

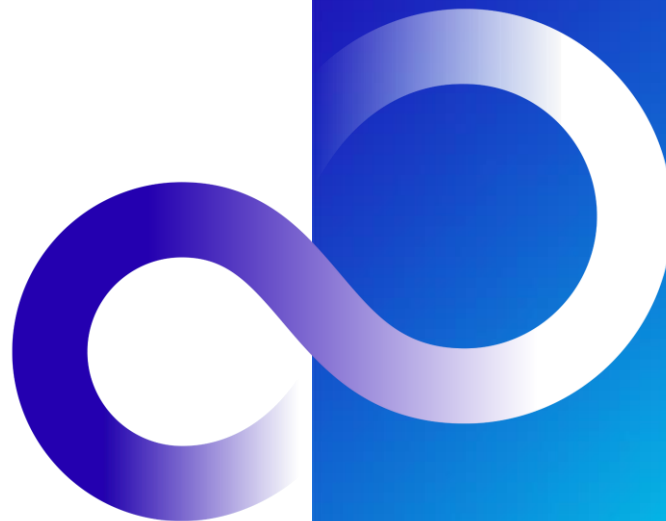
Technology Strategy

Vivek Mahajan

SEVP, CTO, CPO, Co-Head of System Platform

Fujitsu Limited

May 29, 2023



Vivek Mahajan

Corporate Executive Officer
SEVP, CTO, CPO, Co-Head of System Platform

Vivek Mahajan is a global business leader as well as an innovation and technology executive with extensive experience working in number of global leading corporations including Tandem Computers, General Electric, Siebel Systems, Oracle and IBM.

He joined Fujitsu in July 2021 as the Global Chief Technology Officer. His mission is to establish Fujitsu as a leading global technology company known for innovative technology leadership.

Before joining Fujitsu, he worked at IBM Corporation as the Global General Manager for Technology Support and Services, as well as the Chief Revenue Officer for IBM Cloud in addition to previous roles leading Global services, Software product division, and Sales and Marketing.

After graduating from Master's program in electrical engineering and an MBA in Finance/Accounting, he started his career in Silicon Valley as an information technology specialist. Vivek has lived and worked globally including in United States, Australia, Singapore, Japan.

Our purpose

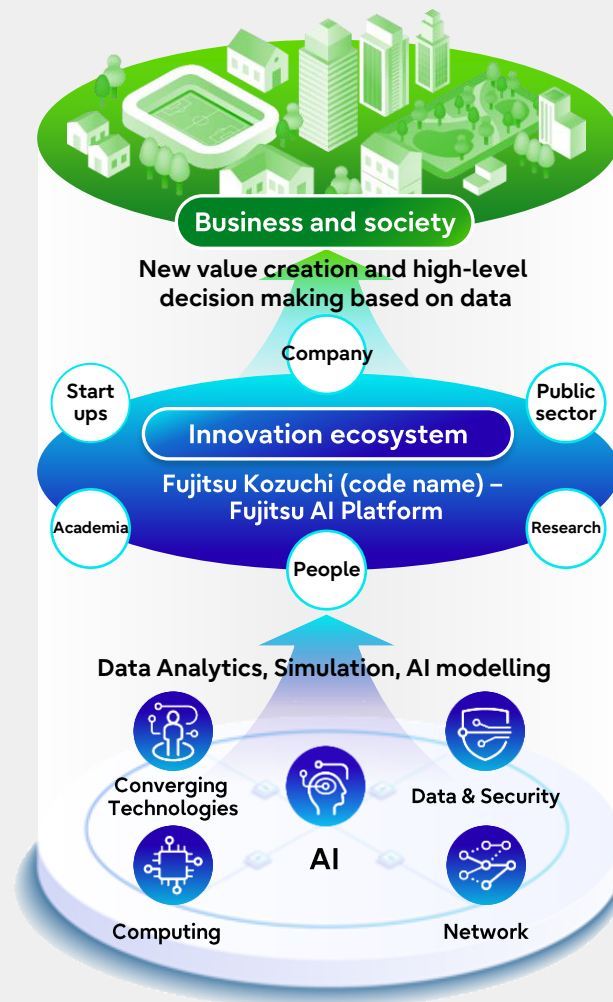
Make the world more sustainable by building trust in society through innovation

