

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

Submission Title: IG DEP Development of Wireless System for Social Public Services

Date Submitted: January 19, 2016

Source: Takashi Takeuchi(NEC), Ryuji Kohno(YNU/CWC-Nippon)

Contact: Ryuji Kohno(YNU/CWC-Nippon)

Voice: :+358-8-553-2849, E-Mail: kohno@ynu.ac.jp

Re: IG DEP Development of Wireless System for Social Public Services

Abstract Reliable and secure wireless remote sensing system for social public services including water pipeline and gavage collection systems using wireless networks

Purpose: This document has been prepared for response to call for interest(CFI) of IG-DEP(Dependability).

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.

IEEE 802.15 IG DEP
Review of Responses to Call for Interest(CFI)

**Development of Wireless System
for Social Public Services**

Atlanta, GA, USA

January, 2016

Takeshi Takeuchi, NEC

Ryuji Kohno. YNU/CWC-Nippon

Agenda

Background

Updated New Type of Equipment Diagnosis
System by using wireless sensor devices

Required specification

Future Activity

Expecting Major Applications of Dependable Wireless Networks

All current serving network systems for social public services are requested to be renewed more reliable, secure, resilient, heavy duty, robust and safer by local and national governments.

Major applications for

-Disasters such as earthquake, tsunami, typhoon, hurricane, water flood etc:

- Disaster prevention
- Rescue and evacuation
- Recovery

-Social service infrastructures:

- Water supply and control networks
- Gas supply and control networks
- Electricity supply and control networks
- Public wastes collection system
- Other city services

Demands for Dependable Wireless



Population Ageing & Medical crisis
Healthcare Service(Medical ICT)



Cost of energy ... fuel supply & demand
Energy Network(Smart Grid)



Increasing environmental requirements
CO₂ Reduction, Green Innovation



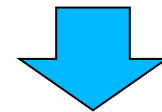
Escalating security concerns
Public Safety, National Defense



