

Smart Agriculture in the IoT era

21nd April 2015

Who we are?

Science Plants' Feeling

ベジタリアが描く、「農業ルネサンス」

緑の革命は、高収量品種、農薬、化学肥料などにより食糧の大量生産を可能にしました。反面、農作物がもつ本来のおいしさ、安全性、環境など多くのものが失われてきました。緑の革命から半世紀以上が経ち、その当時は解明できていなかった植物生育、病虫害発生メカニズム、植物に必要な栄養素を作り出す土壌微生物の多様性バランスなど自然の現象を探究する科学の研究は大幅に進歩を遂げました。また各種センサー/ネットワーク技術や情報技術の発展により、植物生育に必要な日射量、温度、湿度、土壌水分などを管理・最適化するシステムの構築が可能となりました。

我々は、その最新の科学とテクノロジー（Vegetation Science & Technology）をもって、植物がそもそも自然界で持つ力を最大限に発揮できる自然回帰の「農業ルネサンス」が次の緑の革命だと考えています。自然の多様性を保持し、様々な生物が共生できる生態系を維持し、持続可能な農業をベジタリアは創り出していきます。

Green Revolution

過去



Agrichemicals
Fertilizer
Genetically-modified Plants

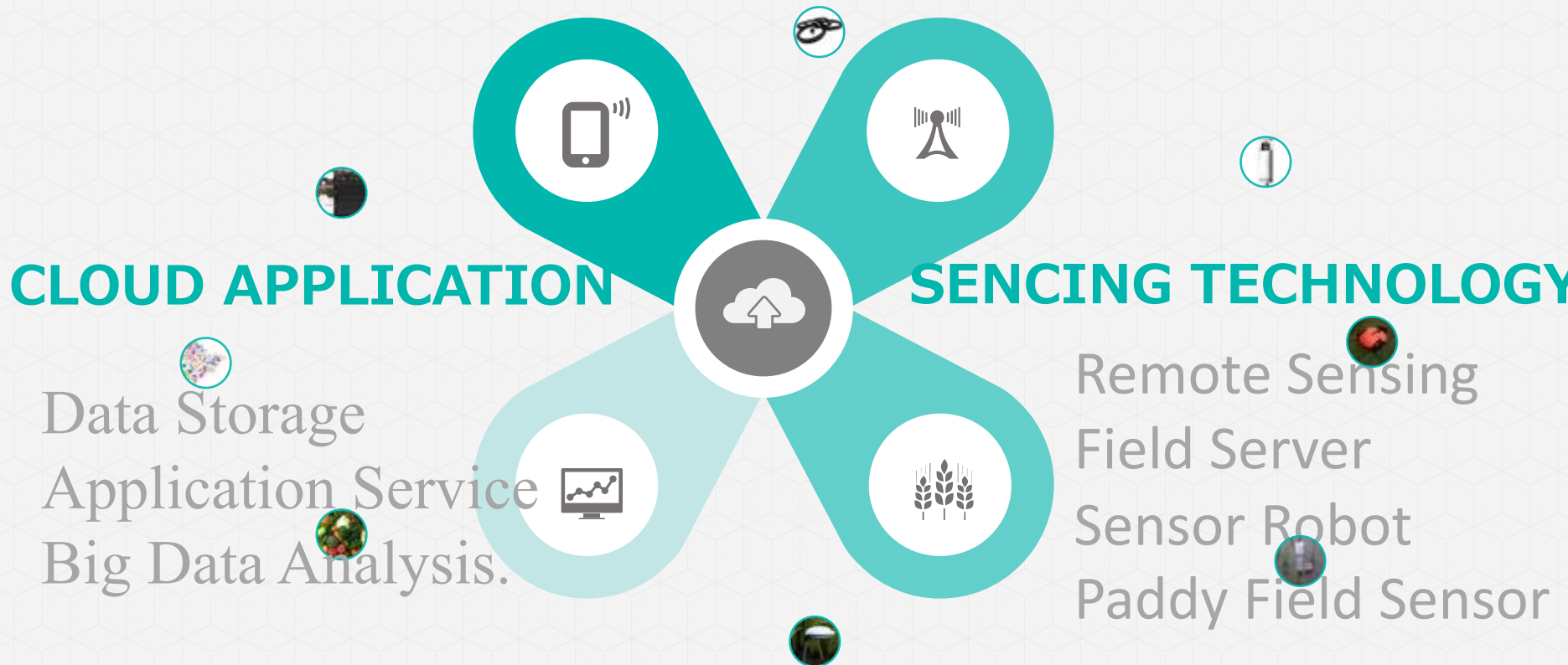


環境破壊
 食の安全
 生産・廃棄ロス



Agriculture Renaissance

SMART AGRICULTURE & MEMS



SENSING TECHNOLOGY

