



# **Supplementary Documentation to the financial report for the second quarter of the fiscal year ending March 2022**

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November 12, 2021

**Eyes to the all machines**

# 1. Highlights for 2Q FY2022

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## Multiple projects getting more certain to lead to customers' commercialization

In both Visual SLAM and Lidar SLAM, Kudan has supported multiple projects to accelerate the integration of SLAM functions into products and solutions under development by its customers. As a result, development toward commercialization is accelerating and becoming more certain. As projects with high certainty of commercialization, there are three projects with targeted market launch timing in FY22 to FY23 and one project with that in FY24, and more projects with a high certainty will be added in the future.

※For details, please refer to “3. Progress toward customers' commercialization” on page 16-19

## The acquisition of Artisense as a wholly owned subsidiary

The schedule of the acquisition of Artisense, Kudan's group company, into a wholly owned subsidiary will be moved up from December 2022, the originally planned, to October 26-December 24, 2021, with the aim of accelerating the schedule of revenue growth and expanding its scale due to accelerated management integration.

※For details, please refer to “2. The acquisition of Artisense” on page 9-15

## Acquiring projects more effectively through partnerships

Especially in Japan, through the partnership with a technology trading company, and overseas, through partnerships with sensor OEMs such as Ouster and processor companies such as NVIDIA and Texas Instruments, there is an increase in the number of projects from companies with high needs for third-party SLAM. Kudan has been able to acquire projects more effectively due to these partnerships.

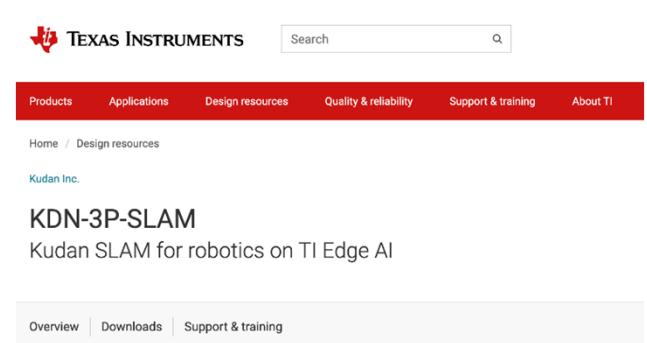
- Has made a partnership with ADLINK (Taiwan), developed an AMR prototype, integrated Kudan Visual SLAM into robotics solutions, and conducted joint sales. Also, joint marketing activities are conducted such as the exhibition of an AMR prototype at “ROSCon JP 2021” and “Robotics & Automation exhibition (UK)”.
- Nuvoton Technology Corporation Japan (formerly Panasonic Semiconductor Solutions) demonstrated its solution enabled by Kudan Visual SLAM at “ITmedia Virtual EXPO 2021 Autumn”
- Has become an official SLAM partner of Ouster, a leading provider of high-resolution digital lidar sensors (US) and started offering the Kudan Lidar SLAM evaluation program on Ouster’s website. Kudan has acquired more than dozens of evaluation projects since the program started in August.



Joint webinar hosted by Ouster



Promotional materials created by ADLINK



Kudan SLAM dedicated page on Texas Instruments' website

## Progress and new participation on large-scale projects

- Artisense participates in ERASMO (Enhanced Receiver for Autonomous Mobility), a multiple-year autonomous driving research project funded by EUSPA, together with other EU companies including Renault
- Progress on autonomous driving project using Kudan Lidar SLAM with a global leading automotive OEM
- Progress on the optimization project of Kudan Visual SLAM for robotics with a global leading semiconductor chip manufacturer



The ERASMO project aims at developing an on-board positioning device enabling fully autonomous driving. This project is being carried out by a consortium including Renault, a leading automotive OEM. Artisense plays a critical role in the project by contributing visual-based positioning and sensor fusion technology to augment GNSS data.

<https://erasmo-gnss.eu/>

**Javier IBANEZ-GUZMAN, Corporate Expert Autonomous Systems (AI), Renault**  
*"The Artisense team lead by Prof. Cremers has built a unique visual positioning solution that should enhance position estimates for vehicle navigation, particularly in areas where GNSS signals are poor or non-existent. The reason why we invited them to join us in the ERASMO project around the Galileo GNSS."*

# Highlights / R&D – R&D progress in the last 6 months: Visual SLAM



- For each algorithm, we have efficiently acquired and progressed projects by focusing on development items that are in high demand in the targeted areas and are more likely to gain competitive advantage

Algorithm	Development Item	Project progress (examples)
	<ul style="list-style-type: none"><li>Improved performance on fisheye type cameras</li><li>Improved performance on the integration of wheel odometry</li><li>Improved tracking accuracy using GPS</li></ul>	 Major automotive Tier1: ADAS
		 Major Japanese telecommunication company: Robotics
		 Engineering company: Indoor positioning
	<ul style="list-style-type: none"><li>Improved performance on IMU integration and wheel odometry integration</li><li>Localization on existing point cloud map and its implementation on the cloud</li><li>More accurate time synchronization of sensors</li></ul>	 Japanese engineering Company: Autonomous driving
		 Major Japanese telecommunication company: AR
		 Chinese autonomous delivery robot OEM: Robotics
		 SLAM image with a fisheye camera

# Highlights / R&D – R&D progress in the last 6 months: Lidar SLAM

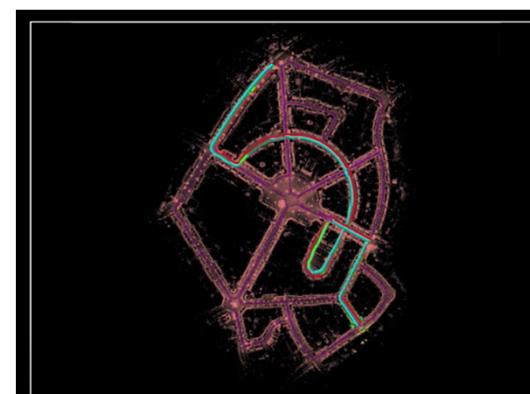


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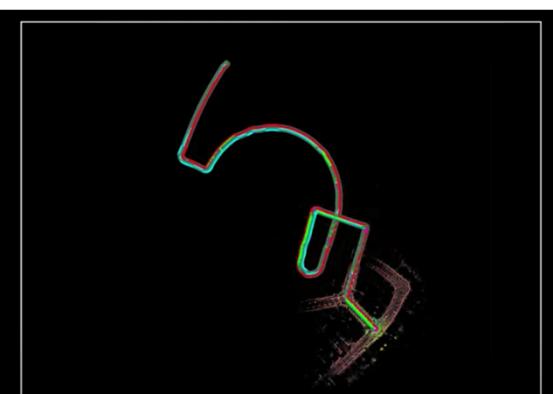
Algorithm	Development Item	Project progress (examples)
	<ul style="list-style-type: none"><li>Map merging function</li><li>Map streaming function</li><li>Improved accuracy by correcting point cloud distortion, etc.</li></ul>	<p> Automotive OEM: Autonomous driving</p> <p> Major telecommunication: 5G x SLAM</p> <p> US mapping provider: Mapping</p>



Merge several maps  
into a single large map



Without Map Streaming



With Map Streaming

Comparison of maps  
with and without map streaming

# Performance overview



- Expansion of Lidar SLAM and Artisense SLAM technology lineup and the optimization of the project portfolios have had a positive impact, resulting in continued revenue recovery trend due to an increase in orders and progress in the development phase of existing projects after bottoming out the performance in the previous fiscal year from the rapid deceleration of the market due to the COVID-19 pandemic and the delay in a new product launch

(Unit : million yen)

	Performance for 2Q of FY21	Performance for 2Q of FY22	Forecast for FY22	Change (from the performance for 2Q of FY21)	Performance For FY21 (Reference)
<b>Net Sales</b>	<b>30</b>	<b>110</b>	<b>300 ~350</b>	<b>262.7%</b>	<b>127</b>
<b>Operating Profit</b>	<b>△238</b>	<b>△220</b>	—	—	<b>△451</b>
<b>Ordinary Profit</b>	<b>△220</b>	<b>△323</b>	—	—	<b>△1,575</b> (incl. "share of loss of entities accounted for using equity method"(1,232))
<b>Profit Attributable to Owners of Parent</b>	<b>△220</b>	<b>△321</b>	—	—	<b>△1,608</b>