Heightened investor demands
Global Borderless Economics

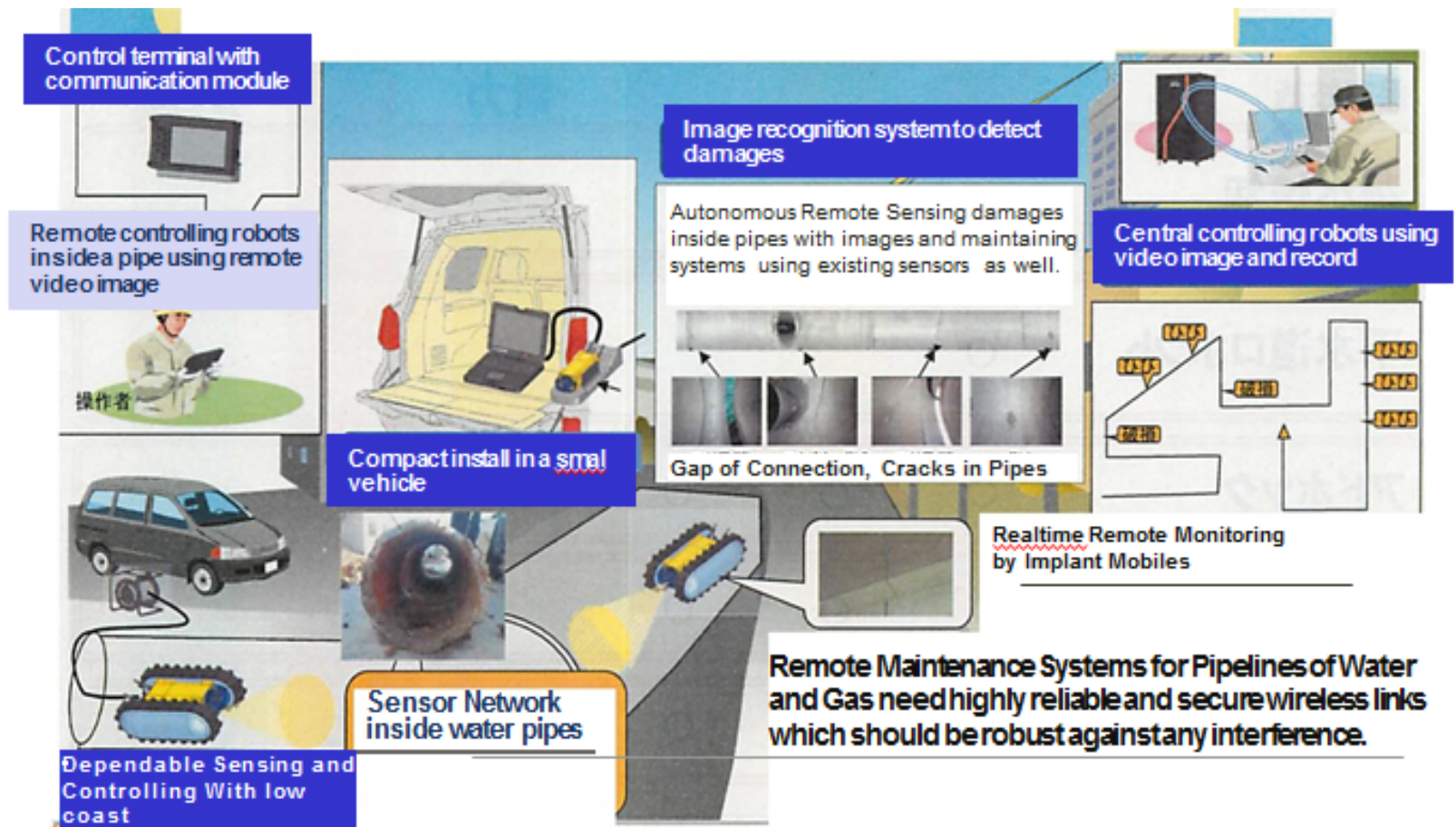
**Driving
Technology**

**Dependable
Wireless BAN:
IoT & M2M**



**Reliable and Secure
Social Public Services
by Government**

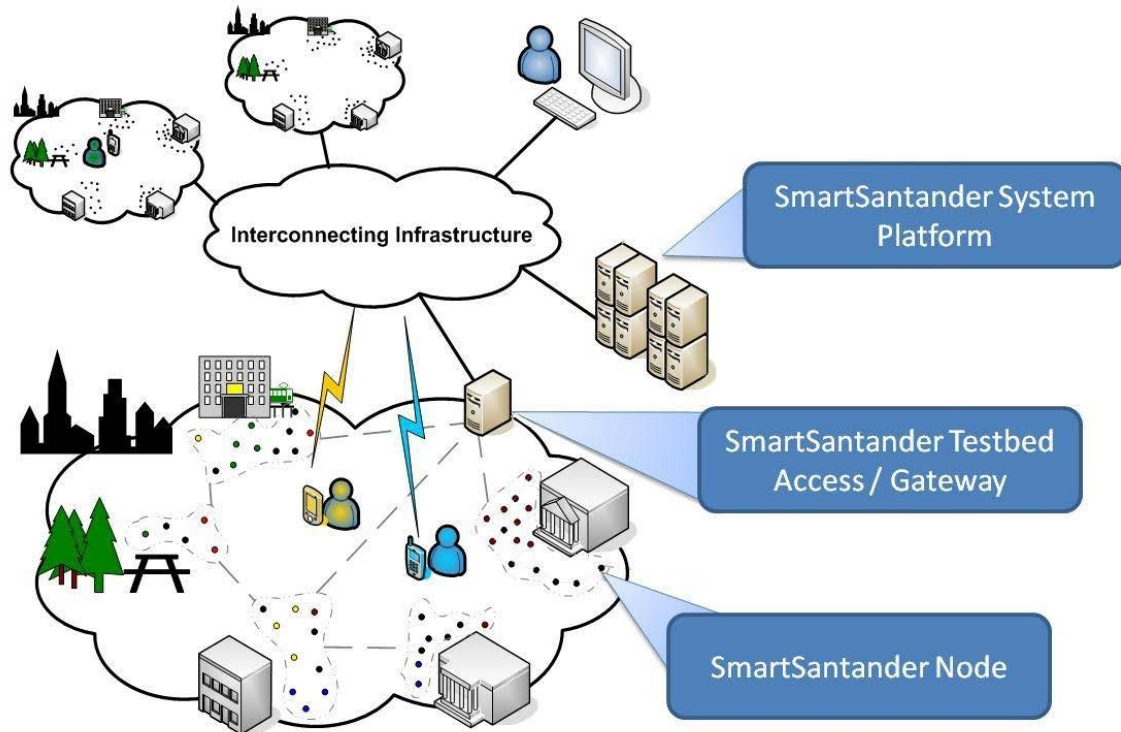
Water Pipeline Maintenance System



Public Wastes Collection System

Social Facility of Smart City Santander in Spain

The Santander testbed is composed currently of around 2000 IEEE 802.15.4 devices deployed in a 3-tiered architecture.



