Big Data and use of AI in IoT

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9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

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Rutgers University BA Mechanical Engineering
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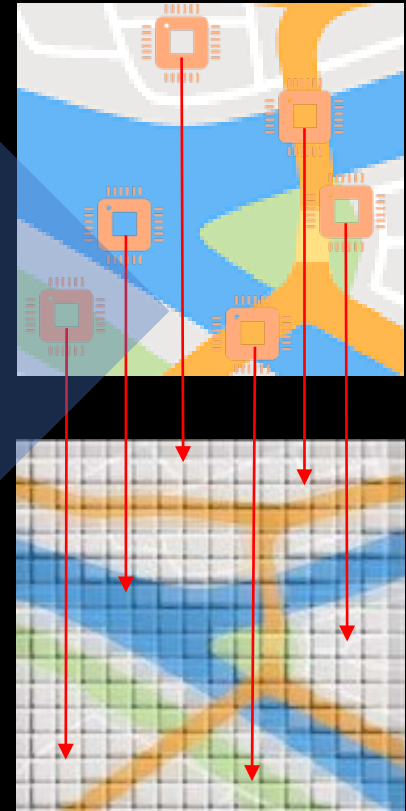Canon Inc.:   Semiconductor Engineer
Sony Corp.:   Product Planner, Product Development
Microsoft Corp.:   Product, Program Manager
Ant's Eye View Japan   Founder, CEO

IoT ➜ Big Data ➜ AI ➜ Innovation

Digital Twin

Data Explosion

44 ZB
Data created in 2020 *

POS

ERP

ERP

CRM

*Source: IDC

People Behind Devices

5 Billion
Smart phones Shipped in 2017 (estimate)

Connected Devices

50 billion
Connected Devices

PHILIPS

Using the Big Data withdrawn from these connected devices we can create a Digital Twin of the physical world.   AI Analytics on Digital Twin is expected to drive:

1. Optimization and Automation of the existing business process.
2. Inventing new business models, solutions, and products.

IoT Applicable Fields

	Smart Factory
	Connected Marketing
	Innovation, Reduced Time to Market
	Connected Gaming
	Micro-Payment
	Smart Grid
	Connected Supply Chain
	New Work Style
	Physical Cyber Security
	Business Process Outsourcing

IoT in process layers

People Process

Application

Data Analysis

Data Ingestion

Cloud Infrastructure

Wide Area Connectivity

Data Element Analysis
And Transformation

Edge Computing

Local Area Connectivity
(Lola, Sigfox, etc.)

