NCHC TAIWAN 臺灣

National Center for
High-performance Computing

HPC++

DRIVING TRANSFORMATION FOR A BETTER FUTURE

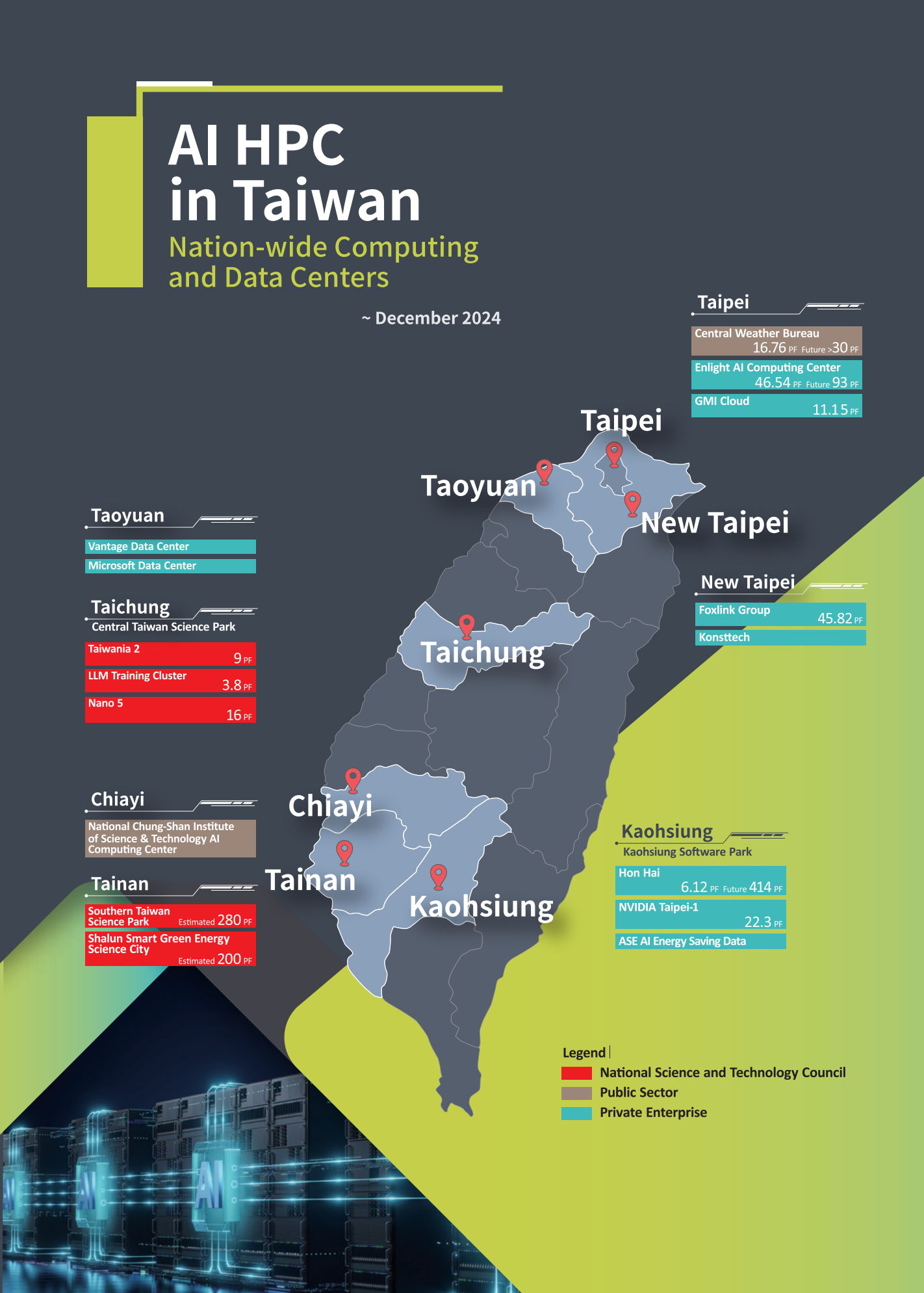
NCHC

ISC High Performance
The HPC Event.