Key Functions

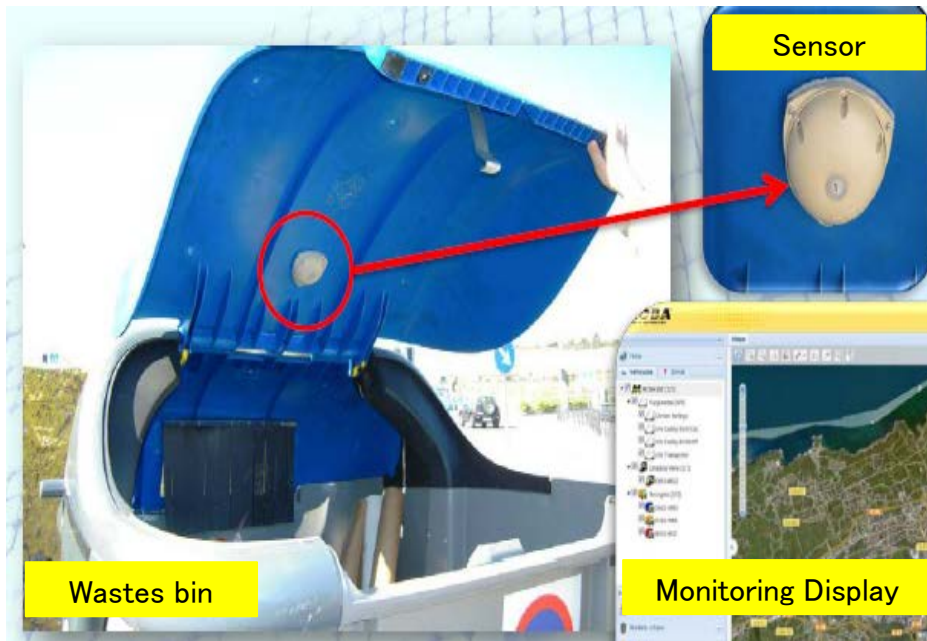
Validation of approaches to the architectural model of the IoT. Evaluation of the key building blocks of the IoT architecture, in particular, IoT interaction & management protocols and mechanisms; device technologies; and key support services such as discovery, identity management and security. Evaluation of social acceptance of IoT technologies and services.