e-LAB experience

Field Server

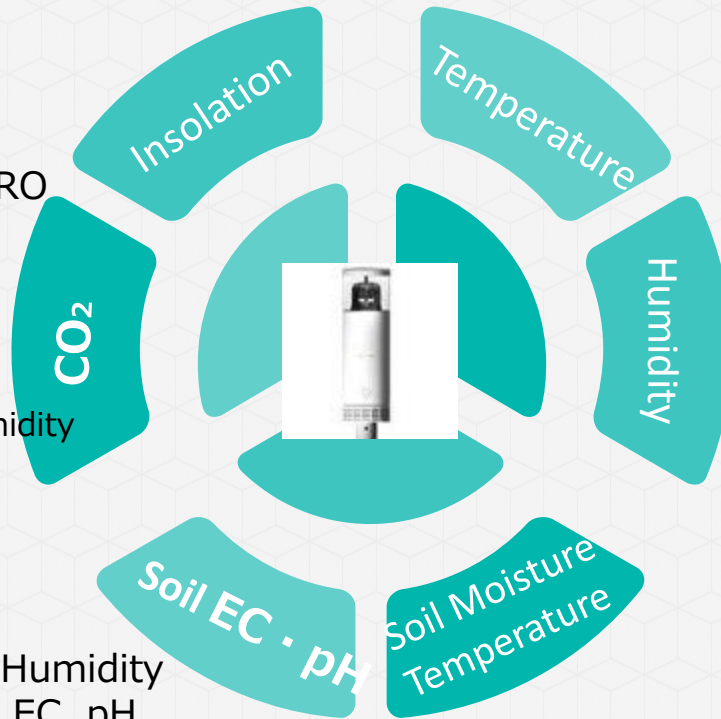
Agriculture Sensor
Co-development with NARO

Air Watch

Low cost air sensor
Insolation, Temperature, Humidity

Soil Watch

Low cost soil sensor
Insolation, Temperature, Humidity
Water level/temperature, EC. pH



Remote Sensing

Satellite (Micor wave), UAV
Cultivation status
Production and Quality

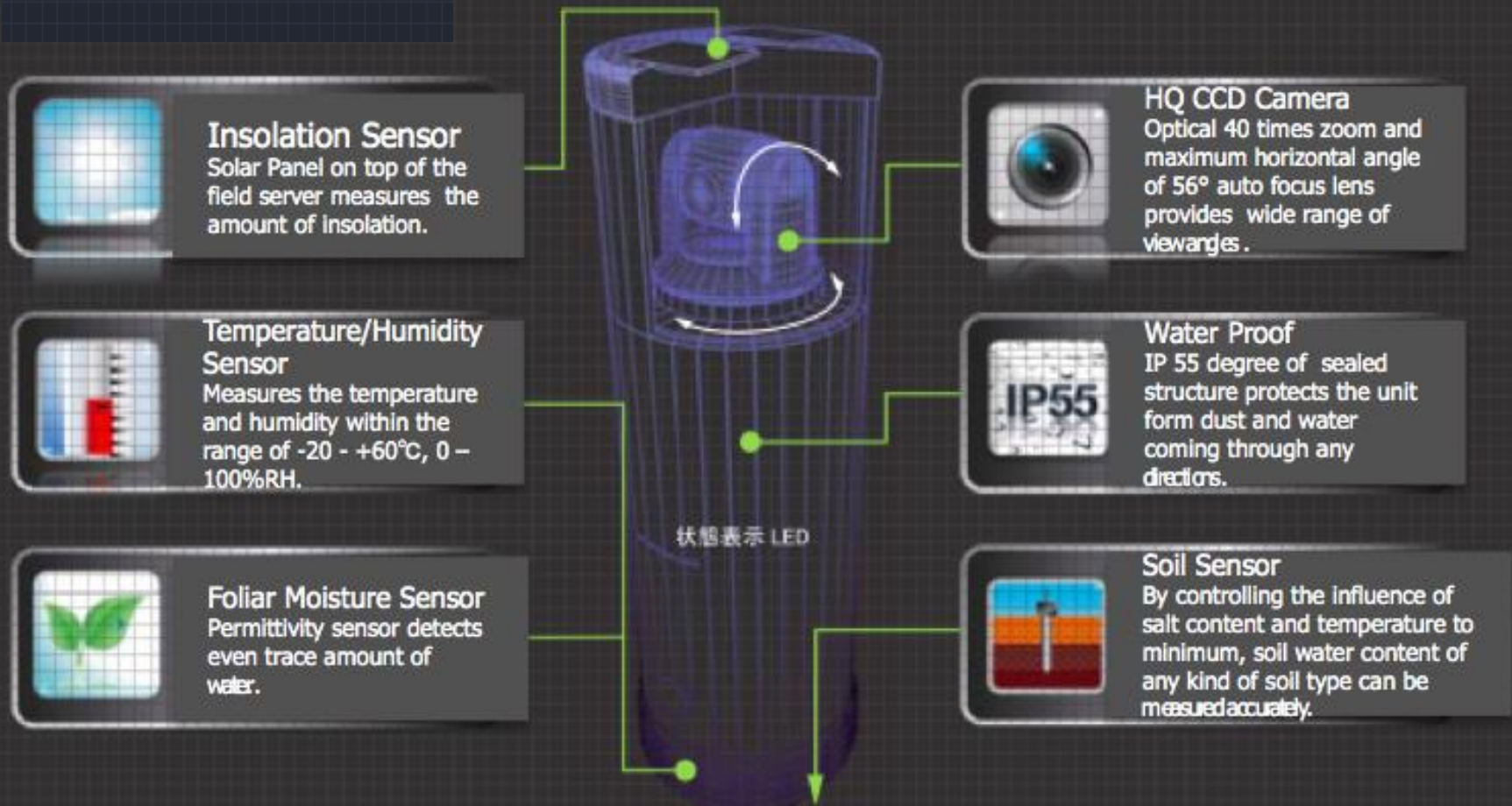
Image Scanning Sensor

Robot with camera

Paddy Field Sensor

Paddy Field Sensor
Water level / Temperature
Water gate control

Field Server



CONTROL of Diseases & Pests

Plant Clinic

Prevention and Diagnostic System for Diseases and Pests

vegetalia



Prevention and Diagnostic System for Diseases and Pests Simple and Easy User Experience (UX)