Things, Devices, Sensors

Edge

5G
Will have both

IT

Query
Based

Data at
Rest

OT

Event
Based
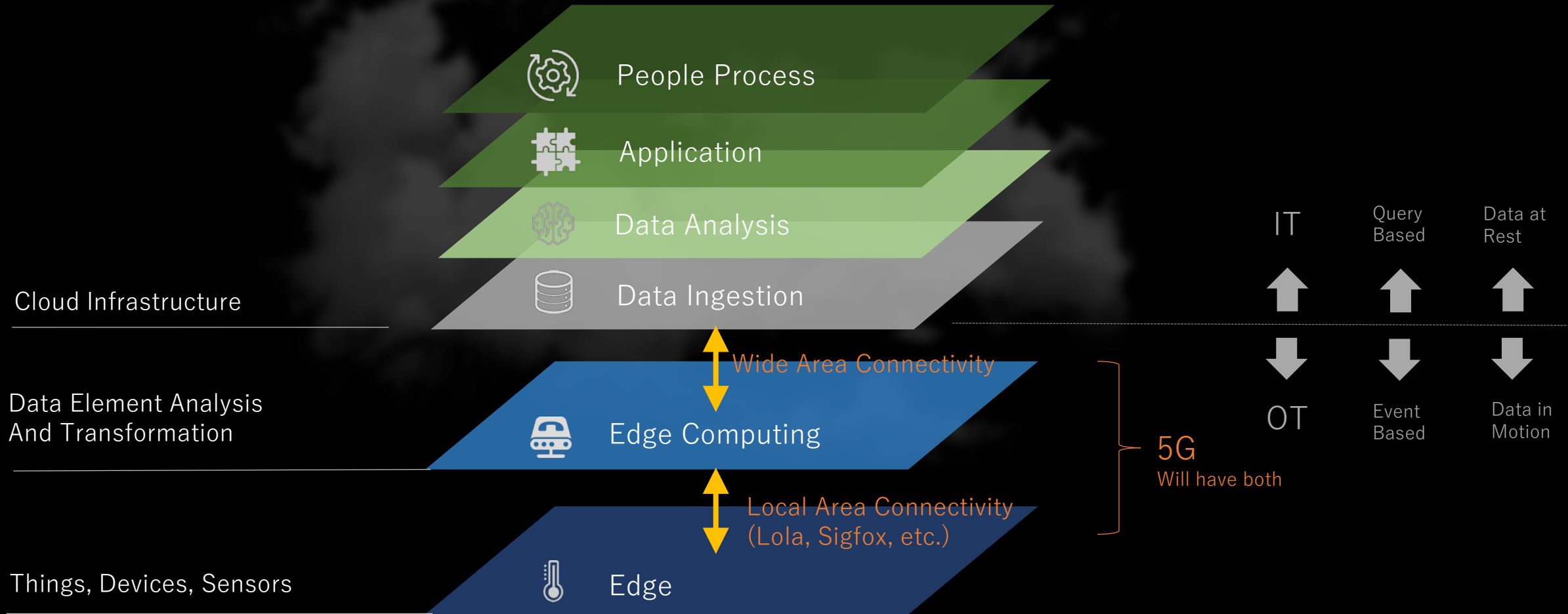
Data in
Motion

Roll of BIGDATA and AI in IoT

People Process

Application

Data Analysis

Data Ingestion

Edge Computing

Edge

AI

BIGDATA
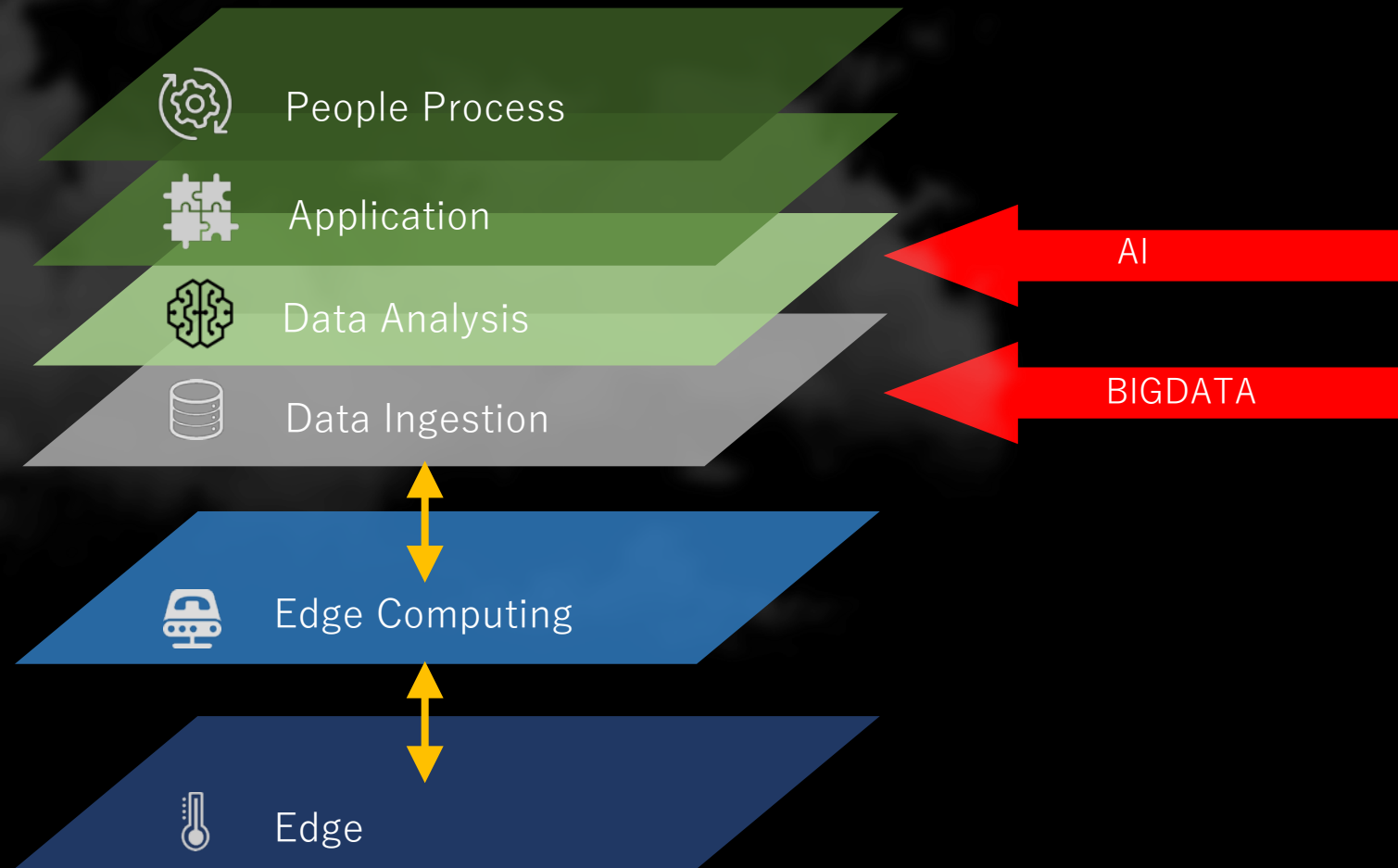
USE CASE: Automobile IoT

OT → Optimization

People Process

Data Ingestion

Edge Computing

Edge

+IT
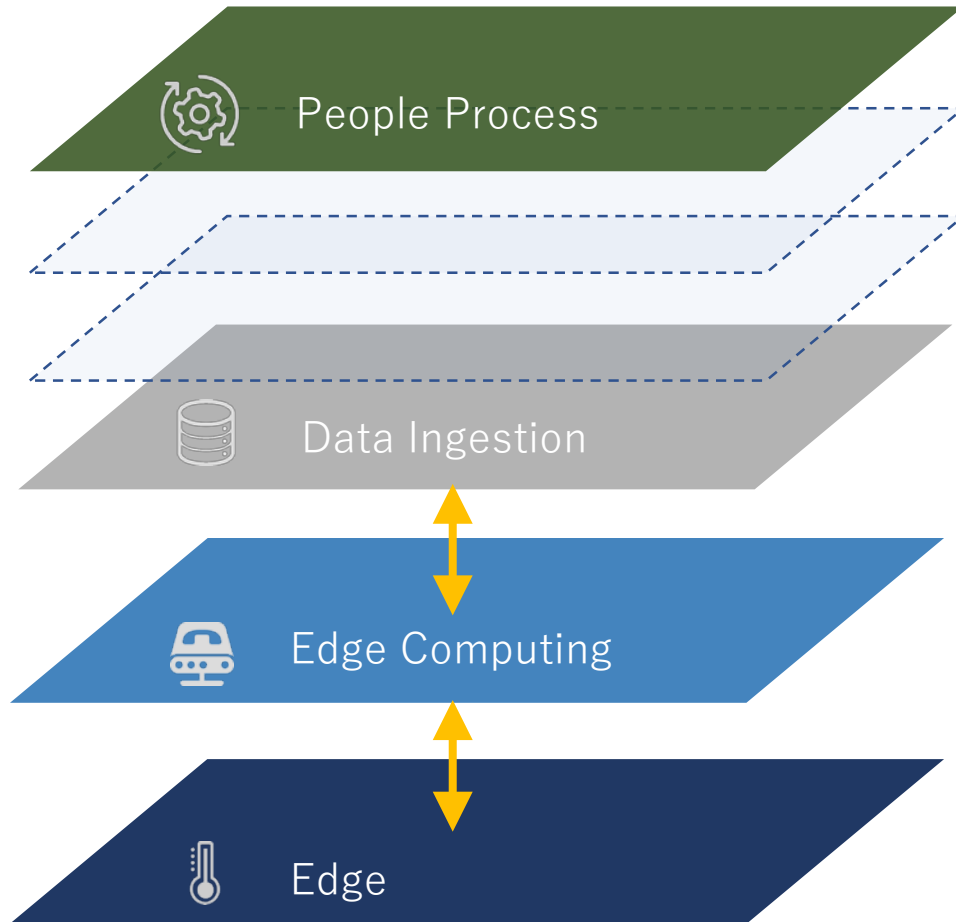
OT + IT = Supply & Demand Matching
(→ UBER)

