NEC Innovation Day

NEC

Executive vice president, CTO and
member of the board

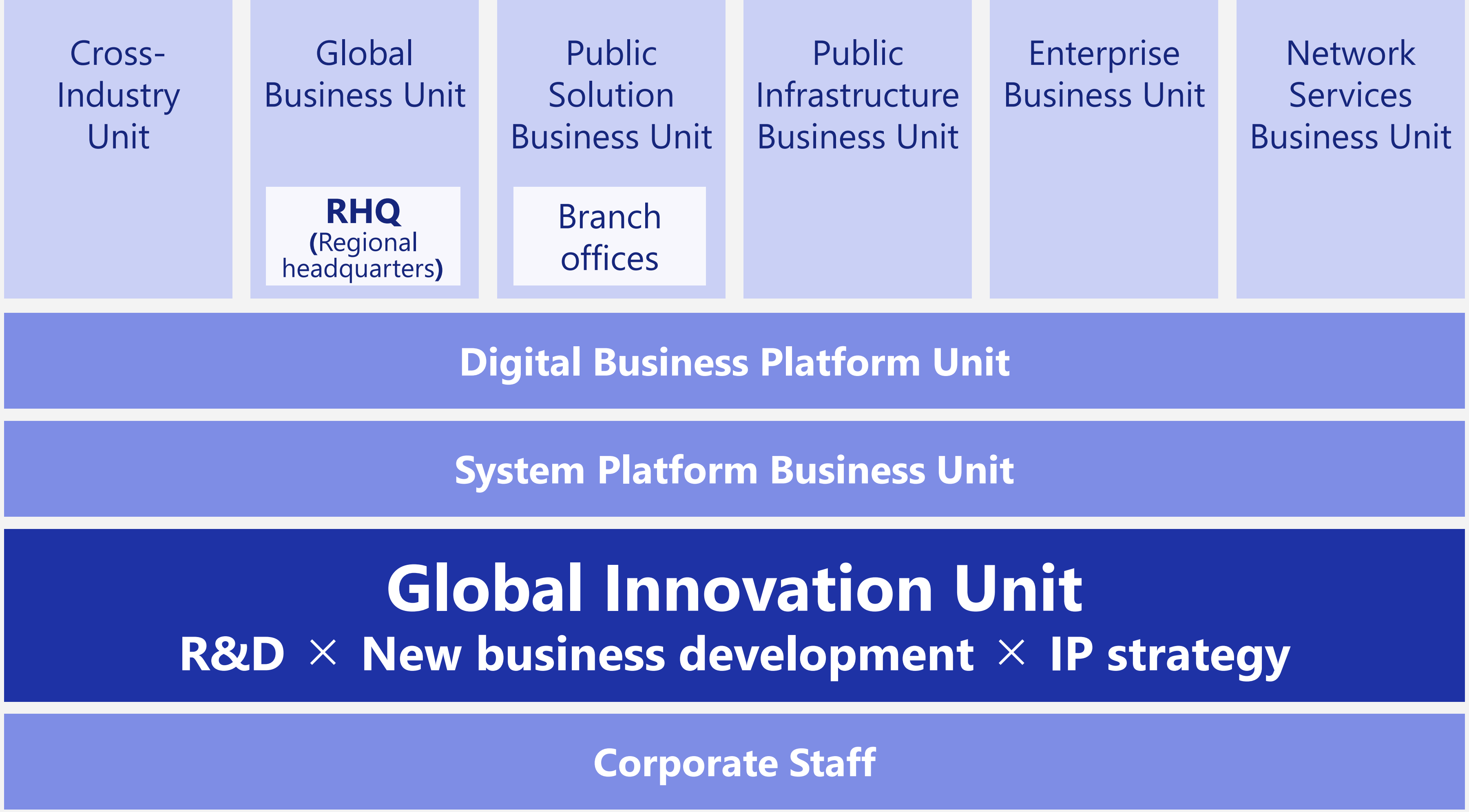
Motoo Nishihara

Driving NEC's growth

Contribution to the mid-term management plan 2025 and expansion of new business based on our cutting-edge technology

November 30, 2022
NEC
Executive vice president, CTO and member of the board
Motoo Nishihara

NEC organizational structure (fiscal 2022)



Cross-Industry Unit

Global Business Unit

RHQ
(Regional headquarters**)**

Public Solution Business Unit

Branch offices

Public Infrastructure Business Unit

Enterprise Business Unit

Network Services Business Unit

Digital Business Platform Unit

System Platform Business Unit

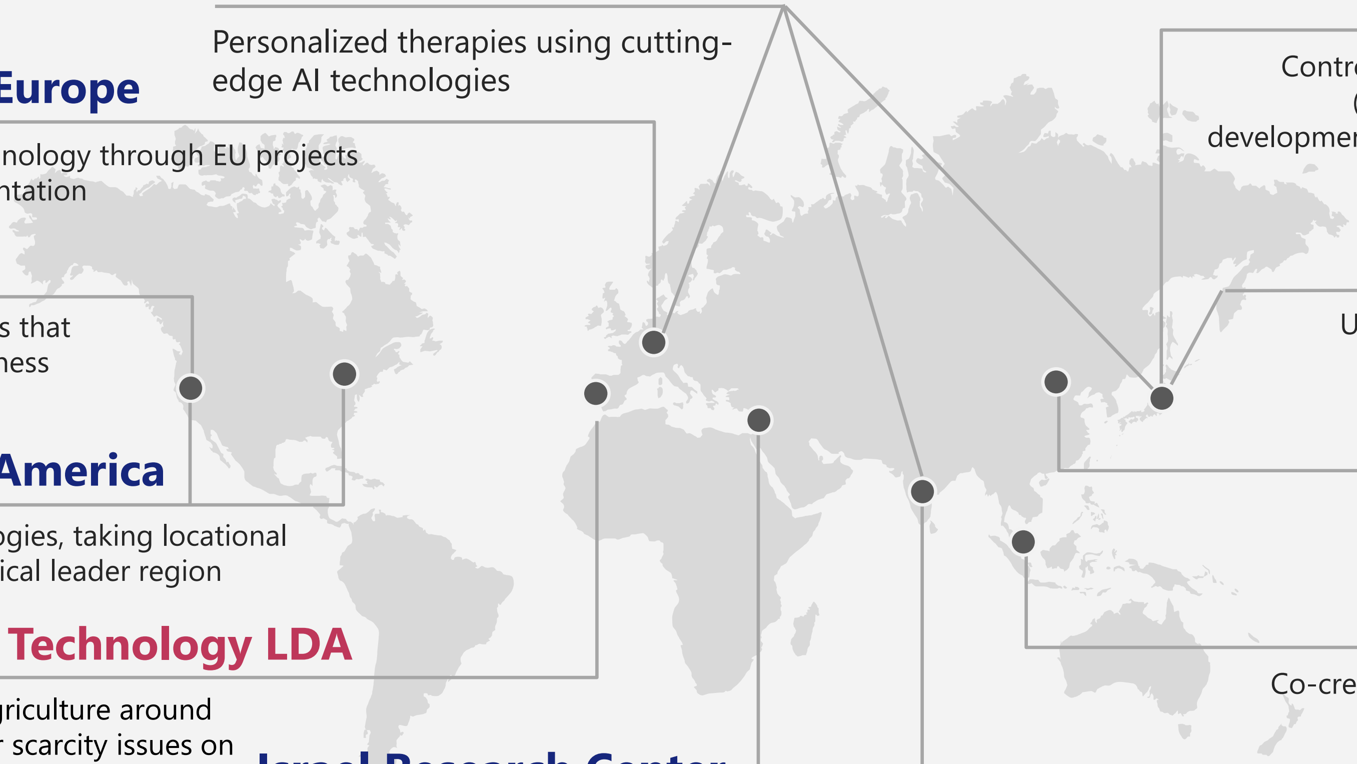
Global Innovation Unit

R&D × New business development × IP strategy

Corporate Staff

NEC's innovation scheme

Expanding R&D and business development opportunities, utilizing our global assets



AI Drug Development

Personalized therapies using cutting-edge AI technologies

NEC Laboratories Europe

Creation of solutions and technology through EU projects and high-tech social implementation

NEC X

Supports of startup companies that contributes to successful business establishment

NEC Laboratories America

R&D of cutting-edge technologies, taking locational advantage of latest technological leader region

DXAS Agricultural Technology LDA

Contributing to sustainable agriculture around the world by addressing water scarcity issues on farms and promoting more environmentally friendly and profitable farming.

Israel Research Center

Rapid creation of solutions that combine NEC's technology with advances in technology from outside the Group, leveraging the world's largest source of start-ups

NEC's Six Domestic Research Laboratories

Controls over NEC R&D worldwide. Mainly focus on AI (analysis and recognition), security, ICT platforms developments, and other cutting-edge technologies such as quantum computing and devices

BIRD INITIATIVE

Unprecedented co-creation type of R&D business originated in Japan

NEC Laboratories China

AI and network related R&D

NEC Laboratories Singapore

Co-creation of innovative solutions with customers and partners, mainly for developed countries

NEC Laboratories India

Creation of core technologies and solutions to address the challenges of emerging countries

NEC’s innovation scheme

Achieving the mid-term management plan 2025 and NEC 2030VISION by technological and business innovations

Creating global No. 1 technologies

Increasing new global No. 1 technologies

Cutting-edge business innovation

New business development processes and finance scheme

High potential human resources

Acquire and train business × Technology professionals

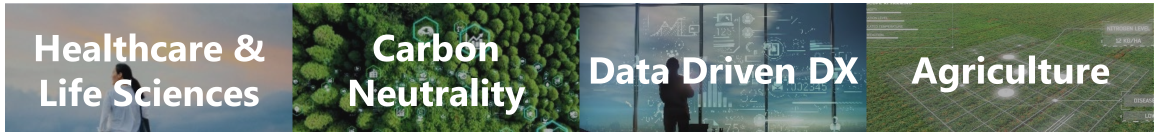
Improving innovation environment

Establish innovation base /
No. 1 AI simulation environment among Japanese companies*

* Source NEC, March 2023 (scheduled)

The mid-term management plan 2025 focus area

- Digital Government Digital Finance
- CoreDX
- GLOBAL 5G



- Healthcare & Life Sciences
- Carbon Neutrality
- Data Driven DX
- Agriculture

01 Contribution to the mid-term management plan 2025 and NEC 2030VISION based on our global No.1 technology

02 Creating new business by cutting-edge business innovations

03 Develop people / innovation environment for new growth

01 **Contribution to the mid-term management plan 2025 and NEC 2030VISION based on our global No.1 technology**

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03 **Develop people / innovation environment for new growth**

Creation of global No.1 technology

High technological competitiveness in the world - AI, security and communication -

Artificial intelligence

Machine learning
The number of papers accepted by top-quality international academic conferences *1

Ranked 7th in the world

Video and image processing
The number of papers accepted by top-quality international academic conferences*2

Japan No.1

Security*3 / Communication*4

Cyber security
IPSJ Yamashita SIG Research award, CSS2021, etc.

Received numerous awards

Optical communication
Paper acceptance by top-quality international academic conferences

45 consecutive years

Patents

Top 100 global innovators*5
Global survey of patent activities

11year consecutive selection

Biometrics authentication + video analytics + analysis / prescriptive AI
Number of international patent applications*6

World No.1

Machine learning
ranking of paper acceptance by top-academic conferences (Companies)

Rank	Corporate name	Number of papers
1	Microsoft	1186
2	Google	1149
3	IBM	915
4	DeepMind	378
5	Yahoo	341
6	Facebook*7	319
7	Alibaba	222
8	**NEC**	**201**
9	Amazon	191
10	Tencent	172

2000-2021 Our research

*1 NeurIPS, ICML, KDD, ECML-PKDD, ICDM
*2 CVPR, ICCV, ECCV, ACCV, ICPR
*3 Security : ACM CCS, Eurocrypt, IEEE S&P, etc.
*4 Communication : OFC/ECOC, etc.
*5 TOP100: https://clarivate.com/top-100-innovators/
*6 Number of international patent applications: cumulative number of applications as of Nov. 2022 (our research)
*7 Current company name : Meta

World No.1 biometric authentication technologies

Technology

Facial recognition

World No.1

- FRVT Ongoing (2022*1, 2021*2)
- FRVT(2019)
- FIVE (2017)
- FRVT (2013)
- MBE (2010)
- MBGC (2009)

Iris recognition

World No.1

- IREX 10 (2021)
- IREX IX (2018) (Iris Exchange IX)

Fingerprint recognition

World No.1

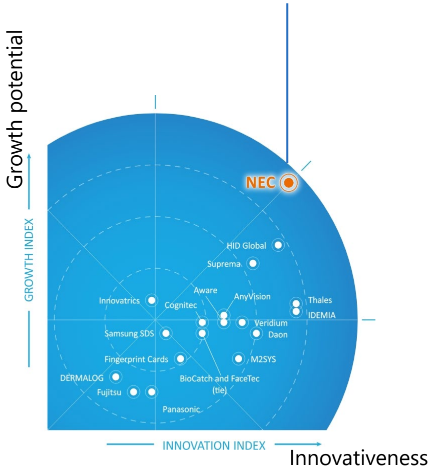
- MINEX(2016,2006)
- PFT/PFT Ⅱ (2013,2009)
- FpVTE (2012,2003)
- SlapSeg(2004)
- ELFT(2007)

* NEC's fingerprint recognition, Facial recognition, and iris recognition technology are ranked No.1 in benchmark testing conducted by the National Standards and Technology Research Laboratories (NIST). Evaluation results by NIST do not recommend any particular product/service/companies by the U.S. government.

