Fujitsu ActivateNow
Technology Summit
Silicon Valley 2023

Welcome & Fujitsu Technology Strategy

February 22, 2023

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Senior Executive Vice President
CTO

Fujitsu Limited

FUJITSU

Our Purpose

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

Fujitsu ActivateNow
Technology Summit
Silicon Valley 2023

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Turning Crisis
into an Opportunity

Technologies Powering
Sustainability Transformation

Sustainability through Digital Innovation

Borderless ⋯⋯ **Network**
6G, LEO/MEO, Space Tech, XR

Augmentation ⋯⋯ **AI**
Applied AI, ML, Synthetic Data

Resilience ⋯⋯ **Converging technology**
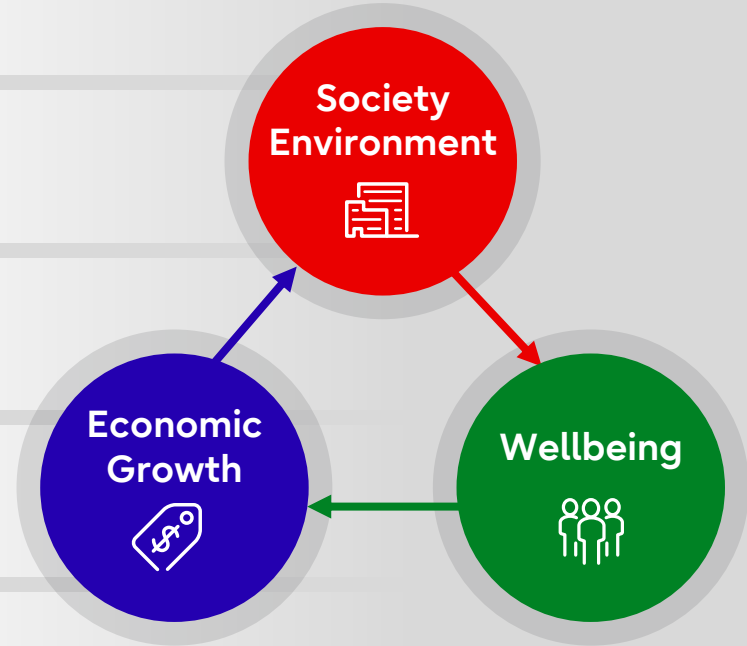Digital Human, Digital Twin
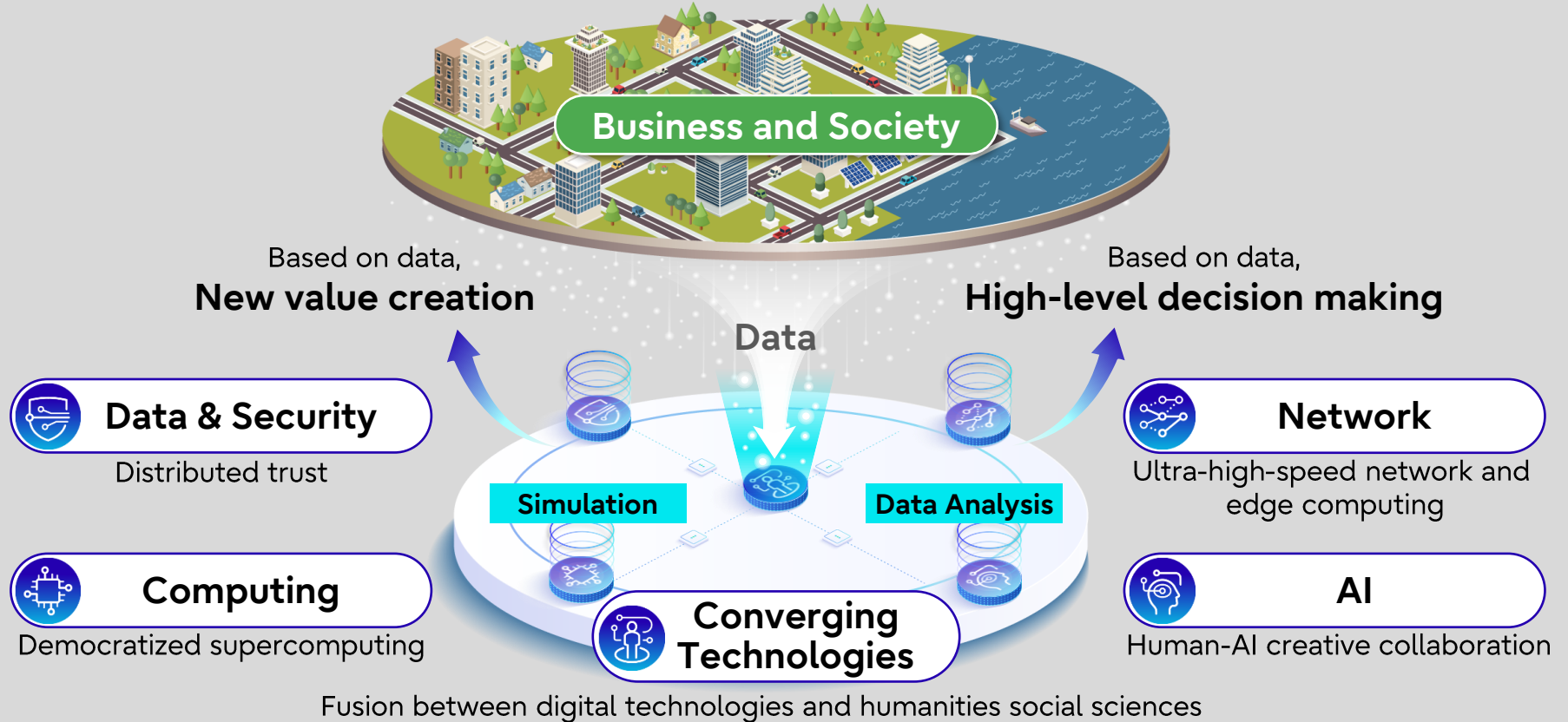
Innovation ⋯⋯ **Computing**
Quantum, Neuromorphic, CaaS