Refereed from <http://www.smartsantander.eu>

Wireless Sensor Network for Public Wastes Collection

Optimization of wastes collection by utilizing sensor and M2M network has been operated since 2014 with ASCAN as the first practical application of Smart City.

http://www.nec.com/en/press/201410/global_20141007_03.html



- Transmit volume of wastes with its location information via M2M network in real time.
- Analyze above information and display the optimized route and timing on onboard monitor in collection vehicles.
- NEC and ASCAN to launch pioneering smart waste collection service in Santander
- Real-time data on bin levels enables city to optimise collection intervals and routes and reduce refuse vehicle emissions and running costs

Combination of sensor, M2M network and big data analytics

Efficient
collection

Cost
reduction

CO2
reduction

Relaxation of
traffic jam

Improved
community
environment

Have Current and Challenged Wireless Solutions

- Several trials using existing wireless technologies of
 - Mobile phones (3G, 4G),
 - WiFi, Bluetooth,
 - 900MHz public servicesfor mature and reasonable cost technologies.

- **Designed and implemented some prototypes for**
 - **Disaster rescue**
 - **City social services such as water supply and maintenance and waste collection**

- Required dependable performance has not been satisfied.

- Radio regulations do not approve for frequency allocation.

Further Demands for Current Systems

- Social insurance services request much reliable and secure wireless connection and permissible feedback delay in sensing and controlling than existing CE applications.
- Performance not sufficient for their requirements
 - Guaranteed network connection not sufficiently robust.
 - **Localization and Ranging capability of damage position should be accurate with permissible delay in real time monitoring and maintaining systems.**
 - **Governmental social public serves should be guaranteed to reliability, efficiency, effectiveness, regular services with reliable and secure networks.**

Expecting Performance Requirements for Forthcoming Services (1/2)

- Single radio solution for both normal and emergency use cases.
- Variable communications range, max. 1 kilometer link distances.
- Requirement, standard definition video transmission.
- Max. 100 devices within communications range.
- Prioritized access for rescue personnel, lower priorities for normal users.
- **In emergency environment, on-demand coordinator conflict resolution.**
- **According to variance of service environment, government social public service system should be guaranteed stability.**

Expecting Performance Requirements for Forthcoming Services (2/2)

- Pseudo real time sensing and controlling with permissible in disaster places and social service infrastructure systems.
- Federal and local government have to guarantee such emergency public safety and public supply services.
- Collaborative sensing with sensor arrays and sensor networks can solve these problems technically but radio regulation may not assume reasonable topologies such as star, tree, multi-layer topologies.
 - Multiple access control scheme matched with wireless remote sensing and controlling systems with limited feedback delay.
- Applicable for both emergency case and usual case.

Required specification

Specification for Social Public Services System

1. Public Satisfaction

1. Local and national government services should satisfy tax payers with enough high QoS in any environment.
2. Services should be adaptive for varying environment.

