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Supplementary Documentation
to the financial report for the first quarter
of the fiscal year ending March 2023
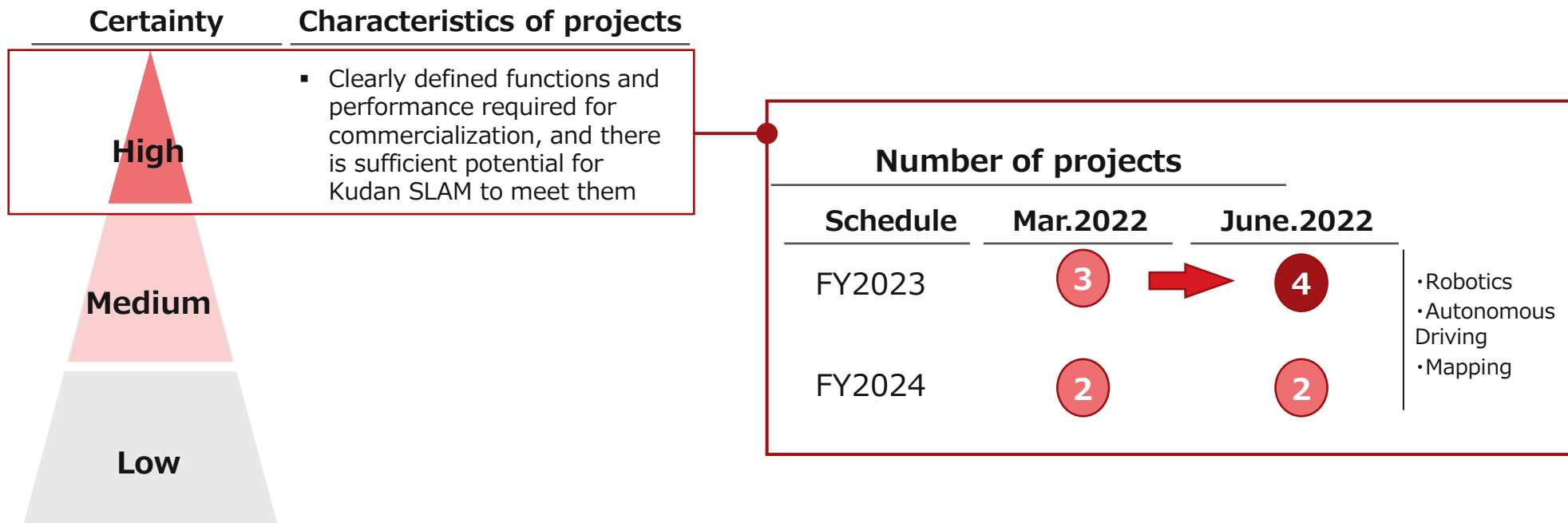
August 15, 2022

Eyes to the all machines

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Beginning of customers' commercialization, and acceleration of the shift from the "preparation phase" to the "harvest phase"

- In July 2022, Whale Dynamic, an autonomous driving technology company in China, has released commercialized products integrated Kudan 3D-Lidar SLAM (KdLidar), along with purchase order of the project in Tier1 city in China

- Due to growing market needs and the maturity of our technology, we expect to increase the number of customers' commercialization projects in the near future and to commercialize 4 projects in FY2023, up from our initial estimate pf 3 projects. Strengthening our financial base through financing, we will further accelerate and expand customers' commercialization and develop our solutions business.

Accumulation of projects toward customers' commercialization

Certainty	Characteristics of projects
High	▪ Clearly defined functions and performance required for commercialization, and there is sufficient potential for Kudan SLAM to meet them
Medium	
Low	

Number of projects

Schedule	Mar.2022	June.2022	
FY2023	3	➡ 4	・Robotics ・Autonomous Driving ・Mapping
FY2024	2	2	

Highlights / Business Development (2/6)

Examples of projects that have made particular progress

		Company	Algorithm	Progress	Timing
Autonomous driving/ ADAS	🇪🇺	TOP5 automotive OEM	3D-Lidar	Implemented Kudan Lidar SLAM on the cloud to create and provide large scale maps using the cloud. Development for large-scale application is ongoing	Mid-term
	🇪🇺	Major automotive Tier1	Visual	For in-vehicle use. Verification is in progress for commercial implementation in parking assist systems, etc.	
Drone	🇯🇵	Major manufacturer	Visual	Completed availability evaluation using Kudan Visual SLAM and shift to the development and implementation phase for commercialization	
Robotics	🇺🇸	Major semiconductor	Visual	Testing of Kudan Visual SLAM to be optimized and accelerated for specific processors is in progress	Short-term
Mapping	🇯🇵	Construction solution provider	3D-Lidar	Currently testing performance under various environments for finalization	
	🇰🇷	Mapping solution provider	3D-Lidar	Completed most of the technology integration and concluded a commercial license contract	

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（Reference）About Whale Dynamic

Company Overview:

| Name	Whale Dynamic Co.Ltd.
Represen-tative	CEO and Founder David Yufei Chang
Office	Shenzhen, China
Established	2017
Business	Development and sales of autonomous driving and intelligent transportation products

Whale Dynamic is an autonomous driving technology company, founded by David Chang, former senior product manager of Baidu's Apollo autonomous driving platform. The company holds a number of basic technology patents related to driverless vehicle, and its technology is widely used by many transportation providers, tier1 companies, and universities in China.

Technology and Product Development

Whale Dynamic has traditionally developed core element technologies and full-stack integration in the area of automated driving for passenger vehicles, and has transplanted these technologies into multi-purpose autonomous vehicles designed from zero-base. By employing a good balance of in-house developed and partner technologies for hardware and software, Whale Dynamic could quickly bring high-quality finished, mass-producible, and cost-competitive products to the markets.

Domestic and international industry organizations have recognized the company for its technological capabilities and high level of product perfection. In 2021, Whale Dynamic received several awards, including the Baidu Apollo's Excellent Team Award and Technology Innovation Award at the World Intelligent Vehicle Conference.
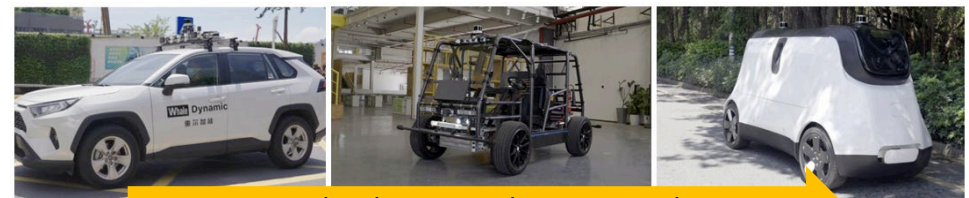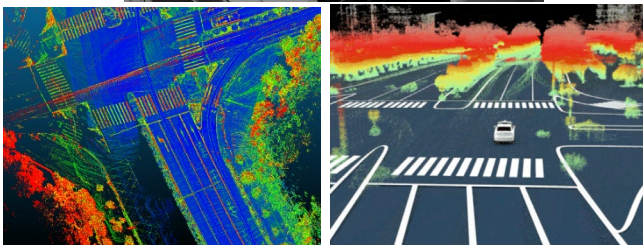

Technology Development Path

（Reference） About Whale Dynamic product release

- As the autonomous driving market continuously grows, Kudan and Whale Dynamic have been in technology collaboration since 2021, to respond to the rapidly increasing market needs for driverless delivery and other autonomous mobility-related services.

- In July 2022, the release of commercilized products integrated Kudan 3D-Lidar SLAM (KdLidar) is announced, along with purchase order of the project in Tier1 city in China. KdLidar integration enables highly accurate and robust mapping and positioning in dynamic changing environments.

- Two companies will further strengthen their technology collaboration, and partner in the sales of products to the global market and expand the sales in China.

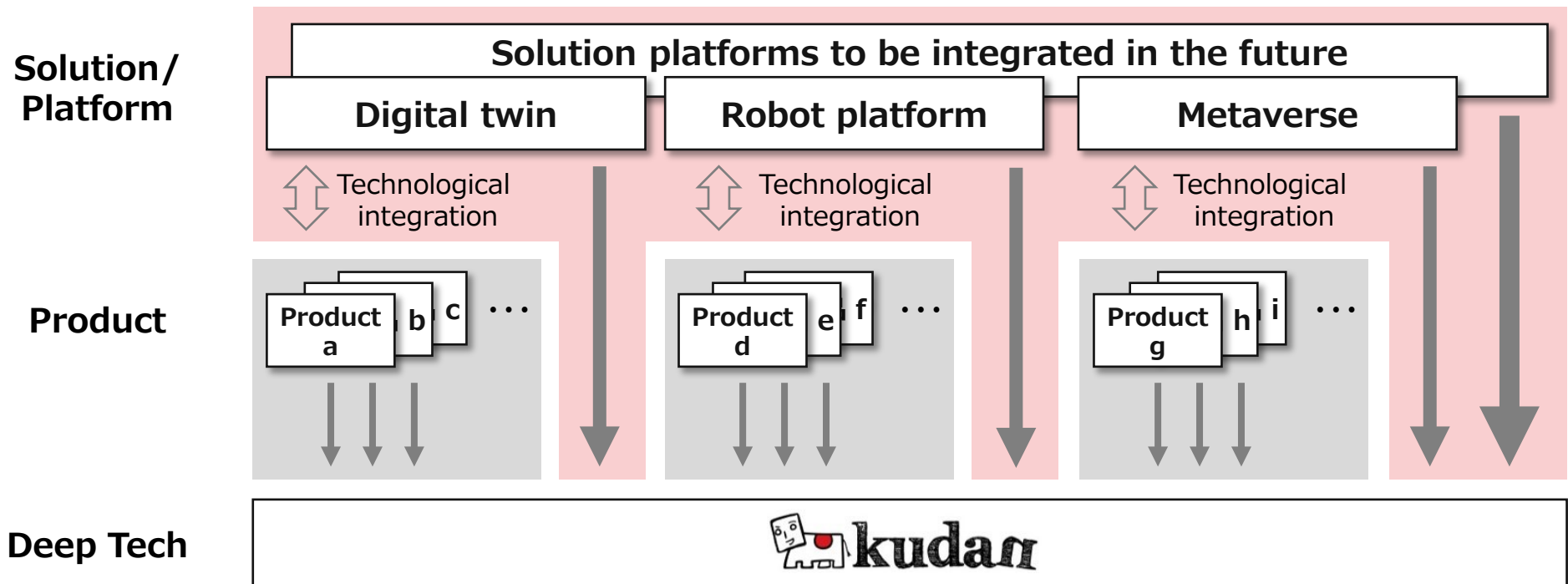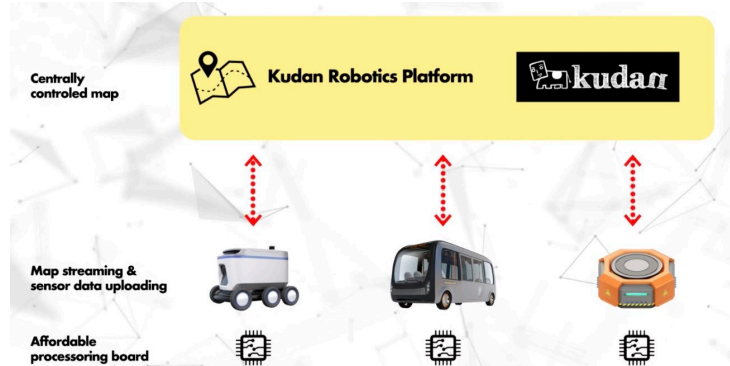| High-definition Mapping Kit	Multi-Purpose Autonomous Vehicle - WD1	Drivable Test Vehicle
• Consists of the mapping hardware kit and software toolchain for HD mapping. • Hardware can be easily installed in passenger cars as a mobile mapping system, enabling high quality data collection. • Software toolchain generates high-density point clouds and semantic HD maps with centimeter-level accuracy.	• As driverless delivery vehicle, it can operate autonomously as the electric vehicle on public roads in urban areas and perform various daily tasks. • Designed and developed from scratch, from hardware (including chassis) to software modules, the sophisticated design, detailed operational scenario design, and extensive on-road testing enables a wide range of use cases.	• Supports autonomous driving and manual driving in parallel, and is developed with good customization flexibility. • Fits for validation of autonomous driving technology by developers and researchers of autonomous service enterprises or academic institutions, and makes it possible to quickly conduct practical tests in reasonable cost levels.

Solution business launch

- Support the realization of solution platforms that allow multiple products to synchronize or expand their applications centered on Kudan technology

- Aim to improve profitability by taking customers' commercialization as a foothold for the solution business and by generating synergies from the solution business that will support the expansion of customers' commercialization

- See next page for specific solution business concepts

Newly launched solutions business

Existing product embedded business

→ Revenue for development support and technology provision

	Solution platforms to be integrated in the future		
Solution/ Platform	**Digital twin**	**Robot platform**	**Metaverse**
	Technological integration	Technological integration	Technological integration
Product	Product a b c ...	Product d e f ...	Product g h i ...
Deep Tech	kudan		

Highlights / Business Development (4/6)

Solution examples

◆ **Robotics platform**

When a phase of introducing one robot on a trial basis is over and entering a phase of operating multiple types of robots on site, we are beginning to see the issue of <u>disorganized maps and management tools</u> for each type of robot
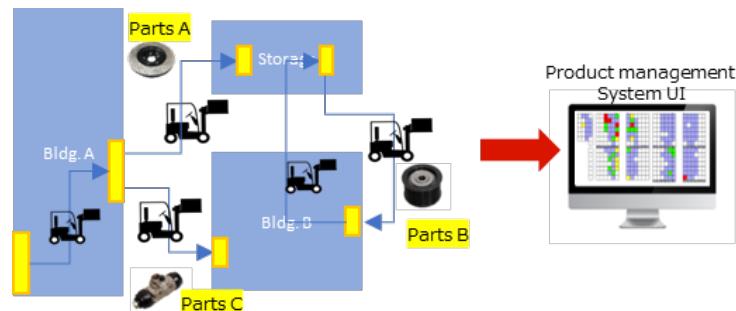
With Kudan's SLAM solution, we can develop **a unified platform that can centrally manage robots** from different companies

◆ **Mapping solutions**

3D maps are used for digital twin and simulation. On-site operations were sometimes difficult since <u>the equipment for acquiring maps has been extremely expensive</u> and <u>it has been necessary to call in specialized companies to acquire and update maps</u>.

Kudan's SLAM solution **enables inexpensive equipment to acquire highly accurate 3D maps**. Also, **the maps include feature points from which location information can be obtained** and can be developed into a number of robotic and Metaverse solutions.

SLAM with AI enable
real-time, integrated management of complex parts
inventory status across buildings

◆ **Location ✕ AI DX Solutions**

By combining location information from our SLAM with AI technology from partner companies, we can provide a completely new DX solution that has never been seen before.