People Process

Application

Data Analysis

Data Ingestion

Edge Computing

Edge
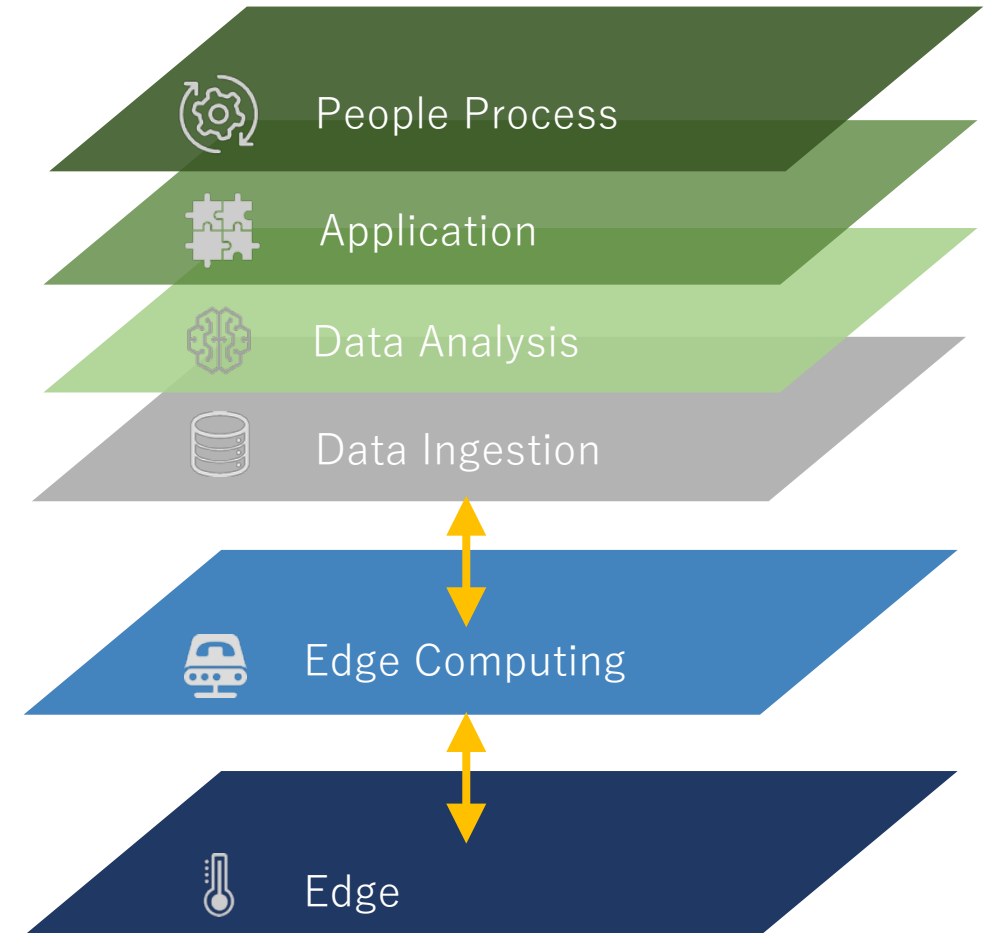
PORT IoT

USE CASE: Port IoT（OT ＝ Optimization）

People Process

Data Ingestion

Edge Computing

Edge

Smart Labels

Inventory Tracking & Analysis

Storage conditions Monitoring & Control

Cargo Integrity Monitoring

Predictive Maintenance

Optimized Warehouse workloads

Real-time fleet Management
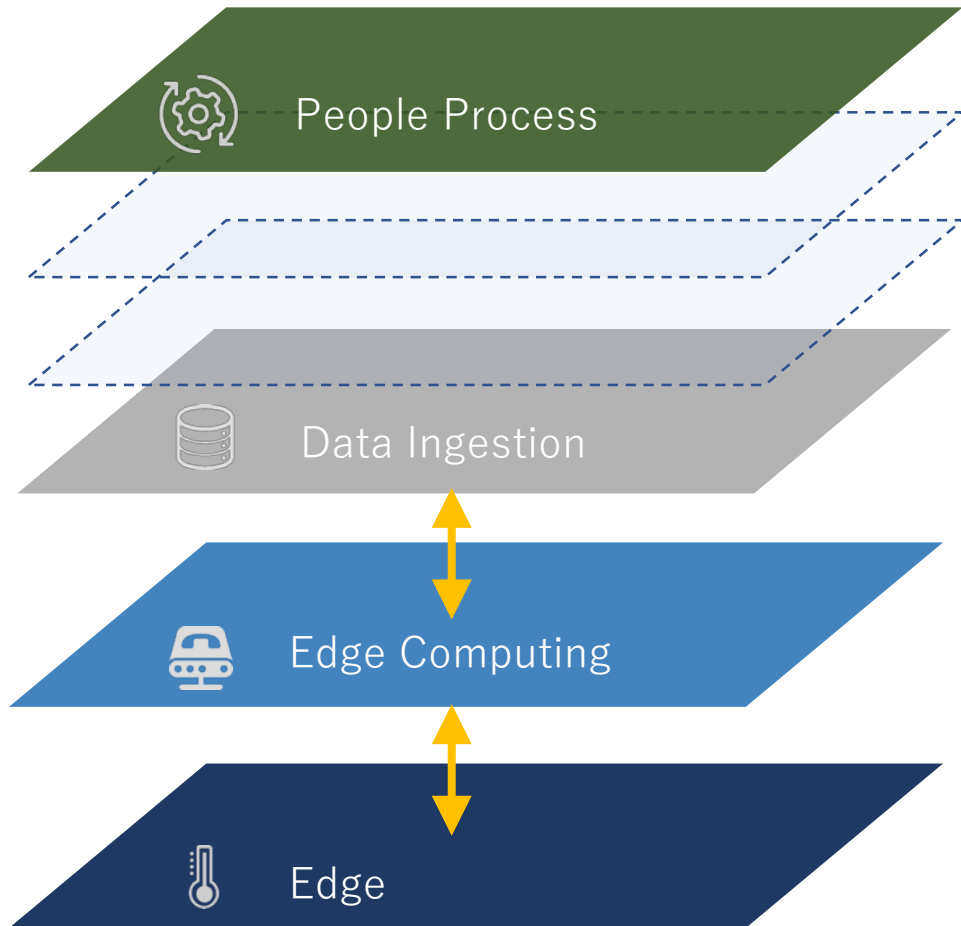
Main Win: Port is capable of higher through-put

(1) Less cost per container
(2) More competitive than rival ports
(3) More TAX income

USE CASE: Port IoT (OT + IT = Smart Logistics = New Business model)
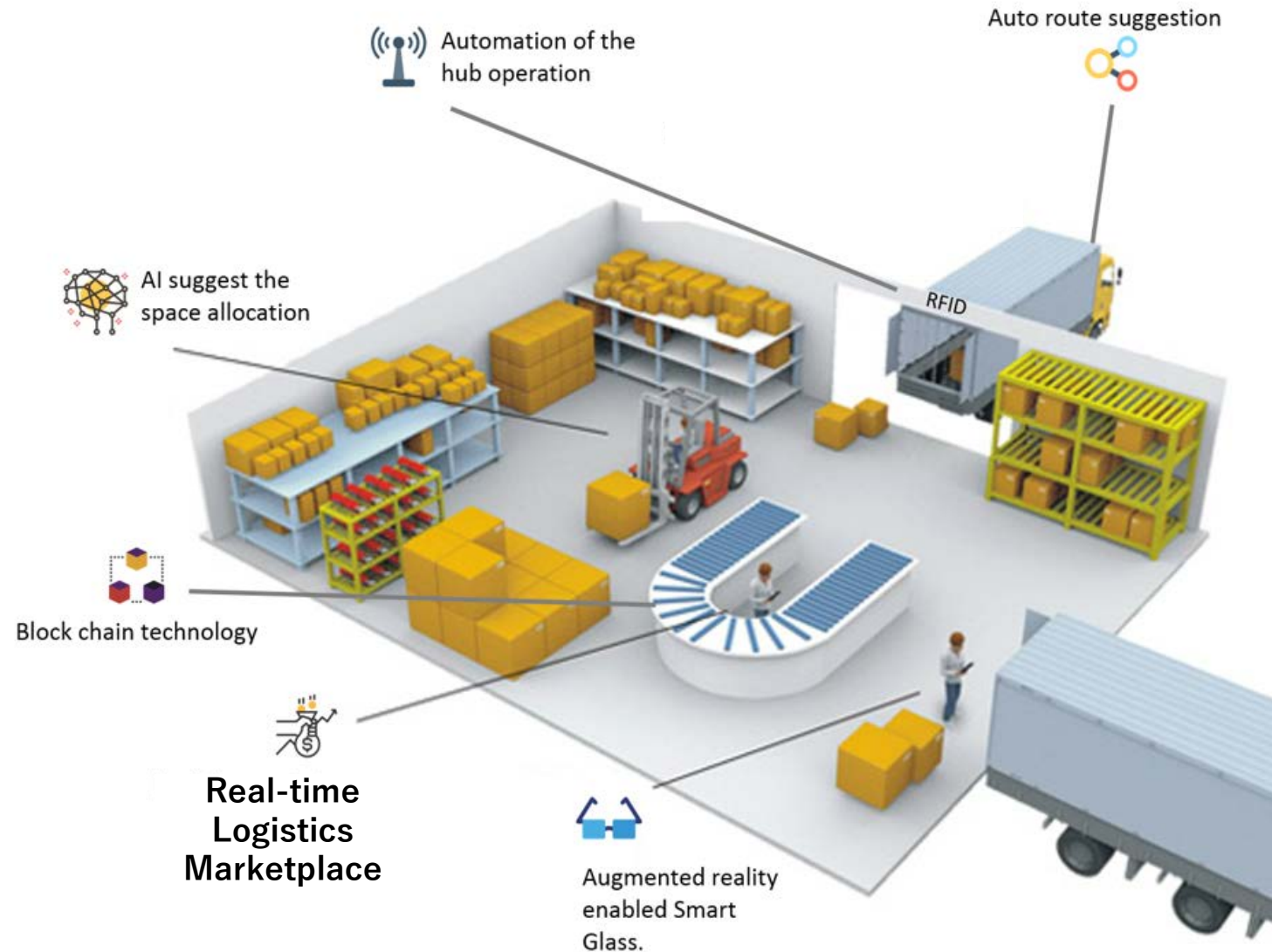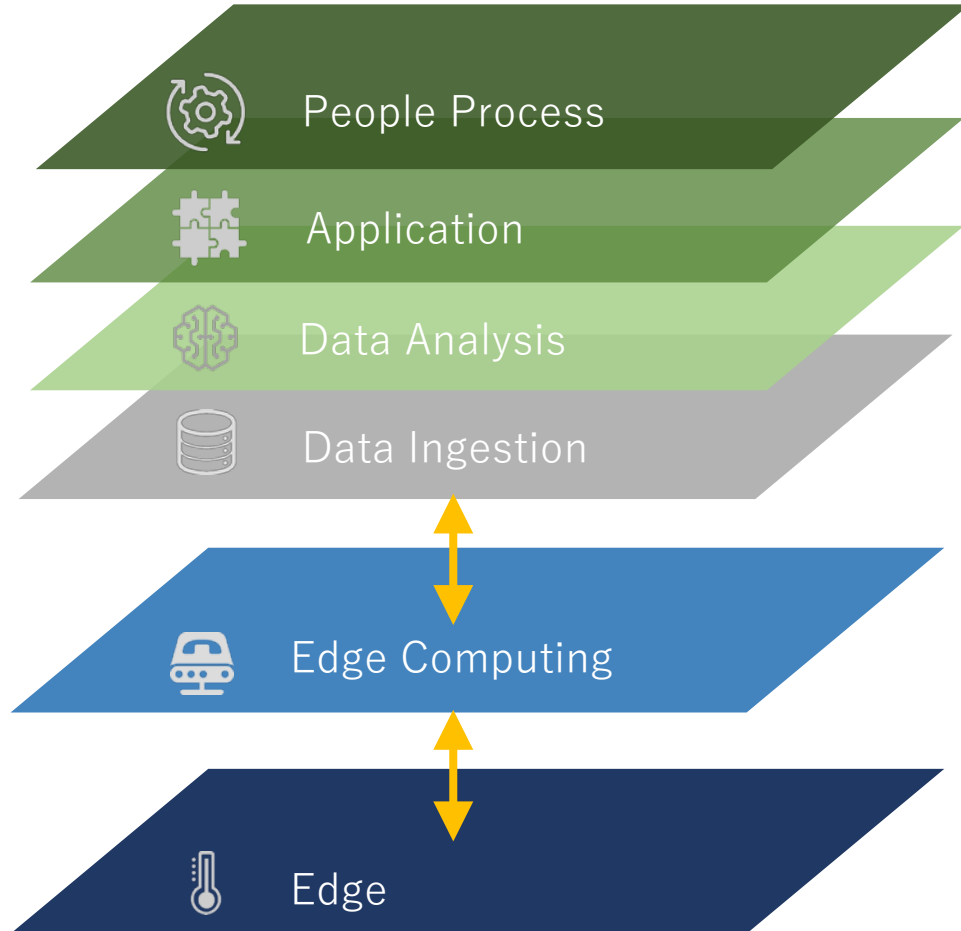
Smart Cities