Field Server



Outcome of the joint research and development with
NARO (National Agriculture and Food Organization)

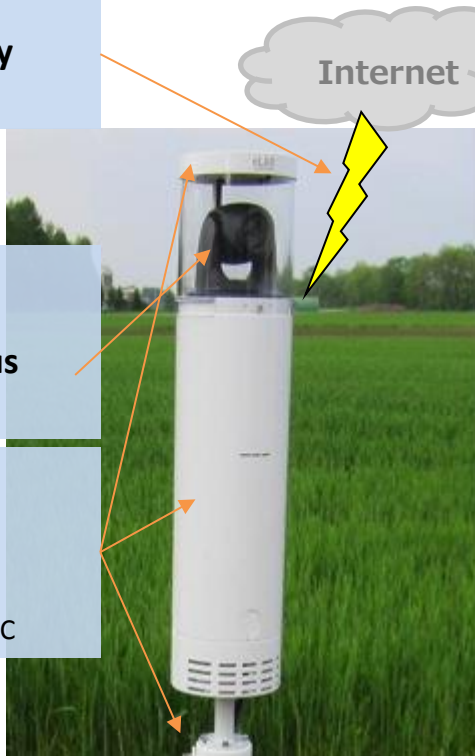
What is Field Server ?

Field Gateway (FG)
Access Point and Gateway
function via 3G/LTE

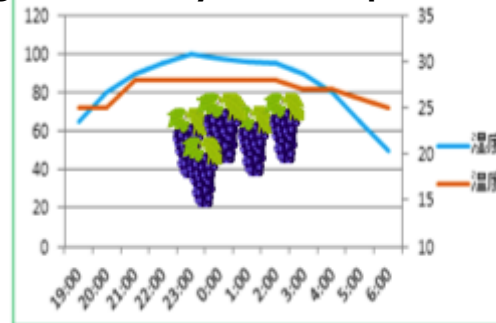
Field Camera (FC)
Camera Function
Observation of crop status
and environment

Field Point (FP)
Sensing Function

- Amount of Insolation
- Temperature, Humidity, CO₂
- Soil Temperature, Moisture, EC