Trust ⋯⋯ **Data and Security**
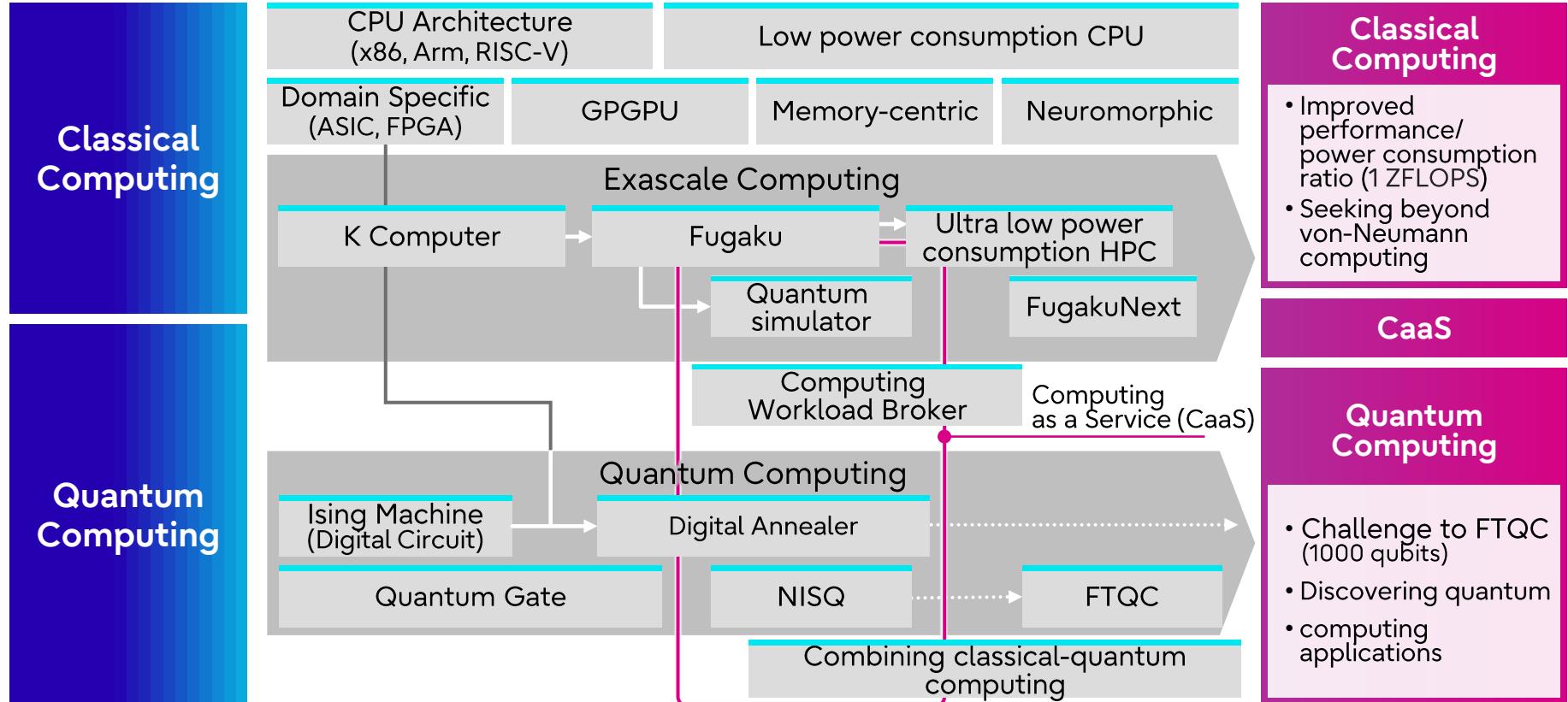Digital identity, Blockchain, NFT, Web3