## **2. The acquisition of Artisense**

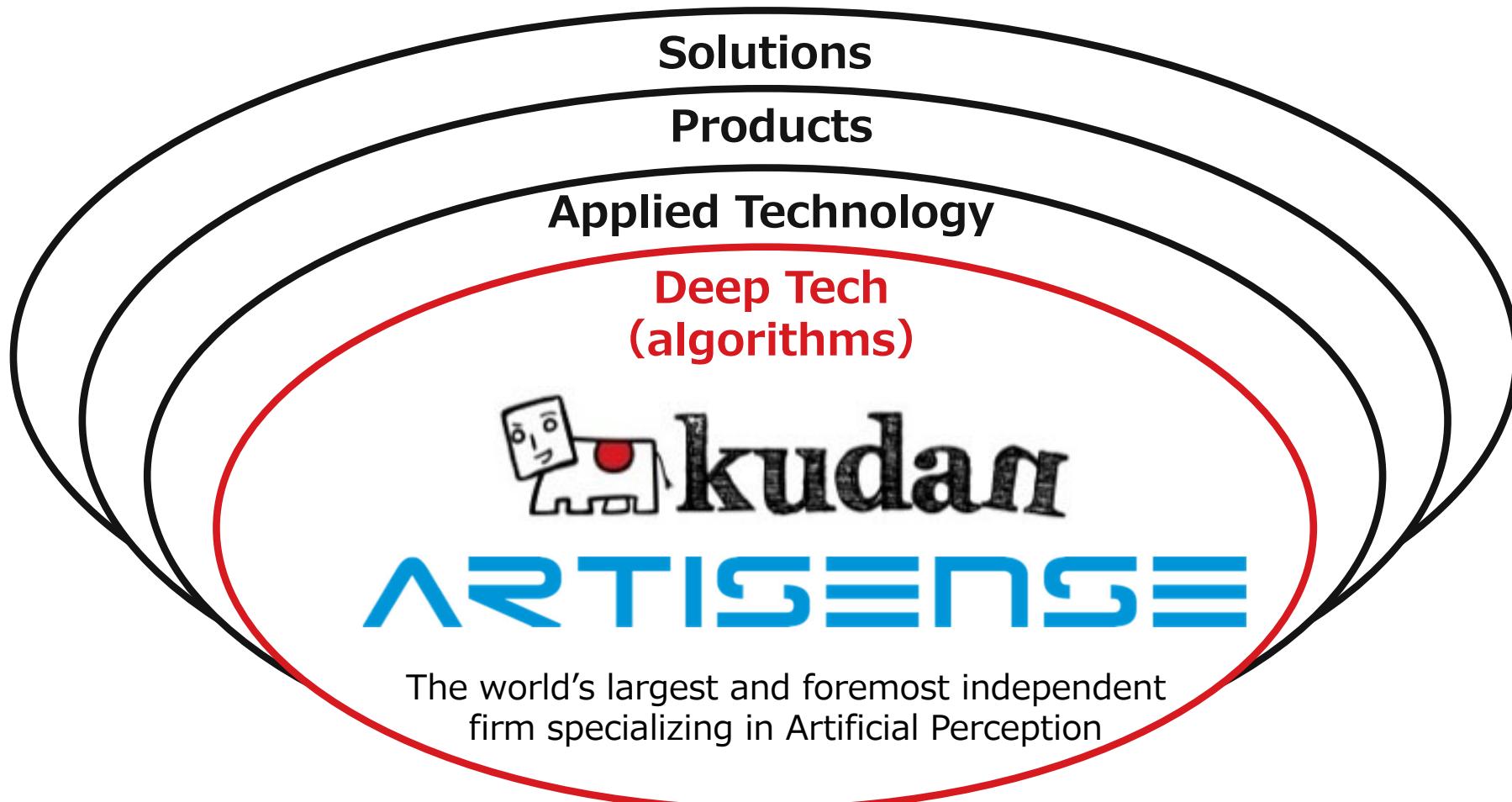
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# Deepen the leadership position with the acquisition of Artisense



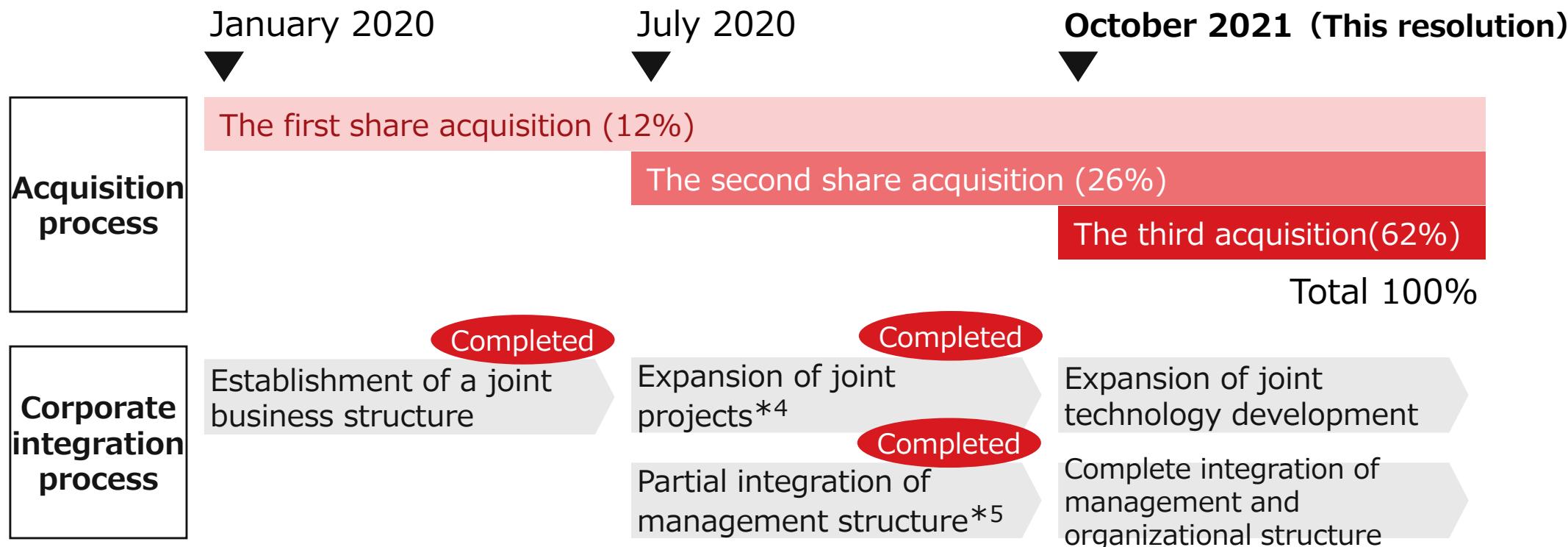
**Kudan acquires its group company, Artisense as a subsidiary to further strengthen its position, which is already the world's largest firm in the field of Artificial Perception and SLAM, and to increase its competitive advantage and growth potential.**

※This acquisition is provided for in the share purchase agreement disclosed in April 2021, and this disclosure is a resolution related to finalizing the schedule and payment method.



# About the resolution on October 4<sup>th</sup> 2021

1. Due to steady progress in the phased corporate integration, the schedule for the third share acquisition was accelerated and moved up to October 26<sup>th</sup> - December 24<sup>th</sup> in 2021\*1
2. In consideration for the acquisition price of 1.7 billion yen\*2, Kudan will issue 494 thousand new shares\*3



\*1 Accelerated from the deadline (December 2022) stipulated in the current share purchase agreement (disclosed in April 2021)

\*2 No amendment from the conditions stipulated in the current share purchase agreement (disclosed in April 2021)

\*3 Newly issued shares are subject to lock-up provision or off-market block trade, etc. is planned to be arranged.