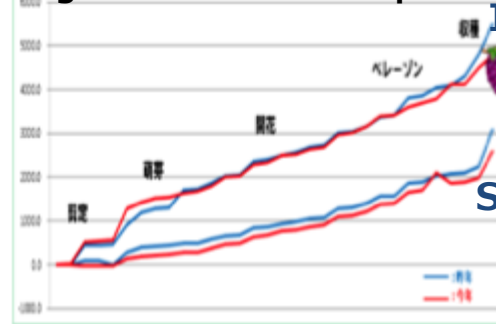


Night Humidity and Temperature



**Disease by High
Temperature &
Humidity
Alert Warning!**

Integrated Value of Temperature



**Integrated value of
Insolation and
Temperature
+
Sugar Content Value
Estimation for
Harvest Timing!**

活用事例: 山梨県 双葉農園 様

**Automated collection of environmental data in the field
Data Utilized for Cultivation Support!**

System Structure Field Monitoring Units Field Server / Field Point

Field Sensor
Field Point

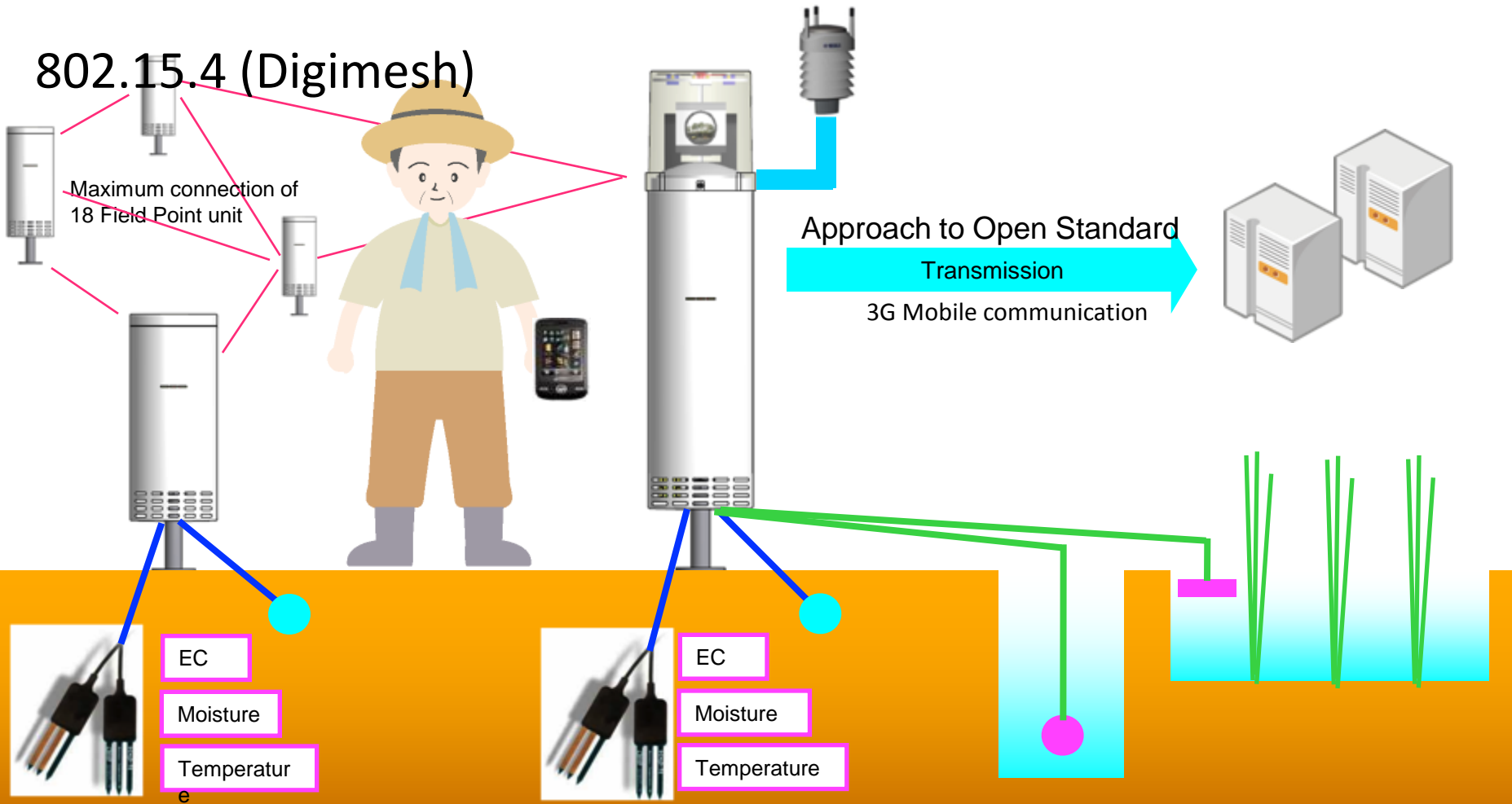
Field GW
Field Server

Field Environment
Data Server

802.15.4 (Digimesh)

Maximum connection of
18 Field Point unit

Approach to Open Standard
Transmission
3G Mobile communication



Science Plants Feeling...

Application software shall be required to monitor the plant's status.



Field Server Measurement data



- Amount of Rain
- Wind Velocity
- Wind Direction

Picture

Insolation

Temperature

Humidity

Foliar Moisture

Soil Moisture

Soil EC

Soil Temperature

For Agriculture purpose...

Report

Accuracy, Credibility, Swiftness

Grasp

Decision

Action

Cognition

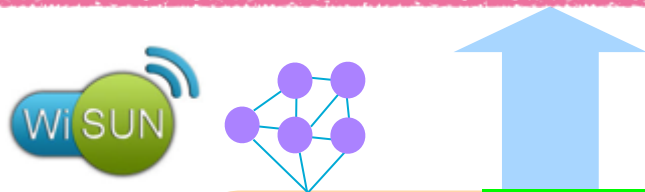
Status

Assist to improve the accuracy of daily operation

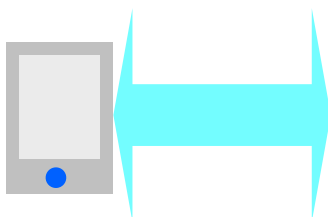


M2M CLOUD SYSTEM

Agricultural Management/Cultivation/GAP Support/Traceability etc.



M2M Short-distance communication
Utilize **Wi-SUN** for Sensor Network



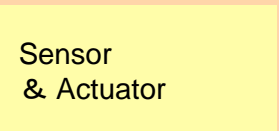
Linkage with **smartphone** technology in the field



XML communication for Information Distribution

Smart Sensor Platform

Open Platform for Field Sensor units



For adapting diverseness of plants, **sensor interface standardization** shall be required to prevent obsolescence.



