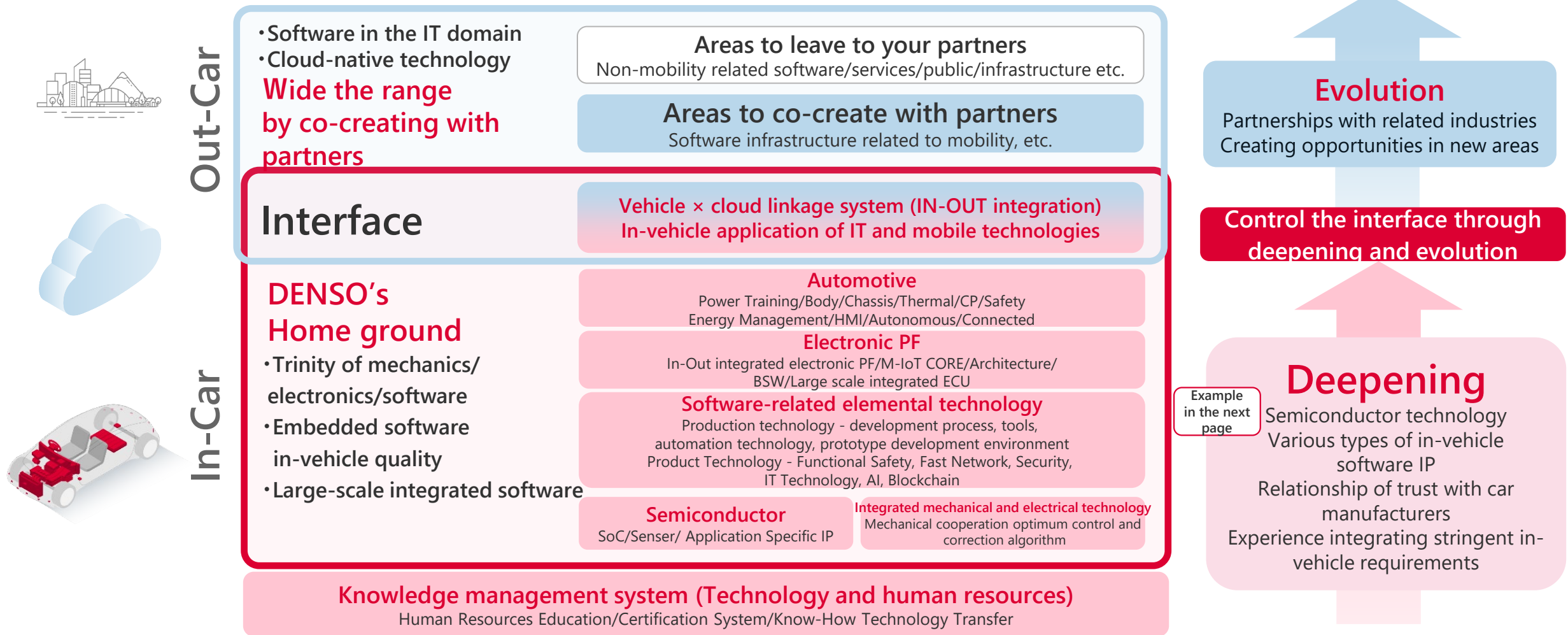
*Software Architect : An engineer who designs the optimal structure of systems and ECU software as a whole that meets the required specifications.

Expectations of car manufacturers	Integration of requirements specifications for a single-purpose ECU		Ideas from the viewpoint of vehicle systems that realize user value
Essence of software	Optimal design as a single-purpose ECU		Optimal design of large-scale software spanning multiple ECUs Integration design that balances quality, cost, and performance => The key lies in nurturing software architects* who can perform overall system design and strengthening project management skills to oversee large-scale development.
Extent of the region	In-vehicle system integration		Software integration based on social systems

Strengths include understanding of needs, optimum software design, and ability to create realistic forms across car manufactures.

Key core competencies for integrated ECU software

1. Integration capabilities
Using software know-how for an entire vehicle and finishing it into a product

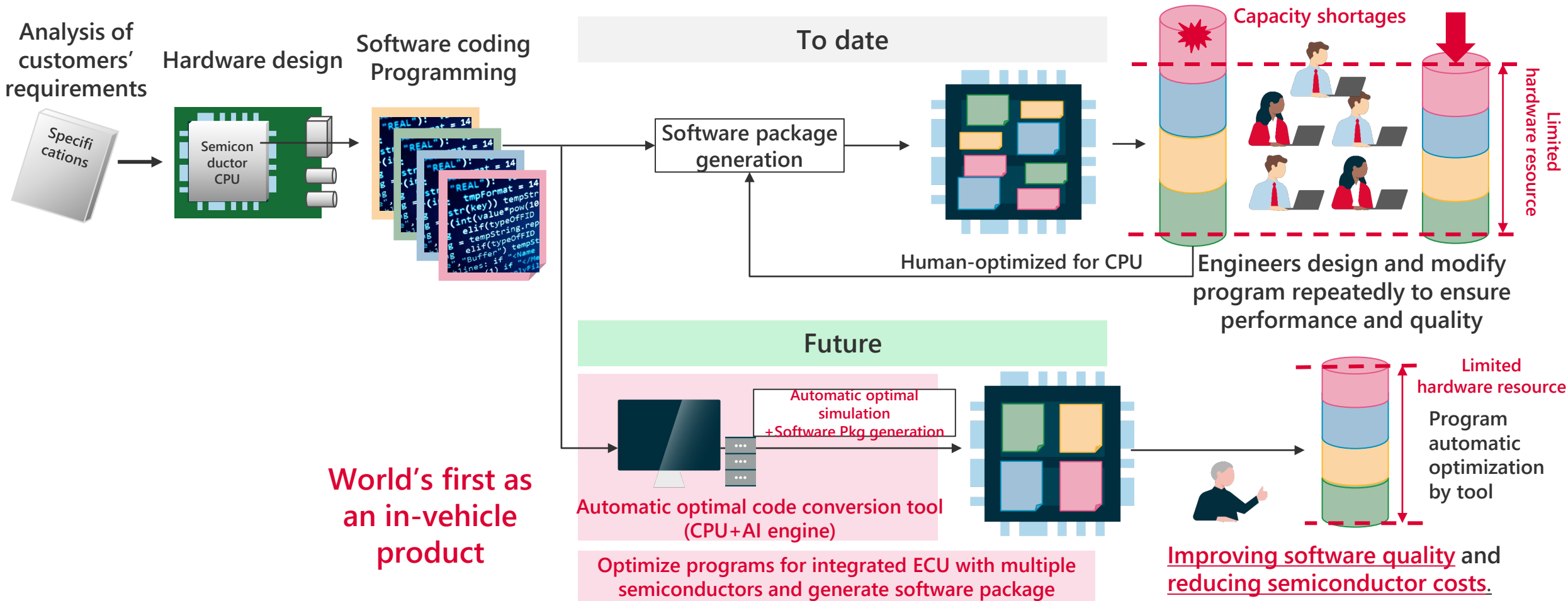


**Realizing the true needs of our customers
with our proven experience of in-vehicle and various software IP.**

Ex. Full use of semiconductors in the software strategy

Optimize and automate software integration within the hardware restrictions to meet the needs of various customers

1. Integration capabilities
Using software know-how for an entire vehicle and finishing it into a product



Accelerate optimization and automation of software integration through the full use of semiconductors and achieve the increased value of integrated ECU.

