

---

**Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)**

**Submission Title:** [CASIO Response to 15.7r1 CFA]

**Date Submitted:** [ March. 2015]

**Source:** [Nobuo IIZUKA] Company [CASIO Computer CO., LTD.]

**Address** [3-2-1, Sakaecho 3-chome, Hamra-shi, Tokyo, Japan]

**Voice:**[+81-42-579-7442], **FAX:** [+81-42-579-7744], **E-Mail:**[iizukan@casio.co.jp]

**Re:** []

**Abstract:** [ ]

**Purpose:** [Call for Applications Response ]

**Notice:** This document has been prepared to assist the IEEE P802.15. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.

**Release:** The contributor acknowledges and accepts that this contribution becomes the property of IEEE and may be made publicly available by P802.15.

# CASIO Response to 15.7r1 CFA

CASIO COMPUTER CO., LTD

Nobuo IIZUKA

iizukan@casio.co.jp

## Motivation of OCC applications of Interest to CASIO

- Use of Imaging, spatial capability
  - Obtaining of signal data and its position in the image
  - Receiving multiple signals in regardless of the variety of background noise
  - Received from small / distance light sources
- Extend of Indicator, warning light, or other non-lighting light source
- The fast rise of the market
  - Camera-ready devices are world overflowing
    - It is desirable not to require a new device.
  - Some applications is good enough even at low speed
    - Than the high speed, applications and user experience is important

# Flicker issue and Application

- Of course, for the lighting, flicker perceptible low-speed modulation is not to be used.
- However, Indicator ,warning light, ... to be suitable low-speed modulation.
  - “Attention by Flicker” is the purpose of itself



- Low-speed pulse rate may allow the software-based implementation.  
→ Market can be launched quickly to.

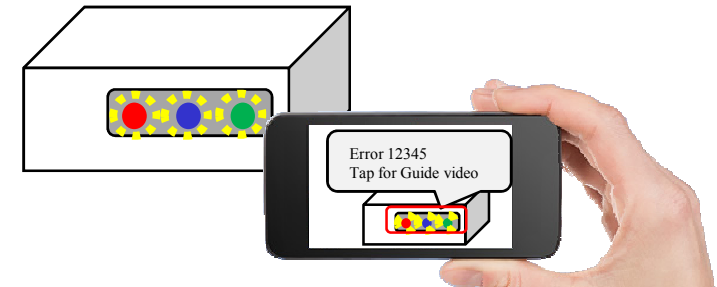


# Applications

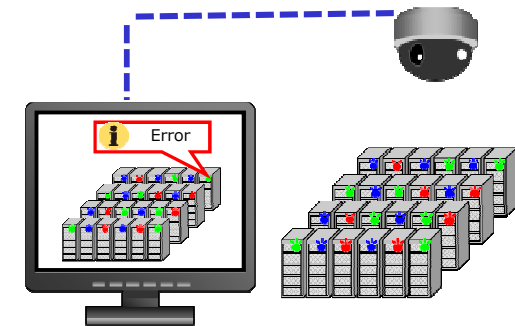
- O2O<sub>(smartphone)</sub>
  - Transmit from signage/signboard



- IoT<sub>(smartphone)</sub>
  - LED indicator of appliances



- M2M / IoT<sub>(PC)</sub>
  - Multi data receive with surveillance camera and add-on LED transmitter



# O2O: Digital signage and smart phone



RGB blinking marker  
40cmΦ 5Hz

approximate 30m

2014/2/27 Demonstration event of "Picapicamera" App.  
Tokyo Shinjyuku "ALTA vision"



Depending on the display contents,  
the user experience by the marker  
had been modified.

- Lottery,
- Character image stamp
- Direct jump to related web sight.

<http://casio.jp/picalico/topics/20140227/>

# IoT: Apparatus Indicator and smart phone

- Ge the url link or smartphone control from the indicator
- You may be pointing your smartphone camera When indicator start to a specific blinking

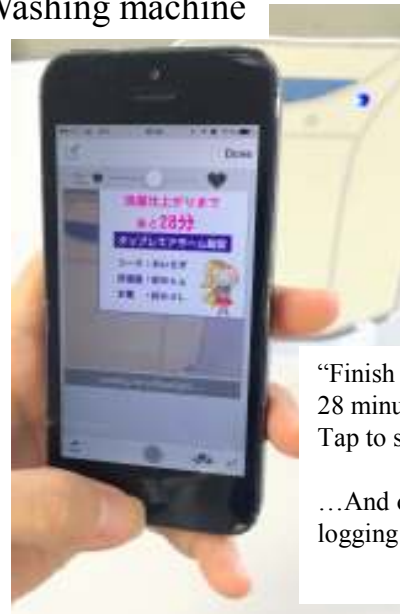
Printer



Call to Support?