計画・戦略



準備・栽培・収穫

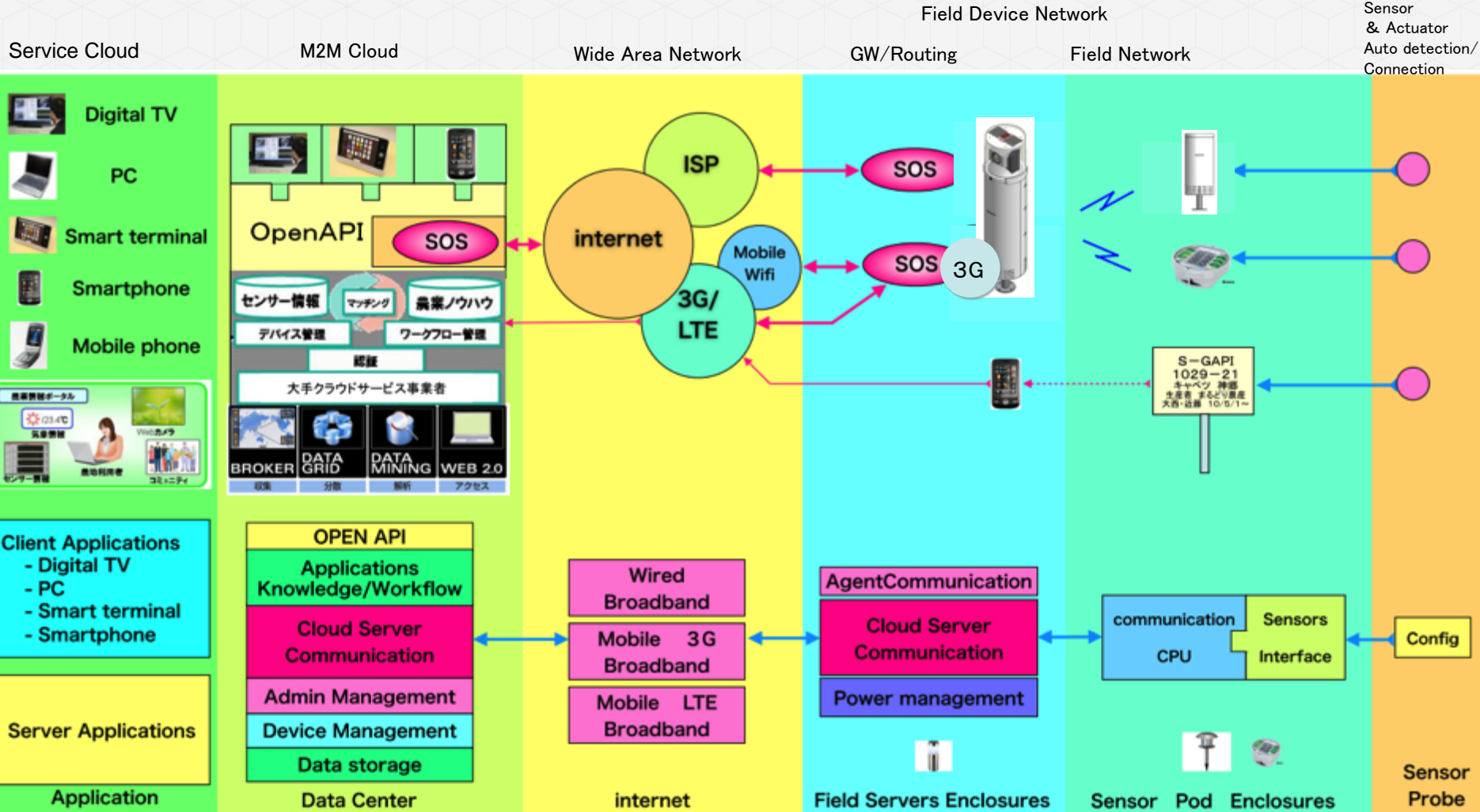


販売・経営



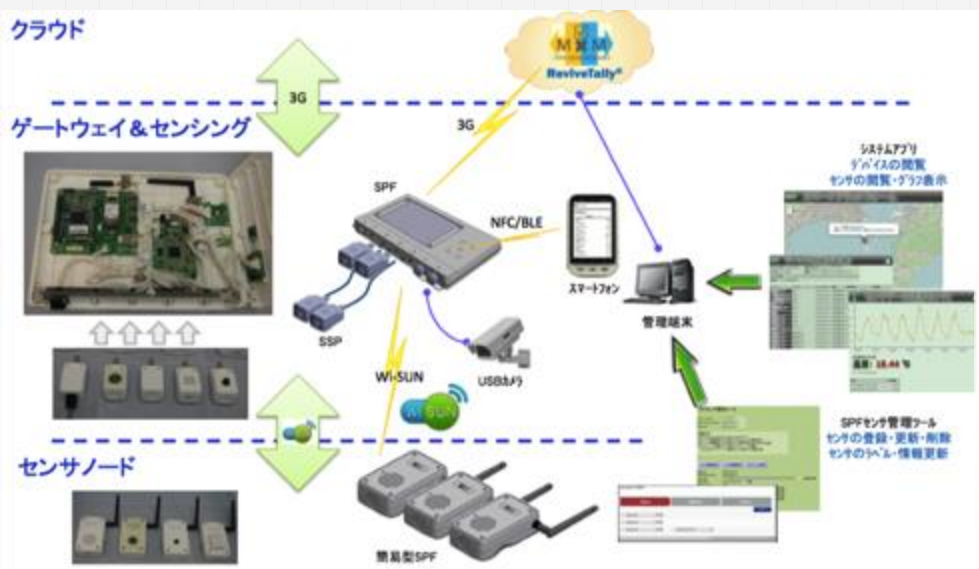
Next Generation Sensor Research and Development

Field Sensor Network Structure



Sensor revolution

National Institute of Information and Communications Technology (NICT)
 「Wireless Smart Utility Platform:SPF」 Development