\*4 As joint projects, we have conducted 7 paid customer projects, joined the NVIDIA Partner Network, and sponsored ICCV conferences

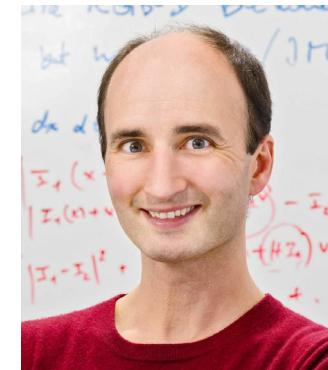
\*5 Integration of top management through concurrent post of CEOs of both companies

- Kudan has acquired a world-class technical team led by Professor Daniel Cremers, the leading authority in the field, and has achieved a dominant position



- **Professor Cremers, a leading authority in Artificial Perception and autonomous driving research**

- Founder and Chief Scientific Officer at Artisense
  - World's most referenced researcher in the fields of spatial AI and SLAM (47,000 citations of his work in academic papers, with a Google h-index, indicating contribution to the academic field, of 101)
  - The head professor of Computer Vision & Artificial Intelligence at the Technical University of Munich



- **Together with Kudan's own personnel, a team of 30 of the world's leading technical experts has been established**

- Professor Cremers' team of around 20 technical experts have joined forces with Kudan
  - Kudan has managed to attain a significant advantage over its competitors by securing this team of experts in the field while there is a global shortage of top engineers and the competition for acquiring such talents is fierce, including even the big-four tech companies

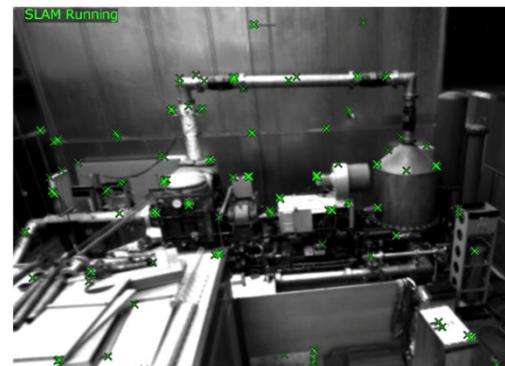
- Company solidification via the acquisition of the IP (Intellectual Property) of future technology
- Aim for successful breakthroughs via industry-leading technology commercialization  
→ Accelerated integrations of each technology, such as SLAM and Deep Learning, Lidar SLAM and Visual SLAM, Direct SLAM and Indirect SLAM



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

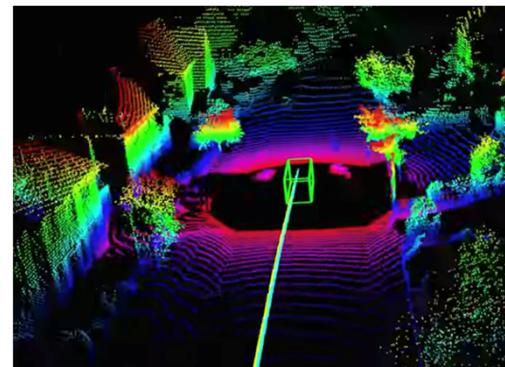
## Indirect SLAM

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



## Lidar SLAM

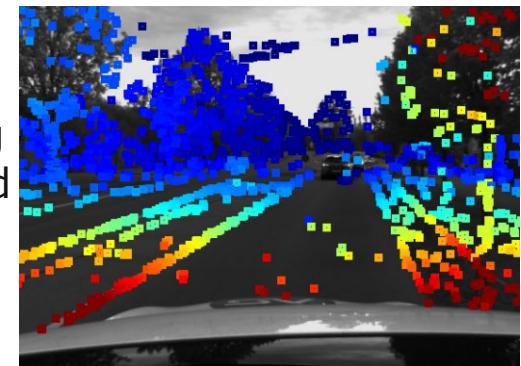
- Lidar data processing
- Strong in recognizing fast movements
- High stability



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

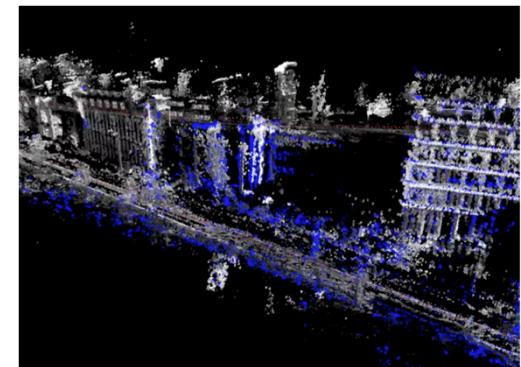
## Direct SLAM

- Camera image (visual) processing
- Capable of detailed recognition
- High stability



## GN-net, etc. (Deep Learning)

- Robust recognition on the verge of a breakthrough
- A revolution in dealing with environmental changes



# Examples of Artisense's projects

- With the world's highest level of technology, Artisense has already developed a large number of projects on a global scale

**SIEMENS**

**BOMBARDIER**

**DB**

**ECARX**



**RENAULT**  
Passion for life

**NNG**



Autonomous  
Electric Truck OEM



Tier 1 automotive  
supplier



Indoor Factory  
Robot



Outdoor delivery robot  
for a general electronics  
manufacturer



Mobile mapping system



Autonomous Vehicle



Autonomous  
delivery robot OEM



Automotive  
Autonomous Valet  
Parking

**BOMBARDIER** : Canadian industrial transportation equipment OEM, mainly aircraft, and sales of \$6.5 billion (2020)

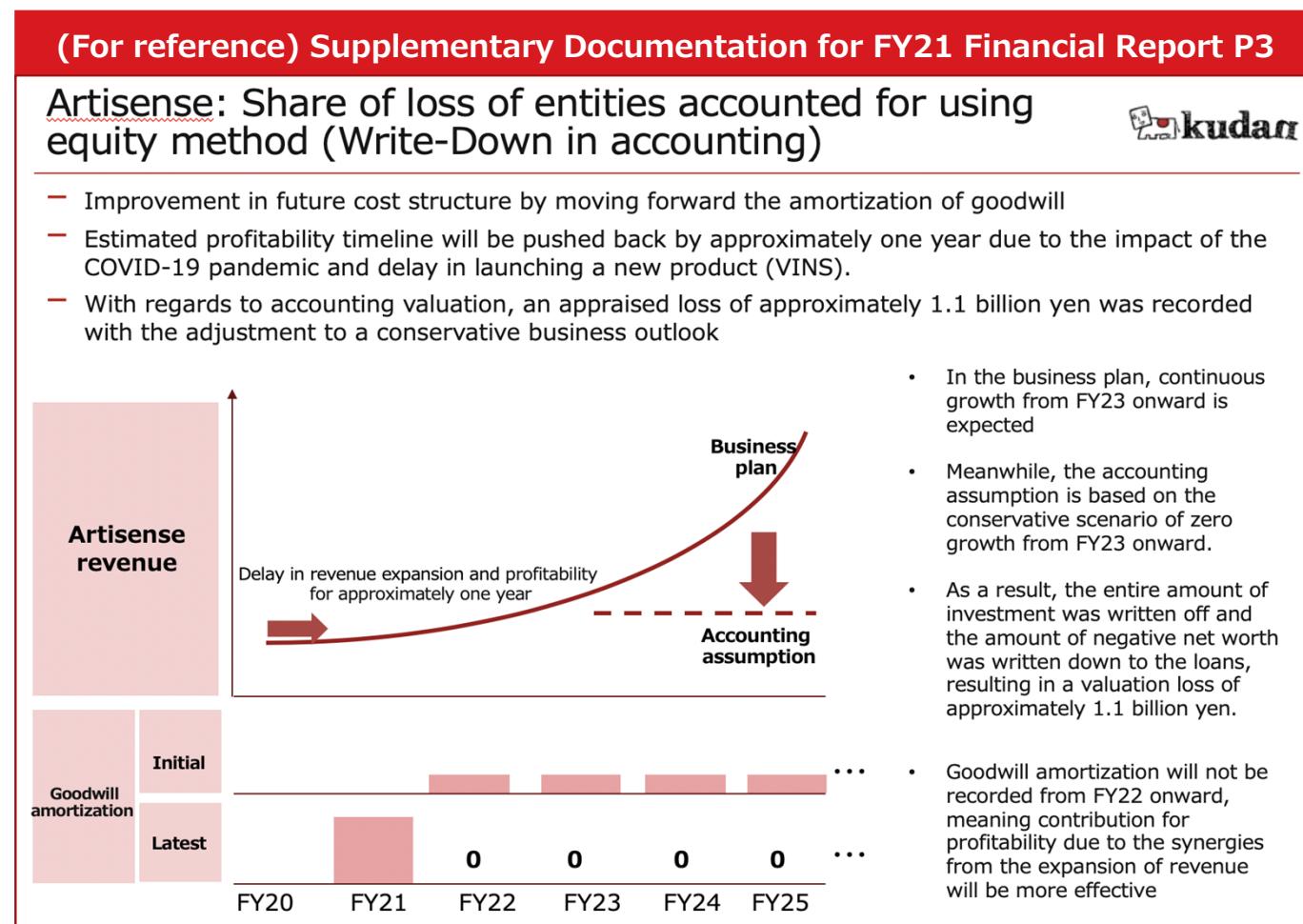
**DB (Deutsche Bahn)** : Germany's largest railroad company, and sales ~€40 billion (2020)

**ECARX** : Chinese autonomous intelligent solutions provider, which received investment from Baidu and Geely and has signed a partnership agreement with Volvo.