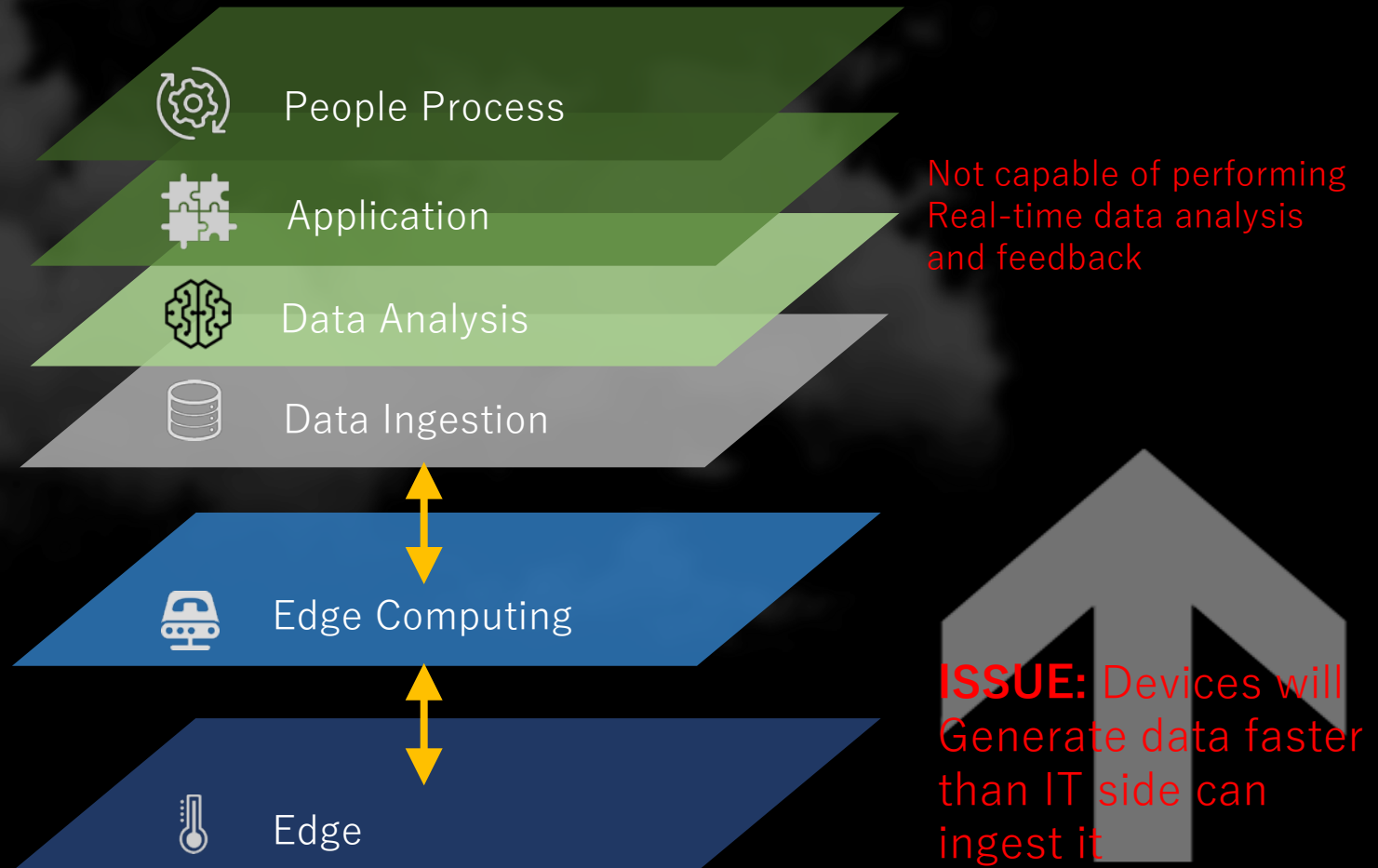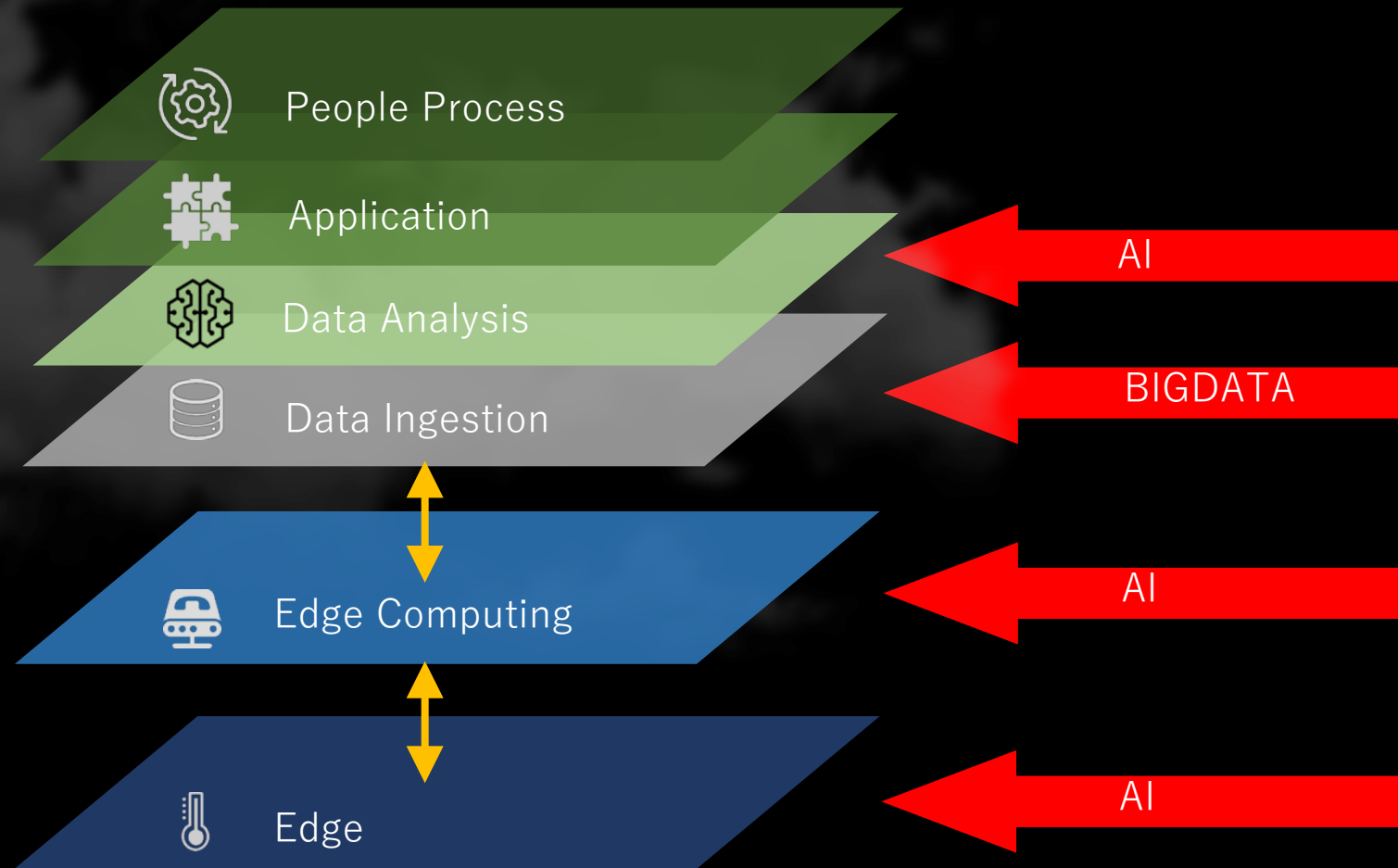Smarter Sustainable Stress-free world