4

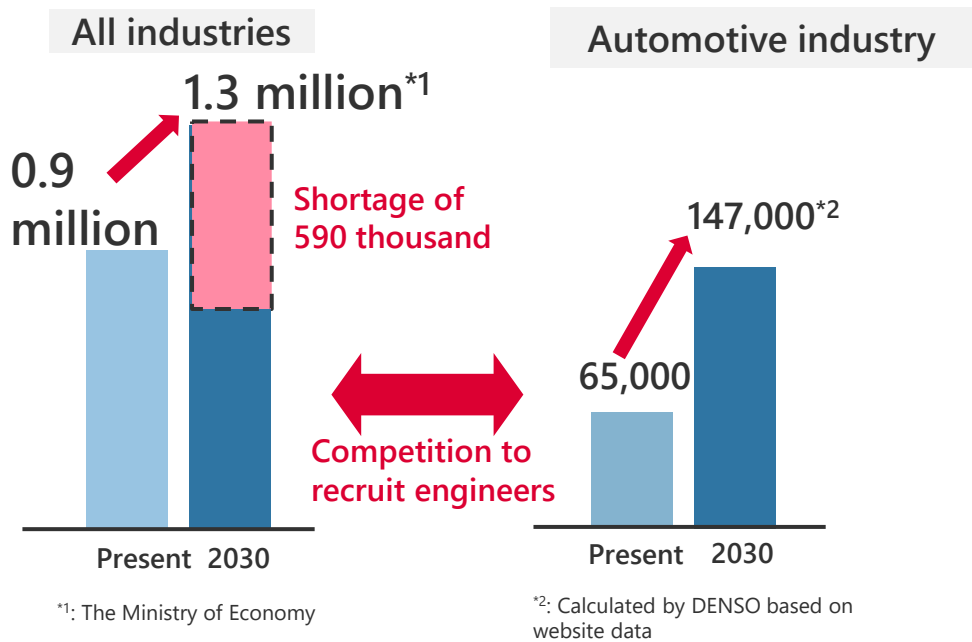
Human resources capabilities

Strengthening Global Development Structure

Trend of software engineers in the automotive industry

With vehicles rapidly becoming more intelligent, the industry faces difficulties in recruiting and cultivating software engineers.

Shortages of software engineers (in Japan)

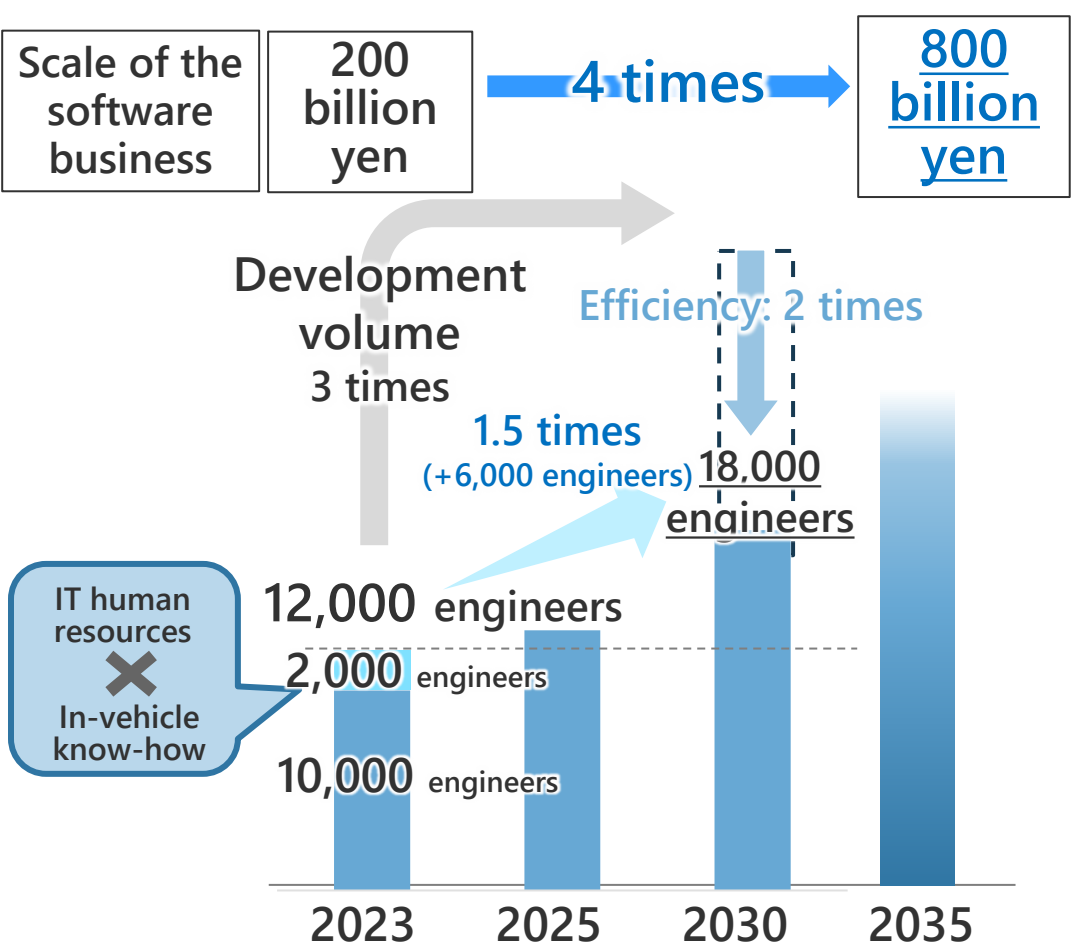


The competition to recruit software engineers has become more intense in the automotive industry.

TOYOTA	Participants in reskilling education expand to 9,000 by 2025 <small>Source: Toyota motor corporation integrated report 2022</small>
HONDA	R&D expenditure for software-defined mobility: Approximately 2 trillion yen <small>Source: Honda motor corporation 2024 business update</small>
NISSAN	Training at the Nissan Software Training Center for 100 people per year <small>Source: Nissan motor corporation web site</small>
BOSCH	Reskilling of approximately 400,000 employees, investing approximately 280 billion yen over the 10 years to 2026 <small>Source: Robert Bosch GmbH web site</small>

The quality and quantity of software engineers will determine the competitiveness in the SDV era.