**NNG**: Hungary's Tier 1 automotive supplier. More than 30 automotive brands have adopted its solution, and seven of the top 10 OEMs have adopted it.

# Impacts on accounting

- (Short-term) In accounting, Artisense has become a wholly owned subsidiary of Kudan as of October 2021, and all revenues and expenses of Artisense will be recorded in Kudan's consolidated financial statements from then on
- Possibility that expenses as R&D investment (impairment loss) will be recorded following the impairment of goodwill for the first acquisition and the second acquisition of shares conducted in FY21\*. In this case, future goodwill amortization will be reduced, and the contribution to profitability from the expansion of revenue achieved by management integration synergies will be more effective
- (Mid- to long-term) Aim to accelerate revenue growth and expand its scale through management integration



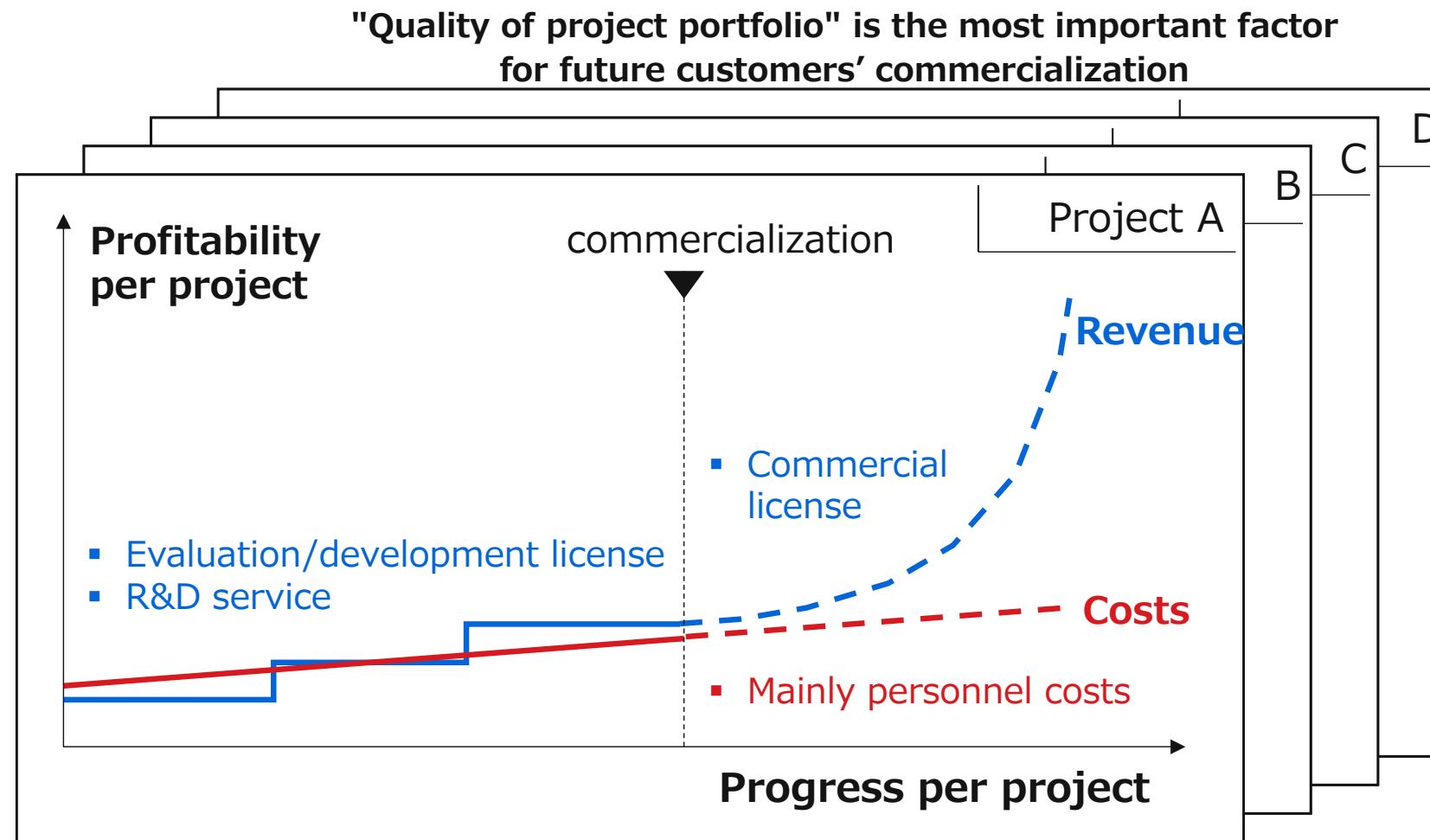
Delays in the business plan due to the impact of the COVID-19 pandemic, etc. will not hinder mid- to long-term growth potential, but the conservative accounting treatment is expected to be maintained for this acquisition as it is immediately after the FY21 financial reporting

### **3. Progress toward customers' commercialization**

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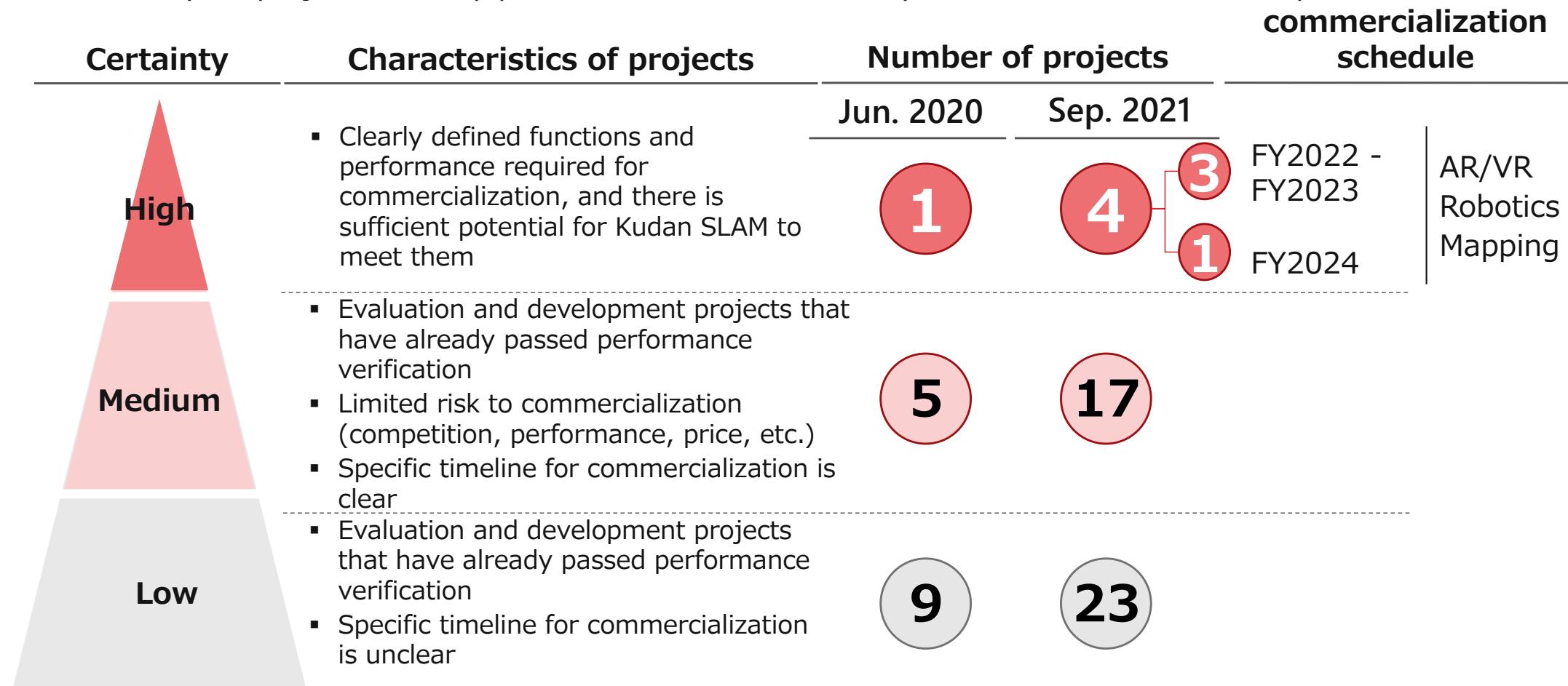
# Revenue model and future growth potential

- Almost all of customers' projects are in the evaluation or development phase, and Kudan is in the preparation phase, focusing on acquiring and continuing **projects that are expected to achieve commercialization and expand the scale of sales in the future**
- Although stable growth can be expected in revenue based on the progress of development milestones from evaluation/development licenses and customer development support, 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.