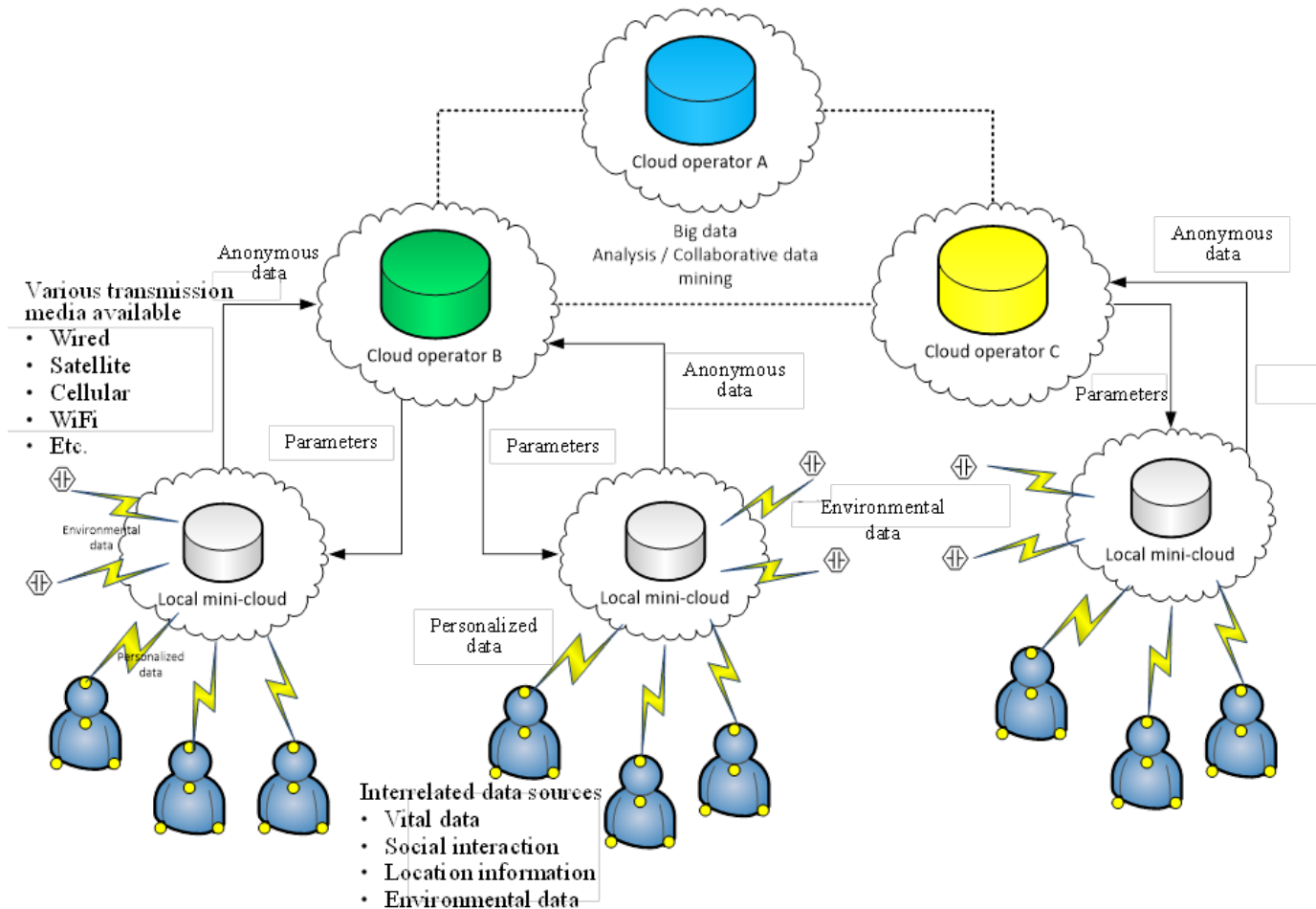
2. Economical and Efficient Services

1. In order to prolong a life time of measuring device to save energy and have good efficiency regarding communication power.
2. System should be robust against any wireless communication environment.

3. Dependable Social Infrastructure

1. In order to adapt varying environment, the system should sensing environment as well as targeting services and adapt the system by remote controlling.
2. Social services should be guaranteed worst performance enough high rather than average performance.

Assumed Upper Layer IoT/BigData/DataMining System for Dependable Wireless Social Public Services



Future Activity

1. Improving Current Social Service Systems with Dependable Short Range Wireless Networks
 1. Highly reliable real-time measuring with short range radio sensor network
 2. Highly secure decision immediately with measured data by wireless network of various sensors and past recorded data
 3. Strongly protected alarm and commands to equipment in a line for dependable remote monitoring and maintenance
2. Entire Social Public Service System Using IoT/Big Data/Mining through Cloud Network Using Dependable Wireless Real-time Feedback
 1. Build up individual dependable wireless networks corresponding to different demands and requirement.
 2. Entire common central management system using various dependable wireless networks through IoT/Data Mining server with cloud network
3. International Standard for Dependable Social Public Service Network Establishment with All other Institutes and Companies
 1. According to demands and requirement, various manufactures should make a common standard social public service system using wireless dependable short range sensing and controlling network with economical and efficient social services.
 2. IEEE802.15 may be the best venue of establishing a standard of dependable wireless feedback network for global common social public service systems.