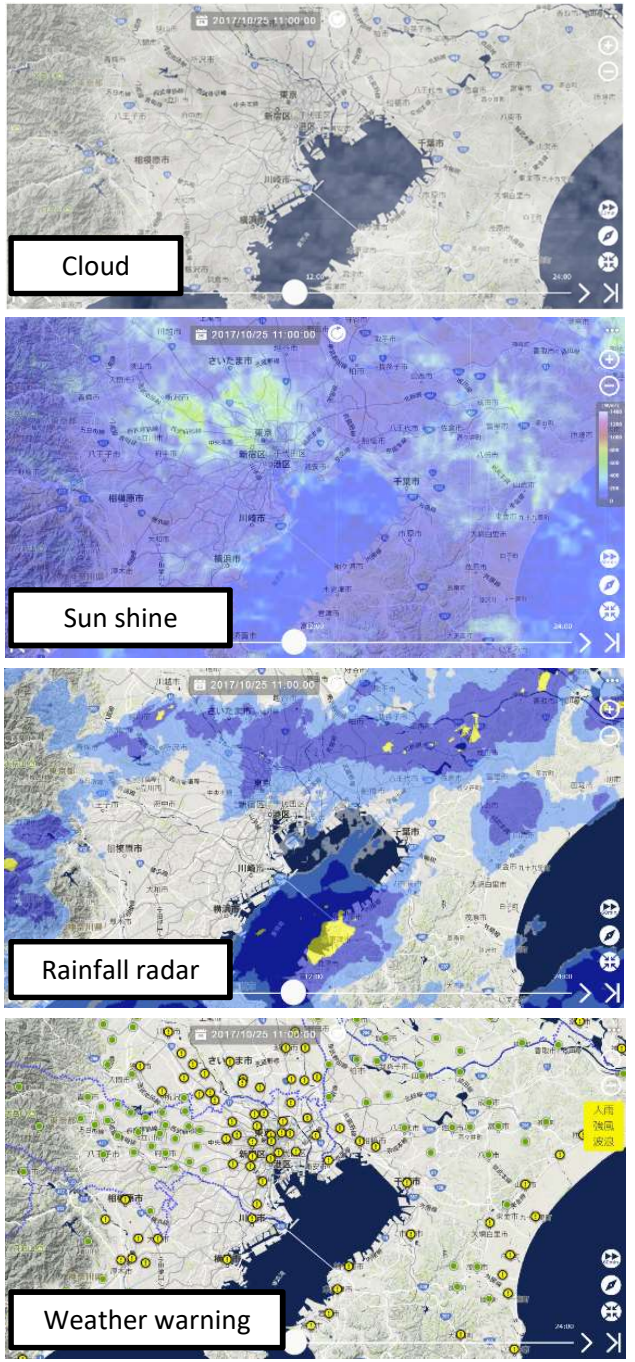
Visual IoT and sensor IoT for disaster mitigation using industry-oriented Raspberry Pi

Ken T. Murata, Sakae Murono, Motoaki Yasui, Praphan Pavarangkoon, Kazunori Yamamoto, and Nobuyuki Asai

National Institute of Information and Communications Technology (NICT/Japan)