Fujitsu Uvance

Innovative solutions that address business challenges and solve societal issues

5 Key Technologies

Combining technologies to generate trusted quality data and deliver new value



5 Key Technologies

- Focus on 5 key technologies
- Integrating technologies to deliver new value to customers

5 technology megatrends

Amplifying creativity

AI



- Semantic graph AI (Semantic graph, Graph AI)
- Explainable AI
- Discovery AI
- Actlyzer

Being connected, inclusive

Network × AI



- 6G technologies
- Disaggregated Computing
- Optical transmission and photoelectric fusion



- Intelligent networks (AI controlled network)

Developing at quantum speed

Computing × AI



- HPC(High performance Processor)
- Quantum computer
- Computing Workload Broker



- Discovery AI
- Materials Informatics

Redesigning the future

Converging Tech. × AI



- Federated digital twins
- Social Digital Twin
- Enterprise metaverse



- Multi-aspect simulation
- Behavior prediction

Evolving Web

Data & Security × AI



- Web3/Blockchain
- IDYX, CDL, Transparent trust transfer
- Trust network



- AI Security and Trust
- Continuous authentication

Fujitsu's key technologies



Computing



Network



AI



Data & Security



Converging Technologies



A platform that delivers AI innovation components one after another

**Fujitsu Kozuchi (code name)
- Fujitsu AI Platform**

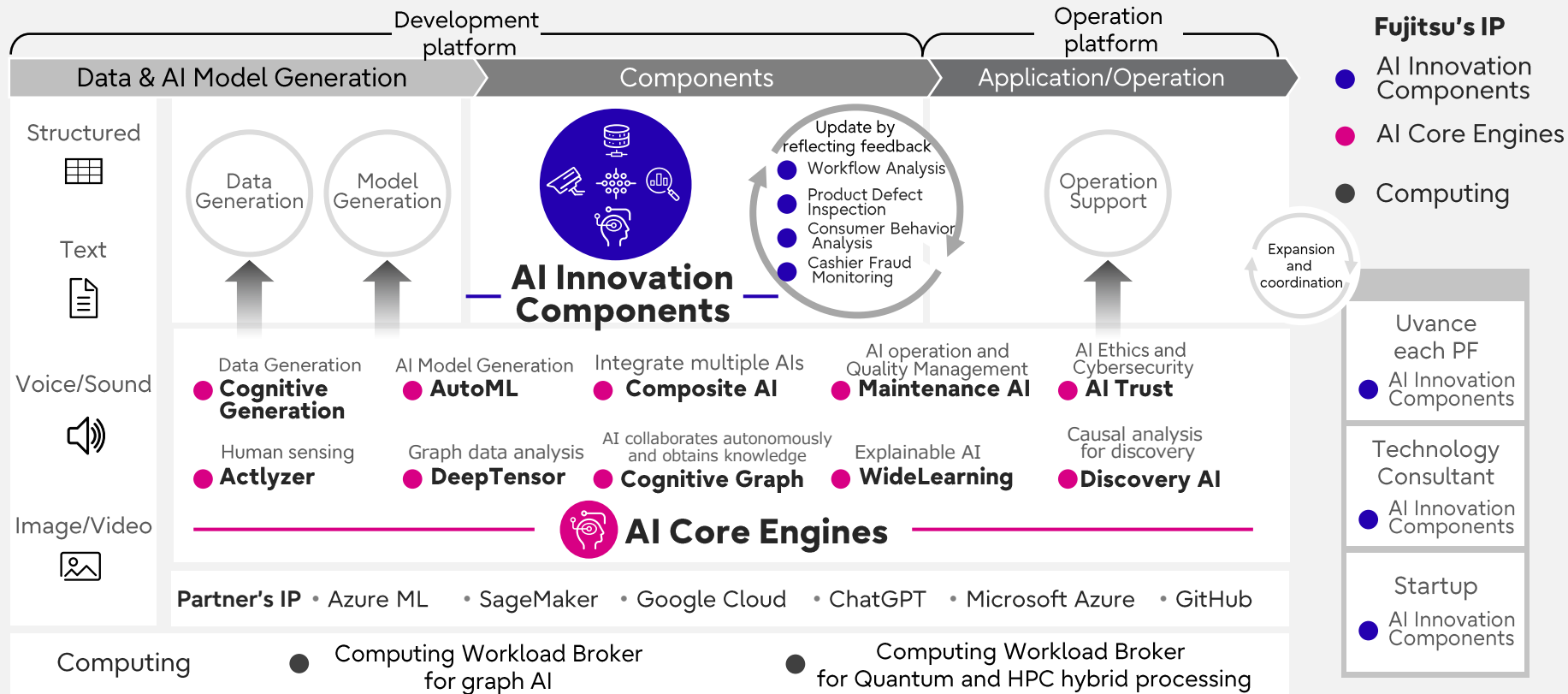
Launched on April 20, 2023

(code name)