Society Environment

Economic Growth

Wellbeing

5 Key Technologies

● **Combining technologies to generate trusted quality data and deliver new value**

Business and Society

Based on data,
New value creation

Based on data,
High-level decision making

Data

Data & Security
Distributed trust

Network
Ultra-high-speed network and edge computing

Simulation

Data Analysis

Computing
Democratized supercomputing

Converging Technologies

AI
Human-AI creative collaboration

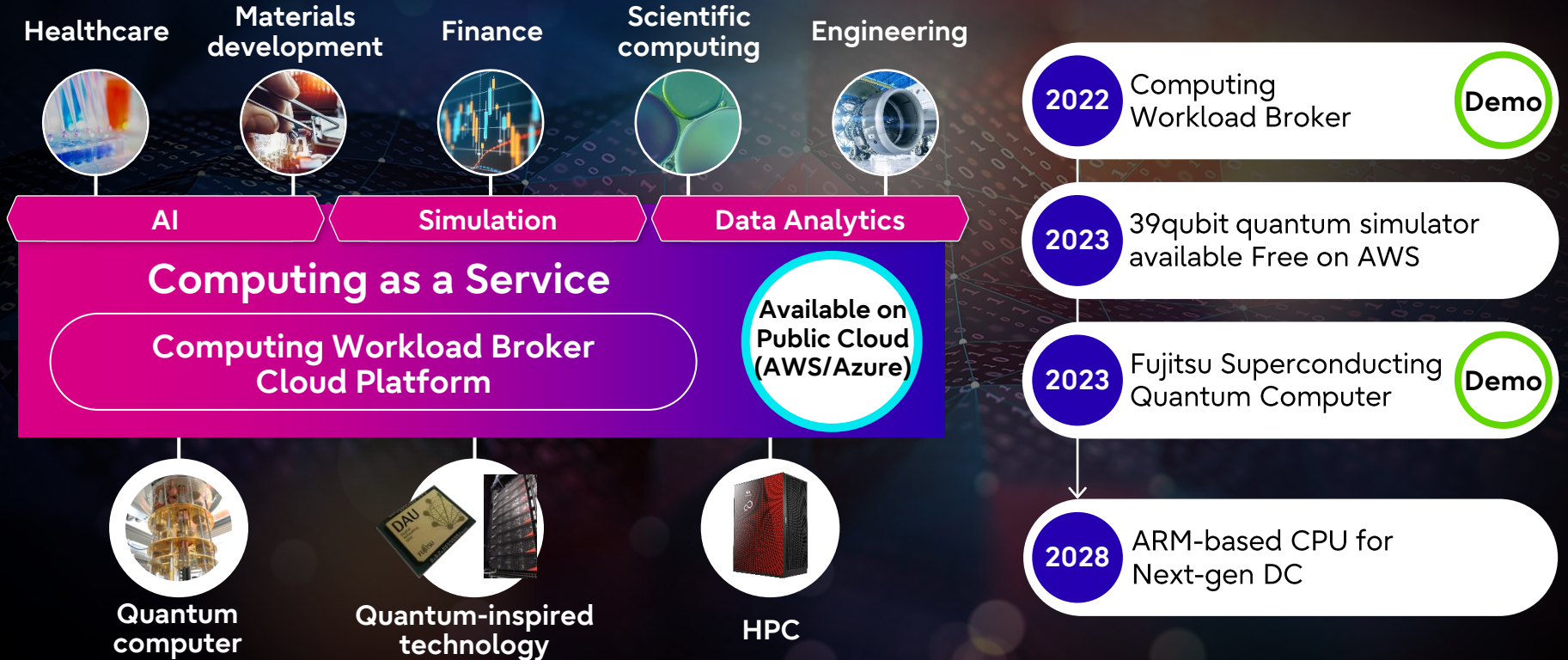Fusion between digital technologies and humanities social sciences