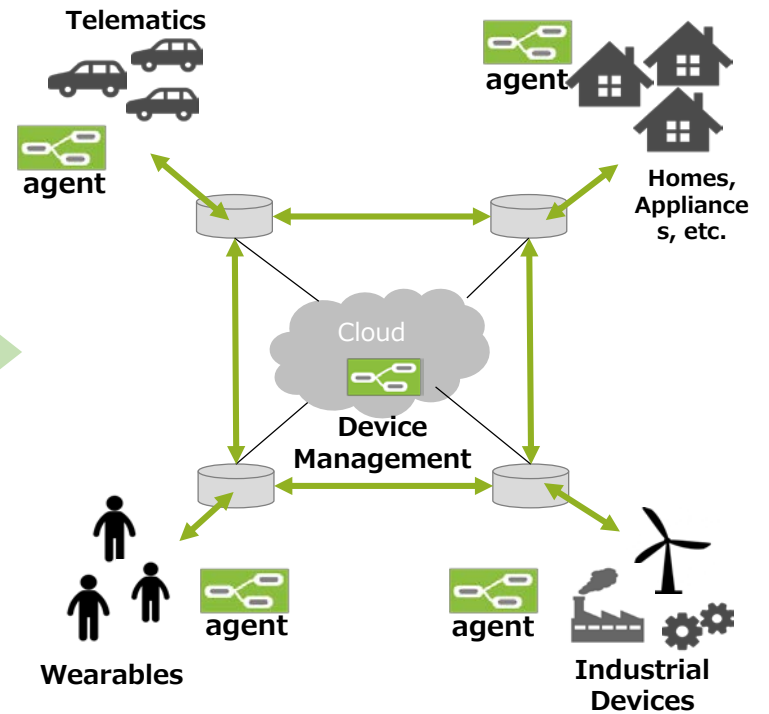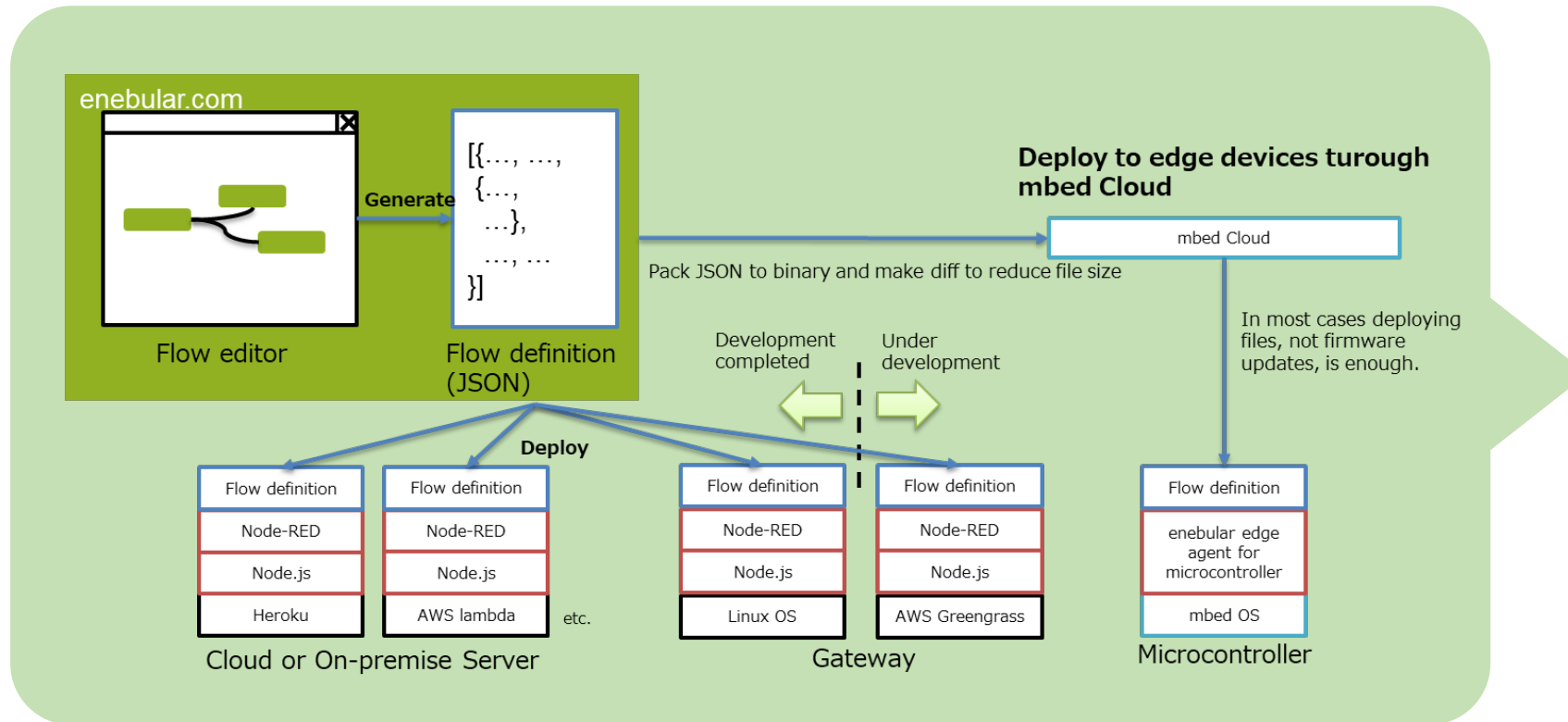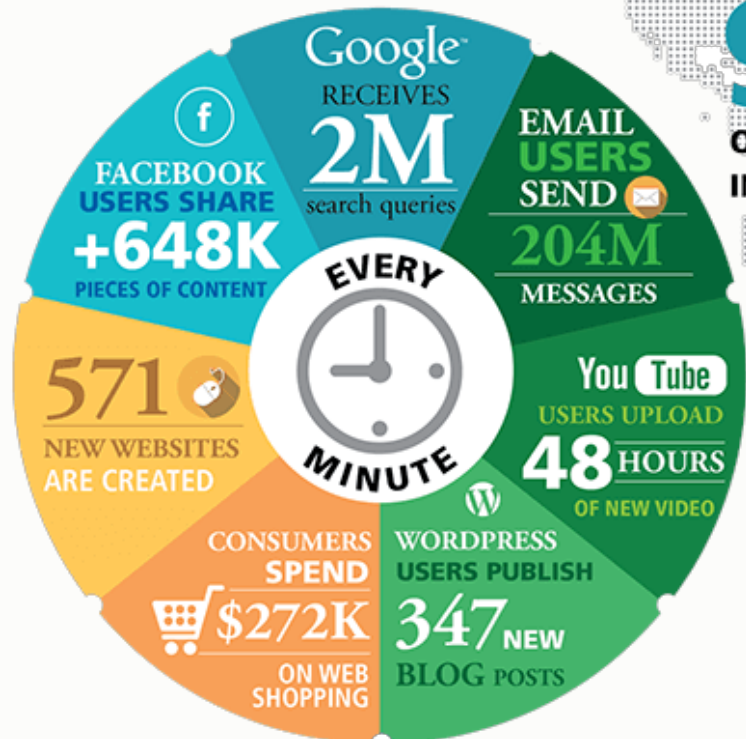we can proudly inherit to our children