Business

NEC's biometrics solutions
(out of 62 global companies)

World No.1



Up-to-date survey by Frost & Sullivan, a research firm

Brand

"Biometric authentication"

No.1 share of mind

Rank	Corporate name
1	**NEC**
2	Fujitsu
3	Hitachi
4	Google
5	Microsoft

NEC survey (2022)

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[1] Ranked No. 1 by NIST for FRVT Ongoing 1: N Identification (Jan. 2022) Identification (T>0) under the category Gallery: Mugshot; Probe: Mugshot; N=12,000,000, as well as the category Gallery: Border; Probe: Border ΔT ≥ 12 years; N=3,000,000 and the category Gallery: Mugshot; Probe: Mugshot; N=12,000,000

[2] Ranked No. 1 by NIST for FRVT Ongoing 1: N Identification (Aug. 2021) Identification (T>0) under the category Gallery: Mugshot; Probe: Mugshot; N=12,000,000 as well as the category Gallery: Border; Probe: Border ΔT ≥ 10 years; N=16,000,000

Providing biometric authentication system for various scenes

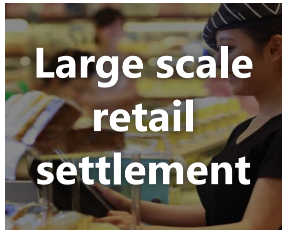
Provide for various scenes

Error rate: 1/10 billion

Multimodal recognition

-Facial and iris recognition-

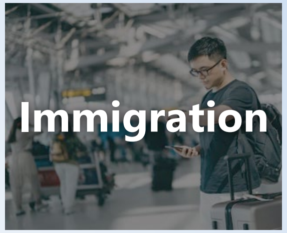
National ID


Large scale retail settlement

Iris recognition

Access control in high security areas

Identification in a medical environment


Immigration

Providing diverse social services with a wide lineup of highly-accurate technologies

Taking advantage of the strengths of each recognition

Facial recognition

Office access control

Stadium access control

Gateless biometric authentication

Announced November 30, 2022

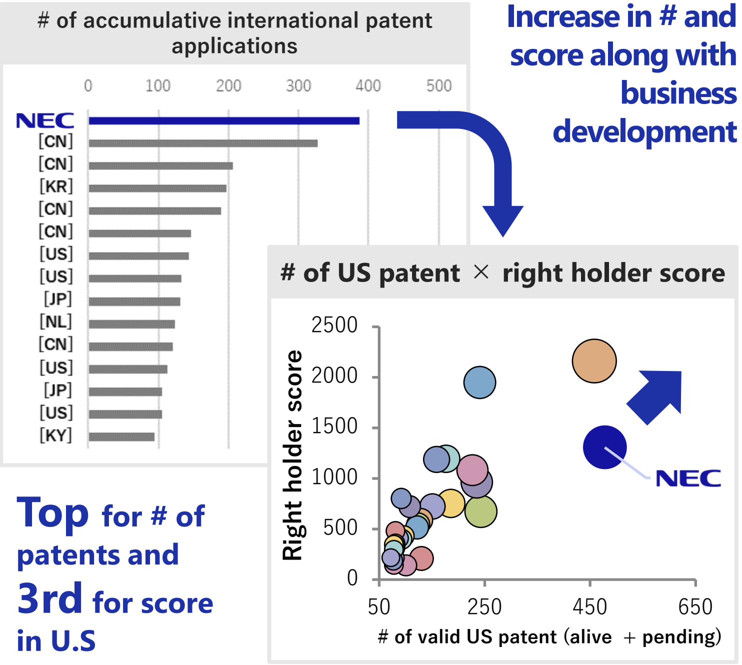
Stop & Go
Walk-through
Gateless

Stress-free

Global No.1 in the three major areas of Biometric authentication, Image recognition, Analysis / Prescription AI

- Targeting global No.1 patents in each areas, in 2025
- Biometric authentication, Image recognition, Analysis / Prescription AI
  - ✓ Contributing to most part of NEC business

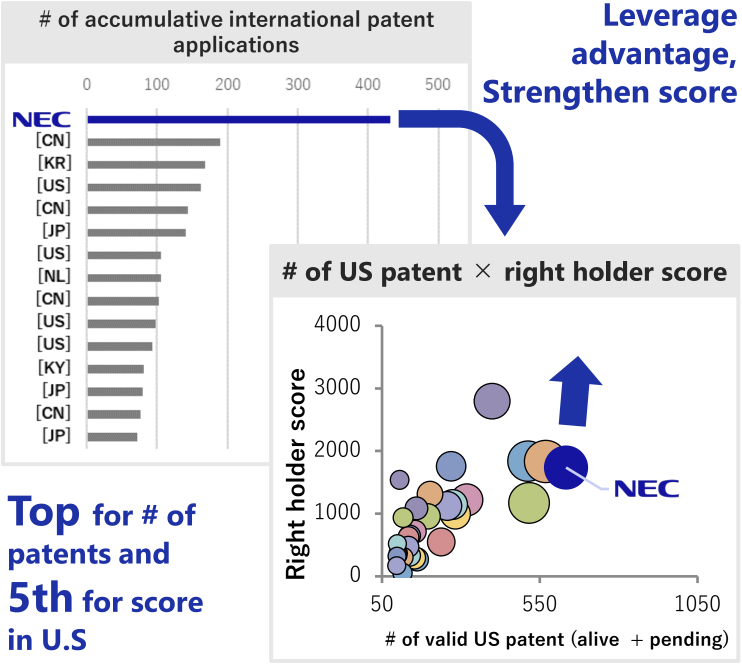
Biometric authentication



Increase in # and score along with business development

Top for # of patents and 3rd for score in U.S

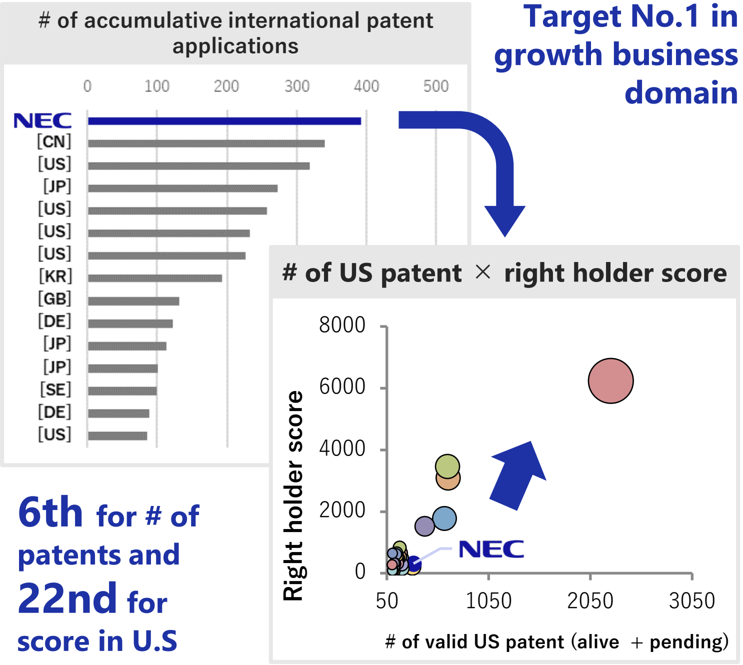
Image recognition



Leverage advantage, Strengthen score

Top for # of patents and 5th for score in U.S

Analysis / Prescriptive AI



Target No.1 in growth business domain

6th for # of patents and 22nd for score in U.S

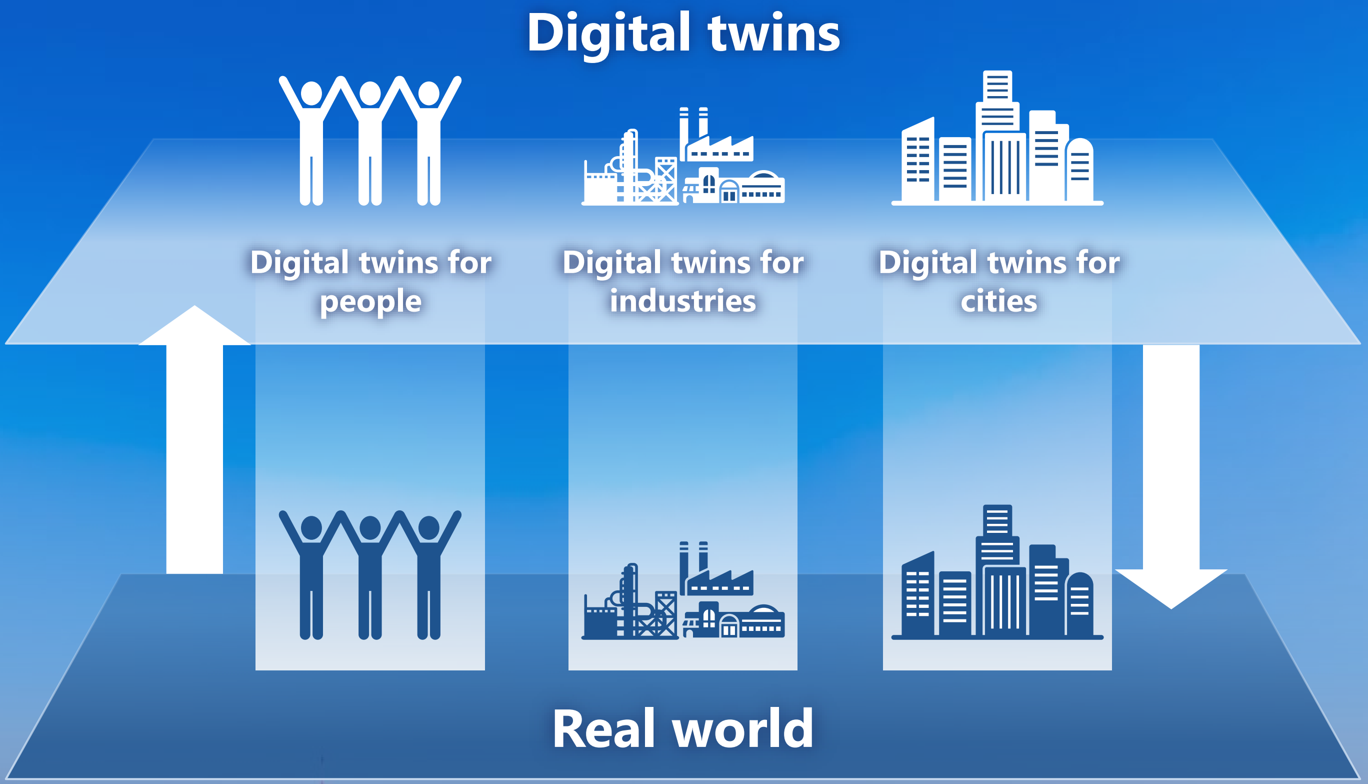
Right holder score: index for strength of patent portfolio of each patent right holder by Patent Result Co. Nov. 2022（Our research）

Technology vision

- All industries are getting smarter by collaborating with DX / digital twins -

NEC businesses

- Healthcare / Life Science
- Digital ID / Identification
- Retail
- Manufacturing
- Digital Government / Digital Finance
- Transport
- Finance
- Smart Cities



Social issues ❯

Digital twins

Digital twins for people

Digital twins for industries

Digital twins for cities

Real world

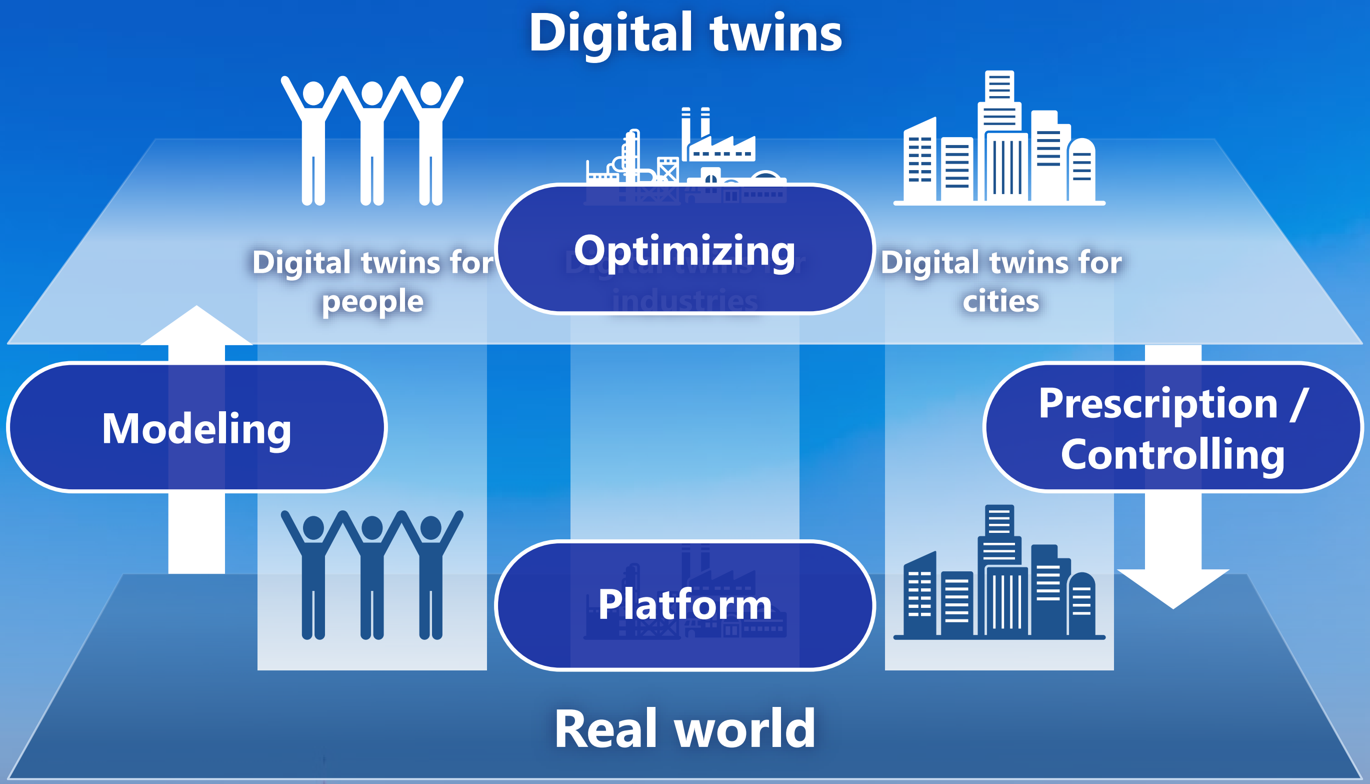
❯ Social value

Technology vision

- All industries are getting smarter by collaborating with DX / digital twins -

NEC businesses	Healthcare / Life Science	Digital ID / Identification	Retail	Manufacturing	Digital Government / Digital Finance	Transport	Finance	Smart Cities

Social issues ❯



Digital twins

Digital twins for people

Digital twins for industries

Digital twins for cities

Optimizing

Modeling

Prescription / Controlling

Platform

Real world

❯ Social value

NEC’s strength in coordination of DX and digital twins

Requirements for digital twins	Strength of NEC’s technology
Elaborate modeling of real world	**Modelling** **World’s best biometrics and image recognition technologies**
Optimization of complex social issues	**Optimization** **World’s best analytic AI technologies**
Control and handling that can satisfy decision makers	**Control/Handling** **World’s best prescriptive AI technologies**
Trusted and green platforms	**Platform** **Track record in mission-critical IT infrastructure (Security / Computing / Networks)**

NEC technology contribution to the mid-term management plan 2025 / NEC 2030VISION