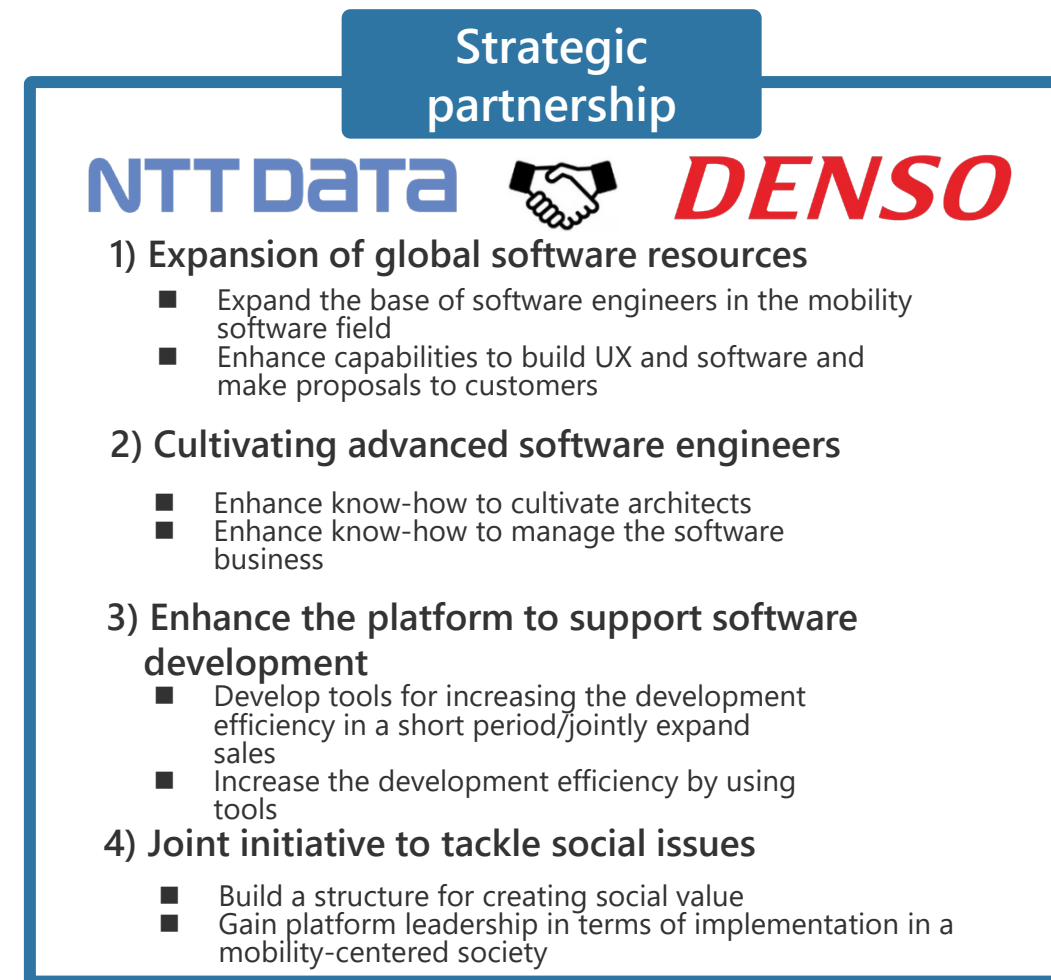
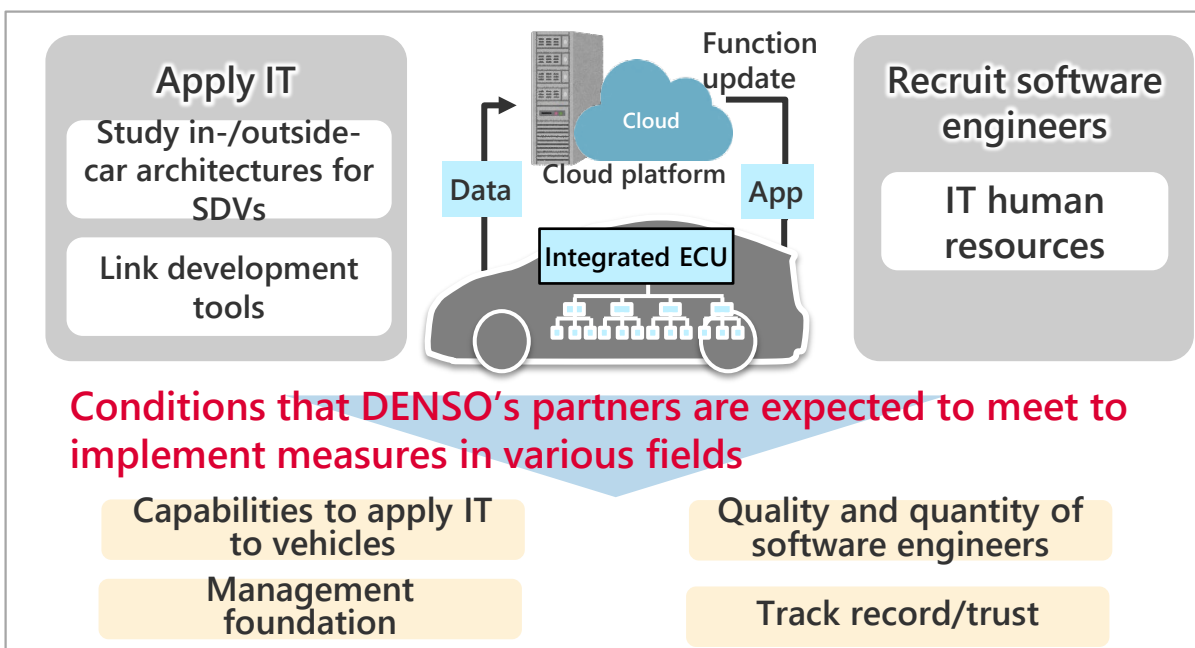
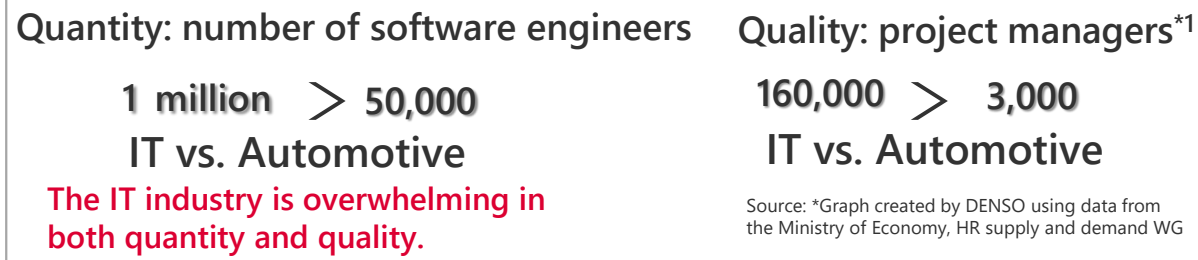
Initiatives to increase the development efficiency and strengthen human resources