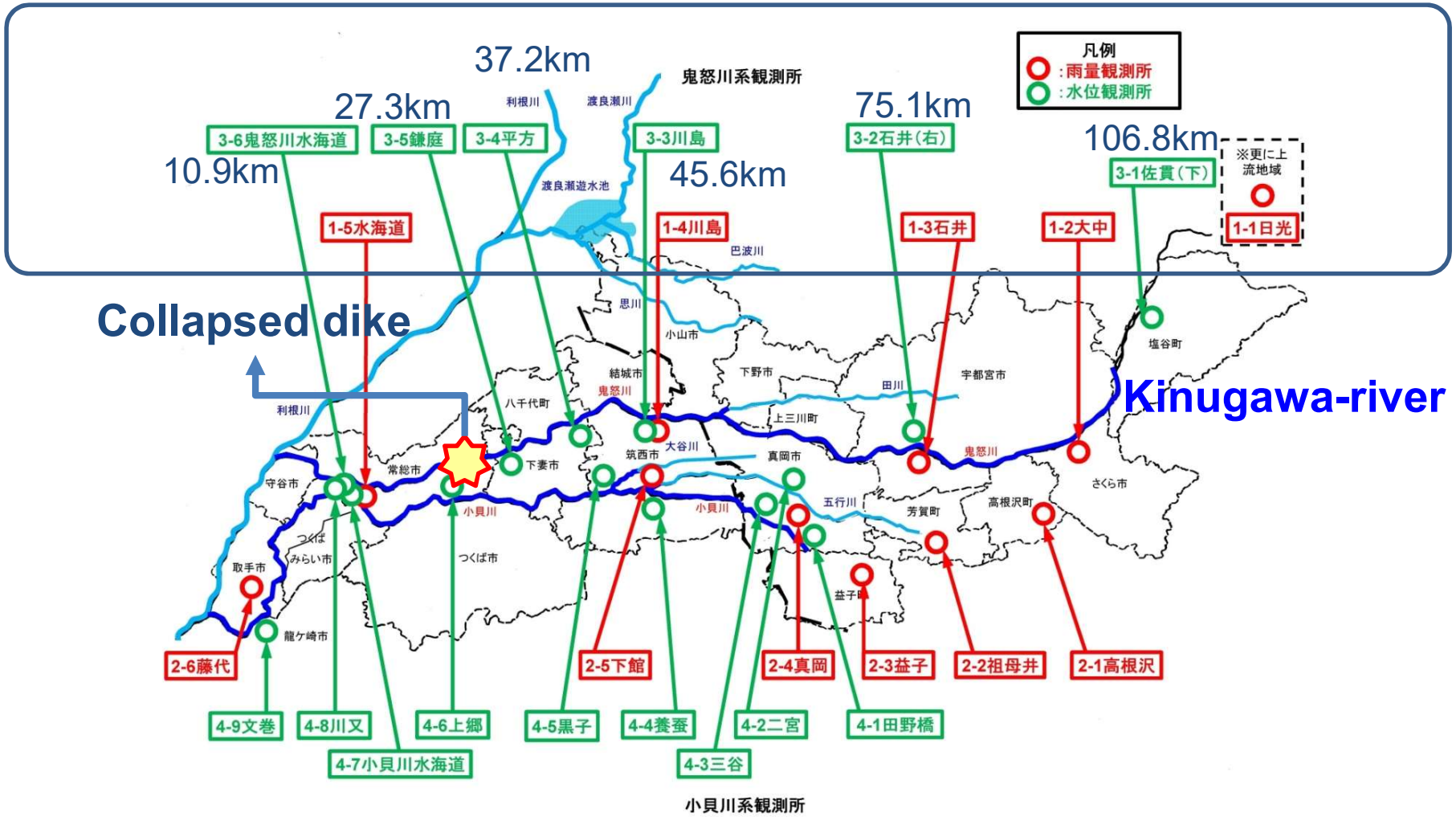
Contact:
asai@nict.go.jp
sc-operation@ml.nict.go.jp



NICT Himawari real-time Web:
for weather and disaster mitigation
http://amaterass.nict.go.jp

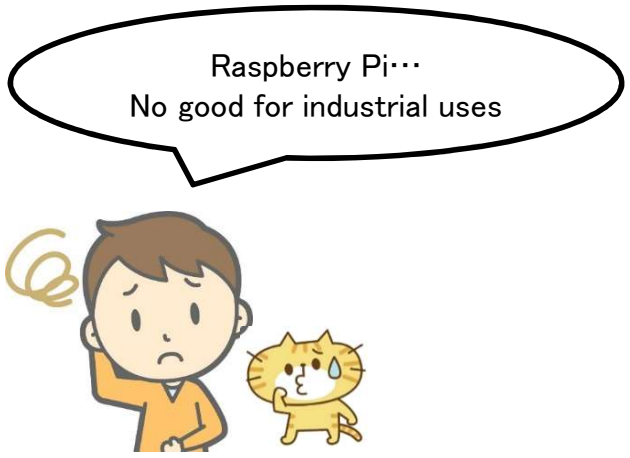
September 2015
Collapsed section of dike for Kinugawa-river in Japan