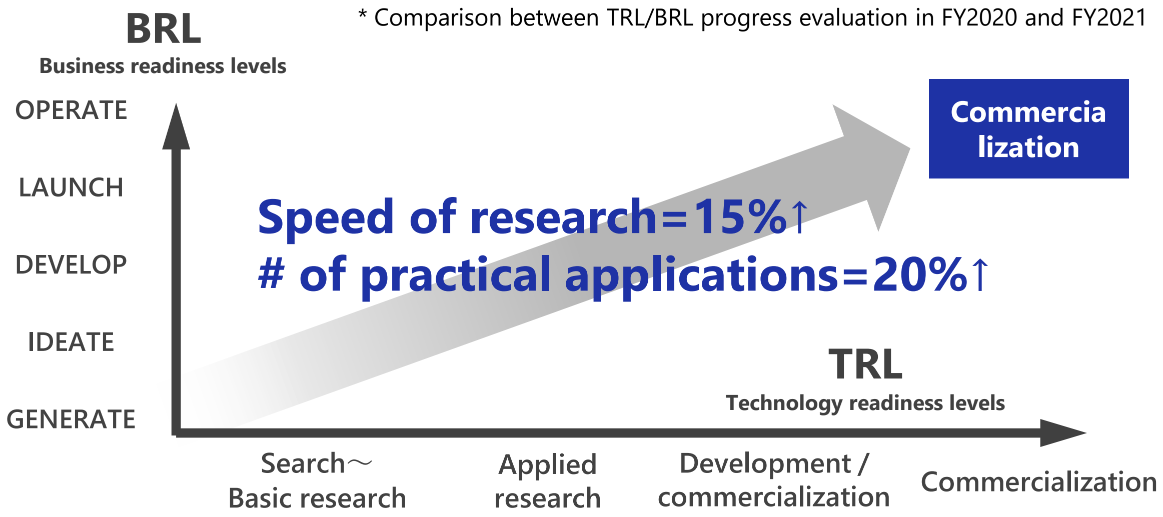
List of technologies introduced today

Technology area	Technology	Phase	The mid-term management plan 2025 / NEC 2030VISION	Exhibition	Press
Modeling (Biometric authentication)	Gate-less biometric authentication	Development	CORE DX	○	30th November 2022
	Multi-modal recognition -Facial and iris recognition-	Commercialization	CORE DX	○	8th November 2022
Modeling	Facility / Road digital twin(Improving efficiency of bridge inspection and management with SAR* satellite x AI)	Development	CORE DX	○	6th July 2022
	Worksite digital twin(Identifies dozens of tasks in real time through video recognition)	Development	CORE DX	○	20th June 2022
	Worksite digital twin(Digitalization of various activities of workers in worksites)	Development	CORE DX	○	28th November 2022
	Health condition digital twin(Physical care innovation with digitalization)	Research	Healthcare / Life science	○	–
Optimization	Pseudo quantum annealing(NEC vector annealing service)	Commercialization	CORE DX	○	29th August 2022
	Optimization Ssupport compiler	Research	CORE DX	○	–
Prescription/ Controlling	Human cooperative robot control	Development	CORE DX		27th January 2022
	Explainability that people can understand(Explainable AI)	Research	CORE DX, Healthcare / Life science		–
	AI negotiation between AIs with different interests	Development	CORE DX		24th August 2022
Platform	Visualize the configuration / risks of ICT systems / device to ensure transparency regarding security	Development	CORE DX,GLOBAL 5G		9th November 2022
	Quantum cryptography communication	Development	GLOBAL 5G		4th October 2022
	Application-aware IT/NW control	Development	CORE DX,GLOBAL 5G	○	14th February 2022
	Beyond 5G distributed-MIMO	Research	GLOBAL 5G	○	31st October 2022
	High-capacity multi-core submarine cables	Development	GLOBAL 5G		28th March 2022

* Synthetic Aperture Radar

Accelerating commercialization through various R&D managements

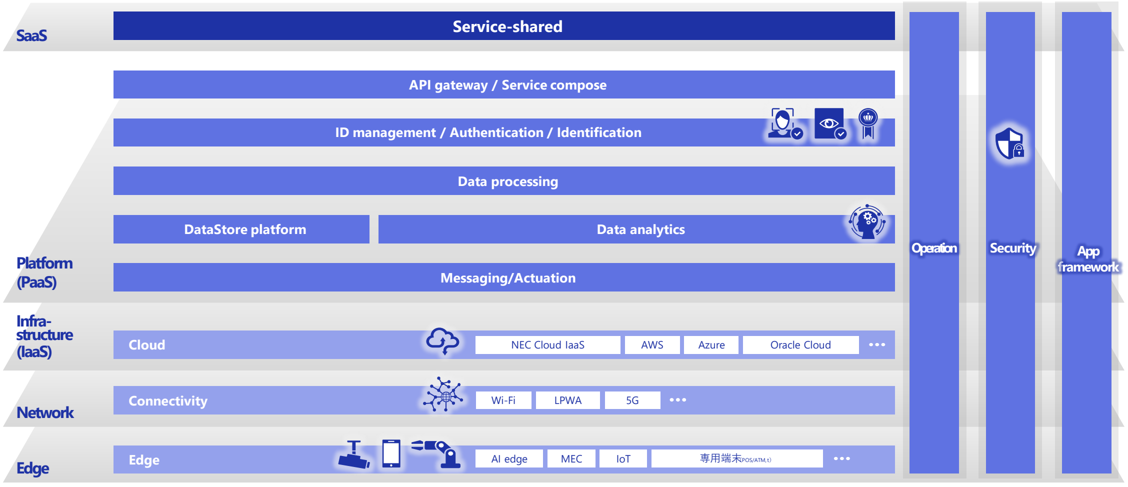
Process management with BRL/TRL (2020〜)


BRL
Business readiness levels
OPERATE
LAUNCH
DEVELOP
IDEATE
GENERATE
Commercialization
TRL
Technology readiness levels
Search〜
Basic research
Applied
research
Development /
commercialization
Commercialization

* Comparison between TRL/BRL progress evaluation in FY2020 and FY2021

Speed of research=15%↑
# of practical applications=20%↑

Common technologization through NEC digital platform


SaaS
Service-shared
API gateway / Service compose
ID management / Authentication / Identification
Data processing
DataStore platform
Data analytics
Messaging/Actuation
Platform
(PaaS)
Infra-
structure
(IaaS)
Cloud
NEC Cloud IaaS
AWS
Azure
Oracle Cloud
…
Network
Connectivity
Wi-Fi
LPWA
5G
…
Edge
Edge
AI edge
MEC
IoT
専用端末POS/ATM,t)
…
Operation
Security
App
framework

Expansion of development functions (applied research & practical development)*

* manpower base

Central Research Labs
（〜2019）

▶

Research & Development Unit
（2020）

Ratio 10 %

▶

Global Innovation Unit
(2022)

Ratio 15 %

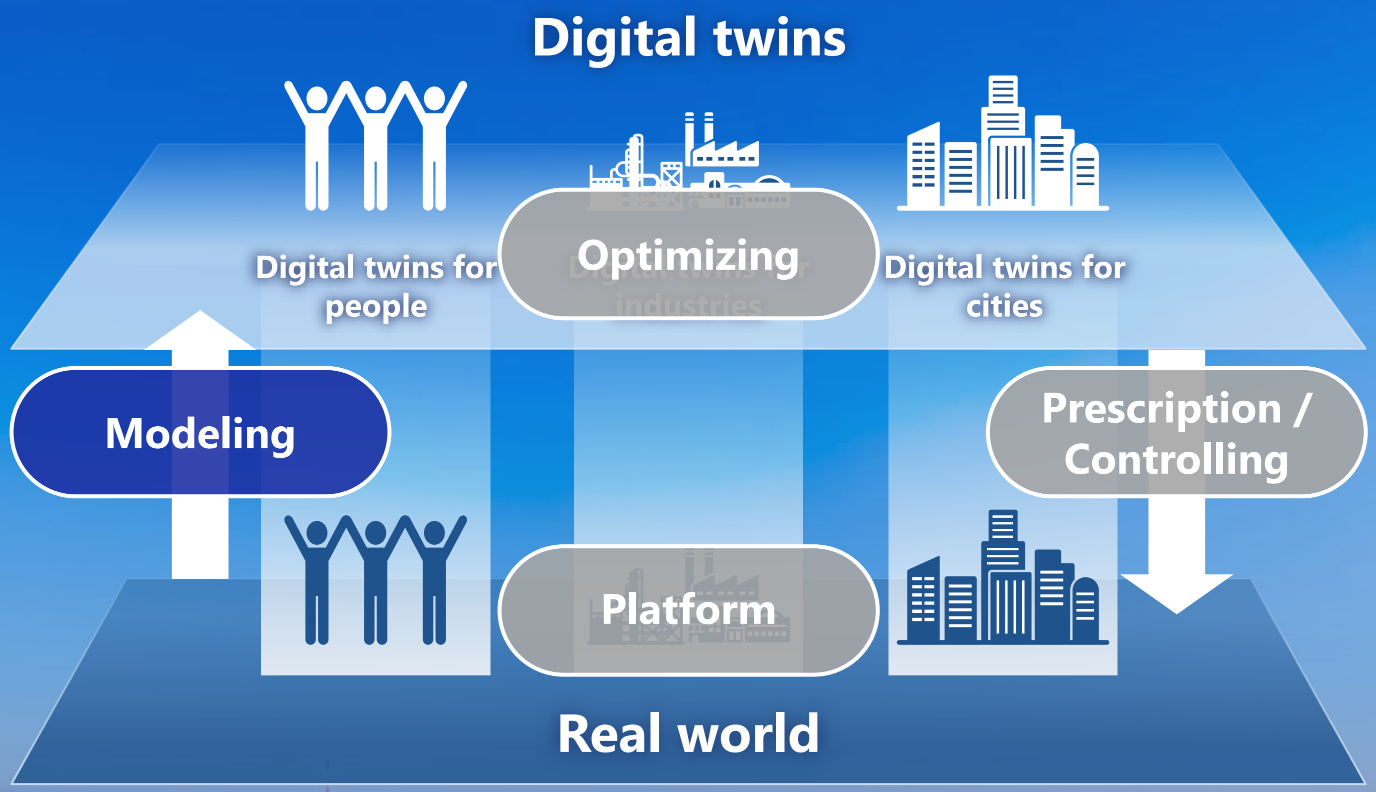
▶

Expansion of global development system (2025)

Ratio 30 %

Modeling

Monitor changes in cities, industries and people in real time through a variety of sensors to create detailed models



Digital twins

Digital twins for people

Optimizing

Digital twins for industries

Digital twins for cities

Modeling

Prescription / Controlling

Platform

Real world

Modeling

Real world modeling with cutting edge sensing analysis technology

Global No.1 technology

Business innovations

Human resources

Business environment

City

Facility / Road digital twin

Improving efficiency of bridge inspection and management with SAR* satellite x AI

Monitoring in mm order / Inspection 720K bridges in Japan, in 5years

Commercializing in 2025 to promote digitalization for infrastructure management.

Announced July 6, 2022

Industry

Worksite digital twin

Identifies dozens of tasks in real time through video recognition

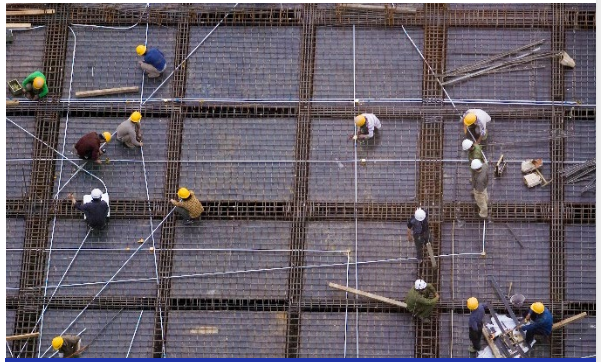
Digitalization of various activities of workers in worksites (DAIWA HOUSE INDUSTRY CO., LTD., etc..)

Convert manual works autonomous / smart in manufacturing / construction / logistics / retail

Commercialization during FY2022

Practical application in FY2023

Announced June 20, 2022



Announced November 28, 2022

Human being

Health condition digital twin

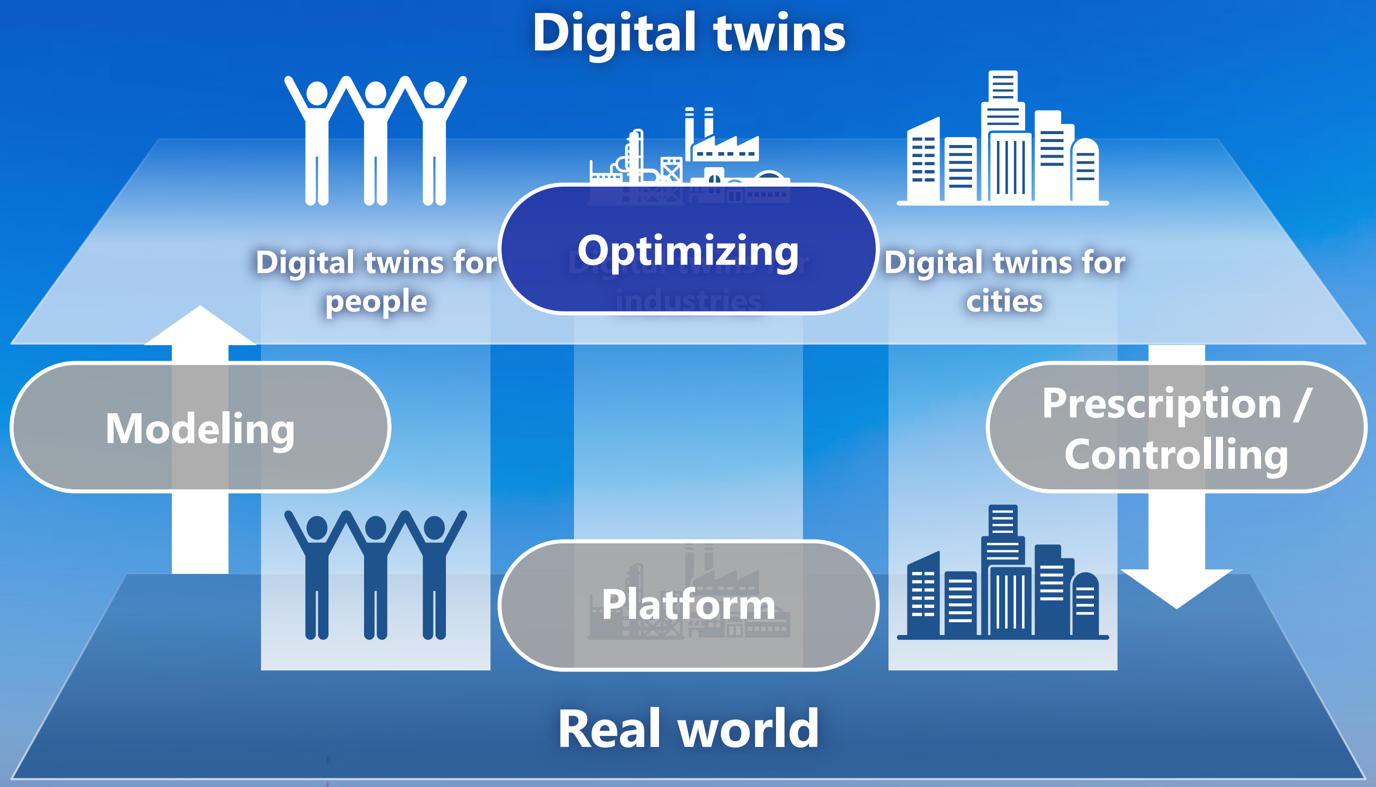
Providing appropriate physical care with personal precise digital twin

Enabling personal physical care everywhere / every time

* SAR(Synthetic Aperture Radar)

Optimizing

Formulate complex social issues and optimize them rapidly from an enormous number of combinations