For example, when parts are transported between buildings in a factory using forklifts in any direction, it has been difficult to manage in real time which parts and how many parts are in which storage area.
To solve this problem, we will develop a DX solution that can manage parts in real time without using markers, RFID, etc. by **using AI to recognize what parts have been picked up and SLAM to recognize where they have been transported to.**

Growing demand for SLAM application to the drone domain

- There is a growing need for industrial drones to improve operational efficiency and reduce labor shortages, and SLAM is expected to be applied in environments where GNSS cannot be used, such as infrastructure inspection, logistics, and mapping and surveying areas in particular

- Kudan Visual SLAM and Kudan 3D-Lidar SLAM are fast and lightweight in their processing, and their high accuracy and robustness make them favorable onboard requirements for autonomous flying drones with limited hardware resources. Currently, we are receiving continuous inquiries from drone manufacturers and service providers in Japan and overseas, and we are working with several of them for commercial implementation.

- In particular, with a major Japanese manufacturer, verification of various performance indicators, including safety, has been completed, and a feasibility study for commercial implementation has been confirmed, so that the development and implementation phase is progressing toward commercialization


Infrastructure inspection

Logistics

Mapping and surveying

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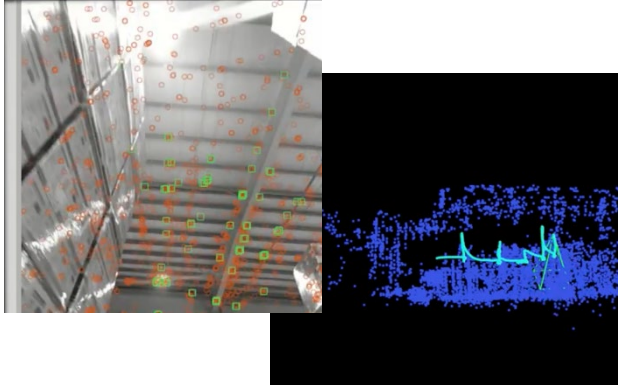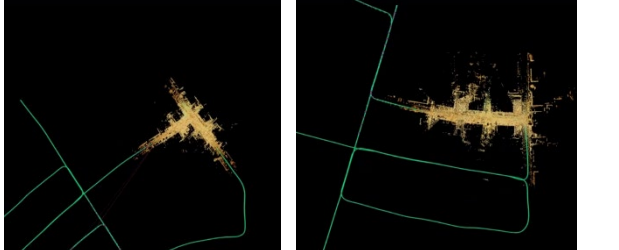
Expand participation in major overseas exhibitions

- Exhibit at the following exhibitions to introduce Kudan and Artisense's latest SLAM technologies, gather industry's information, and obtain project leads:
  - April 2022: AUVSI XPONENTIAL 2022 (Orlando, Florida, USA)
  - May 2022: AUTOMATICA 2022 (Munich, Bavaria, Germany)
  - June 2022: A3 Automate 2022 (Detroit, Michigan, USA)

- Through participation in these events, we were not only able to actively exchange opinions with industry professionals, but also obtained many business leads, including from major companies. Currently, we are in the process of following up with these companies to develop new projects, some of which have already begun verification using our SLAM

Highlights / R&D
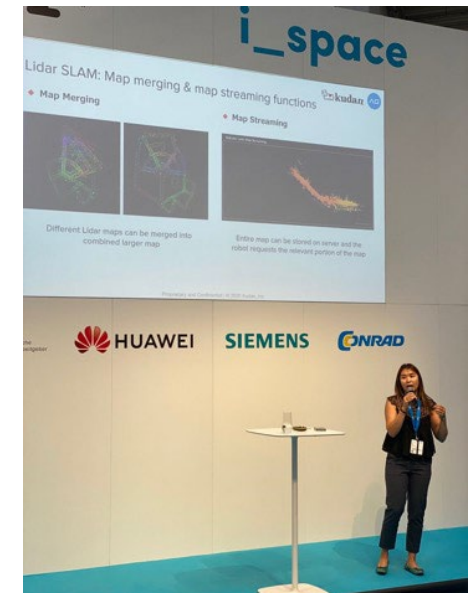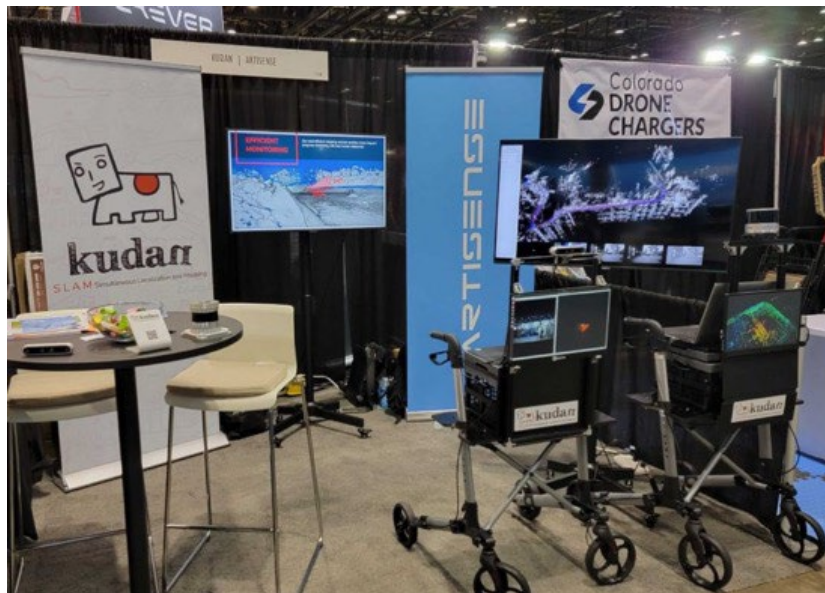
— R&D of Visual SLAM, which integrates Visual SLAM developed by Kudan with Artisense's Visual SLAM, is in progress. This integrated Visual SLAM will be used as our Visual SLAM in the future.

Algorithm	Development item	Examples of ongoing projects	
kudan ARTISENSE Visual SLAM	• Integration of Kudan Visual SLAM and Artisense Visual SLAM • Improved processing speed and load reduction for specific processors • Improved stability in environments with changing landscapes and obstacles	🔴 Major sensor OEM 🇺🇸 Major semiconductor Robotic 🇪🇺 Autonomous Robot OEM Robotics	Localization of forklift in warehouses with large environmental changes
kudan Lidar SLAM	• Cloud-based mapping and map streaming for large-scale deployment • Optimized for NVIDIA GPU to improve speed and reduce processing load	🇪🇺 Automotive OEM Autonomous driving 🔴 Mapping solution Mapping in non-GPS environment	Stream maps from the cloud on multiple devices simultaneously and perform localization on the devices

Highlights / Financing (1/2)

— Develop business strategy initiatives at the optimum timing in line with business progress centered on customers' commercialization

— Financing for the initiatives is arranged in stages, along with discipline to shareholder value (more on next page)

Tranche① : 530 million yen   **Tranche② : 530 million yen**   **Tranche③ : 530 million yen**

▲ Whale Dynamic commercialization   ▲ Second customer commercialization   ▲ Third customer commercialization

A — **Acceleration and expansion of customers' commercialization**

- Strengthen customer support and assistance for customers' commercialization
- Strengthen technological development to encourage product penetration for scaling commercialization projects

- Strengthen business development for global expansion of commercialization projects
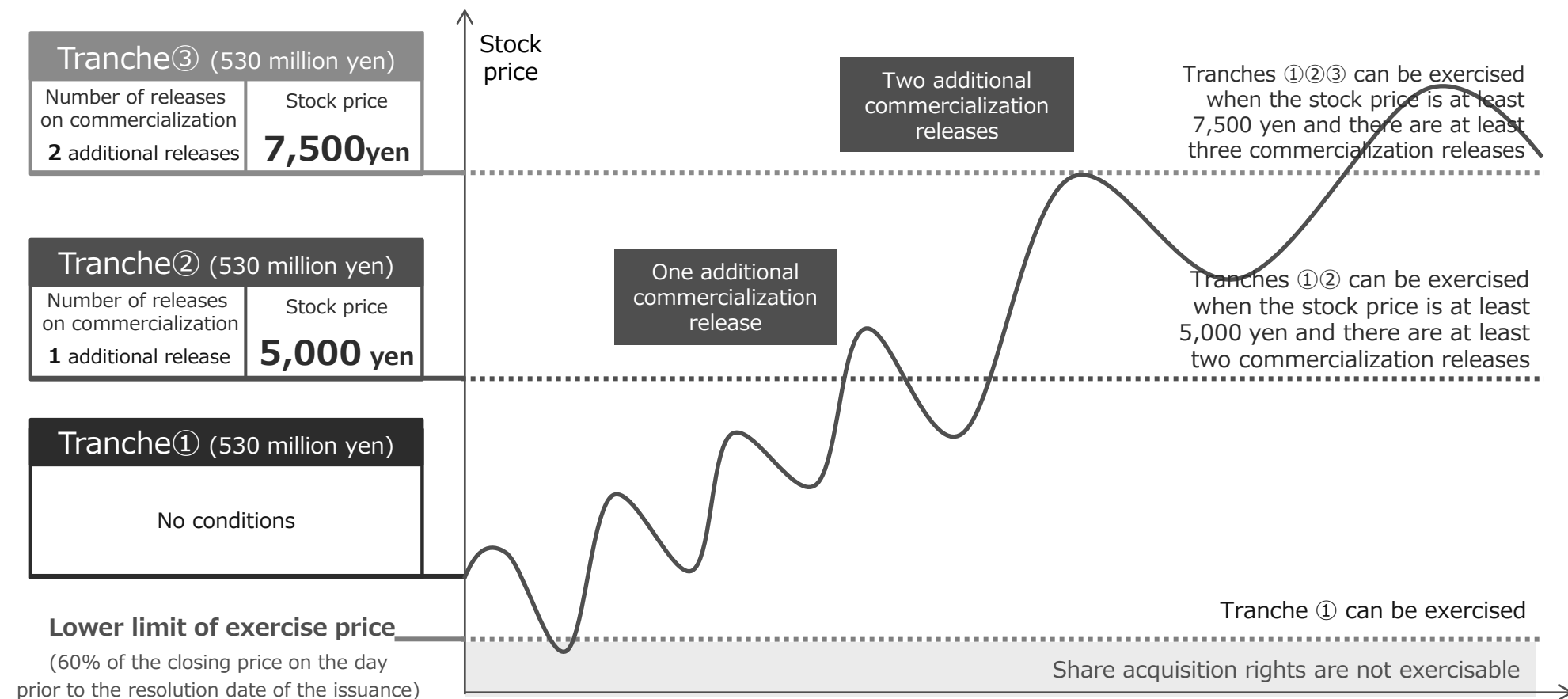
B — **Solutions business launch**

- Establish a joint development system with partners to demonstrate new solutions

- Strengthen business development and technology development to accelerate demonstration and implementation of solutions

Highlights / Financing (2/2)

- Raise **a total 1.5 billion yen of growth fund** in stages in line with business growth through share acquisition rights tranche (1) for **the acceleration of Whale Dynamic and further customer commercialization**, and share acquisition rights tranche (2) and (3) with **"commercialization release"** and **"stock price"** as the exercise conditions

- Designed to minimize dilution with a dilution rate of 5.29% through phased financing in line with business growth

Tranche③ (530 million yen)

Number of releases on commercialization	Stock price
2 additional releases	**7,500 yen**

Tranche② (530 million yen)

Number of releases on commercialization	Stock price
1 additional release	**5,000 yen**

Tranche① (530 million yen)

No conditions

Lower limit of exercise price

(60% of the closing price on the day prior to the resolution date of the issuance)

Stock price

Two additional commercialization releases

One additional commercialization release

Tranches ①②③ can be exercised when the stock price is at least 7,500 yen and there are at least three commercialization releases

Tranches ①② can be exercised when the stock price is at least 5,000 yen and there are at least two commercialization releases

Tranche ① can be exercised

Share acquisition rights are not exercisable

Q. What is the "number of releases on commercialization"?

A. The number of news releases announced for customer commercialization using our technologies

Q. Why does Kudan set the commercialization release as the exercise condition?

A. Our business growth and capital needs for our growth are expected by the realization of customer commercialization

Q. Are share acquisition rights exercised immediately?

A. Tranche ① can be exercised immediately, but other tranches are in principle exercisable only when two conditions are met: commercialization release and stock price.

(*) The above graph of stock price trends is an image only and does not guarantee that the Company's stock price will follow the above trend.

Performance overview

- Achieved continuous revenue growth by accumulating and scaling projects centered evaluation and development

- With achievement of the customer's commercialization, product license profits will contribute to revenue in addition to license and development support revenue from evaluation and development projects. However, full-scale expansion of product license revenue is not expected until the next fiscal year or later.

- Cost of sales and SG&A expenses increase from the previous year due to the full-year consolidation effect of Artisense, but they are progressing as expected

- Due to the sharp depreciation of the yen, a large amount of foreign exchange gains were recorded in non-operating profit from intra-group receivables and payables. Both ordinary profit and net profit have been recorded in the black.