Strengthening of human resources	<h3>Strengthening human resources for upstream processes/advanced development</h3> <ul style="list-style-type: none"> ✓ Project managers/software architects: Expansion of utilization of IT professionals ✓ Enhancement of global capabilities to develop software: Standardization of work processes ✓ Active M&A with software development companies: Enhancement of alliances with the IT industry (utilization of 2,000 IT engineers as of 2023) ✓ Enhancing DENSO's branding as a software company ✓ Career transition to software and professional talent certification system
	<h3>Reform to work processes</h3> <ul style="list-style-type: none"> ✓ Collaboration with car manufacturers: Seamless development from specifications to integration ✓ Improvement of development tools: Integration of in-house tools and generative AI ✓ Enhancement of utilization of expertise on semiconductors: Utilization of SoC/middleware
Efficiency improvement	

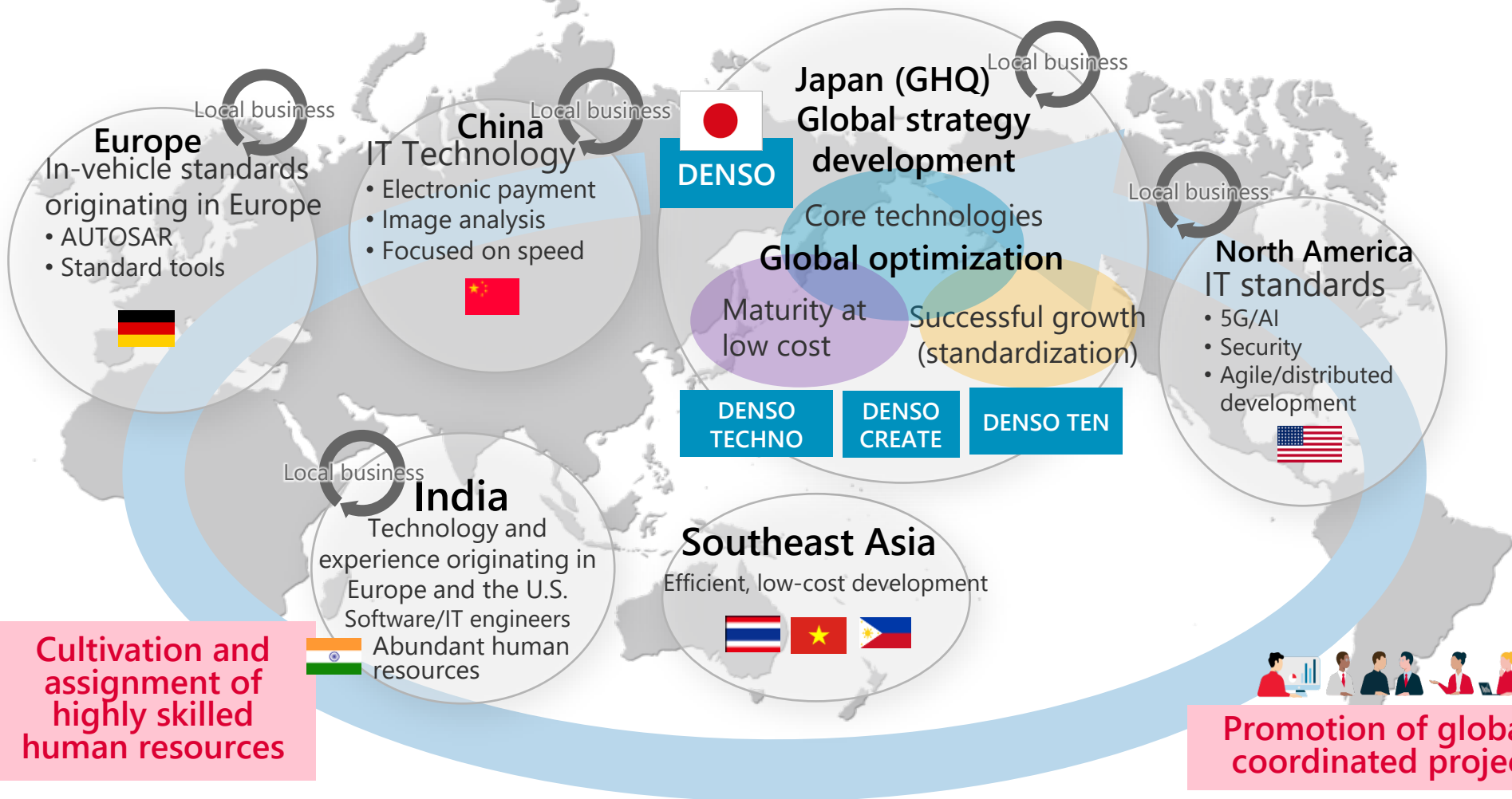
Enhance the quality of human resources and increase human resources by 1.5 times to expand the scale of the software business and build a strong software development system.

Enhance the cultivation of project managers and software architects



Strengthen human resources to cultivate software engineers globally through strategic partnership with NTT DATA.

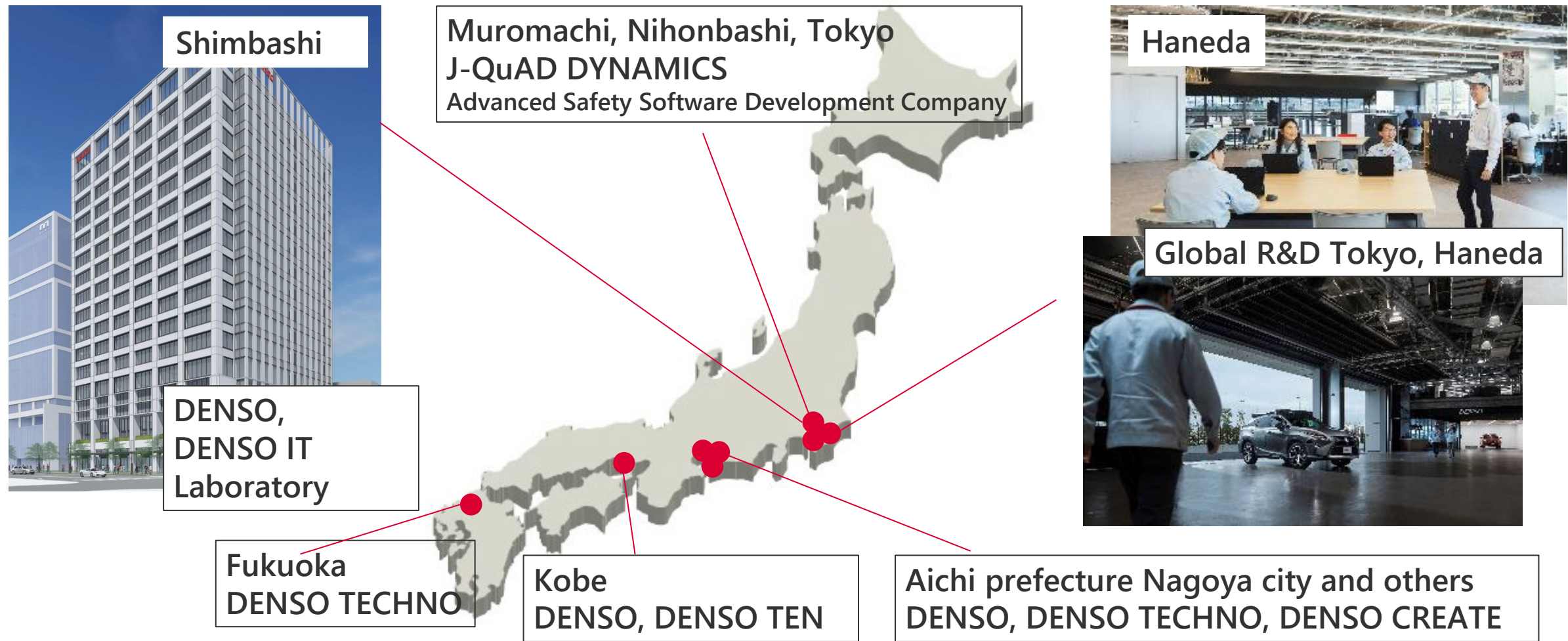
Strengthening global software development capabilities