Solution

constraints

Issues in IoT

Distributed Edge Computation

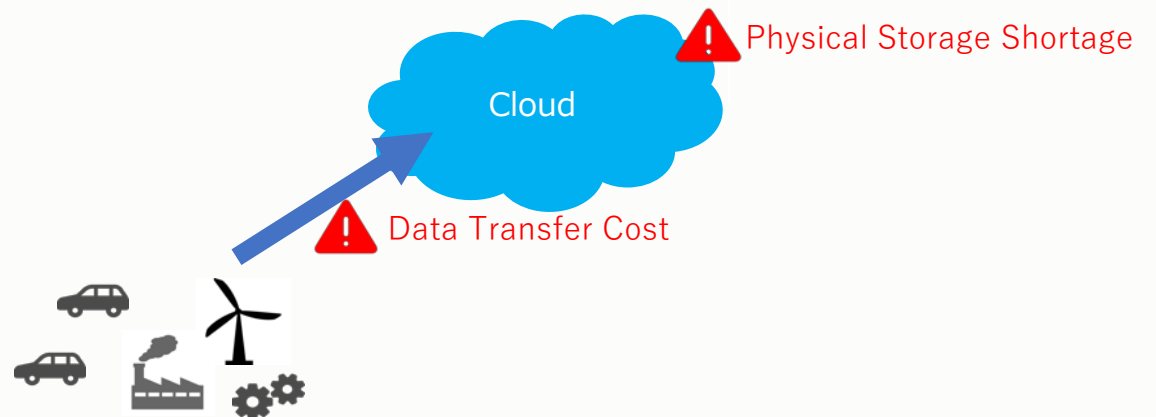AI model inference derived on cloud could be deployed to the edge devices for performing edge computing

Google RECEIVES 2M search queries

FACEBOOK USERS SHARE +648K PIECES OF CONTENT

EMAIL USERS SEND 204M MESSAGES

571 NEW WEBSITES ARE CREATED

EVERY MINUTE

YouTube USERS UPLOAD 48 HOURS OF NEW VIDEO

CONSUMERS SPEND $272K ON WEB SHOPPING

WORDPRESS USERS PUBLISH 347 NEW BLOG POSTS

90% OF THE WORLD'S DATA WAS CREATED IN THE LAST 2 YEARS!

: Web Based

+

IoT Data: Physical World Based

Cloud

⚠ Physical Storage Shortage
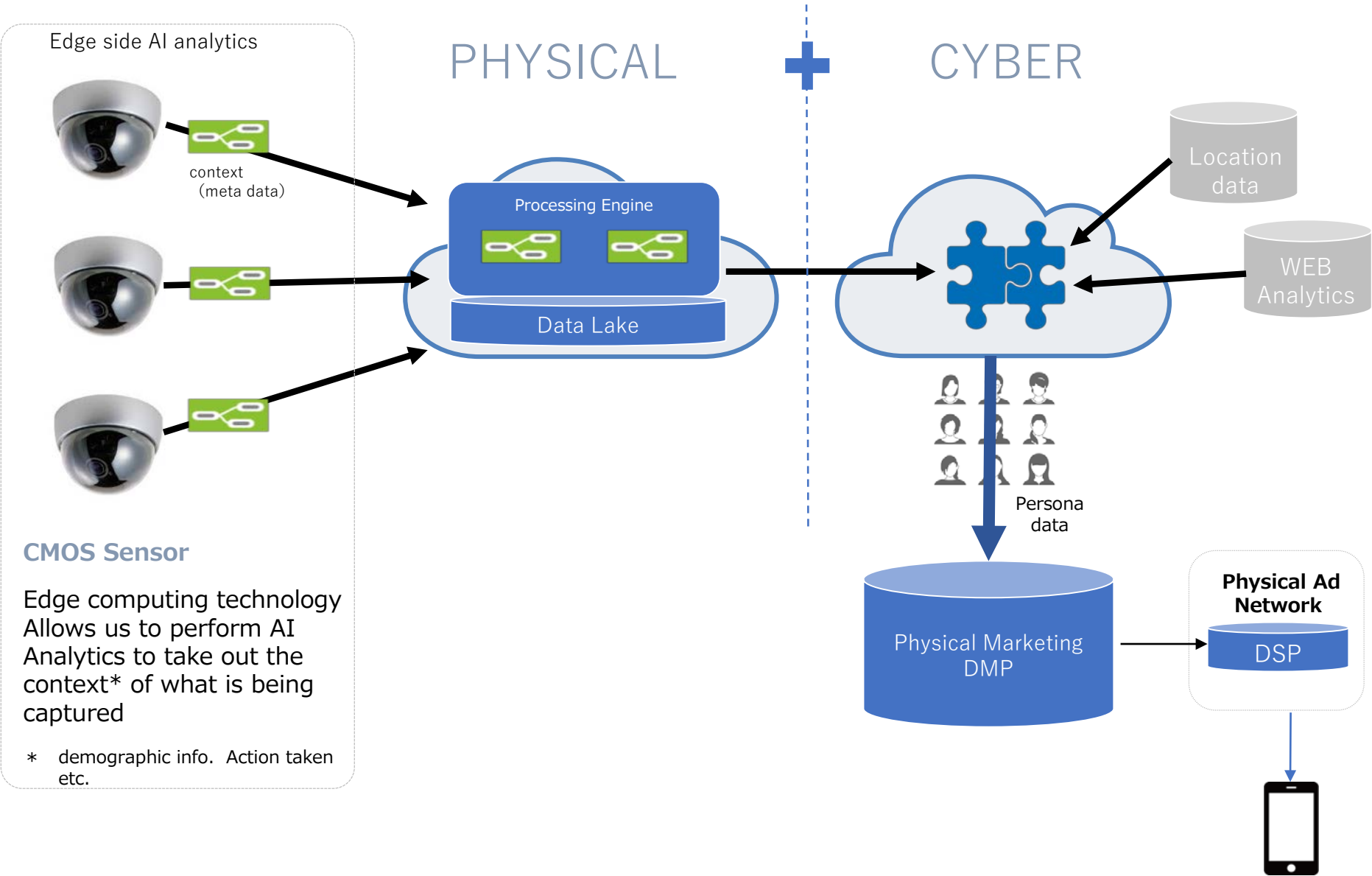
⚠ Data Transfer Cost

Minimizing IoT Data

Minimize data before upload by extracting and sending only the context = metadata

META DATA

Cloud
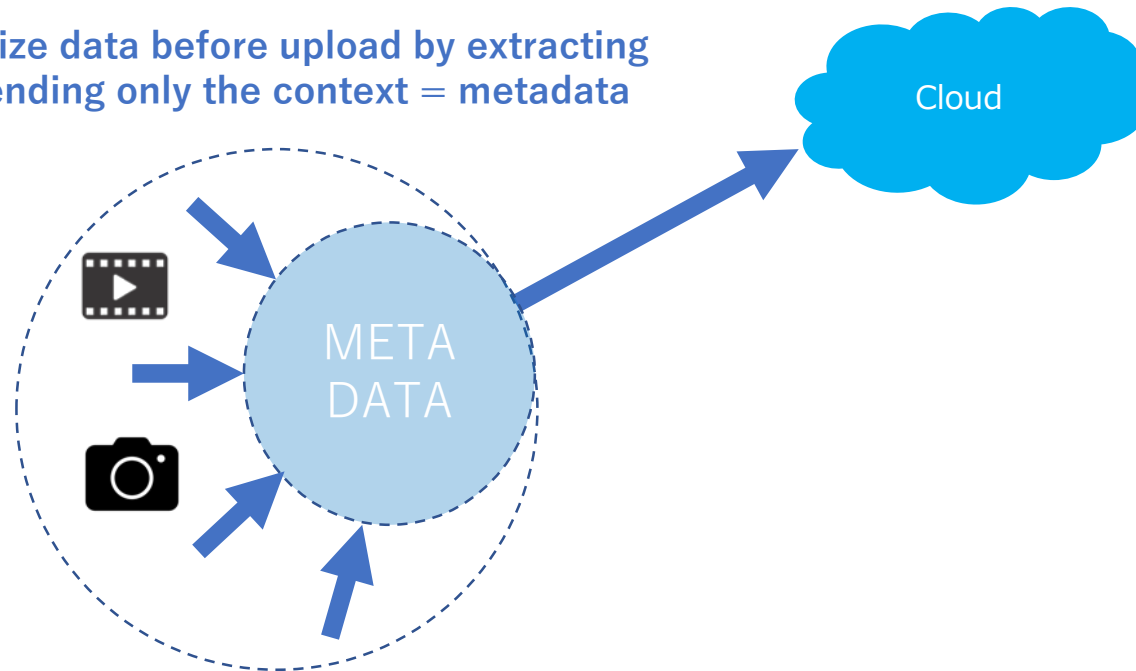
Use case Example ：IoT and Edge Computing

Edge side AI analytics

PHYSICAL ✚ CYBER

context
（meta data)

Processing Engine

Data Lake

Location
data

WEB
Analytics

Persona
data

CMOS Sensor

Edge computing technology
Allows us to perform AI
Analytics to take out the
context* of what is being
captured

＊ demographic info. Action taken
etc.