Fujitsu Kozuchi - Fujitsu AI Platform



- Evolving cloud-based platform enables faster and easier deployment of different AI solutions



(code name)

Fujitsu Kozuchi - Positioning map



● Innovate value for customers with technologies to generate AI innovation components automatically

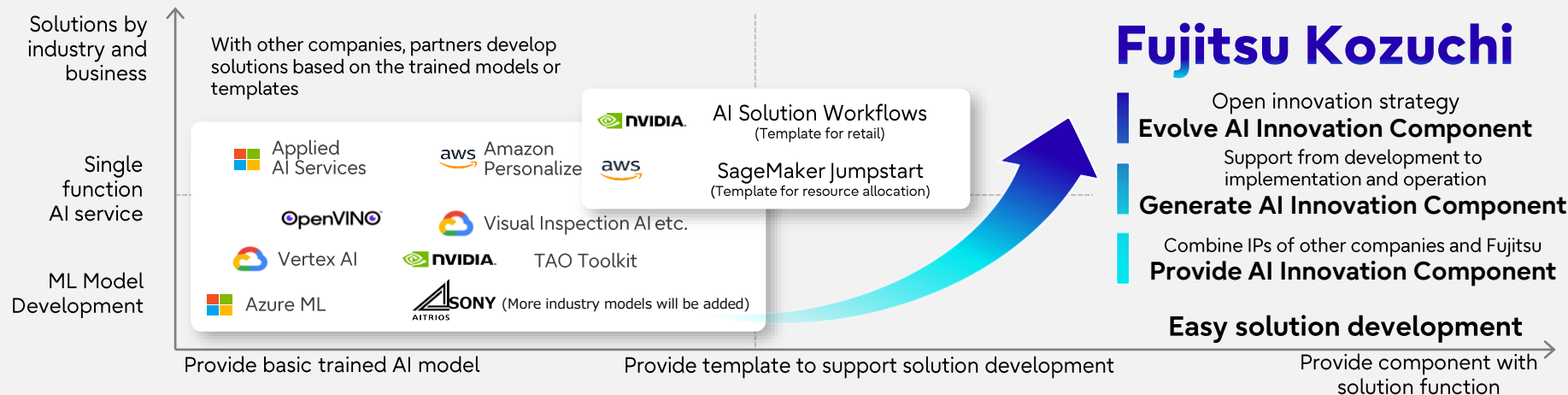
- Transforming existing business model with Fujitsu Kozuchi
- Other companies provide trained AI models or workflow templates, while Fujitsu provides components with solution function

Human Sensing	Explainable AI	Causal discovery
Recognize human behavior and facial expressions	Realize human-AI collaboration	Find out causal relationships for new discoveries
World class human tracking accuracy in 2023	ICLR workshop / Benchmark achievement of world's best (2021)	World's largest causal search using HPC developed at Fugaku to extract important causal factors under individual conditions
Use cases: Store planning, security, production management	Use cases: Product inspections, care prevention, loan review	Use cases: Genomic medicine, materials development, fraud detection

AI related patent publication : 970 (No.1 in Japan*)

*Source: Japan Patent Office (October 2022)

Value for customers



Trust technologies for AI business

- Support the reliability of data for AI through blockchain linkage, rights protection of digital items

Chain Data Lineage (CDL)



Verify the origin of data used by AI

ConnectionChain technology



Transparency of environmental value transactions in different economies

Trust as a Service (TaaS)