設置イメージ

標準型SPF

簡易型SPF

高機能型SPF

電源ケーブルコネクタ・ロックナット

専用電源ケーブル

各種SSP

LANケーブル

USB(防水キャップ付き)

AC電源ケーブルコネクタ・ロックナット

AC電源ケーブル

各種SSP

3G

Wi-SUN/920MHz

BLE/NFC

センシング
ユニット

- ◆ SSP (Smart Sensor Plug) 型センサ最大6台 (高機能型は8台) 接続可能
- ◆ 定点カメラ
- ◆ Wi-SUN通信による無線センサノード (簡易型SPF) との送受信機能
- ◆ 簡易型SPF (無線センサノード) 最大18台接続可能
- ◆ センサ計測周期: 1~60分
- ◆ 収集周期: 10分~8時間 (SPF→クラウド)
- ◆ データ蓄積期間: 2週間
- ◆ BLE/NFCでスマートフォンとユニット情報のハンドオーバー通信可能

Hardware and System Development

Paddy Field Sensor

戦略的イノベーション創造プログラム(SIP)

Cross-ministerial Strategic Innovation Promotion Program

Initiative of the government of Japan



Target Application for Research and Development

1. More than 100ha Large Scale
Agriculture Corporation
2. 20~30ha Independently managed farm

Research Items:

Measurement/Communication/Installation/
Cost Analysis etc.

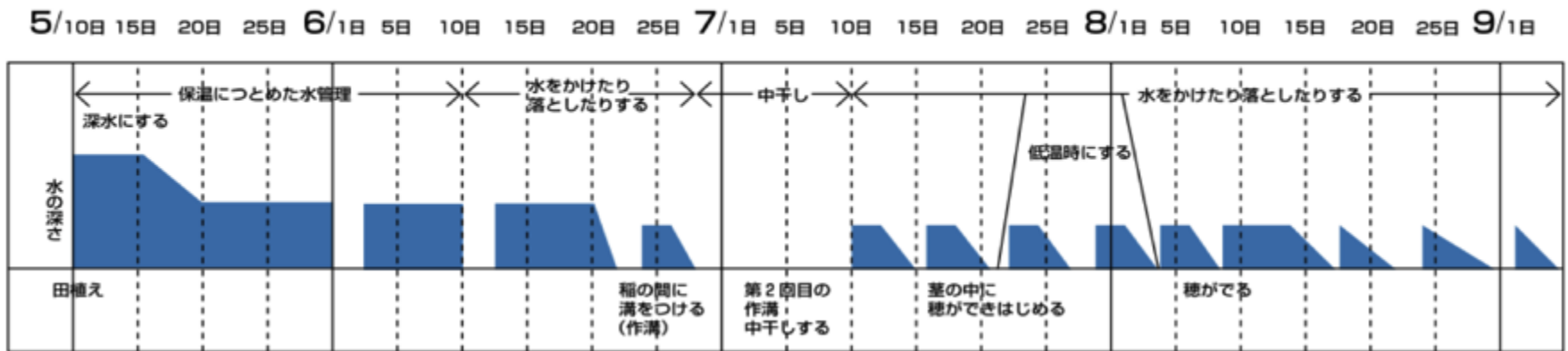
CURRENT WATER LEVEL MEASUREMENT EXAMPLES