Physical Marketing
DMP

**Physical Ad
Network**

DSP

AI in IoT

AI is based on Deep Learning algorithms. Deep Learning involves automatic feature detection from data. Data types in IoT and techniques used in each are:

Data Set	AI
Image and Sound	Convolution Neural Networks (CNN)
Transactional data, Sequences	Long Short Term Memory (LSTM)
Text	Natural Language Processing
Behavior	Reinforcement learning

The difference between other fields and IoT is the volume of data and need for sophisticated real time implementations of the same models. T
Usage of the models or derived solutions are different for each IoT verticals.

IoT Vertical	AI
Manufacturing	Predictive maintenance, anomaly detection, missing event interpolation
Marketing	Churn modelling, Behavioral Prediction
Sales	Cross-sell Up-sell model, Customer life time value

WHAT IS COMMON both vertically and horizontally is the fact that large amount of data is required to derive these models.

DATA

is the new oil

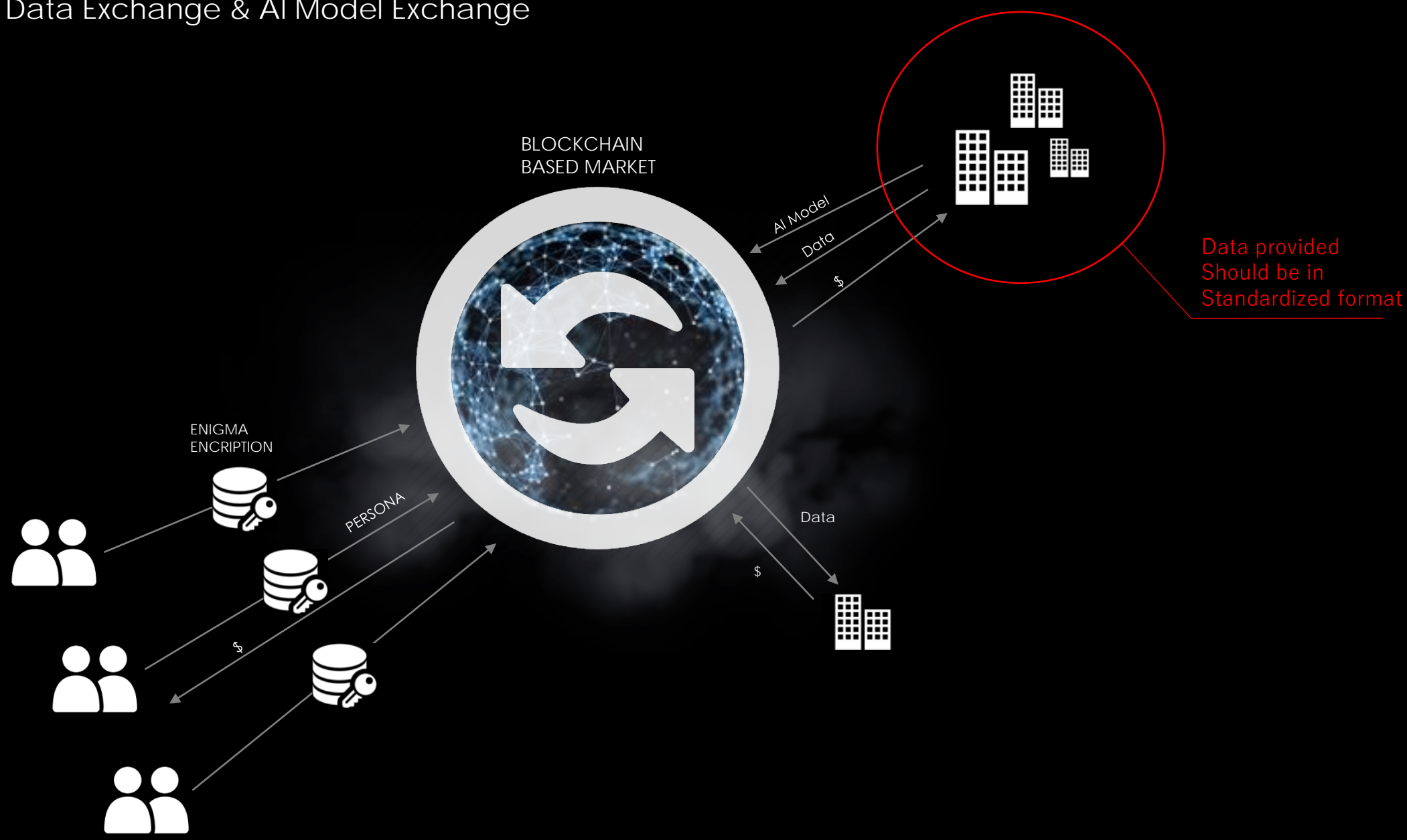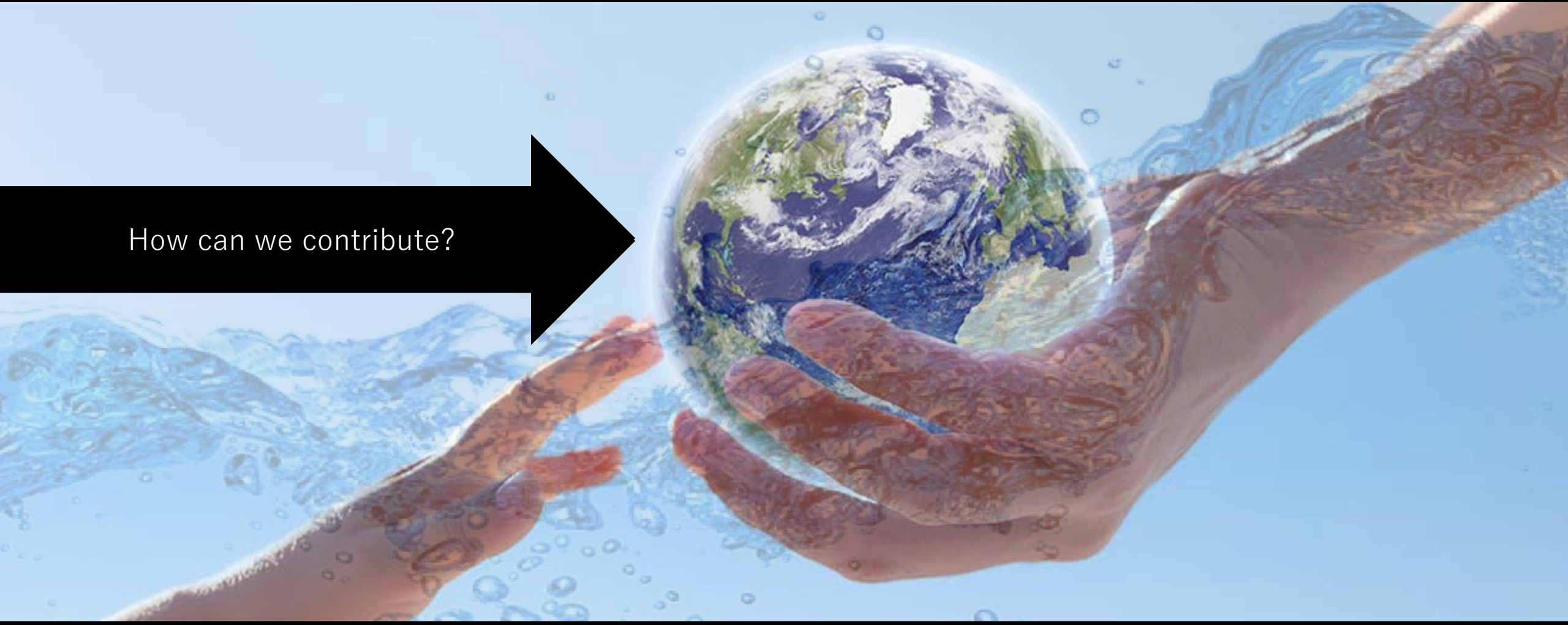Are businesses willing to share their most valued asset?