- Strengths**
- Global development centers
 - Globally deploy the quality control platform refined in Japan
 - Establish the business for local customers under the leadership of local businesses
 - Promote inter-regional collaboration

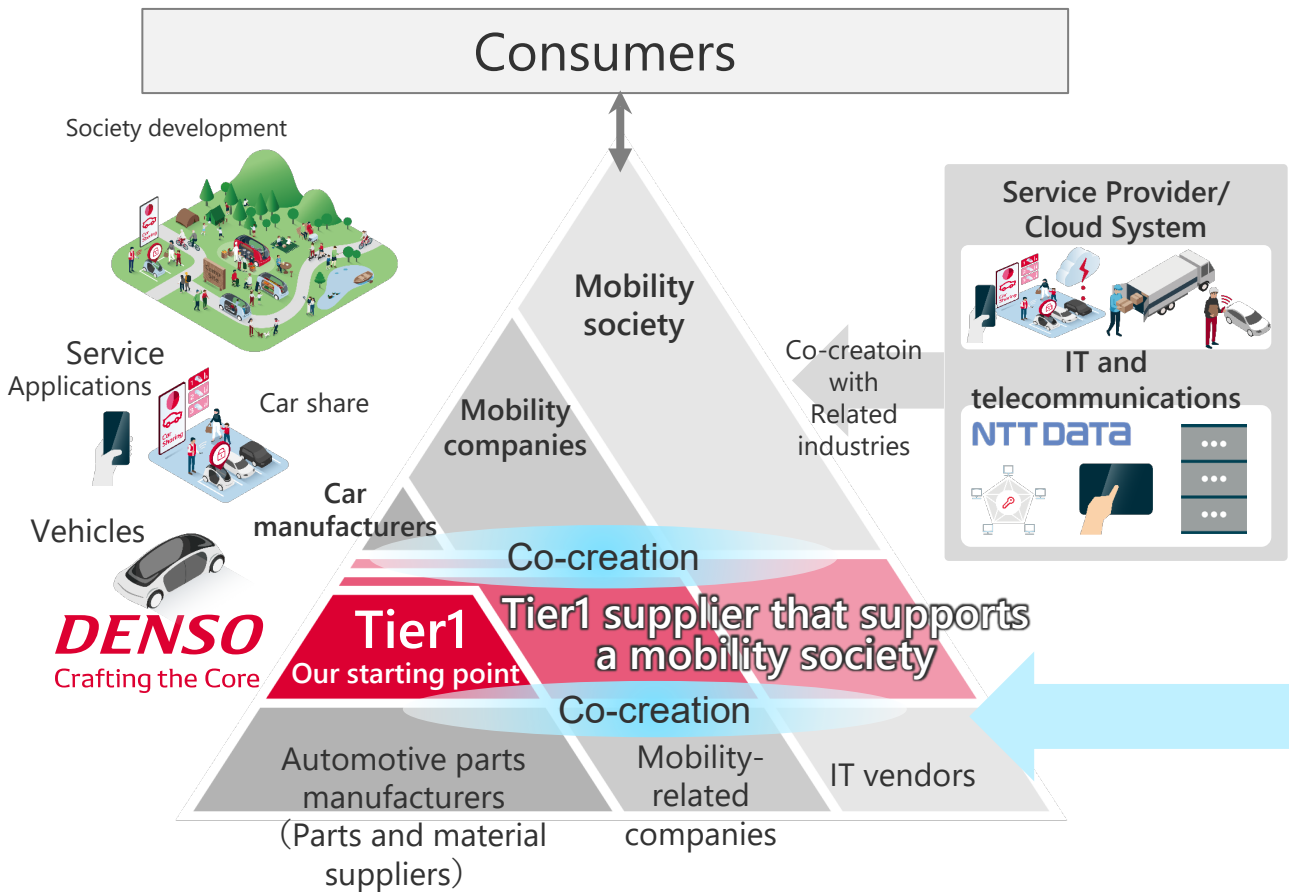
Shift from development under Japan's leadership to global development that takes advantage of regional characteristics.

Domestic software development bases



Aichi, Kobe, Fukuoka, Tokyo, Shimbashi, Haneda, etc.,
also promote research and development of in-vehicle software.

Partnership Strategies



DENSOGroup			
Other industries • DENSOGroup			
Other industries • Investment alliances			
Powertrain Body control	Safe driving	Information Communication	Common fundamental
DENSO TECHNO [JAPAN]	J-QuAD DYNAMICS [JAPAN]	NTT DATA MSE [JAPAN]	DENSO CREATE [JAPAN]
DENSO ELECTRONICS [JAPAN]	DENSO SHANGHAI SMART MOBILITY TECHNOLOGY [CHINA]	DENSO TEN [JAPAN]	PiNTeam Holding [GERMANY]
TOYOTA TSUSHO DENSO ELECTRONICS [THAILAND]	TOSHIBA INFORMATION SYSTEM [JAPAN]	DENSO KOTEI AUTOMOTIVE ELECTRONICS [CHINA]	NTT DATA [JAPAN] *Strategic Partnership
Elemental technology Development technology	DENSO IT Laboratory [JAPAN]	MIRISE Technologies [JAPAN]	NDIAS [JAPAN]

DENSO will provide a wide range of solutions leveraging DENSO Group's collective strength and partnerships with other industries.