AI HPC in Taiwan

Nation-wide Computing and Data Centers

~ December 2024



Taipei

- Central Weather Bureau — 16.76 PF Future >30 PF
- Enlight AI Computing Center — 46.54 PF Future 93 PF
- GMI Cloud — 11.15 PF

Taoyuan

- Vantage Data Center
- Microsoft Data Center

Taichung

Central Taiwan Science Park

- Taiwania 2 — 9 PF
- LLM Training Cluster — 3.8 PF
- Nano 5 — 16 PF

New Taipei

- Foxlink Group — 45.82 PF
- Konsttech

Chiayi

- National Chung-Shan Institute of Science & Technology AI Computing Center

Tainan

- Southern Taiwan Science Park — Estimated 280 PF
- Shalun Smart Green Energy Science City — Estimated 200 PF

Kaohsiung

Kaohsiung Software Park

- Hon Hai — 6.12 PF Future 414 PF
- NVIDIA Taipei-1 — 22.3 PF
- ASE AI Energy Saving Data

Legend

- National Science and Technology Council
- Public Sector
- Private Enterprise

“HPC at NCHC

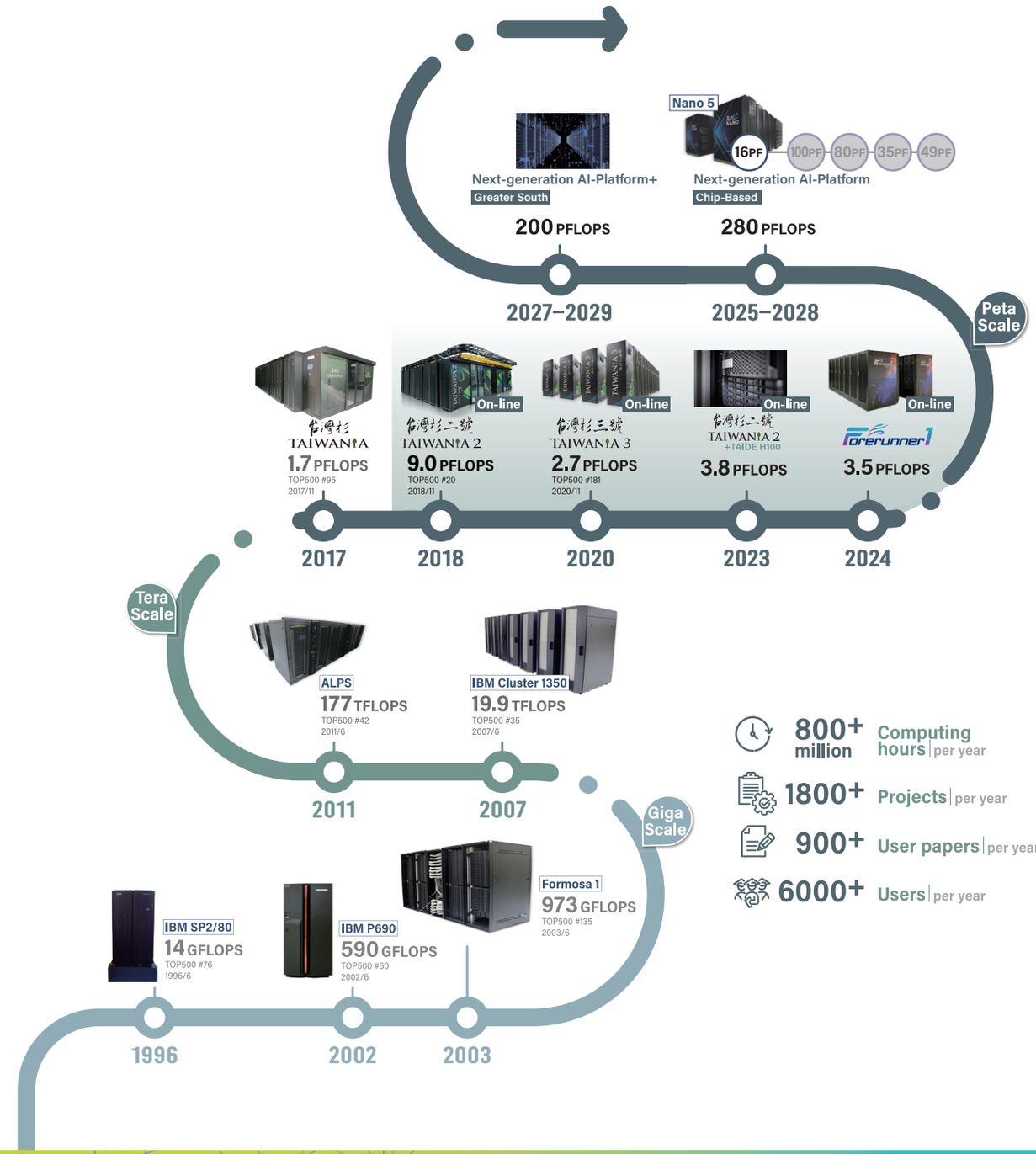
Nano 5

Built in 2024, Nano 5 is specifically developed for the research and application of Generative AI foundation models. It serves as a critical resource for advancing technological development and implementation. The system consists of 21 H100 nodes, 16 H200 nodes, and 4 AMD MI300X nodes. It equipped with 8 GPGPUs and 2 TB of memory. The nodes are connected via 8 InfiniBand NDR400 interfaces and collectively share a 10 PB storage system. The Nano 5 that possesses exceptional high-performance computing capabilities drives rapid progress in Generative AI technologies. It is available for industries, governments, academia, and research organizations.

Accelerator	NVIDIA H100	NVIDIA H200	AMD MI300X
