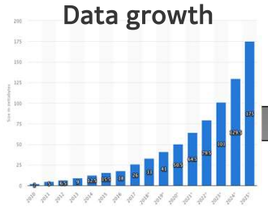
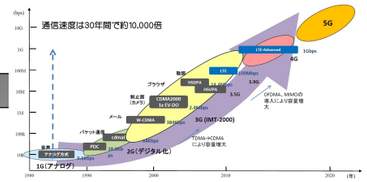
# ■ Issue

## Data growth speed is faster than transfer improvement speed
## ∴ The data is too large to process.

Data growth



Transfer improvement



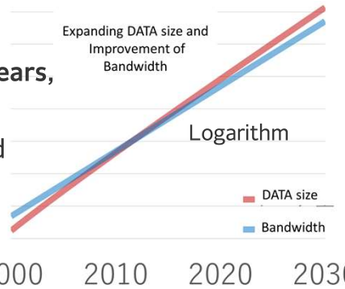

**Approximate expression:**

Data growth : $\lim_{x\to\infty} n \times \log n$ > Transfer improvement : $2^{x/1.5} \times 3$

Fibonacci number : $n = \frac{\phi^x - (-\phi)^{-x}}{\sqrt{5}}$, Golden ratio : $\phi = \frac{1+\sqrt{5}}{2}$

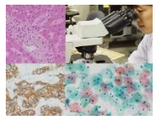
**If <u>the transfer speed improvement</u> is calculated from data of the past 30 years, it will be <u>1/10 in 10 years relatively.</u>**

Even in reality, it takes time to upload RAW data from digital cameras.




# ■ Current status

## Medical images



Medical images with large amounts of data (Terabytes or more), such as DICOM format files on MRI, **cannot be transferred to the cloud.**
These are also **high level of privacy information**, and if the cloud were cracked it would be a massive data breach.

## Smart cameras

Object recognition in security cameras requires an advanced processor for image processing and is provided as a service in the cloud. Since it is **difficult to transfer** all security camera images **to the cloud**, it is important to reduce the number of security cameras in smart stores.

## Factory line inspections

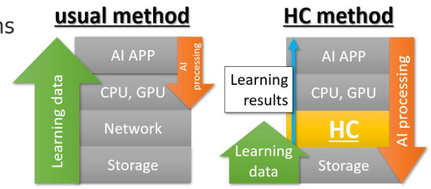
In the line inspections of the factory, the image of several Mbps is always acquired, and the failure judgment is carried out by the inference by AI.
Images acquired during the examination **were discarded** because they were **too large**. In order to change the inspection object on the line, it is necessary to learn a new AI, and image data of the new inspection object is collected as teacher data in the development room.

## Server racks

Servers consume less power due to higher semiconductor density, but the network that connects the storage (JBOD) at the bottom of the rack to the CPU/GPU at the top is always low on bandwidth, so transfer speed is more important than power. Therefore, **37% of the power consumption of the server rack** is consumed **by the network communication** of 40 cm in the rack.

# ■ HC Technology

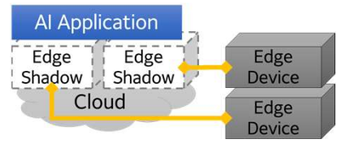
The current memory, such as the GPU that runs AI applications, is around 16GB, so it is not suitable for reading large amounts of data beyond terabyte, and it corresponds by batch processing.




HC transfers and executes distributed logic (the left figure "AI processing") that actually accesses data to storage where large amounts of data are stored. Transfer efficiency is improved by transferring only the results processed within the storage (learning results).

## Shadow image

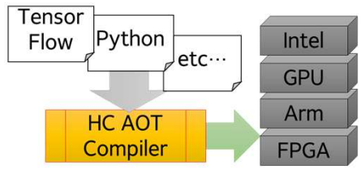
The technology that makes all edge devices look as if they are in the cloud.
For existing AI applications, distributed processing is possible only by rewriting the code according to this patent technology.