When catastrophic failure,  
dialing automatically to call  
center

Washing machine



“Finish Until  
28 minutes  
Tap to set alarm”

...And other washing  
logging info is obtained

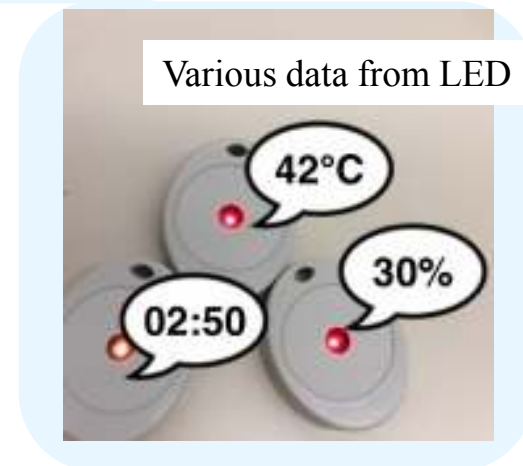
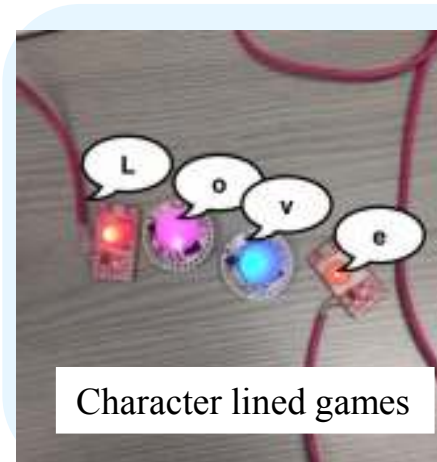
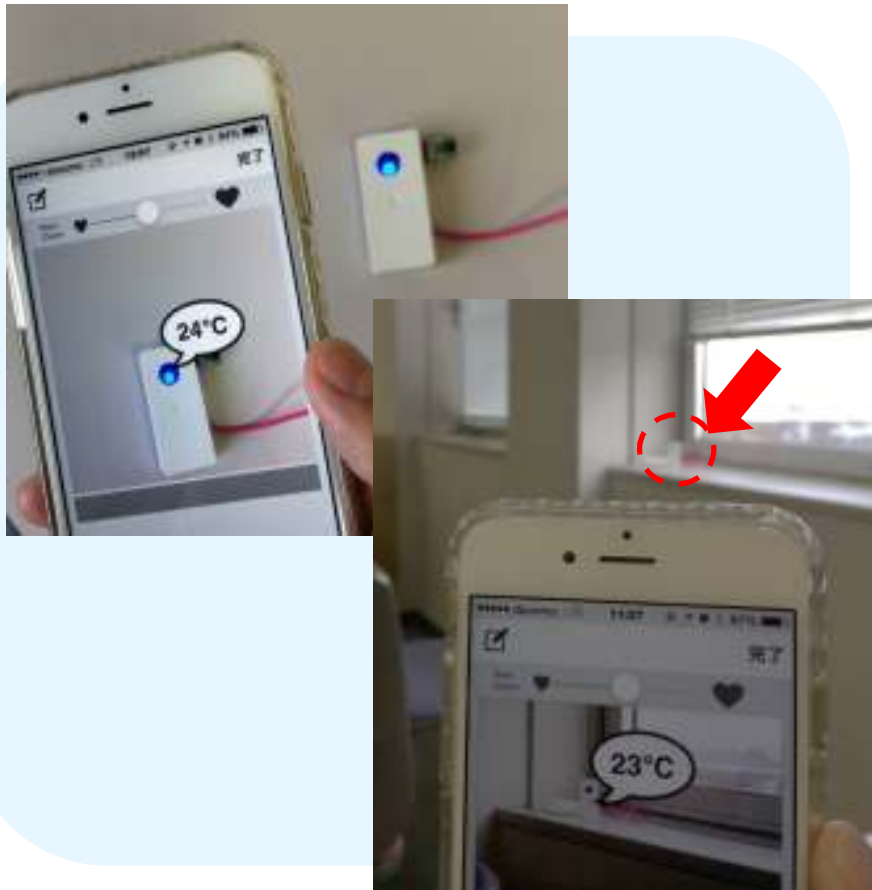
When washing is started, it  
automatically sets the finish time  
to smartphone alarm