Number of Node	21	16	4
GPU per Node	8 x H100	8 x H200	8 x MI300X
Performance FP64 Rpeak	19.86 petaflops		2.6 petaflops
Performance FP64 Rmax	13.06 petaflops		1.84 petaflops
AI Performance BF16 sustained peak performance	334.5 petaflops		
Interconnect	NVIDIA InfiniBand NDR 400 x 8		
Storage	Weka HDD 4PB Weka All Flash 6PB		

NCHC

HPC MILESTONES



800+ million Computing hours | per year

1800+ Projects | per year

900+ User papers | per year

6000+ Users | per year

Taiwan CHIP-BASED Industrial Innovation Program

To support the advancement of the Taiwan Chip-based Industrial Innovation Program, NCHC will gradually establish a shared heterogeneous supercomputing environment, providing various services such as general-purpose AI computation (GPU), large-scale scientific research computation (CPU), and future quantum computation. We will also develop a high-quality and convenient cloud service platform to enhance user experience and improve application efficiency. In 2024-2025, the program will focus on the research and development of generative AI technology, especially in building Traditional Chinese foundation models, and help Taiwan's industries and government to implement GAI applications.

2024	2025	2026	2027	2028
16 PF GPU	100 PF GPU	80 PF GPU+CPU	35 PF GPU+CPU	49 PF GPU+CPU +Quantum
▪ 400+ GPUs ▪ 10 PB storage ▪ InfiniBand 200Gbps ▪ PUE <1.35	▪ 1680+ GPUs ▪ 25 PB storage ▪ InfiniBand 200Gbps ▪ PUE <1.30	▪ 1200+ GPUs ▪ 20 PB storage ▪ InfiniBand 400Gbps ▪ PUE <1.27	▪ 520+ GPUs ▪ 10 PB storage ▪ InfiniBand 400Gbps ▪ PUE <1.25	▪ 700+ GPUs ▪ 10 PB storage ▪ InfiniBand 800Gbps ▪ PUE <1.25