ISSUE:
Collapsed section of dike for Kinugawa-river in Japan 2015



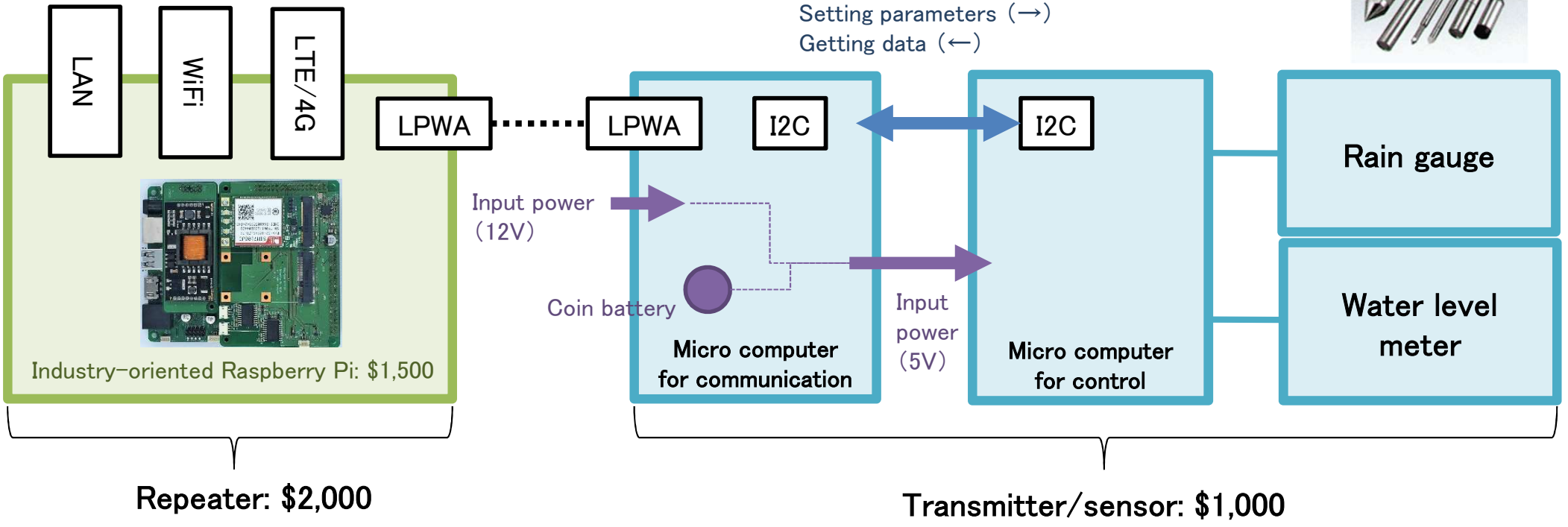
Only… 5 rain gauges and 6 water level meters on 100km river

IoT water level meter and rain gauge (Under development)

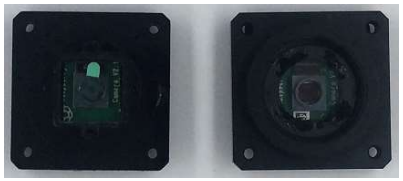


Rain gauge: $500

Water level meter: $500



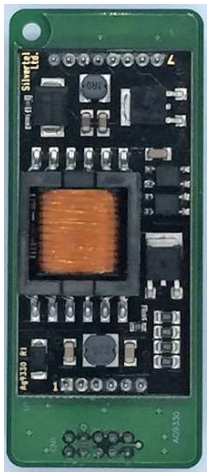
Option HAT modules (ready for use)