Initiatives to increase the efficiency of software development

-Actively using AI-

Improvement of development tools

Process automation

(Optimize workforce efficiency)

- Digitalization of design information
- Automation of multiple process tool (all automatic testing)



Use of AI (Improve development quality)

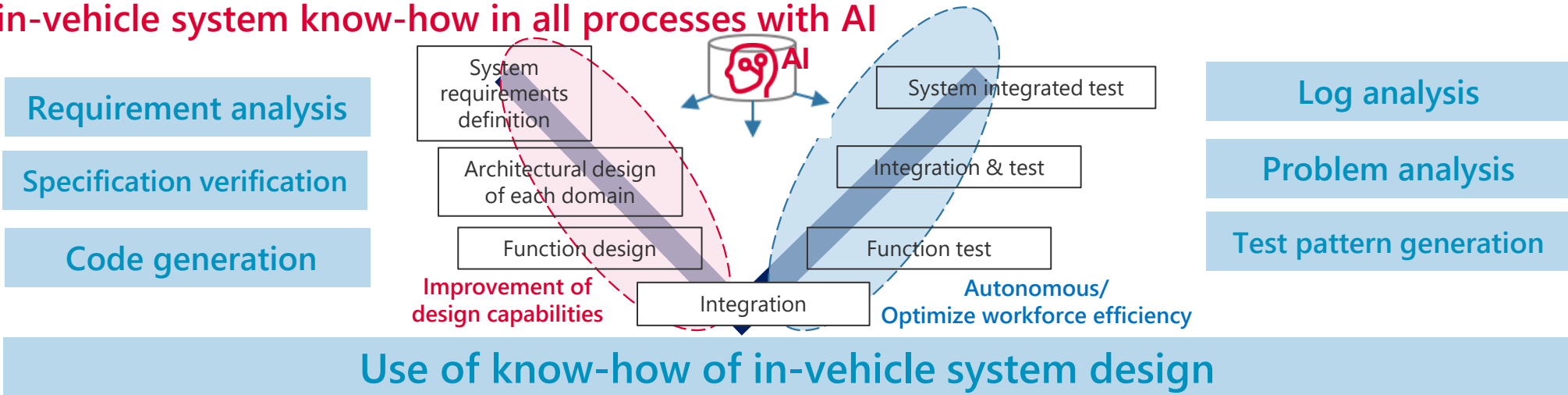
- Digitalization of design information
- Machine learning requirements analysis and verification of past project data
- Generative AI design/implementation

Converting know-how cultivated through In-vehicle system development to AI



Use of AI in software development (example)

Utilizing in-vehicle system know-how in all processes with AI



Accelerate development efficiency through optimal integration of leading-edge technologies inside and outside the company.

5

Deployment capabilities

Contribution to the Industry Through Software Talent Development Programs and Standardization of Technology

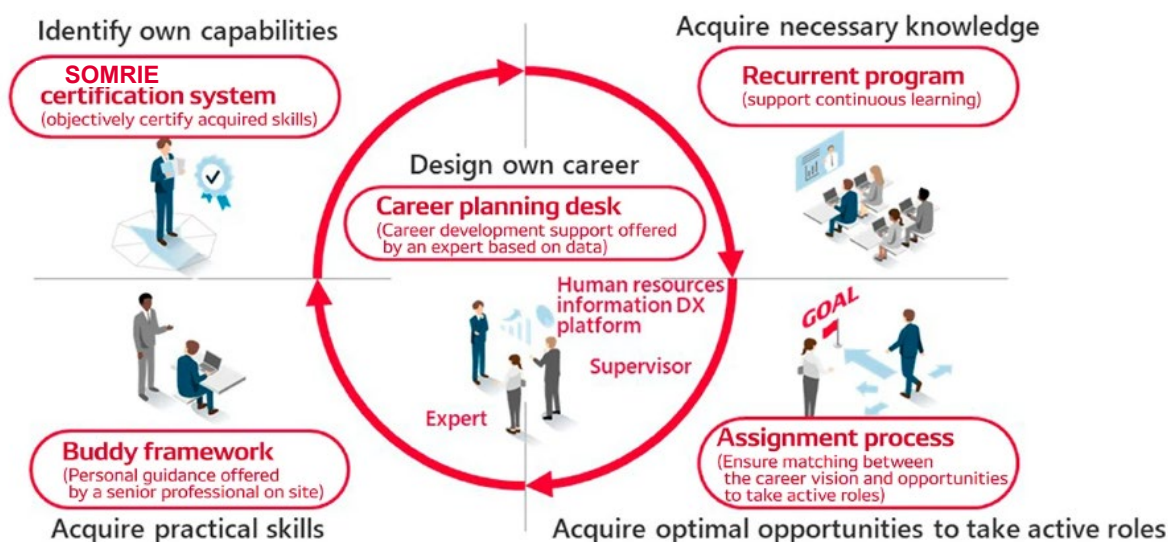
Software in the SDV Era: DENSO's contribution to the industry

3. Deployment capabilities
Contributing to the industry through software human resource development program and standardization of technology

As the volume of software development for cars increase with SDV, we are to build an industry-wide collaborative system through both talent and technology standpoint. So that Japan's mobility industry can thrive globally.

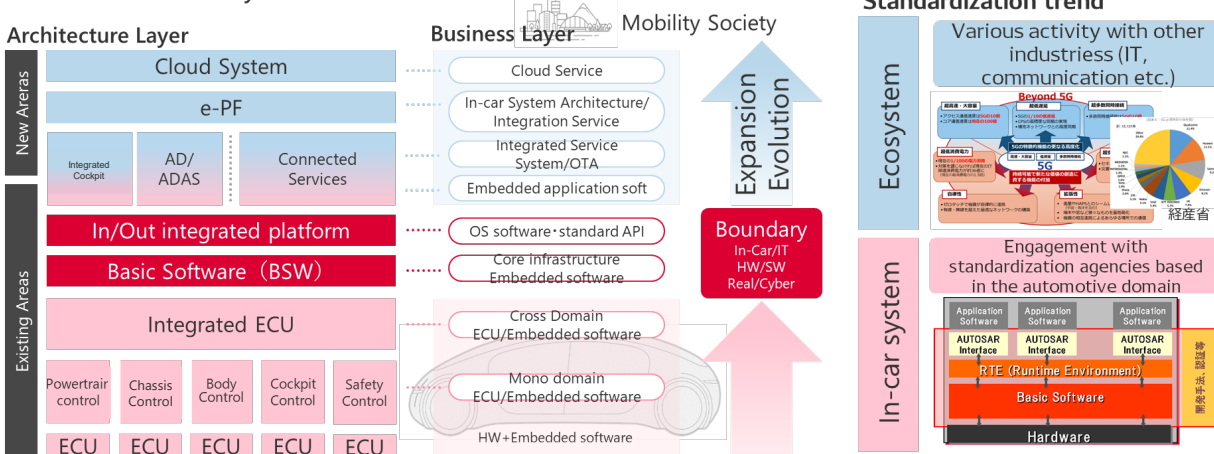
HR development

Career Innovation Program



Software Technology

Overview of the Mobility software business



Build an independent career path free from organizational boundaries.
Promoting DENSO's HR development program as the standard for the industry.