2027–2029

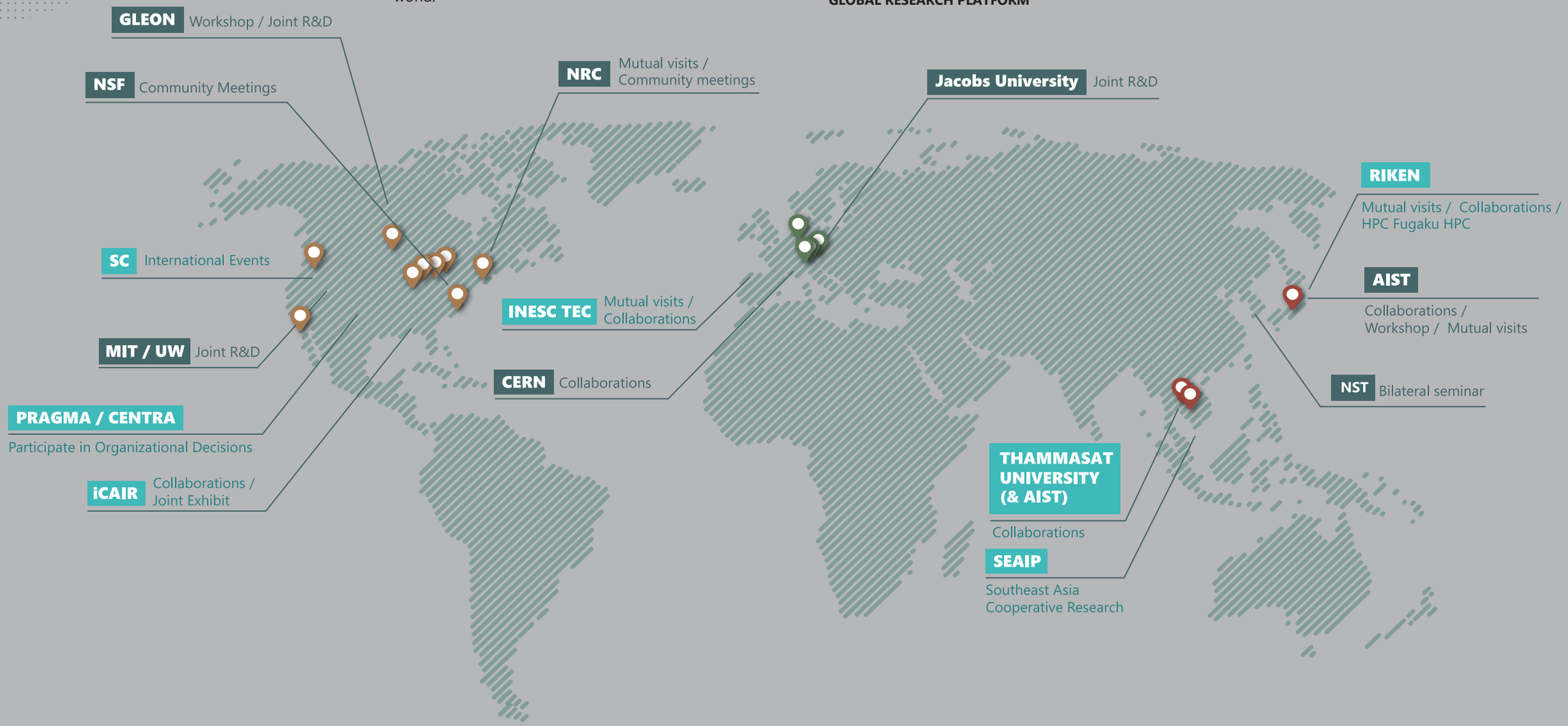
Greater South Smart-Tech Industrial Ecosystem Project

The National Science and Technology Council launched a national program in August 2024. The program is to invest in the development of Taiwan's own artificial intelligence platform over the next five years, thus to promote the smart technology industry ecosystem in southern Taiwan. The plan aims to build 200PF of computing power which will bring the overall computing power of the country to 480 PF.

International Collaboration

NCHC is an active organization in the international community. Through participating in various conferences and international collaborations, we strive to establish platforms for talents and technologies. NCHC plays, and will continue to be, a major role in innovative technologies in the world.