Ensure trust in data flow across the organizations

Disinformation measures



Basic architecture for endorsement

SB Technology

Data traceability for the official vehicles used by local government

JEITA

Visualizing CO2 emission in the supply chain

IHI

Environmental value distribution

ADB

Cross-border transactions

JCB, JP Games

Digital data rights protection

TEIKOKU DATABANK

Electronic seal
Corporate digital signature

Keio University SFC

Joint research

IETF / W3C

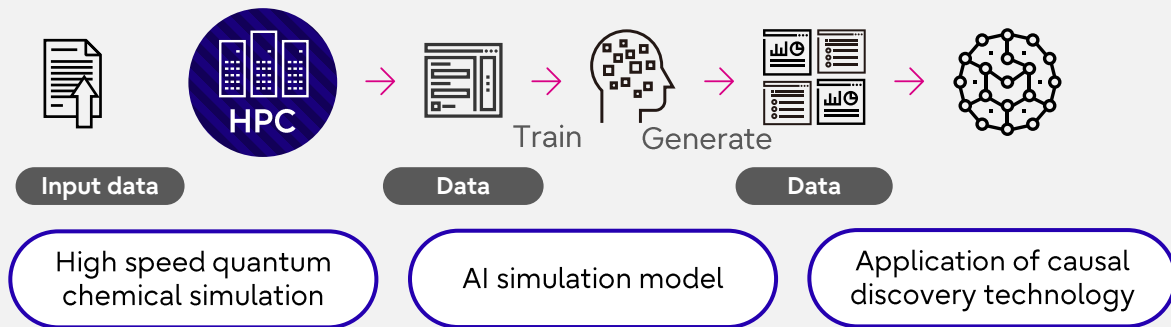
Global standardization

Computing for AI



- Breaking through the limit of innovation using computing technology for AI

Technologies for break through



10 times faster using computing technology to generate data

Reduce computational complexity to 1/100 using AI while maintaining accuracy

Analyze causality of trial and error to discover unknown characteristics

Reduce accuracy degradation and volume of calculation using AI and computing

PoC with Atmonia

- Used AI and computing for catalyst development for ammonia production
- Conducted vast amount of energy calculation to discover trends in the properties of materials

Discovery in PoC

Discovered that elements of lower group numbers in the periodic table are more suitable as the base metals in the catalysts

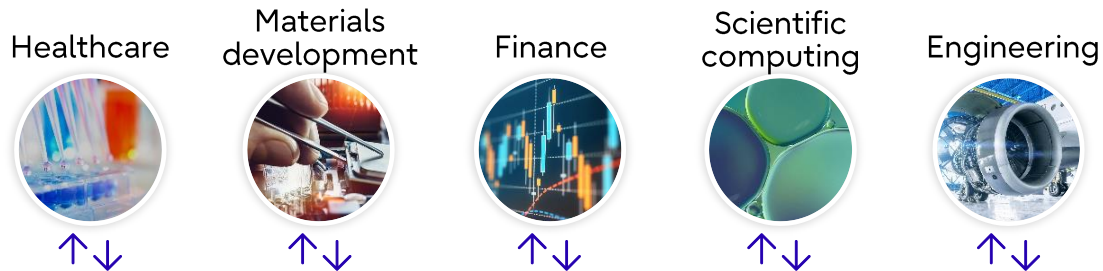
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1	1 H																	2 He														
2	3 Li	4 Be	5 B	6 C	7 N	8 O	9 F	10 Ne					11 Na	12 Mg	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar												
3	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr														
4	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe														
5	55 Cs	56 Ba	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
6	87 Fr	88 Ra	89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Nh	114 Fl	115 Lv	116 Ts	117 Og	
7	119 Uu	120 Uu	121 Uu	122 Uu	123 Uu	124 Uu	125 Uu	126 Uu	127 Uu	128 Uu	129 Uu	130 Uu	131 Uu	132 Uu	133 Uu	134 Uu	135 Uu	136 Uu	137 Uu	138 Uu	139 Uu	140 Uu	141 Uu	142 Uu	143 Uu	144 Uu	145 Uu	146 Uu	147 Uu	148 Uu	149 Uu	150 Uu

※Press Release February 2023

Commitment to the world-class computing



- Deliver world-class tech to customers worldwide with Computing as a Service



AI — Simulation — Data Analytics

Computing as a Service

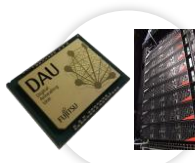
Computing Workload Broker
Cloud Platform

Available on Public Cloud
(AWS/Azure)