Evolution of Computing Technologies

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- **Pioneering solutions to navigate an unknown future, solving previously unsolvable problems**

Classical Computing

CPU Architecture (x86, Arm, RISC-V)	Low power consumption CPU	

Domain Specific (ASIC, FPGA)	GPGPU	Memory-centric	Neuromorphic

Exascale Computing

K Computer	Fugaku	Ultra low power consumption HPC

	Quantum simulator	FugakuNext

Computing Workload Broker

Computing as a Service (CaaS)

Quantum Computing

Quantum Computing

Ising Machine (Digital Circuit)	Digital Annealer

Quantum Gate	NISQ	FTQC

Combining classical-quantum computing

Classical Computing

- Improved performance/ power consumption ratio (1 ZFLOPS)
- Seeking beyond von-Neumann computing

CaaS

Quantum Computing

- Challenge to FTQC (1000 qubits)
- Discovering quantum
- computing applications

Computing

● **Provide cutting-edge computing technologies to wider range of users**

Healthcare

Materials development

Finance

Scientific computing

Engineering

AI

Simulation

Data Analytics

Computing as a Service

Computing Workload Broker Cloud Platform

Available on Public Cloud (AWS/Azure)

Quantum computer

Quantum-inspired technology

HPC

2022	Computing Workload Broker	Demo
2023	39qubit quantum simulator available Free on AWS	
2023	Fujitsu Superconducting Quantum Computer	Demo
2028	ARM-based CPU for Next-gen DC	

Computers – case studies

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Quantum-inspired technology:

Digital Annealer 200 + use cases

🏛 National WestminsterBank	⬡ PeptiDream
⬡ Toray Industries	▭ Geniee
🏛 Commerzbank AG, Germany	✦ UK Space Agency
🏛 MELCO Investments	🚢 Nippon Yūsen
🚚 TOYOTA SYSTEMS	💊 PeptiAID
🚢 JOGMEC	▯ Showa Denko
📶 KDDI	🚢 Port of Hamburg

HPC 100 + use cases

Fugaku	RIKEN	**X86 Cluster**	Hokkaido University Information Initiative Center
X86 Cluster	National Institute of Advanced Industrial Science and Technology	**X86 Cluster**	Tohoku University Institute of Fluid Science
FX 1000	Japan Aerospace Exploration Agency (JAXA)	**FX 1000** / **X86 Cluster**	The University of Tokyo Information Technology Center
X86 Cluster	The Australian National University (operated by NCI)	**FX 1000** / **X86 Cluster**	Nagoya University Information Technology Center
FX 1000 / **X86 Cluster**	Minho Advanced Computing Center (MACC)	**X86 Cluster**	Kyushu University Research Institute for Information Technology

Accelerating application development and delivering to a wider range of users

Quantum simulator

FUJIFILM

Joint research in the field of computational chemistry with Fujifilm and others, as well as in the fields of manufacturing and finance

To other applications

Materials development

Engineering

Finance

Quantum-inspired technology

Port of Hamburg

Application of the overall system optimization as a holistic solution. Complex calculations of a high number of possible scenarios in a few seconds.