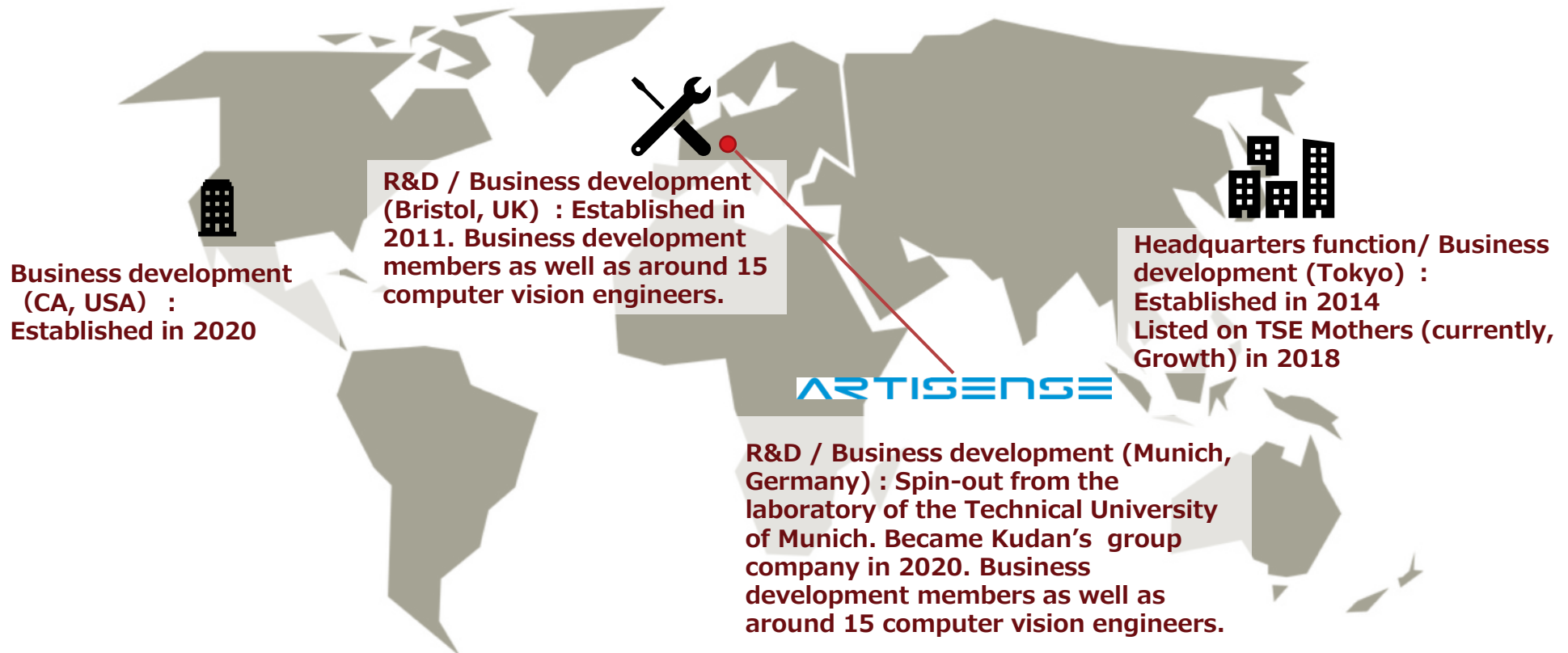| (Unit: million yen)	Performance for 1Q of FY22	Performance for 1Q of FY23	Forecast for FY2023	Change (from the performance for 1Q of FY22)	Performance For FY22 (Reference)
Net Sales	**33**	**103**	**500**	**206.6%**	**271**
Operating Profit	△**112**	△**138**	△**350**	—	△**433**
Ordinary Profit	△**122**	**40**	△**300**	—	△**681** (incl. "share of loss of entities accounted for using equity method"(403))
Profit Attributable to Owners of Parent	△**122**	**37**	△**315**	—	△**2,237** (incl. impairment losses of (1,474))

Appendix

Company Overview

Company overview

- **Kudan is a research and development company that provides AP (Artificial Perception) algorithms and embedded elemental technologies**, specializing in SLAM as the core, which give vision to computers and robots

- Established in the UK in 2011, and with a R&D team of about 30 people in the UK and Germany, Kudan has developed partnerships and customer projects with top global companies. Promoting business for social implementation of AP technology in all next-generation industries including AR, robotics, and autonomous driving

Business development (CA, USA) : Established in 2020

R&D / Business development (Bristol, UK) : Established in 2011. Business development members as well as around 15 computer vision engineers.

Headquarters function/ Business development (Tokyo) : Established in 2014 Listed on TSE Mothers (currently, Growth) in 2018

ARTISENSE

R&D / Business development (Munich, Germany) : Spin-out from the laboratory of the Technical University of Munich. Became Kudan's group company in 2020. Business development members as well as around 15 computer vision engineers.

AP will be the basis for broad range of industries alongside AI

- The artificial perception technology provided by Kudan (providing machines with "eyes") both complements and operates in unison with artificial intelligence (providing machines with "brains") to allow a range of machinery (robots and computers) to move and function autonomously

Artificial Perception

||
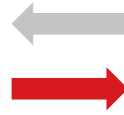
The "eyes" of machines, allowing them to perceive and understand their environment

Artificial Intelligence

||

The "brains" of machines, allowing them to make appropriate decisions
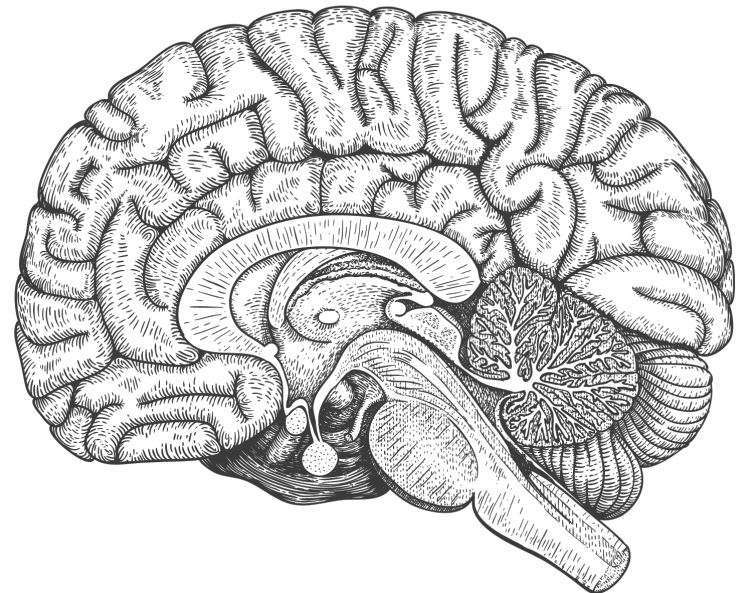
SLAM (Simultaneous Localization and Mapping) as the core of AP technology

- AP technology is a group of Deep Tech centered on SLAM (Simultaneous Localization and Mapping)

SLAM technology (Simultaneous Localization and Mapping)

①Localization   ②Mapping

Re-localization technology

Tight-coupling technology

What is SLAM (Simultaneous Localization and Mapping)?

- Technology that simultaneously determines where we are (Localization) and what our surroundings look like (Mapping) based on input from sensors such as cameras and Lidars

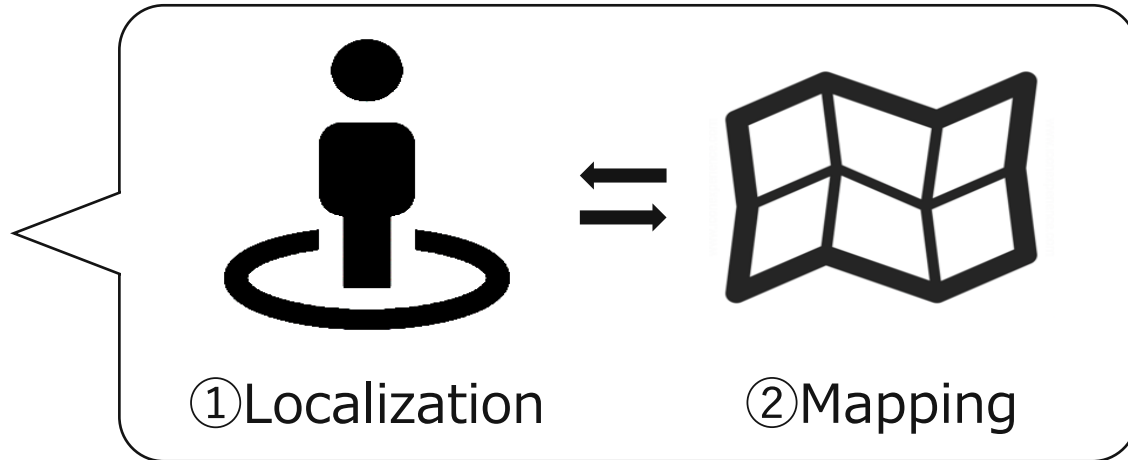- We can keep a track of how we move while creating a map in a new environment (tracking), and recognize where we are based on a map we created beforehand (re-localization)

- Unlike GPS and beacons, which use external radio waves to detect location, SLAM can recognize its own location as a stand-alone software and can be used in a wider range of environments, situations, and use cases

The view seen by the camera

Trajectory of movement

Position and direction of the camera

Environmental map created by SLAM algorithm

https://www.youtube.com/watch?v=01lV9rZNjX0
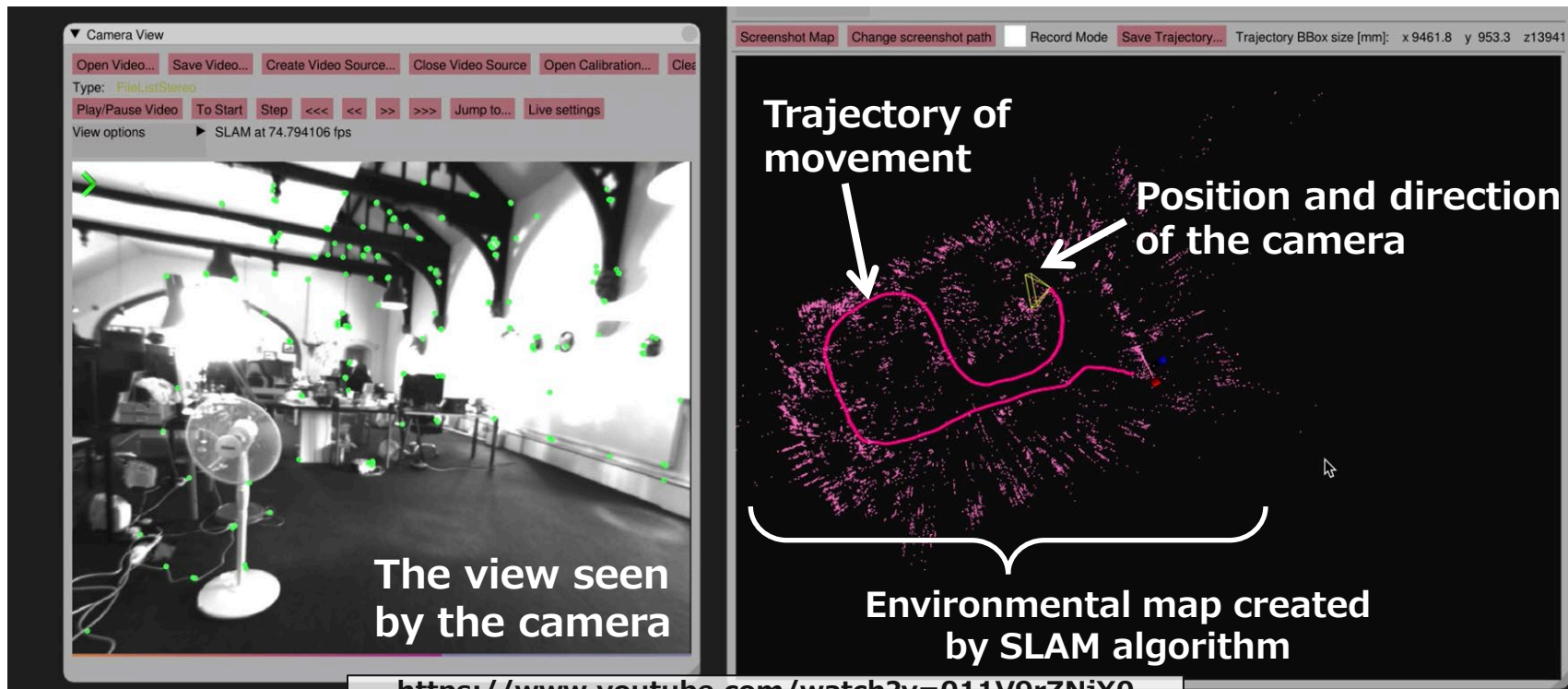
Kudan is one of the world's largest SLAM development company groups

- Company solidification by securing a world-class technical team and the IP (Intellectual Property) of future technology. Achievement of a dominant position in the field
- Aim for successful breakthroughs via industry-leading technology commercialization
⇒ Accelerated integrations of each technology, such as SLAM and Deep Learning, Lidar SLAM and Visual SLAM, Direct SLAM and Indirect SLAM

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Strength in turning technology into business, with leading, unique methods of implementing technology, and a global track record.

Indirect SLAM

- Camera image (visual) processing
- Capable of high-speed recognition
- High versatility
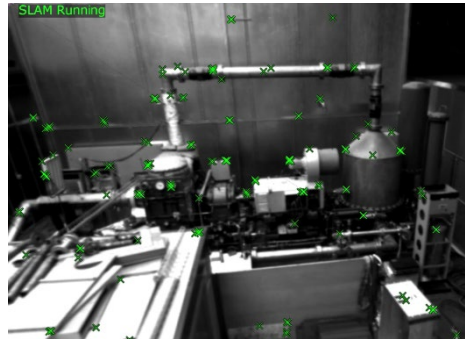
Lidar SLAM

- Lidar data processing
- Strong in recognizing fast movements
- High stability
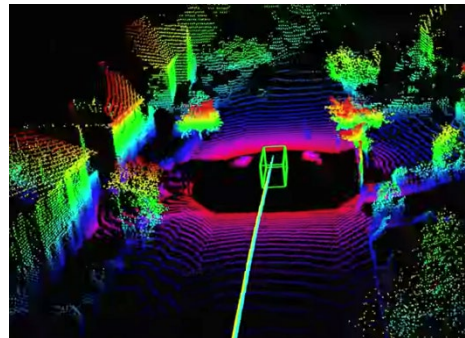
ARTISENSE

Headed by a global leader in self-driving automotive research, Prof. Daniel Cremers, technical experts including Ph.Ds from TUM
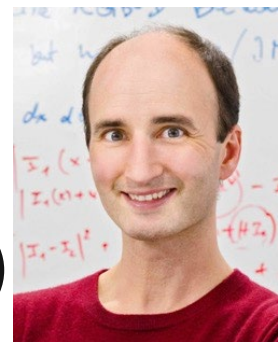
Prof. Daniel Cremers
Artisense founder and CSO

- Over 52,000 citations of his work in academic papers, h-index 107 (Nobel laureates average 45.1)
- 2016 Leibniz Prize Winner (Germany's most prestigious academic award)
- More than 10 years of joint research with European OEMs, including Daimler, in autonomous driving research

Direct SLAM

- Camera image (visual) processing
- Capable of detailed recognition
- High stability
- Integration with deep learning models
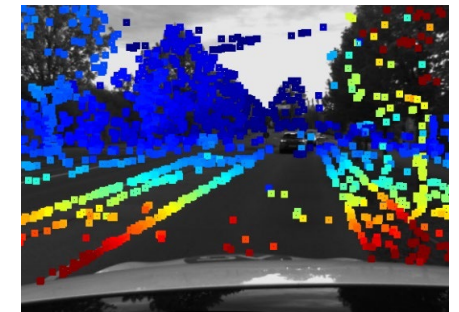
Unique algorithms <u>refined to overcome the "hurdle to commercialization"</u>
many customers who are developing on an OSS (open source) basis are sure to face

High performance in a variety of environments
High accuracy and high stability Environmental robustness

Flexibility to adapt to various sensors and various operating environments **according to usage and purpose**

Commercial-grade SLAM

Provide essential functions for field operations **such as map handling and map sharing to multiple devices**

Updates with resources **not found in OSS and** **strong technical support** **by a dedicated team**

Broad range of SLAM application areas including AR, Robotics and Autonomous Driving

- Localization & Mapping technology centered SLAM is necessary in cases where moving machines and equipment need to change their subsequent movements and outputs depending on their positions and movements

- GPS and beacons are greatly limited in terms of accuracy and applicable environment

Drone / UAV

WAREHOUSE

Autonomous Driving / Driving Assistance

Autonomous Robots (incl. AGVs / AMRs)