# Accumulation of projects toward customers' commercialization

- From the end of June 2020, before Artisense became a group company, to the end of September 2021, the total number of projects that have passed performance verification and are on track for customers' commercialization has increased from 15 to 44
- Of these projects, four projects have a high certainty of commercialization (three projects are expected to be productized in FY22/FY23, and one project is expected to be productized in FY24). In addition, there are nearly 20 projects in the pipeline for which the certainty of commercialization is expected to increase.



# Highlights of projects accumulated for customers' commercialization



Market	Company	Algorithm	Overview
Autonomous driving	TOP5 automotive OEM	Lidar	Use of KdLidar in the project on urban operation and sensor cost reduction in the field of autonomous driving
	Major engineering	Visual	Conducted evaluation and development of the use of ArtiSLAM for vehicle positioning in autonomous truck operation in factories and plants
ADAS	Major automotive Tier1	Visual	In progress of evaluation and development of driver assistance functions using KdVisual with cameras installed in commercial vehicles
	Major medical device OEM	Visual	In progress of final evaluation and the integration of KdVisual into medical AR headset
AR/VR	Major telecommunication	Visual	Conducted the development to create a solution platform using AR in various locations
	Major telecommunication	Visual	In progress of developing a platform that embeds KdVisual and cooperative use of various robots
Robotics	Autonomous delivery robot OEM	Visual	In progress of final evaluation of ArtiSLAM implementation, including integration, for positioning of outdoor delivery robots
	Mapping provider	Lidar	In progress of KdLidar being integrated into a solution that enables mapping in non-GPS environments

# Factors behind the increase in projects for customers' commercialization



## (R&D) Adaptation to market needs by adding functions, improving performance, and expanding technology lineup

- Enhanced wheel odometry in KdVisual and improved accuracy in KdLidar enable us to respond to customers' projects with more specific commercialization timeline
- The launch of Artisense SLAM enable us to acquire more projects, especially in outdoor robotics
- In robotics, easier integration through ROS (Robot Operating System) allows for a wider range of projects

※ For other R&D progress and contributions to project acquisition/progress, please refer to "Highlights / R&D – R&D progress in the last 6 months"

## (Business Development) Enhance sales channels and technology lineup by expanding partners and strengthening relationships

- Enhance channels to expand projects that fit Kudan/Artisense SLAM through partnerships with sensor OEMs, processor OEMs and technology trading companies
- Develop solutions combining SLAM and other technologies through partnerships and collaborations with engineering companies (e.g: Develop a package that includes not only SLAM functions but also robot hardware and software)

## (Market environment) Increasing market needs in both Visual SLAM and Lidar SLAM

- Increasing the number of projects for development of autonomous mobile robots for industrial use, and accelerated adoption of Visual SLAM by OEMs developing autonomous delivery robots using conventional technologies such as magnetic tape and 2D-Lidar SLAM
- The 3D-Lidar market is maturing, driven by price reductions, and as a result, the need for 3D-Lidar SLAM solutions is increasing

# Appendix

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# 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

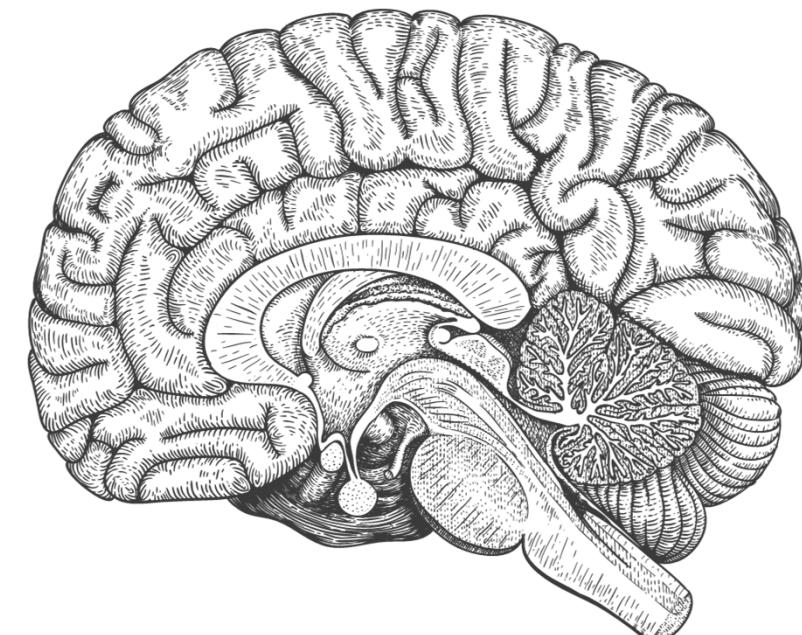


## Artificial Intelligence

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



||  
**The "brains" of machines,  
allowing them to make  
appropriate decisions**



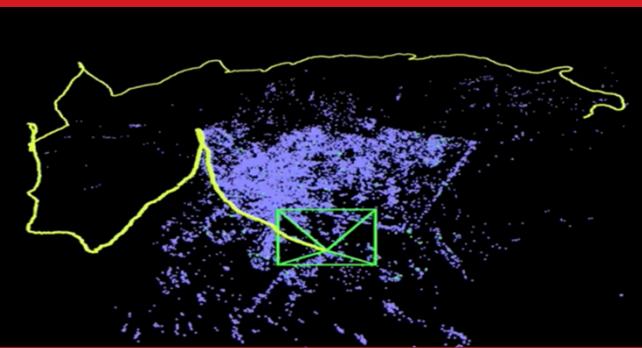
# AP will be the basis for broad range of industries alongside AI

- A group of technologies including SLAM and its related technologies to enable special recognition

## Visual processing (3D and kinesthetic sense)

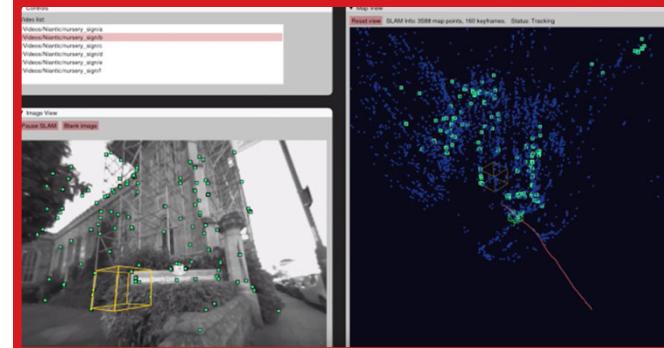
### SLAM\*<sup>1</sup>

(Simultaneous Localization and Mapping)



### ALAM\*<sup>2</sup>

(Asynchronous Localization and Mapping)



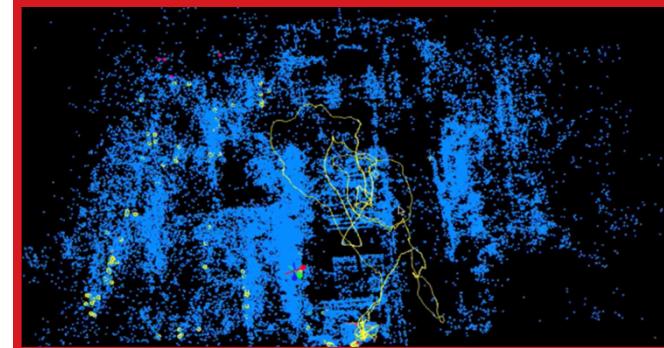
### VIO\*<sup>3</sup>

(Visual Inertial Odometry)