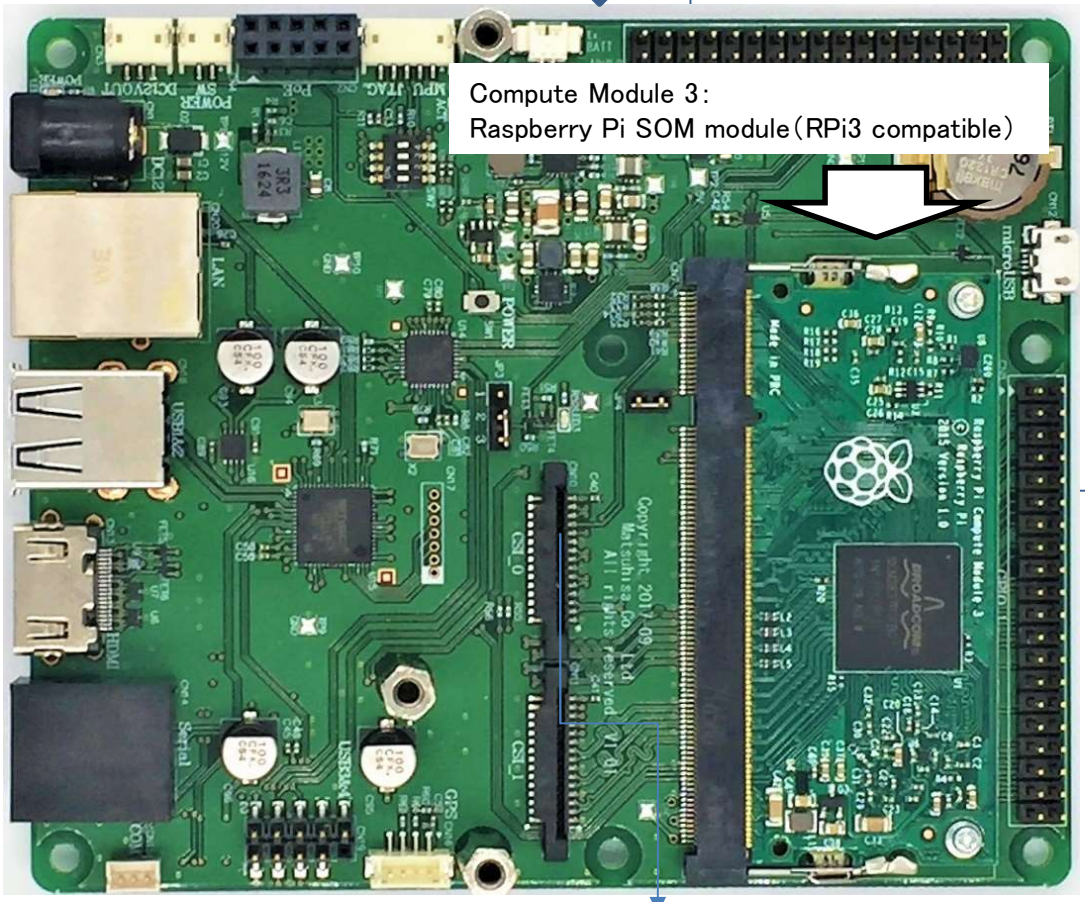
Camera module (V2)
L:M12 mount
R:CS mount

LTE communication

GNSS(GPS)/RTC



PoE



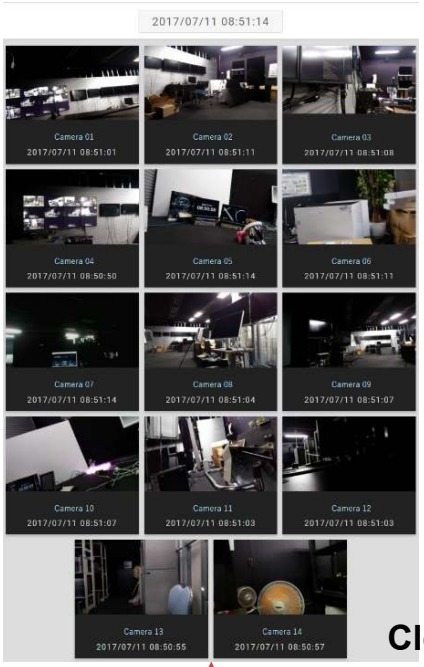
Private LoRa

LoRa Area network experiment @Kyoto (Keihanna)

- All parts are temperature guaranteed (from -45 to +80 degree in Celsius)
- Rich optional HAT boards