Photo credit:
RIKEN

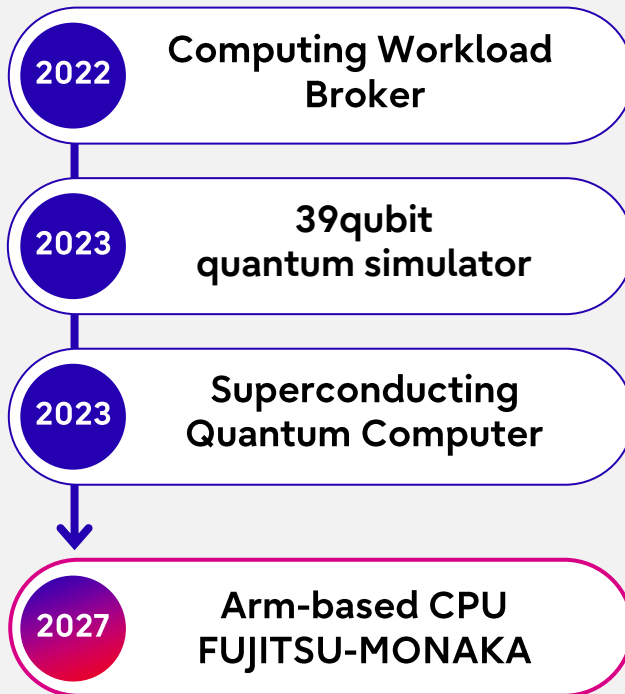
Quantum
computer



Quantum-inspired
technology



HPC



Initiatives for Generative AI on Supercomputer Fugaku

- Research and development of deep learning AI model “Large Language Models (LLM)” used as the core of generated AI
- Utilizing Fugaku in academia and industry to contribute to improving AI research capabilities in Japan

Collaboration with Tokyo Institute of Technology, Tohoku University, and RIKEN

Tokyo Institute of Technology

Oversight of overall processes, parallelization and acceleration of LLMs

Tohoku University

Collection of learning data, selection of models

Fujitsu

Acceleration of LLMs

RIKEN

Distributed parallelization and accelerating communication of LLMs, acceleration of LLMs

Distributed Training of Large Language Models

- Technology for efficiently performing large-scale language model learning in a massively parallel computing environment of supercomputer Fugaku

Future Plans

- Plan to publish the research results obtained through the scope of the initiatives for use of Fugaku defined by Japanese policy on GitHub and Hugging Face in fiscal 2024
- Creating an environment for building large-scale language models that can be used widely by academia and companies



Quantum Computing development strategy

Medium- and Long-Term Initiatives



- Cover all the layers from devices to applications with world's leading research institutions
- Work on several types of hardware, while putting emphasis on software technologies
- Work on application development with end users by using our quantum simulator

[Technology Layer]

QunaSys

Quantum Application

Materials, Drug discovery, Finance, etc. with end uses

Quantum Software

Algorithm

Keysight Technologies

Error Suppression

Osaka Univ.