To ports around the world

9

Fujitsu Quantum Simulator Challenge

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- **$100K award contest for developing innovative new applications on the world's fastest-class 39-qubit quantum simulator**

$100,000 Prize

First Prize	**$50,000**
Second Prize	**$30,000**
Third Prize	**$20,000**

Benefits

- Collaboration with our quantum experts
- Training, support and insights
- Potential future partnerships

Join the Contest

- February 22 to June 30, 2023
- QR or email: fra_quantum@fujitsu.com

Fujitsu
Quantum Simulator
Challenge

AI – case studies

6,000+ use cases since 2019

Atmonia — Demo
Ammonia catalyst search with HPC and AI

LARUS Business Automation — Demo
Graph XAI services for financial institutions

ITO EN

National Hospital Organization Nagoya Medical Center

Otsuka Pharmaceutical Factory

UNICEF

Inria

Southern Tohoku General Hospital

TBS

NTT Docomo Tokai / Nagoya Dome

MIT Center for Brains, Minds and Machines

Kongsberg Digital

Toyo University/ Amagasaki City

Aichi Cancer Center

SUNTORY LOGISTICS

Ben-Gurion University of the Negev

Maritime and Port Authority of Singapore

Tokyo Medical and Dental University

The University of Tokyo Hospital

Recruit

Tohoku University, The University of Tokyo, Kawasaki City

International Gymnastics Federation (FIG)

AEON RETAIL

SUBARU

Japan Coast Guard

(AIST) National Institute of Advanced Industrial Science and Technology

Evolution of Data & Security Technologies

- **Infuse trust into all autonomous decentralized societies and systems**

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	Perimeter Security	Zero Trust Security	Digital Trust	**Trust in Everything**
Cyber Security	Cyber attack defense	Cloud Security	Cyber physical trust Digital evidence	**Digital trust AI security Privacy enhancing technologies**
	Privacy protection	Data Security	AI Security	
	Authentication Multi Biometrics	Identity Management (TaaS)	Privacy enhancing technologies	
	IoT Security	Zero-Trust Network	Self-Sovereign ID (DID / SSI)	
Blockchain	Public chain	Interoperability (Connectionchain)	Web 3.0/ Distributed Web (Smart Contract, SSI, NFT)	**Web3 Trusted Web**
	Consortium / private chain			
Data Platform	PDS (Individual)	Distributed PDS Cooperation	Distributed data platform	**Autonomous distributed cooperation type data platform**
	Administrative Function Data Platform	GAIA-X / SIP	Multi-Cloud Data Integration Platform	
	DWH ETL Corporation	Centralized Data Platform Data Lake		

Fujitsu Web3 Acceleration Platform

- **Provide Fujitsu's trusted Web3 technologies globally and demonstrate use cases for new business creation with co-creation partners**

Digital contents

Digital trust

DAO*

*Decentralized Autonomous Organization

Fujitsu Web3 Acceleration Platform

Community activities based on development environment

API infrastructure

Data e-TRUST *March 2023 release

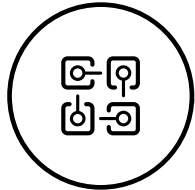Ensuring trusted data collection and distribution led by users

Digital ID | Digital wallet | Ledger

HPC | **Digital Annealer**

Computing as a Service

Fujitsu's advanced blockchain technology

*Provision starting fiscal 2023

Evolution of Network Technologies

● **Intelligently combine decentralized virtual environments and real worlds**

				6G
Wireless Mobile	5G (NSA)	5G (SA)	Beyond 5G	**Non-Terrestrial Network** • Space Network /Satellite
	Base Station (ORAN、vRAN)	Software-defined Base Station	Small, low power consumption Software-defined Base Station	
Virtualization, Software-defined	Virtual Network	Cloud Native Network	Multi-Cloud Network	**Intelligent Network** • Workload Optimization /Autonomy • Network Orchestration
		AI / ML	Automation of Network Operation Management	
		Network Security	Product Security	
Front system	IoT	Edge Computing	Multi-Edge Computing	**Autonomous Decentralized Network** • Data/AI Model/ Application Cooperation
Core Network (Wired)	Optic (5 Tbit)	Optic (100Tbit)	Small, low power consumption All Optic (1 Pbit)	

Core of Network Technologies

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● **Realizing a flexible and autonomous open network to meet service requirements**