AR/VR Metaverse

Mapping / Surveying (incl. High-Definition Mapping)

SLAM application (Project Highlights) : Autonomous mobile robots

- **Japanese leading telecommunication company :** Progress toward commercialization of a platform that enables the cooperative use of various robots

- **Japanese leading manufacturer :** Development and implementation underway for autonomous flight of drones for infrastructure inspection

- Several other projects including **European robot manufacturer, Japanese leading auto parts supplier, (several) localization of forklift projects**
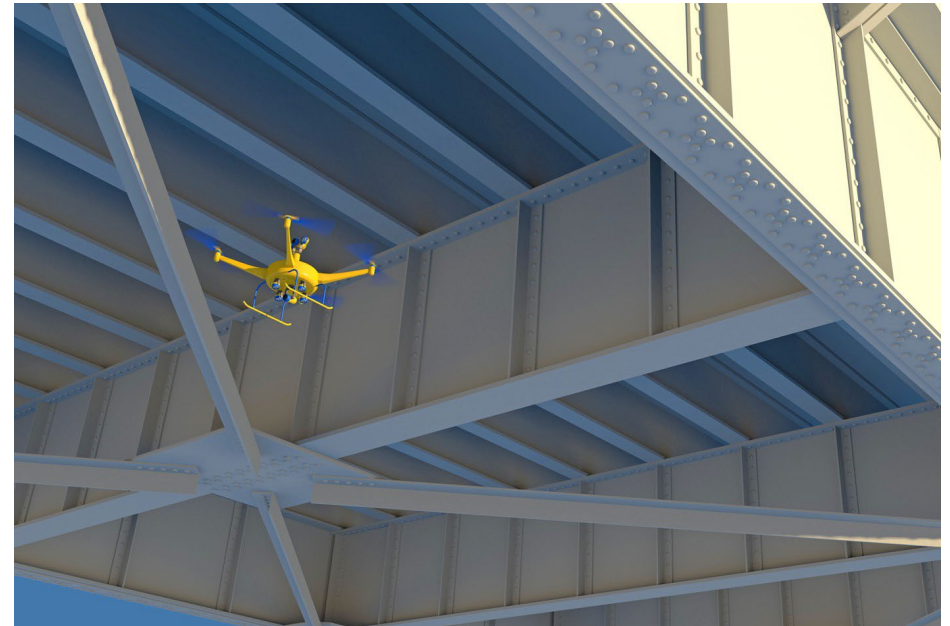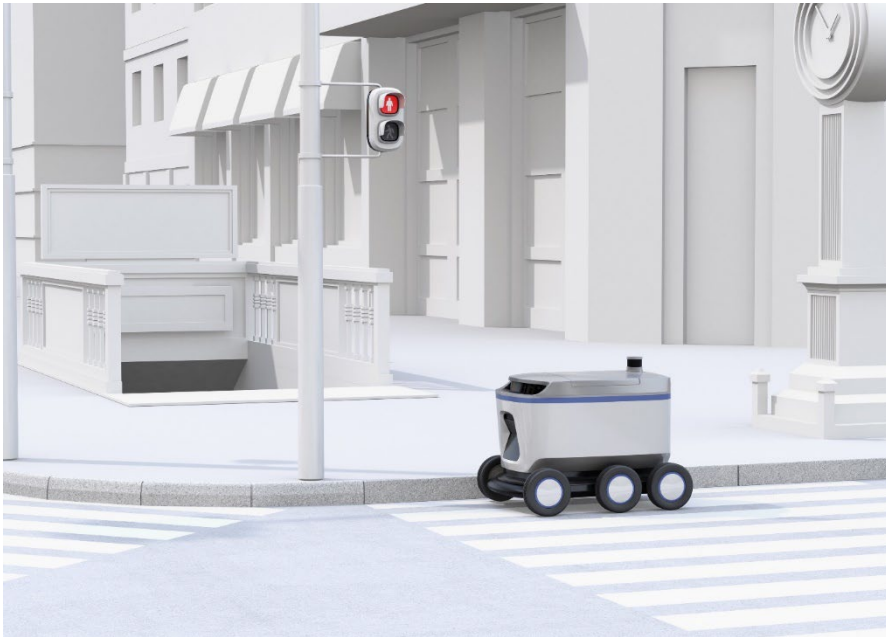
SLAM application (Project Highlights) : Implementation in technology infrastructure (AR/General)

- **NTT DOCOMO** : Developing an AR cloud application and released publicly in April 2021

- Several other projects including **leading telecom companies** (three of the top seven global companies), **leading telecom equipment manufacturer** (top global company)
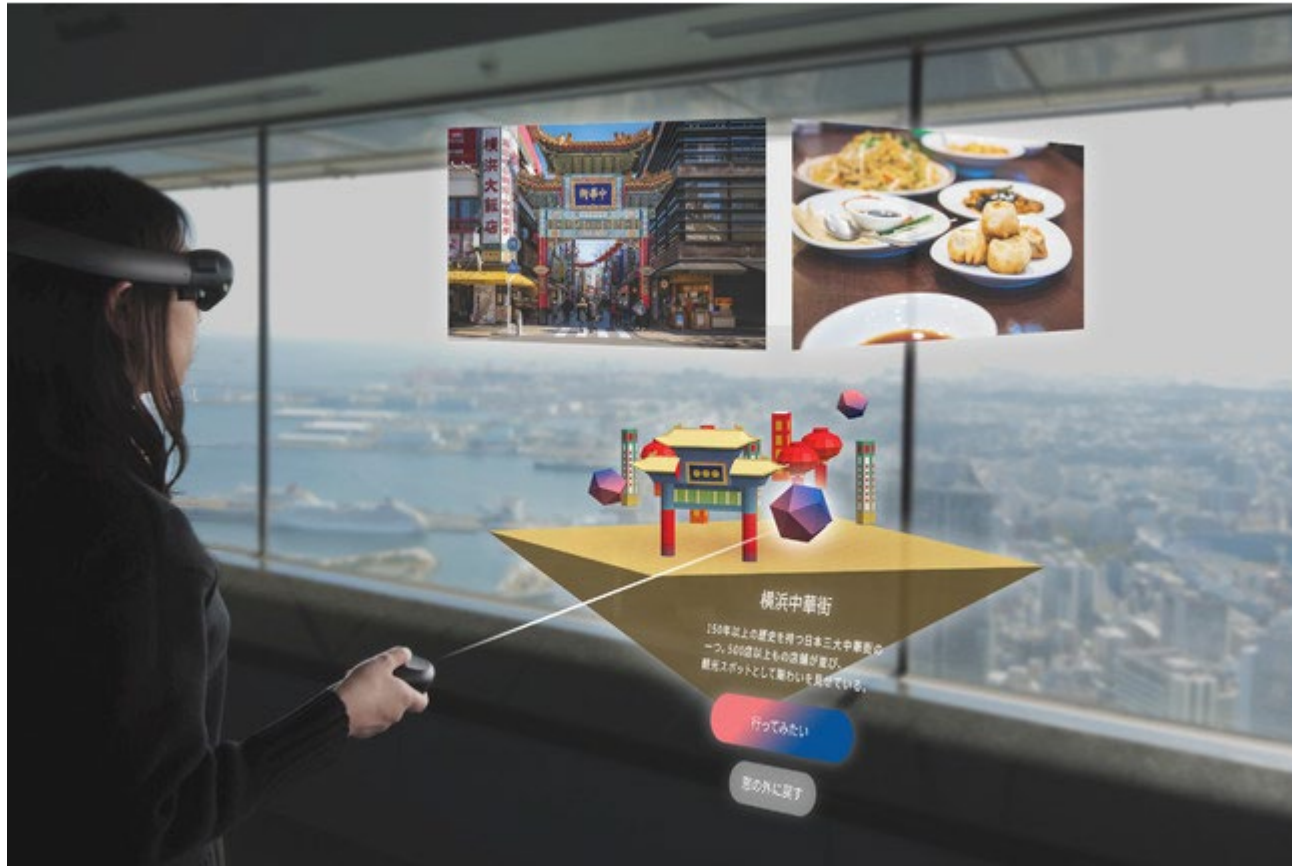
AR cloud with NTT DOCOMO

SLAM application (Project Highlights) : Next-generation map kudan

- **Atos** : Succeeded in technology validation of handheld mapping, and promote joint development for commercialization

- **US mapping solution provider** : Signed a commercial license agreement and is undergoing final development for commercialization
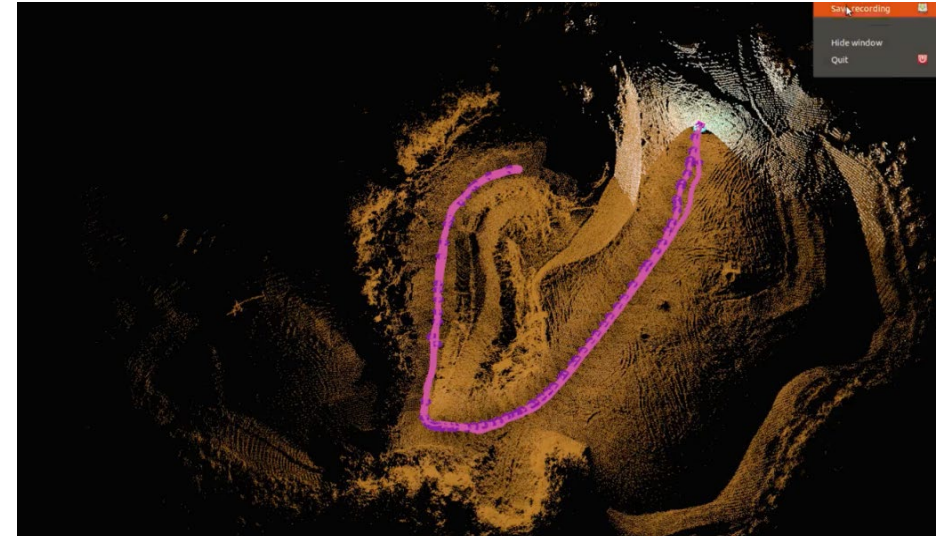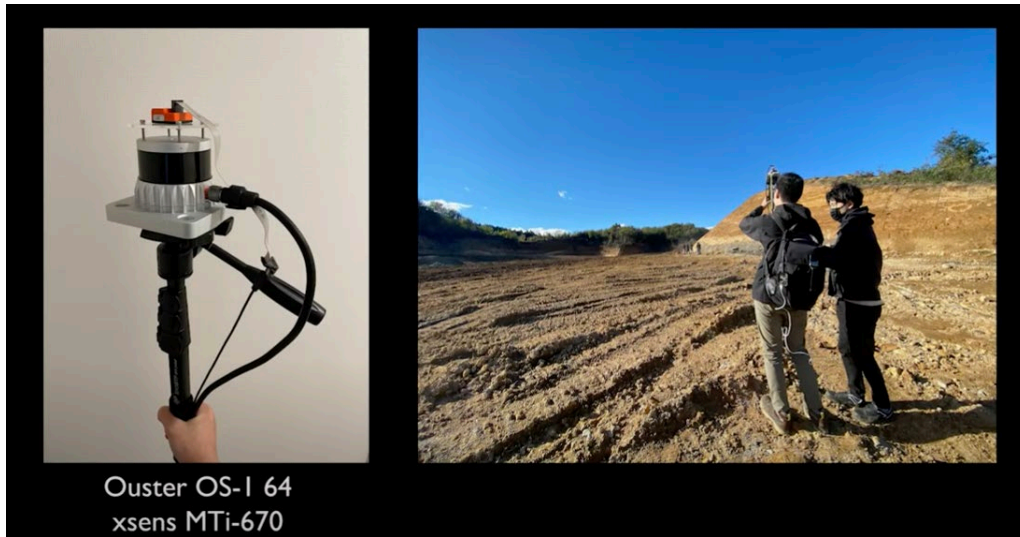
"Construction DX" (= i-Construction* project) with Atos

*i-Construction is an initiative by the Ministry of Land, Infrastructure, Transport and Tourism to improve the productivity of the entire construction production system and make construction sites more appealing.

SLAM application (Project Highlights) : Automobile-related

- **Whale Dynamic, an autonomous driving technology company in China** : Products for autonomous driving by integrating Kudan 3D-Lidar SLAM are released

- **"ERASMO", a multi-year autonomous driving research project funded by an EU research institute** : Participation on this project with other EU companies including Renault and the development of an on-board positioning device enabling fully autonomous driving is in progress (https://erasmo-gnss.eu/)

- Not only autonomous driving, but also a wide variety of applications such as driving support and traffic management including **AR navigation development with HERE / NNG**

- Several other projects including **two of the top three global automotive OEMs** and **four major sensor companies**
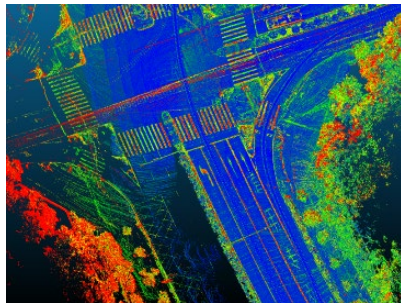
Whale Dynamic commercialization
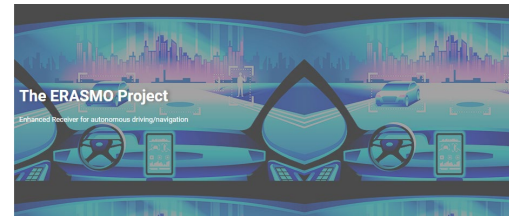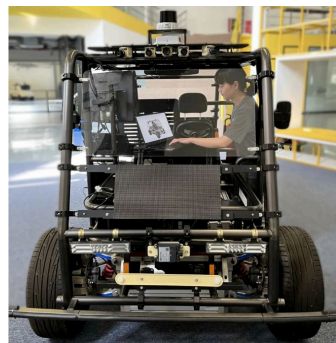
ERASMO project
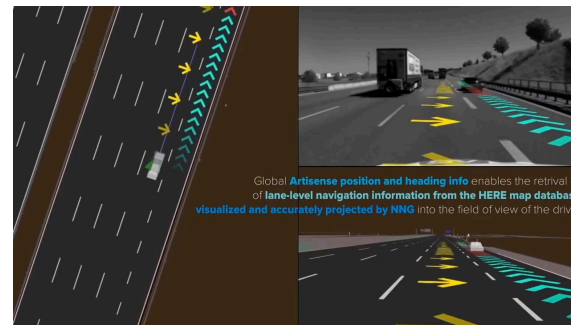
AR navigation with HERE / NNG

Business Strategy

Leader in the Deep Tech layer with strategic positioning

— While maintaining a fundamental focus on the establishment and maintenance of leading position on the low-volatility deep tech layer, measures are being implemented to accelerate the creation and cultivation of markets for Kudan's products in the higher layers of the AP technology pyramid

Layers of AP technology	Players	Measures put in place targeting each layer
Solutions	▪ Providers of product operation and added-value services	① Provision of prototypes and dev kits, allowing clients to reduce lead-in time / accelerate commercialization VINS dev kit
Products	▪ Developers of end-user products in the mobile / wearable / robotics / mobility fields	
Applied technology	▪ Developers of algorithm and sensor packages	② Accelerated market penetration through cooperation with sensor and semiconductor manufacturers Qualcomm Qualcomm Technologies, Inc. SONY
Deep tech	▪ **Provision of AP tech algorithms (frameworks), including SLAM**	③ Strengthening of R&D and maintenance of deep tech monopoly through corporate acquisitions ARTISENSE ④ Continued strengthening through increased investments

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Expansion of potential customers or investment targets through strategic positioning

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Kudan/Artisense enjoys an exclusive position in the area of commercial SLAM algorithms while avoiding direct competition with GAFAM, and many companies that use SLAM technology are also potential customers or investment targets.