Industry-oriented Raspberry Pi

Concept of Visual IoT and Sensor IoT



Video transfer with small latency (for real-time operation)

High-quality video transfer on wireless networks

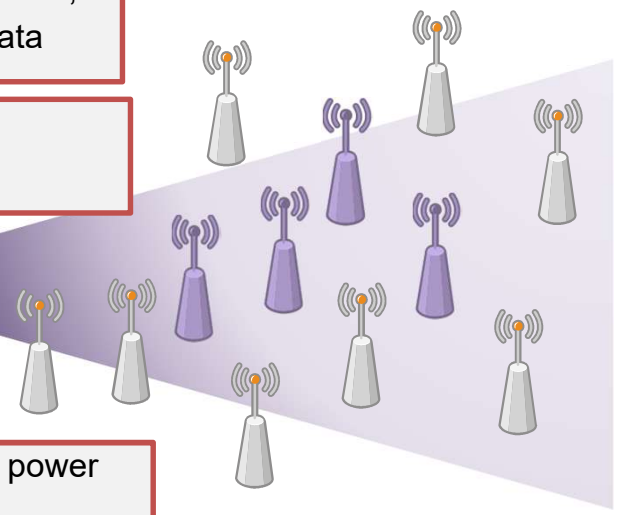
Narrow band video transfer (100Kbps)

Low cost communication (MVONO)

Video triggering (on/off, direction, zoom level) by IoT sensor data

Edge computing

IoT sensors



Cloud

Multi-view web

- **WAN**
- **4G/LTE/3G**
- **WiFi**

Raspberry Pi based camera

Multi-point view from multi-point camera

GIS web of video/image and sensor data

Adaptive movie/image transfer parameters

Cloud computing (A/I)