Paddy Field Sensor revolution

Rice Cultivation; An Example of Water Control

田植えから刈り取りまでの水管理



Paddy field is Water Control! **Time and Effort required!**

Paddy Field Sensor



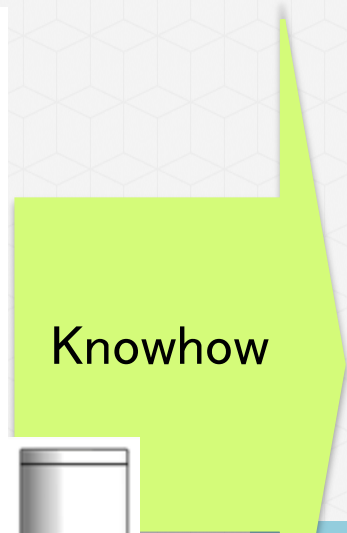
Daily confirmation with Smartphone



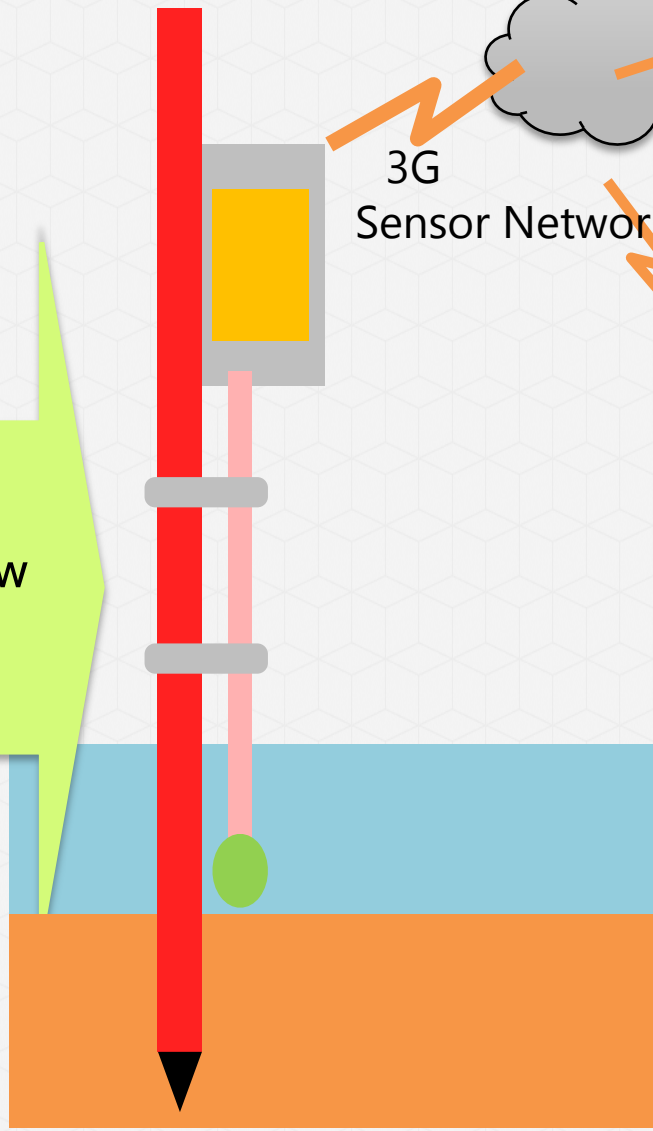
3G Sensor Network



Automated Water Gate Control



Knowhow



Sensor: Water Level and Water Temperature

Communication : Short and Medium distance (300 → 600m ~ 1 Km)

Power: Battery&Solar power (Cost to be examined)

Field Server

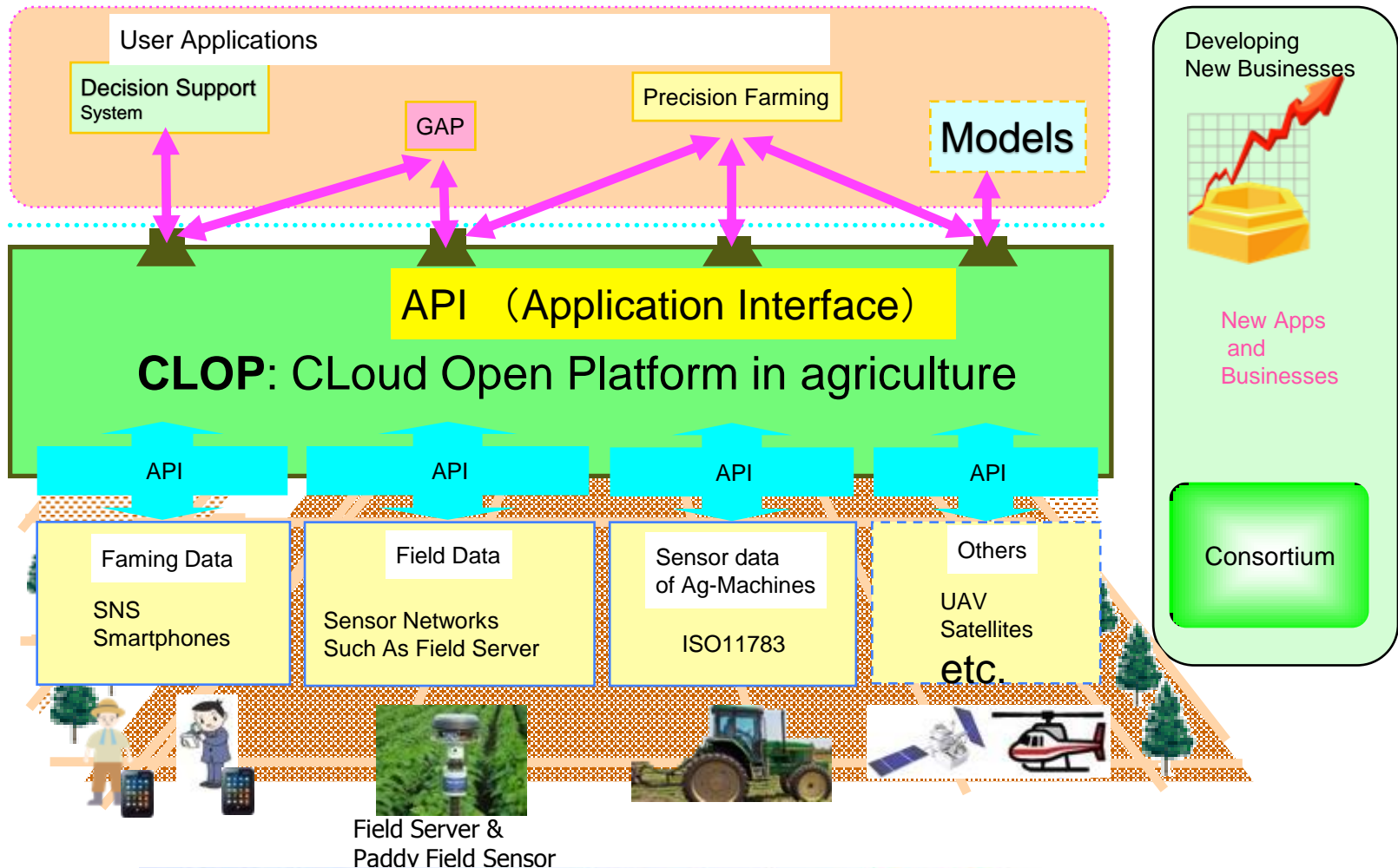


Strategy and concept of CLOP

CLoud Open Platform for applications in agriculture

Strategy and concept of CLOP

(Cloud Open Platform for applications in agriculture)