### SfM\*<sup>4</sup>

(Structure from Motion)



## Other sensing

Depth



Inertia



Odometry

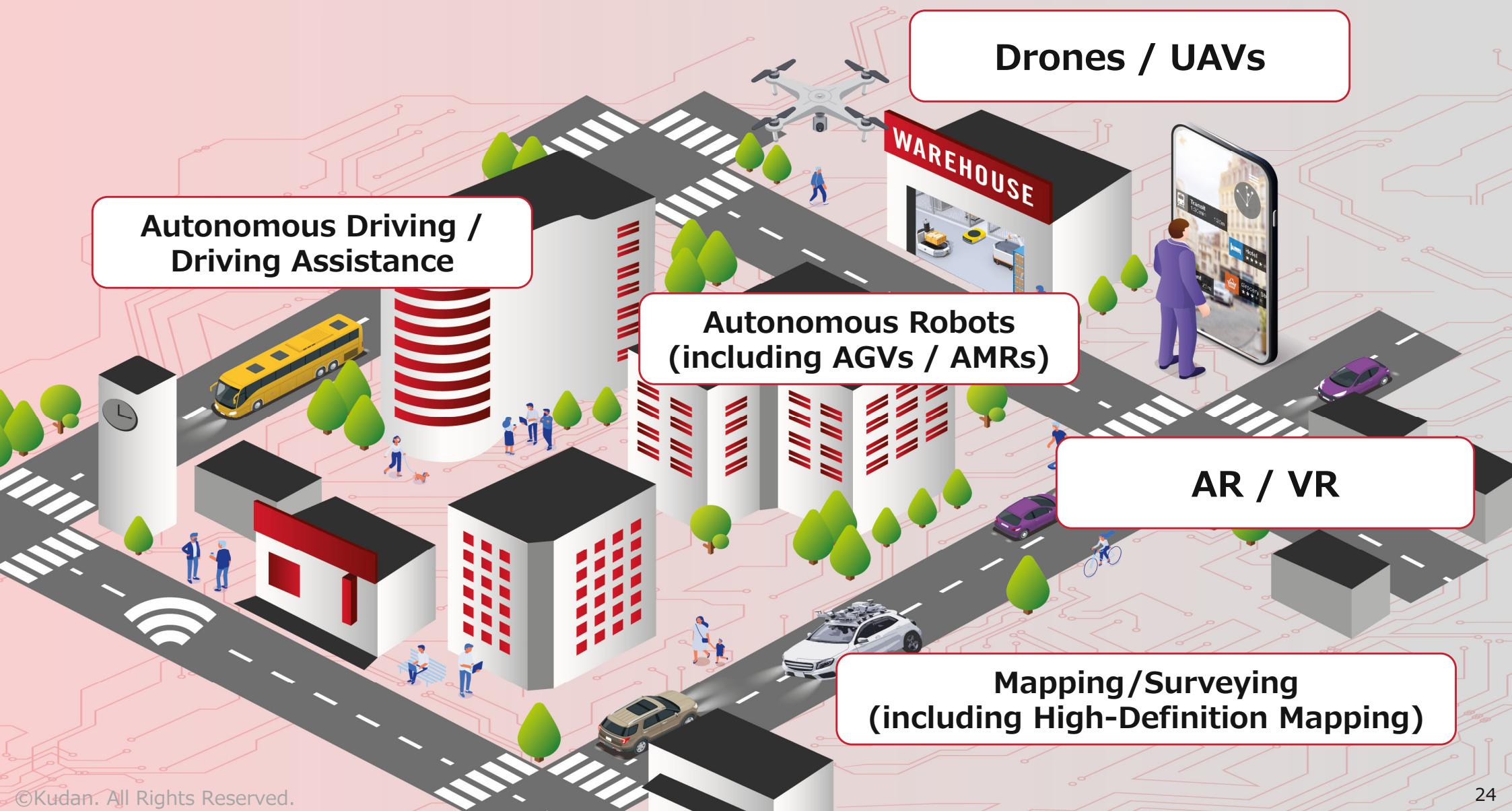


Position



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

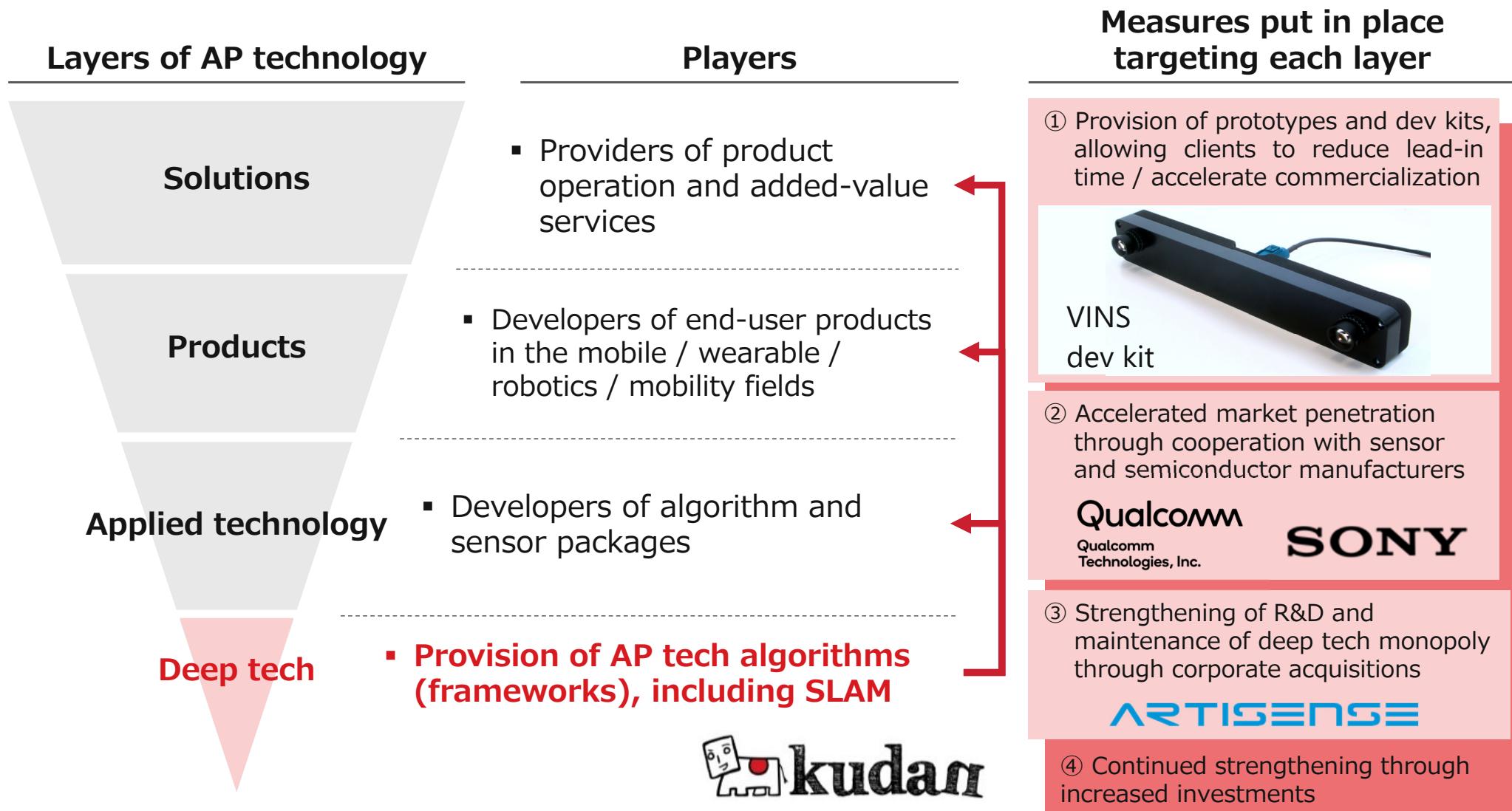
- Kudan aims to provide the gold-standard localization and mapping technology to be incorporated into a broad range of next-generation solutions for which spatial and positional cognition will be essential to all industries