ISC International Supercomputing Conference, EU
SC International Supercomputing Conference & Exhibition, US
PRAGMA Pacific Rim Applications and Grid Middleware Assembly
SEAIP Southeast Asia International Joint-Research and Training Program
SMART CITY SUMMIT & EXPO Smart City Exhibition
GLOBAL RESEARCH PLATFORM



CONNECTING THE WORLD,
SHAPING THE FOREFRONT OF TECHNOLOGY!

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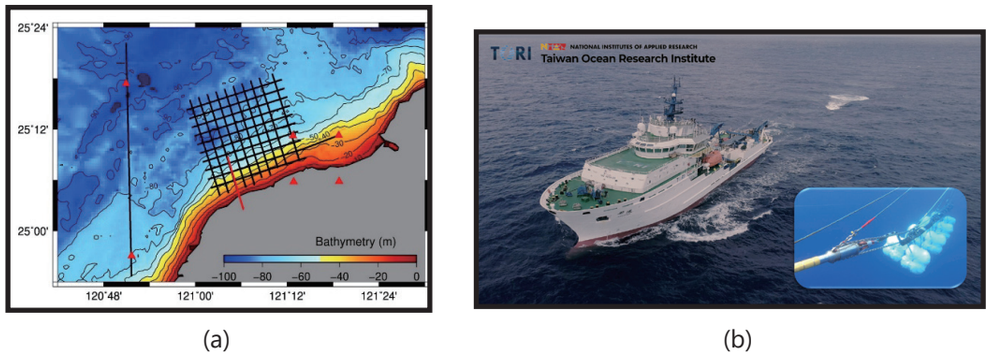
Toward Net-Zero: High-Performance Geological Modeling and Carbon Sequestration in Offshore Energy Domains

For finding a good field for stably injecting CO_2, LMCS system is used to survey the sedimentary structures of carbon storage off west Taiwan with depth of 800-3500 m below seafloor. By applying intelligent point cloud methods to seismic stratigraphic data, this research develops negative-carbon offshore geological models and leverages high-performance computing for CO_2 migration analysis, providing a scientific basis for future offshore carbon storage site selection.

"Transform To Net Zero" Marine Geology is Surveyed by LMCS system of TORI

In 2015, Long-offset Multi-Channel Seismic (LMCS) system was operated by Taiwan Ocean Research Institute (TORI), NARLabs. Data quality of seismic signals will be improved by mixing volumes of gun array and solid streamer. A server of navigation system will calculate the locations of the equipment and shooting points to shoot by distance and overcome the unstable sea situation offshore Taiwan. The LMCS system help survey the marine geology of "Transform To Net Zero".



(a) (b)

Fig.1 (a)Geological Survey for Carbone Storage. (b) The seismic survey line planning of the offshore waters of Guanyin, Taoyuan.

Optimizing Geological Modeling: Leveraging CSPCP to Advance the Practical Application of Carbon Sequestration Technology

The AI technology CSPCP, applied in geological modeling for negative-carbon marine energy, has demonstrated its capabilities through automated fault interpretation using the international geological benchmark model, Marmousi. Unlike traditional geological methods, which often result in errors over 100 meters, this innovative approach has successfully reduced the average error to under 40 meters, or 2%.

High-Performance Computing for Carbon Sequestration: A Case Study of the Changbin Pilot Test Site in the Taixi Basin, Taiwan

Using the Changbin pilot test site in the Taixi Basin as a case study, a hydrogeological model was developed, incorporating key parameters such as formation porosity and permeability, while validating the flow and carbon transport simulation models. The TOUGH model was used to simulate the migration behavior of injecting 1Mt CO_2 into a single well over 20 years, thus establishing a numerical framework for carbon storage in deep geological formations beneath the seabed. In the future, by integrating seismic data from relevant domestic organizations, the simulation technology can be further optimized, accelerating the localization of carbon sequestration modeling research and its application.