These companies utilize internally developed algorithms and applications, and are not competitors for the SLAM algorithms. For applications that include SLAM such as ARCore and ARKit, there has been an increase in synergy as people use their products as well as those from Kudan.

Many companies using SLAM, including large companies, have only about 2 to 3 SLAM engineers, and are trying to compensate through the use of OSS and customized software. In particular, companies that are considering autonomous driving of existing products are actively seeking to outsource their SLAM needs.

For own business/solutions (for end users)

GAFAM

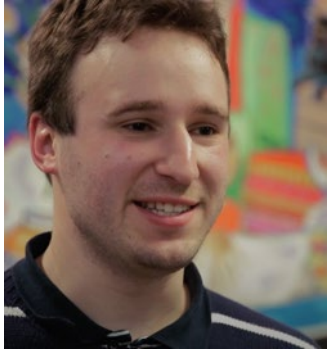**Robot OEMs, drone OEMs, etc.**

Separate / Coexist

Potential customers / investment targets

Internally developed algorithms

Open source software (OSS) / Custom OSS

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ARTISENSE

Academic

Very few companies use their SLAM algorithms as a stand-alone product, not as part of their own solutions. Kudan/Artisense is the only company with a team of 30 SLAM engineers and that has the ability and technical knowhow to actually pursue commercial applications.

For outside companies/algorithms (Deep Tech)

Management structure for promoting R&D and social implementation of Deep Tech

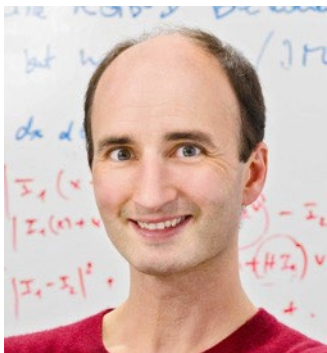**Research & Development**

Kudan founder & CTO John Williams
- Implemented SLAM technology for smartphones ahead of Apple / Google

Artisense founder & CSO Professor Daniel Cremers
- The most influential SLAM/robotics expert in the world
  (The head professor at the Technical University of Munich, about 52,000 citations of his work in academic papers, h-index 107)

Other management members (previous employments)

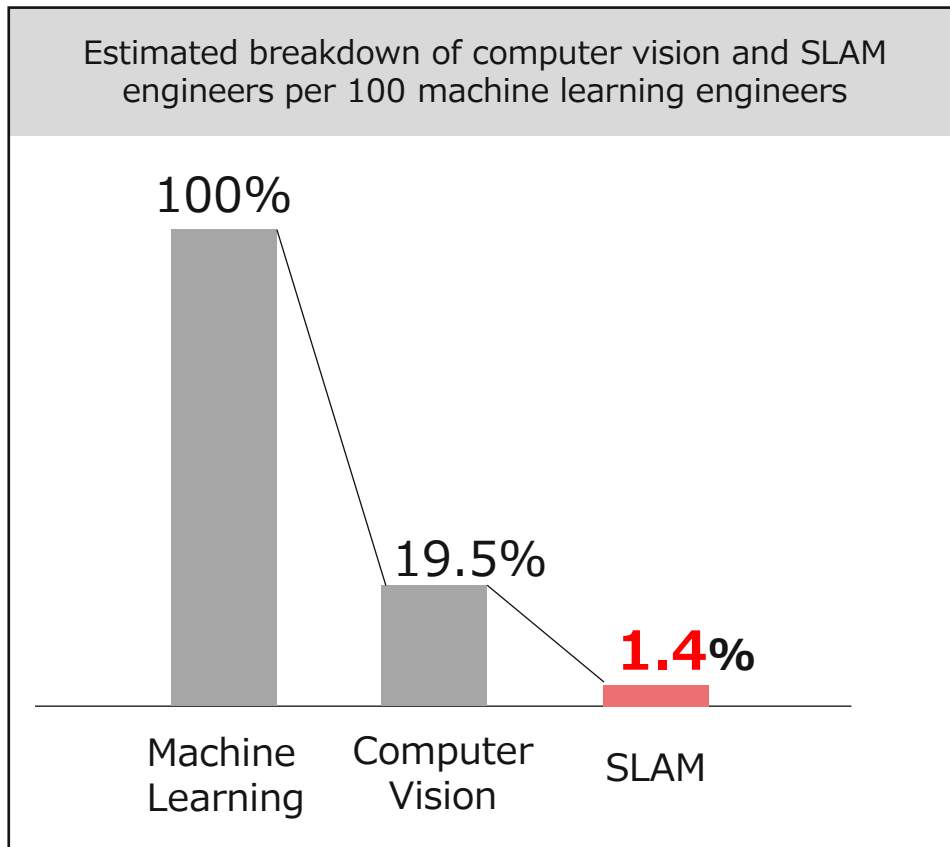accenture | McKinsey &Company | TOYOTA | EY | KPMG | SAMSUNG

Acquired world-class technical team to support R&D

Researchers and engineers specializing in SLAM technology are extremely rare, even in the field of computer vision. Despite this, Kudan and Artisense employ many world-class professionals with PhDs in the field. The partnership with industry leaders such as Professor Daniel Cremers and the Technical University of Munich will ensure continued access and expand further to top talent and cutting-edge research.

University of BRISTOL

Technical University of Munich — TUM

There is Professor Cremers, a founder & CSO at Artisense

Estimated breakdown of computer vision and SLAM engineers per 100 machine learning engineers

100%
19.5%
1.4%

Machine Learning   Computer Vision   SLAM

Other companies trying to organize SLAM engineer teams of the same level and scale will require large investments in both recruitment and labor costs

*Based on a LinkedIn search

Related technologies are acquired in the world, only a few independent SLAM development companies left

🐘kudan

🇬🇧 🐘kudan
Founded in 2011

🇩🇪 ARTISENSE
Founded in 2016

IPOed in 2018 🇯🇵

Fully acquired in 2021

🐘kudan
🇯🇵 🇬🇧 🇩🇪

Around 30 SLAM specialized engineers

🇸🇪 13th lab
Founded in 2010

🇬🇧 SCAPE
Founded in 2016

Acquired in 2014

Acquired in 2020

facebook

🇩🇪 metaio
Founded in 2003

🇬🇧 6 D . A I
Founded in 2016

Acquired in 2015

Acquired in 2020

 Apple

NIANTIC
(Google)
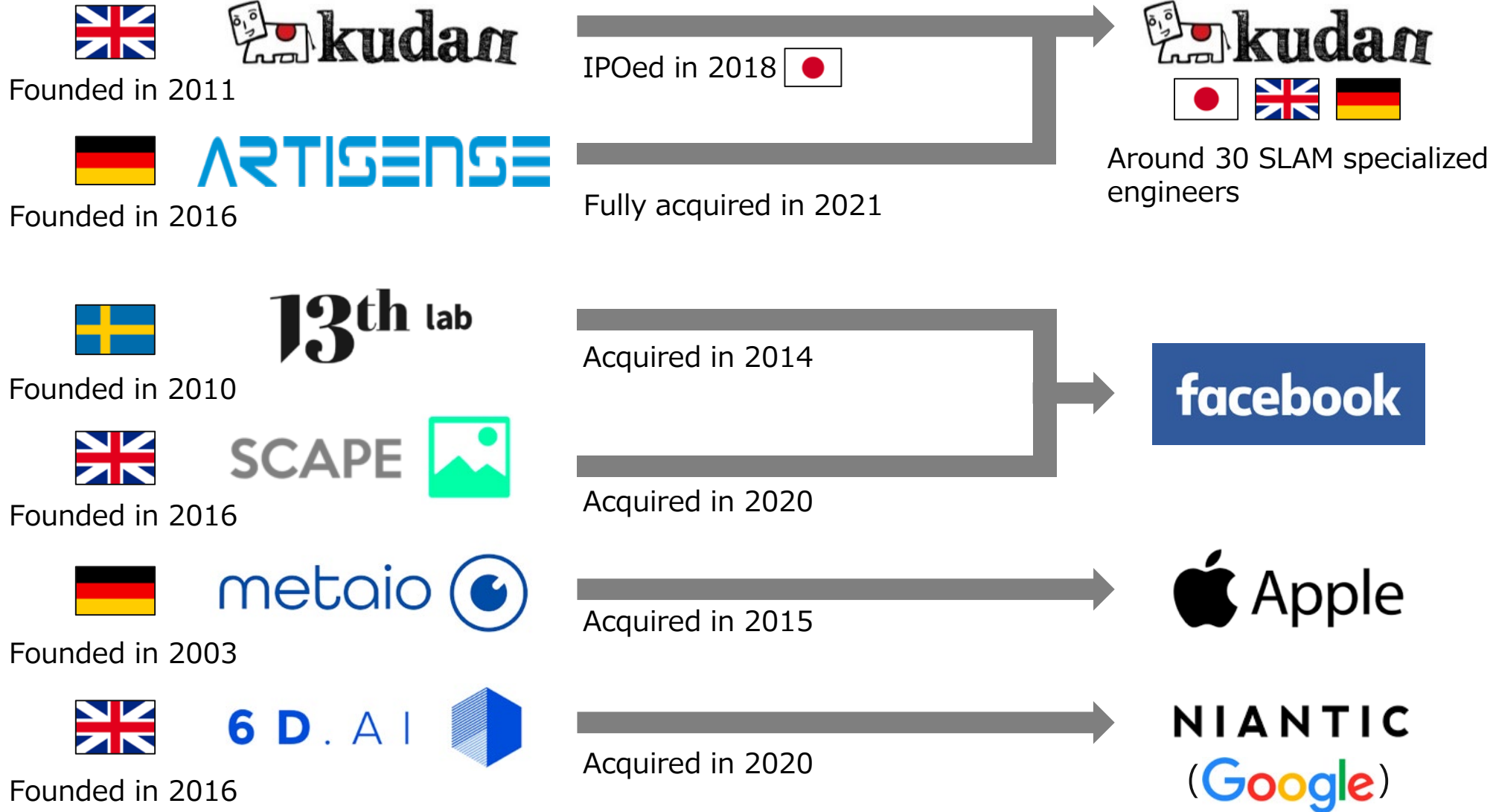
While the increase of acquisitions of the related technologies, Kudan and Artisense leads the market in track record and awareness

- More limited numbers of SLAM-focus / SLAM-feature software companies due to acquisitions by larger technology companies

- Kudan and Artisense have been in a leading position in terms of breadth of offering, track record and awareness in the market

SLAM-focus / SLAM-feature software player

kudan

+

ARTISENSE

- Offers Indirect & Direct Visual SLAM and Lidar-SLAM
- Flexible sensor options
- Track records in various applications such as AR, robotics and autonomous driving

SLAMCORE

- Only Indirect Visual SLAM
- Optimized for limited camera models

VanGogh Imaging

- Focus on very specific medical application

outsight

- Only Lidar-SLAM
- Optimize for their own hardware kit

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# Development projects and partnership with global leading players have been increasing

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Timing		Main target applications and project overview	
F Y 2 0	May.	**Robotics**) Partnership with Thales group for next-gen tracking system development	THALES
	Aug.	**Robotics**) Alliance with SEAOS for warehouse automation with Autonomous robots with capital tie-up	SEAOS
		Mobility) Signed with Japan Unisys to collaborate as Business Scaling Partner	UNISYS
	Sep.	**Mobility**) Partnership with Macnica to develop new value-added solutions for mobility business	MACNICA
		Robotics, Mapping) Partnership with Ouster	OUSTER
	Nov.	**AR**) Develop RGB-D SLAM on smartphones with ToF sensor with Sony Semiconductor Solutions	SONY
	Dec.	**AR/VR, Mobility**) Partnership with Fixstars to offer accelerated high-performing SLAM	FIXSTARS
	Jan.	**Robotics, Mapping**) Partnership with Cepton on Lidar-SLAM and joint exhibition demo	CEPTON
		Robotics, Mapping) Partnership with Velodyne on Lidar-SLAM	Velodyne Lidar
F Y 2 1	May	**Robotics**) Launch SLAM library for Qualcomm® Robotics RB3 Platform with their technical support	Qualcomm
		Robotics) Joint development of 3D SLAM demo application with Analog Devices	ANALOG DEVICES
	Nov.	**Robotics**) Partnership with Vecow to jointly offer integrated solution for autonomous mobile robots	Vecow
		AR, Mobility) Artisense released Automotive AR navigation demo with HERE technologies and NNG	here NNG
	Dec.	**General**) Achieved 40% image process acceleration with Synopsys ARC EV processor IP on Kudan SLAM	SYNOPSYS
	Feb.	**Mobility**) Provide Lidar SLAM to IIT Bombay autonomous vehicle project team	UNMESH MASHRUWALA Innovation Cell IIT BOMBAY
	Mar.	**General**) Joined NVIDIA Inception Partner Network	NVIDIA
F Y 2 2	Apr.	**AR)** Released utilization of Kudan SLAM in NTT docomo's developing AR cloud	NTT docomo
	May.	**Robotics**) Partnership with robotics developer UGO to integrate Kudan SLAM into robotics and joint sales	ugo
	July.	**Mapping**) Signed a Developing License General Agreement with BIMEXPERTS and develop joint solutions	BIMEXPERTS
	Aug.	**Robotics**) Partnership with ADLINK, development of AMR, integration of Kudan SLAM into robotics, joint sales	ADLINK
		General) Joined Texas Instrument's partnership network in robotics	TEXAS INSTRUMENTS
		General) Become official SLAM partner with Ouster, a leading Lidar provider, and start offering tools on Website	OUSTER
	Oct.	**Autonomous Driving**) Participation with Renault and other companies in ERASMO, an autonomous driving project by an EU research institute	ERASMO
	Mar.	**Robotics**) Exhibited at Intel-sponsored event "Intel IoT Planet ~ Robotics Week"	

Growth Potential

Revenue model

- Almost all of customers' projects are in the evaluation or development phase, and we have focused on acquiring and continuing high-quality projects that are expected to achieve customers' commercialization and expand the scale of sales in the future (Business phase in the red due to upfront investment in R&D expenses, mainly engineer personnel expenses)