Mobile battery



Get detailed state of mobile  
battery

# IoT: Sensor data from LED -proof of concept-



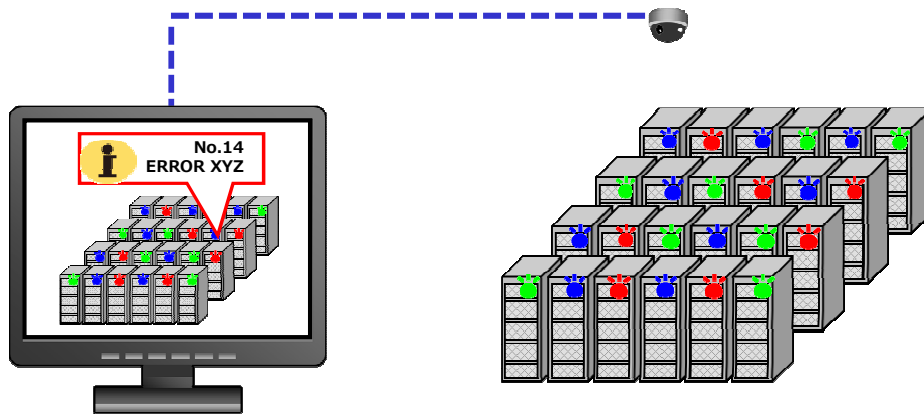
Get the data from the temperature sensor with LED to smartphone

Picalico Free  
<http://casio.jp/picalico/topics/>



## M2M / IoT: Industrial application and surveillance camera

- There are a lot of sites that hard to set up an existing wireless network
- Many applications where communication speed is not required
- There is also the place where surveillance cameras are already installed



Already, such as add-on LED warning light is being used.



# M2M / IoT: Proof of concept

## Proof of concept with diorama

Machine status surveillance.  
8bit/s x 10 markers,  
10Hz pulse rate, 20fps  
Based on Picalico Windows SDK



Optical system and software is the same as shown above  
(means, Ability to receive a similarly 10 markers)

## Long distance setting



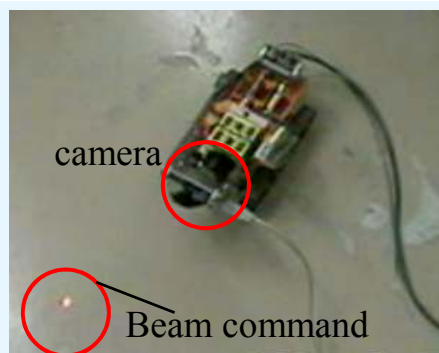
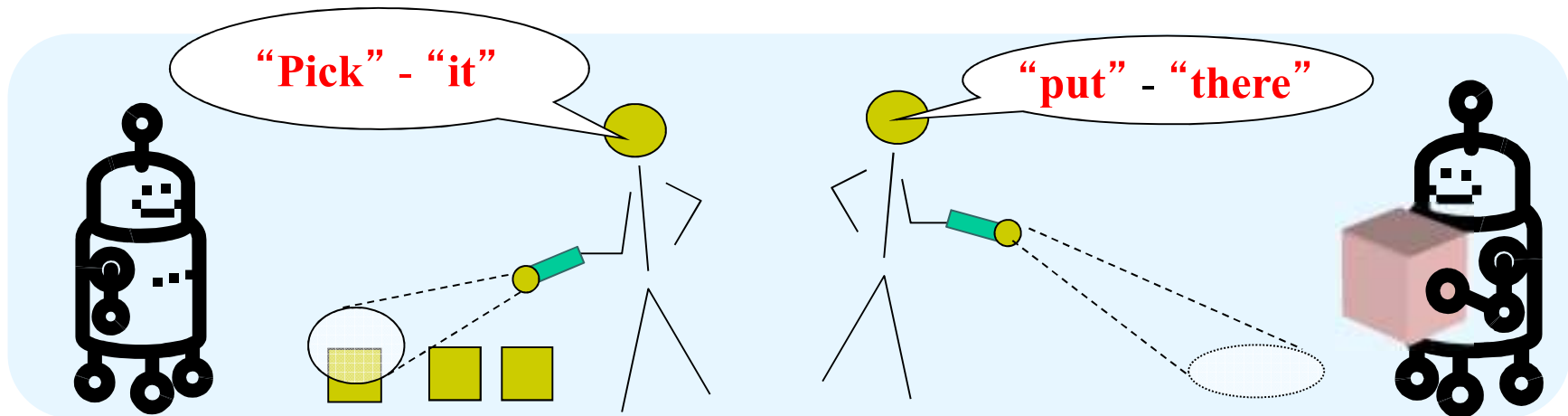
Distance 104m  
FOV : 56°  
Resolution: HD  
10fps , 8bit/s