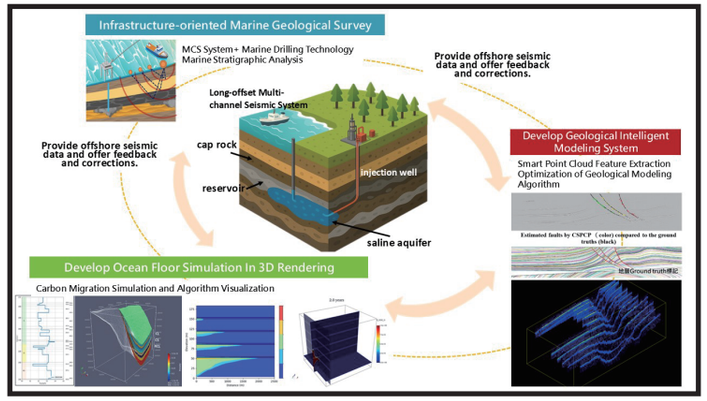


Fig.2 NCHC has established a marine geological background database on the cloud, enhancing geological intelligent modeling systems and marine simulation 3D visualization computing functions.

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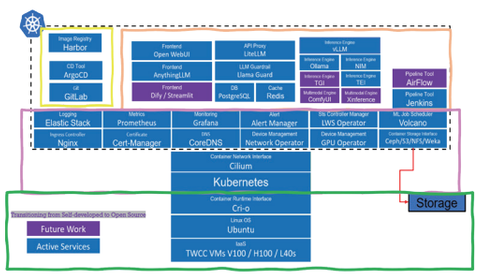
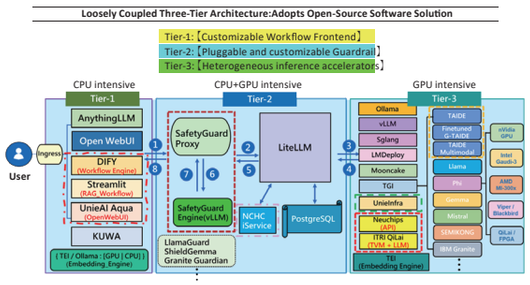
TAIWAN AI RAP: Resilient and High-Performance AI Platform

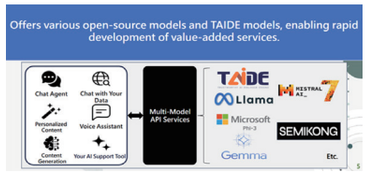
TAIWAN AI RAP is a next-generation platform driving Taiwan's leadership in generative AI. RAP integrates robust computing infrastructure with flexible AI development tools to accelerate the creation of customized AI services. With a user-friendly, no-code workflow designer, developers can easily build end-to-end solutions without strong AI expertise. RAP supports a wide range of open-source and domain-specific models through a unified multi-model API service, enabling rapid experimentation and deployment. Advanced model fine-tuning and evaluation pipelines ensure high performance and its continuous improvement. Designed to scale across industries—from smart agriculture to enterprise AI—RAP reduces technical barriers, shortens development cycles, and fosters collaboration among researchers, startups, and industry leaders. It is a cornerstone of Taiwan's AI innovation ecosystem.



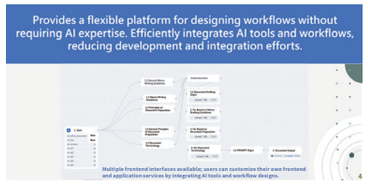
Software Stack - RAP Running on K8S



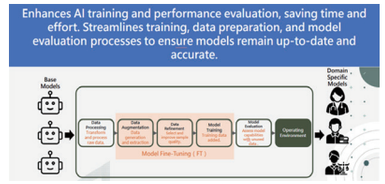
RAP:LLM Service software architecture(Phase-2)