Digital twins

Digital twins for people

Digital twins for industries

Digital twins for cities

Optimizing

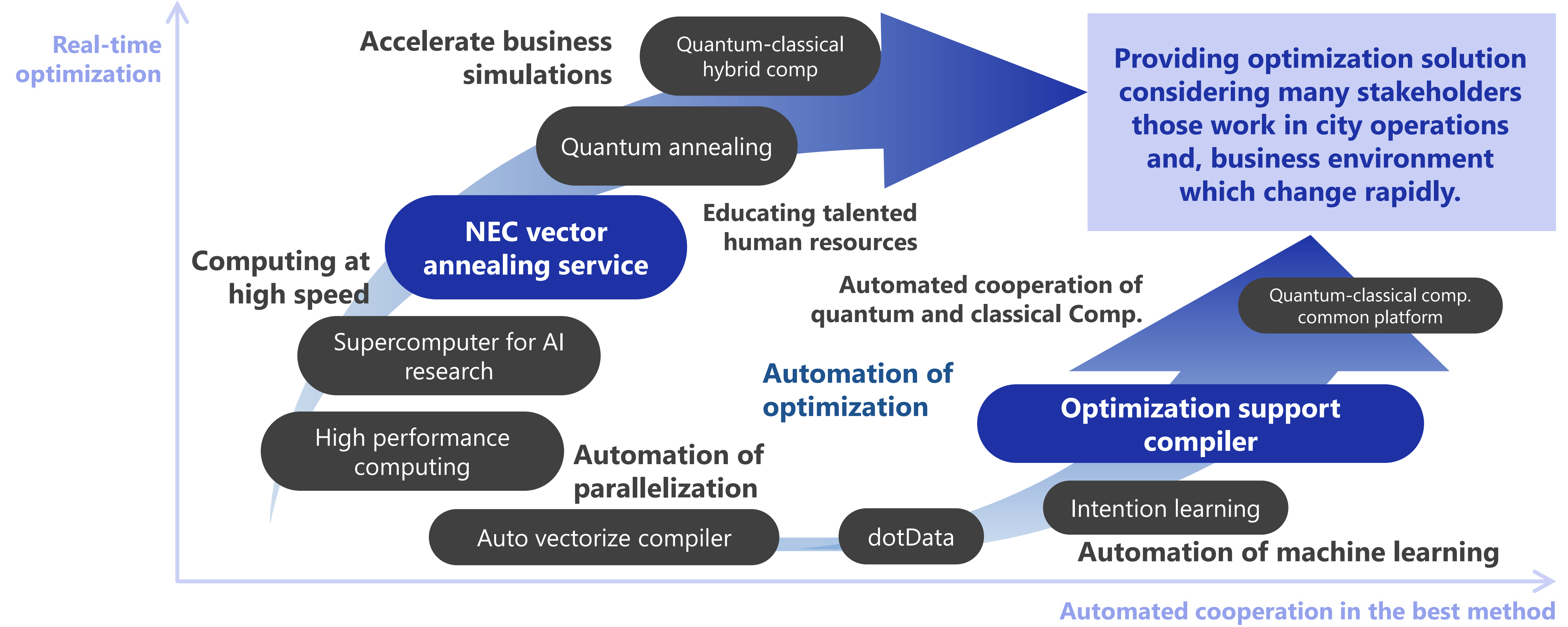
Modeling

Prescription / Controlling

Platform

Real world

Optimization problem solving technology to realize sustainable society


Real-time optimization
Accelerate business simulations
Quantum-classical hybrid comp
Quantum annealing
NEC vector annealing service
Computing at high speed
Educating talented human resources
Supercomputer for AI research
High performance computing
Automation of parallelization
Auto vectorize compiler
dotData
Automation of optimization
Automated cooperation of quantum and classical Comp.
Quantum-classical comp. common platform
Optimization support compiler
Intention learning
Automation of machine learning
Automated cooperation in the best method

Providing optimization solution considering many stakeholders those work in city operations and, business environment which change rapidly.

Optimization technology to accelerate social issues optimization(examples)

NEC vector annealing service

Pseudo quantum annealing to select the best candidate option from a huge number of combinations in a realistic time

November 2021 : Started cloud service
November 2022 : Accelerate solving performance by 30x

Announced August 29, 2022

Optimization support compiler

Automatic conversion to the appropriate conditional formula for each property of the optimization tool.
Providing developing environment to efficient optimization programming

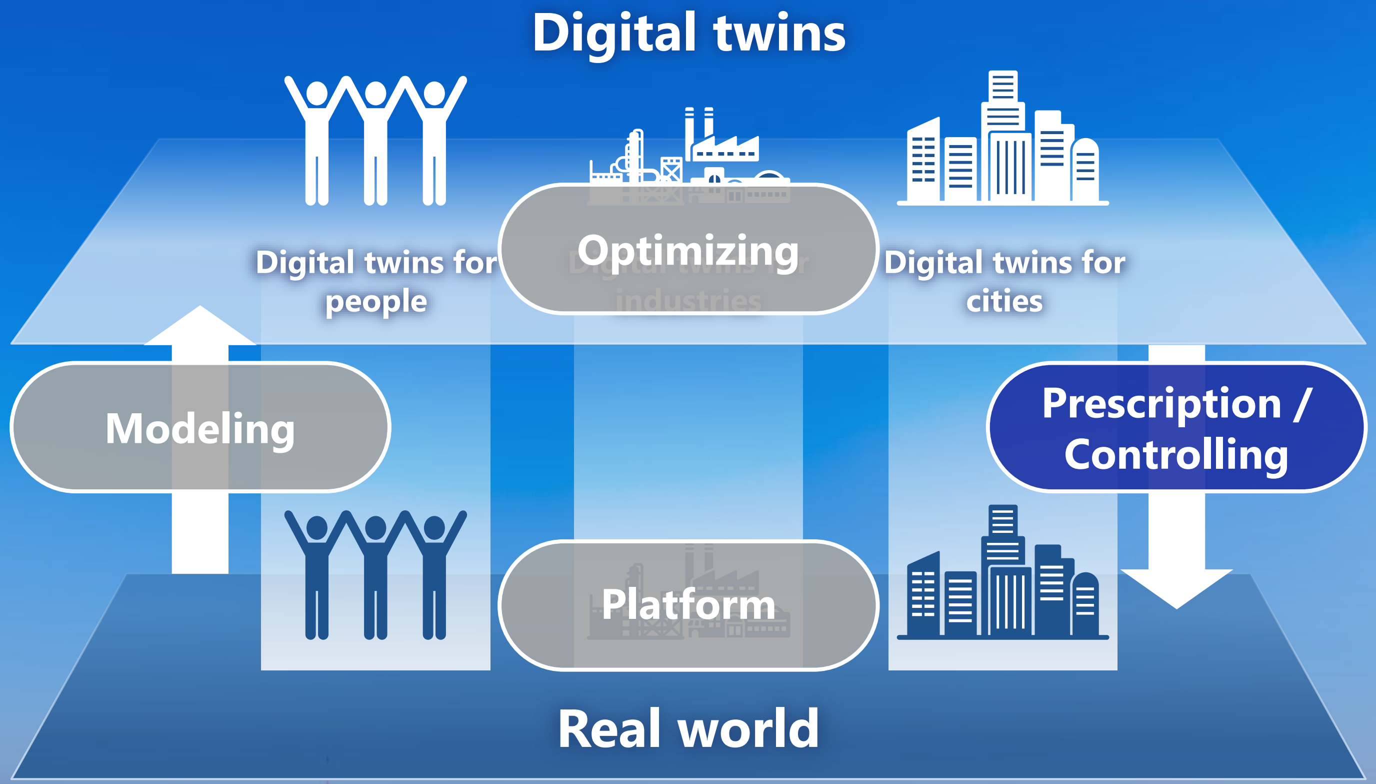
Developing toward middleware as a common platform for solving optimization problems,
regardless of whether they are classical or (pseudo) quantum

```
_mod = modifier_ob.modifiers.new("
object to mirror_ob
_mod.mirror_object = mirror_ob
ation == "MIRROR_X":
_mod.use_x = True
_mod.use_y = False
_mod.use_z = False
ation == "MIRROR_Y":
_mod.use_x = False
_mod.use_y = True
_mod.use_z = False
ation == "MIRROR_Z":
_mod.use_x = False
_mod.use_y = False
_mod.use_z = True

tion at the end -add back the desel
ob.select= 1
ob.select=1
.scene.objects.active = modifier_ob
```

Prescription / Controlling

Increase the persuasiveness and credibility of decision makers through explanations and dialogues that are tailored to people


Digital twins

Digital twins for people

Optimizing

Digital twins for industries

Digital twins for cities

Modeling

Prescription / Controlling

Platform

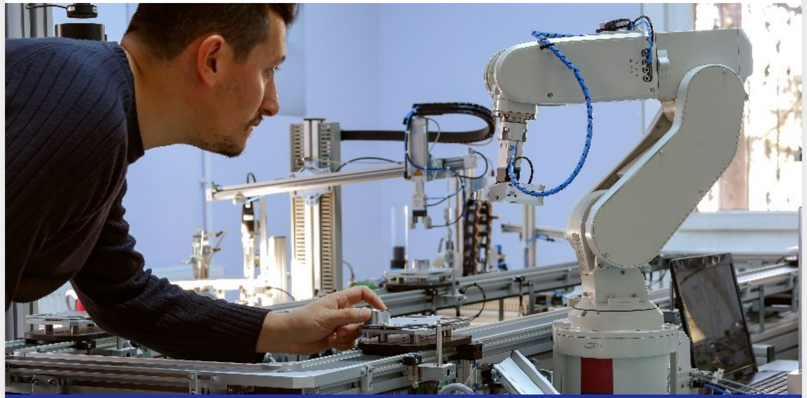
Real world

Plausible prescription and control for decision-maker

Human cooperative robot control

1. Performing complex task autonomically such like merchandise display with simple instruction
2. Robot autonomously decides and executes risk avoidance against environment changes, etc.

1. Targeting actual work during 2023-24
2. Practical application in FY2023



Announced January 27, 2022

Explainability that people can understand(Explainable AI)

Providing human behavior explain by natural language based on time-series video and NLP joint analysis

Planning commercialization in industrial smartization, sport support and so on.

AI negotiation between AIs with different interests

Optimizing transaction instantly between human-AI or AI-AI through autonomously negotiation
EX) Number of orders, delivery date etc.

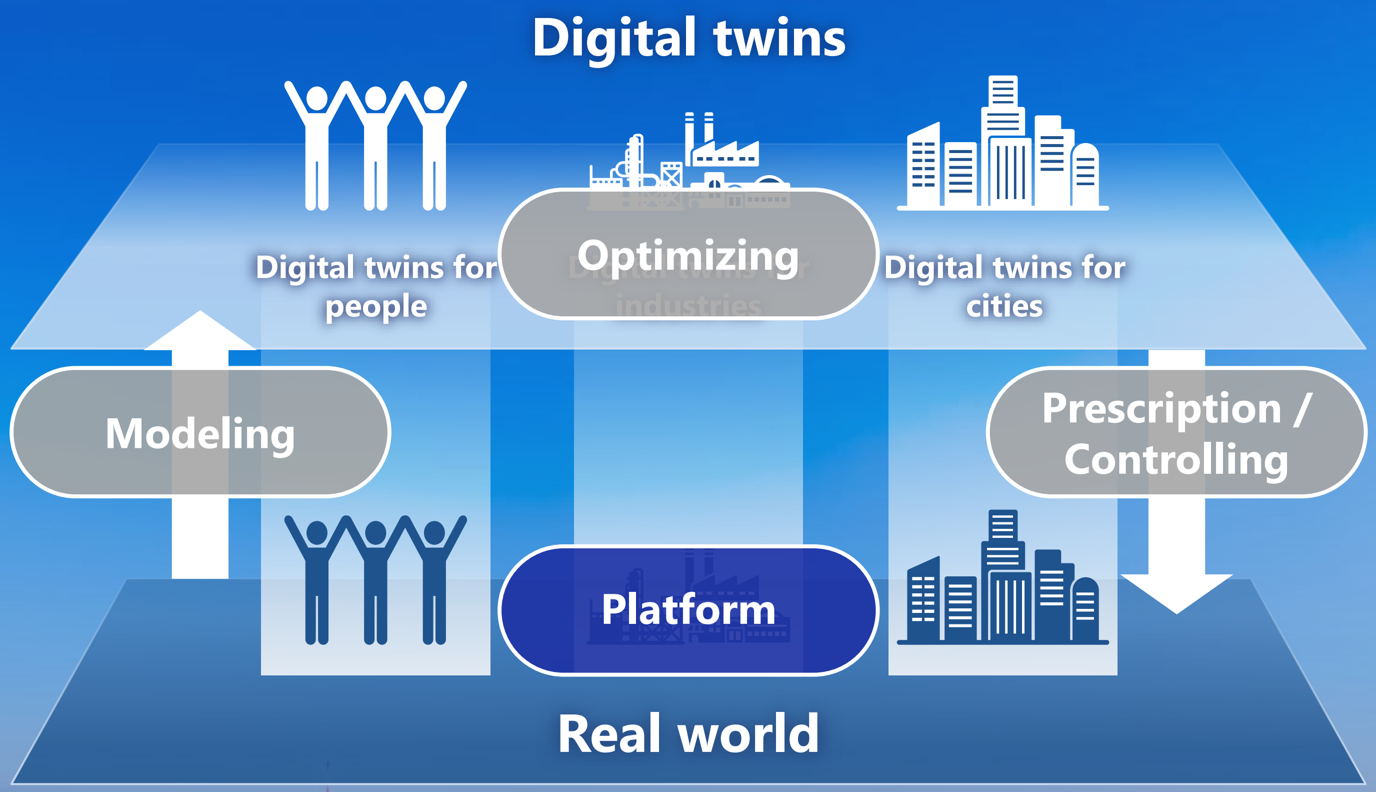
Commercialize through automated negotiation SCM consortium in 2023

Announced August 24, 2022

Platform

A platform that is comprehensively reliable, from data to systems, as well as highly-efficient and environmentally friendly

(Security / Computing / Network)



Digital twins

Digital twins for people

Digital twins for industries

Digital twins for cities

Optimizing

Modeling

Prescription / Controlling

Platform

Real world

Realizing total trust and promoting economic security

Ensure safety and reliability of open ICT systems

Visualize the configuration / risks of ICT systems / device to ensure transparency regarding security

NTT NEC

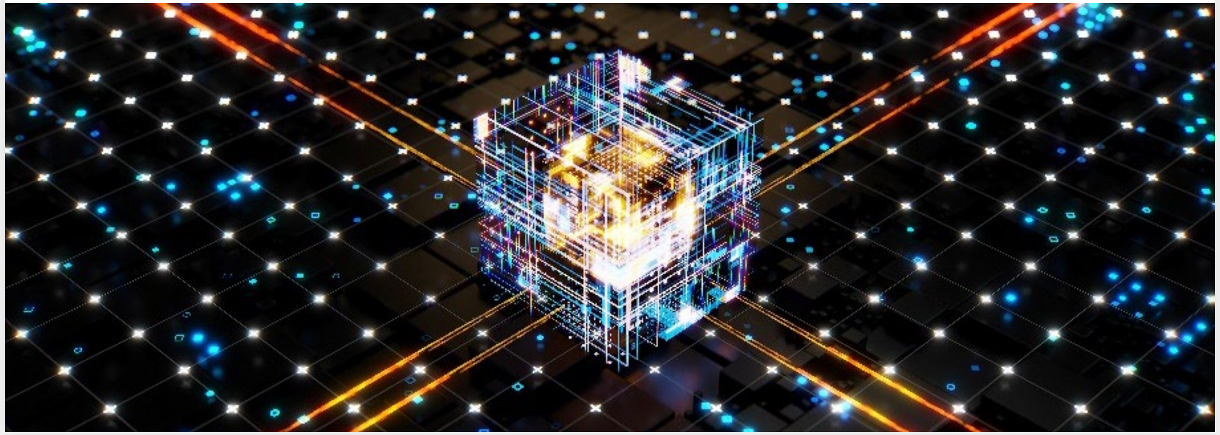
November 2022: Field test with NTT toward business apply
First half in FY2023 : Planning to launch open consortium

Announced November 9, 2022

Domestically produced quantum cryptography communication

Ultimate cryptography communication with information-theoretic security utilizing quantum properties

Staring field test with NICT, Kyoto University and Keio University in SIP*
Received orders for test beds for social implementation in FY2022



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* SIP (Cross-ministerial Strategic Innovation Promotion Program leaded by cabinet office)

High-speed high-capacity network supporting digital twin

Beyond 5G distributed-MIMO

Solving the problem of radio wave disconnection caused by obstacles, with AI, which is a challenge for the spread of ultra-high-capacity communications.