Without the rain...

We need to increase Data Liquidity by incentivizing and shaping the data flow for the data providers.

(1) Customer   - Privacy
(2) Businesses   - Core Competency

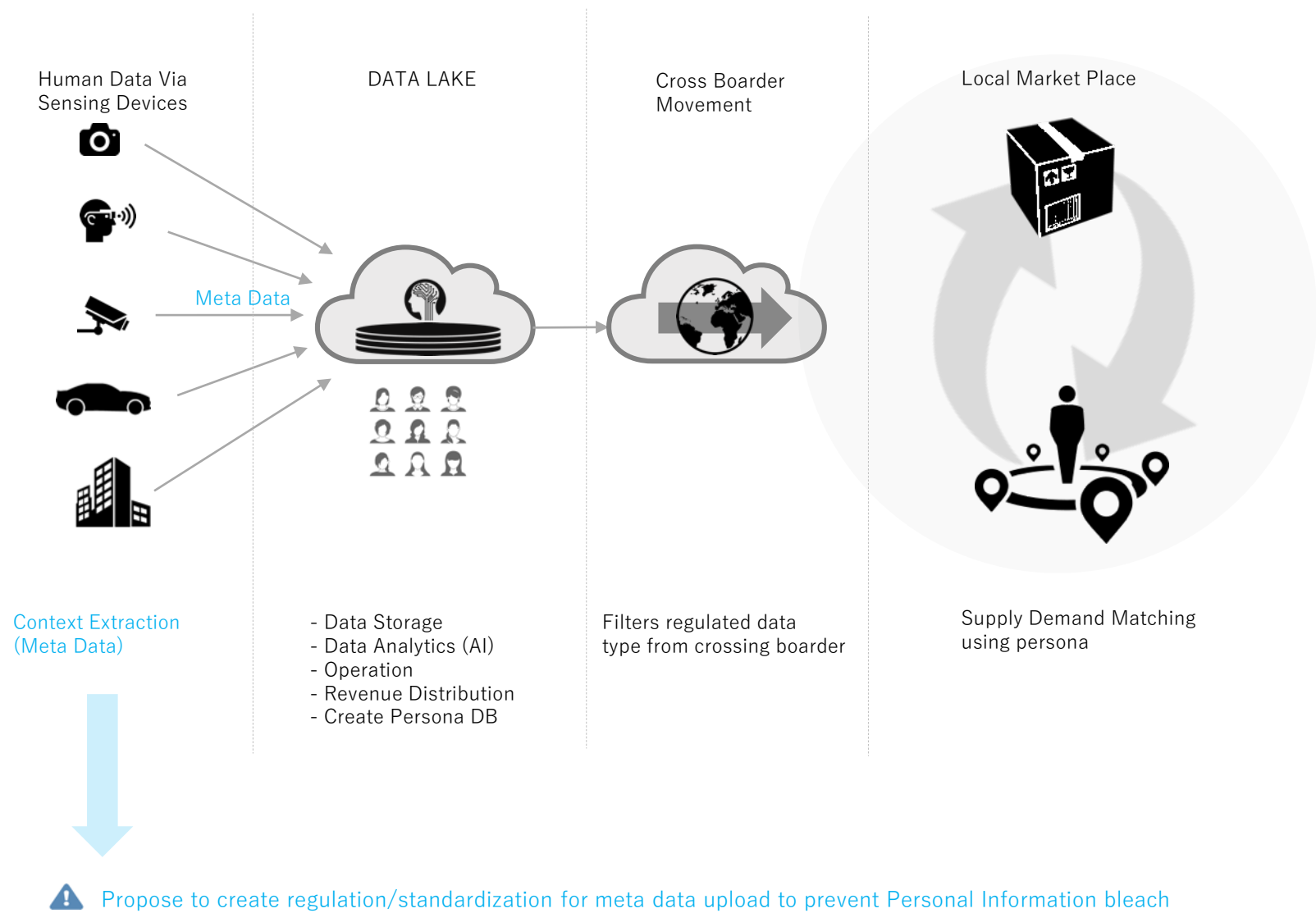Incentivizing: Data Exchange & AI Model Exchange

How can we contribute?

Shaping the Data Flow by Standardizing IoT data

Privacy policy in human data acquisition and data transfer in world of IoT

Human Data Via
Sensing Devices

DATA LAKE

Meta Data

Cross Boarder
Movement

Local Market Place

Context Extraction
(Meta Data)

- Data Storage
- Data Analytics (AI)
- Operation
- Revenue Distribution
- Create Persona DB

Filters regulated data
type from crossing boarder

Supply Demand Matching
using persona

⚠ Propose to create regulation/standardization for meta data upload to prevent Personal Information bleach

Convergence of IoT and Marketing

New businesses are bringing about major revolutions based on sophisticated IoT Devices, such as cameras, microphones, etc., and the data they create, combined with AI is creating this opportunity. This is expected to yield numerous innovations to the world. However, from the perspective of protecting privacy, problems may arise due to collecting and storing (and reusing) the personal information data generated by these devices.

Due to these conditions, we believe it will be necessary for international institutions to regulate/standardize the collection and utilization of IoT data.

We would like to make a proposal to present at this forum, so we kindly request an opportunity to present our proposal.

Metadata

Human Data Via
Sensing Devices

DATA LAKE

Meta Data

Context Extraction
(Meta Data)
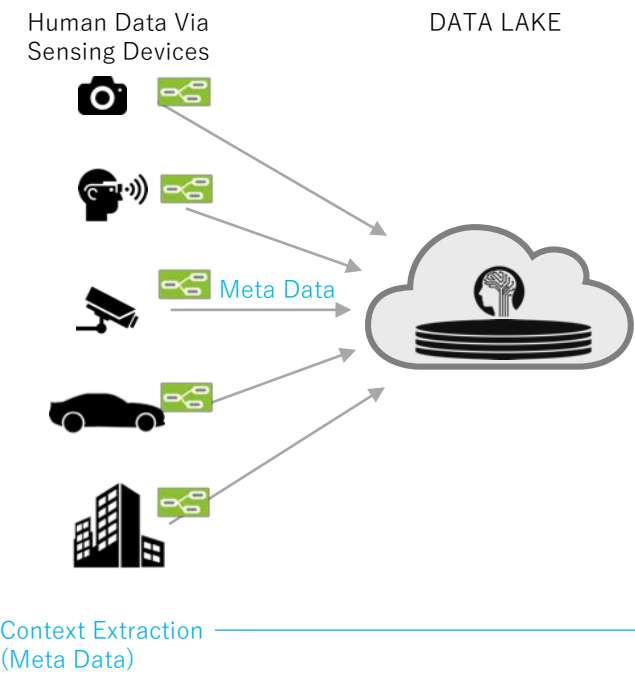
 Metadata created from video context (Full Set)

Meta Data Type	Data
Time Stamp	Time
Demographics	Age, Gender, Height, Build, Skin Color
Facial Feature	Eye Color, Eye Type, Hair Color, Hair Type, Nose Type, Mouth Type, Ear Type, Scars, Relative Distance
Action	Buying, Walking, Running, Standing, Sitting, Talking, Stealing, Holding, Attacking, etc.
Feeling	Normal, Happy, Sad, etc.
Object	Object Type, Object Color, Object Size, What Object
Environmental	Weather, Temperature

USA   FRANCE   JAPAN

IoT Data Standards for
Smarter Sustainable Stress-free world

Summery

- IoT data will contribute greatly to data explosion.
- This big-data is the fuel for advancing AI technology.
- In order for
- By Standardizing IoT data, we can increase the liquidity of the data, contributing to the realization of smarter, stress-free world

Next Steps

・Project team member, Leader
・Objective & Scope
・Output（Recommendation, Regulation, White paper）
・Scheduling and next steps（teleconference）

Use case Example 1: Sports Data Lake

Community

Community Engagement

Persona

Persona Data Analysis

direct 1 to 1

Behavior Prediction

Data Lake

Expand Customer Base

Supply and Demand Matching

1 to 1 Direct Conversion

Collect   Analyze   Format   Monetize