Error Correction

Quantum Platform

Middleware, Compiler, Cloud Technology

Quantum State Control

RIKEN

Control Circuit

TU Delft

Control Circuit

Control Circuit

Quantum Device, Integration

Superconducting

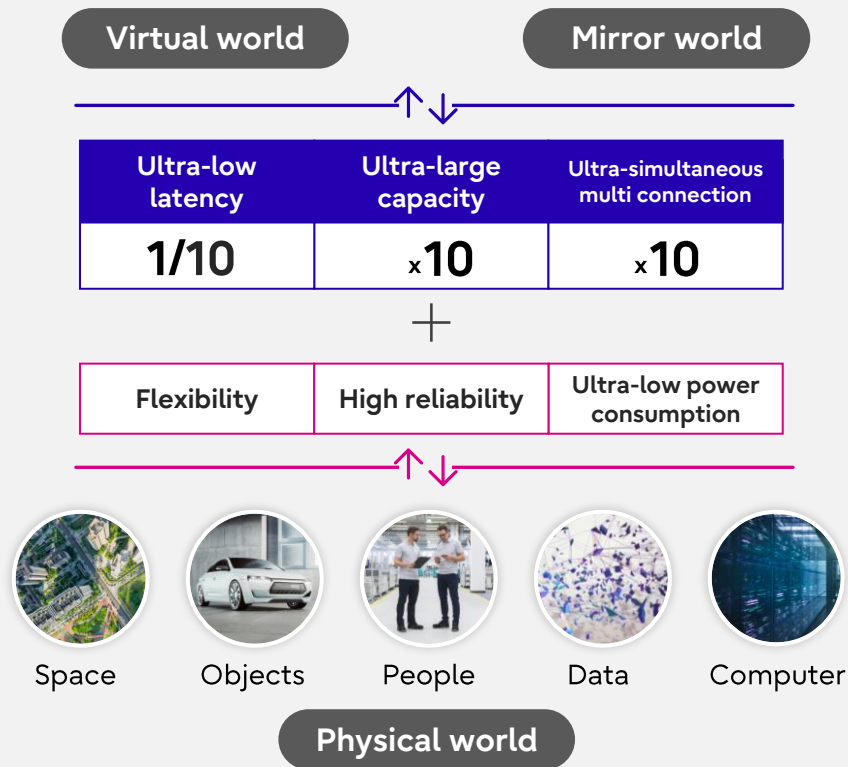
Diamond Spin

Other methods

Exploring Possibilities

Network for AI

- Connect data between distributed AI nodes in real time to realize a digital twin society



Open Network

Network Software

- Orchestration
- Operation management automation
- Security

5G/6G Mobile

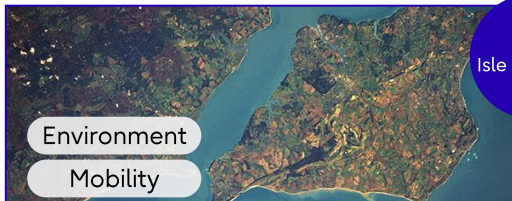
- Virtual base station
- Small, low power consumption
- Autonomous distributed network

Photonics

- All-optical network
- High-capacity transmission
- Low power consumption

Leading Digital Twins with Converging Technologies

- Establish and develop the World's First Social Digital Twin Platform
 - Verify the effectiveness of measures to solve social issues across industries and sectors
 - Working with global partners such as Isle of Wight and Kawasaki City in six areas of social issues



Environment
Mobility

UK
Isle of Wight

Achieved CO2 reduction targets through green and multimode transport measures

Europe
Region



Well-being


Realized **more efficient provision of medical services** by applying to the regional medical ecosystem

Yamagata
Prefecture

Japan
Region

Americas
Region

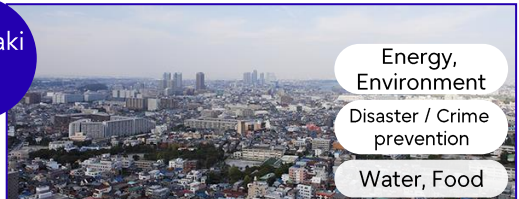
United
States



Energy, Environment
Mobility
Disaster / Crime prevention

Improved the social infrastructure with Carnegie Mellon University

Kawasaki
City








Energy, Environment
Disaster / Crime prevention
Water, Food

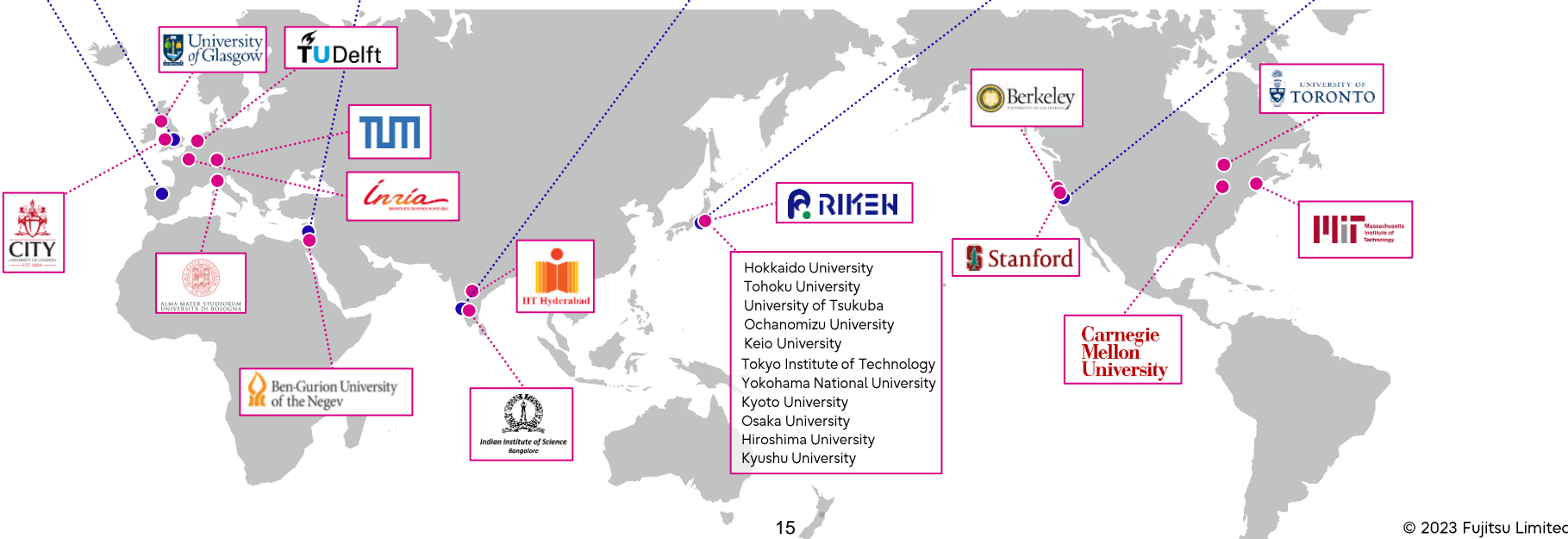
Creating a Marketplace for Companies
Engaging in **Environmental Behavior Change**