NTT docomo NEC

Promoting proof-of-concept with NTT and NTT docomo for practical realization over Beyond 5G(28GHz band implementation、IOWN)

Announced October 31, 2022

High-capacity multi-core submarine cables

Realizing sustainable high-capacity submarine cable with multi-core fibers

Top quality international conference OFC publicized as a remarkable achievement

Targeting practical realization till mid-2020s. (1.74petabit@3000km)

Announced March 28, 2022

Application-aware IT&NW control

Autonomous and real time ICT platform control according to properties of application

Targeting a platform for all digital twin which respond quickly to city or industry change

Announced February 14, 2022

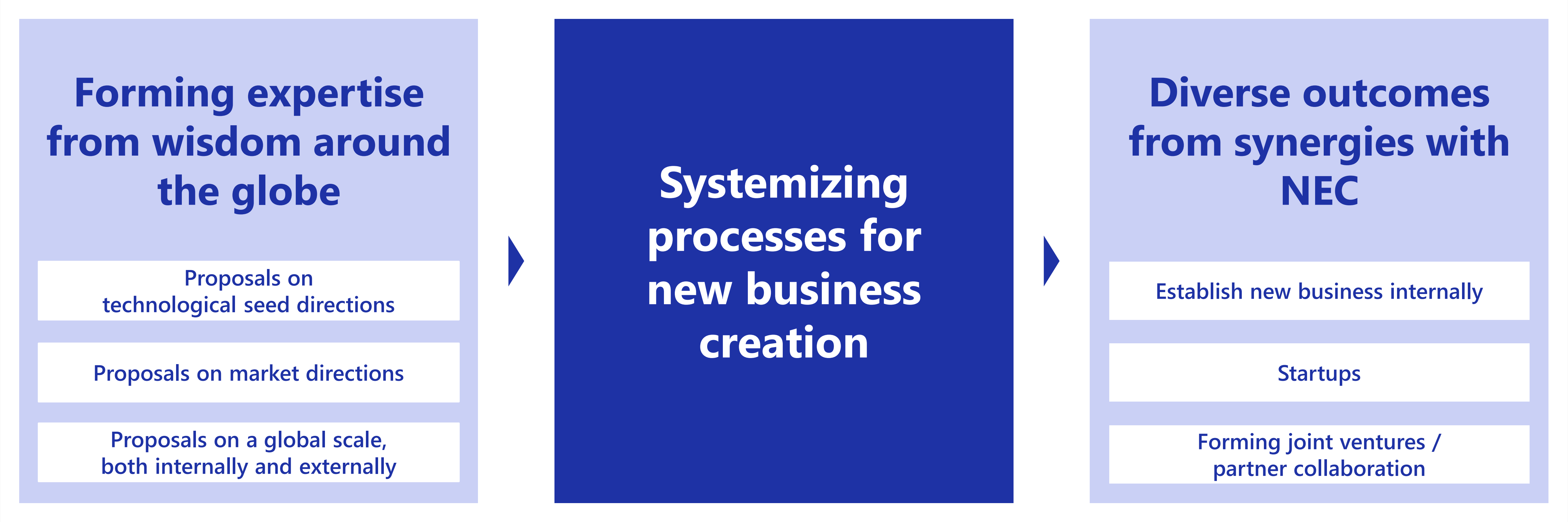
01 Contribution to the mid-term management plan 2025 and NEC 2030VISION based on our global No.1 technology

02 Creating new business by cutting-edge business innovations

03 Develop people / innovation environment for new growth

Basis for NEC’s business innovations

- Making new business creation processes systematic and internally standardized
- Widening gateway for new business creation with global alignments / ecosystems



Forming expertise from wisdom around the globe

Proposals on technological seed directions

Proposals on market directions

Proposals on a global scale, both internally and externally

Systemizing processes for new business creation

Diverse outcomes from synergies with NEC

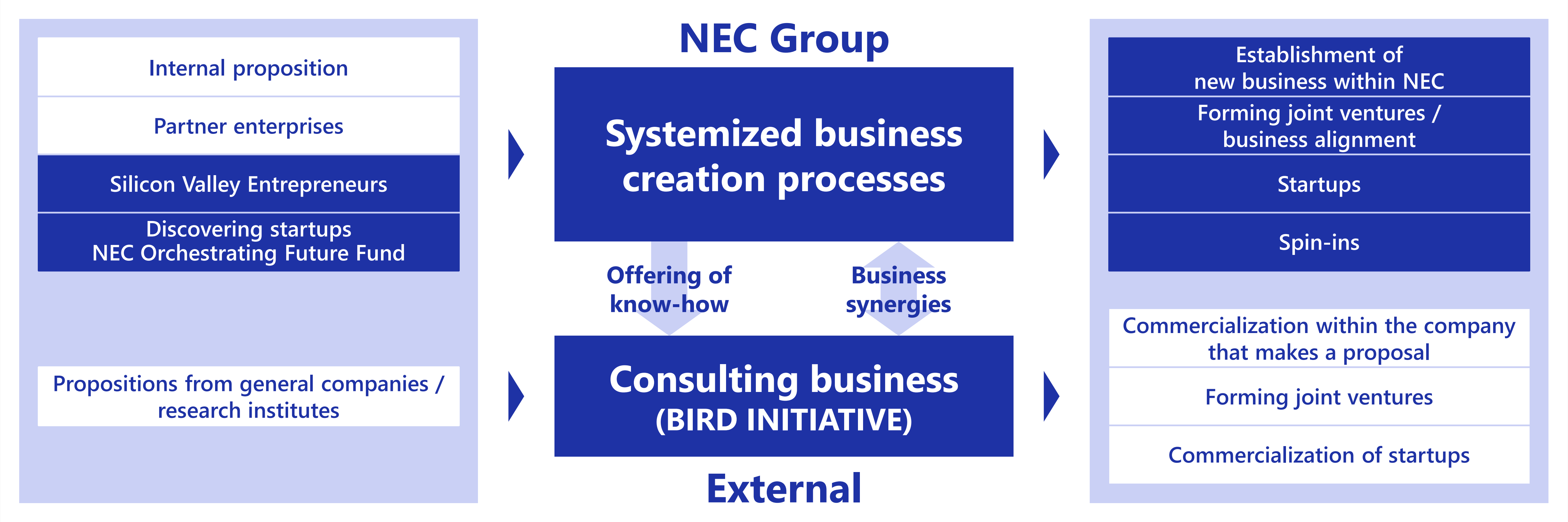
Establish new business internally

Startups

Forming joint ventures / partner collaboration

Basis for NEC's business innovations

Achieving business synergies by offering systemized processes as NEC's consulting business, while taking various initiatives to widen gateways for new business creation



Internal proposition

Partner enterprises

Silicon Valley Entrepreneurs

Discovering startups
NEC Orchestrating Future Fund

Propositions from general companies / research institutes

NEC Group

Systemized business creation processes

Offering of know-how

Business synergies

Consulting business (BIRD INITIATIVE)

External

Establishment of new business within NEC

Forming joint ventures / business alignment

Startups

Spin-ins

Commercialization within the company that makes a proposal

Forming joint ventures

Commercialization of startups

(Reference) Systemizing process for new business creation

GENERATE

Market research
Business vision
Business strategy
Business idea

IDEATE

Business validation
Business model
Rough business plan

DEVELOP

Product development
Business launch preparation
ROI / financing plan

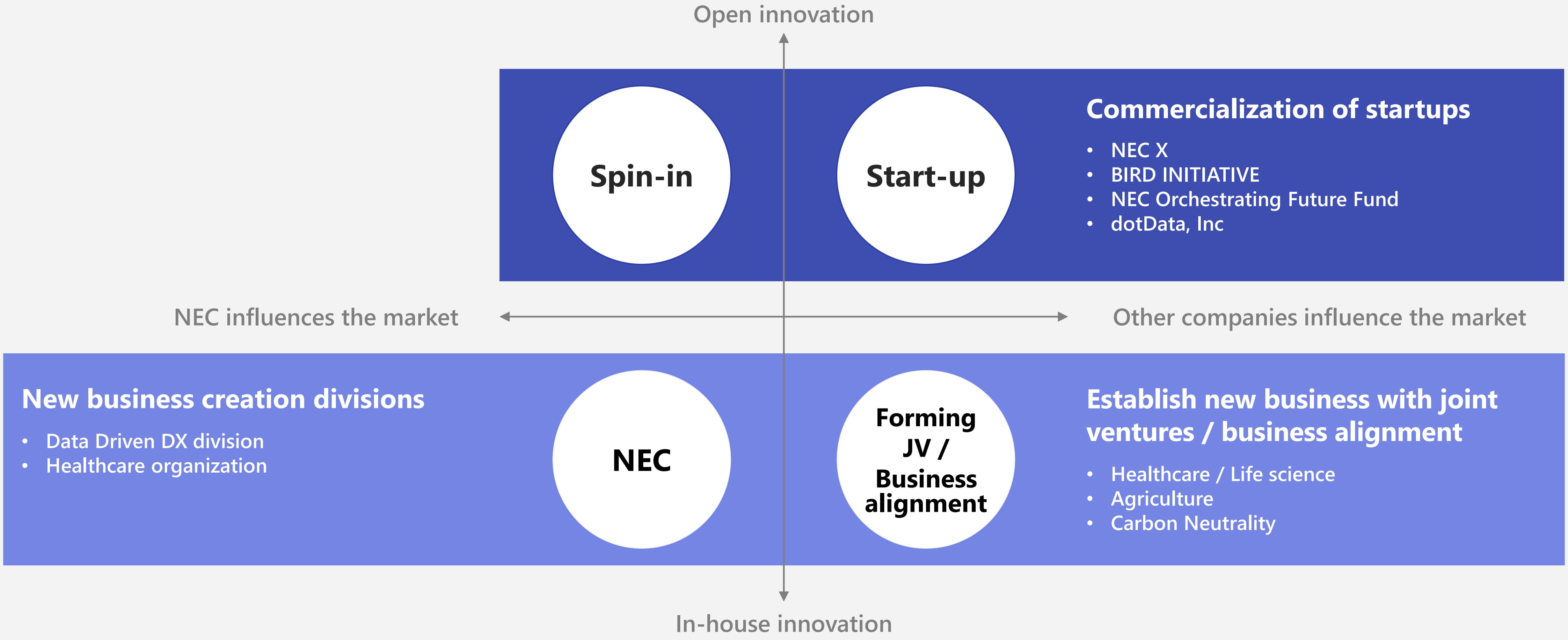
LAUNCH

Market introduction
Business expansion / accelerate monetization

OPERATE

Process	Adopt 'lean startup,' define overall process from generating business idea to commercialization
Investment decision	Investment decision at each milestone of the stage gates set focus areas, exit & pivot through portfolio management
Project evaluation	For business plan after certain market validation, as leading indicator, evaluate maturity and business value periodically by a third party
HR development	With cycle of training / execution / reflection, provide abundant menu to promote growth of biz dev personnel and operate a community of 1600 members for mutual learning & information sharing

Types of outcomes



Open innovation

Spin-in

Start-up

Commercialization of startups

- NEC X
- BIRD INITIATIVE
- NEC Orchestrating Future Fund
- dotData, Inc

NEC influences the market

Other companies influence the market

New business creation divisions

- Data Driven DX division
- Healthcare organization

NEC

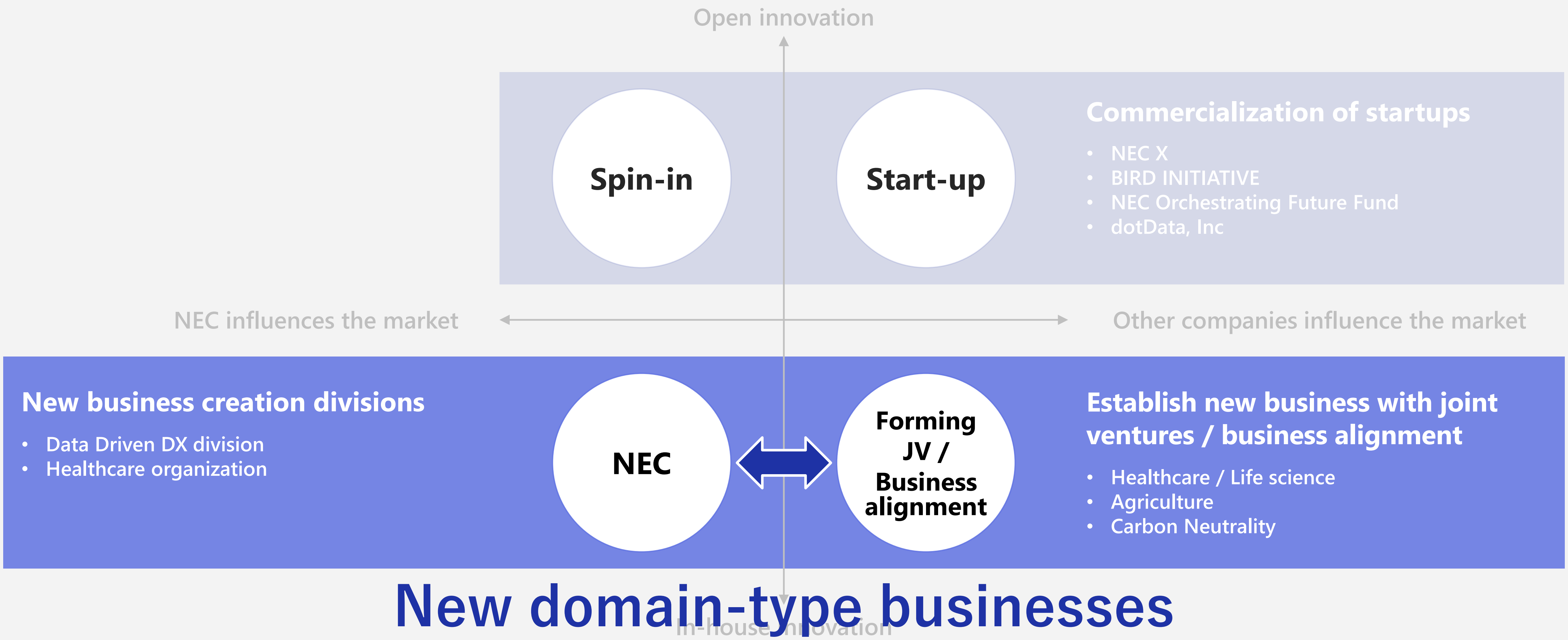
Forming JV / Business alignment

Establish new business with joint ventures / business alignment

- Healthcare / Life science
- Agriculture
- Carbon Neutrality

In-house innovation

Types of outcomes



Open innovation
Spin-in
Start-up
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Other companies influence the market
NEC
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In-house innovation