Remote monitoring and operation

Autonomous power supply

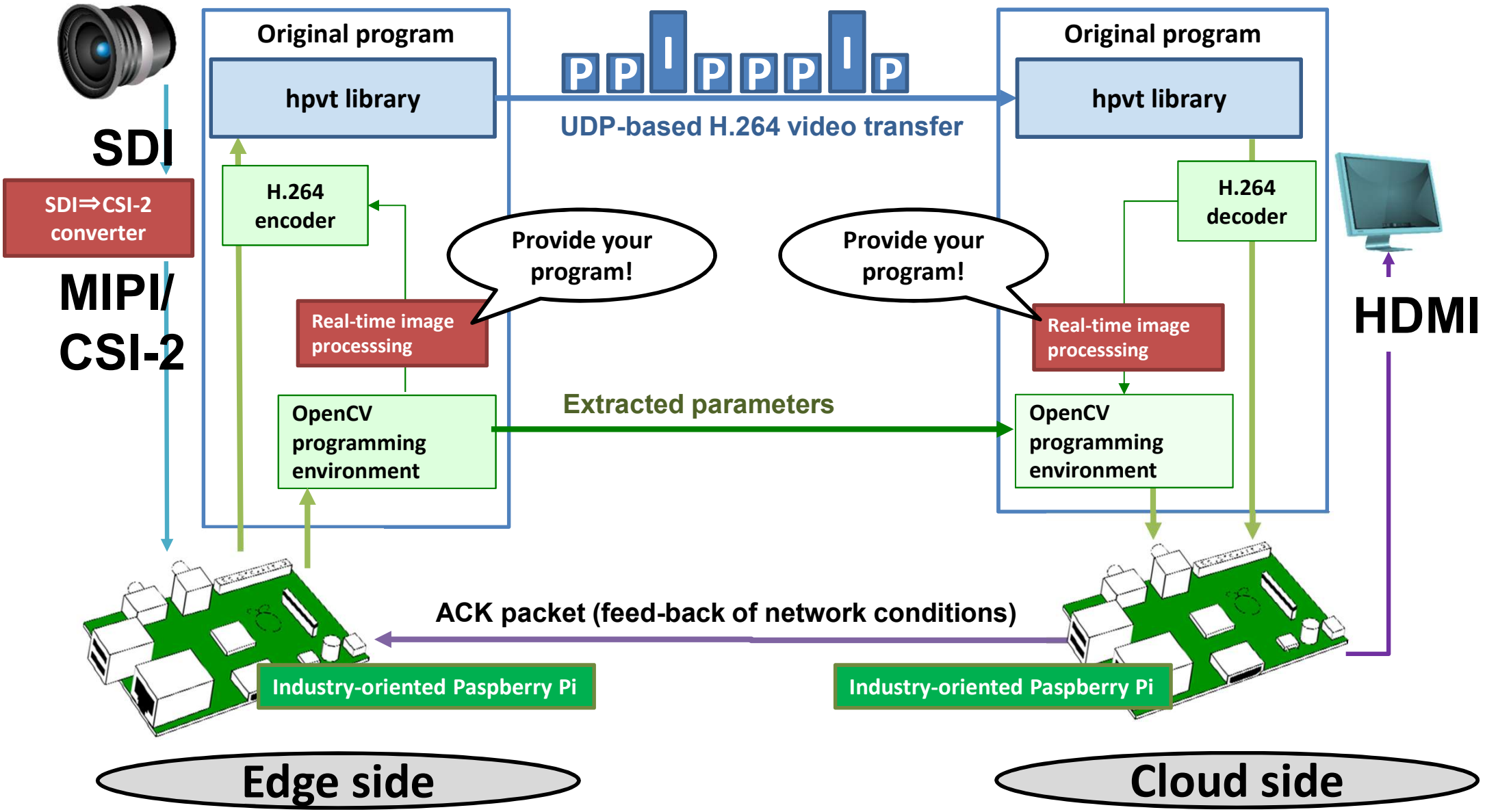
Small size camera system

Durability in outdoor

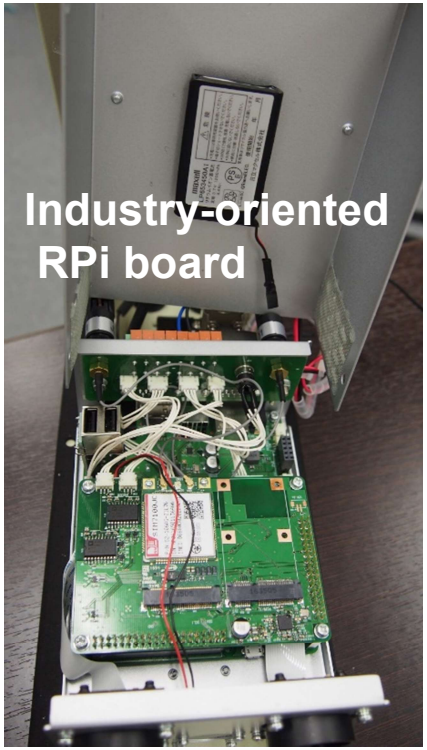
Multi-directional camera

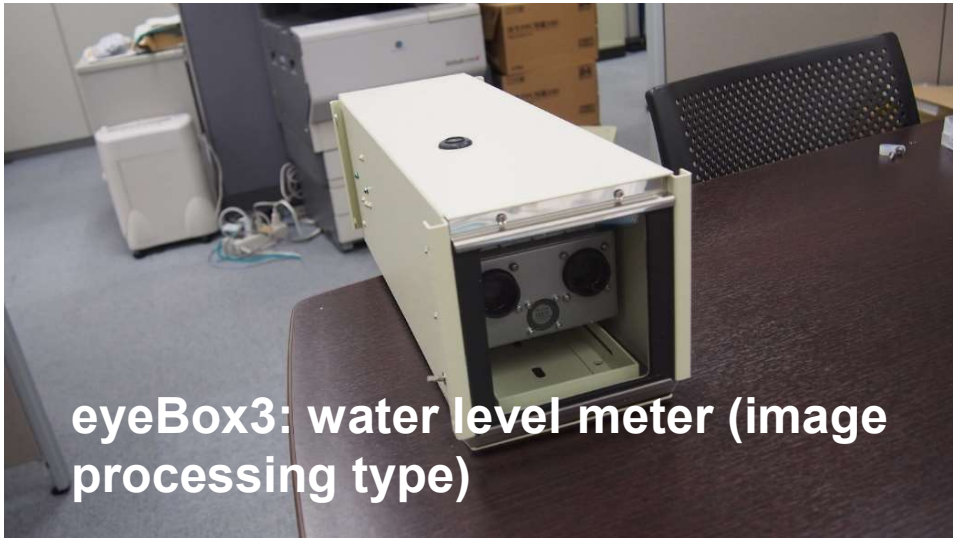
WONM: Wide-area Observation Network Monitoring system