- Although stable growth can be expected in revenue based on evaluation/development licenses and customer development support in the evaluation or development phase, the most important goal is to contribute to all next-generation industries and to achieve a significant increase in revenue through commercial license profit with the implementation of Kudan's Artificial Perception technology
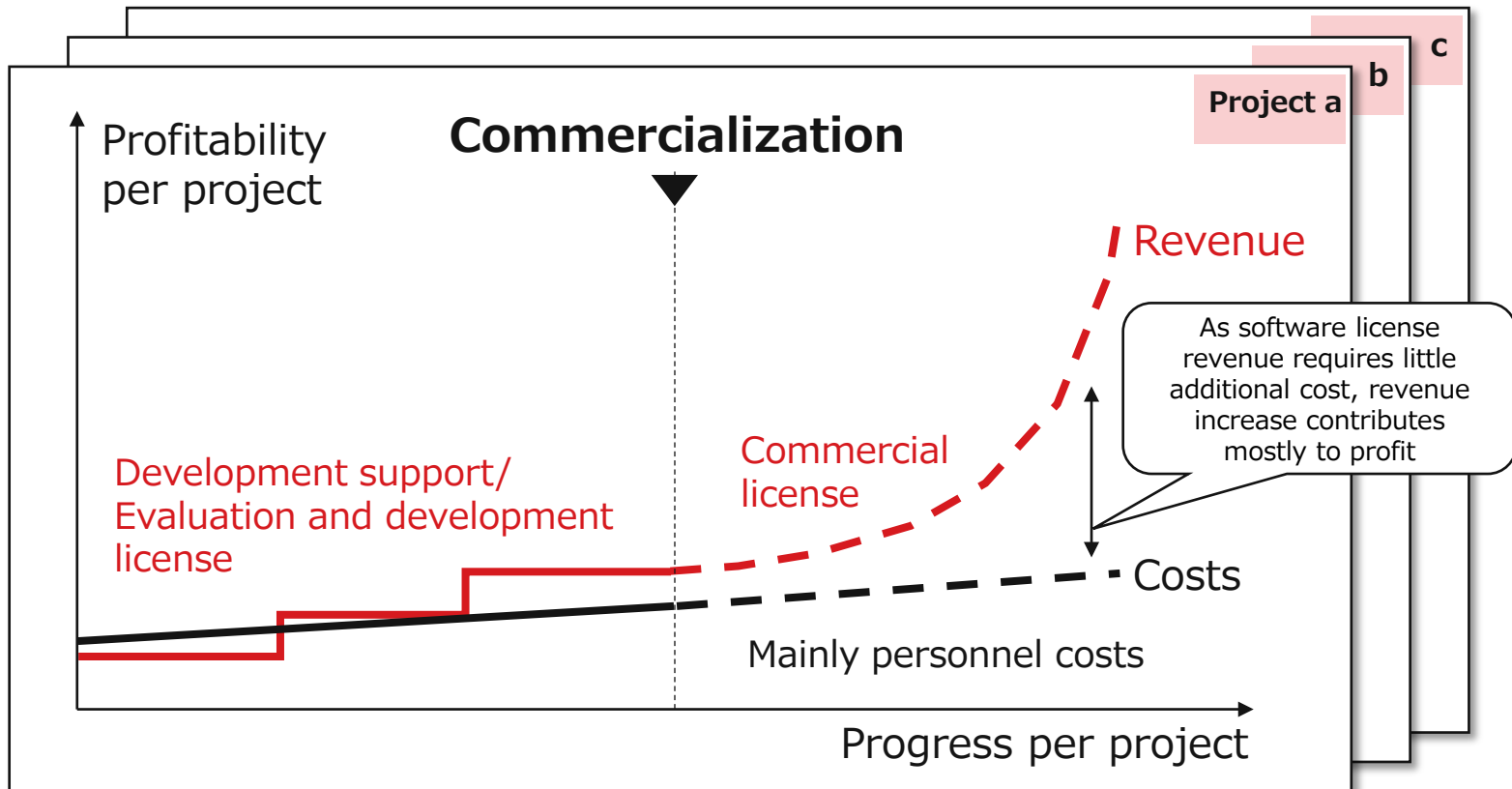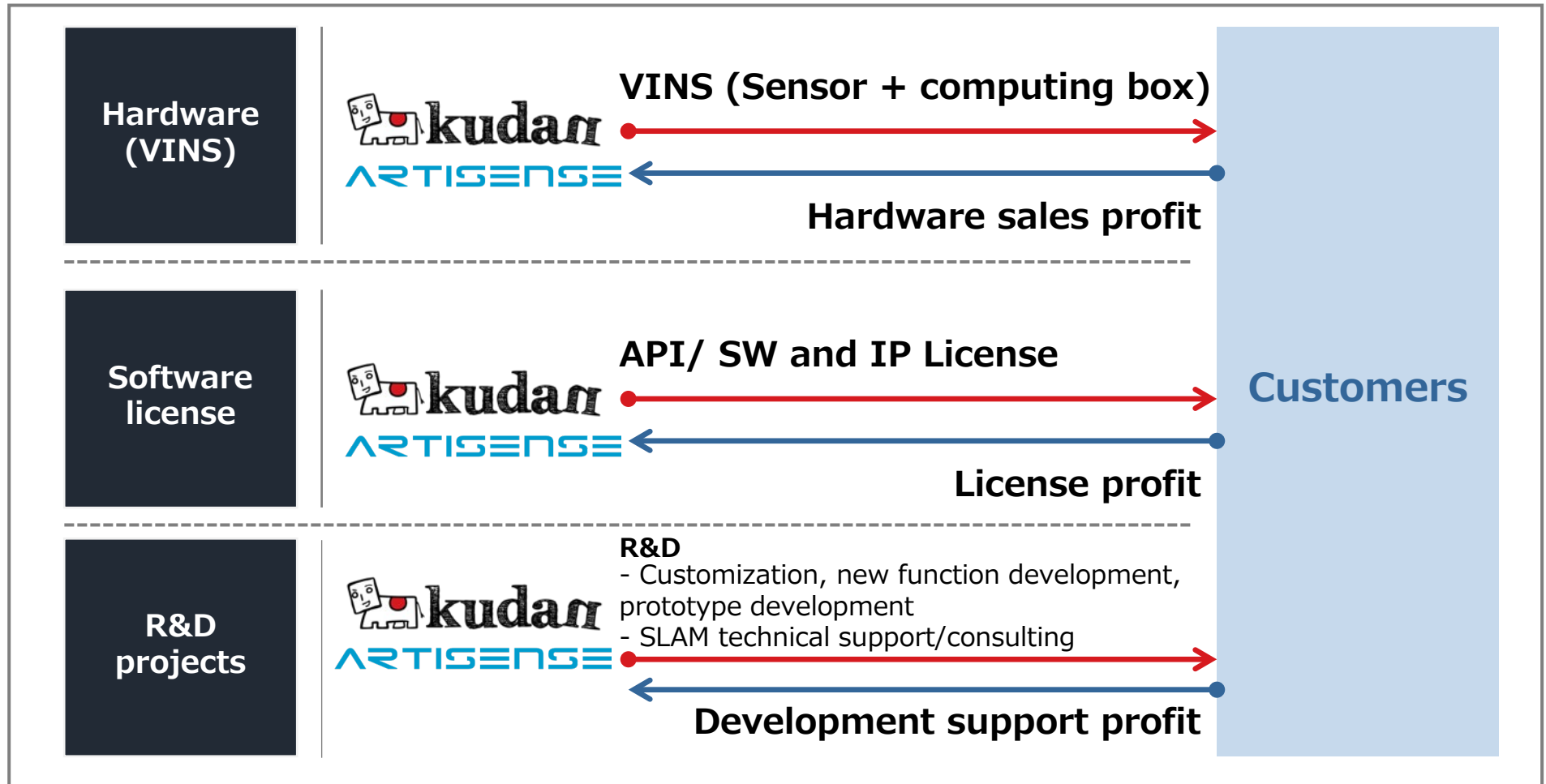
# (Reference) Revenue model (Evaluation/Development phase)

- After commercialization of customer-developed projects, expand license profit through pay-as-you-go billing based on the number of products sold, data volume ,etc. according to the customer's business model (Shift to a stock revenue model)

- In the "evaluation and development" phase, which is prior to the commercialization of customers ' products, we gain revenue mainly from license profit and development support profit based on the development volume and development period.

Hardware (VINS)	**kudan** ARTISENSE	**VINS (Sensor + computing box)** → ← **Hardware sales profit**	**Customers**
Software license	**kudan** ARTISENSE	**API/ SW and IP License** → ← **License profit**	
R&D projects	**kudan** ARTISENSE	**R&D** - Customization, new function development, prototype development - SLAM technical support/consulting → ← **Development support profit**	

About performance forecast for FY2023

- Continued business growth resulting in +130% (+170 million yen) year-on-year revenue growth, and projected to grow significantly by +60% (+200 million yen) in FY23

- In addition, cost synergies from the technology integration with Artisense (significant efficiency in development through sharing of architecture, modules, etc.) will significantly improve the loss-making structure by FY23/4Q, ensuring profitable earnings structure
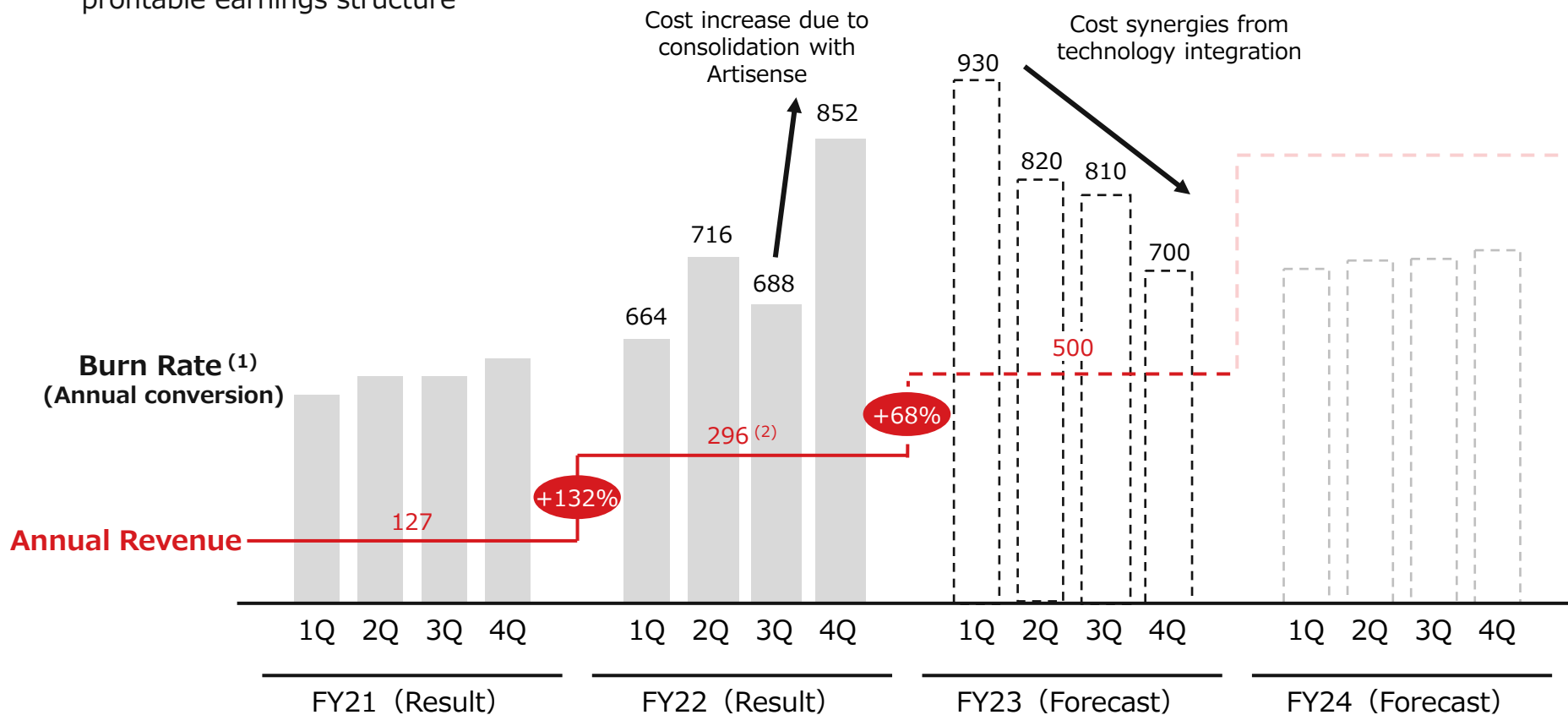
(1) Annual costs required for business activities, calculated by each quarterly cost times four. Calculated by deducting R&D subsidy income from total cost of sales, SG&A expenses, non-operating expenses, extraordinary losses, income taxes, etc. (adjusted for seasonal variations, foreign exchange losses and other transitory costs). Prior to FY22/3Q before Artisense was consolidated, Artisense-related costs such as impairment losses and share of loss (income) of entities accounted for using equity method were deducted and only Kudan's costs were totaled. (2) Revenue adjusted for the impact due to accounting standards change

Performance forecast for FY2023

- Continuous significant revenue growth is expected due to increasing of evaluation and development projects and scaling of projects
- Cost of sales and SG&A expenses are expected to increase from the previous year due to the full-year consolidation effect of Artisense (consolidated only for 3 months in the previous year), but cost structure will be improved by 4Q
- Non-operating profit is expected to include subsidy income from R&D in the U.K. and Germany

(Unit : million yen)

	Performance for FY2020	Performance for FY2021	Performance for FY2022	Forecast for FY2023
Net Sales (Prior to accounting standards change)	456	127	271 (296)	500
Operating Profit	9	△451	△433	△350
Ordinary Profit	△12	△1,575 (incl. "share of loss of entities accounted for using equity method"(1,232))	△681 (incl. "share of loss of entities accounted for using equity method"(403))	△300
Profit Attributable to Owners of Parent	△29	△1,608	△2,237 (incl. impairment losses of (1,474))	△315

Accumulation of projects toward customers' commercialization

- Compared to September in 2021, the overall pipeline has expanded, and in particular, we have succeeded in raising the number of "low/medium" projects to "medium/high" in terms of certainty

- Currently four projects in FY2023 and two projects in FY2024 are highly certain to be commercialized, and projects are actively progressing

Certainty	Characteristics of projects	Number of projects		Commercialization schedule
		Sep. 2021	Mar. 2022 ※	
High	▪ Clearly defined functions and performance required for commercialization, and there is sufficient potential for Kudan SLAM to meet them	**4**	**6** — **4** FY2023 / **2** FY2024	・Robotics ・Autonomous Driving ・Mapping
Medium	▪ Evaluation and development projects that have already passed performance verification ▪ Limited risk to commercialization (competition, performance, price, etc.) ▪ Specific timeline for commercialization is clear	**17**	**22**	
Low	▪ Evaluation and development projects that have already passed performance verification ▪ Specific timeline for commercialization is unclear	**23**	**26**	

*The number of "Certainty: High" is updated from 5 to 6 as of June 2022. Changes from September 2022 were AR/VR: -1 (due to delay in development progress), robotics/autonomous driving: +3.