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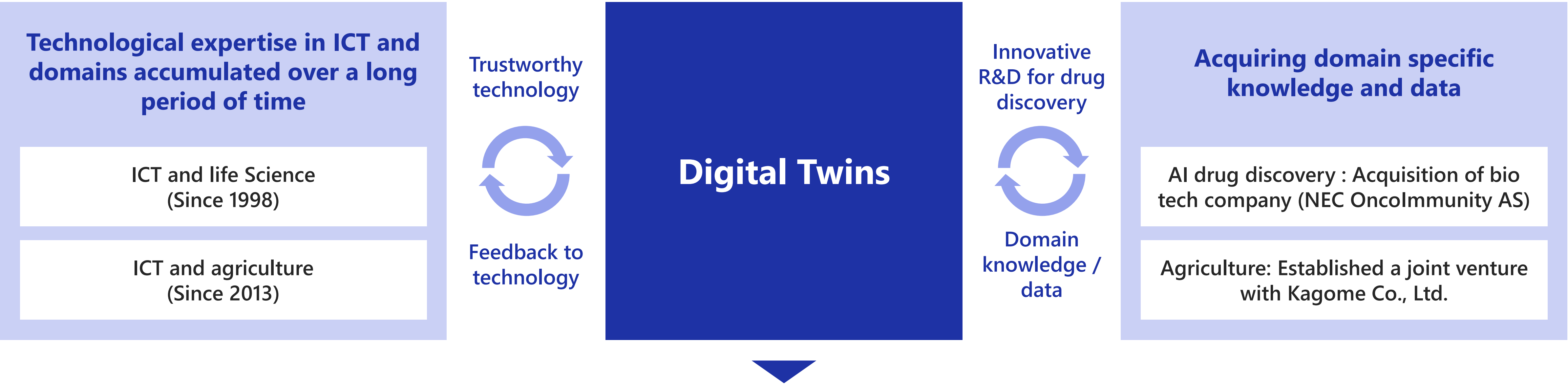
New domain-type businesses

Characteristics of new domain-type businesses that NEC is undertaking (Healthcare and ICT agriculture)

- Technological expertise in ICT and domains which has been accumulated over a long period of time
- Innovative R&D for drug discovery by incorporating domain knowledge and data from trusted partners into digital twins



Technological expertise in ICT and domains accumulated over a long period of time

ICT and life Science
(Since 1998)

ICT and agriculture
(Since 2013)

Trustworthy technology

Feedback to technology

Digital Twins

Innovative R&D for drug discovery

Domain knowledge / data

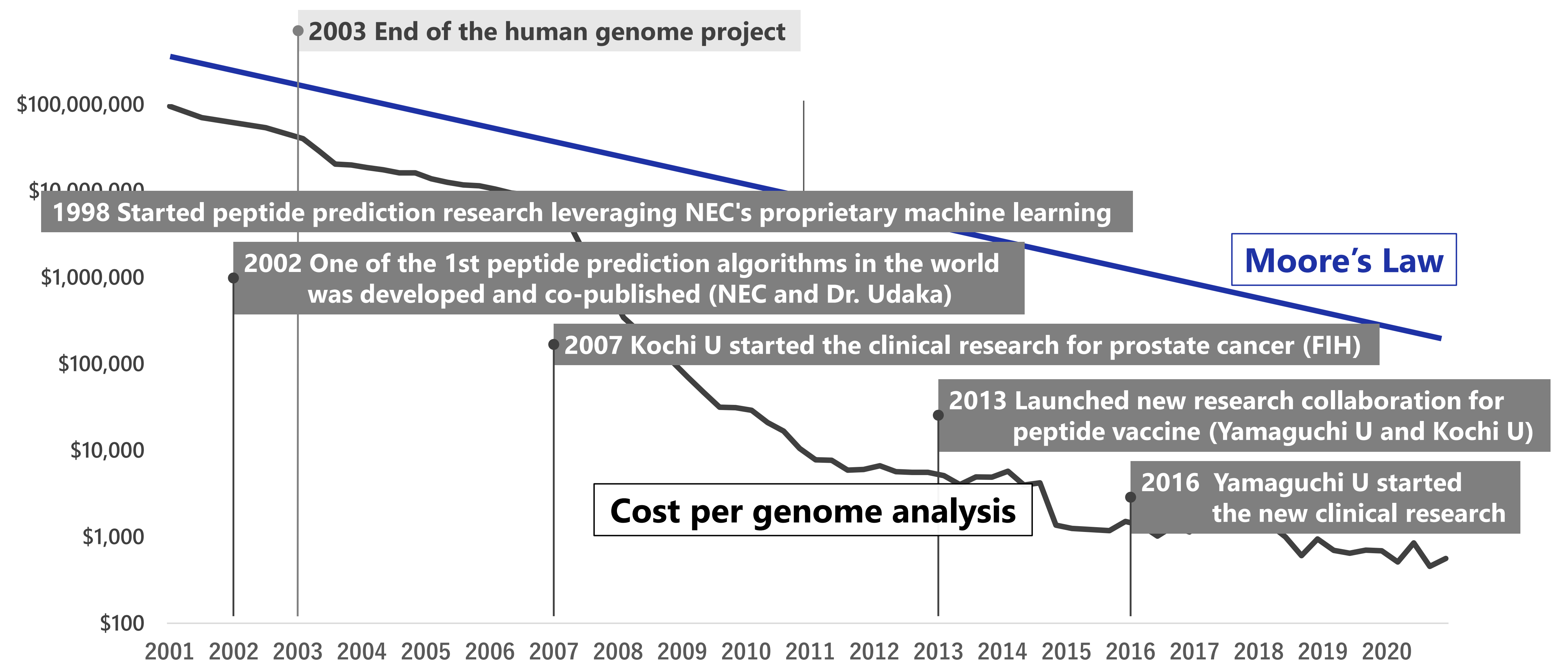
Acquiring domain specific knowledge and data

AI drug discovery : Acquisition of bio tech company (NEC OncoImmunity AS)

Agriculture: Established a joint venture with Kagome Co., Ltd.

Achieving meaningful product releases and incremental business enhancement

History of NEC Healthcare / Life science research and development



2003 End of the human genome project

1998 Started peptide prediction research leveraging NEC's proprietary machine learning

2002 One of the 1st peptide prediction algorithms in the world was developed and co-published (NEC and Dr. Udaka)

2007 Kochi U started the clinical research for prostate cancer (FIH)

2013 Launched new research collaboration for peptide vaccine (Yamaguchi U and Kochi U)

2016 Yamaguchi U started the new clinical research

Expansion to AI drug discovery business (2018～2022)

2018

- NEC and transgene announce a collaboration in the field of individualized cancer immunotherapy

transgene
Orchestrating a brighter world
NEC

2019

- NEC invests in BostonGene
- Partial amendment to the articles of incorporation
- NEC becomes the first Japanese company to join the TESLA consortium
- NEC acquires OncoImmunity AS
- NEC invests in VAXIMM, and made a co clinical trial agreement

2020

- **NEC and transgene start clinical trials**
- NEC publishes design blueprints for SARS-CoV-2 vaccines
- NEC and transgene demonstrate high accuracy of AI-based neoantigen prediction
- NEC and Aichi Cancer Center launch joint research on fundamental study
- NEC and BostonGene collaborate to analyze cancer patients in clinical trials
- NEC, Transgene and BostonGene announce strategic collaboration
- NEC OncoImmunity AS and Oslo University Hospital team up to develop a diagnostic for COVID-19 using artificial intelligence

2021

- NEC joins the CONNECT
- NEC and transgene announce positive preliminary data from Phase I studies of TG4050,
- BostonGene and NEC announce global partnership

2022

- NEC OncoImmunity acquires VAXIMM's neoantigen vaccine development assets
- **CEPI partners with NEC to develop AI-designed broadly protective betacoronavirus vaccine**
- **NEC and Shionogi enter into strategic research collaboration for Novel Hepatitis B therapeutic vaccine**

NEC NEC OncoImmunity AS **transgene**

Started clinical trials of neoantigen vaccines in the US and Europe

CEPI

Develop AI-designed broadly protective betacoronavirus vaccine

Shionogi & Co., Ltd.

Collaborate on research for novel hepatitis B therapeutic vaccine

NEC group selected as first Japanese industry partner

CEPI

100 Days

CEPI

An innovative partnership to develop vaccines against future epidemics

The 100 Days Mission

Produce safe and effective vaccines in 100 days

NEC's innovative AI-powered vaccine design strategy is leveraged for the development of next-generation vaccine for a wide range of betacoronaviruses

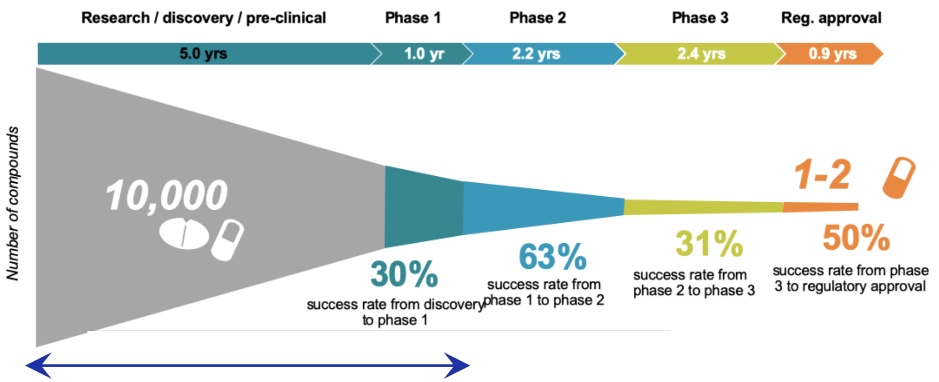
CEPI provides seed funding of up to US$4.8 million (to initial development)

Innovation for vaccine development against infectious diseases - Toward 100 Days Mission -

Innovate drug discovery process with AI x code optimization x HPC* technology

Drug discovery issue is the long vaccine design period

45 % of vaccine development period is occupied with "research and design" phase

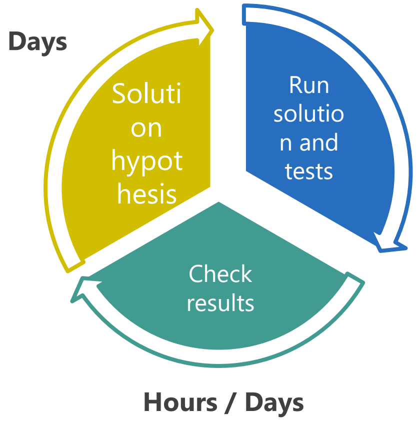


45% of total period

Most of "research and design" phase is for modeling and numerical simulation of partial differential equations, chemical structures, etc.

Shorten vaccine design period to less than 1/15

NEC case: 2 times / Y→ 30+ times / Y
(4 months / trial→1 week / trial)



~~4 Months~~ ▶ **1 Week**

Design cycles per 6 months

~~1 Cycle~~ ▶ **15 Cycles**

Shorten a trial period of a model to less than 1/15 with NEC advanced AI and novel computing optimization technology

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* HPC: High-performance computing

Collaboration with BostonGene

Scheduled JV establishment to develop AI-based genomic and immunoprofiling products in Japan

April 2019
$50M invested

July 2020
Collaboration on analysis of cancer patients in clinical trials

October 2020
Collaboration on genetic analysisof clinical patients with ovarianand head and neck cancers in clinical trials

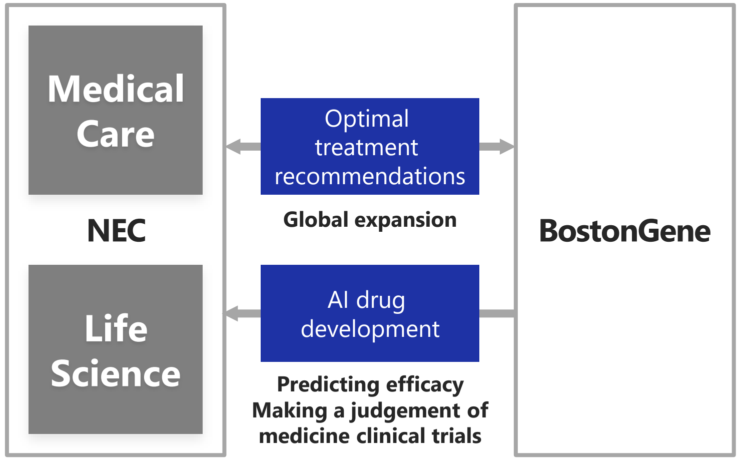
December 2021
Expansion into strategic and global partnership

within 2022 (scheduled)
Establishment of joint venture

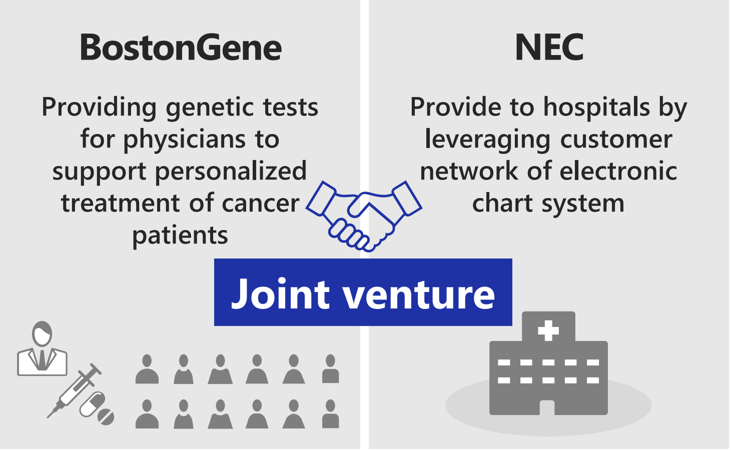
BostonGene

- Established：2015
- Location：Waltham MA, USA
- Employees：>400
- Cutting-edge analytics technology：Identifying each immune profile of cancer patient’s tumor by combining whole gene next-generation sequencing (NGS) analysis and informatics

Business Synergy


Medical Care
NEC
Life Science
Optimal treatment recommendations
Global expansion
AI drug development
Predicting efficacy
Making a judgement of medicine clinical trials
BostonGene

Develop markets by leveraging both companies’ strengths


BostonGene

Providing genetic tests for physicians to support personalized treatment of cancer patients

NEC

Provide to hospitals by leveraging customer network of electronic chart system

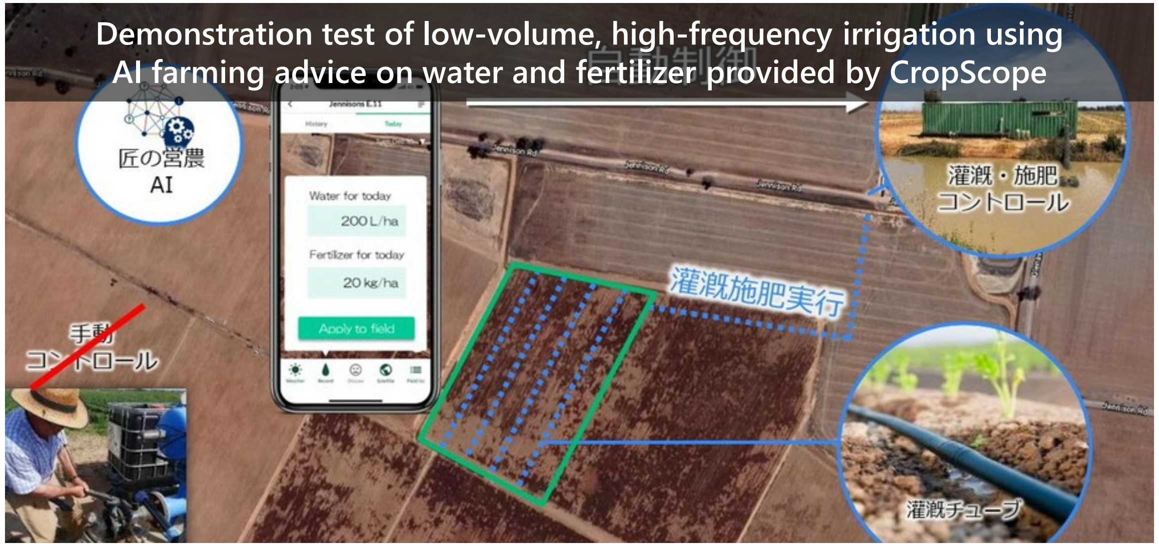
Joint venture

AgriTech with digital twin in agriculture

- Established JV with Kagome Co., Ltd. in Portugal (September 2022) and began operations -

Establishment of JV with Kagome DXAS agricultural technology LDA

Crop model growth simulation[*1] has succeeded in reducing nitrogen fertilizer by 20%[*2] , increasing yields by 20% while reducing irrigation by 15% in Portugal.