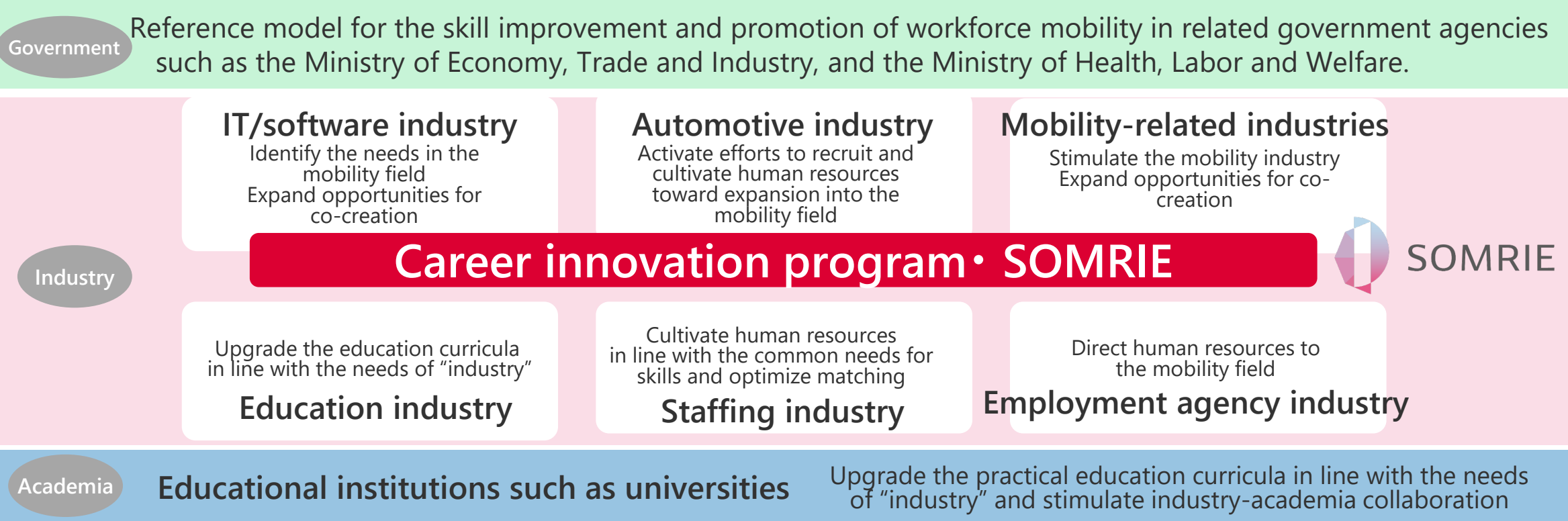
Establish an industry-wide collaborative mobility ecosystem by driving standardization and unification.

Making significant contributions to the mobility industry from both talent and software technology perspective.

Examples of initiatives toward standardization of human resource development

Expanding career innovation programs to external parties towards becoming the industry standard in the mobility sector.

Objective	Define and publicize the capabilities required of software engineers in the mobility industry, and their expected roles Promote and utilize as an industry standard to enhance the skills of engineers, facilitate their active participation, and create opportunities for career advancement.
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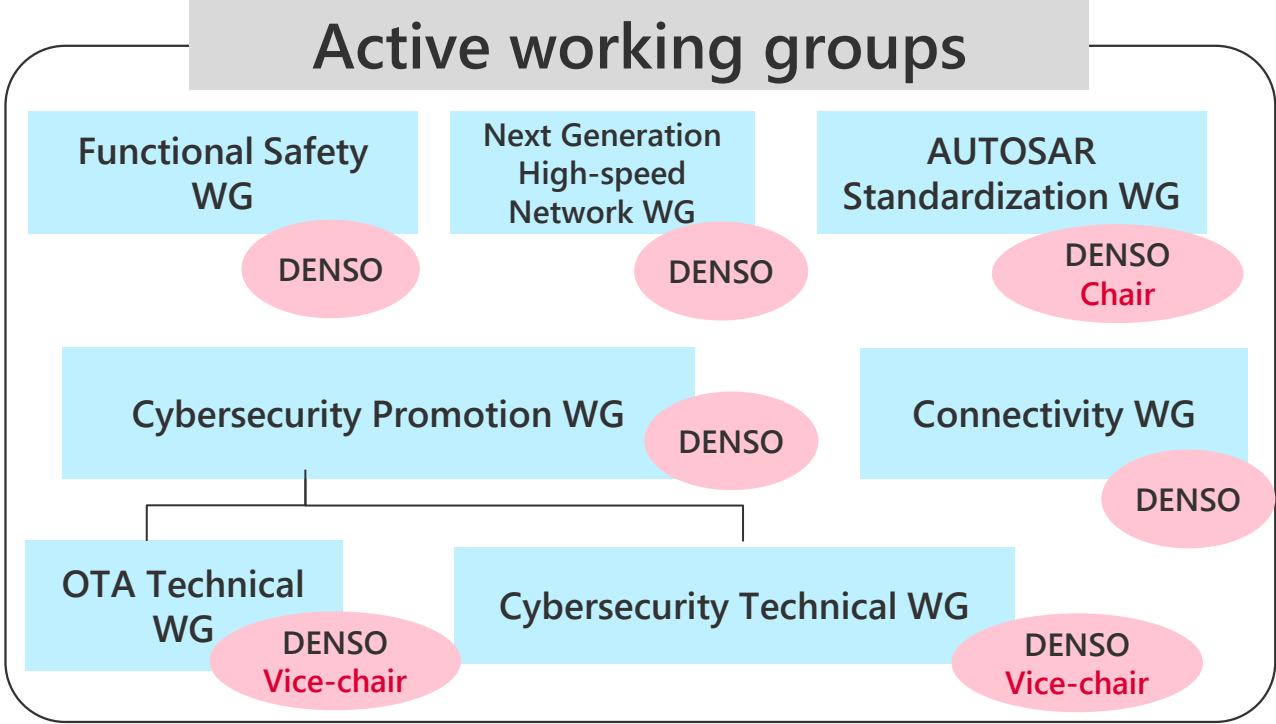
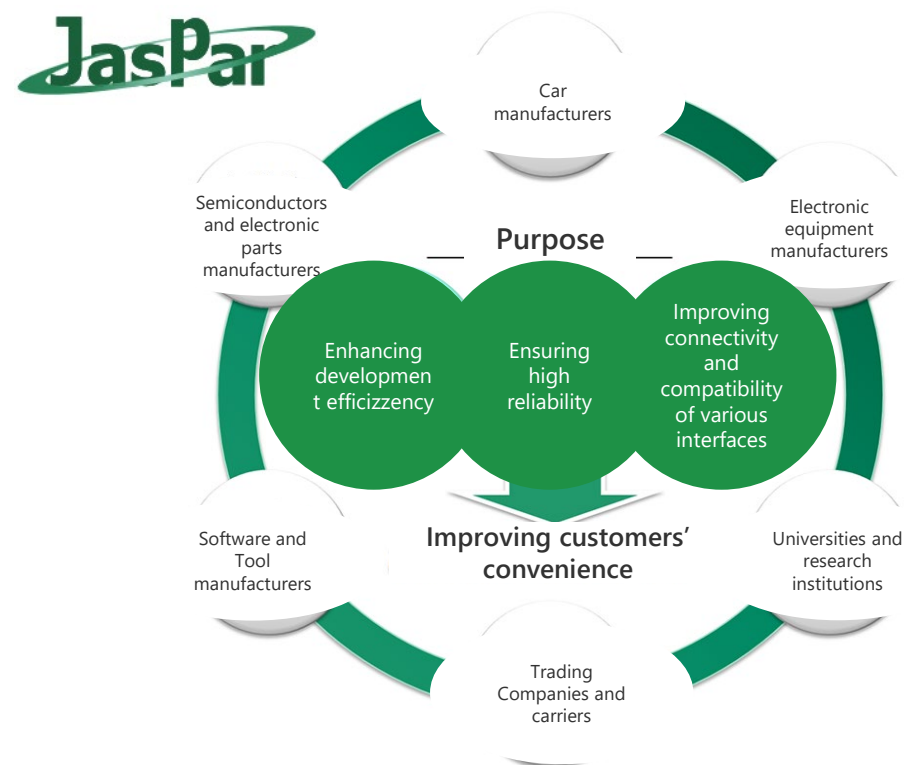