RAP:Multi-Model API Services



RAP:Customizable Workflow Frontend



RAP:Model Fine-Tuning & Evaluation

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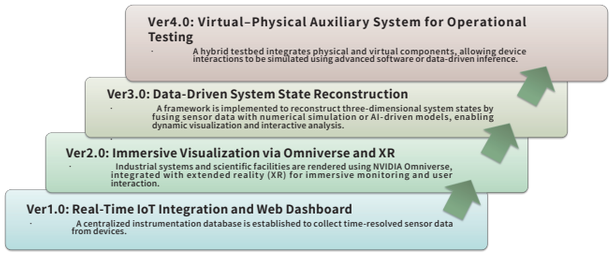
Digital Twin for Industrial Systems: UAVs, Robotics, and Smart Manufacturing

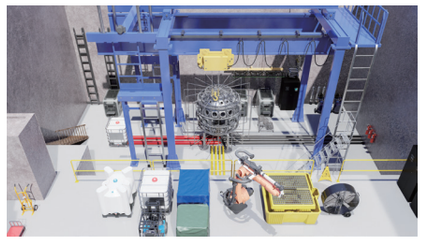
The National Center for High-performance Computing (NCHC) is developing a digital twin platform to support complex industrial systems and scientific facilities such as UAVs, robots, wind tunnels, tokamak laboratories, and synchrotron facilities. The platform integrates system simulations, diagnostic modeling, and control emulation to enhance design, monitoring, and predictive analysis.

Sensor data - such as positions, air flows, temperatures, and environmental conditions - are streamed into the system and processed through numerical simulation or AI-driven models to evolve system states and behaviors. Inferred outputs are compared with real-world measurements to support validation, diagnostics, and anomaly detection. The digital twin enables synchronized interaction with control systems, optimizing operational strategies, scenario evaluation, and system understanding.

Built on the NVIDIA Omniverse platform, the digital twin visualizes simulation and sensor data using Omniverse Kit, enabling interactive visual system diagnostics. A preliminary virtual laboratory has been constructed as a demonstration case, featuring 3D models of the tokamak device and surrounding laboratory environment.



Development roadmap of the digital twin platform.



Preliminary virtual laboratory constructed as a demonstration case, showcasing 3D models of the tokamak device and its surrounding laboratory environment.

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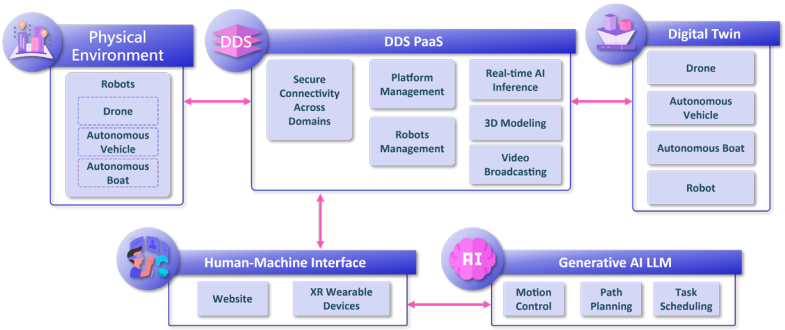
Digital Twin-Based UAV Control Platform with Omniverse and DDS

The Digital Twin and UAV Management Platform uses DDS (Data Distribution Service) technology to enable real-time, secure, and low-latency communication. This architecture supports data synchronization between physical drones and their digital twin models in a decentralized environment.

The platform integrates with NVIDIA Omniverse to simulate realistic 3D environments, including terrain, weather, and obstacles. These simulations help test drone behaviors and mission scenarios before real deployment, reducing operational risks.

The system supports both single-drone and swarm drone operations. It allows task scheduling, mission assignment, dynamic coordination, and monitoring through a unified control interface. Users can view real-time drone positions and status via the digital twin.

In future developments, the platform will incorporate AI and reinforcement learning. This will allow drones to make autonomous decisions, adapt to changing environments, and optimize collaborative mission performance. Together, these features aim to support smart airspace management, logistics automation, and other advanced UAV applications.



Architecture Diagram of Digital Twin-Based UAV Control Platform

Demo View of Digital Twin-Based UAV Control Platform

Demonstration of Task Scheduling in Digital Twin-Based UAV Control Platform

Infrastructure

Core Technology

Key Platform

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