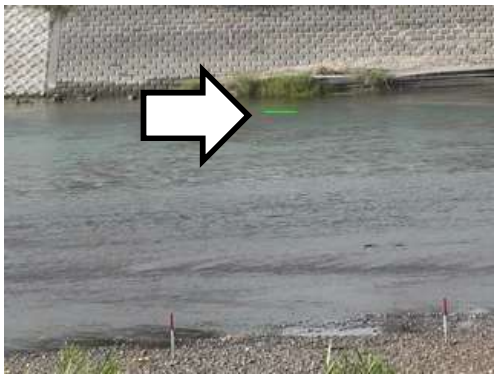
High-speed video transfer system via industrial-oriented Raspberry Pi



Ongoing: water level meter (image processing type)

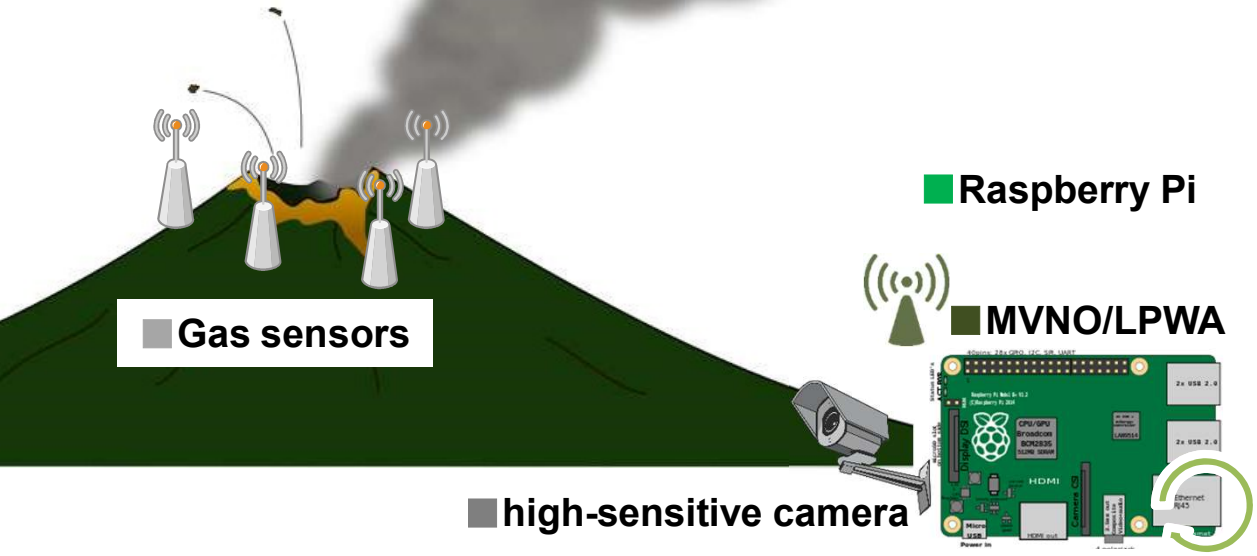


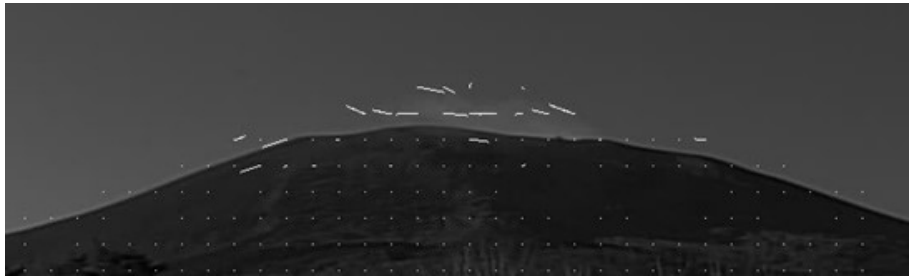




Water level detection results

Ongoing: volcano monitoring