Demonstration test of low-volume, high-frequency irrigation using AI farming advice on water and fertilizer provided by CropScope

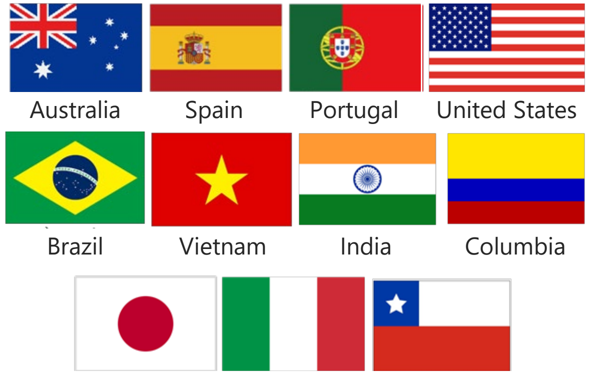
匠の営農
AI
Water for today
200 L/ha
Fertilizer for today
20 kg/ha
Apply to field
灌漑・施肥
コントロール
灌漑施肥実行
手動
コントロール
灌漑チューブ

*1 Digital Twin for agriculture *2 Comparing with common farmer average

Expansion of target regions and crops Track record of 14 crops in 11 countries

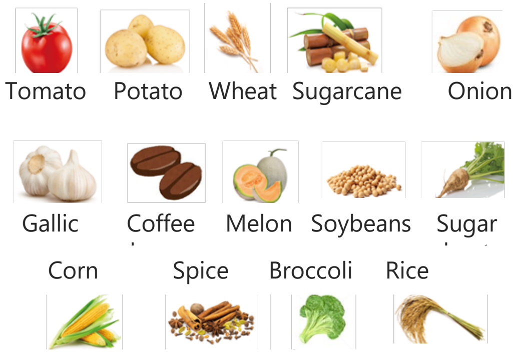
Targeting for NEC consolidated sales of **5 billion** yen by 2025

Expanded to 11 countries



Australia
Spain
Portugal
United States
Brazil
Vietnam
India
Columbia
Japan
Italy
Chile

14 crops supported



Tomato
Potato
Wheat
Sugarcane
Onion
Gallic
Coffee
Melon
Soybeans
Sugar
Corn
Spice
Broccoli
Rice
Corn
Spice
Broccoli
Rice

* AI farming only provided for tomatoes

Carbon neutrality challenge

Carbon credit for disaster prevention

Forest peat fire around 6~9%*

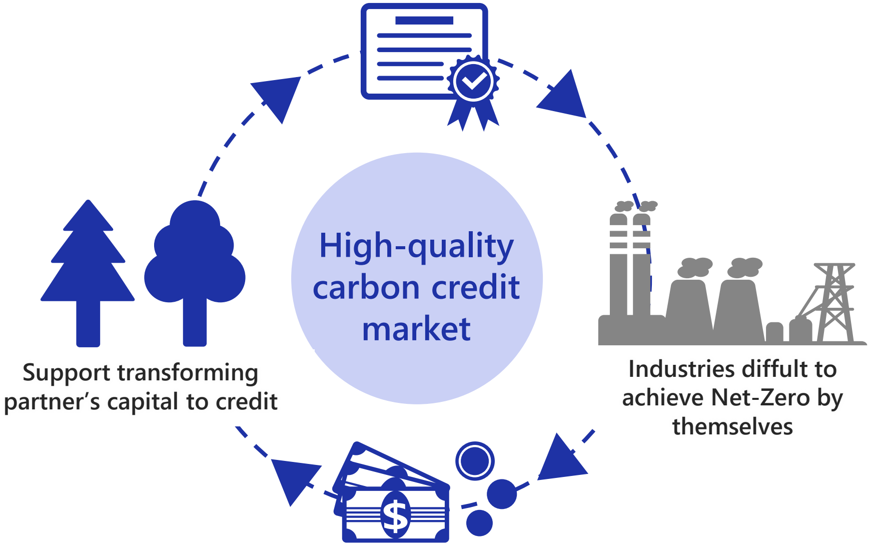
Reconstruction from flood damage around 1%*

Market creation by making it credit for reducing CO2 emission through disaster prevention

- New scheme through NEC-Keio Univ “Creating Knowledge” discussion. In the future, promote creation of technology, business, social systems
- NEC will promote the creation of a credit market and the commercialization of disaster prevention solutions

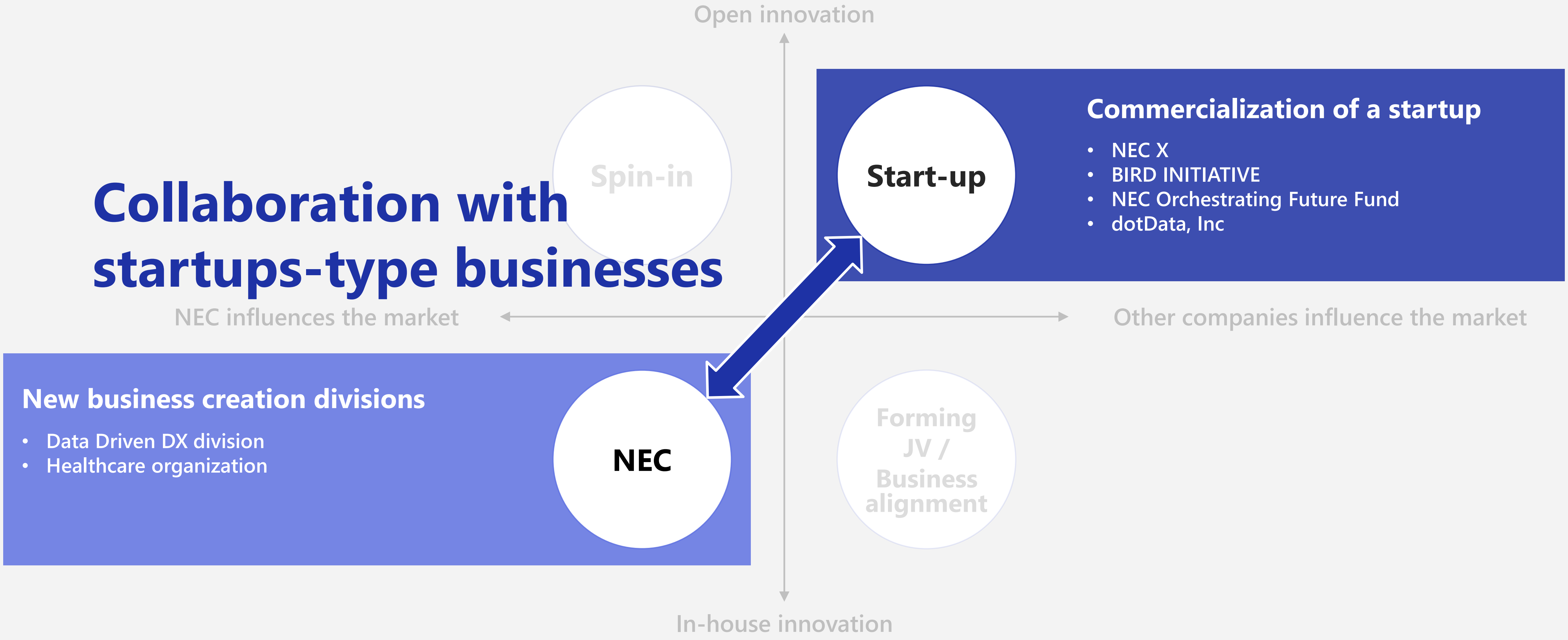
* Percentage of global annual CO2 emissions (NEC estimate)

Creation of high quality carbon offset market


High-quality carbon credit market
Support transforming partner’s capital to credit
Industries diffult to achieve Net-Zero by themselves

Make natural capital (e.g. forests) of forestry, trading company and so on to carbon credit, then supporting offset for industries and corporations difficult to achieve Net-Zero

Types of outcomes



Collaboration with startups-type businesses

Open innovation
In-house innovation
NEC influences the market
Other companies influence the market
Spin-in
Start-up
NEC
Forming JV / Business alignment

Commercialization of a startup

- NEC X
- BIRD INITIATIVE
- NEC Orchestrating Future Fund
- dotData, Inc

New business creation divisions

- Data Driven DX division
- Healthcare organization

Expanding new business through dotData, Inc. and NEC's data driven DX business

Steadily expanding toward corporate value of 50 billion yen as dotData, Inc.

- Series B funding completed in spring 2022 ($74.6 million cumulative)
- Provided to a cumulative total of approximately 100 companies (more than 80 paid companies, including Fortune 500)

NEC will provide data driven DX solutions centered on dotData products

- Orders were strong for services such as roadmap development, predictive analysis, human resource development, etc.
- Expanded product lineup including products and cloud services for SMEs
- Standard patterns by industry for data driven DX are improved and expanded to enable global development

Targeting unicorn level business value by 2025

Unique ecosystem

- dotData and data driven DX business -

Business lead

NEC

Hideto Mori,
Senior executive director,
Global Innovation Unit

Kohei Haga,
Executive manager,
Data driven DX

×

Technology lead

dotData, Inc.

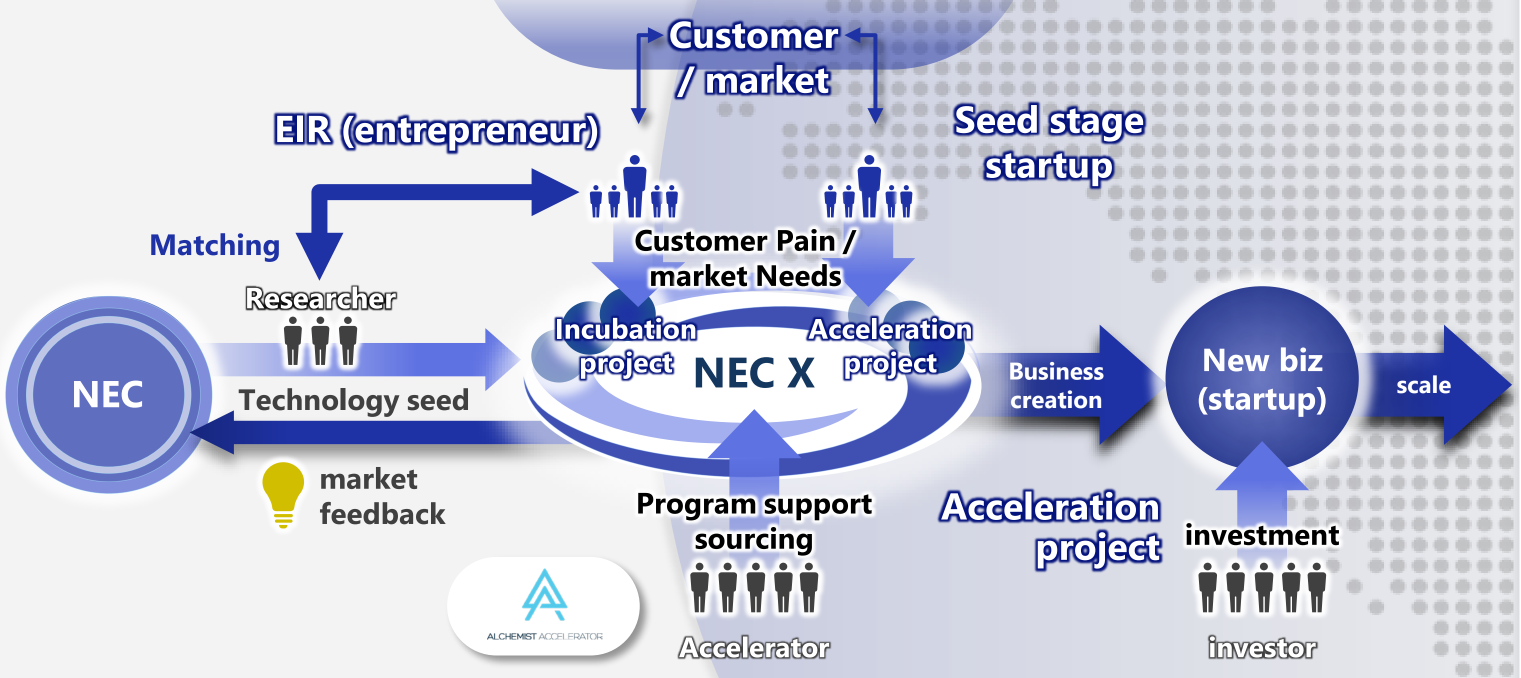
Ryohei Fujimaki,

CEO & Founder

New business development with US investors and entrepreneurs

NEC X（Established 2018）

Business creation leveraging Silicon Valley resource



Customer / market

EIR (entrepreneur)

Seed stage startup

Matching

Customer Pain / market Needs

Researcher

NEC

Technology seed

Incubation project

NEC X

Acceleration project

Business creation

New biz (startup)

scale

market feedback

Program support sourcing

Acceleration project

investment

ALCHEMIST ACCELERATOR

Accelerator

investor

Introduced as case study at Stanford Univ. MBA

"NEC X has evolved from being a new startup itself and is on track to have a success rate that surpasses the norm"

by Charles O'Reilly
Author of 'Lead and Disrupt'

Build ecosystem, expand partnership

Mentor from alchemist X and individual guide of NEC X projects

Collaboration with academia

Collaboration with investor network

Expansion of EIR partnership **5,000 +**

* Quote from NEC Corporation in 2020: Innovating for the Future, STANFORD BUSINESS, Faculty & Research, Case Studies, Ulrike Schaede, Vanessa Ceia, Charles A. O'Reilly III
https://www.gsb.stanford.edu/faculty-research/case-studies/nec-corporation-2020-innovating-future

New business development with US investors & entrepreneurs

2021-2022 Launch 7 startups' business

Metabob

Software services code review and debug support for Software developers
(announced in May 2021)

eCommerce Insights.ai

Product review comment analysis service for e-commerce sellers
(announced Jan. 2022)

BEAGLE TECH

Automated pruning / bud picking SL for farms
(announced in Apr. 2022)

Ongoing support after commercialization, including external funding

NavigateIO

Infrastructure-free, real-time location-based Solution for first responders
(announced in July 2022)

Coming soon..

Platform offering employee mental resilience improvement programs

Quali

Platform providing matching between real estate brokerage agents and buyers / sellers

Coming soon..