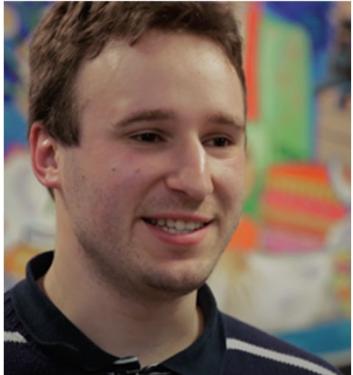
# Leader in the Deep Tech layer with strategic positioning



- 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

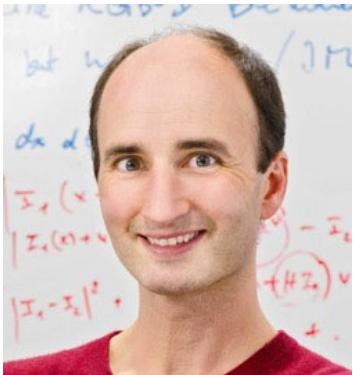


## Research & Development



### 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 47,000 citations of his work in academic papers, h-index 101)

## Other management members (previous employments)

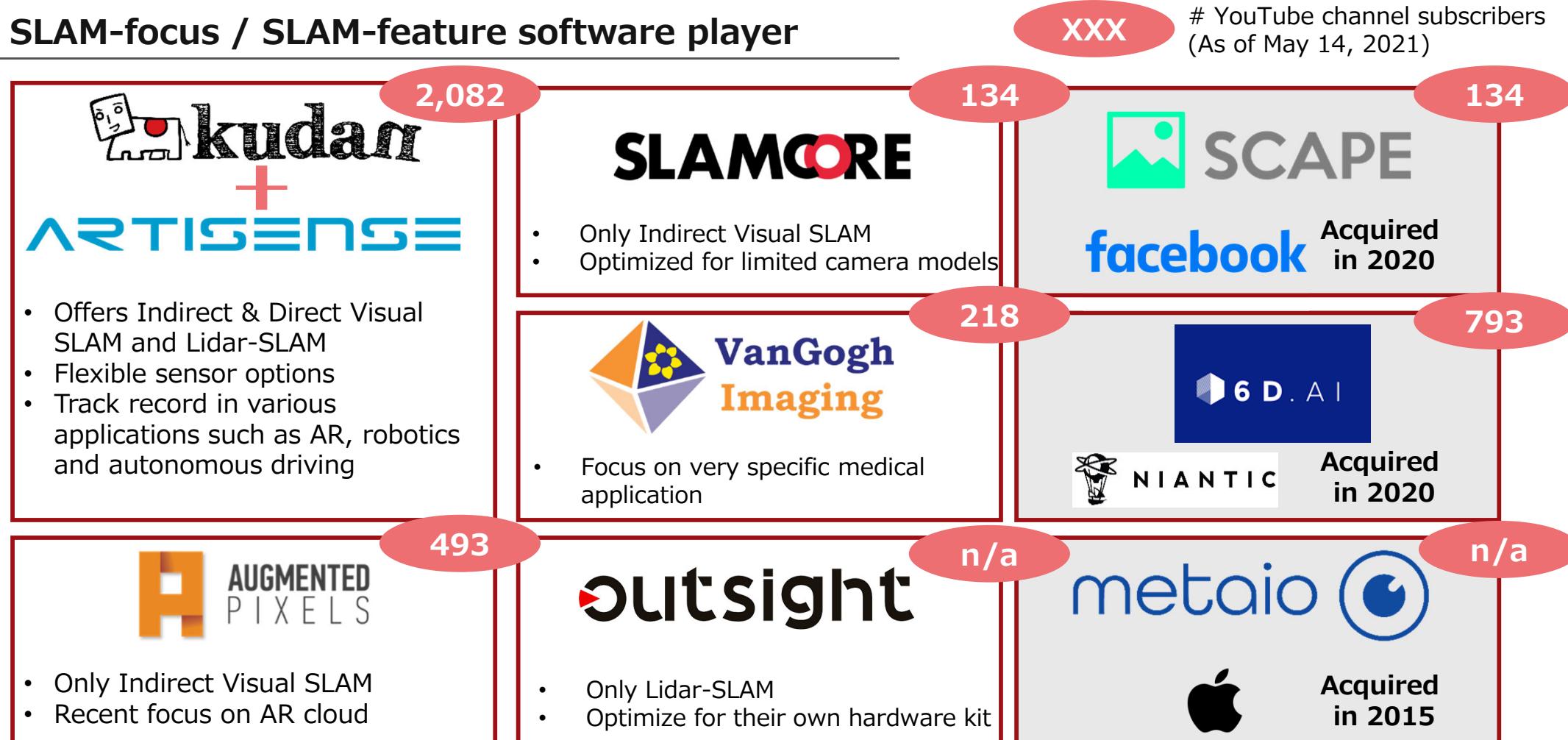


While the increase of acquisitions of the related technologies, Kudan and Artisense leads the market in track record and awareness



- 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 won prestigious awards in and outside of Japan



- Won the “embedded award 2021 start-up category” at Embedded World 2021, the most prestigious embedded system exhibition in the world (March 2021)
- Won Silver Prize at NTT docomo 5G DX awards (May 2020)
- These award has brought more media exposure and business opportunities