Collaborate with universities and research institutions globally





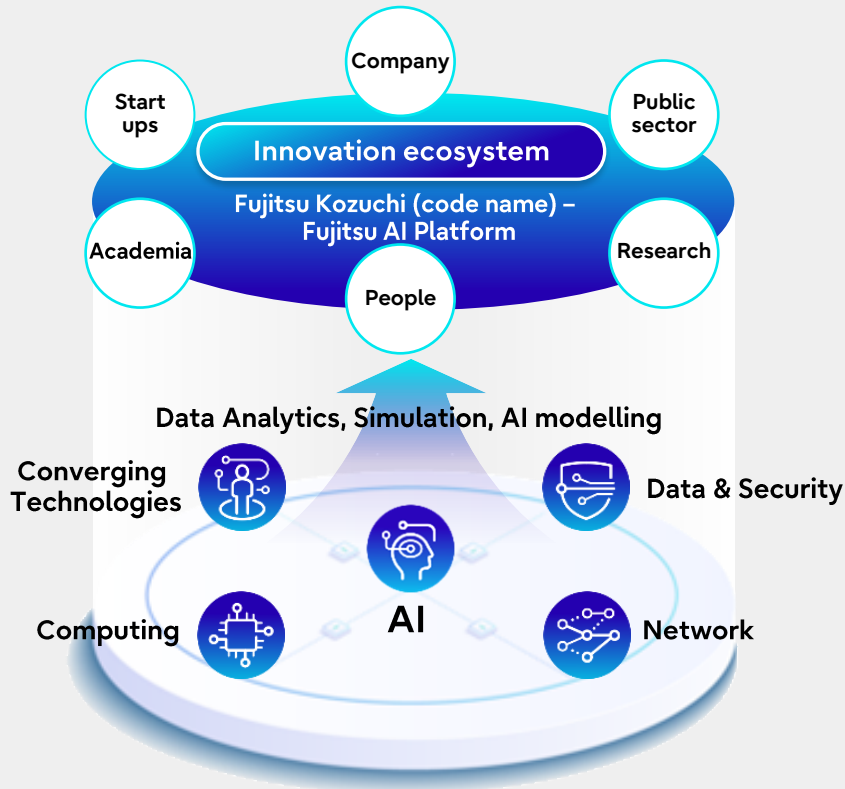
Fujitsu Research Group

 <p>FRE</p> <p>AI, Quantum Converging Technologies</p> <p>FRE: Fujitsu Research of Europe Ltd</p>	 <p>FRE Israel</p> <p>Data & Security, AI</p> <p>Established in April 2023</p>	 <p>FR IPL</p> <p>AI, Computing Quantum Software</p> <p>FR IPL: Fujitsu Research of India Private Ltd</p> <p>Established in April 2022</p>	 <p>Fujitsu Limited</p> <p>AI, Computing, Quantum Network, Data & Security Converging Technologies</p>	 <p>FRA</p> <p>AI, Computing, Quantum Converging Technologies</p> <p>FRA: Fujitsu Research of America, Inc</p>
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Create Business and Society with Partners


**Create
 Innovation and
 Business through
 Technologies**




Thank you