Standardize Standardizing DENSO's software talent development system to contribute to the establishment of an environment that attracts and nurtures mobility professionals.

Initiatives toward standardization of software

JASPAR (a general incorporated association) (Japan Automotive Software Platform and Architecture)

Established in September 2004, JASPAR aims to improve development efficiency and ensure high reliability through the standardization and common use of software and networks for in-vehicle electronic control systems.



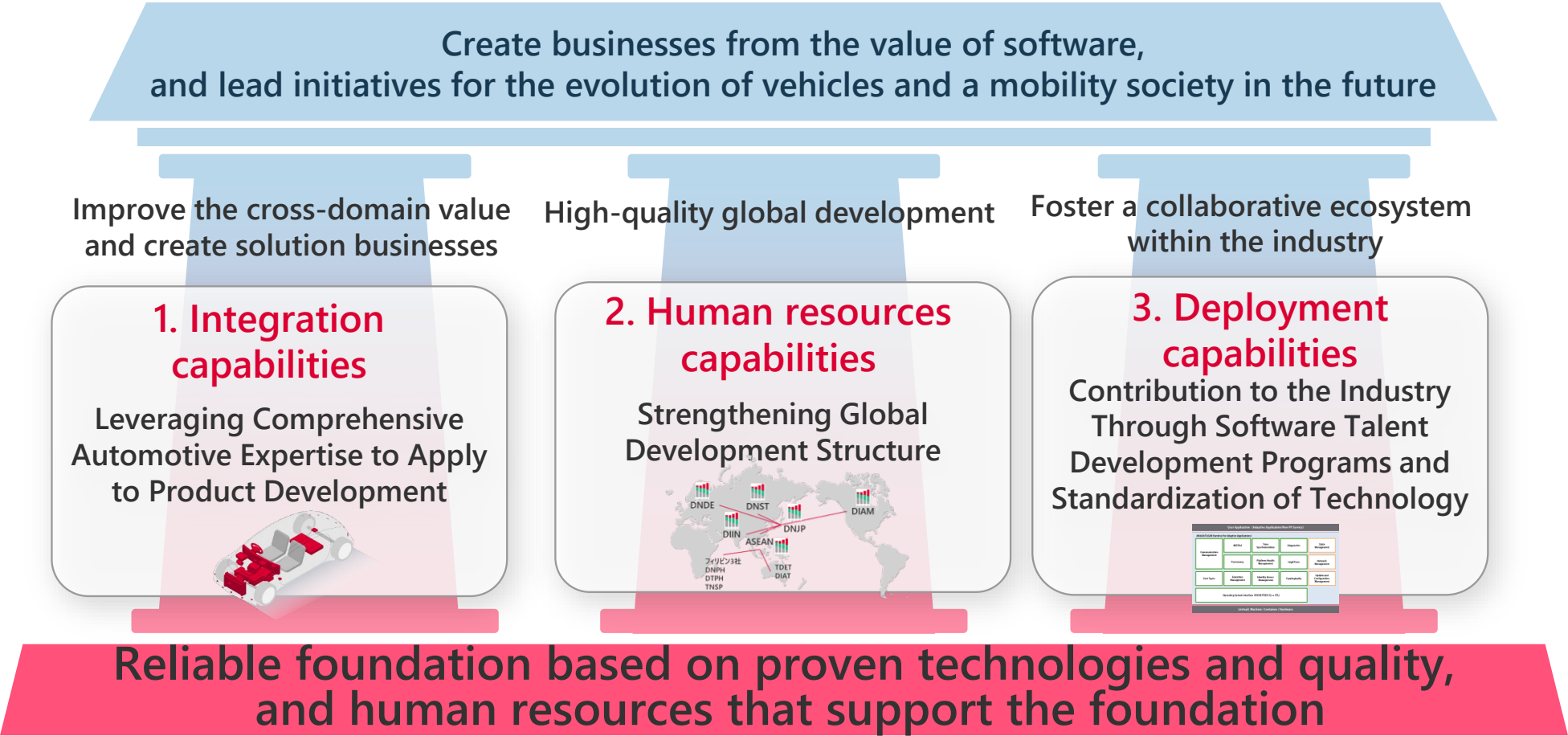
Source: reproduction of JasPar's website with information added

As the sole supplier participating in the executive committee of JASPAR, which consists of five companies, DENSO is actively promoting standardization with various industries and research institutions.

6

Wrap-up

DENSO's basic strategy for software [Repeat]



**DENSO will acquire a new competitive advantage based on software.
DENSO aims to increase the number of software engineers to 18,000 by 2030^{*1}
and achieve an 800 billion yen business scale* by 2035.^{*2}**

*including software with ECU

*"Without DENSO's software,
we will not be able to create the future of the mobility society."
Aiming for such an existence,
We, DENSO will enhance our software development
and value delivery capabilities in a wide range of fields
as an integrated system manufacturer,
contributing to the environment and achieving peace of mind of the entire
mobility society.*

DENSO

Crafting the Core