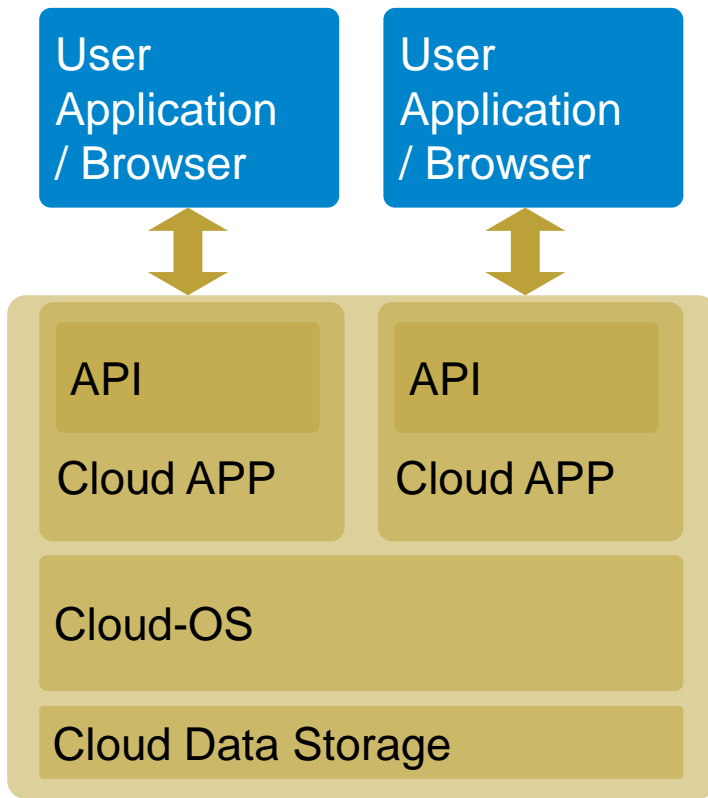
戦略的イノベーション創造プログラム(SIP)

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Strategy and concept of CLOP

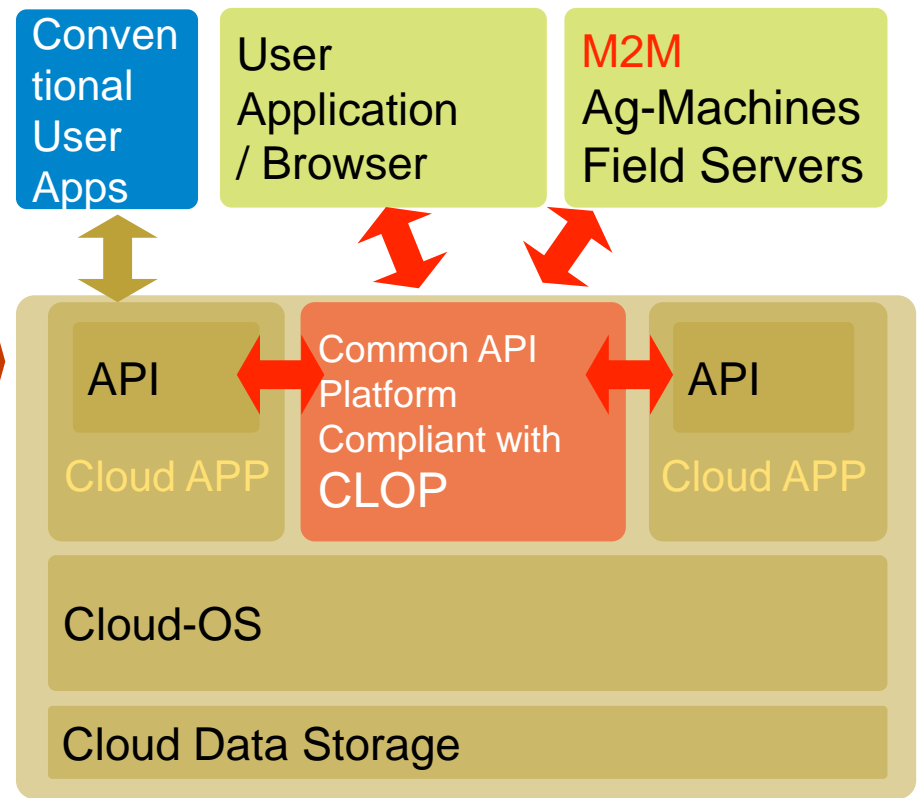
(Cloud Open Platform for applications in agriculture)

Existing Cloud-based Applications



Difficult to integrate Data / APIs / User Apps

CLOP



Easy to integrate APIs
Can provide certification service of QOD
(Quality of Data)



Thank you for your attention!!!