Performance	Virtualization	Automation	Efficiency	Integration & Security
Cutting edge technologies to improve performance and capacity	Public cloud compatible Open RAN network (AWS, Microsoft Azure)	Advanced RAN resource control to optimize performance	Multi-band Radio Unit (RU) with high-efficiency RF components	Advanced O-RAN integration skillset incorporating security by design
MEC / RIC / CU / DU(L2) / DU(L1) / Container / IA Server	vCU vDU	**Demo** AI & ML + Digital Annealer RIC	Dual Band RU Triple Band RU 64TRX mRU	MITC Mobile Integration and Testing Center

Expansion into Wide Range of Applications

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Public 5G

DISH Network

Fujitsu is 5G base station vendor Delivering radio units to North America (since 2020)

Realized interoperability with DISH Network's virtual distributed units

Contributing to DISH Network's new entry into MNO Business

Private 5G

KDDI

Promoting linkage between private 5G and au 5G networks for metaverse realization (since Sep 2021)

Combined with XR technology to integrate the real and digital worlds

Creating new experiences by adopting private 5G in metaverse

Next Generation 6G

NTT

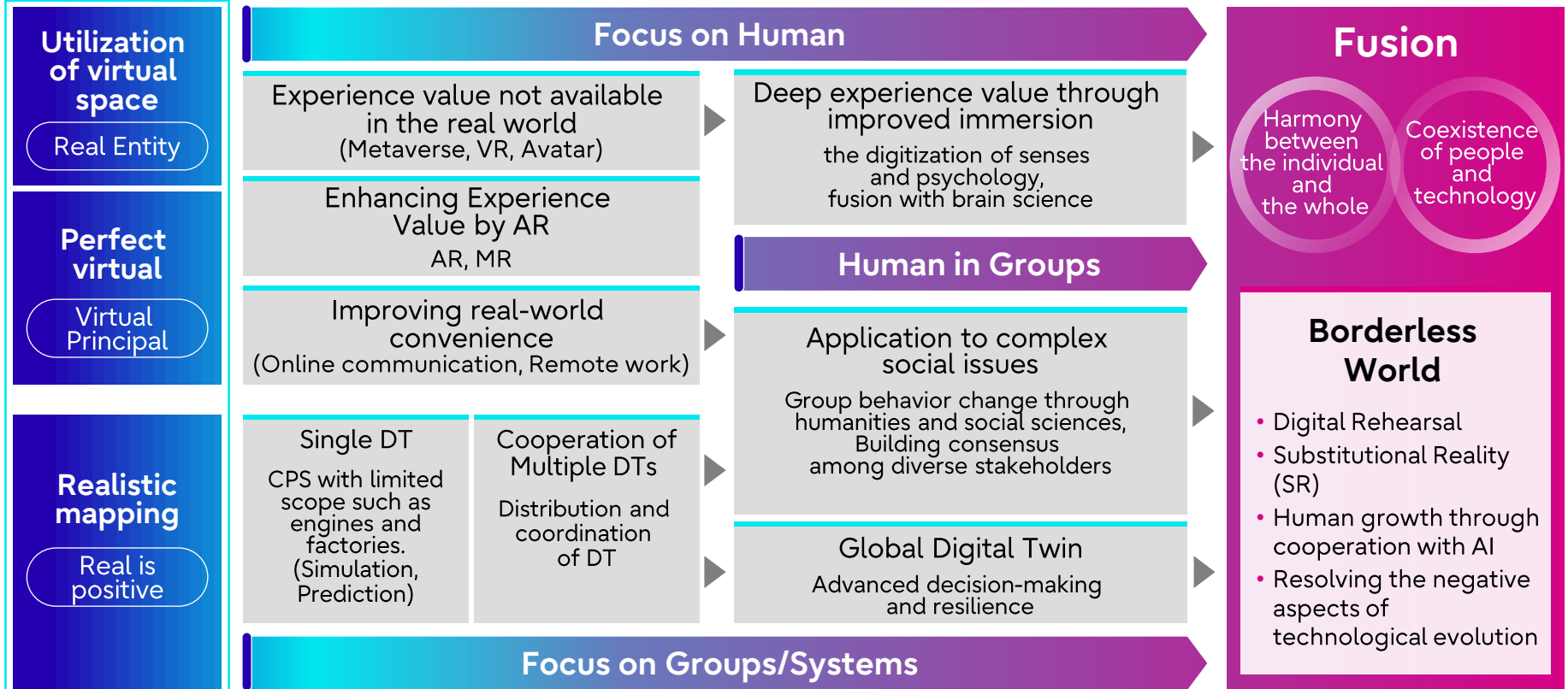Promoting joint R&D to realize next-generation "6G" (since April 2021)