LEDmarker,  
0.95W  
15cm×10cm

# Robotics-1 Human to Robot

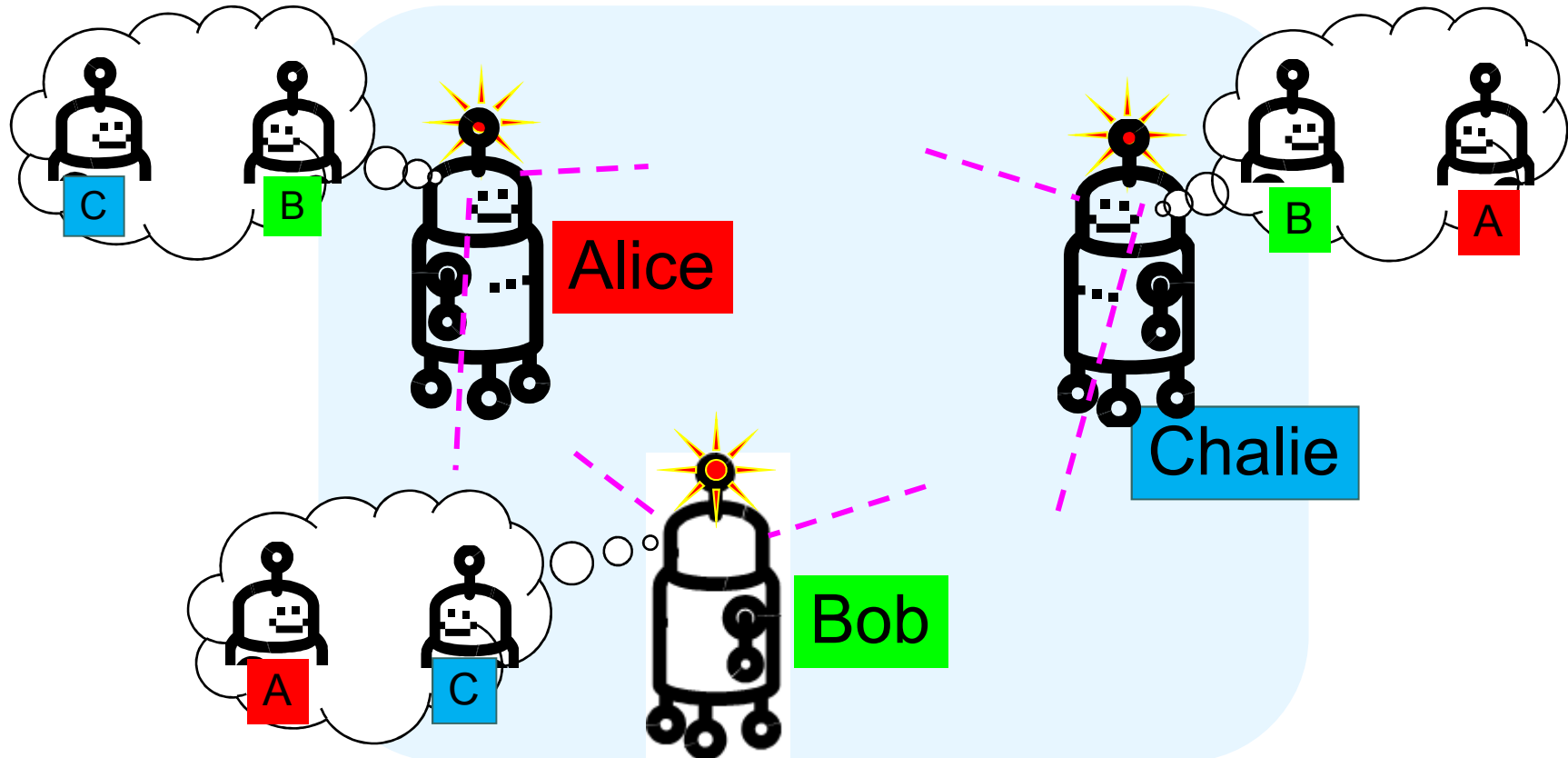
- Command in VLC , position in the irradiation



Laser pointer remote control  
(Forward/ Backward control by laser)

# Robotics-2 Robot to Robot

Understanding of the ID or status and the position relationship of each other.



# Desired Technical Features

The standard should be a consideration that meet following requirement

- Possible to multiple simultaneous reception
  - In any environment, easily discovery and receive plural signals are stable
- Image acquisition as an ordinary camera can also be simultaneously
- Use at a distance range of 0.5m ~ 100m or more.
- Unidirectional, Low speed, ID Beacon or simple data transmit
  - Low speed: pulse rate 5Hz – 120Hz (Tentative)
  - Acceptable short format to ensure acceptable response times even at low speed

## references

- 15-14-0037-00-007a
  - OCC proposal and applications (CASIO N. Iizuka)
- 15-14-0429-01-007a
  - Low-speed OCC, Adaptation to technical issues and Applications (CASIO N. Iizuka)
- 15-15-0112-03-007
  - Short-Range Optical Wireless Communications Tutorial (Intel Rick Roberts)
  - Slide #30 - #36