Highlights of projects accumulated for customers' commercialization

Market	New・Ongoing (Comparison as of September 2021)		Company	Algorithm	Overview
Robotics	**Ongoing**	🇯🇵	Major telecommunication	**Visual SLAM**	A platform that enables the cooperative use of various robots
	New	🇺🇸	Major semiconductor	**Visual SLAM**	Visual SLAM optimization and SLAM packaging for specific processors
Autonomous driving・ADAS	**Ongoing**	🇪🇺	TOP5 automotive OEM	**Lidar SLAM**	Autonomous driving project for general passenger cars
	Ongoing	🇪🇺	Major automotive Tier1	**Visual SLAM**	Development of driver assistance functions with cameras installed in commercial vehicles
Metaverse (AR/VR)	**Ongoing**	🇯🇵	Major camera OEM	**Visual SLAM**	Development of Mixed Reality headset for medical applications
	Ongoing	🇪🇺	UK engineering company	**Visual SLAM**	Development of digital twin solutions for industrial facilities
Mapping	**Ongoing**	🇺🇸	Mapping provider	**Lidar SLAM**	Mapping solutions in non-GPS environments
	New	🇯🇵	Construction Solution Provider	**Lidar SLAM**	Development of simple mapping device for construction and civil engineering

*This page shows highlights of the projects which are close to commercialization, have made a significant progress toward commercialization, etc.

Highlight for future growth strategy based on customers' commercialization

— With plans to have several customers launch their products using Kudan software from this fiscal year ending March 2023, **the transition from the "preparation phase" to the "harvest phase" is underway**

— To accelerate this transition, we will strengthen our business based on customers' commercialization

A **Acceleration and expansion of customers' commercialization:** Strengthen support, technology development, and business development with the aim of increasing the number of projects to be commercialized and increasing profit at the project level

B **Solution business launch:** Not only embedding Kudan technology in individual products, but also providing engineering service to accelerate new solution development that synchronize multiple products and expand their applications centered on Kudan technology (digital twin, robot platform, Metaverse, etc.)

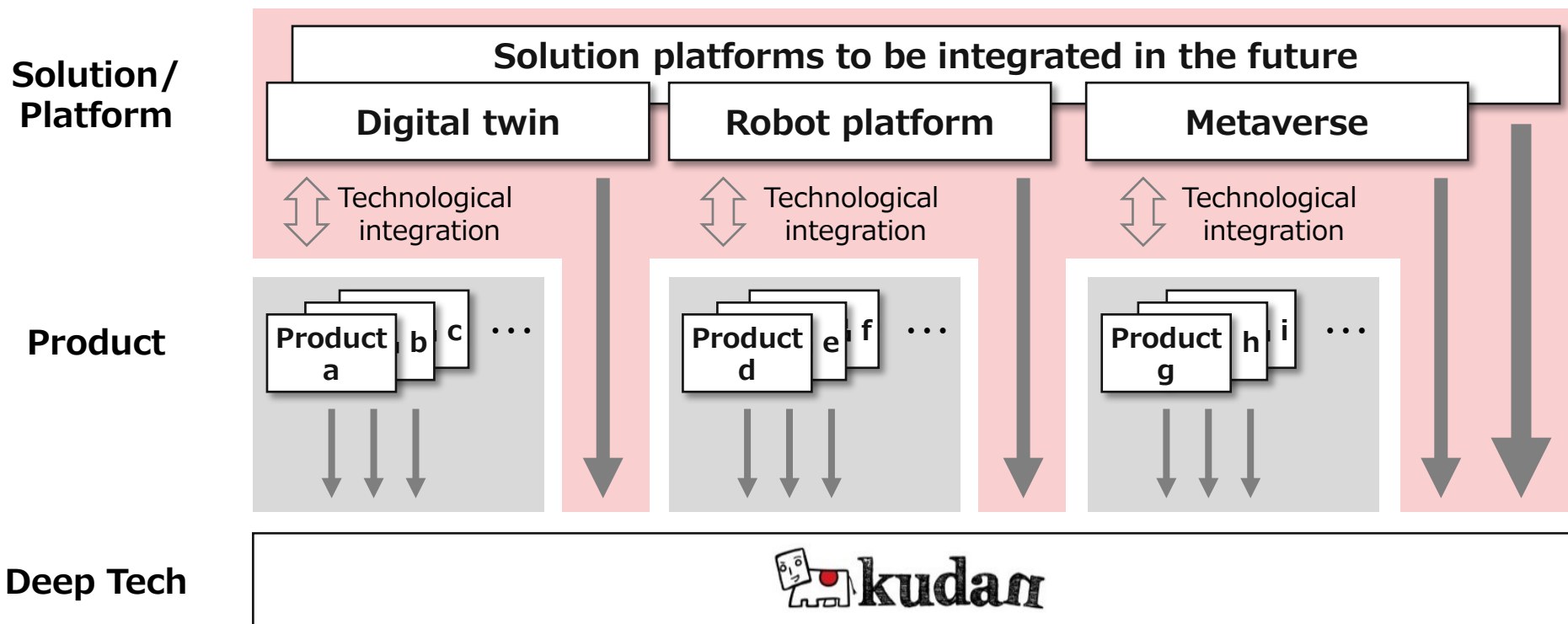# A Acceleration and expansion of customers' commercialization

- **Scaling projects:** Strengthen support functions and technology development for the purpose of scaling projects in order to advance to the harvest phase at the project level, starting with the realization of customers' commercialization

- **Increasing the number of projects:** Strengthen business development, including global expansion, to increase the number of commercialization projects by leveraging the existing projects
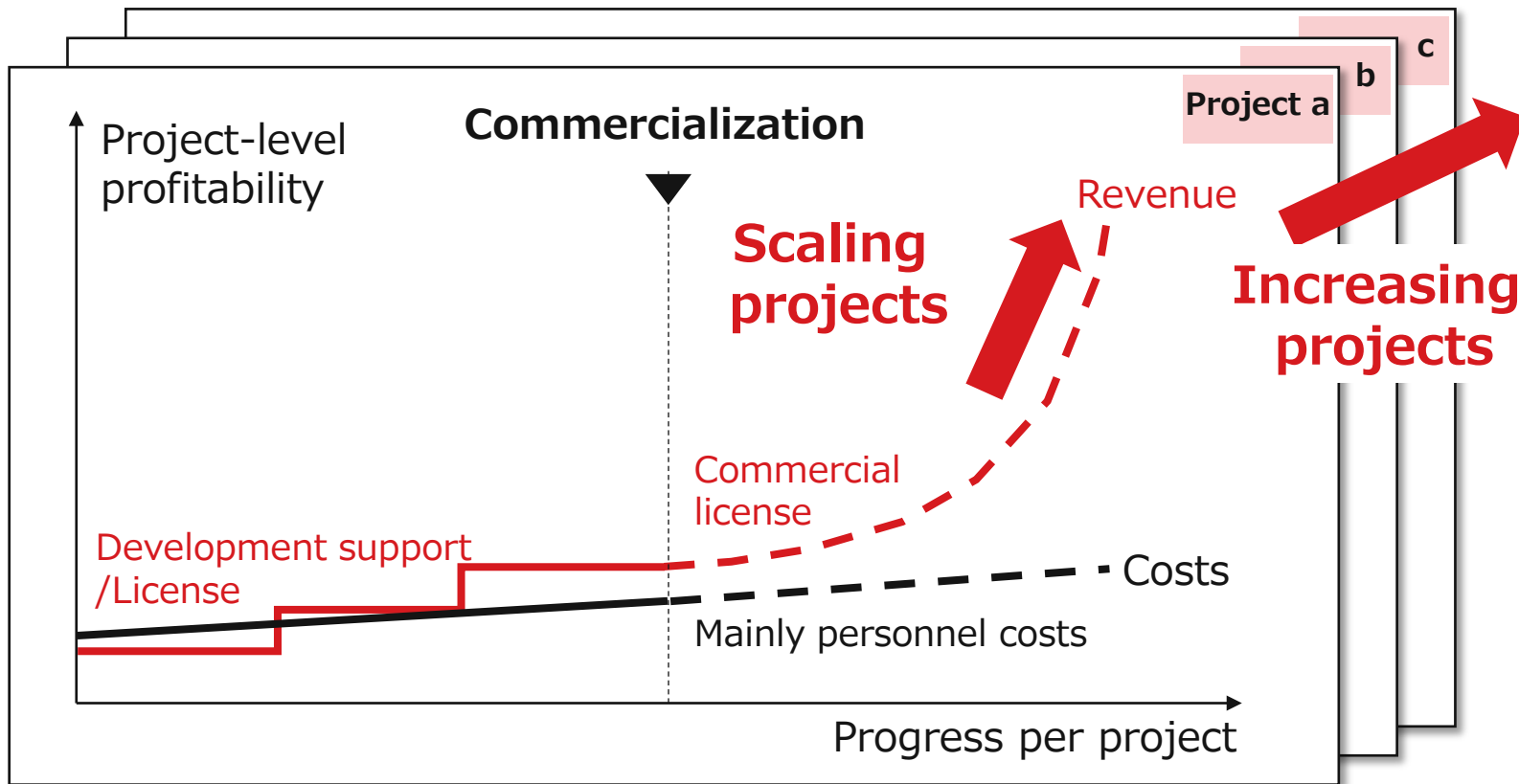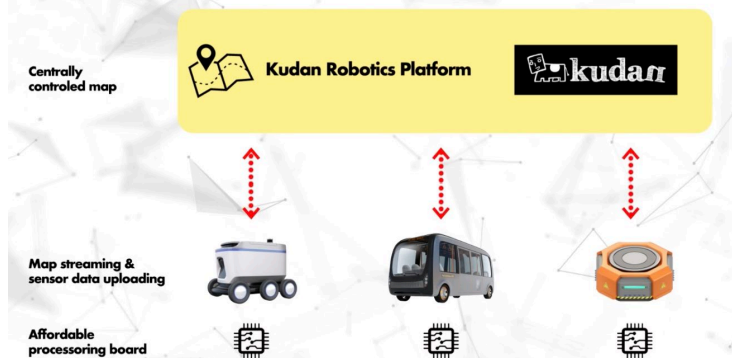
- Support the realization of solution platforms that allow multiple products to synchronize or expand their applications centered on Kudan technology
- Aim to improve profitability by taking customers' commercialization as a foothold for the solution business and by generating synergies from the solution business that will support the expansion of customers' commercialization

Newly launched solutions business
Existing product embedded business
→ Revenue for development support and technology provision

Solution/ Platform

Solution platforms to be integrated in the future

Digital twin	Robot platform	Metaverse

Technological integration · Technological integration · Technological integration

Product

Product a | b | c · · ·

Product d | e | f · · ·

Product g | h | i · · ·

Deep Tech

kudan

Solution examples

◆ Robotics platform

When a phase of introducing one robot on a trial basis is over and entering a phase of operating multiple types of robots on site, we are beginning to see the issue of <u>disorganized maps and management tools</u> for each type of robot
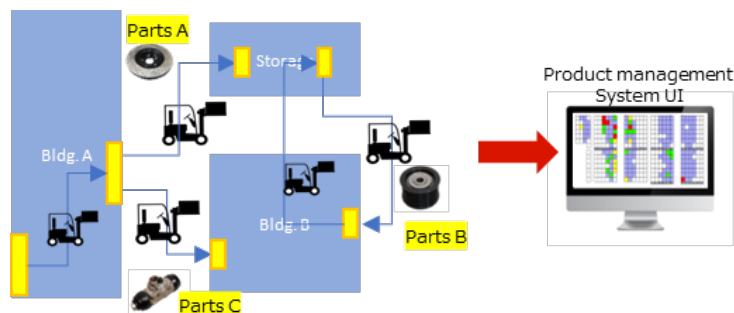
With Kudan's SLAM solution, we can develop **a unified platform that can centrally manage robots** from different companies

◆ Mapping solutions

3D maps are used for digital twin and simulation. On-site operations were sometimes difficult since <u>the equipment for acquiring maps has been extremely expensive</u> and <u>it has been necessary to call in specialized companies to acquire and update maps</u>.

Kudan's SLAM solution **enables inexpensive equipment to acquire highly accurate 3D maps**. Also, **the maps include feature points from which location information can be obtained** and can be developed into a number of robotic and Metaverse solutions.
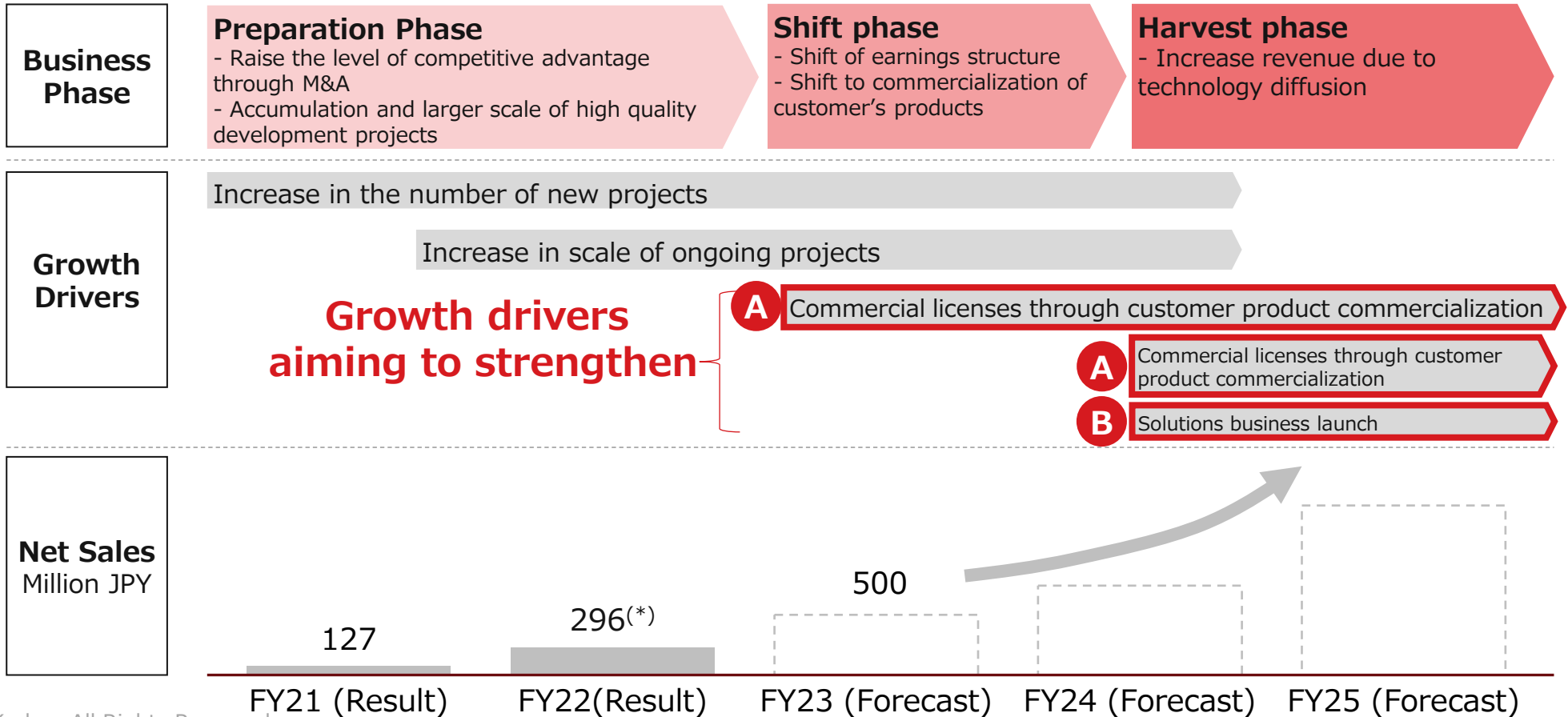
◆ Location ✕ AI DX Solutions

By combining location information from our SLAM with AI technology from partner companies, we can provide a completely new DX solution that has never been seen before.