Adopting Fujitsu's advanced computing technology for realizing photonics-electronics convergence technology and disaggregated computing

Achieving dramatic advances in network computing toward a sustainable green society

Evolution of Converging Technologies

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● **Expand human ability while preserving a sustainable society**

Utilization of virtual space
Real Entity

Perfect virtual
Virtual Principal

Realistic mapping
Real is positive

Focus on Human

Experience value not available in the real world
(Metaverse, VR, Avatar)

Enhancing Experience Value by AR
AR, MR

Improving real-world convenience
(Online communication, Remote work)

Single DT	Cooperation of Multiple DTs
CPS with limited scope such as engines and factories. (Simulation, Prediction)	Distribution and coordination of DT

Deep experience value through improved immersion
the digitization of senses and psychology, fusion with brain science

Human in Groups

Application to complex social issues
Group behavior change through humanities and social sciences, Building consensus among diverse stakeholders

Global Digital Twin
Advanced decision-making and resilience

Focus on Groups/Systems

Fusion

Harmony between the individual and the whole

Coexistence of people and technology

Borderless World

- Digital Rehearsal
- Substitutional Reality (SR)
- Human growth through cooperation with AI
- Resolving the negative aspects of technological evolution

What is Converging Technologies?

● **Understand "Human Feelings" and Predict Human Behavior**

Image processing x behavioral science Analyze and predict human behavior

Behavioral analysis technology

Demo

Real world

Actlyzer

Digitalize human behavior and **extract** its characteristics statistically

→ Quantitative human behavior description

Behavioral science

Real world

Watch human behavior and find its characteristics to create the model

→ Qualitative human model

Build a safe city with converging technologies

Reduce traffic accidents by detecting and informing dangerous driving, etc.

Monitor and detect the danger of the elderly wandering off or falling to ensure their safe living
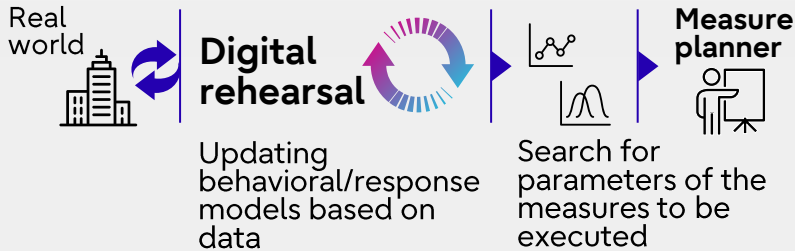
Build a safe city by detecting and predicting criminal behavior

Digital Rehearsal by Converging Technologies

Social science x individual person's behavior Simulate the whole society

Digital rehearsal of measures

Real world ⇄ **Digital rehearsal** ⟳ 📈 → **Measure planner**

Updating behavioral/response models based on data

Search for parameters of the measures to be executed

Possible to follow the real-world changes

Social science

Incorporating knowledge of social science

Digital technology

Real-time evaluation and simulation

Quickly create effective measures through digital rehearsal

Realizing a society that can reduce CO_2 emissions without losing convenience in transportation

Demo

Dual-purpose city planning for peacetime and emergencies

Realizing a society that can keep ordinary economic activities while preventing congestion during a pandemic

Accelerating Research with Global Partners

Fujitsu Research Group

FRE | FRIPL | FRDC | Fujitsu Limited | FRA

University of Glasgow
TU Delft
TUM
Berkeley UNIVERSITY OF CALIFORNIA
UNIVERSITY OF TORONTO
Inria INVENTEURS DU MONDE NUMÉRIQUE
IIT Hyderabad
Stanford
MIT Massachusetts Institute of Technology
CITY UNIVERSITY OF LONDON EST 1894
ALMA MATER STUDIORUM UNIVERSITÀ DI BOLOGNA
RIKEN
Carnegie Mellon University
Ben-Gurion University of the Negev
Indian Institute of Science Bangalore

FRA: Fujitsu Research of America, Inc
FRDC: Fujitsu R&D Center, Co, Ltd
FRE: Fujitsu Research of Europe Ltd
FRIPL: Fujitsu Research of India Private Ltd

Enjoy
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Thank you

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