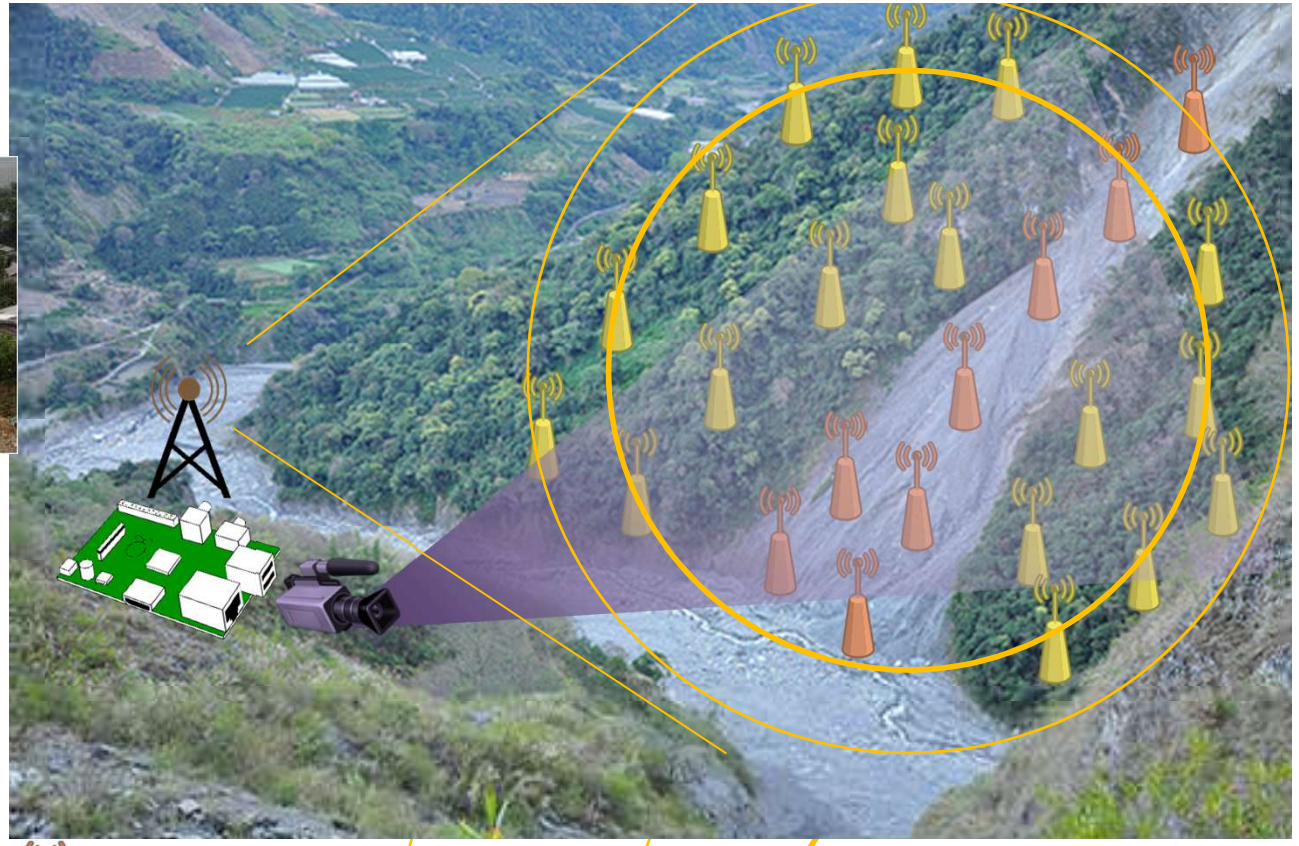
Optical flow processing (Prof. Honda, 2017)

Monitoring pavement, wall and other facilities in real-time

Ongoing: highway monitoring

Proposal: landslide monitoring

http://dil.bosai.go.jp/disaster/2009philippine/9e.html



Proposal: island monitoring