Search and rescue support solution using drones to locate missing persons

Expanding commercialization of new business creation consulting business as steadily business

BIRD INITIATIVE

New business creation consulting business by NEC and BIRD INITIATIVE

Grand design

Learning for change	Guideline development	Process development	Implementation measures and planning
Provision of know-how	Workshop	Consulting	

Business acceleration

Assessment & acceleration approach	Innovative facilitation approach
Acceleration	Workshops

Innovation from art to science

- Portfolio management
- Hypothesis testing and study
- Examination guides and learning
- Customer acquisition scenario building

▶ Projects supported **34**

Capturing high market growth ▶ CAGR* **29.2** %

* Innovation management market (REPORTOCEAN Study)
https://prtimes.jp/main/html/rd/p/000002972.000067400.html

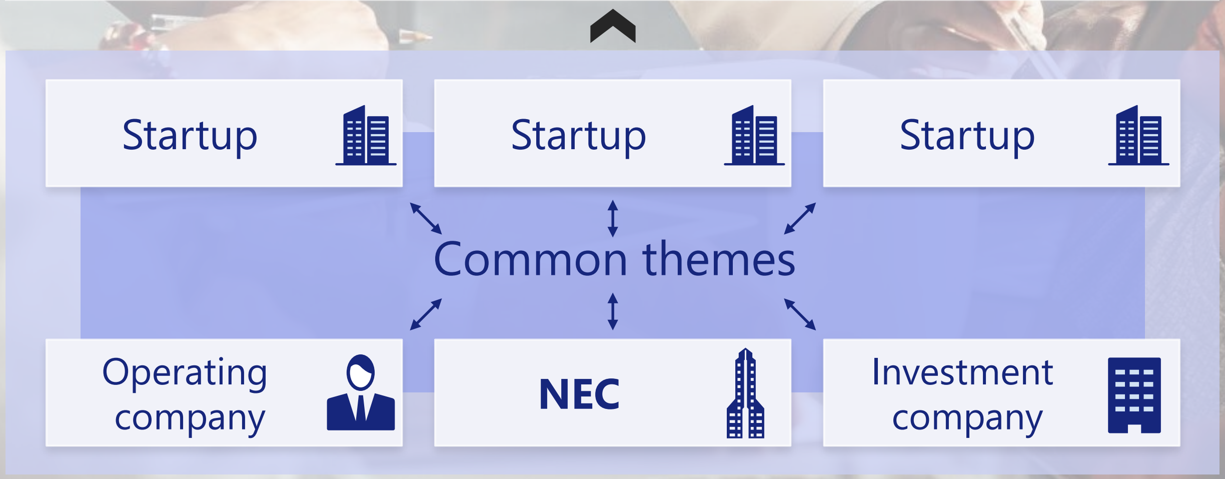
6-Company JV

NEC	Japan Industrial Partners, Inc.	ITOCHU Techno-Solutions Corporation
OBAYASHI CORPORATION	Japan Investment Adviser Co., Ltd.	UTokyo Innovation Platform Co., Ltd.

Business co-creation through the NEC Orchestrating Future Fund

Investment mainly in 6 areas based on the mid-term management plan 2025

- 5G / 6G
- Smart City
- DIGITAL GOVERNMENT DIGITAL FINANCE
- DX
- Healthcare & Life Sciences
- Carbon Neutrality



Results of the first year of the fund's establishment

Raised approx. 20 billion yen

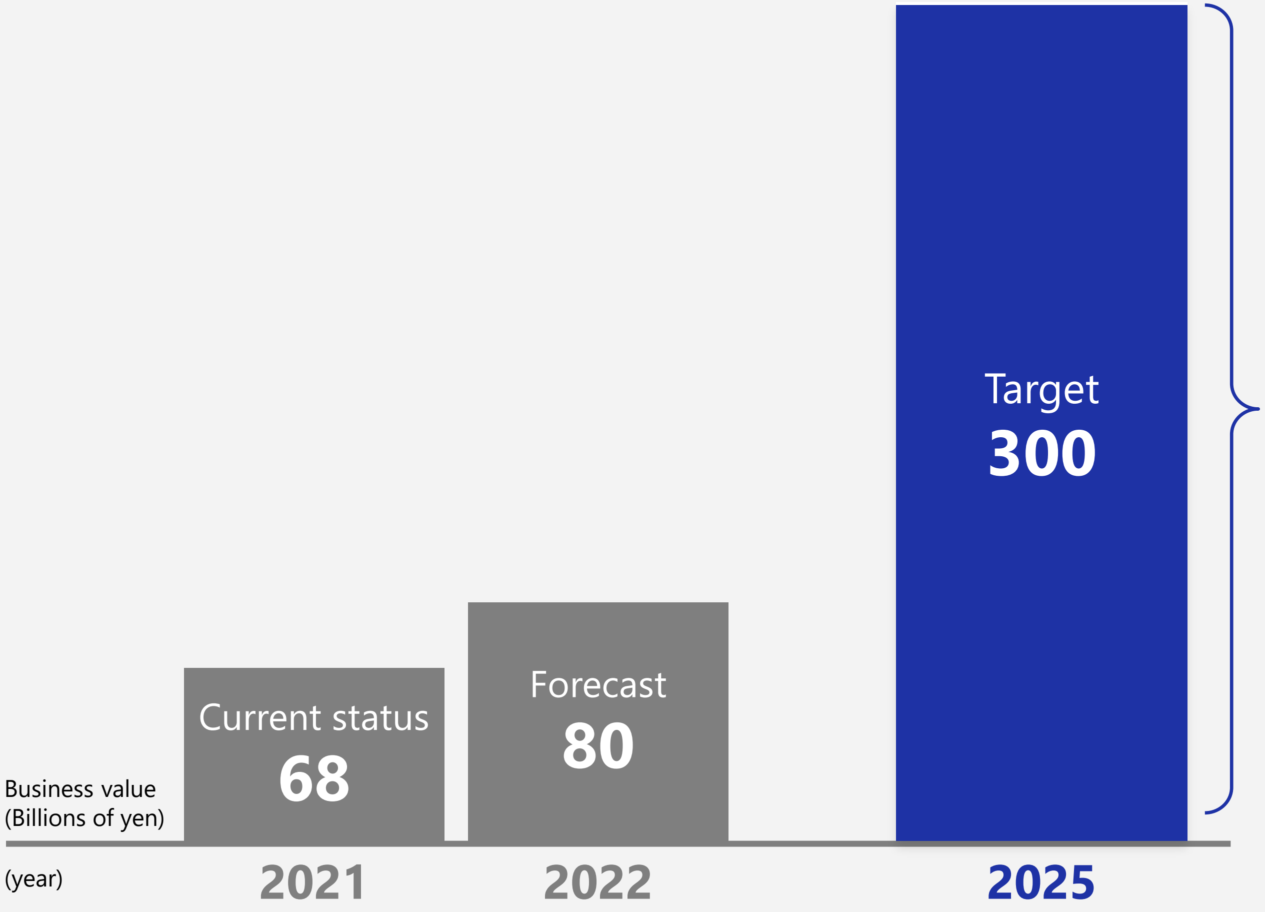
6 companies including NEC invested

Invested in 2 companies and started collaboration with 1 company

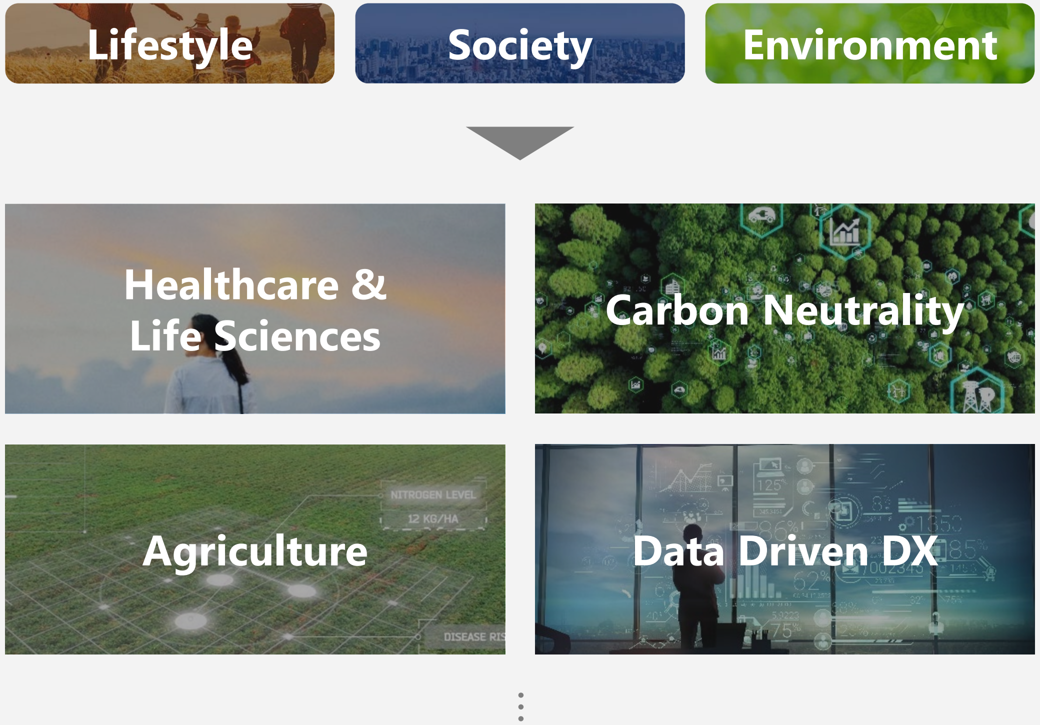
Discussions with dozens of companies for collaboration

Co-create and formulate eco-system through investments in late stage startups in addition to early stage

Creating 300 billion yen in business value by fiscal 2025



Creation of new business areas based on social issues related to NEC 2030VISION


Lifestyle
Society
Environment
Healthcare & Life Sciences
Carbon Neutrality
Agriculture
Data Driven DX
⋮

- Total business value of ongoing business development projects.
- Selecting the most appropriate evaluation method according to project characteristics. (e.g., discounted cash flow method, comparable multiple valuation method (multiple), and others)

01 Contribution to the mid-term management plan 2025 and NEC 2030VISION based on our global No.1 technology

02 Creating new business by cutting-edge business innovations

03 Develop people / innovation environment for new growth

Development of high potential human resources that bring innovations

Professionals development system

* Headcount: In domestic

Business lead × **Technology lead**

Business development specialist program — FY2023 **4** people

Research specialist program — FY2023 **5** people

Highly skilled professionals with outstanding skills are treated in a high-return manner based on their market value

Accelerator training — FY2023 **769** people

Selective compensation program for professional researchers — Cumulative **22** people

Measures for human resource development through industry-academia collaboration

Joint development of university lectures, collaborative research internships, hackathons for students, scholarships for doctoral students, etc.

NEC DX Innovators 100

NEC DX Innovators 100
ビジネスリード
Business lead
テクノロジーリード
Technology lead
詳しくはこちら ＞

44 out of 100 professionals who lead successes in DX were selected from the Global Innovation Unit

Attracting talented resources from around the world, assigning the right person in the right place

- Full-scale ability-based human resources management in R&D divisions, with 40% consisting of those in abroad.
- In new business development divisions, approximately 40% were hired mid-career, even as high as 70% in some.

Leading AI supercomputing center in Japan

The key to competitiveness is enhancing computing power to meet the demands of AI innovation and deep learning

Computing

Incorporated 928 units of high-end GPU（580PFLOPS)

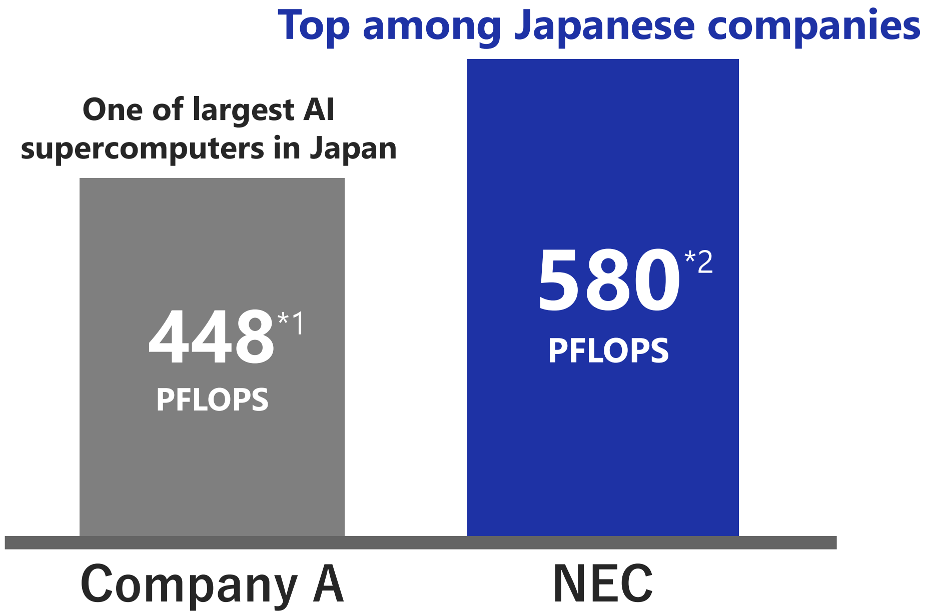
Network

High-speed / low latency network（200GbE)

Storage

Large capacity / high-speed storage（16PB）

The largest AI research supercomputer among Japanese companies

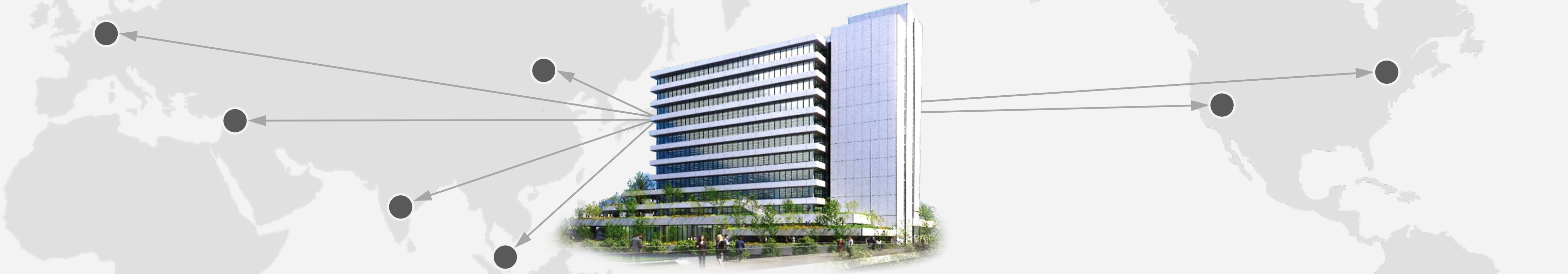


*1 Source: NEC (Sum of company A's AI supercomputers performance) August 2022

*2 Forecast for March 2023. NEC's performance is estimated based on BF16 of A100. Other companies' performance estimated based on FP16 as their BF16 data is not available.

Establish a global open innovation base in 2025

Technology demonstrations field for co-creation the future A place where a variety of people from around the world are invited and where IP value is created by one team



New NEC Innovation Building (tentative name)
(-2025)

Virtual integration of global bases

NEC Partners Universities
Investors Startups

Promotes open innovations worldwide and becoming a company that expands the ecosystem for transformation with technological and business innovations.

\Orchestrating a brighter world

NEC