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

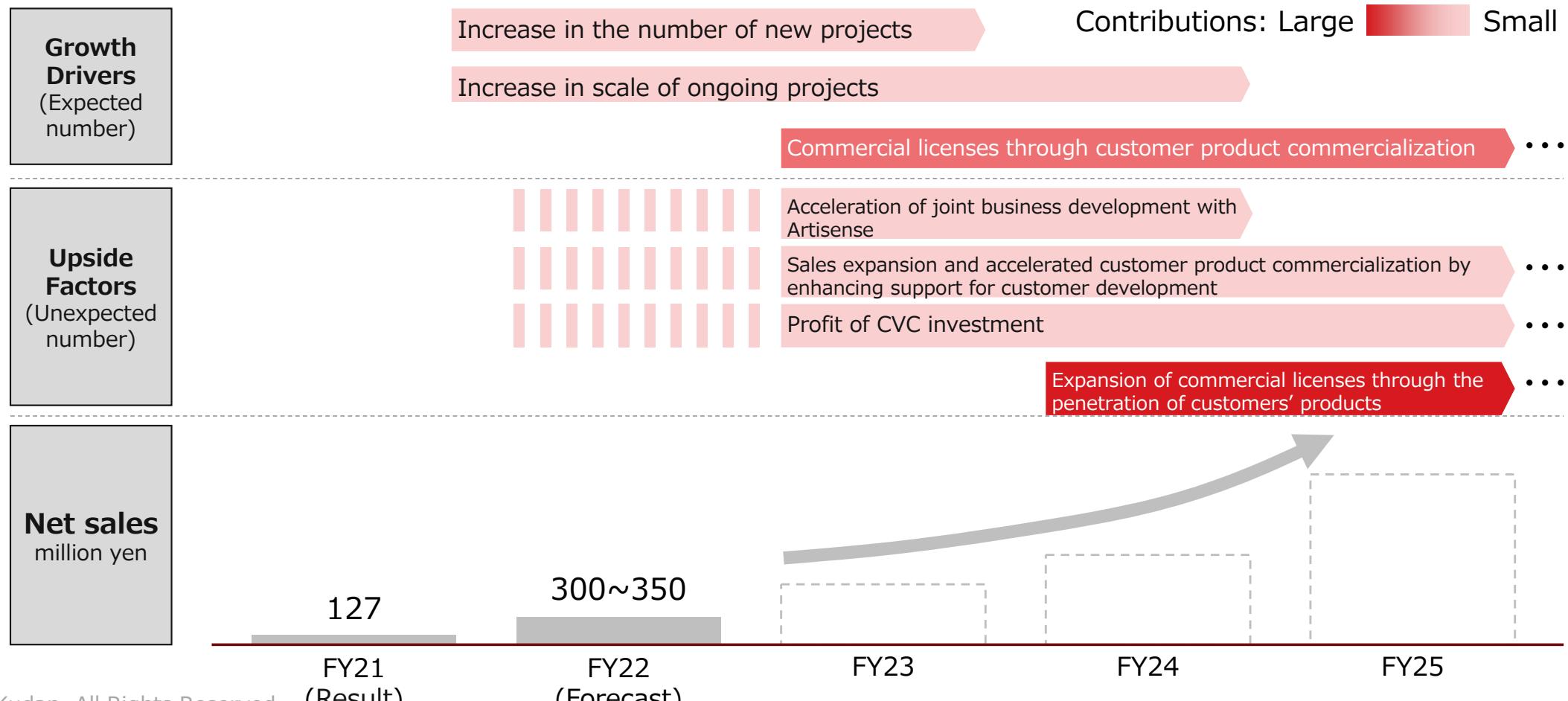


Timing	Main target applications and project overview	
F Y 2 0	May. <b>Robotics</b> ) Partnership with Thales group for next-gen tracking system development	<b>THALES</b>
	Aug. <b>Robotics</b> ) Alliance with SEAOS for warehouse automation with Autonomous robots with capital tie-up	<b>SEAOS</b>
	<b>Mobility</b> ) Signed with Japan Unisys to collaborate as Business Scaling Partner	<b>UNISYS</b>
	Sep. <b>Mobility</b> ) Partnership with Macnica to develop new value-added solutions for mobility business	<b>MACNICA</b>
	<b>Robotics, Mapping</b> ) Partnership with Ouster	<b>OUSTER</b>
	Nov. <b>AR</b> ) Develop RGB-D SLAM on smartphones with ToF sensor with Sony Semiconductor Solutions	<b>SONY</b>
	Dec. <b>AR/VR, Mobility</b> ) Partnership with Fixstars to offer accelerated high-performing SLAM	<b>FIXSTARS</b>
	Jan. <b>Robotics, Mapping</b> ) Partnership with Cepton on Lidar-SLAM and joint exhibition demo	<b>CEPTON</b>
	<b>Robotics, Mapping</b> ) Partnership with Velodyne on Lidar-SLAM	<b>Velodyne Lidar</b>
	Feb. <b>General</b> ) Initiated business collaboration discussion with Artisense	<b>ARTISENSE</b>
F Y 2 1	May <b>Robotics</b> ) Launch SLAM library for Qualcomm® Robotics RB3 Platform with their technical support	<b>Qualcomm</b>
	<b>Robotics</b> ) Joint development of 3D SLAM demo application with Analog Devices	<b>ANALOG DEVICES</b>
	<b>5G</b> ) Won Silver Prize at NTT Docomo 5D DX Awards	
	Jul. <b>Robotics</b> ) Launch SLAM library for Qualcomm® Robotics RB5 Platform with their technical support	<b>Qualcomm</b>
	Nov. <b>Robotics</b> ) Partnership with Vecow to jointly offer integrated solution for autonomous mobile robots	<b>Vecow</b>
	<b>AR, Mobility</b> ) Artisense released Automotive AR navigation demo with HERE technologies and NNG	<b>here</b> <b>NNG</b>
	Dec. <b>General</b> ) Achieved 40% image process acceleration with Synopsys ARC EV processor IP on Kudan SLAM	<b>SYNOPSYS</b>
	Feb. <b>Mobility</b> ) Provide Lidar SLAM to IIT Bombay autonomous vehicle project team	UNMESH MASHRULWA Innovation Cell IIT BOMBAY
	Mar. <b>General</b> ) Won “embedded award 2021 – Start-up” at embedded world 2021 DIGITAL	
	<b>General</b> ) Joined NVIDIA Inception Partner Network	<b>NVIDIA</b>
F Y 2 2	May. <b>Robotics</b> ) Partnership with robotics developer UGO to integrate Kudan SLAM into robotics and joint sales	<b>ugo</b>
	July. <b>Mapping</b> ) Signed a Developing License General Agreement with BIMEXPERTS and develop joint solutions	<b>BIMEXPERTS</b>
	<b>Robotics</b> ) Partnership with ADLINK, development of AMR, integration of Kudan SLAM into robotics, joint sales	<b>ADLINK</b>
	<b>General</b> ) Joined Texas Instrument's partnership network in robotics	<b>TEXAS INSTRUMENTS</b>
	<b>General</b> ) Become official SLAM partner with Ouster, a leading Lidar provider, and start offering tools on Website	<b>OUSTER</b>

# Performance forecast for FY22 and future growth potential (short-term)

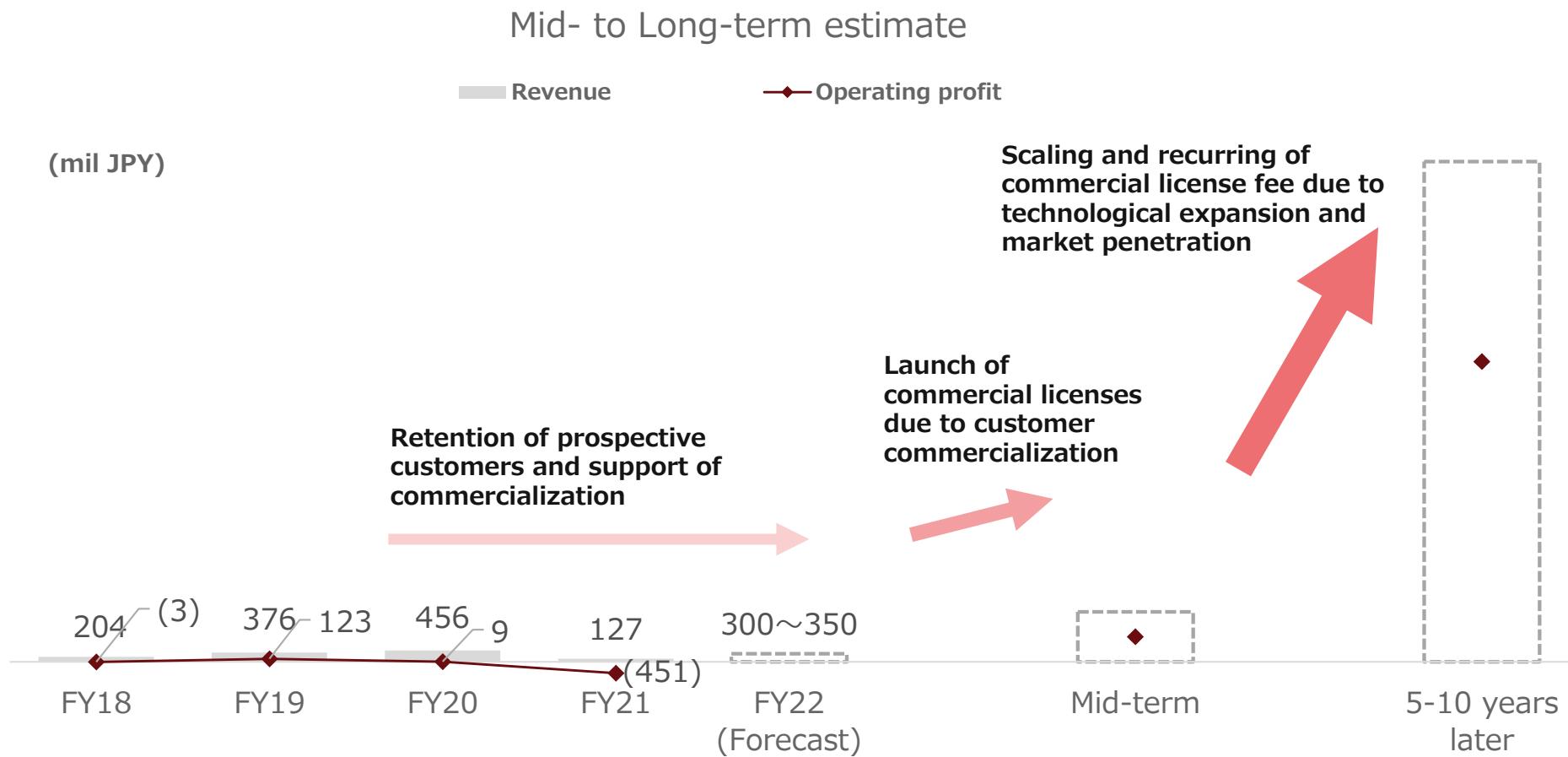


- In FY22, the current recovery trend will continue, mainly due to the expansion of projects toward commercialization with customers
- For FY22, only revenues are disclosed in the range due to the continued uncertainty of the impact of Covid-19 and other factors
- In FY23 and onwards, expect upside from accelerated joint business development with Artisense, sales expansion and accelerated customer product commercialization by enhancing support for customer development, and investment business.



# 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



- 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 November 12th, 2021, and may not be updated or changed to reflect future developments or changes in status.