Japanese Patent : 2018-089022

## Heterogeneous

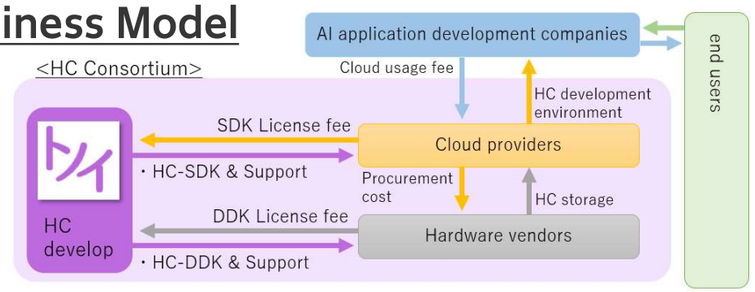
A technology that compiles the same source code into the native execution form of each processor and distributes it through images.
Storage controllers and edge devices use various processors, making this technology an important part.




Japanese Patent : 2018-159325
Related patent applications in preparation

# Hybrid Computing (HC)
## ~ next-gen data access technology ~

# ■ Business Model




**1. HC-SDK**

An expansion kit to make an existing AI application as a HC compatible. It consists of a pre-compiler and libraries that extend the existing compiler, and tools to execute it.
Provided for software development vendors and cloud providers.

**2. HC-DDK**

Object storage expansion kit to make existing storage devices as a HC compatible.
Provided for hardware vendors and homebuilders.

**3 . Crypt key**

tonoi in-house encryption keys to bind the cloud and the edge. It protects data access and computing resources in the quantum computer era.
Provided for any HC users.

# ■ Main members

Mitsuo Koikawa
Founder, Primally Inventor
2015 Establish tonoi co.,ltd.
2014 CEDEC award for IPv6
MOT at TUS
Biz School' of Grenoble
2008 MS president award
2002 MS Xbox core patent
Nihon Silicon Graphics SE

Takeyuki Ogura
Co-Founder, Inventor
Virtua Fighter 2 dev
Xbox Math Library dev
CEDCE Committee

Shinich Manaka
Advisor
MS former officer
VMS, Win98, Xbox LIVE dev lead

Kouichi Hashida
Advisor
Professor of Tokyo University

# ■ HC Advantages

HC is designed for the Product Life Cycle.
There are advantages in each product face.

**Attention**

**Advantages over the existing environment**

- High-resolution analysis independent of transfer rate
- Faster response times regardless of data capacity
- Object Storage — Provides equal or greater functionality than existing embedded development.

**Install**

**Immediate effects**

- Communication load reduction
- Power consumption reduction

**Post-implementation benefits**

Dev Ops
- Achieve centralized management at multiple sites
- Reduce SIer travel cost
- Reduce code development effort

- reduce risks for leakage of personal information

Provides operational capabilities for non-stop services.

**Update**

**Hardware update / replacement**

- Cost reduction of system update
- Heterogeneous

General-purpose services based on general-purpose parts provide continuity so that users can continue to switch to the latest commodity hardware without being noticed.

**Replace**

needs → benefit → sustainable

# ■ HC's Introduction effects

## Medical images

Using HC's distributed processing technology, pathological images can be analyzed from the cloud while remaining in the hospital. Because **it doesn't transfer data**, it can get a second opinion from, say, a European doctor. Even for privacy information, **analysis results anonymized by logic dispersion** can be used for research.

## Smart cameras

The HC imaging technology allows the security cameras in the smart store to process images **as if they were in the cloud**.
Because distributed processing is performed regardless of the communication band, it is possible to install a security camera **without worrying about the number limit.**

## Factory line inspections

With HC's distributed processing technology, the image data discarded in the factory line inspection is distributed as if it were in the development room, and the inspection objects in the line are **changed at zero downtime.**

## Server racks

HC's heterogeneous technology allows existing large data analysis apps written in various languages to be offloaded (distributed operation) to storage with simple HC support, **reducing network power consumption** by 40 cm.

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