For example, when parts are transported between buildings in a factory using forklifts in any direction, it has been difficult to manage in real time which parts and how many parts are in which storage area.
To solve this problem, we will develop a DX solution that can manage parts in real time without using markers, RFID, etc. by **using AI to recognize what parts have been picked up and SLAM to recognize where they have been transported to.**

SLAM with AI enable
real-time, integrated management of complex parts
inventory status across buildings

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Shift to the harvest phase

- Keep the strategy to shift earnings structure aiming for profitability and revenue model through the commercialization of customers' products to realize revenue growth from the fiscal year ending March 2024 onward

- Aim to shift to the harvest phase from "project-level profitability" to "business-level profitability" by strengthening growth drivers

- Depending on the commercialization of customers' products, Kudan aims to generate several million yen to several tens of millions of yen per project at the start of commercialization, and then to generate revenue in the hundreds of millions of yen per project as product sales expand

Business Phase	**Preparation Phase** - Raise the level of competitive advantage through M&A - Accumulation and larger scale of high quality development projects	**Shift phase** - Shift of earnings structure - Shift to commercialization of customer's products	**Harvest phase** - Increase revenue due to technology diffusion

Growth Drivers

Increase in the number of new projects

Increase in scale of ongoing projects

Growth drivers aiming to strengthen

A Commercial licenses through customer product commercialization

A Commercial licenses through customer product commercialization

B Solutions business launch

Net Sales
Million JPY

- FY21 (Result): 127
- FY22 (Result): 296 (*)
- FY23 (Forecast): 500
- FY24 (Forecast)
- FY25 (Forecast)

(*) Revenue adjusted for the impact due to accounting standards change

Metaverse demand pushes us forward

- With the demand for Metaverse as a tailwind, Kudan's Artificial Perception/SLAM technology is the core technology of the Metaverse, which realizes the "coupling of real space and digital space," and further extends the Metaverse to integrate with robotics

- Capture the ongoing evolution of Metaverse demand for growth by providing versatile-purpose technology for both Metaverses

Metaverse（AR/VR）

Real space → **Digital space**
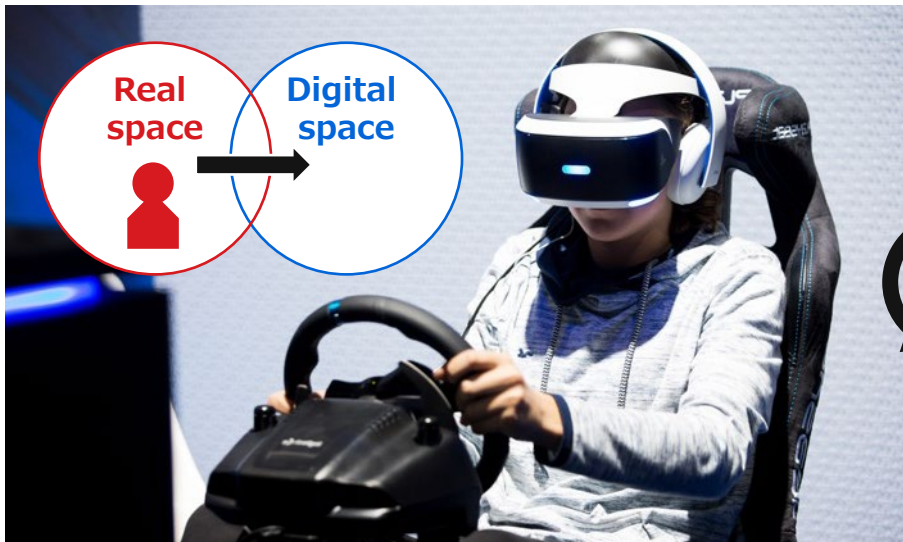
Extended Metaverse（Robotics）

Real space ← **Digital Space**
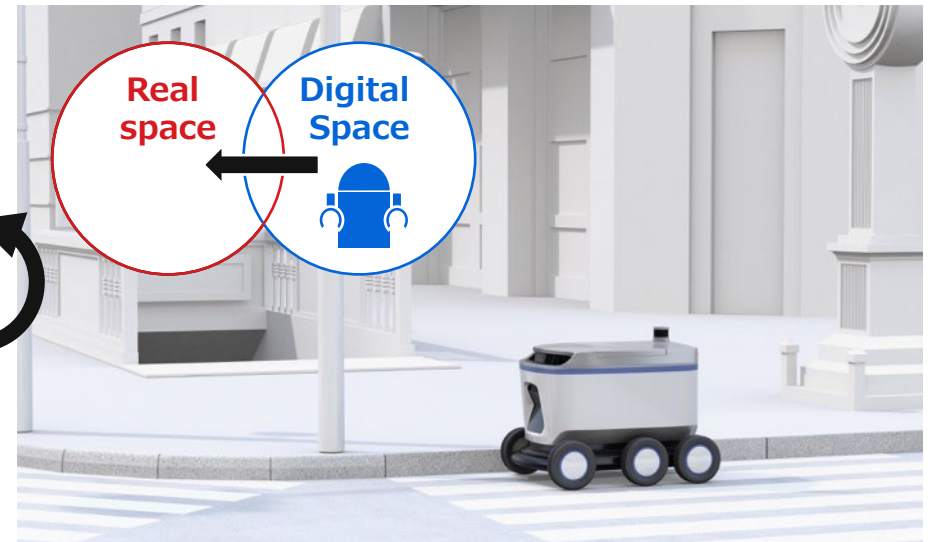
Metaverse evolves as real and digital spaces are more highly connected, such as robot operations via the Metaverse

Mid- to long-term R&D investment for discontinuous growth

- In addition to developing its Deep Tech efforts, the company will invest in additional technological innovations for discontinuous growth over the mid to long term

- Due to the nature of an algorithm-layered Deep Tech company, the majority of R&D investment is in personnel costs, and the scale of additional investment in the future is expected to be about several additional engineers per year

Business scale

Mid-to-long term
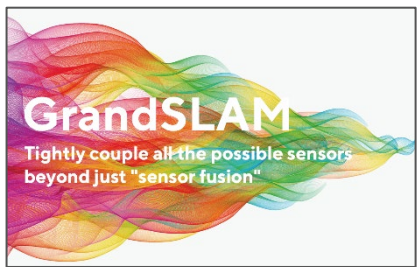
Short term

Present

Time

Dramatic growth via mid-to-long term technological innovation

Event-based camera SLAM
(Applied technology for next-generation cameras that imitate the visual nerve and retinal structure of living organisms. Further breakthrough technology for autonomous driving and robotics because it is ultra-high speed but stable even in dark place.)
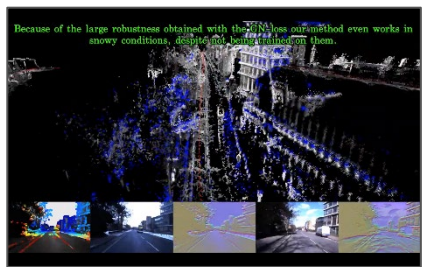

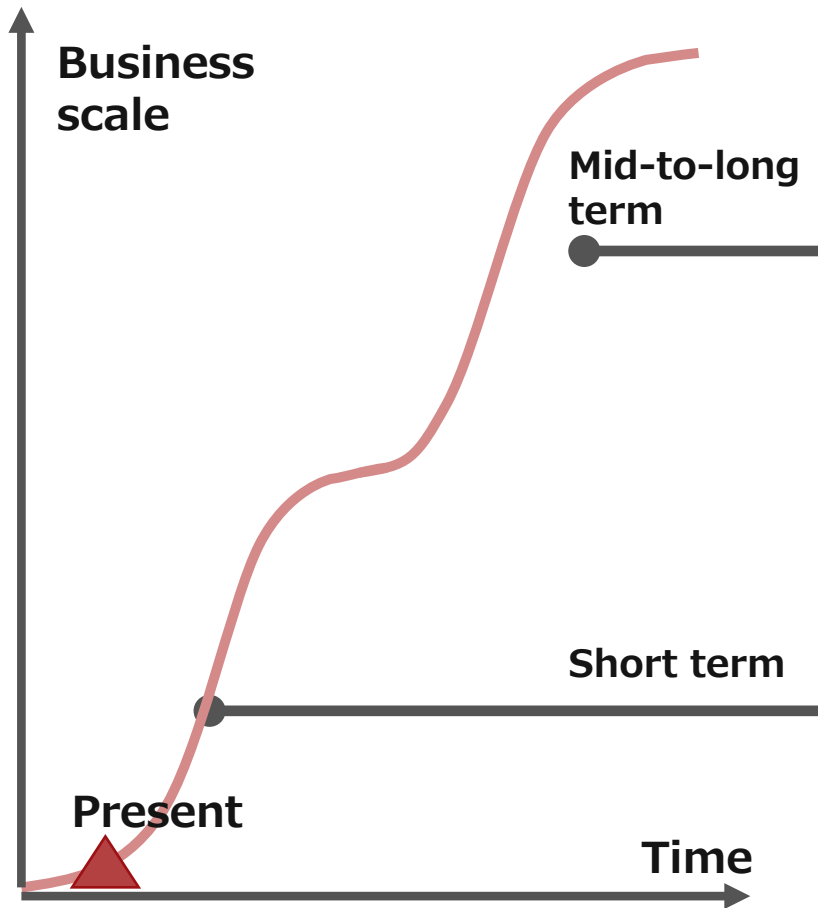## Growth by capturing and strengthening the base upon areas where the demand is evident

GrandSLAM
(Tight coupling of major sensors)

GN-Net/Super-point
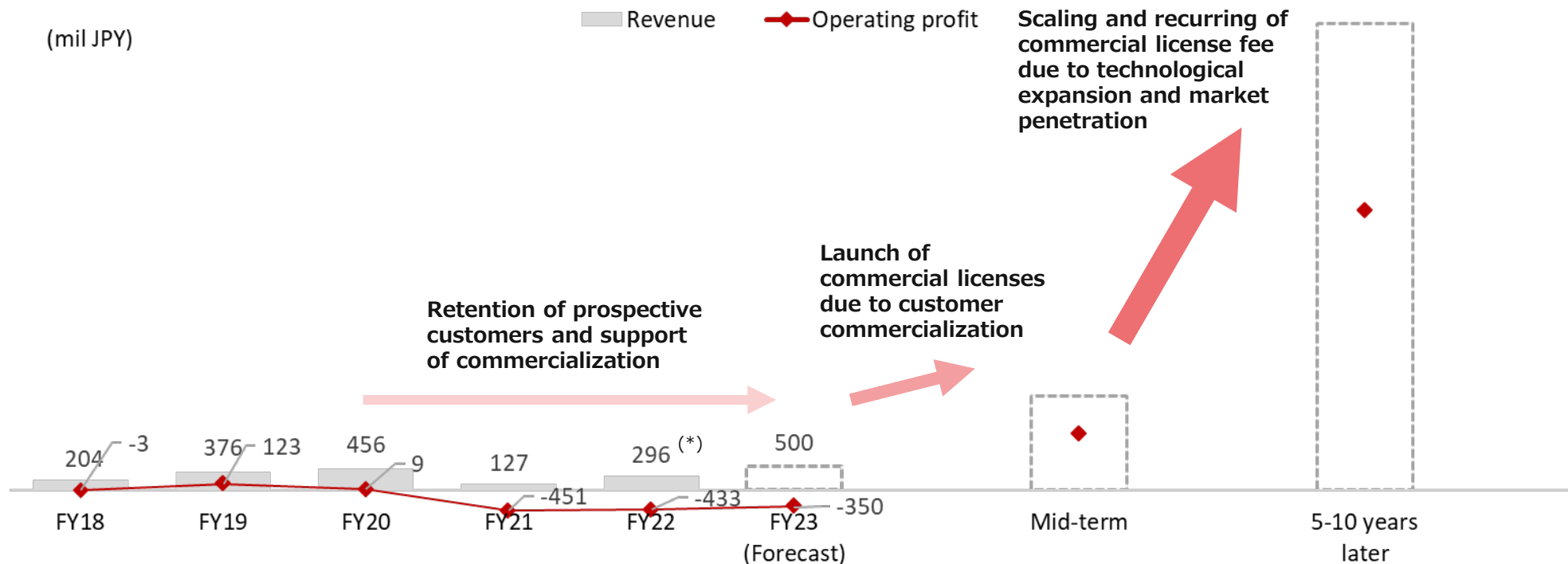(Combining SLAM with deep learning)

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Future growth potential (Mid- to Long-term)

— Stable commercialization from the cumulative customer projects creates technological penetration to the market, leading to recurring revenue from commercial licenses and significant growth in profit

Mid- to Long-term estimate

Revenue ▬ Operating profit

Scaling and recurring of commercial license fee due to technological expansion and market penetration

Launch of commercial licenses due to customer commercialization

Retention of prospective customers and support of commercialization

(mil JPY)

	FY18	FY19	FY20	FY21	FY22	FY23 (Forecast)	Mid-term	5-10 years later
Revenue	204	376	456	127	296 (*)	500		
Operating profit	-3	123	9	-451	-433	-350		

（*） Revenue adjusted for the impact due to accounting standards change

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Important Notice

- This document contains Kudan's plans, estimates and expectations for the future based on its current business situation and industry trends.

- All such projections for the future inherently involve uncertainty and a wide variety of risks.

- It is conceivable that risks both understood and unforeseen, uncertainties and other factors may cause actual results to differ from the projections contained within this document.

- Kudan offers no guarantee of the accuracy of its projections for the future and accepts that they may differ significantly from actual results.

- All projections for the future included in this document are based upon information available to Kudan as of August 15th, 2022, and may not be updated or changed to reflect future developments or changes in status.